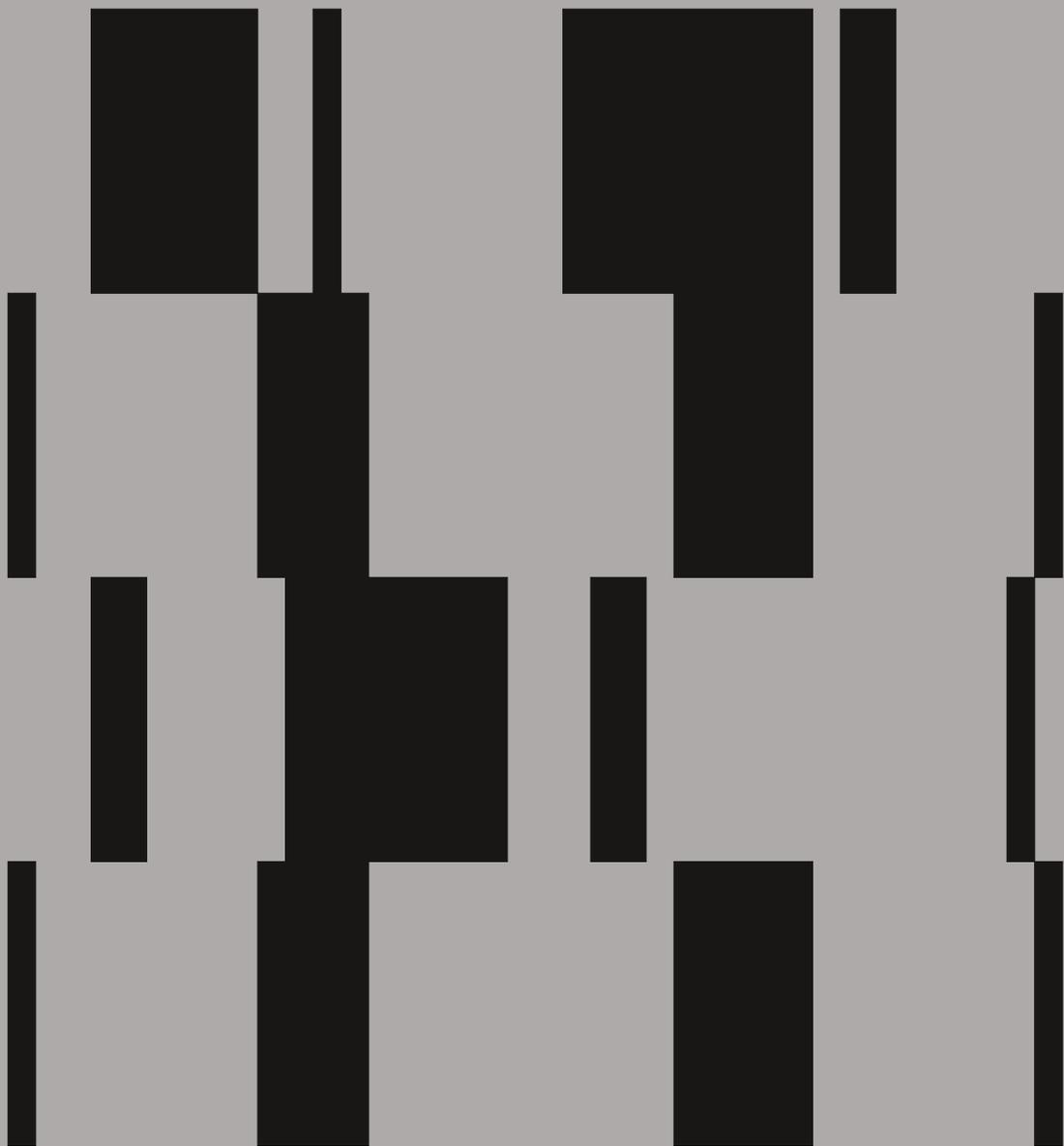
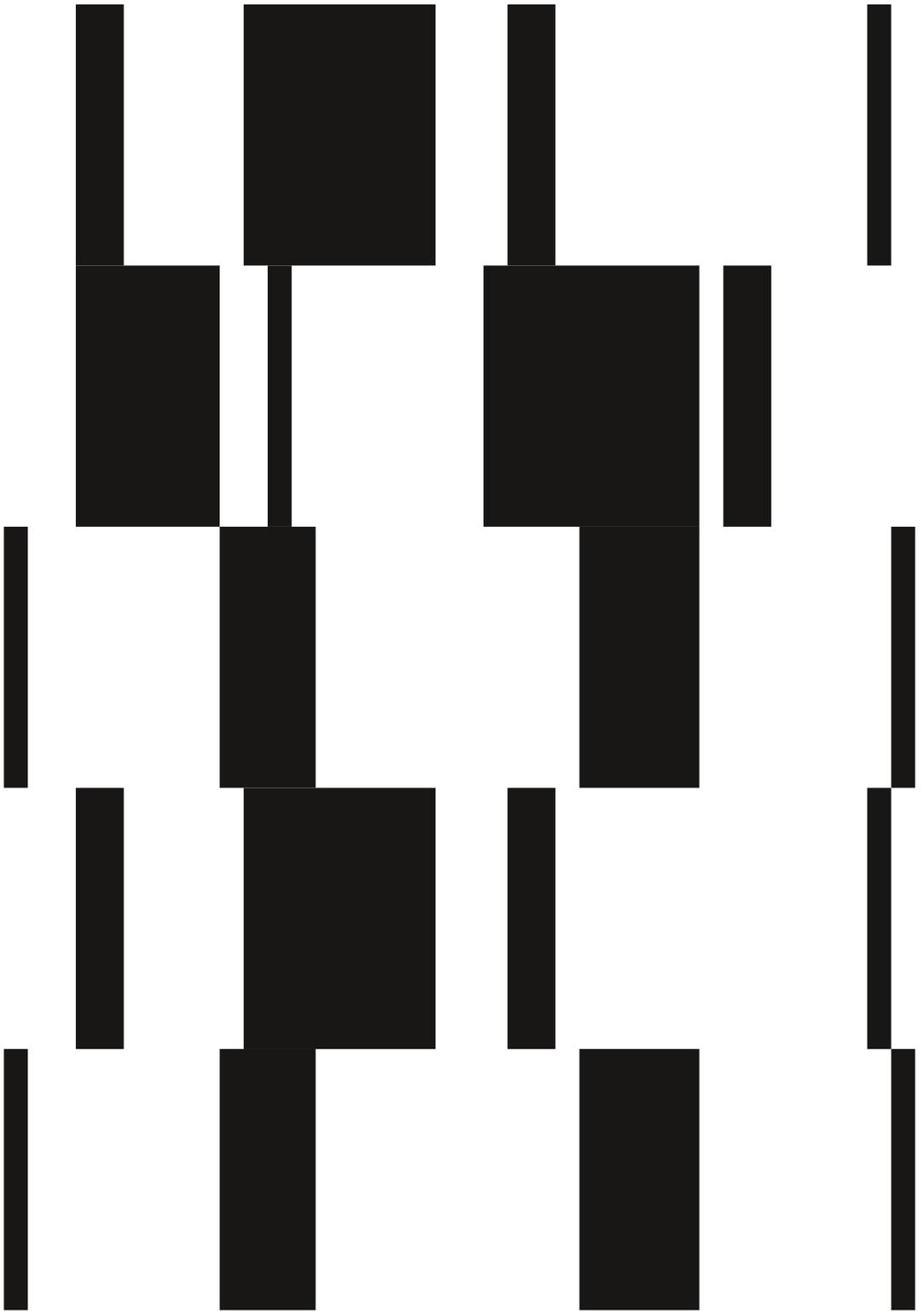


# The Practice of Art and AI







Gerfried Stocker, Markus Jandl, Andreas J. Hirsch

# The Practice of Art and AI

 **ARS ELECTRONICA**  
Art, Technology & Society

 **AI LAB**  
European ARTificial  
Intelligence Lab

**HATJE  
CANTZ**

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# Preface

# The Practice of Art and AI

European cultural projects give us an opportunity to formulate new, concrete answers to the major challenges facing European society and to experiment with them. The European ARTificial Intelligence Lab initiated by Ars Electronica is that kind of project. It brings together 13 cultural institutions for productive and exciting work on the questions currently surrounding artificial intelligence.

Funded by the European Union's Creative Europe Program, the AI Lab addresses visions, expectations and fears that we associate with artificial intelligence and builds on the European Digital Art and Science Network, a creative collaboration between scientific institutions, Ars Electronica, and cultural partners from all over Europe. Guided by the core idea of Human-Centered Innovation, the focus is always on people.

As a result of the Covid-19 pandemic, new exhibition formats have now emerged that provide exclusive insights into the fields and environments of the participating artists.

The results of the interdisciplinary exchange between art and science can be seen in this publication, which summarizes what the AI Lab has achieved in three years. I would like to thank all participating artists and institutions for their participation and their inspiring output.



**Andrea Mayer**  
State Secretary for Arts and Culture



 **Federal Ministry**  
Republic of Austria  
Arts, Culture,  
Civil Service and Sport

# Promises and Challenges in the Practice of Art and AI

Gerfried Stocker, Markus Jandl, Andreas J. Hirsch

Artificial intelligence (AI)—an umbrella term (though a somewhat vague and misleading one) encompassing many different technologies—is everywhere. Throughout the history of media art, artists have eagerly approached new technologies and explored their potentials and limits, as well as their implications for society. Experimental and critical enquiry of this kind is also at the core of Ars Electronica, which Hannes Leopoldseder (1940–2021) co-founded in 1979 as a “Festival for Art, Technology, and Society.” Since then, over more than four decades, Ars

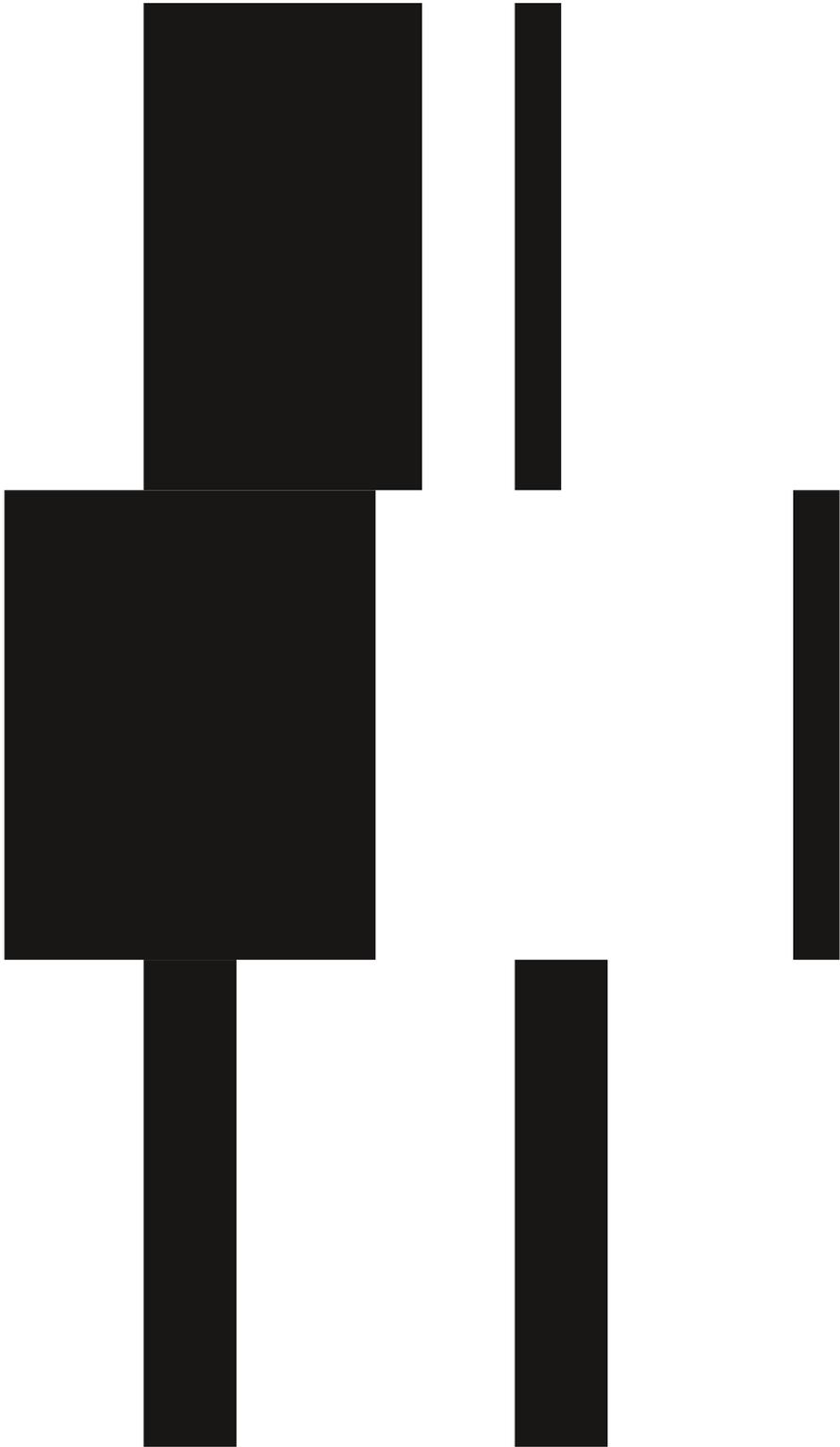
Electronica has developed into an ecosystem that offers artists and researchers manifold opportunities to work in transdisciplinary teams at the intersection of art and science. Consequently, in 2015 Ars Electronica—with support from the European Union—formed the European Digital Art and Science Network as an unprecedented collaboration of scientific and cultural institutions across Europe. The aim was to facilitate a project-oriented residency program that would bring artists and scientists together. Clearly, it is only in such international cooperative relationships that the momentum

for substantial impulses to break new ground can be realized. It seems noteworthy that several of the scientific partners in the European Digital Art and Science Network were institutions that had been founded on the basis of alliances between several European states, which were only able to create such massive infrastructures for research by joining together: the Large Hadron Collider of CERN near Geneva, the European Southern Observatory (ESO), located in Chile, and the European Space Agency (ESA). While the more recent international trend seems to lead back to the egoism of nation states, the spirit of collaboration over competition is still of paramount importance to our mutual efforts to support encounters between art and science, including the new field of “Art and AI.”

In 2017, the same year we published “The Practice of Art and Science” as a first account of the experiences and lessons from the work of the Digital Art and Science Network, the Ars Electronica Festival was devoted to the topic “AI—The Other I,” which allowed for a broader view of artistic approaches to the dynamic developments in the technologies around machine learning and neural networks. When the Ars Electronica Center initiated the comprehensive thematic redesign in 2019, the exhibition “Understanding Artificial Intelligence” played a key role in the effort to provide a broader public with an informed view of those new technologies and their far-reaching and often problematic implications for all areas of modern life. The exhibition “AI x Music” (Artificial Intelligence meets Music) focused on the encounter between artificial intelligence and music, and on human creativity and technical perfection. While “Understanding AI” laid the educational groundwork for approaching AI, the year 2019 saw further groundbreaking activities in this field at Ars Electronica. Under the thematic umbrella “AI x Music,” Ars Electronica continued its long tradition of highlighting the interplay of music and technologies by presenting a wide range of innovative music projects using AI, both at the Monastery of St. Florian and at the POST CITY in Linz, complemented by a symposium with leading experts from that field. The Big Concert Night of the 2019 Ars Electronica Festival at the Gleishalle of the POST CITY

was also the setting for *Mahler Unfinished*, a collaboration between Ars Electronica Futurelab key researcher and composer Ali Nikrang, an AI-based generative system for composition and the Bruckner Orchestra Linz conducted by Markus Poschner, where the unfinished *Symphony No. 10* by Gustav Mahler was presented in a completed version for the first time. Besides establishing a new Prix Ars Electronica category for “Artificial Intelligence and Life Art,” 2019 also saw the start of the European ARTificial Intelligence Lab, which is the reason for this book about “The Practice of Art and AI.”

The book combines a documentation of artistic projects presented within the European ARTificial Intelligence Lab and beyond with many voices, both artists and experts, discussing the most burning questions the practice of AI and art has raised so far. “The Practice of Art and AI” strives to give an account of the current state of affairs surrounding artistic work with AI, the challenges and constraints of such work, and the broad spectrum of approaches that have emerged. This is a highly dynamic field, where the technology itself advances at breathtaking speed, while the efforts to interpret and understand what is actually going on are in constant flux. What has become clear in the meantime is the urgent necessity of supporting further artistic work with AI, since expertise from engineering and policymaking alone will not be able to shape a humane and sustainable use of AI in the future. Efforts in this area are also part of Ars Electronica’s role in the European initiative for a “Digital Humanism” and a “New Digital Deal,” which is the theme of the Ars Electronica Festival 2021. All of this calls for the innovative potential of artists and their ability to ask unexpected, but most relevant questions. However, encouraging a broader and deeper involvement of a rising number of artists in this arena will require sustained and intensified efforts and funding from public institutions if we want the practice of Art and AI to flourish. The promising outcomes from the European ARTificial Intelligence Lab and the critical inputs from this publication may serve as a contribution to inspire and stimulate further artistic work and future humane uses of AI.



# Five Preliminary Notes on the Practice of AI and Art

Andreas J. Hirsch

For Lady Ada Byron, Countess of Lovelace (1815 – 1852), considered the first computer programmer, and for Hannes Leopoldseder (1940 – 2021), co-founder of Ars Electronica, two pioneers in the field between art and science, connected across the ages by their shared passion for computer technology as well as—paradoxical as it may seem—for Romanticism.

# 1. AI—Where a Smoke Screen Veils an Opaque Field

A phantom is roaming around the world, visible at certain points, but mostly hidden from plain sight, moving stealthily into every area of life and work, and into every private recess. It comes in the guise of the epitome of progress, promising increased efficiency and profit to some, absolute control and power to certain others, and commodities to the masses. Some see it as the harbinger of doom for humankind, a Pandora's box of self-destruction now opened and impossible to close again. Artists are attracted by this phantom, begin exploring its profoundly alien behavior, and experience its invasion of even the most exclusive realms of artistic creation, so far deemed to be one of the last reserves of what makes humans human. It sprang from the research laboratories of the digital transformation and quickly roused the interest of those who have the power and the means and who can comfortably act beyond public control. This phantom, after all, is no phantom, but a stark reality with phantom-like behavior, best known by a name, which again is part of the smoke screen frequently surrounding it: 'AI'—short for: Artificial Intelligence.

“The digital revolution, which originated in the 1940s with the pioneering work of people like Alan Turing, is now experiencing its real breakthrough with the hype around AI and the success stories about machine learning. The debates about AI can serve as a catalyst for new and far-reaching forms of reflection about the digital transformation.”

**Gerfried Stocker**, media artist, artistic director, and co-CEO Ars Electronica, Linz, Austria

“In case that the so-called singularity actually comes, it would be good if societies had learned until then, not only to consider but to practice collaborative negotiation also with machines. So far real collaboration among humans, namely between different disciplines, rarely takes place. For a collaboration with an autonomous technosphere we would need completely new cultural techniques.”

**Horst Hörtner**, media artist, CTO of Ars Electronica, and managing director Ars Electronica Futurelab, Linz, Austria

The smoke screens blurring the phenomenon of the current AI hype, however, are multifold and render the picture of AI opaque. They have been building up along highly symbolic events like the defeat of the Russian world chess champion Garry Kasparov by IBM’s Deep Blue in 1997 and Google’s AlphaGo winning against South Korean Go master Lee Se-dol in 2016. Those two events carry significance far beyond the impressive mastery of the games of chess and Go by machines. Between them lies the shift in power and significance from the traditional giants of the IT industry, like IBM, to the new major players of the digital transformation, the so-called “Big Four.” Those include Alphabet, Google’s mother company, which had acquired “Deep Mind,” the original developer of AlphaGo, as part of their expansive business strategy regarding AI. Mostly they are “young” corporations, which grew to market-dominating status and incredible net worth within a few years during the upswing of the digital transformation. They are essentially children of the internet, who abandoned the original spirit of the internet and the world wide web as open infrastructures for sharing and collaboration and replaced them with a neo-liberal logic of data capitalism. In 2017, when making AI the topic of the Ars Electronica Festival, Gerfried Stocker described that shift of research to the private sector: “Never before has so much capital been invested in pursuit of successful technologies and promising innovations. The concentration of scientific and economic power as it now exists among the so-called Big Four of the Internet is shifting scientific research from the military and elite universities into the private sector, and establishing it on a broad basis.”<sup>1</sup>

Between the two tournaments, where AI-based systems were victorious in chess and Go, lies the advent of machine learning and deep neural networks, the actual technology behind the hype around AI. And there is another aspect of the two events that points to the deeper questions behind AI, and at the same time helped to pull up a smokescreen of mythology around the technology. Early into the 1997 tournament, in the forty-fourth move of the first game, Garry Kasparov got irritated by a move of Deep Blue, an unexpected and puzzling sacrifice, which ultimately seemed to have led to the surrender of the human player several games later. There arose speculation about Deep Blue's mysterious move, which presumably has resulted from a software bug, qualifying as a "creative leap"<sup>2</sup> of this highly specialized machine. Somehow similar and at the same time even more earth-shaking was Lee Se-dol's puzzlement at AlphaGo's move number 37 in the second game of the tournament, "a move no human player would have made."<sup>3</sup> Even through the smoke of mythologizing, we get a glimpse of the profoundly alien form of intelligence that humans may experience in the encounter with machines.

After decades of research on artificial intelligence, a paradigm shift brought about the breakthrough that led to the current surge in AI. Research moved away from attempts to create an artificial intelligence after the model of the human mind, as had been described in books like *The Society of Mind*<sup>4</sup> by Marvin Minsky (1927 – 2016). It shifted towards a primarily statistical approach, which characterizes technologies like machine learning and deep neural networks. This paradigm shift resulted in systems that "see" the world and "think" in ways profoundly different from the ways in which humans perceive the world and make sense of it. One factor behind this paradigm shift is the growing amount of digital data accumulated from all kinds of applications. The digitalization of processes in business, public services and knowledge production, together with the migration of communication towards the so-called social media platforms and the outsourcing of services to the cloud, formed the realm of big data, which could not remain unattended for long. Big data formed the main value core for the corporations that collected and harvested them. Consequently, significant investments were made in technologies for continuously analyzing those data and for turning them into profit. Machine learning algorithms are trained with enormous amounts of data, and find patterns in those data that humans oftentimes would not have detected. Ars Electronic Futurelab key researcher Ali Nikrang draws the connection to artistic work: "Deep Learning systems are able to work with large amounts of training data. ... They can identify relationships and dependencies that human observers might never have paid attention to, and can therefore serve as a new source of inspiration for creative tasks in general. Especially for artists, AI can also be seen as a new creative field for experimenting and discovering new possibilities for artistic works."<sup>5</sup>

**"There are lots of mystifications, misconceptions, misunderstandings, and false expectations regarding AI. We became aware of the biases inside the algorithms very quickly, but the problem is, are the engineers really listening to us?"**

**Jurij Krpan**, artistic director Kapelica Gallery Ljubljana, Slovenia

“[AI systems] try to imitate the human creators by generating something similar to the data in the dataset. Besides, in my understanding, for creation you need the intention to create. This is also something that AI systems do not have and will not have in the near future.”

**Ali Nikrang**, artist, key researcher *Creative Intelligence* Ars Electronica Futurelab, Linz, Austria

Certain analog patterns can also be found between the dynamics of the IT industry and the art market. In both areas a constant flow of novelty—real or imagined—is needed to keep attention and prices up by frequently announcing “the next big thing.” Art that uses AI can meanwhile be found under the heading “AI Art,” which is heavily promoted as “art created by a machine.” In 2018 this new type of artwork even received the blessing of being auctioned at Christie’s in New York for the first time, where an artwork created by a Generative Adversarial Network (GAN) with the title *Portrait of Edmond de Belamy* went to an anonymous bidder for US \$432,500<sup>6</sup>. In the maelstrom of the art market, another smoke screen of an imagined modern mythology arose, which makes it even more important to separate the serious, in-depth artistic work with AI from the a la mode exploitations of AI-based technologies like “style transfer,” which celebrate the derivative look-alike qualities of some of the so-called “AI Art.” Instead, Ars Electronica Futurelab key researcher Ali Nikrang points to the limitations and open questions of this field: “Nowadays, A.I.-based generative systems are able to create realistic images, videos and even text and music in high quality. However, the question that arises here is: Can machines create something that can trigger emotional responses in us, in the way art does?”<sup>7</sup>

“Creativity affects the integral development of an individual, in his or her personal and professional growth and evolution, in ways of relating, interacting, and managing the known and foreign environment. Why should a machine do it, when it is precisely this process that distinguishes humans and also some other living beings? Why should we share this privilege with a machine?”

**Karin Ohlenschläger**, artistic director of LABoral Centro de Arte y Creación Industrial in Gijón, Spain, from 2016 until 2021

“It is somehow misleading to point in the direction of one kind of singularity. I am more concerned by another kind of singularity, from which we are no longer able to escape. AI is just one single segment of the dominance of the techno giants. There is the singularity of us no longer being able to live, to communicate, or to move around cities any more without the technology from those monopolies, which are already too complex. This is the main issue and not the rather abstract problem of singularity in AI. There is a Silicon Valley tendency to create such dreams like an AI singularity, which are a kind of veil for many forms of exploitation taking place today.”

**Vladan Joler**, director SHARE Lab, professor at University of Novi Sad, Serbia

For any in-depth artistic exploration, the technologies behind Deep Learning require substantial technical knowledge and programming skills. So far there is only a limited number of relatively easy-to-use AI-based applications for creative work with images, texts and music, which may be suspected of generating a certain aesthetic convergence in the results created with them. This situation raises questions about the ability of machines to actually make art and about a potentially new understanding of creativity, detached from previous concepts of human creativity. The range of opinions on this subject is fairly wide. The position in favor of the creativity of machines finds an eloquent promoter in an author like Arthur I. Miller, who based his book *The Artist in the Machine—The World of AI-powered Creativity*<sup>8</sup> on his life-long research into the secrets of human creativity and a profound survey of an emerging art scene working with AI.

“Can we as humans learn to appreciate art created by machines? That is a tricky and time-dependent question because we are merging with machines. As time goes on, we will have more affinity for art produced by machines.”

**Arthur I. Miller**, emeritus professor of History and Philosophy at University College London, author of *The Artist in the Machine: The World of AI-powered Creativity* (2019)

Although presenting impressive results in areas of artistic production, and powering numerous applications in non-artistic areas, the capabilities of deep learning, neural networks and GANs are still limited. Mostly they rely on the data with which they have been trained, and their processes are basically statistical. However, some systems—like a successor to AlphaGo, the system “AlphaZero” using a technology called “reinforcement learning”—teach themselves to play a game like Go, based only on the initial input of the rules of the game, but without any training on the countless existing records from matches that have already been played. Systems like AlphaZero fuel speculations about the advent of AI systems that go beyond the specialized and limited systems of today to deliver a form of “general artificial intelligence,” which would presumably lead to the emergence of a “superintelligence” that surpasses human intelligence in all areas. That critical moment is meanwhile heavily discussed as the so-called “singularity,” a term originally used in the context of technology by the Hungarian-American computer scientist John von Neumann (1903–1957), and further applied to the development of technology by Ray Kurzweil in his 2005 book *The Singularity Is Near—When Humans Transcend Biology*. There, Kurzweil describes the “singularity” as “a future period during which the pace of technological change will be so rapid, its impact so deep, that human life will be irreversibly transformed. Although neither utopian nor dystopian, this epoch will transform the concepts that we rely on to give meaning to our lives, from our business models to the cycle of human life, including death itself.”<sup>9</sup> Swedish-born philosopher Nick Bostrom in his 2014 book *Superintelligence—Paths, Dangers, Strategies* characterized the challenges presented by this scenario, which he considers dystopian: “Once unfriendly superintelligence exists, it would prevent us from replacing it or changing its preferences. Our fate would be sealed.”<sup>10</sup> Again, as with the question of true machine creativity, the debate about the “singularity” and its imminent or distant arrival delivers a broad spectrum of positions in favor and against, as well as more “agnostic” approaches.

**“Beyond the innovative use of technologies by artists, the most critical aspect is the questioning of the role of AI in societies: The ways platforms extract data, ideas of machine vision, and how they affect our own interaction with systems, surveillance, and AI-based weaponry, for example. The critical area is asking what AI is in our lives.”**

**Christos Carras, director Onassis Stegi, Athens, Greece**

“The promiscuity of AI as a term, its openness to being reconfigured, also means that it can be put to use in a range of ways ... The breadth of the term ‘artificial intelligence’ gives us license to consider all these elements and how they are deeply imbricated: from the politics of intelligence to the mass harvesting of data; from the industrial concentration of the tech sector to geopolitical military power; from the deracinated environment to ongoing forms of discrimination.”

**Kate Crawford**, co-founder of AI Now Institute at New York,  
author of *Atlas of AI* (2021)

The debate, however, shows some similarities with the great historic debate about the two world systems at the time of the Copernican revolution, which relocated humankind on planet earth from the center of the universe to an orbit in the solar system. The quasi-religious furor in parts of the debate also seems reminiscent of conflicts like the one between the Catholic and the Protestant version of the Christian faith, a juxtaposition which the Italian scholar and novelist Umberto Eco (1932 – 2016) once compared to the followers of the Apple and Windows operating systems. In those debates, an element of apocalyptic drama is always close at hand, fueling latent fears of humans being threatened or enslaved by machines. As with all such debates, there is a certain pressure to take sides, a pressure which an increasing number of experts and artists seem unwilling to succumb to, when they declare the debate about the “singularity” irrelevant and even futile. The debate, however, adds to the opaque character of the field of AI and also provides an oscillating background for artistic explorations into AI and its implications for our lives and societies.

“It is too late to go back and to try to change the way in which AI has been integrated in the fabric of all parts of our societies. But it is not too late to become aware of what it is to understand it. We can start thinking about an alternative that is equally powerful, but represents a different way of working with the machines.”

**Victoria Vesna**, PhD, artist, professor at the UCLA Department of Design Media Arts, director of the Art|Sci Center and California NanoSystems Institute (CNSI) at UCLA



<https://u.aec.at/3D5335F7>

## 2. A Wide and Deep Problem Horizon— Massive Powers behind AI in Stealthy Advance

What the distortions of the art market, the polarizing debates about a potential singularity and the widely misunderstood complexities of the new technologies—commonly summarized under the heading of “AI”—distract us from, is the real problem horizon in front of which the entire story of “AI and Art” is taking place today. That problem horizon has been created by the massive deployment and often problematic use of AI in the hands of a few huge corporations and not a few governments. The convergence of big data, advances in processor power, the emergence of machine learning and related technologies, the rise of new players in the private sector and the spread of totalitarian or proto-totalitarian governments worldwide have resulted in a complex situation, which in itself can be seen as presenting more than one kind of “singularity” in the social, cultural and political arena.

“It seems to be a human dilemma that every new technology surprises us so massively, that we want to reinvent everything. Artificial Intelligence can serve as an interface to understand certain existentially important things, like climate data for instance. Here the traditional role of art as science comes into play, to ask the questions that would otherwise not be asked and to see things clearer and earlier.”

**Martin Honzik**, artist, chief curatorial officer Ars Electronica Festival, Prix Ars Electronica, and Exhibitions, Ars Electronica, Linz, Austria

“The real singularity is about the industrial and financial power exerted by a few big players. We need to raise society from this lethargic state, since it does not make sense to be afraid of something that still can be shaped.”

**Gerfried Stocker**, media artist, artistic director, and co-CEO Ars Electronica, Linz, Austria

“We are in a paradox situation: A widely uncontrolled and also undemocratic use of technologies has brought us to the situation of a crisis, for which we can find solutions only through the use of technology.”

**Horst Hörtnner**, media artist, CTO of Ars Electronica, and managing director Ars Electronica Futurelab, Linz, Austria

“In contrast to other emerging technologies, in the case of AI for the first time decision-making is handed over to machines in areas like media, education, and consumption. Therefore, questions around the data, with which AI systems are trained, urgently need to be discussed in a transparent way.”

**Veronika Liebl**, director of European Cooperation and managing director Ars Electronica Festival, Prix Ars Electronica, and Exhibitions, Ars Electronica, Linz, Austria

The advent of this problem horizon went largely unnoticed for some time, during which AI-based instruments spread to most areas of modern societies. This process was readily supported by the people themselves, who long ago traded their roles as citizens for their main occupation as consumers and users. This readiness accelerated the ubiquity of smartphones, which had begun with the presentation of the first Apple iPhone by Steve Jobs in 2007, and coincided with the rise of companies like Google or Facebook. As became public only much later, Facebook had been instrumental in fueling political and ethnic hatred and in influencing elections in favor of the enemies of democracy. In parallel to this, systems like Amazon’s Alexa were welcomed into many homes as an AI-based “assistant” which actually—as it turned out later—spied on the users. Besides being subject to surveillance by the state for the sake of fighting crime and terrorism, the consumers actively made themselves accomplices in their own oppression. In a strangely unsettling way, this is a motif unpleasantly familiar from the history of totalitarian regimes, mirrored in the books of the British author George Orwell (1903–1950), written more than half a century earlier. In his 2015 book *The Stack—On Software and Sovereignty*, the philosopher and computer scientist Benjamin H. Bratton reflects on the geopolitics of computation and points to a shift, which he locates in the years around 2008: “Before this break, the growth of planetary-scale computing systems was seen more generally as a beneficent blossoming. ... After this break, however, the sky darkened, and now the Cloud portends instead state surveillance, tax evasion, structural unemployment, troll culture, and flash crashes.”<sup>11</sup>

Another form of tight surveillance and control appeared in a rising number of companies that seem to hold their workforce in a state of AI-enforced exploitation reminiscent of capitalism in the early industrial age, which the German philosophers Karl Marx (1818 – 1883) and Friedrich Engels (1820 – 1895) had analyzed in the middle of the 19th century. Worker’s rights, which had long been fought for, meet with a political backlash that is seeking to bypass or erode them, which comes reinforced by the uncontrolled and unrestricted use of AI-based technology. In all those areas AI is involved, while the malignity is not to be found in the technology itself, but in the management or governmental decisions forging the ways in which it is put to use—or misuse, that is. Civil rights, human rights, worker’s rights as well as privacy and freedom have come under attack and this attack is carried out with AI-based tools used for surveillance, facial recognition, profiling and more.

The selection of data used for training a system plays a crucial role in machine learning applications. This selection can easily result in certain kinds of biases in the systems, which then lead to problematic decisions in areas like jurisdiction, human resource management, insurance or healthcare. Such biases, if not corrected, can become more deeply entrenched as the AI system is used over time, through a kind of self-enforcing loop. Effects of erosion in such areas as rights can also be observed in the domain of media, where not only have journalists and media organizations increasingly come under attack, but also on a deeper level, where a dwindling attention span undermines the ability to conduct profound and nuanced background analysis of a news item. “Fake news” rapidly replaces serious, quality journalism as the dominant source of information for large parts of the population. While of course not all “fake news” is AI-driven, its amplification on social media platforms is, and the potential of AI-based tools to create so-called “deep fakes” in the form of video, speech, images and texts indicates further growing problems in this area. Stuart Russell, a leading researcher on AI, had—together with Peter Norvig—written one of the standard textbooks<sup>12</sup> on the subject in 1996. Two decades later and in the light of the rise of machine learning, Stuart Russell in a 2015 interview compared uncontrolled AI to nuclear power and its devastating effects not only in military, but also in civilian use. Russell advocated for a “modification of the goals of AI and the training of students so that alignment of AI systems with human objectives is central to the field, just as containment is central to the goals of fusion research.”<sup>13</sup>

**“While our economy and global markets do not accept the limits of growth, the evolution of AI is unstoppable. The Singularity University already exists in Silicon Valley, preparing a new generation for these speculative post-singularity futures where AI surpasses human intelligence. So, development is already underway and neither politicians nor the current legal system seems to be able to react in a timely manner.”**

**Karin Ohlenschläger**, artistic director of LABoral Centro de Arte y Creación Industrial in Gijón, Spain, from 2016 until 2021

“In the current discussions about ethical regulations for AI, a reflection about ethics as such and about questions of justice and fairness is missing. Ethics means to pose exactly those difficult and unsolvable questions, where there are no solutions in sight but only processes of a continuous negotiation of interests.”

**Gerfried Stocker**, media artist, artistic director, and co-CEO Ars Electronica, Linz, Austria

“AI and art can help understand the impact of AI. But the criticality comes from the artist, from conversations and societies, not from the art itself. There are urgent and important conversations happening also around AI, but the criticality is not built into the technology per se.”

**Caroline Sindors**, artist, machine-learning-design researcher, founder of Convocation Design + Research

A scan of the problem horizon behind AI would not be complete without considering the devastating ecological footprint of the technical infrastructures necessary for performing the work of all the machine learning systems and deep neural networks. AI researcher Kate Crawford describes artificial intelligence as an “extractive industry”: “The creation of contemporary AI systems depends on exploiting energy and mineral resources from the planet, cheap labor, and data at scale.”<sup>14</sup> Researchers Kate Crawford and Vladan Joler have analyzed the entire—human and natural—resource scheme behind Amazon’s Echo system in a project called “Anatomy of an AI.” Like the small hut containing the upper end of an elevator shaft leading deep underground into a mine, Echo sits on top of a wide and deep structure of breathtaking complexity and interdependency, which somehow eerily resembles the exploitation patterns of colonialism, which sucked natural resources out of colonized countries and their enslaved populations. Together with the team of the SHARE Lab, Vladan Joler also realized the project “Facebook Algorithmic Factory,” which sheds light on the inner processes and the layers of algorithmic data processing inside Facebook, which may conceal new ways of exploitation and manipulation. In her 2021 book “Atlas of an AI,” Kate Crawford draws a detailed, meticulously researched picture of the problem horizon behind AI and in her analysis deconstructs, step by step, the myths surrounding AI, which together form the smokescreens and affect the “Practice of AI and Art.” Such extensive and rigorous analysis is not intended to feed dystopian scenarios around the future of AI, but rather aims to lift the veil from processes that have been invisible until now, thus providing an informed basis for actively shaping the future use of the technology. It is evident that neither the utopian promises of AI—mainly to be found in the marketing of the IT companies promoting their tools—nor the dystopian scenarios of human self-destruction will be useful guides for future design decisions and policy making. The challenge

at hand is to find a third way between the Scylla and Charybdis of those two extremes and to steer clear of the many conceptual traps waiting there. A crucial point in this endeavor is to get rid of the notion of inevitability, which comes embedded in most discussions about AI, be they utopian or dystopian in flavor. The notion of inevitability is a distraction that immunizes AI from reflections and decisions about the purposes of the technology. Kate Crawford and the historian of technology Alex Campolo call the epistemological flattening of complexity that is a key element of machine learning, "enchanted determinism": "AI systems are seen as enchanted, beyond the known world, yet deterministic in that they discover patterns that can be applied with predictive certainty to everyday life. In discussions of deep learning systems, where machine learning techniques are extended by layering abstract representations of data on top of each other, enchanted determinism acquires an almost theological quality. That deep learning approaches are often uninterpretable, even to the engineers who created them, gives these systems an aura of being too complex to regulate and too powerful to refuse. ... We are told to focus on the innovative nature of the method rather than on what is primary: the purpose of the thing itself. Above all, enchanted determinism obscures power and closes off informed public discussion, critical scrutiny, or outright rejection."<sup>15</sup>

**“Many organizations are now developing policies regarding the use of AI. The debates are being held among policymakers, scientists, and representatives of the industries. The artists are mostly excluded. We are setting up policies that are looking into the past instead of the future. Digital artists should be involved and provide a broad, long term future view of potential developments and long term implications that these technologies have on humanity and nature.”**

**Mitja Jermol**, head of Centre for Knowledge Transfer at Institute Jozef Stefan, Ljubljana, Slovenia

**“The military past and present of artificial intelligence have shaped the practices of surveillance, data extraction, and risk assessment we see today. Extralegal tools used by the intelligence community have now dispersed, moving from the military world into the commercial technology sector, to be used in classrooms, police stations, workplaces, and unemployment offices. The military logics that have shaped AI systems are now part of the workings of municipal government, and they are further skewing the relation between states and subjects.”**

**Kate Crawford**, co-founder of AI Now Institute at New York, author of *Atlas of AI* (2021)

“We live in a time where we as human beings are the product. We need to have the humans in the center of the discussion instead of fitting them into the algorithmic systems, where AI drives the economy. There is something significant going on where art can play a vital role in creating immersive experiences that generally make those topics accessible to people.”

**Cecilie Waagner Falkenstrøm**, artist

On an individual level of an ethical approach to the practice, the Dutch fashion tech designer Anouk Wipprecht advocates for self-restriction and for a balanced and respectful use of AI as the responsibilities of those who are designing the systems: “The problem with Artificial Intelligence (AI) / Machine Learning (ML) is: it needs data, it is ‘hungry’ for information, as in—the more data, the better solutions it can come up with to spit out. This is what I want as a developer working with ML for example: the more data, the better interactions I can create. But when I put the ‘hat’ of a designer on: I want to be gentle with this data, make sure that the wearer is protected, and secured. So there is a big contrast between the two and that needs a balance. The balance you can bring by creating simplified settings and keeping things as close and personal as you can while designing a system, while thinking of less to non-invasive ways to do so.”<sup>16</sup>

Meanwhile, initiatives from the European Community and from Ars Electronica together with organizations across Europe are underway, which strive to formulate and promote a “digital humanism.” They react to the paradoxical situation that the use of human-made technologies urgently needs to be regulated to allow for their humane and non-destructive use. This initiative looks for a European way into the digital societies, which steers clear of the “data capitalism” of the IT monopolists and the “data totalitarianism” of authoritarian regimes. In the efforts of the “European Platform for Digital Humanism,” the “cooperation of art and technology is a much-requested bearer of hope.”<sup>17</sup> If not already at various other instances along the problem horizon of AI, the input from artists now comes into play as a kind of “last resort” in the search for solutions.

“We still have to make our decisions ourselves. Automated decision-making should only be applied when there are no ethical concerns in the broadest sense.”

**Jurij Krpan**, artistic director Kapelica Gallery Ljubljana, Slovenia

“Artists have a capacity of anticipation and might already be able to show us what practices and uses might be induced by AI. The relationship between AI and Art can identify the potential benefits and limits or even threats of the uses of AI.”

**Michel Ida**, Commissariat à l'énergie atomique et aux énergies alternatives, Grenoble, France

# 3. A Practice Challenging and Promising— Art and Science Encounters Put to the Test by AI

Although the field of AI today appears opaque and the problem horizon behind it looks grim, artistic approaches to the various aspects of AI are highly interesting and challenging. Given the long tradition of the media arts in exploring new technologies, taking them to their limits and casting light on their implications early on, the attraction of AI for an artistic practice seems more than logical. Recent developments in AI even take on the character of a culmination of the digital transformation, combining a technology not yet fully understood with implications in practically every direction one might choose to look. Such artistic approaches to new technologies have also been an integral part of Ars Electronica, where transdisciplinary work and the facilitation of encounters of art and science characterize the daily practice. Experiences from activities of Ars Electronica regarding AI, including the “European ARTificial Intelligence Lab,” which was initiated in 2019, reveal the contours of promising perspectives as well as significant challenges for artistic work with AI. Preceding the “AI Lab” was the European Digital Art and Science Network (EDASN), where Ars Electronica successfully brought together scientific institutions like CERN, the European Southern Observatory (ESO), and the European Space Agency (ESA) with cultural partners from the digital arts in order to enable residency formats for artists to gain practical experience in the encounter of art and science. An important aim of the “AI Lab” is to strengthen the role of artists as catalysts in reflection and innovation around the issue of AI.

“The main point about ‘AI and Art’ lies in the role that art should play in such an area of global relevance for societies. Questions around creation by AI are merely distractions. Should human artists be actually replaced by AI, then already substantial other things have happened in society before.”

**Martin Honzik**, artist, chief curatorial officer Ars Electronica Festival, Prix Ars Electronica, and Exhibitions, Ars Electronica, Linz, Austria

“When approaching work with AI, ask yourself why you want to work with this medium. Is the technology helping you to express something? Does the technology fit to what I want to express? Caution away from technology just for technology's sake. AI won't make an idea more interesting.”

**Caroline Sindors**, artist, machine-learning-design researcher, founder of Convocation Design + Research

Because most specialists in machine learning and deep neural networks are employed by the leading companies that drive research and development in this field with access to significant investment money, there is a great demand for experts who would be both interested and available to collaborate with artists, who naturally do not have such institutional and financial backing. Artists active in this field have frequently chosen one of three main options: team up with programmers and finance their work from project funding, take the steep learning curve to acquire the necessary skills themselves or deepen existing skills from previous education and projects, or get a place in one of the residency programs of the major corporations or in public programs like the “European ARTificial Intelligence Lab.” Not all of those three paths represent a realistic option for everyone, because most artists usually work with low-budget funding for their art projects or do not have the programming skills upon which they might build deeper AI expertise. Consequently, an increase in public funding for “AI and Art” residency programs seems to be badly needed.

Looking more closely at the first two options reveals the variety that can result from certain aspects of an artist's biography. The Danish artist Cecilie Waager Falkenstrøm always works with programmers in her teams, which—depending on the project—might also include choreographers or visual artists. Her project “Centaur”<sup>18</sup> was realized in a multi-disciplinary encounter with choreographer Pontus Lidberg and media artist Ryoji Ikeda. “Centaur” applies the metaphor of the half-human, half-horse creature from Greek mythology to a combination of artificial and human intelligence in “a modern dance piece that articulates the tension between man and machine, by enabling 9 dancers to interact with a machine-learning-based installation live on stage.” American roboticist and illustrator Sarah Petkus has teamed up with her partner, the electronics engineer and software developer Mark J. Koch, and together they use artist-in-residence programs like the “AI Lab” to widen the circle of experts around them for specific projects. In the case of “Moon Rabbit” their participation in the “AI Lab” includes residencies at the Leiden Observatory in the Netherlands and the Ars Electronica Futurelab in Linz. This makes perfect sense, as in their residency project they “attempt to teach a suite of artificial intelligences to recognize familiar shapes and objects in images of star clusters, planetary surfaces and other celestial bodies.”

“At the moment the question is more about the ways in which artists are able to make use of AI technologies in their work, and less about how computer scientists use art. It is a stronger flow in one direction.”

**Christos Carras**, director Onassis Stegi, Athens, Greece

Turkish computational artist Memo Akten is himself also an engineer and computer scientist, thus combining art and science in his own education and practice.<sup>19</sup> His project “Learning to See: Gloomy Sunday” is based on the insight that “We see things not as they are, but as we are” and uses an artificial neural network loosely inspired by the human visual cortex. In this project, AI technology—which is no longer modeled after the human mind—finds itself reflected back onto profoundly human ways of perceiving and allows us to explore the “difficulty of seeing the world through the eyes of others.” Ali Nikrang, key researcher for “Creative Intelligence” at the Ars Electronica Futurelab, also combines two different lines of expertise in his background. Ali Nikrang studied composition and received training as a pianist but also studied computer science. This prepared him for research in AI and music, which plays an important role at Ars Electronica. In the encounter of “AI and Music,” the role music has played at Ars Electronica since its founding in 1979—when the first “Klangwolke” made the *Symphony No. 8 in C minor* by Anton Bruckner flow through the city of Linz—converges with the close affinities between music and mathematics. This proximity turns the use of AI-based technologies in composition into a fruitful area of research and experimentation, which Ali Nikrang put to a spectacular test with the project “Mahler Unfinished” in 2019. By entering the first ten notes of the viola motif from Mahler’s fragment into the AI-based music system “MuseNet” from OpenAI, Ali Nikrang—together with the Bruckner Orchestra conducted by Markus Poschner—presented a completed version of Gustav Mahler’s last composition, his unfinished *Symphony No. 10*. The results from the machine learning system were orchestrated by Ali Nikrang and Markus Poschner and then performed by the human musicians of the Bruckner Orchestra at Ars Electronica’s Big Concert Night at the Gleishalle of the POSTCITY during the 2019 Ars Electronica Festival. In the same year 2019, Ars Electronica—as part of the STARTS initiative of the European Commission—presented “AlxMUSIC,” a combination of concerts and a symposium to enable “Encounters in the uncharted territories between human creativity and mechanical perfection.” At “AlxMUSIC,” several of the crucial questions around “AI and Art” were raised with the aim to move beyond a mere technological discussion towards cultural reflection: “Will machines be able to create compelling works of art or ingenious scientific theories? Will we be able and willing to appreciate it in the same way and at the same depth that we appreciate art created by humans?”

“Art explores and makes visible the edges of AI and its impact on all spheres of political, social, economic, and cultural life. It raises reflections and debates in a more transversal and multifaceted way, connecting facts and fictions, beyond what is determined by the interests of the market or politics. Regarding AI and art, this is not only interesting, but also necessary: disruptive and out of the box thinking, visualizing, or performing.”

**Karin Ohlenschläger**, artistic director of LABoral Centro de Arte y Creación Industrial in Gijón, Spain, from 2016 until 2021

“Due to the current hype around AI and the economic pressures behind AI research, most specialists for the involved technologies are fully booked, and financing AI projects is impossible for many artists. Public investment will be needed to support more artistic projects with AI, which in turn would benefit the common interest.”

**Veronika Liebl**, director of European Cooperation and managing director Ars Electronica Festival, Prix Ars Electronica, and Exhibitions, Ars Electronica, Linz, Austria

Even this brief glimpse at recent “AI and Art” projects indicates at least two noteworthy aspects. Artistic work relating to AI can serve as the most prominent incarnation of an encounter of art and science. At the same time, such work puts the collaboration between art and science through a serious litmus test, because the actual facilitation is substantially more difficult when a technology as demanding as AI is involved. Furthermore, with a refreshing directness and originality, many projects point immediately to some of the deeper and most crucial questions around AI and eventually towards the finer modalities of artistic work with this technology. In 2020, the German media artist Mario Klingemann received an Honorary Mention at Prix Ars Electronica for his piece “Appropriate Response,” which uses an enhanced version of the GPT2 neural network, trained with an additional 60,000 quotes. As in a chapel, the installation lets visitors kneel down on a bench in front of a split flap display, which presents each visitor with a unique aphorism created by the built-in AI. Mario Klingemann refers to the fact that “We fear AI but also hope it might help us,” which evokes the quasi-religious setting, where ultimately the users themselves furnish the aphorisms with meaning. On a different note, “Appropriate Response” may also serve as a point of departure to reflect on the intuitive ways in which a spontaneous collaboration between humans and an AI may take place.

“I enjoy the collaboration with scientists, the things that come out in conversations. I also like those moments when something goes wrong, and this sparks the interesting things. But I don't feel that I collaborate with an AI, since those statistical programs are not conscious. It is the concept behind it that makes art.”

**Anna Ridler**, artist and researcher

# 4. An Emerging New Relationship—AI and the Artist

As much as the “Practice of Art and AI” may be defined by structural constraints and a looming problem horizon, the actual encounter at the core of any artistic project in this field takes place between a human artist and an AI system. It is the inner workings of that encounter that shape the practice, the process and any results that go on to reach an audience. Because the heading of “AI” covers a bundle of technologies that are not yet fully understood, and due to the widespread experience of a profoundly alien kind of intelligence at work in AI systems, this encounter turns out to be far more delicate and challenging than the usual work of artists with digital technology. Only through experimentation in the practice itself can new forms and modalities of an artistic process involving AI emerge.

“Machines can be partners in creation on eye-level, in a situation that could be compared to a jam session, where one partner reacts to the other and vice-versa. Creation from machines remains statistical and limited by the data, which the system has been trained on. It lacks intention and namely the ‘dreaming’ in between. It is the intention, the process, and the context that define art.”

**Horst Hörtner**, media artist, CTO of Ars Electronica,  
and managing director Ars Electronica Futurelab, Linz, Austria

“Using AI in an artistic context requires a collaborative way of working with AI. The most significant limitation in the area of cooperation and collaboration between AI and humans is the lack of a common language between AI and humans. AI systems are very complex systems and there is not yet a satisfactory way to control and collaborate with AI in a way that humans can understand.”

**Ali Nikrang**, artist, key researcher *Creative Intelligence Ars Electronica Futurelab*, Linz, Austria

Christos Carras, Director of the Onassis Centre in Athens, observes: “Computational creativity does make us think more profoundly about our own creativity.”<sup>20</sup> Ideally, such experimentation brings us closer to the crucial questions about human and machine creativity. Once again, there is a broad spectrum of philosophical answers and approaches to be found in the actual practice, informed by individual positions on a “singularity” and the attribution of “creativity” to machines. This spectrum ranges from those who use AI-based applications merely as a “tool” to those who understand the AI as an “autonomous creator.” The more experience is accumulated, the wider the middle ground between those two extremes seems to become, and it now encompasses notions of “collaboration” as well as “companionship.” Although there is widespread consensus in this middle ground that even the most advanced AI systems today lack human intention and emotions, the deeply rooted human tendency to “humanize” machines lets us assume an entity with whom we can have an exchange at eye level. Even in cases where this tendency to attribute human features to a machine does not take place, the degree of unexpected results from deep neural networks can be awe-inspiring and practically forces us to presume an autonomous intelligence as our counterpart. Approaching a form of collaboration between human artists and AI systems is not exactly easy, as Ali Nikrang points out: “Collaboration means working together as equals and as counterparts. A trained neural network has its own expectations and assumptions about the music learned during training. Based on these assumptions, it calculates the probability of the next note based on some given previous notes. A human artist has different assumptions and expectations. Our goal as researchers and artists should be to bring these two worlds together by creating a new environment that can be used by both professional and non-professional artists. The potential of current A.I. systems for creative tasks can only be used in cooperation with human beings.”<sup>21</sup>

“The machine learning algorithms are artistic media that I use to bring forth my artwork. I would not say that a machine can be an artist that creates on its own.”

**Cecilie Waagner Falkenstrøm**, artist

<https://u.aec.at/DDCB4FD9>



“Sometimes, before we delve in creation we have to build an inspiring environment, a special mental state, where we can relax, immerse ourselves, and start to be creative. Machines can be good at that by creating a lot of interesting, thought–provoking starters of a conversation. But we should not be fooled to see this already as an original creative act. Artistic creation is the production of meaning.”

**Jurij Krpan**, artistic director Kapelica Gallery Ljubljana, Slovenia

Music and its proximity to mathematics, along with its affinity for technology throughout its history, may provide us with insights into the subtler aspects of the encounter between a human artist and an AI in the artistic process. The American trombone player and composer George E. Lewis, who is also a scholar of experimental music, created an improvising software called *Voyager* back in 1988, long before the advent of machine learning and deep neural networks. *Voyager* “analyzes an improvisor’s performance in real time, generating both complex responses to the musician’s playing and independent behavior arising from the program’s own internal processes.”<sup>22</sup> Improvisation in Jazz can serve both as a viable metaphor for such a collaboration and also as a hands–on example, as the performances of George E. Lewis with *Voyager* demonstrate.

“Machines can be a vital player in a creative process. The machine can create, but it is always part of a process, where human and non–human actors work together.”

**Cecilie Waagner Falkenstrøm**, artist

“Could forging meaningful relations to our developing AI help prime us for a healthier dialogue with our technological descendants once this time comes? ... machine parenting is as much about understanding [our] AI children, as it is about the AI’s learning and development. While [we] help them grow into individuals, capable of determining what they see, it is [our] hope as creators, that they gain insight towards what it means to achieve individuality as an artificial intelligence.”

**Sarah Petkus and Mark J. Koch**, artists

“AI is not a tool, but a sophisticated instrument that is capable of working with an artist. Collaboration happens when you both play off each other’s strengths.”

**Arthur I. Miller**, emeritus professor of History and Philosophy at University College London, author of *The Artist in the Machine: The World of AI-powered Creativity* (2019)

<https://u.aec.at/44C75ED5>



Ars Electronica Futurelab key researcher Ali Nikrang enjoys the unexpected outputs of AI systems, which can detect patterns in music that humans would not notice. Since he observed certain deficits of existing programs for AI-based composition, he decided to create his own system, which he describes as a “musical companion.” Ali Nikrang called this system RICERCAR in reference to the musical term for searching through variations of a theme. RICERCAR can receive input from a human composer and continue based on that, but can also propose ideas, which are then picked up by its human counterpart. This process of “searching” may continue back and forth over many iterations and can, as Ali Nikrang points out, “provide us with some insight into the inner workings of the music itself by showing us new aspects of musical data that have not yet been considered by human observers.”<sup>23</sup> What still makes such forms of collaboration difficult is the lack of a common language between humans and an AI, because the AI perceives music—or images or texts, respectively—in an entirely different way than humans do. Even with profound knowledge about the ways in which Generative Adversarial Networks or Deep Learning systems with several layers work, this gap in understanding does not seem to close. Such knowledge is certainly necessary to properly work with those systems or to modify or even design them, but the “common language,” which Ali Nikrang misses, does not emerge from engineering knowledge alone. It will require individuals with “hybrid” skills from art and science, like Memo Akten or Ali Nikrang, and interdisciplinary teams—as in the residency programs of the “AI Lab” or the work of the Ars Electronica Futurelab—to develop fresh and prototypical approaches to the human–AI collaboration, which may promise the most interesting results.

“It is interesting to look at the difference between cooperation, collaboration, and competition. You can use machine learning and AI in a way where the work can demonstrate how cooperation, co-creation, collaboration result in a much more magnificent way towards unpredictable and exciting results, than competition could. AI can amplify this experience.”

**Victoria Vesna**, PhD, artist, professor at the UCLA Department of Design Media Arts, director of the Art|Sci Center and California NanoSystems Institute (CNSI) at UCLA

“AI and Art is not just about collaboration, but about deeper symbiosis between humans and machines. Symbiosis here would mean complementing inefficiencies of human and AI thus helping each other, not just taking, but also giving back. Machines can detect, predict, see patterns, but it is hard for them to understand the meaning of their findings.”

**Mitja Jermol**, head of Centre for Knowledge Transfer at Institute Jozef Stefan, Ljubljana, Slovenia

“There are many reasons why machines should create. Art since World War II has been involving experimental practices, in order to produce results that are not mediated by human subjectivity. Think of John Cage or of Fluxus. The desire to have a result that you would not produce by yourself is basically the same. Computational creativity is one way to be inscribed in that process.”

**Christos Carras**, director Onassis Stegi, Athens, Greece

# 5. A Distant Mirror Coming Closer— AI and the Human Condition

The close encounter of human artists and AIs in an artistic process not only results in interesting works of art that raise questions and inspire critical discussion—it may also go beyond that and provide insights about the character of human creativity as such. Clearly, the notion of creative machines challenges the human self-image as the only living creature on earth that can create and enjoy art. Even after a long series of “insults” to human grandeur and self-esteem, the challenge from AIs creating art seems substantially threatening, because it touches upon the human condition even more deeply than the vision of a coming superintelligence. The Austrian founder of psychoanalysis, Sigmund Freud (1856 – 1939) once sketched<sup>24</sup> a list of “narcissist insults,” which begins with cosmology and the Copernican turn, and is followed by the discovery of Charles Darwin (1809 – 1882) that humans had sprung from animal ancestors in the process of the evolution, culminating with Sigmund Freud’s own theory of the unconscious, which confronts humans with the insight that their conscious “self” is not the master in its own house. Others have added to this list, which now includes the realization that humans are existentially embedded in and bound to the fate of the biosphere, as well as the vision of an artificial superintelligence surpassing human intelligence. After absorbing all those “blows,” the realm of human artistic creativity—with all the attributes of surprising originality, expression of a personal artistic intention, and the ability to arouse deep emotions—seems to have taken on the role of a last resort of humanity, which has now come under siege itself. This history of “insults” might help to explain some of the reactions to the topics around AI.

“Will we ever even be able to accept the fundamental otherness of such an artificial intelligence, considering how difficult this is for us in our interactions with other people with a different skin color or of another religion?”

**Gerfried Stocker**, media artist, artistic director and co-CEO Ars Electronica, Linz, Austria

“Due to AI, we have to think once again about our human condition, about our limited knowledge of what intelligence really is. By the way, we are discovering not only artificial, but also other human and non-human intelligences, awareness and consciousness.”

**Karin Ohlenschläger**, artistic director of LABoral Centro de Arte y Creación Industrial in Gijón, Spain, from 2016 until 2021

Those reactions—including all the extremes involved—are also due to the ways in which AI confronts humankind with a mirror, albeit a mirror into which we might not be too keen to glance. There we would see how technology affects human behavior in societies and induces changes to the disposition of the individual, from an erosion of attention span and empathy to the loss of different forms of literacy, which are no longer considered necessary, but which might suddenly become essential for survival again if electricity is not available.<sup>25</sup> AI does not merely confront us with ourselves, but also with a form of “the other,” which may be even more challenging to comprehend, if not to come to terms with. Gerfried Stocker in 2017 expressed a certain skepticism in this regard: “Will we ever even be able to accept the fundamental otherness of such an artificial intelligence, considering how difficult this is for us in our interactions with other people with a different skin color or of another religion?”<sup>26</sup>

“The most intriguing situation comes up when AI possibly emancipates from us and starts thinking independently as a machine. When you combine two AI algorithms and they start talking to each other, and all of a sudden we don't understand their conversation anymore. This also occurs when you combine machines with other living, non-human organisms. Their interaction provides you with this distance from an anthropocentric view. We should somehow enable machines to emancipate from us in order to be able to reflect our Cartesian attitude towards explaining things. Also science is recently teaching us that a rational approach is not enough.”

**Jurij Krpan**, artistic director Kapelica Gallery Ljubljana, Slovenia

<https://u.aec.at/41587B67>



“The risk is not so much that machines will get more intelligent than humans, but that humans will subjugate themselves to the decision-making processes of AI and slowly forget all the other elements, which are left out in these processes. Those may be extremely valuable things, like human experience or a value-based existence. The risk is us accepting to sacrifice elements of the human condition and slowly forgetting about them, when it becomes second nature to constantly communicate with machines.”

**Christos Carras**, director Onassis Stegi, Athens, Greece

Transcending the anthropocentric way in which we approach the “fundamental otherness” of AI seems to be part of the challenges waiting for us. In fact, the story of the “insults” to human self-understanding can also be read in an entirely different, no longer anthropocentric way. This would be a view based on the information theory as founded by Claude Shannon (1916–2001), which presumably also integrates another way of seeing things, if not by machines, then at least from the side of a broader understanding of computation. Here, milestones in the long history of science—from physics with the abstractions formulated by Sir Isaac Newton to biology with DNA as a message processor at the cellular level—are converging towards an understanding that all of them are basically about information. Such a view also sees the information-theoretical origin of the physical universe, as James Gleick points out in his 2011 book *The Information—A History, A Theory, A Flood*: “The whole universe is thus seen as a computer—a cosmic information-processing machine. ... The laws of physics are the algorithms. ... The universe computes its own destiny. ... Every new medium transforms the nature of human thought. In the long run, history is the story of information becoming aware of itself.”<sup>27</sup> This would then be the even broader “horizon” behind all the problem horizons drawn up in the culmination of the digital transformation, which AI has brought about.

“A collaboration between different AIs would let them develop their own art, interactions, language, values.”

**Mitja Jermol**, head of Centre for Knowledge Transfer at  
Institute Jozef Stefan, Ljubljana, Slovenia

“We are continuously redefining the human condition. If we need to rethink our position in this world, the relation of humans and technology is only one vector. The other important vector is the relation of humans and nature. In fact, it is a triangle of relations: humans, technology, and nature. It is important to put nature into the equation. This third factor has been left out of the discussion from the industrial revolution until today.”

**Vladan Joler**, director SHARE Lab,  
professor at University of Novi Sad, Serbia

<https://u.aec.at/BF7CF31C>



In the meantime, however, there are things to do. Reflection and discussion contribute substantially to reformulating the human condition, but to a large extent the human condition is shaped by the practice of living together in local and global contexts, interacting with the biosphere, and—notably—designing the systems and the technologies that surround us wherever we go. Therefore, managing a turnaround to wisely design or re-design those systems—including the practice of the entire complex of AI—in a sustainable and humane way, remains paramount. Artists experienced in the practice of AI and art will play a crucial role in this.

“It is difficult to understand how a machine understands. What we will be led to do, is to redefine our ways of understanding, what it means to be a human being. We are not only collaborating with machines but also merging with them. Before, it was us and the machines as ‘the other,’ but now we are merging into one. Consciousness is computable and so there is no reason why we cannot program a machine to have consciousness.”

**Arthur I. Miller**, emeritus professor of History and Philosophy at University College London,  
author of *The Artist in the Machine: The World of AI-powered Creativity* (2019)

“What AI does in interesting ways, is to create a kind of mirror to humanity. We created this and now it is reflecting back on us.”

**Victoria Vesna**, PhD, artist, professor at the UCLA Department of Design Media Arts,  
director of the Art|Sci Center and California NanoSystems Institute (CNSI) at UCLA.

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Born in 1961 in Vienna, Austria, **Andreas J. Hirsch** lives and works there as a writer, art curator, and photographic artist. He obtained his PhD in Law from the University of Vienna in 1986. His writings include books on Pablo Picasso, Tina Modotti, Friedensreich Hundertwasser, HR Giger, and Ludwig van Beethoven, as well as the children's book *Florian Featherlight and the Quest for the Magic Pearl*. As curator of Kunst Haus Wien from 2009 until 2014, he was responsible for large monographic exhibitions of works by photographers such as René Burri, Henri Cartier-Bresson, and Linda McCartney. He has worked with a wide variety of artists including Franz West, Bill Fontana, Scott S. Snibbe, and HR Giger.

His involvement with Ars Electronica, which includes a range of roles as consultant, curator, juror, and artist, started in 1996 with the concept for the SKY Media Loft at the Ars Electronica Center. From 2004 until 2007 he served on the Prix Ars Electronica jury for the Digital Communities category, which he had helped to create. He curated the conference *Open Source Life* at the 2010 Ars Electronica Festival. When the Swiss artist HR Giger was selected as the Featured Artist for the 2013 Ars Electronica Festival, Andreas J. Hirsch curated both the exhibition *HR Giger—The Art of Biomechanics* at Lentos Art Museum and the project *HR Giger's World for the Deep Space* at the Ars Electronica Center. In 2015 he participated in the POSTCITY Festival with his photographic project *Re-Reading the City—Views of the Posturban Condition*. Together with Gerfried Stocker, he published the book *The Practice of Art and Science* in 2017. He is the author of the 2019 book *Creating the Future—A Brief History of Ars Electronica 1979–2019*.

# Starting the European ARTificial Intelligence Lab

The AI LAB—European ARTificial Intelligence Lab emerged from the European Digital Art and Science Network, a creative collaboration between scientific institutions, Ars Electronica, and cultural partners throughout Europe that unites science and digital art. The European ARTificial Intelligence Lab takes up this theme and addresses the visions, expectations, and fears that we associate with the topic of Artificial Intelligence and makes them accessible in a variety of formats. Up to July 2021, the European ARTificial Intelligence Lab can proudly point to a host of substantial accomplishments—more than 200 activities showcasing approximately 400 artists from 40+ countries.

The European ARTificial Intelligence Lab is strongly focused on the legal, cultural, educational, and ethical dimensions of artificial intelligence, and human values as well as elementary questions about what AI should or should not do, and how and by whom AI systems are developed, deployed, used, and monitored are at the very center of its work. From the perspective of 13 major cultural operators in Europe, and led by Ars Electronica, the AI LAB encompasses the visions, expectations, and fears we associate with a future, all-encompassing artificial intelligence. While industries are investing in cutting-edge technologies to develop intelligent systems, we are connecting artists with research institutions and scientists to fill a gap in dealing with the social components and political questions arising from these enormous technological advances. An extensive program of activities addressing different target groups at various experience levels was carried out and will be continued until the end of the project.

### A Network of Collaborators

- **Kersnikova Institute / Kapelica Gallery** in Slovenia as one of the world's longest-established institutions for media art and driving force behind the ongoing redefinition of the avant-garde
- **Center for the Promotion of Science** in Serbia as a state institution with an ambitious long-term focus on getting across scientific content
- **LABoral Centro de Arte y Creación Industrial** as one of Spain's as well as Europe's largest and most important media art institutions with an educational program focused on its region
- **Zaragoza City of Knowledge Foundation** in Spain as a municipal project with remarkable infrastructure in the field of new media and technology that's open to citizens as well as to local and international artists
- **Science Gallery Dublin**, Ireland with its qualitatively superb educational programs dedicated to igniting creativity and discovery where science and art collide
- **Onassis Stegi** in Greece with its unparalleled mission to support modern cultural expression of new Greek artists and the cultivation of international collaborations at the intersection of sciences, innovation, and arts

- **The Culture Yard** in Denmark with its multi-cultural center and award-winning modern architecture embracing and exploring the field between art, science, and technology
- **GLUON** in Belgium has impressively maximized collaborations between artists, researchers, industrialists, young people, and active citizens for many years
- **Hexagone Scène Nationale Arts Sciences** in France, dedicated to a creativity platform shared with the French research center CEA to promote creativity through encounters between art, culture, technology, and sciences
- **SOU Festival** in Georgia with its SOU festival, cultural happenings, and education and information accessibility through workshops and other educational programs
- **Le lieu unique** in France with its magnificent credo and spirit of discovery in different fields of art such as visual arts, theater, dance, circus, music, literature, humanities, architecture, comics, or art taste
- **Waag** in the Netherlands, a European pioneer working at the intersection of science, technology, and the arts and its focus on emergent technologies as instruments of social change, guided by the values of fairness, openness, and inclusivity
- **Ars Electronica** as one of the longest standing and most important institutions in the media art genre, which, due to its tripartite orientation as a cultural, educational, and R&D facility, has served as overall project coordinator. Further, the European ARTificial Intelligence Lab unites a manifold network of scientific partners, research organizations, and AI industry collaborators, without whose intensive consultation and cooperation the project would not have been possible.

### Working with and on AI

All of these institutions have shared the same goal since 2018: to shed light on the question of what Artificial Intelligence is and more importantly what effects the advances in this field will have on our society. Every day we hear about the truly astonishing developments in AI, and they will soon be advancing exponentially with the increasing scientific and economic power that is invested by research and industry.

However, Artificial Intelligence and machine learning are difficult to understand—not only for society in general—and difficult to trust. And it is exactly this gap that has been addressed since the very beginning by the partner network of the European ARTificial Intelligence Lab, to contribute to a much stronger commitment to a better understanding, trust, and to a legal and ethical framework in AI.

On the one side, this meant allowing artists to experiment with Artificial Intelligence and gain an understanding of the creative exploration of this technology in their artistic practice. Many artists received opportunities to work with AI researchers and technology experts directly, or exchange knowledge in dedicated workshops, hackathons, and trainings.

On the other side, the activities strongly reflected Human-Centered-AI and highlighted strategies for how we need to advance AI reflecting real societal needs. Many such pathways addressed models for responsible governance of AI and the question of how AI should be deployed, used, and monitored.

## **Programming AI and Art**

Exactly these questions were at the core of an extensive program of more than 200 activities addressing different target groups at various experience levels:

- 14 residencies bringing artists and AI technologies and researchers together, starting with the first steps with AI and Art collaborations up to joint scientific publications
- A wide variety of cultural presentations including 24 exhibitions and 17 performances
- Educational activities for kids and youngsters with more than 82 activities
- 5 radio shows and 4 concerts
- Capacity building programs for professionals with over 46 training activities and 32 conferences and talks
- And a highly active professional exchange among the consortium members and beyond through the many scientific and technological partners

A strong focus of all activities in the program was audience development and AI literacy. Profound mediation formats in exhibitions, an extensive knowledge exchange program, and

many educational activities were targeted to increase both the understanding of citizens for AI as well as their capability to critically reflect current AI developments. The co-curation meetings of the network focused on how we can support our citizens to become creative and flexible thinkers, embracing and at the same time looking at AI innovation from a critical viewpoint. Engaging and involving the whole society in decisions about the development of art, culture, and science for a smarter, more sustainable, inclusive, and resilient Europe was a core priority in all our programs.

## **Re-thinking Mobility and Exchange**

And no one would have thought at the beginning of the project that resilience and solidarity would become more necessary than ever before. As always in pan-European projects, the European ARTificial Intelligence Lab started with a focus on transnational mobility by organizing mutual curatorial and jury meetings, touring exhibitions, residencies as well as educational programs to support the artistic exchange within Europe and beyond. What began with 13 diverse cultural partners geographically spread over the continent, and the plan for intercultural exchange through mobility led to a long-needed and truly thriving reflection on exchange without travel. The global pandemic changed the organizational principle of a festival in a global lockdown: a festival that should not dive into the network and disappear there but wants to emerge from the network and manifest itself in many places around the world, distributed and networked. The European ARTificial Intelligence Lab responded to the COVID-19 crisis by collectively participating in and re-thinking the hybrid Ars Electronica festival in September 2020 and September 2021. During the five-day Festival, partners—first and foremost from our network—presented programs both online as well as on-site in their respective cities, readapting their content to the new formats. This collective experiment opened doors to new audiences, contributed to building bridges between regional and international audiences, advanced classical cultural models like residency formats, and improved the project's outreach.

## Role of Artists in (AI) Innovation

Completely re-thinking models of (cultural) exchange is only one of the many examples for the transformative power of arts and culture. The European ARTificial Intelligence Lab has introduced a deeper understanding of the role of artistic practices in innovation culture, especially AI connected industries, and linked their protagonists to companies and research institutions. Cultural institutions strengthened their positions by expanding networks with new partners and exposing them with what we deem so irreplaceable: art thinking. We are connecting artists with research institutions and scientists to fill a gap in dealing with the social components and political questions arising from these enormous technological advances. Along the way, we have commissioned and presented a wide range of projects that are proposing actual product or process innovation connected to AI. Some of the frequently occurring critical contributions deal with many creative forms of grassroots technology, altering or hacking technology, and citizen's science. And many projects promote an agency shift from industry to consumers, especially for so-called smart products and increased privacy.

## A European Way into AI

Ars Electronica's European Platform for Digital Humanism, hosting the AI Lab, is only one of many possible European initiatives preoccupied

with a digital society, between the "data capitalism" of the IT monopolists and the "data totalitarianism" of the authoritarian regimes.

The platform reflects on fundamental questions about our relationship with technologies and how and for what we use them:

- How can we ensure that applications of digital technology oriented towards human needs and established social conventions, which respect the autonomy of users over their data, will offer the competitive advantage in the future?
- How can we advance and scale the role of artists and art thinking in developing and re-thinking technologies and, even more importantly, the governance models around them?
- How can we further increase the understanding of AI and technologies in our society to be able to act informed, be critical, and contribute to a discussion on AI's implications on wider levels—future of work, ecological, legal, and other dimensions relevant for us as individuals and as society as a whole.

These are the very questions that were addressed by the European ARTificial Intelligence Lab in the more than 200 wide-ranging, high-quality activities. But more work must be done fast and capacity must be greatly increased, if we want to exploit the human-centered innovation potential of Europe.

**Veronika Liebl**

<https://ars.electronica.art/ailab>

**Veronika Liebl** is director of European Cooperation at Ars Electronica and managing director of Ars Electronica Festival, Prix Ars Electronica, and Exhibitions. She leads Ars Electronica's European collaboration projects in the field of culture, research & education and developed, launched as well as executed in this position—together with her team—numerous EU projects such as the STARTS Prize or the European ARTificial Intelligence Lab.



The European ARTificial Intelligence Lab is co-funded by the Creative Europe Programme of the European Union. The European ARTificial Intelligence Lab is co-funded by the Federal Ministry of Arts, Culture, Civil Service and Sport.



# Scientific Partners

The European ARTificial Intelligence Lab is a creative collaboration between scientific institutions, Ars Electronica, and cultural partners throughout Europe that unites science and digital art. In the framework of the Lighthouse Residency Programme, Ars Electronica cooperated with four scientific institutions (Muntref Centro de Arte y Ciencia, Edinburgh Futures Institute, Leiden Observatory, and SETI Institute), which provide insights into their approach to the project on the following pages.

# Experiential AI

## @ Edinburgh Futures Institute

Experiential AI is a research group at Edinburgh Futures Institute and Edinburgh College of Art. It aims to support the creation of artistic works using machine learning algorithms and robotics, and to inspire new concepts and paradigms on ethical and responsible AI.

The group develops research on AI futures, science, art and ethics through collaborations with artists, festivals and the AI community. It tests the hypothesis that art and tangible experiences can mediate between computational technologies and human comprehension, in order to overcome the limitations of explainability and accountability in AI systems.

One programme of the group is The New Real, delivered in partnership with the Alan Turing Institute and Edinburgh's Festivals. The New Real creates experiences and supports the development of artists working with machine-learning data and algorithms as material (see fig.1 *The Zizi Show* by Jake Elwes). The research investigates how the design of digital experiences can surface critical issues and scaffold human understanding of AI systems. A desire to expand artistic uses of AI and explore the interactions between AI and our day-to-day reality is at the core of The New Real.



*The Zizi Show* by Jake Elwes (fig.1)



## Edinburgh, Scotland, UK

In our participation in AI LAB, we hosted an artist residency by Anna Ridler and Caroline Sindere. Anna and Caroline responded to the residency theme of Entanglements—Fair, Moral and Transparent AI by proposing an artistic exploration of the hidden human labor involved in creating an AI. The residency took the form of a cooperative research enquiry, in which Anna and Caroline participated in our research, and we supported their development of a new body of artistic work. One output is *Mechanized Cacophonies*, a newly commissioned artwork by Anna and Caroline presented jointly in 2021 by Edinburgh Futures Institute and Edinburgh International Festival. (see fig.2) In *Mechanized Cacophonies*, Ridler and Sindere present an immersive artwork inspired by their time during lockdown, which explores how interactions with nature are increasingly mediated by technology. Edinburgh is the world’s foremost festival city, and has been a center for AI research since the early 1960s. These two strengths combine to create a fertile environment for work on art and AI. Edinburgh Futures Institute is a new institute within University of Edinburgh to pursue knowledge and understanding that supports the navigation of complex futures. The Alan Turing Institute is the national institute for data science and artificial intelligence,

headquartered at the British Library. The AI & Arts Group is a multi-disciplinary expert group based at the Institute. It explores the interplay between AI, data science, the arts, creativity, and heritage. Edinburgh International Festival is the world’s leading performing arts festival.

**Drew Hemment**

Experiential AI and The New Real are led by Drew Hemment and funded by the Arts and Humanities Research Council, Scottish Funding Council, Creative Scotland, and Edinburgh’s Data Driven Innovation programme.

[www.newreal.cc](http://www.newreal.cc)



*Mechanized Cacophonies* (fig.2)



THE UNIVERSITY of EDINBURGH  
Edinburgh Futures Institute

# Leiden Observatory

The Leiden Observatory is housed in the Leiden Bio Science Park near the city center of Leiden, which has the largest cluster of dedicated medical life sciences companies and institutions in the Netherlands—around 103, and the largest number of bioscience start-ups in the Netherlands, including several multinationals and internationally acclaimed research institutes. The Leiden Observatory is divided over two buildings: the Van Oort building and the Huygens building. The institute also maintains the historical observatory in the center of the city Leiden. The old observatory has a visitor center that hosts several exhibitions related to astronomy and educational programs. Moreover, the historical building has multiple telescopes, both historical and modern. Leiden Observatory is the astronomical institute of the Faculty of Science of Leiden University. Established in 1633, it is the oldest university observatory in operation today, with a very rich tradition. Leiden Observatory carries out world class research in the formation of structures in the universe and the origin and evolution of galaxies, the detection and characterization of exoplanets, and the formation of stars and planetary systems. The institute consists

of about 35 faculty and adjunct faculty, 50 postdoctoral researchers, 50 MSc and 80 PhD students, and 30 support staff. They offer an excellent educational program at Bachelor and Master level and a renowned PhD program. Within the Faculty of Science, the institute closely collaborates with the Leiden Institute of Physics, the Mathematical Institute, and the Leiden Institute of Advanced Computer Science. The ambitious research program of the Leiden Observatory focuses on observations using the world's most powerful ground-based and space telescopes, on theoretical astrophysical and astrochemical modeling, on large scale simulations, and on laboratory experiments that mimic space conditions. This world-class astronomical research is supported by the development of key technologies for ground-breaking astronomical discoveries and translates into an excellent educational program at Bachelor and Master level. The PhD program delivers scientists who find employment in astronomy, industry, and society worldwide. Through their work, they also seek to engage the public with the wonders of the universe and share the scientific, technological, cultural, and educational aspects of astronomy with society.

<https://www.universiteitleiden.nl/en/science/astronomy>

## Leiden, The Netherlands



**Universiteit  
Leiden**  
The Netherlands

***Oude  
Sterrewacht***  
Sinds 1633

LEIDEN

Museo de la Universidad  
Nacional de Tres de Febrero

# Centro de Arte y Ciencia

The Museum of the Universidad Nacional de Tres de Febrero, Centro de Arte y Ciencia (Muntref Art-Sci Center), was established in 2011 in Tecnopolis Science and Technology Park in Buenos Aires City. Initially established due to transdisciplinary research on Art and Neuroscience made by Mariano Sardón (artist) and Mariano Sigman (neuroscientist), Muntref Art-Sci Center became a nodal platform for sustainable collaboration projects between artists and scientists. Since then, further research has included connecting Electronic Arts to visual cognition of still and moving images as well as text and musical partiture reading. Later, Artificial Intelligence—data visualization and sound; semantics analysis for text; mathematical models applied to music,

Synthetic Biology, mechatronic interfaces for medical rehabilitation, and trans-modal perception studies among other topics were added.

Art and Science can be thought of as performative practices implying a way to do things in ordinary life in scientific labs, academic institutions, and artistic contexts, sometimes very separate from each other. In this sense, the Muntref Art-Sci Center can be considered as a Meta-Lab that fosters the growth of a spread ecosystem constituted by linked persons and technical resources. It promotes the relationship between necessary contexts for the development of transdisciplinary projects that need to traverse scientific, artistic, technological, and other territories.

Buenos Aires, Argentina



Muntref Art&Sci—Rocio Pilar de Lara

Initial partners of the Muntref Art-Sci Center network were the Neuroscience Laboratory of the Universidad de Buenos Aires and Neuroscience Laboratory of the Universidad Torquato Di Tella. Additional institutions from Argentina and abroad were linked by the inclusion of new research and staff, for example, Ars Electronica (AT), Universidad Nacional de Quilmes (AR), Oxford University (UK), IBM Thomas J. Watson Research Center (US), Turku University (FI), Universidad de Valencia (ES), University College of Volda (NO), Universidad Católica de Argentina (AR), University of Vaasa (FI), Universidad de Los Andes (CO), Ferrán Adria's Bullilab (ES), Université de Perpignan (FR), and the Argentinean space technology company INVAP.

<http://untref.edu.ar/muntref/es/arte-y-ciencia>

Muntref Art-Sci Center is also an educational transdisciplinary platform for the Electronic Arts Degree Program at the Universidad Nacional de Tres de Febrero. Every research project has a group of students and scholarships that facilitate regular access to laboratories in different institutions, acquainting them with everyday on-site protocols under the guidance of professionals. Students spend time familiarizing themselves with relevant theories, frameworks, and methods, and engage in idea exchange and debates incorporating multiple perspectives. Through this practice, Muntref Art-Sci Center attempts to stimulate a generation of people trained in transdisciplinary thinking and practices, aiming at a more integrated and inclusive society.

## **MUNTREF** CENTRO DE **ARTE Y CIENCIA**

# SETI Institute

Founded in 1984, the SETI Institute is a non-profit, multi-disciplinary research and education organization whose mission is to explore, understand, and explain the origin and nature of life in the universe and the evolution of intelligence. Our research encompasses the physical and biological sciences and leverages expertise in data analytics, machine learning, and advanced signal detection technologies. The SETI Institute is a distinguished research partner for industry, academia, and government agencies, including NASA and NSF. The SETI Institute's Artist in Residence (AIR) Program is an international leader in the movement of integrating art and science. The AIR Program connects contemporary artists with SETI Institute researchers and facilitates an exchange of ideas to catalyze new perspectives, insights, and modes of comprehension. Our curatorial direction emphasizes projects that consider the evolution of intelligence, ponder the beginnings of life, and critically reflect on our anthropocentric world view. We explore the entanglements of art, science, and technology, and examine how this fusion connects to the human condition and our future as a society. The SETI AIR program sees the art-science convergence not only as a strategy to engage with the public at large, but also as a way to create new knowledge and reinvent epistemologies. The playing field of art-science-technology allows both our scientists

and our artists to challenge assumptions, ask questions, and contemplate possibilities. The AIR Program encompasses various artistic disciplines, including visual arts, literature and spoken word, music, film, dance, and theater. The artworks, performances, and public projects resulting from the AIR collaborations are situated at the cutting edge of artistic and scientific practice. The AIR Program's focus on AI and machine learning intersects with the SETI Institute's research into alien intelligence, astrobiology, and the search for cosmic technosignatures. In its endeavor to identify a signal from an alien civilization, the SETI Institute employs its Allen Telescope Array to sweep the sky. The vast amounts of data resulting from this search are parsed using AI in order to distinguish a possible technosignature from the cosmic background noise. Other significant areas of the SETI Institute's research are astrobiology, the exploration of life beyond Earth, and exoplanet research—the study of planets beyond our solar system. Here, SETI researchers rely on AI and ML to identify and classify various types of exoplanets and possible biosignatures. The search for alien signals, life beyond Earth, and habitable worlds are all linked to the same fundamental, overarching research question: Are we alone? It is a rich ground of exploration for both scientists and artists alike.

<https://www.seti.org>

## Mountain View, CA, USA

ATA Antenna, Alexander Poliak



# Ars Electronica Futurelab

Laboratory and Atelier  
for Future Systems



Robert Bauernhansl

Linz, Austria

Ars Electronica Futurelab is a laboratory and atelier for future systems. As the think-and-do tank of Ars Electronica, it always places the human being at the center of the research, considering the social aspects of technological developments such as artificial intelligence, robotics, media architecture, interactive technologies, new aesthetic forms of expression, or swarm intelligence and their effects on the future of society. At the interface of art, technology, and society, it creates future visions, which are realized for the public, together with cooperation partners from the fields of business, culture, research, and education. It networks and discusses the methods of creativity and technology to

accompany this development, and shapes future trends and visions. It develops new concepts for an autonomous future society in an inspiring field of tension between disciplines and transnational cooperation.

The European ARTificial Intelligence Lab offers residencies at distinguished scientific institutions to artists working with artificial intelligence. The AI Lab residency winners Anna Ridler (UK) and Caroline Sindors (US) as well as the collective Interspecifics (INT) were invited for online residencies at Ars Electronica Futurelab. Sarah Petkus (US) and Mark J. Koch (US), winners of the “Astronomy x AI” residency call, will visit the Futurelab in summer 2021 to work on their project *Moon Rabbit*.

**ars.electronica.art**



Martin Mittermayr

**ARS ELECTRONICA**  
**FUTURELAB**

# Scientific Institutions

The subsequent list indicates the scientific institutions that the consortium partners have worked with in the framework of the European ARTificial Intelligence Lab.

## **Ars Electronica**

### **SETI Institute**

Mountain View, California (US)  
<https://www.seti.org>

### **Leiden Observatory, University of Leiden**

Leiden (NL)  
<https://www.universiteitleiden.nl/en/science/astronomy>

### **Edinburgh Futures Institute at Edinburgh University**

Edinburgh (UK)  
<https://efi.ed.ac.uk/>

### **Muntref/ Laboratory of Neuroscience**

Buenos Aires (AR)  
[arte-ciencia.untref.edu.ar/home](http://arte-ciencia.untref.edu.ar/home)

## **CPN—Center for the Promotion of Science**

### **School of Electrical Engineering, University of Belgrade**

Belgrade (RS)  
<https://www.etf.bg.ac.rs/en>

### **Serbian Neuroscience Society**

Belgrade (RS)  
<https://sites.google.com/view/srneurosociety/>

### **Faculty of Media and Communication, Singidunum University**

Belgrade (RS)  
<https://fmk.singidunum.ac.rs/>

### **Faculty of Philosophy, University of Belgrade**

Belgrade (RS)  
<https://www.f.bg.ac.rs/en2>

### **Mathematical Institute of the Serbian Academy of Sciences and Arts**

Belgrade (RS)  
<http://www.mi.sanu.ac.rs/>

### **Faculty of Sciences, University of Novi Sad**

Novi Sad (RS)  
<https://www.pmf.uns.ac.rs/en/>

### **Faculty of Philosophy, University of Novi Sad**

Novi Sad (RS)  
<http://www.ff.uns.ac.rs/en>

### **Faculty of Technical Sciences, University of Novi Sad**

Novi Sad (RS)  
<http://www.ftn.uns.ac.rs/n1386094394/faculty-of-technical-sciences>

### **Slavic Department—Faculty of Arts and Humanities, University of Cologne**

Cologne (DE)  
<https://slavistik.phil-fak.uni-koeln.de/en/home>

## **GLUON**

### **Studio Stelluti**

Brussels (BE)  
<https://stelluti.art/home>

### **Raoul Frese (Vrije Universiteit Amsterdam)**

Amsterdam (NL)  
<https://www.vu.nl/nl/index.aspx>

### **Sinem Aslan (Ege University, Izmir)**

Izmir (TR)  
<https://ege.edu.tr/eng-O/homepage.html>

### **Rachel Rapp (Technical University, Berlin)**

Berlin (DE)  
<https://www.tu.berlin/en>

### **Carlo Santagiustina**

**(Ca' Foscari University of Venice)**  
Venice (IT)  
<https://www.unive.it/pag/13526>

### **Luc Steels (Catalan Institute for Advanced Studies ICREA, Barcelona)**

Barcelona (SP)  
<https://www.icrea.cat>

### **Bjorn Wahle (Universitat Politecnica di Catalunya, Barcelona)**

Barcelona (SP)  
<https://www.upc.edu/ca>

### **Televic Group**

Izegem (BE)  
<https://www.televic.com/nl>

## **Hexagone Scène Nationale Arts et Sciences**

**CEA (Commissariat à l'Énergie Atomique)**  
Grenoble (FR)  
[www.cea.fr](http://www.cea.fr)

### **MIAI (Multidisciplinary Institute for Artificial Intelligence)**

Saint-Martin-d'Hères (FR)  
<https://miai.univ-grenoble-alpes.fr/miai-institute>

### **UGA (Université Grenoble Alpes)**

Saint-Martin-d'Hères (FR)  
<https://www.univ-grenoble-alpes.fr>

## **Waag**

### **ILEWG—International Lunar Exploration Working Group**

Noordwijk (NL)  
[https://en.wikipedia.org/wiki/International\\_Lunar\\_Exploration\\_Working\\_Group](https://en.wikipedia.org/wiki/International_Lunar_Exploration_Working_Group)

### **Hybrid Forms lab at Vrije Universiteit Amsterdam**

Amsterdam (NL)  
<https://hybridformslab.com>

## **Onassis Stegi**

### **Athena Research Center**

Athens (GR)  
[www.athena-innovation.gr](http://www.athena-innovation.gr)

## **LABoral Centro de Arte y Creación Industrial**

**Centro de Inteligencia Artificial (AIC)**  
Gijón (ES)  
<https://www.aic.uniovi.es>

### **Instituto de Neurociencias (INEUROPA)**

Oviedo (ES)  
<https://ineuropa.uniovi.es/>

## **Science Gallery Dublin**

### **ADAPT Research Centre**

Dublin (IE)  
<https://www.adaptcentre.ie/>

### **Akara Robotics**

Dublin (IE)  
<https://www.akara.ai/>



# Cultural Partners

## European ARTificial Intelligence Lab

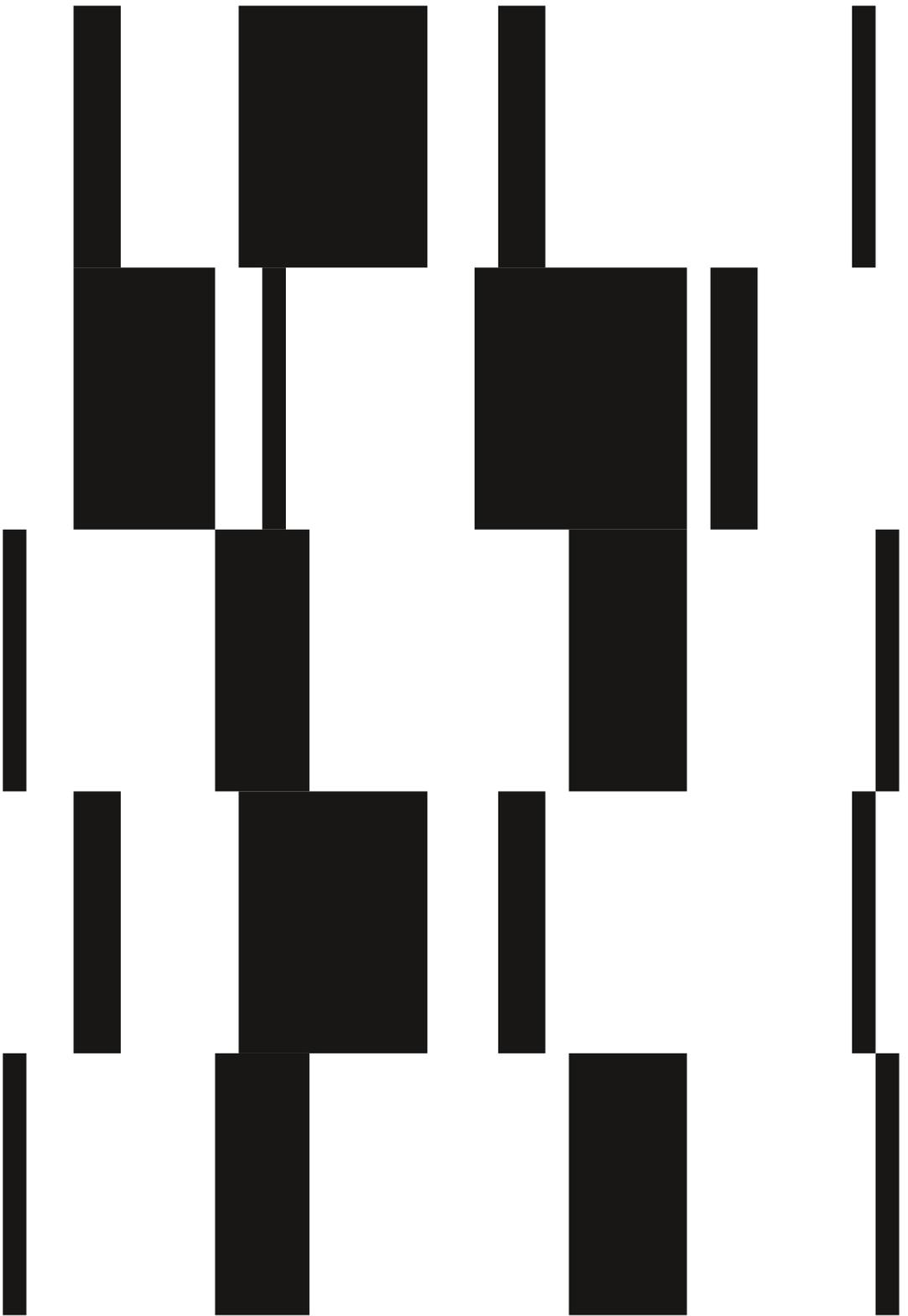
The European ARTificial Intelligence Lab is a creative collaboration between scientific institutions, Ars Electronica, and cultural partners throughout Europe that unites science and digital art. The European ARTificial Intelligence Lab brings AI related scientific and technological topics to general citizens and art audiences in order to contribute to a critical and reflective society. It focuses on aspects beyond the technological and economic horizon to scrutinize cultural, psychological, philosophical, and spiritual aspects. From the perspective of 13 major cultural operators in Europe, the European ARTificial Intelligence Lab centers visions, expectations, and fears that we associate with the conception of a future, all-encompassing artificial intelligence.

### **Cultural Partners**

Ars Electronica, CPN—Center for the Promotion of Science, Zaragoza City of Knowledge Foundation, LABoral Centro de Arte y Creación Industrial, Kersnikova Institute Kapelica Gallery, Science Gallery Dublin, Onassis Stegi, The Culture Yard /clickfestival, GLUON, Hexagone Scène Nationale Arts Sciences, SOU Festival, le lieu unique, Waag

### **Activities**

An extensive activity program in the form of exhibitions, labs, workshops, conferences, talks, performances, concerts, mentoring, and residencies fosters interdisciplinary work, transnational mobility, and intercultural exchange.



# Ars Electronica



Linz, Austria

# Ars Electronica

## Innovative Ecosystem for Art, Technology and Society

Ars Electronica has created an ecosystem for innovation. This ecosystem not only supports and enables a wide range of artistic developments and achievements, it also allows for pioneering technological developments because it replicates the artistic thinking process from inspiration to experiments through to creation, involving a wide range of disciplines and skills. This ecosystem evolves around the triangle of Art, Technology and Society that was coined for the first Ars Electronica Festival in 1979 and has since developed to encompass a whole spectrum of activities.

At the annual **Ars Electronica Festival** every September, we bring together artists and scientists, creators and engineers, activists and economists from all over the globe to present their work and their visions of the future. It's a great feast of eclectic, enchanting, intriguing, and captivating creations, a unique environment of intense discussions and inspiring encounters. **Prix Ars Electronica** is the world's most highly

regarded award for artists working in science and technology. Up to 4,000 submissions from more than 100 countries each year impressively document the dynamics of international media art. The presentations of the awarded projects and artists are special highlights of each Ars Electronica Festival. **Ars Electronica Center** with its exhibitions and programs focuses all year long on educating people about how new technologies and sciences are changing their lives as well as engaging them in the process through interactive displays and experiences. Special education programs and workshops have earned the Center its reputation as a "School of the Future."

The powerful pillar for research and development is **Ars Electronica Futurelab**, a place of inspiration and creative ideas, where artists, engineers, and developers team up to work together from the outset on art projects as well as commissioned research projects. As a spin-off of the Futurelab, **Ars Electronica Solutions** brings the creations and prototypes

that emerge from this ecosystem to the market and supports local industry and business in their development of new products and services.

**Ars Electronica—create your world** is the name of Ars Electronica's exciting programs and initiatives for and with young creators. Since 1998 we celebrate and support the creative and innovative ideas of young people and their visions for the world of tomorrow. **Prix Ars Electronica u19—create your world** is an own category for young creators up to age 19. Based on its big international network of artists and creators and the rich experience of curating and producing festivals and exhibitions, Ars Electronica has become an attractive collaborator for many museums, festivals, and exhibition venues worldwide. Under the name **Ars Electronica Export** we realize exhibitions and workshop programs worldwide, each custom-tailored for our partners. With a permanent presence and activities in Tokyo and Osaka, **Ars Electronica Japan** is engaged in artistic projects, collaborations with

universities and museums as well as research, development, and consulting projects with many Japanese leading companies.

The development and practical evaluation of new innovative methods and technologies for education and knowledge transfer with special consideration of new digital media is the goal of **Ars Electronica Education**. The applications range from kindergarten and schools to special programs for universities and professional training and qualification services for business and industry. The latest programs are the **Ars Electronica Future Thinking School** and **Ars Electronica Home Delivery**, a service that was created in response to the global pandemic and its lockdowns.

**Ars Electronica Archive** is a unique collection of descriptions and audio-visual documentations of over 150,000 projects linked with Ars Electronica since 1979, a unique opportunity to research the cultural impact of the digital revolution.

[ars.electronica.art](https://ars.electronica.art)

# Humanizing Technology

From the very beginning, Ars Electronica's field of tension in terms of content was characterized by the concepts "art," "technology," and "society." Three terms that, analogous to the rapid technical developments of the industrial revolution, clash in ever new constellations and simultaneously create new spaces for negotiating answers to the question of what it means to be human and reflecting on the role that technology plays. In the history of Ars Electronica, the discovery and development of these new spaces and the aforementioned negotiation is and was carried out by media artists, whose common paradigm was to enter these spaces as pioneers for art and society in order to explore whether common models of values and references in society would still hold up and to question the fundamental social changes that technological progress would lead to. After the elementary thrust of change brought about by electronification and automation, it was the "digital" whose potential for change opened up a whole new category. Rarely before has there been a technology whose potential and power for change has been as great as the digital itself. Media art proclaimed the "Digital Revolution," and an avant-garde was formed that was able to simulate the visionary potential of the Digital Revolution, including its utopias and dystopias, through its philosophical reflectiveness and its high level of technical understanding. New designs of democratic appropriation concepts with technology up to alternative prototypical, innovative applications of technology were the result of artistic reflection and visionary power. What's amazing here is that back in the 80s and 90s of the last millennium, it was the world of media art, also at Ars Electronica, that was building up expertise on those technologies that are considered cutting edge and state of the art in our reality today. VR,

AR, or AI has been part of Ars Electronica's narrative since the early days. If you just look back at the old festival titles and the participating protagonists, it is astonishing to see how long these themes have been around and who was involved—artists. Back in 1990 cognitive scientist Marvin Minsky (co-founder of the Massachusetts Institute of Technology's AI laboratory), one of the pioneering researcher of artificial intelligence, took part in the Ars Electronica Festival. In 1993 the Festival was focused on "Generic Art and Artificial Life." And there are many more such examples. Artificial Intelligence was a key topic and an immanent part of an artistic vision of a future permeated by technologies long before the turn of the millennium. But it is also astonishing what has happened since then, what place the digital space has become, what radical and fundamental changes have occurred within a generation, how the utopias and dystopias have come true or even surpassed them, and also how urgently the digital revolution should be followed by a digital concept of culture. "Humanizing Technologies" is a concept coined by Ars Electronica and can certainly be seen as a core element of the cultural mission of Ars Electronica. This conceptualization conveys that technology should serve people, includes the question of where we specifically want it to work for us, and also addresses which technologies have the greatest potential for transformation. The importance and relevance of this concept and the questions it raises can be seen in the development of Ars Electronica itself and its various orientations. Today, the questions of the avant-garde can be found again in this cultural "ecosystem" that attempts to communicate its themes to, and is geared towards, society as a whole. The Ars Electronica ecosystem endeavors to demystify technology and to communicate the central

technological achievements of humankind with all the potential benefits and risks, to individuals, groups, and society in general. One of the greatest challenges facing humanity, and arguably the most pervasive technology of the present and future, is AI. As a new phenomenon, “the autonomization of automation” has led to one of the most challenging paradigm shifts in human history. The omnipresence of the discourse surrounding AI and the resulting mystification of a technology have also led to fundamental changes in the basic orientation of Ars Electronica as a whole. Today, there is virtually no area of Ars Electronica that does not deal with AI.

In 2017, “Artificial Intelligence—The Other I” was the festival theme, and in the Prix Ars Electronica it was also noticeable, especially in the categories of Interactive Art and Hybrid Art, that an increasing number of submissions dealt with AI. It was the time of hype, but also of finger exercises. A few applications became instruments on which artists practiced, and some of the early results were rather insubstantial—such as style transfer and psychedelic image worlds from the “eyes” of the machines, the creation of Art, designing artificial intelligences and machines that, in the hype and self-absorption of the technology itself, caused a brief stir on the art market. But in retrospect, the beginning was important because it initiated an important fundamental discussion, which was, however, rather back to the human being. Basic concepts needed to be clarified—something that only a handful of artists managed well. An ironic comment by Gerfried Stocker at the 2017 Ars Electronica Festival was: “It would be better for us as humans to work on our vices and bad manners, before we pass them on to other machines as intelligence.”

So this is what we tried to do. But the beginnings of 2017 quickly turned into a more substantive, critical, and professional discussion. This could be seen in many areas outside the art world, which also had an immediate impact on the reflective quality of the Art itself. The question of “what” was replaced by the question of “where” this technology should be applied in a meaningful and critical way to make it work for the whole and not against the individual. The potential ubiquity of AI in our future, and already in our present, meant that it has become the central theme in all areas of Ars Electronica. In 2019, on the occasion of the thematic redesign of the Ars Electronica Center, AI was the defining theme. “Understanding AI” became the central exhibition in the Museum of the Future, “AI x Music” not only a permanent exhibition in the museum but also a central program format of the Ars Electronica Festival itself. In 2019, the Prix Ars Electronica’s “Hybrid Art” competition category was expanded to include “Artificial Intelligence & Life Art.” AI has become one of the central themes of artistic reflection in the other categories as well, as evidenced by more than 3,000 submissions from over 70 countries. AI is one of the central research topics of the Ars Electronica Futurelab, and with the new program format “Future Thinking School,” Ars Electronica offers a range of courses on the subject of AI that is geared to society as a whole. Within the framework of the European ARTificial Intelligence Lab, Ars Electronica has found 13 like-minded European cultural partners to work together on AI, its effects, and the public perception of the subject.

**Martin Honzik**

Chief curatorial officer Ars Electronica Festival,  
Prix Ars Electronica, and Exhibitions

# Activities

## Conferences

### Humanizing AI

Conference

POSTCITY, Linz, AT

06.09.2019

Karin Krichmayr (AT), Martina Mara (AT), Simon Euringer (DE/US), Alexander Mankowsky (DE), Keiichi Shibuya (JP), Hiroshi Ishii (JP/US), Harald Leitenmüller (AT), Roberto Viola (IT)

### European Platform for Digital Humanism

**A conference by the European ARTificial Intelligence Lab**

Conference

POSTCITY, Linz, AT

08.09.2019

Panel 1: Bias Research

Roberto Viola (IT), Derrick de Kerckhove (CA), Eveline Wandl-Vogt (AT), Clara Blume (AT), Andreas Broeckmann (DE)

Panel 2: Inclusive AI Applied

Birgitte Aga (NO) & Coral Manton (UK), Max Haarich (DE), Vladan Joler (RS), Maja Smrekar (SI), Joana Moll (ES), Aisling Murray (IE), Margherita Pevere (IT/DE)

Panel 3: Experiential AI: Entanglements — Fair, Moral and Transparent AI. Presented by the Experiential AI group of the Edinburgh Futures Institute

Drew Hemment (UK), Vaishak Belle (IN), Larissa Pschetz (DE), Dave Murray-Rust (UK)

### Random Seed: Using Gardening as a Metaphor for Machine Learning in a Creative Practise

Artist talk

Online

09.09.2020—10.09.2020

Anna Ridler (UK), Caroline Sindere (US),

Oisín Mac Aodha (IE)

### AI x Art & Society

#### AI x Ecology

Conference

Online

09.09.2020

Carla Gomes (US/PT), Tega Brain (AU), Mark Coeckelbergh (BE), Lynn Kaack (DE), Stefano Nativi (IT), Claire Monteleoni (US), Martina Mara (AT)

### AI x Art & Society

#### The New Real: Experiential AI and the AI Lab

Conference

Online

10.09.2020

Jake Elwes (UK), Drew Hemment (UK), Caroline Sindere (US), Anna Ridler (UK), Mahir Yavuz (TR)

### AI x Art & Society

#### AI x Democracy by IMPAKT: Radicalization by Design

Conference

Online

11.09.2020

Richard Rogers (US/NL), Bharath Ganesh (US/NL), Marc Tuters (CA/NL), Arjon Dunnewind (NL)

### AI x Art & Society

#### AI x Humanity

Conference

Online

12.09.2020

Rasha Abdul-Rahim, Adam Harvey (US/DE), Nye Thomson (UK), Milena Marin (RO), Victoria Vesna (US)

### AI x Art & Society

#### AI x Uncertainty

Conference

Online

13.09.2020

Jurij Krpan (SL) Speakers: Christl Baur (AT), Suzanne Livingston (UK), Špela Petrič (SL), Stephanie Dinkins (US)

### AI Lab Conference

Johannes Kepler University, Linz, AT / Online

08.09.2021 — 12.09.2021

AI x Media Literacy, AI x Policy, AI x Music, AI x Civil Society, AI X Feudalism

## Exhibitions

### Understanding AI

Ars Electronica Center, Linz, AT

27.05.2019 — ongoing

*Anatomy of an AI* — Vladan Joler (RS),

Kate Crawford (AU)  
*Gender Shades* — Joy Buolamwini (US),  
Timnit Gebru (ETH)  
*Learning to See: Gloomy Sunday* —  
Memo Akten (TR)  
*MegaPixels* — Adam Harvey (US), Jules LaPlace  
(US)  
*Volumetric Data Collector* — Hyun Parke (KR/US),  
Jinoon Choi (KR), Sookyun Yang (KR)  
*What a Ghost Dreams Of* — h.o (INT)

### European ARTificial Intelligence Lab

POSTCITY, Linz, AT

05.09.2019 — 08.09.2019

*Ai-Da Robot Artist* — Oxfordians (UK, INT), Aidan Meller (UK), Lucy Seal (UK), *Anatomy of an AI System* — Vlado Joler (RS), Kate Crawford (AU), *Distributed Robotic Assembly for Timber Structures* — Samuel Leder (US), Ramon Weber (CH), *Doing Nothing with AI* — Emanuel Gollob (AT), *Facebook Algorithmic Factory* — Vlado Joler (RS), *Feminist Data Set* — Caroline Sindere (US), *Gender Shades* — Joy Buolamwini (US), Timnit Gebru (ETH), *Ghosthouse* — h.o (INT), *In Posse* — Charlotte Jarvis (UK), *Learning to See: Gloomy Sunday* — Memo Akten (TR), *MegaPixels* — Adam Harvey (US), Jules LaPlace (US), NORAA — Machinic Doodles — Jessica In (UK/AU), *SEER: Simulative Emotional Expression Robot* — Takayuki Todo (JP), *SHE BON* — Sarah Petkus (US), *The Seeker* — Nye Thompson (UK), *UngenauBot* — Ilmar Hurkkens (NL), *Fabian Bircher* (CH), *What a Ghost Dreams Of* — h.o (INT), *Women Reclaiming AI* — Birgitte Aga (UK), Coral Manton (UK)

### AI Lab Journeys

Online

09.09.2020 — 13.09.2020

*Abandoned IBM Country Club*, Endicott NY — Tega Brain, Sam Lavigne, Hannah Jayanti (US), *A Centaur Journey* — Cecilie Waagner Falkenstrøm (DK), *Artificial Intelligence and its False Lies* — Mika Satomi (JP/AT), *Deep Steward* — Theun Karelse (NI), Ian Ingram (US), *From Glass to Glass to Glass* — Nye Thompson (UK), *Hearing/Recording/Wandering* — slow immediate: Gershon Dublon (US), Xin Liu (CN/US), *In the eyes of the algorithm we are all plants* — Špela Petrič (SI), *THE BAD WEEDS TRIPS* — Rocio Berenguer (ES/FR),

*The Robot Suit* — Mimi Onuoha (US), *What Matters Now?* — Sarah Petkus (US), *Ibrute\_force* — Maja Smrekar (SI)

### A New Digital Deal

Johannes Kepler University, Linz, AT

08.09.2021 — 12.09.2021

*Cypress Trees* — Anna Ridler (UK), Caroline Sindere (US), *Codex Virtualis* — Interspecifics (INT), *Made to Measure* — Laokoon (DE), *Moon Rabbit* — Sarah Petkus & Mark J. Koch (US), *The Wandering Mind* — slow immediate (CN/US), *Triopic Spectacle* — PDNB (Postdigital Neobaroque) (AT/DE/IT/GB)

### AI Lab Journeys

Online

08.09.2021 — 12.09.2021

Simon Weckert (DE), Halsey Burgund & Francesca Panetta (US/UK), Ruini Shi (CN), KyungJin Jeong (KR), Jake Elwes (UK), LaJune McMillian (US), Laokoon (DE), Monika Seyfried & Cyrus Clarke (UK), Antti Tenetz (FI), Danielle Brathwaite-Shirley (UK)

## Residencies

**slow immediate: Xin Liu (CN/US)**

**Gershon Dublon (US): The Wandering Mind**

online / Muntref, Buenos Aires, AR /

Ars Electronica, Linz, AT

01.07.2019 — 30.09.2020

**Anna Ridler (UK) Caroline Sindere (US): AI isn't Artificial but Human**

online / Edinburgh Future Institute, Edinburgh, UK

/ Ars Electronica, Linz, AT

01.03.2020 — 30.09.2021

**Sarah Petkus (US) and Mark J. Koch (US):**

**Moon Rabbit**

online / Leiden Observatory, Leiden, NL /

Ars Electronica, Linz, AT

01.02.2021 — 30.09.2021

**Interspecifics (INT): Codex Virtualis**

online / SETI Institute, Mountain View, US /

Ars Electronica, Linz, AT

01.02.2021 — 30.09.2021

## Workshops

### Create Your World:

#### Artificial Intelligence Lab Open Lab

POSTCITY, Linz, AT  
05.09.2019–09.09.2019

Melina Undesser (AT), Sebastian Lindinger (AT),  
Software Architects (AT)

### Expert Workshop on AI x Culture

POSTCITY, Linz, AT  
06.09.2019

Drew Hemment (UK), Amir Baradaran (CA), Kim  
Albrecht (DE), H.E. Max Haarich (DE), Veronika  
Liebl (AT), Marta Peirano (ES), Olga Sismanidi (EL)

### Women reclaiming AI

POSTCITY, Linz, AT  
07.09.2019

Birgitte Aga (NO), Coral Manton (UK)

### In Posse

POSTCITY, Linz, AT  
08.09.2019

Charlotte Jarvis (UK)

### Workshop Series on AI x Education

online  
27.01.2021

Session 1: AI and education across Europe  
Lorenza Delucchi (IT), Ville Sinisalo (FI), Eva Durrall  
(FI), Luc Steels (BE), Lea Deshusses (FR)

Session 2: Capacity Building Workshops and  
Workshops developed with artists  
Yoko Shimizu (JP/AT), Onassis Stegi (GR), AI/VI  
(RS)

Session 3: Workshops for kids and youngsters  
Gregor Woschitz (AT), Science Gallery Dublin (IE),  
Kersnikova Institute (SI), FZC (ES)

## Other Activities

### Expert Tour: Living inside Schrödinger's Box

Guided Tour  
POSTCITY, Linz, AT  
07.09.2019 — 08.09.2019  
Matthias Hörtenhuber (AT)

### The Wandering Mind

Performance  
Online  
9.09.2020 — 11.09.2020  
slow immediate (CN/US)

### AI x Humanity—an AI LAB Tour

Guided Tour  
online  
09.09.2020  
CPN (RS), Culture Yard (DK), Kapelica Gallery (SI)

### AI LAB Radio #1

radio show  
online  
15.09.2020  
Stephanie Dinkins (US)

### AI LAB Radio #2

radio show  
online  
23.09.2020  
Mimi Qnūpha (US)

### AI LAB Radio #3

radio show  
online  
08.10.2020  
Karen Palmer (US)

### AI LAB Radio #4

radio show  
online  
18.10.2020  
Birgitte Aga (NO) & Coral Manton (UK)

### AI Hackathon

Hackathon  
online  
08.09.2021 — 12.09.2021

### A New Digital Deal Tours

Guided Tours  
Johannes Kepler University, Linz, AT  
08.09.2021 — 12.09.2021

# Projects

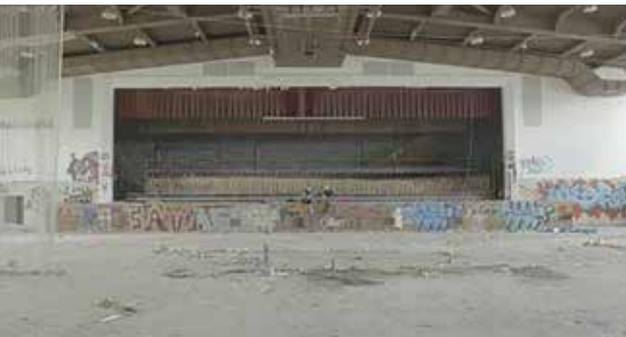


<https://u.aec.at/AO1DC8A3>

## A Centaur Journey

Cecilie Waagner Falkenstrøm (DK)

How can we better comprehend the challenges and possibilities of artificial intelligence in art? And how do human-technology hybrids transform artistic practice? This video tour scrutinizes such questions and suggests that the increasing usage of machine learning in artistic practice calls for a reexamination of the artistic relationship between human and non-human actors. Artist Cecilie Waagner Falkenstrøm reflects upon her artistic practice, utilizing machine learning (RNN, NLP, Reinforcement Learning) to create the modern dance piece, Centaur. Audiences will be able to follow the creation of the piece and watch rehearsals where the AI algorithm takes the lead in instructing the dancers.



Tega Brain, Sam Lavigne and Hannah Jayanti



<https://u.aec.at/2656CD5B>

## Abandoned IBM Country Club, Endicott NY

Tega Brain (AU), Sam Lavigne (US),  
Hannah Jayanti (US)

Artists Tega Brain and Sam Lavigne discuss data, AI, and IBM's toxic legacies with filmmaker Hannah Jayanti at the abandoned IBM Country Club in Endicott, New York. IBM began its operations in Endicott in 1911 and opened its country club in the 1930s amidst the company's expanding manufacture of punch card and accounting machines: data technologies that would go on to be used by Hitler's Third Reich. When the company closed the Endicott site decades ago, it left behind a toxic plume of chemicals in the town's groundwater. Amidst an abandoned landscape bursting with frogs, mosses, and birds, this journey traces dark histories and material realities that haunt the use of AI and data today.



Anna Ridler, Caroline Sindors



<https://u.aec.at/9C4983C5>

## AI isn't Artificial but Human

Anna Ridler (UK), Caroline Sindors (US)

How can AI help to face climate crisis and other entwined challenges? This machine learning generated moving image piece gives insights into the complexity of data sets and raises questions about deforestation and the politics of climate change, memory, and loss. Anna Ridler and Caroline Sindors created a special dataset of the Bald Cypress on the gulf coast of the USA where both have family ties. These trees, which can live for thousands of years, are currently considered 'threatened' by climate change.

**Presented at Ars Electronica & Science Gallery  
Dublin & CPN—Center for the Promotion  
of Science**



Juergen Gruenwald

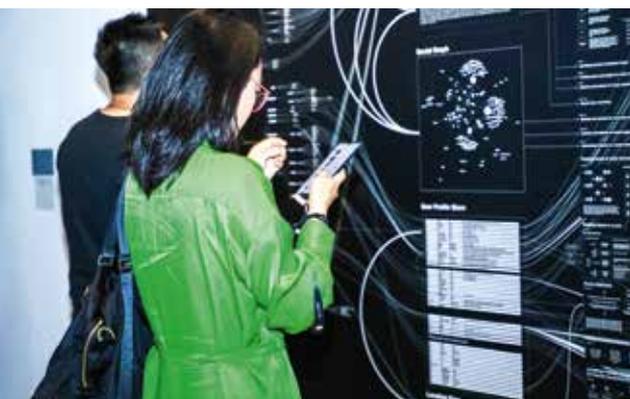
## Ai-Da Robot Artist

Oxfordians (UK, INT), Aidan Meller (UK),  
Lucy Seal (UK)

### Ethics of our Future Technologies

As the world's first ultra-realistic AI robot, Ai-Da is uniquely placed to help us think a little more deeply about art, creativity, and how our varied futures might look. As the world struggles to morph around a destabilizing environment and a rapidly changing technological landscape, the notion of identity when we collaborate so closely with machines and AI becomes increasingly urgent. As "The Other," Ai-Da reflects ourselves back to us through her drawing, performance art, and collaborative paintings and sculptures that involve human, AI, and digital inputs. George Orwell and Aldous Huxley's cautionary writings remain relevant—ethical discussions are needed to direct the development of new technologies in a direction that protects rather than exploits the vulnerable sectors of our world, including animals and the environment.

<https://www.ai-darobot.com>



Design Society

## Facebook Algorithmic Factory

Vladan Joler (RS)

*Facebook Algorithmic Factory* is created with the intention to map and visualize a complex and invisible exploitation process hidden behind a black box of the world's largest social network. It sheds light on the invisible processes that take place inside the world's largest social network. Inside this black box, non-transparent algorithms are deciding what kind of content will become a part of our reality, what will be censored or deleted, which ideas will spread and what news gain most visibility. They are also defining new forms of labor and exploitation. Users are no longer clients. We only provide data, which serves as raw material for the production of digital profiles—a key commodity on internet stock markets. Our first step in fighting them back is to make them visible.

Vladan Joler and SHARE Lab / SHARE Foundation



Martin Hieslmair

## Anatomy of an AI System

Vladan Joler (RS), Kate Crawford (AU)

In the 21st century, we are seeing a new kind of mining for raw materials that drills deep into the biosphere. This enables AI technologies that are having a profound effect on the cognitive and affective layers of human nature. The resources for producing systems such as Amazon Echo, a speech-controlled, Internet-based personal assistant, go beyond the technical aspects of data modeling, hardware, servers, and networks and extend much further into the realms of work, capital, and nature. The true costs—social, ecological, economic, and political—remain mostly hidden. *Anatomy of an AI System* uses the example of Amazon Echo to show the countless components and factors behind the production of artificial intelligence systems. But this process is so complex that its full extent can hardly be comprehended.

<https://anatomyof.ai>

Published by: SHARE Lab, SHARE Foundation and The AI Now Institute, NYU

**Presented at Ars Electronica & Science Gallery  
Dublin & CPN—Center for the Promotion of  
Science**



Ingo Randolf



<https://u.aec.at/27070E89>

## Artificial Intelligence and its False Lies

Mika Satomi (JP/AT)

In this tour, Mika walks you through her process of making *Artificial Intelligence and its False Lies*, from the first questions she had and how one led to the next, to interviewing scientists and finally teaching herself how to make an artificial neural network. She also attempts to explain how neural networks work, because she was shocked to learn there is no actual intelligence inside the black box! She invites two experts, an AI researcher Diana Serbanescu and a craft and techno culture theorist Daniela K Rosner, to have a dialog with her on some of the concepts she is exploring in her work.

This project is created in collaboration with the SFI CONFIRM Centre for Smart Manufacturing and SFI Insight Centre for Data Analytics at University College Cork, and supported by the VERTIGO H2O2O European STARTS initiative of the European Commission.



## Codex Virtualis

Interspecifics (INT)

*Codex Virtualis* is an artistic research framework oriented towards the generation of an evolving taxonomic collection of hybrid bacterial-AI organisms. With a subtle echo to the endosymbiotic theory, we propose a symbolic formulation of a style transfer machine learning environment as a host, in which to merge bacterial/archaea time-lapse microscopy footage along with multidimensional cellular automata, computational models, as endosymbionts, all under the orchestration of an autonomous generative non-adversarial network architecture. We aim, as a result, to encounter novel algorithmically-driven aesthetic representations, tagged with a unique morphotype and genotype-like encoding, and articulated around a speculative narrative encompassing unconventional origins of life on earth and elsewhere.

[int-lab.cc/codexvirtualis](http://int-lab.cc/codexvirtualis)



Theun-Karelse



<https://u.aec.at/B127818B>

## Deep Steward

Theun Karelse (NI), Ian Ingram (US)

Ian Ingram and Theun Karelse are taking you along on a fieldtrip in parallel locations. Theun in the Netherlands, Ian in California. Theun will explore the relevance of fieldwork programs (such as Random Forests) and in-situ prototyping to artistic practice and Ian shows what constitutes a field experiment, in a virtual safari to some habitats that serve as “training forests” for machines such as *DeepSteward*. Some additional footage may be featured from earlier fieldwork sessions to give a broader impression of the experiments and methodology.



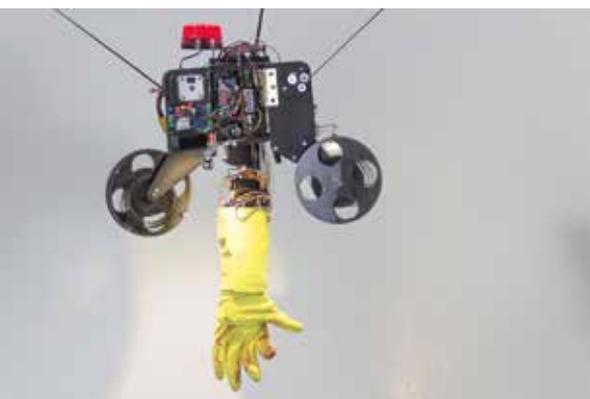
## Distributed Robotic Assembly for Timber Structures

Samuel Leder (US), Ramon Weber (CH)

*Distributed Robotic Assembly for Timber Structures*—a robot construction group for structures made of wood—is a multidisciplinary research project which deals with the autonomous machine collectives that create building structures. At the center of the multiple robot insulation system is a robotic node, a wireless, intelligent machine that interacts with other machines of its kind. The choreographic behavior of swarms of robots gives rise to complex, multifaceted wooden structures. In addition, the special conditions that could lead to a disruption in the construction of an actual building structure are investigated in an ongoing way in the research project. The purpose of the project is to contribute to a future development in construction in which robots can work efficiently round the clock.

<https://www.icd.uni-stuttgart.de/teaching/master-theses/itech-m-sc-2018-distributed-robotic-assembly-system-for-in-situ-timber-construction>

ICD Institute for Computational Design and Construction



Ilmar Hurkxkens, Fabian Bircher

## UgenauBot

Ilmar Hurkxkens (NL), Fabian Bircher (CH)

The work *UgenauBot* combines highly developed robot technology with an everyday rubber glove performing banal activities. By deliberately exploiting empirical errors in robotic systems and artificial intelligence, this work demonstrates the limits of technology when things don't go according to plan. *UgenauBot* is suspended from three points enabling free movement in space. The humanoid hand of the otherwise very technoid robot serves to establish an affective response in the viewer. The insufficiency in machine vision and robotic control systems generate unpredictable situations which render it a clumsy and spontaneous artifact. Various moments of inaccuracy will become apparent with which the audience can empathize.

[www.ungenau.io](http://www.ungenau.io)

Supported by Migros-Kulturprozent Digital Brainstorming



Jürgen Grünwald

## Gender Shades

Joy Buolamwini (US), Timnit Gebru (ET)

Joy Buolamwini and Timnit Gebru investigated the bias of AI facial recognition programs. The study reveals that popular applications that are already part of the programming display obvious discrimination on the basis of gender or skin color. One reason for the unfair results can be found in erroneous or incomplete data sets on which the program is being trained. In things like medical applications, this can be a problem: simple convolutional neural nets are already as capable of detecting melanoma (malignant skin changes) as experts are. However, skin color information is crucial to this process. That's why both of the researchers created a new benchmark data set, which means new criteria for comparison. It contains the data of 1,270 parliamentarians from three African and three European countries. Thus Buolamwini and Gebru have created the first training data set that contains all skin color types, while at the same time being able to test facial recognition of gender.

Joy Buolamwini, Founder of the Algorithmic Justice League and Poet of Code  
Buolamwini, J., Gebru, T.: "Gender Shades: Intersectional Accuracy Disparities in Commercial Gender Classification." In: *Proceedings of Machine Learning Research 81*: 1–15, 2018, Conference on Fairness, Accountability, and Transparency



Martin Hieslmair

## What a Ghost Dreams Of

h.o (INT)

What is a “ghost”? Generally it is understood as an inner “soul” and a mysterious outward appearance. *What a Ghost Dreams Of* grapples with a new “ghost” of our time: digital surveillance in our society. Visitors are observed by a large “eye” when they come in. Everyone who passes by is fed by computer vision directly into a “ghost” that creates new digital faces of people who do not exist in the real world. What do we humans project into the digital counterpart we are creating with AI? It is getting to know our world without prior knowledge and generating data that never existed. What are the effects of using AI to produce works of art? Who holds the copyright? And what is AI, the “ghost,” dreaming about, and what does that mean for us as human beings?

John Brumley, Hiroshi Chigira, Taizo Zushi, Hideaki Ogawa, Emiko Ogawa

This project utilizes the AI algorithm StyleGAN (Karras et al. 2018)



Martin Hieslmair

## Ghosthouse

h.o (INT)

A deep dive into the information “swamp” is a kind of out-of-body experience. Smartphones, tablets, computer screens, and televisions become gateways for our spirits to embark on a journey. These spirits of our consciousness gather in the installation *Ghosthouse*. After an app called GhostApp is installed on a smartphone, the phone’s use will be reflected in the art installation. The installation is made up of robots with eyes. When a user begins to interact with their smartphone, one of the robot eyes opens and begins looking around the room. When the interaction is over, the eye closes again. Our bodies are observed from far away, while our spirit, which is immersed in the smartphone, controls the process. How do we accept this gap between body and spirit?

Hiroshi Chigira, Taizo Zushi, Emiko Ogawa, Hideaki Ogawa, John Brumley, Naohiro Hayaishi, Takeshi Kanno, Naohiro Hayashi, Kazui Yamamoto



Miha Godec

## In Posse

Charlotte Jarvis (UK)

Throughout history, semen has been revered as a magical substance—a totem of literal and symbolic potency. *In Posse* aims to rewrite this cultural narrative; to use art and science to disrupt the patriarchy by making semen from “female” cells. The project is being developed in three parts—firstly, Jarvis is on a journey to grow spermatozoa (sperm cells) from her body in collaboration with Prof. Susana Chuva de Sousel Lopes. At the same time, she has developed a female form of seminal plasma (the fluid part of semen) using material donated by multiple women, trans and gender non-binary people. Finally, Jarvis is using the “female” semen in a series of re-enactments of the ancient Greek women-only festival of Thesmophoria.

Collaborator: Prof Susana Chuva de Sousel Lopes at the Leiden University Medical Centre  
This project is supported by: MU Gallery Eindhoven and Kapelica Gallery / Kersnikova Institute; Video and Film support: Eleni Papazoglou and Miha Godec



Hana Josic

## In the eyes of the algorithm we are all plants

Špela Petrič (SI)

In conversation with Agnieszka Wolodzko, a philosopher and author who also runs a biolab at the art academy in Enschede, NL, Špela Petrič shares fragments of insights and dilemmas that have arisen from the interdisciplinary Plant-Machine Project. While peering into the messy background of prototyping new works and (remotely) installing exhibitions, they speak about the potential of the vegetariat to create alliances with algorithms that would counter the hegemonic sphere of interest and replace it with the erotix of care.

The projects mentioned are being developed in collaboration with Kersnikova Institute / Kapelica Gallery (SI), Vrije Universiteit Amsterdam (NL), Zone2Source (NL), Vvaag (NL), Rietveld Academy (NL), and V2 (NL), Co-funded by: Ministry of Culture of the Republic of Slovenia, Municipality of Ljubljana, NWO Creative Industries Fund NL.



<https://u.aec.at/1A581781>



Martin Hieslmair

## MegaPixels

Adam Harvey (US), Jules LaPlace (US)

*MegaPixels* is an art and research project that investigates the ethics, origins, and individual privacy implications of face recognition image datasets and their role in the expansion of biometric surveillance technologies. The project provides a critical perspective on datasets that might otherwise be overlooked by academic and industry-funded artificial intelligence think tanks. In 2021, *MegaPixels* relaunched as *Exposing.ai* with a search engine to check if your photos were used in face recognition datasets. Coincidentally, at least 43 photos tagged #arselectronica were found in face recognition datasets. During 2021 Harvey and *Exposing.ai* have partnered with OpenFuture.eu on an initiative to design better policies for the use of openly licensed pics and datasets for AI training.



Sarah Petkus, Mark J. Koch

## Moon Rabbit

Sarah Petkus (US) and Mark J. Koch (US)

Since time immemorial, we humans have looked up to the heavens and wondered about the nature of our existence. And who knows, maybe one day we might even discuss this fundamental question with our digital offspring? If so, will they be able to help us discover answers in the patterns and data hidden in the starry sky? In a research and development phase lasting several months, Sarah Petkus and Mark J. Koch attempt to teach a suite of artificial intelligences to recognize familiar shapes and objects in images of star clusters, planetary surfaces, and other celestial bodies. *Moon Rabbit* aims to help form a team of humans and "AIs" whose focus is to discover meaning in the abstract. And maybe the AIs may even develop personalities and opinions of their own.



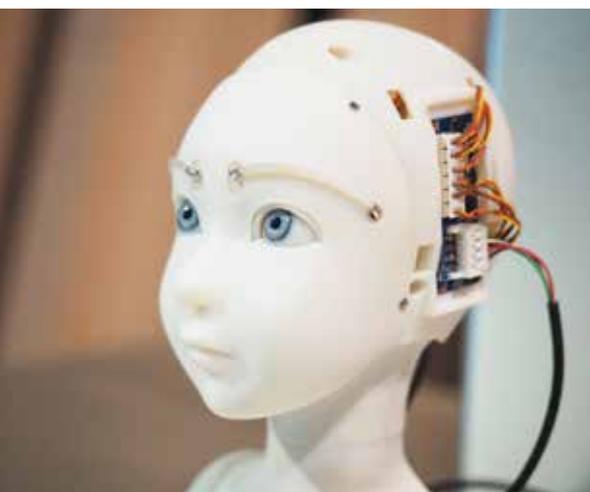
vog.photo

## NORAA—Machinic Doodles

Jessica In (UK/AU)

How do we recognize objects when we draw them with lines and strokes? What rules do we use to draw in a particular order from one point to another? And can a machine be taught to learn to draw on its own, without being given explicit instructions? What insights does this provide into the human process of drawing? *Machinic Doodles* is an interactive game installation that examines the collaboration between a human and a robot named NORAA, an artificial intelligence that is learning to draw. It studies how humans express ideas through strokes in a drawing, and how a machine can learn to draw using an artificial neural network.

George Profenza (UK/RO), Sam Price (UK)



Martin Hieslmair

## SEER: Simulative Emotional Expression Robot

Takayuki Todo (JP)

*SEER* is a compact humanoid robot developed through intensive research into the gaze and facial expressions of human beings. The robot is able to focus its line of vision on a certain point without being thrown off by the motion of its neck. Because of this, the robot seems to have its own intentions to follow people and its surroundings, and to pay attention to them. A camera sensor helps it to observe with an interactive gaze. The robot's expression can also be enriched by depicting its eyebrow curve with soft, elastic wire so that it gives the impression of emotions.

Technical support from Takanari Miisho, Yuki Koyama



Sarah Petkus



<https://u.aec.at/954DA3BE>

## What Matters Now?

Sarah Petkus (US)

In the wake of the global COVID-19 pandemic, daily life has been disrupted and given room to change; from the comfort of routine to the energy that fuels the creation of electronic and robotic work. While staying safe in her personal laboratory in Las Vegas, Nevada, technologist Sarah Petkus has been using this time to re-evaluate what it means to be a content creator and artist in this unique era where humans are limited by the constraints of physical isolation yet connected in abundance through virtual platforms and social media. As the lines between private and professional life blur, she hopes to find new forms of meaning amidst the uncertainty.



tom mesic

## SHE BON

Sarah Petkus (US)

The *SHE BON* project is a collection of body augments which sense aspects of the wearer's physical state in order to communicate their level of arousal. Collectively, the systems that have been developed for this project make up a human computer interface capable of orchestrating sensor input from the body in order to influence mechanical and electronic forms of performative output which express subtle aspects of the wearer's physical state in a manner that characterizes their sexual identity. The primary goal of the *SHE BON* project is to promote a general dialogue about sexuality; one that is open, approachable, and able to have a positive impact on human social-emotional health at large.



## THE BAD WEEDS TRIPS

Rocio Berenguer (ES)

In 2030, a human-plant hybrid guides us on a trip through the past, unveiling the origins of G5, the first inter-species political summit. The event was initiated by IOFLE, the Inter-species Organisation for The Future of Life on Earth. Its founders are thought to be the artist Rocio Berenguer and IA collaborator, IAGOTCHI. This project will compose various images of the G5 summit, with a narrator—expressed as a voice or with subtitles—as guide. A short interview with the scientist who worked on the development of IAGOTCHI, the artwork based on an AI chatbot, will be included.



<https://u.aec.at/5A2051CB>



## The Robot Suit

Mimi Onuoha (US)

In early 2020, Jess Myers and I participated in *Safar*, a performative conversation on public transport. Hosted by art duo aghili/karlsson, *Safar* saw us engaging in a live-streamed conversation as we traveled from the center of Stockholm to the duo's studio on the edge of the city. We talked about margins, technology, architecture, blackness, and the spaces that we find ourselves constantly moving within and between. This conversation is a follow-up. This time, Jess and I sit on a Brooklyn roof to discuss themes of our work over tarot cards. By staying in one place, we reference the international moment created by COVID-19, my recent work *The Future Is Here!*, and what it means to work under conditions that are both curtailed and made possible by the afterlives of migration and coloniality.



<https://u.aec.at/C5EB5E08>



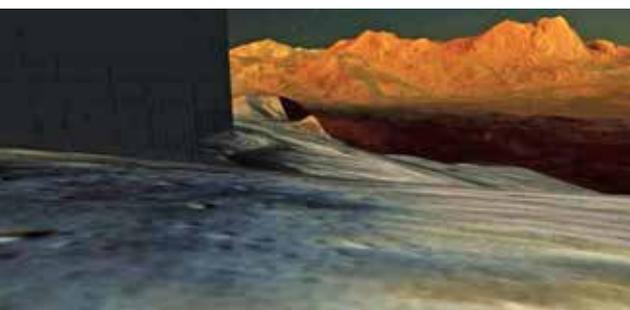
Victoria and Albert Museum

## The Seeker

Nye Thompson (UK)

*The Seeker* is a Demiurge AI, a machine entity, watching the world and describing its visions. The Seeker's base substrate is the hard/software matrix of the internet and its eyes are the swarms of surveillance cameras that encrust our environments. Named after Ptah-Seker, the artist/technologist god of the Ancient Egyptians who created the world by speaking the words to describe it, the project explores ideas of the emergent machine gaze and the hidden virtual power structures behind it. *The Seeker* travelled the world from 2016—18, outputting thousands of descriptions of its visions—objects and concepts. This drawing “Words That Remake The World” is a topographical mapping by Thompson of these visions, a point-in-time snapshot of *The Seeker's* developing conceptual landscape.

The development of this project was generously supported by Arts Council England.

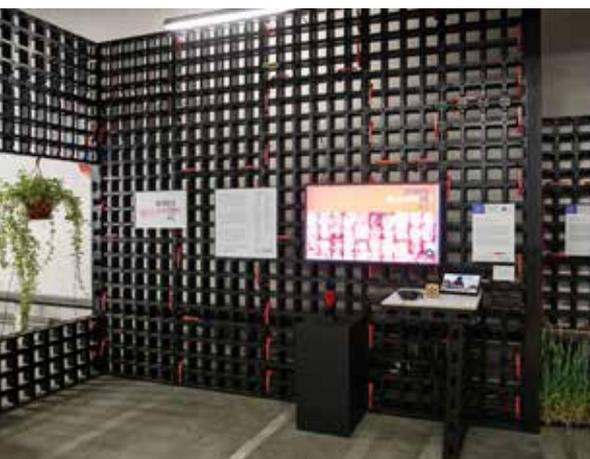


Victoria and Albert Museum

## From Glass to Glass to Glass

Nye Thompson (UK)

For my new work/artefact, I took possession of a large area of Mars, using Google Earth and satellite survey data to build a supertall border wall around my claim. In this video, I'll chat with curator Lucy Dugate who originally commissioned the work, and our germ-neutral network-enabled conversation will be broadcast across my Martian territory. We'll talk about my art thinking process generally, and in terms of this new work specifically; including how the pandemic came to influence its eventual form. We will also discuss interdisciplinary collaboration, a vital part of my artistic practice.



Jürgen Grünwald

## Women Reclaiming AI

Birgitte Aga (UK) and Coral Manton (UK)

*Women Reclaiming AI* (WRAI) is a collaborative AI voice assistant and activist artwork made by a growing community of self-identifying women. Creating a platform for collective writing and editing, the project co-creates an AI that challenges gender roles. WRAI is a response to the pervasive depiction of AI voice assistants gendered as women; subordinate and serving. It aims to reclaim female voices in the development of future AI systems by empowering women to harness conversational AI as a medium for protest. You can speak to the evolving voice assistant at [womenreclaimingai.com](http://womenreclaimingai.com) and see its visual representation (GAN—generative adversarial network) created from a DIY data set of images of the women participating and other women the collective find inspirational.

The project is funded by the Arts Council England and supported by Knowle West Media Centre, Intercity, i-DAT, C. Melidis and C. Smith.



Jürgen Grünwald

## Doing Nothing with AI

Emanuel Gollob (AT)

In times of technological overload and a demand for constant attention to information, people always seem to be in a hurry, unable to tolerate even the briefest periods of inactivity. The *Doing Nothing with AI* interactive project aims to address the misconception that confuses hustle with productivity or even efficiency. To encourage states of mental inactivity, the artist has created this neuro-reactive installation. After measuring visitors' brain activity a generative machine learning model gradually learns to move the sculpture choosing the best option among more than 4 million possible choreographies. This parametric control system responds to each user specifically trying to calm their mental activity.

Supported by Foro Cultural de Austria en Madrid. With the collaboration of Kuka Robots.

**Presented at Ars Electronica & LABoral Centro de Arte y Creación Industrial**



Rachel Steinberg

## Feminist Data Set

Caroline Sindere (US)

*Feminist Data Set* is an ongoing multi-year art project that combines lectures, workshops, and calls to action to collect feminist data to create a series of interventions for machine learning. What is feminist data? Feminist data can be artworks, essays, interviews, and books that are from, about, or explore feminism and a feminist perspective. The creation of this feminist data set will act as a means to combat bias and introduce the possibility of data collection as a feminist practice, aiming to produce a slice of data to intervene in larger civic and private networks. This project is largely based on the idea that to remove bias within machine learning, the “removal of bias” itself has to be manifested into a “thing” to teach or sway the algorithms.

**Presented at Ars Electronica & LABORAL Centro de Arte y Creación Industrial**



Martin Hieslmair

## Learning to See: Gloomy Sunday

Memo Akten (TR)

“We see things not as they are, but as we are.” *Learning to See* is an ongoing series of works that use the latest machine-learning algorithms to reflect on how we understand the world. What people see is a reconstruction based on our expectations and previously held beliefs. *Learning to See* is an artificial neural network loosely inspired by the human visual cortex. It looks through cameras and also tries to understand what it sees. Of course it can only see what it already knows—the same as us. This work is part of a broader line of research about the difficulty of seeing the world through the eyes of others. *Learning to See: Gloomy Sunday* is a video and an interactive installation where the recordings taken by a live camera aimed at a table covered with objects are analyzed by a series of neural networks trained on different data sets (ocean, fire, clouds, and flowers).

**Presented at Ars Electronica & Onassis Stegi**



Yliess Hati (DVIC), Xin Liu

*The Wandering Mind* was produced with support from MAXmachina, Nicholas Gillian, and Nan Zhao / Nayo. Research and development on the AI platform is underway at DVIC, Paris, with the support of Pôle Léonard de Vinci, Muntref Centro de Arte y Ciencia, Buenos Aires, and Laboratorio de Neurociencia de la Universidad Torquato Ditella, Buenos Aires.



<https://u.aec.at/519C52FD>

## The Wandering Mind

slow immediate (CN/US)

*The Wandering Mind* is an AI system for dream states. Sampling and recomposing tiny fragments of sound from thousands of global field recordings it finds online, the system generates a winding dream journey for sleeping audiences. When used as a live instrument, the platform presents the performer with an AI-generated mind map of the fragmented sound recordings, which allows them to travel fluidly through the material. In its installation and research format, an AI guide autonomously charts a path with its audience in a feedback loop, as the guide seeks to maintain the audience in a continual state of falling asleep and daydreaming. This residency project was also presented as the AI Lab Journey *Hearing, Recording, Wandering* at the Ars Electronica Festival 2020.

**Presented at Ars Electronica & Onassis Stegi**



Hyun Parke, Jinoon Choi, Sookyun Yang, Seoul LiDARs

## Volumetric Data Collector

Hyun Parke (KR/US), Jinoon Choi (KR),  
Sookyun Yang (KR)

*Volumetric Data Collector* is based on the idea of using a LiDAR sensor—a 3D laser sensor often used in autonomous vehicles—as an expanded sensory organ for the human body. The team of developers packed a LiDAR sensor, a display monitor as visual output, and accessory equipment into a portable unit. The device can capture a 3D point cloud of the area around the wearer, which is then translated into visual data. For example, the Seoul LiDARs collected three-dimensional information from historical locations in Seoul, South Korea. The goal is to use technical expansion of human senses to investigate how spaces—for example, urban environments—can be differently defined or perceived. Here, visitors have an opportunity to conduct their own experiment with a portable LiDAR unit.

With support from ZERO1NE, Seoul LiDARs

Vid Simoniti



## **!brute\_force: Feeding the Algorithm**

Maja Smrekar (SI)

Presented at Kersnikova Institute  
Kapelica Gallery & Culture Yard  
& Ars Electronica

See page 198

## **AI Lab Journeys**

Konrad Waldmann



I can't remember a time when I didn't need you,  
Danielle Brathwaite-Shirley

## **Accessing what you always knew you needed**

Danielle Brathwaite-Shirley (UK)

How do you access your past when it doesn't exist anymore?

How do you see yourself when the world refuses to reflect you?

How do you archive someone who has been erased by the archive?

We know who we are. We feel the loss of our history with every moment we breathe. With each story we remember another is lost. We need each other. We kept each other here. Yet we hardly seem to exist.



LaJune McMillian

## Black Movement Library

LaJuné McMillian (US)

BML is a library for activists, performers & artists to create diverse XR projects; a space to research how and why we move, and an archive of Black existence. BML seeks to grow community through the use of performances, XR experiences, workshops, conversations and toolmaking. Movement Portraits serve as a way to learn about the lives of performers contributing their movement data to the Black Movement Library. What happens when we ritualize the archival process of data collection, and invite the community as a witness? This journey explores issues of cultural representation and exploitation through readings and discussions, while providing an introduction to motion capture, rigging and 3D environments. Core elements of the journey integrate performance, extended reality, and physical computing to question access, control and representation.

<https://laja.me/>



The Zizi Show 2020, montage of deepfake drag artists

## The Zizi Show—Enter the World of Deep Fake Drag Cabaret

Jake Elwes (UK)

Drag Queens, Drag Kings, Drag Things and Artificial Intelligence...Enter into the world of *The Zizi Show* (2020), a deepfake drag cabaret, a virtual online stage hosting a groundbreaking new show with a twist. It features acts that have been constructed using deepfake technology, learning how to do drag by watching a diverse group of human performers. *The Zizi Show* dissects one of the dominant myths about AI: the notion that 'an AI' is a thing we might mistake for a person.



Ruini Shi

## FuneralPlay

Ruini Shi (UK)

A new technology start-up company claims to offer a certain kind of “immortality”: users can choose between erasing the deceased’s electronic footprint or uploading it to virtual heaven, permanently secured and published on an immutable blockchain, allowing the addition of remembrance NFTs to the memorial. This website “FuneralPlay” speculates on a near future when diverse ideologies and values are accepted within the setting of a funeral: apart from traditional religion, a series of subcultures are emerging as new elements in a funeral scenario. As a result, cat meme lovers, boyband fandoms, fengshui masters, otakus, gangsters, cypherpunks... all can find a private post-mortem comfort zone. This journey records the recent life dynamics of some residents on the platform.



Dominic Smith

## How to Strand Astronauts on the Moon

Halsey Burgund (US), Francesca Panetta (UK)

The narrative of *In Event of Moon Disaster* is a journey; a journey filled with the technical and emotional triumphs of individuals and a nation that ultimately comes to a tragic end on the lunar surface. Using an analogous voyage through highs and lows, we plan to use our personal journey of creating *In Event of Moon Disaster* to dive into the dual nature of AI-enhanced synthetic media: on the one hand, an incredibly powerful creative and educational tool and, on the other hand, potentially the most effective purveyor of disinformation society has ever seen. We will tap into both the technologists who helped us create our deepfake as well as experts in AI, law and disinformation to contextualize and broaden the view. We hope to experiment with using synthetic media techniques to enhance the video to engage our audience and directly demonstrate some of the power of these new technologies.

<https://halseyburgund.com>



Konrad Waldmann

## Made to Measure— I is a Search Engine

Laokoon (DE)

Is it possible to create the doppelgänger of someone using only their personal Google data? This question stood at the core of the project *Made to Measure*. Using personal online data, the group Laokoon created a doppelgänger of a person they did not know, telling “her” story. The spectacular experiment can be experienced on an interactive storytelling website.

In this Journey, Laokoon cinematically recorded the installation of *Made to Measure* at this year’s Ars Electronica Festival and captured the reactions and impressions of the audience. Complemented by excerpts from interviews with experts who explain how the information collected is used for profiting from people’s weaknesses, insecurities, illnesses and addiction potentials.

<https://de.madetomeasure.online>



## Optic nerves and their time

Geocinema (Solveig Qu Suess,  
Asia Bazdyrieva) (INT)

The work will focus on the key questions which sit at the core of Geocinema—both as a documentary-led research project and a collaborative practice. We will depart from the unobvious images of the Earth (such as calibration images, mathematical modeling of climates, satellite footage, etc.) to speak of the distributed and decentralized processes of sensing and imaging.



## Spaces Camouflaged by AI

KyungJin Jeong (KR)

As a highly developed photographic technology, image distortion can be created via photo-editing software. With enough pictures, machine learning can determine attributes. I will explore the gap between advertising and reality by visiting a common room in a single house in Seoul. The project began with the question, "Can artificial intelligence (AI) distinguish between advertising and reality?" In this journey, I will explore how the AI interactive web program converts real-life room photos into commercial images and vice versa.

<https://2020.rca.ac.uk/students/kyungjin-jeong>



Antti Tenetz

## Perihelion

Antti Tenetz (FI)

In his work Perihelion (2019), Antti Tenetz combines images of space, celestial bodies, technology, space science and life. Applying machine learning, the work brings out dreamlike images of the worlds and beings of possible futures in space. The Perihelion concept wraps up microbiology, artificial Intelligence and technologies evolving with humans in space and deep space traveling. What we would be in space and how life and evolving technological frame reflect unexpected and out of human. The Journey video unravels process and challenges and steps leading from idea to work, such as how to build M.L machine and learn GAN training and develop it with ideas of life evolutive process, who to collaborate and get gold generating bacteria and right species of cyanobacteria as well as how to understand possibilities, limitations and dangers in space.



Simon Weckert

## Ubuntu—The Other Me!

Simon Weckert (DE)

The video journey wants to create a dialog between the artworks by the artist and AI-driven technologies in the process of making and creating. On the one hand, the scenario shows the environment the artist is working in with technologies as a tool that affect his artworks. On the other hand, it shows how these tools shape and manipulate his creative output. By doing so, he would like to show how machines were introduced to optimize the working processes, save time or increase accuracy, and open the question of how we became so dependent on them that we often forget what they actually do. Instead of hyping or damning the technology, he would like to invite visitors to reflect on the meaning and modes of existence of technology in a critical and sober way.

<http://www.simonweckert.com/>

# Artists

## A Centaur Journey

**Cecilie Waagner Falkenstrøm**

**Cecilie Waagner Falkenstrøm** (DK) is an award-winning artist using new media (e.g. machine learning) to create interactive artworks. Her work has been exhibited internationally e.g. at Victoria and Albert Museum in London, Experimenta 2020 in France, and Click Festival in Denmark. Her piece *ARTificial Intelligence FRANK* was awarded The Lumen Prize and the British Art and Humanities Research Council's TECHNE Award.  
<https://www.ceciliefalkenstrom.com>

## Abandoned IBM Country Club, Endicott NY

**Tega Brain, Sam Lavigne, Hannah Jayanti**

**Tega Brain (AU), Sam Lavigne (US), Hannah Jayanti (US)**

Their work examines the shifts in behaviors, desires, language, and economics catalyzed by computational systems and the internet. In their collaborations they have simulated international organizations, run a real dating service in NYC, and shared the entire Enron email archive with online audiences. Recently works include *The New York Apartment* commissioned by the Whitney Museum of Art, *Get Well Soon* commissioned by Chronus Art Center, and *The Good Life* commissioned by Rhizome and *Smell Dating*. Their work has been widely discussed in the media, in outlets such as *Marie Claire*, *The Ellen Show*, *Art in America*, *The World Almanac*, Slovenian Public Radio and *India Today*, and they have given collaborative talks at the Sonar Festival and the New Museum. In 2015, the UN filed a complaint with the US Department of State about their work.  
<http://www.tegabrain.com>, <https://lav.io>

## AI isn't Artificial but Human

**Anna Ridler, Caroline Sindors**

**Anna Ridler** (UK) is an artist and researcher. She has exhibited at institutions such as the V&A Museum, Ars Electronica, HeK Basel, Impakt, and the Barbican Centre and has degrees from the Royal College of Art, Oxford University, and University of Arts London. She was a 2018 EMAP fellow and was listed by Artnet as one of nine "pioneering artists" exploring AI's creative potential. She is particularly interested in ideas about measurement and quantification and how this relates to the natural world. <http://annaridler.com>

**Caroline Sindors** (US) is a machine learning researcher and artist obsessed with language, culture, and images. Her work explores the intersections between natural language processing, artificial intelligence, abuse, online harassment, and politics in digital conversational spaces. Her work has been featured in the V&A Museum, MoMA Ps1, the Modern Art Museum of Bologna, Ars Electronica, and others. She is the founder of Convocation Design + Research, an agency focusing on the use of machine learning and design for public good. <https://carolinesinders.com>

## Ai-Da Robot Artist

**Oxfordians, Aidan Meller, Lucy Seal**

**Aidan Meller** (UK) is creative director and project manager of Ai-Da. **Lucy Seal** (UK) is a curator and researcher based in Oxford.

**Engineered Arts** (UK) is the robot developer for Ai-Da. **Salaheldin Al Abd** and **Ziad Abass** (EG) are AI developers and responsible for drawing arm robotics for Ai-Da. **Adam Meller** (UK) is the engineering manager for Ai-Da. **Aidan Gomez** (CA) is an AI Researcher at the University of Oxford. **Charline Le Lan** (FR) is an AI Researcher at the University of Oxford. **Alex Kafoussias** (SE) is a digital artist based in Stockholm. **Christian Johnstone** (UK) is a designer based in Oxford. **Petra Cozianu** (RO) is a videographer based in London. **Zoe Corsellis** (UK) is a fashion designer based in London. **Javier Alba-Tercedor** (ES) is a micro-CT scientist and professor at the University of Granada. **Marco Castellani** (IT) is an AI developer at the University of Birmingham in the UK.

## Facebook Algorithmic Factory

**Vladan Joler**

**Vladan Joler** (RS) is the director of the SHARE Foundation and a professor at the New Media Department of the University of Novi Sad. SHARE Lab is a research and data investigation lab for exploring different technical and social aspects of algorithmic transparency, digital labor exploitation, invisible infrastructures, black boxes, and other contemporary phenomena at the intersection of technology and society. <https://labs.rs>

## Anatomy of an AI System

Vladan Joler, Kate Crawford

**Vladan Joler** (RS) is the director of the SHARE Foundation and a professor at the New Media Department of the University of Novi Sad. SHARE Lab is a research and data investigation lab for exploring different technical and social aspects of algorithmic transparency, digital labor exploitation, invisible infrastructures, black boxes, and other contemporary phenomena at the intersection of technology and society. <https://labs.rs>

**Kate Crawford** (AU) is a leading international scholar of the social implications of artificial intelligence. She is a Research Professor at USC Annenberg, a Senior Principal Researcher at Microsoft Research in New York, and the inaugural Visiting Chair for AI and Justice at the École Normale Supérieure in Paris. Her project *Anatomy of an AI System* with Vladan Joler won the Beazley Design of the Year Award and is in the permanent collection of the Museum of Modern Art. Her latest book is *Atlas of AI* (2021).

## Artificial Intelligence and its False Lies

Mika Satomi

**Mika Satomi** (JP/AT) is a designer and an artist exploring the combination of textile craft techniques with electronics technology. Since 2006 Mika has collaborated with Hannah Perner-Wilson, forming the collective KOBAKANT, creating artistic projects in the field of eTextiles and Wearable Technology Art. She is a coauthor of the e-Textile online database “How To Get What You Want.” She currently lives and works in Berlin. [www.nerding.at](http://www.nerding.at)

## Codex Virtualis

Interspecifics

**Interspecifics** (INT) is an independent artistic research bureau founded in Mexico City in 2013. We've focused our research on the use of sound and A.I., to explore patterns emerging from biosignals and the morphology of different living organisms as a potential form of non-human communication, developing a collection of experimental research tools we call Ontological Machines. Our current lines of research are shifting towards exploring the hard problem of consciousness and the close relationship between mind and matter, where magic appears to be fundamental. Sound remains our interface to the universe. [interspecifics.cc](http://interspecifics.cc)

## Deep Steward

Theun Karelse, Ian Ingram

**Theun Karelse** (NI) studied fine arts at the Sandberg Institute in Amsterdam before joining FoAM, a transdisciplinary laboratory at the interstices of art, science, nature, and everyday life. His interests and experimental practice explore edges between art, environment, technology, and archaeology. Lately he has been creating research programs that consist of fieldwork and prototyping as means of critical reflection. [theunkarelse.net](http://theunkarelse.net)

**Ian Ingram** (US) is a Los Angeles-based artist who is interested in the human-made body's future as a willful entity and the nature of communication. He builds robotic objects that borrow facets from animal form and behavior, from the shapes and movements of machines, and from our stories about animals. The resulting works—often intended to cohabitate and interact with the animals in their own places—explore our relationship with non-human animals, behavior and object performance as artistic media, and the interface between the built and the grown. [ianingram.org](http://ianingram.org)

## Distributed Robotic Assembly for Timber Structures

Samuel Leder, Ramon Weber

**Samuel Leder** (US) and **Ramon Elias Weber** (CH) are both architects and researchers, investigating how computational tools and experimental fabrication methods can impact future architecture. Sam is a research associate at the University of Stuttgart in the Institute for Computational Design and Construction (ICD). Sam worked previously as an architect and designer in offices from San Francisco, California to Munich, Germany. Ramon is a PhD Student at the Massachusetts Institute of Technology in Building Technology. Ramon worked as an architect for Zaha Hadid Architects and graduated from the MIT Media Lab, the University of Stuttgart, and ETH Zurich. *Distributed Robotic Assembly for Timber Structures* displays work from Sam and Ramon's Master thesis, completed as part of the Integrative Technologies and Architectural Design Research (ITECH) program at the University of Stuttgart as led by the Institute for Computational Design and Construction (ICD) and the Institute of Building Structures and Structural Design (ITKE).

## UngenauBot

**Ilmar Hurkkens, Fabian Bircher**

UngenauRobotics. Since 2013, Fabian Bircher (CH) and Ilmar Hurkkens (NL) work together exploring the limits of autonomous robotic systems and their interaction with people. They won the 2018 Digital Culture Work Contributions award of Migros-Kulturprozent.

**Fabian Bircher** (CH) studied architecture at the ETH Zürich, lives and works in Zurich. He has worked in various architectural firms and in parallel, he founded the company vonturm with Eva Wüst, which is active in the field of architecture and of electronic luminaires.

**Ilmar Hurkkens** (NL) studied architecture at the Technical University of Delft. Since 2010 he teaches at the Chair of Landscape Architecture of Professor Christophe Girod at the ETH Zurich. He is currently working in Zurich, where he is doing his doctorate at the NCCR Digital Fabrication group from within the Chair of Landscape Architecture, ETH Zurich to investigate the potential of mobile robots that implement autonomous terrain modeling methods for landscape architecture.

## Gender Shades

**Joy Buolamwini, Timnit Gebru**

**Joy Buolamwini** (US) is the founder of the Algorithmic Justice League. Her TED Featured Talk on algorithmic bias has over 1 million views. Her MIT thesis methodology uncovered large racial and gender bias in AI services from Microsoft, IBM, and Amazon. She advises world leaders on reducing AI harms through service on the Global Tech Panel, congressional testimonies, and keynotes. *TIME Magazine* and *New York Times* carry her op-eds. Her visual poem "AI, Ain't I A Woman?" is part of international art exhibitions. Joy's journey is depicted in the feature-length documentary Coded Bias.

<https://www.poetofcode.com>

**Timnit Gebru** (ET) is a computer scientist who works on algorithmic bias and data mining. She is an advocate for diversity in technology and co-founder of Black in AI, a community of black researchers working in artificial intelligence. In 2020, her employment with Google as technical co-lead of the Ethical Artificial Intelligence Team ended after the management demanded that she withdraw a submitted peer-review publication about the problems of modern AI systems for processing natural language, such as those used for Google searches.

## What a Ghost Dreams Of

**h.o** (Biography see below)

## Ghosthouse

**h.o**

**h.o** (INT) (hdoto) is an artist group based in Europe, Japan, and the United States. With receiving a grand prize of Philip Morris Art Award of "Memory of Media (2000)" they started their artistic activity. Each member has specialized in a field such as sensor technologies, database system, interaction design, hardware design, and robotics, and this group has unique forms of the collaboration, changing team members depending on the work. Recently, their exhibition titled "Ghosts in the Digital Realm" aims to create a dialogue on the future of humanity through provocative projects about robotic and AI society. Thus, they search for witty new ideas depending on current social contexts, and h.o will be realizing artistic expressions with the speed of technological progress.

## In Posse

**Charlotte Jarvis**

**Charlotte Jarvis** (UK) is an artist working at the intersection of art and science. Charlotte's practice often utilizes living cells and DNA: she has grown her own tumor, recorded music onto DNA, and seen her heart beat outside her body. Charlotte has exhibited her work in eleven international solo shows and over one hundred group exhibitions. Charlotte is currently a lecturer at the Royal College of Art.

<https://cjarvis.com/in-posse>

## In the eyes of the algorithm we are all plants

**Špela Petrič**

**Špela Petrič** (SI) is a new media artist and former scientific researcher currently based between Ljubljana, SI, and Amsterdam, NL. Her practice is a multi-species endeavor, a composite of natural sciences, wet media, and performance. She envisions artistic experiments that enact strange relationalities to reveal the ontological and epistemological underpinnings of our (bio)technological societies and challenge the scope of the adjacent possible. Much of her recent work has focused on plant life.

<https://www.spelapetric.org>

## MegaPixels

Adam Harvey, Jules LaPlace

**Adam Harvey** (US) is a researcher and artist based in Berlin and NYC focused on computer vision, privacy, and surveillance. He is a graduate of the Interactive Telecommunications Program at New York University (2010). Harvey has worked as a digital fellow with Weizenbaum Institut, a research associate at Karlsruhe HfG, a future fellow with EYEBEAM's Rapid Response for a Better Digital Future, and is the founder of the VFRAME computer vision project.

<https://ahprojects.com>

**Jules LaPlace** (US) is a programmer and musician working in Berlin. Their work explores interface design as a lens for artistic practice and has facilitated works shown at the Venice Biennale, Serpentine Gallery, and the Centre Pompidou, as well as digitally at KVV Berlin, e-flux, and the NeurIPS creativity workshop. They contribute to Exposing.ai, the VFRAME computer vision project, and make cosmic music as part of Magisphere. <https://asdf.us/jules>

## Moon Rabbit

Sarah Petkus and Mark J. Koch

**Sarah Petkus** (US) and **Mark J. Koch** (US). Sarah Petkus is a roboticist and illustrator who works with her partner Mark J. Koch, an electronics engineer and software developer. Together they create wearable devices and robots designed to challenge the way people view their relationship with technology. Furthermore, Sarah Petkus and Mark J. Koch use social media and various video sharing platforms to engage in dialogue with other creators, engineers, and artists around the world. In this way, they hope to strengthen a creative community that focuses on their shared values. <http://moonrabbit.zoness.com>

## NORAA—Machinic Doodles

Jessica In

**Jessica In** (UK/AU) Originally from Melbourne, Australia via Ithaca, Seoul, and Zurich, Jessica is an Architect, Designer, and Creative Coder, specializing in the expressive potentials of computation as a means to explore bespoke design. She is a lecturer at the Bartlett School of Architecture, running design studios in the undergraduate and masters programs, as well as a PhD candidate, pursuing her interests in machine learning for architectural drawing explorations.

<http://jessicain.net>

## SEER: Simulative Emotional Expression Robot

Takayuki Todo

**Takayuki Todo** (JP) born in Kobe, 1985. Bachelor in Aesthetics and Art Theory, Kyoto City University of Arts, Kyoto, Japan; Master in Media Creations, Institute of Advanced Media Art and Science (IAMAS), Gifu, Japan. [www.takayukitodo.com](http://www.takayukitodo.com)

## What Matters Now?

Sarah Petkus (Biography see below)

## SHE BON

Sarah Petkus

**Sarah Petkus** (US) is an artist who creates mechanical-electronic devices, and robotic entities derived from their own character illustrations. Their goal in doing so is to challenge the way humans relate to technology, encouraging reflection and the consideration of empathy towards the inanimate things we share our lives with. <http://www.zoness.com>

## THE BAD WEEDS TRIPS

Rocio Berenguer

**Rocio Berenguer** (ES) explores the narratives of our contemporary world, including the evolution of spaces for individual freedom within our society, the place of technology in our daily lives, and environmental issues. Whether in Homeostasis#V2, which focused on the dialogue between human and artificial intelligence; Ergonomics, inspired by the world of start-ups, or G5, about the threats to the future of humanity and species diversity, her creations are fictions that explore the possibility of "another tomorrow." [rocioberenguer.com](http://rocioberenguer.com)

## The Robot Suit

Mimi Onuoha

**Mimi Onuoha** (US) is a Nigerian-American artist and writer whose work interrogates the power dynamics and global hierarchies contained in acts of data collection. Her multimedia practice uses print, code, installation, and video to call attention to how people are differently abstracted, represented, and missed by digital systems. Onuoha has spoken and exhibited internationally. She has been in residence at Studio XX (CA), the Data & Society Research Institute (US), the Royal College of Art (UK), the Eyebeam Center for Arts & Technology (US), and the Arthouse Foundation (Nigeria, upcoming). <https://mimionuoha.com>

## Cultural Partners

## From Glass to Glass to Glass

**Nye Thompson** (Biography see below)

### The Seeker

**Nye Thompson**

**Nye Thompson** (UK) creates software systems to explore technology paradigms and the underlying power dynamics of the machine gaze. She has had exhibitions at the Tate Modern, the Barbican, V&A, ZKM Karlsruhe, and Ars Electronica. Her first solo show, described by C4 News as “too shocking to broadcast,” triggered an international government complaint. Her work has been featured by the BBC, CNN, *The Guardian* and *WIRED*. She’s been called “the new Big Brother” (*Vogue*) and “a contemporary Jacques Cousteau” (Bob & Roberta Smith). [nyethompson.net](http://nyethompson.net)

## Women Reclaiming AI

**Birgitte Aga and Coral Manton**

**Birgitte Aga and Coral Manton** (UK). The work of artist–technologist duo B Aga and Coral Manton manifests as collaborative workshops, events, and installations aimed at (re)claiming conversational artificial intelligence (AI) systems as a medium for protest. It critiques the commercial pursuit of humanizing AI technologies and challenges the bias, stereotyping, and pervasive influence embedded within. By activating the public, Aga and Manton re-write and re-imagine the cultural myths of AI and robotics, creating futures mediated by alternative technology. Their most recent work is *Women Reclaiming AI* (2019), an expanding activist artwork, presented as a feminist AI voice assistant, programmed through workshops by a growing community of self-identifying women, and *The Infinite Guide* (2018), a speculative artwork and research project, powered by a conversational AI, (LSTM Recurrent Neural Net), trained on a biased and non-diverse data set. [Birgitteaga.com](http://Birgitteaga.com), [coralmanton.com](http://coralmanton.com)

## Doing Nothing with AI

**Emanuel Gollob**

With his art practice, **Emanuel Gollob** (\*1991, AT) bridges aesthetic research, human—A.I. interaction, neuroscience and robotics. Gollob graduated at the University of Applied Arts Vienna with a diploma in Design Investigation (2019). Currently, he is artist in residency at MindSpaces, an EU research project in the STARTS initiative framework. Since 2020, he is a PhD candidate and part of the Creative Robotics research team at the University of Art and Design Linz. [www.emanuelgollob.com](http://www.emanuelgollob.com)

## Feminist Data Set

**Caroline Sindere**

**Caroline Sindere** (US) is a machine learning researcher and artist obsessed with language, culture, and images. Her work explores the intersections between natural language processing, artificial intelligence, abuse, online harassment, and politics in digital, conversational spaces. Her work has been featured at V&A Museum, MoMA Ps1, Modern Art Museum of Bologna, Ars Electronica, and others. She is the founder of Convocation Design + Research, an agency focusing on the use of machine learning and design for public good. [carolinesindere.com](http://carolinesindere.com)

## Learning to See: Gloomy Sunday

**Memo Akten**

**Memo Akten** (TR) is a computational artist, engineer, and computer scientist working with emerging technologies to create images, sounds, experimental films, large-scale responsive installations, and performances. He has recently completed a PhD at Goldsmiths University of London in AI / Deep Learning and expressive human-machine interaction and is Assistant Professor of Computational Arts at University of California, San Diego (UCSD). Akten received the Prix Ars Electronica Golden Nica for his work *Forms* in 2013 and has exhibited and performed internationally. [www.memo.tv](http://www.memo.tv)

## **The Wandering Mind**

**slow immediate**

**slow immediate** (CN/US) is the creative studio of Gershon Dublon and Xin Liu. To them, immediacy to the self and environment is pivotally important to being human on our shared planet. **slow immediate** is a member of the New Museum's NEW INC and ONX Studio, and recipient of the European ARTificial Intelligence Lab residency initiated by Ars Electronica. Their VR film, *Living Distance*, explores an individual's place in the cosmos, and is a 2020 official selection of Sundance. [slowimmediate.com](http://slowimmediate.com)

## **Volumetric Data Collector**

**Hyun Parke, Jinoon Choi, Sookyun Yang**

**Sookyun Yang** (KR) is an artist who is interested in bringing imagination—that comes from experience accumulated by living in a current state of technology—into a tangible outcome. Current work scope includes investigating the potential of human beings as a medium interconnecting technology and physicality in the time when technology exists ubiquitously in everyday life. [maumchine.net](http://maumchine.net).

**Hyun Parke** (KR/US) is a Seoul based designer and artist whose work investigates the possibilities between the gap of the physical and digital world. His projects involve designing and building contraptions for small scale fabrication by employing technologies in atypical ways. By investigating new methods of manufacturing, he introduces a shift in perspective for making objects from centralized power to decentralized individuals. [hyunparke.com](http://hyunparke.com).

**Jinoon Choi** (KR) takes generally accepted rules as data and transforms them into diverse platforms. Many discoveries happen during the process of transformation, such as irreplaceable originality or meta-conversion rules are found on the way. His works depart mostly from underlying doubt and are realized in alternative forms of products. Trained as a painter, he adopts the grammars of design and programming in experimentation for better form, style, and methodology. Currently, as a ZERO1NE creator, he explores the LiDAR rule. [seoullidars.com](http://seoullidars.com)

## **!brute\_force: Feeding the Algorithm**

**Maja Smrekar**

**Maja Smrekar's** (SI) work has been established in the international art and science milieu, based on interdisciplinary research of the developments and application of ideological structures in contemporary society. Grounded in sculpture, Smrekar's practice has allowed her to lead strong collaborations in developing cross-conceptual productions that include installations, performances, site specific art, drawings, videos, sound, workshops, lectures, talks and texts. Among other prizes, she received the Prix Ars Electronica—Golden Nica 2017 Award in Hybrid Art and Prešeren Foundation Award, the highest national award for artistic achievements in Slovenia in 2018.

<https://www.majasmrekar.org>

## **Accessing what you always knew you needed**

**Danielle Brathwaite-Shirley**

**Danielle Brathwaite-Shirley** (UK) is an artist working predominantly in animation, sound, performance and Video Games to communicate the experiences of being a Black Trans person. Their practice focuses on recording the lives of Black Trans people, intertwining lived experience, fiction and interactivity to create work that refuses to let viewers be passive. The work is often seen as a form of autonomous archiving in which the experience shifts and moulds based on the identity of the user as well as the choices they make during the experiences.

## **Black Movement Library**

**LaJuné McMillian**

**LaJuné McMillian** (US) is a multidisciplinary artist and educator creating art that integrates performance, extended reality, and physical computing to question our current forms of communication. They are passionate about discovering, learning, manifesting, and stewarding spaces for liberated Black realities and the Black imagination. LaJuné believes in making by diving into, navigating, critiquing, and breaking systems and technologies that uphold systemic injustices to decommodify our bodies, undo our indoctrination, and make room for different ways of being.

## **The Zizi Show—Enter the World of Deep Fake Drag Cabaret**

**Jake Elwes**

**Jake Elwes** (UK) is a media artist living and working in London. He studied at The Slade School of Fine Art, UCL (2013 – 17). Recent works explore his research into machine learning and artificial intelligence. His practice looks for poetry and narrative in the success and failures of these systems, while investigating and questioning the code and ethics behind them. His current work in the Zizi Project explore AI bias by queering datasets with drag performers, to simultaneously demystify and subvert AI systems. Jake's work has been exhibited in museums and galleries internationally, including the ZKM, Karlsruhe, Germany; TANK Museum, Shanghai; Today Art Museum, Beijing; CyFest, Venice; Edinburgh Futures Institute, UK; Zabudowicz Collection, London; Frankfurter Kunstverein, Germany; New Contemporaries 2017, UK; Ars Electronica 2017, Austria; Victoria and Albert Museum, London; LABoral Centro, Spain; Nature Morte, Delhi, India; RMIT Gallery, Australia; and Centre for the Future of Intelligence, UK. He has been featured on ZDF & BBC.

## **FuneralPlay**

**Ruini Shi**

**Ruini Shi** (UK) is an animation director based in London, currently pursuing her PhD on the possibilities presented by the confluence of crypto and animation. Combining film language and technological aesthetics, she creates narratives that interrogate the compatibility between humanity and emerging technologies. Her first film *Strings* won the Award of Distinction at Prix Ars Electronica 2019. She was nominated for the 2019 Rapoport Award for Women in Art and Technology.

## **How to Strand Astronauts on the Moon**

**Halsey Burgund, Francesca Panetta**

**Francesca Panetta** (UK) is an immersive artist and journalist using emerging technologies to innovate new forms of storytelling that have social impact. She led immersive innovation at The Guardian for 10 years, including running their in-house VR production studio.

**Halsey Burgund** (US) is an artist and technologist focused on the combination of modern technologies—from mobile phones to artificial intelligence—with fundamentally human “technologies,” primarily language, music and the spoken voice.

## **Made to Measure—I is a Search Engine**

**Laokoon**

**Laokoon** (DE) develops essays, documentaries, theater productions, lectures and radio plays. The group's works deal with the question of how the idea of man and society changes in the digital age. Cosima Terrasse develops participatory performance projects and teaches at the University of Applied Arts in Vienna. The documentary *The Cleaners* by Hans Block and Moritz Rieseewieck, about the shadow industry of digital censorship, received the Prix Europa and the Grimme Audience Prize among others.

## **Optic nerves and their time**

**Geocinema (Solveig Qu Suess, Asia Bazdyrieva)**

**Geocinema (Solveig Qu Suess, Asia Bazdyrieva)** is a collective that explores the possibilities of a “planetary” notion of cinema. Their practice has been concerned with the understanding and sensing of the earth while being on the ground, enmeshed within vastly distributed processes of image and meaning making. Their work has been shown internationally, including the solo show *Making of Earths* (Kunsthall Trondheim). In 2020 they were nominated for the Schering Stiftung Award for Artistic Research.

## **Perihelion** **Antti Tenetz**

**Antti Tenetz** (FI) is a sub-arctic based artist. Through a practice of video, installation, interactive and biological arts he explores how humans, non-humans and machines envision, dream, perceive and relate to the changes in hybrid environment where the technosphere and biosphere merges. His works are situated at the interface between media arts, biological arts and urban art. His focus is on multi-disciplinary and multi-artistic cooperation between art and science, and he often uses technologies such as drones, satellite tracking, game engines and machine learning. Tenetz's works and collaborative projects have been exhibited in Finland and internationally, including at the Venice Biennale, Istanbul Biennale parallel program, Tate Modern Exchange program, Science Gallery Dublin, Lumipalloeefekti exhibitions, X-Border, ISEA Istanbul, Pan-Barentz, and e-mobil art. He has also won three national snow-sculpting competitions.

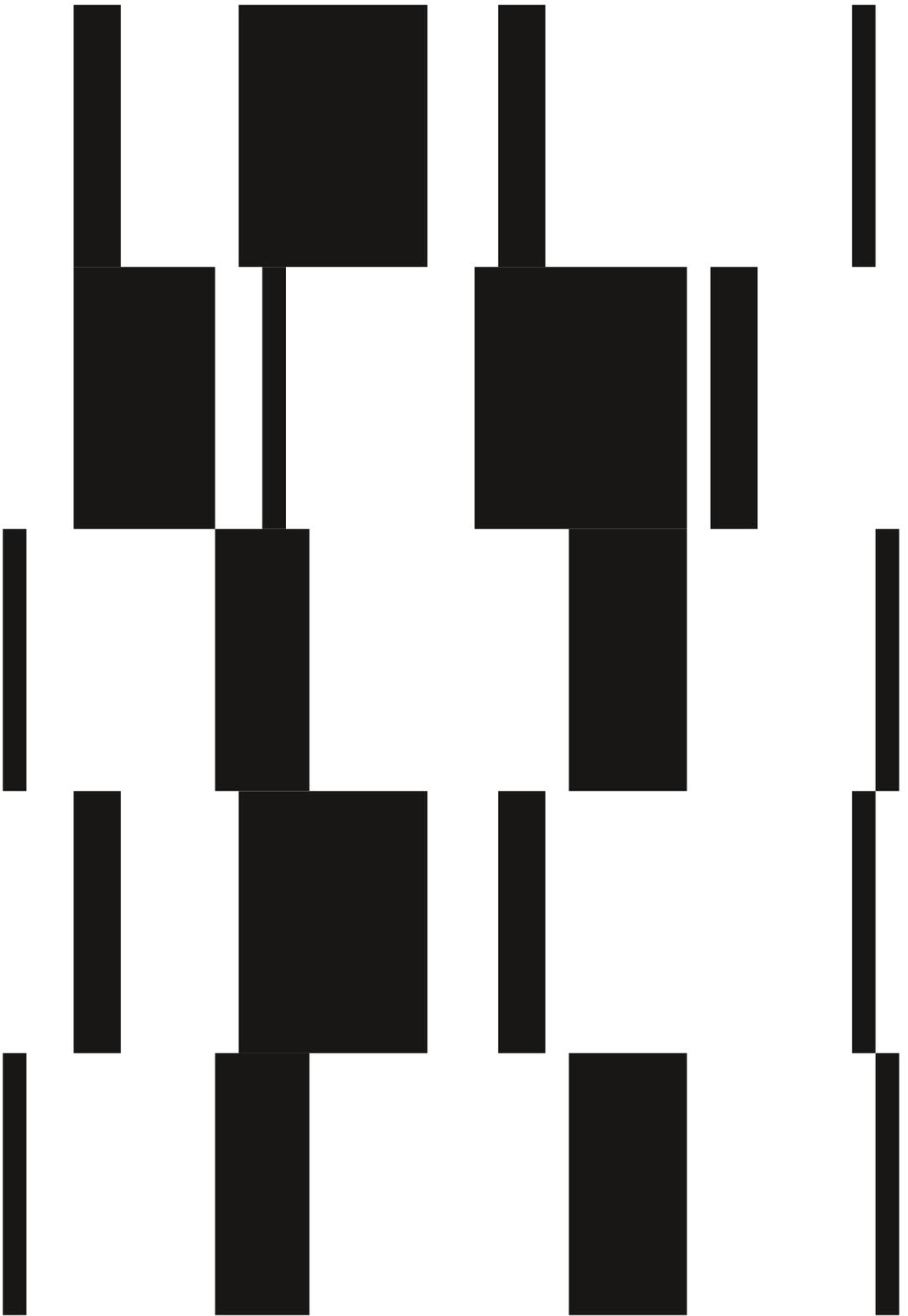
## **Spaces Camouflaged by AI** **KyungJin Jeong**

**KyungJin** (KR) is a designer, artist and researcher with an interest in the social concerns people face in daily life. She believes that artists, designers and researchers can reveal such concerns to the public through their work and offer feasible solutions to them. She is keen on how emerging technologies, such as AI and VR, will influence human society in the future. KyungJin earned a master's degree with a distinction in information experience design from the Royal College of Art.

## **Ubuntu—The Other Me!** **Simon Weckert**

**Simon Weckert** (DE) likes to share knowledge in a wide range of fields, from generative design to physical computing. His focus is the digital world under the reflection on current social aspects, from technology-oriented examinations to the discussion of current social issues.





# CPN — Center for the Promotion of Science



CENTER FOR  
THE  
PROMOTION  
OF SCIENCE

Belgrade, Serbia

# CPN—Center for the Promotion of Science

CPN—Center for the Promotion of Science is a public institution established in 2010 by the Government of the Republic of Serbia with the task to promote science and technology. The Center, according to its mandate, cooperates with research and educational institutions (universities, research centers, and schools) in Serbia and worldwide, works closely with the government ministries as well as the media and the private sector.

CPN's mission is to bridge the gap between science and society by bringing together researchers, educators, policy makers, civil society organizations, business and industry, and the general public in the process of research and innovation. The ultimate aim is to influence and adapt the general research agendas to reflect the needs of the society and to address societal challenges engaging all actors involved in the process. Through numerous activities on the national and regional levels, the Center advocates and fosters the ideas and concepts of Responsible Research and Innovation and Open Science. CPN organizes numerous exhibitions, educational workshops, lectures, panel discussions, and other kinds of events on different topics (climate issues, mathematics, artificial intelligence, robotics, archeology, biology, etc.), e.g. "May Month of Mathematics—M3" (annual event since 2012), "Days of the Future: Robotics," "CERN in Serbia" and "art+science" (annual series since 2016), are the most prestigious examples. Behind all

exhibitions and other formats is the idea to create them in an interactive and engaging way, so visitors can play an active and contributing part.

One of the most popular products of CPN is a popular-science magazine *Elements*, which is published four times a year. Each edition has its main topic, which is elaborated by renowned local and international scientists, science communicators, and journalists. It also brings original illustrations by established and young designers and artists. Being a beacon of science journalism in the region, CPN has been among the initiators of the Balkan Network of Science Journalists.

In parallel with the Center's core activities, the Department of International Cooperation is currently handling 10 active EU projects out of 40 projects in which CPN has been involved since 2012, funded through diverse programs and calls (Horizon 2020, Creative Europe, Erasmus+, FP7, LLP, COST). CPN has strategic partnership and signed cooperation agreements with numerous entities across the globe, including participation in several relevant European and global networks.

At the national level, the Center facilitates and coordinates the Network of Science Clubs, which currently consists of 15 units exceptionally well-spread across Serbia. Additionally, CPN financially and logistically supports around 70 science promotion and popularization projects of its local partners, after an annual public call.

# art+science lab 2020

## Intelligence IO

Are we progressing? Are we fulfilling idea(l)s of our ancestors who dreamed about bright, rectangular cities run and led by fascinating machines? Did they ever consider matching first something on the opposite side of scale—our invisible counterparts, tiniest of all creatures? So simple and logical that they can be seen as a founding element, as the clear common-sense led intelligence. The one without conscience and meaning, purely existence-driven.

A sad 2020 showed so many *sums of all our fears*. It also emphasized multiplied shortcomings, misconceptions, and prejudices, even corruptions and superficialities at the highest levels. It undermined our belief in Knowledge, as a humankind and as a civilization capable of astonishing achievements. Our technology-powered and knowledge-based societies literally collapsed, thanks to something with just a couple of features. We instantly forgot the past days, years, even decades of progress, getting (b)locked by something unseen.

The ultimate goal of artificial intelligence would be to create an all-encompassing means capable of solving any issue and coping with the greatest of all challenges that we're facing. It was somehow foreseen that AI will represent human+ intelligence. But what if for our world, or for all the worlds that we're capable of imagining, there is a more adequate protagonist, or rather a more compatible option? Less destroyer, more upgrader.

Our AI Lab has been growing yet we were forced to halt its progress and reconsider ourselves. In a globalized world, even a tiny, neglected subject from a remote market booth may become a prophet of a new paradigm, or a media star. Therefore, we need to be humans more and to deploy all our knowledge and imagination. The AI Lab is fully open in 2020 as we can't offer anything determining and closing. No protocols, just collaboration and solidarity.

Together with partners in Trieste (EuroScience

Open Forum—ESOF) and Linz (Ars Electronica), the fifth art+science edition is trying to tackle, analyze, and discuss a very unique moment of our existence. Our systems of belief are hacked by a clearly alternative way of thinking and better applied intelligence. That intelligence is binary, and it has only positive and negative solutions. Not to exist isn't really an option and we should try to observe ourselves through that principle.

By means of limitless artistic creativity, firm scientific foundation, and advanced technologies embodied through AI systems, art+science lab is more of a sequence in time than a firm, compact event. Its content is therefore presented in numerous ways and—to be on the safe side—virtually. This, however, leads to an existential question: how to treat digital content which obtained its physical representation only for being re-transferred to a virtual realm? In a loop that may announce new modes of (co)existence, we shall consult the classic—(being) replicant or not? To exist or not? IO

**Dobrivoje Lale Eric**

Head of Department of International  
Cooperation, CPN

## Becoming Artificial

As an unprecedented collective experience, the 2020 pandemic has come to emphasize the importance of both creatively cognitive character, as well as universal aspirations constituting a point of intersection between art and science. With respect to the theme of this exhibition, though already present, yet, by unforeseen circumstances, accelerated transfer of digital data, and enforced reliance on artificial intelligence, intensified the interdependent relationship of humans and state of the art machines, making it an everyday occurrence. From the techno-pessimistic perspective, this affects a reinforced control and surveillance of human activities. However, coalescing with art, science succeeds in not only overcoming its self-sufficiency, but in becoming self-conscious of possible instrumentalization.

AI Lab is a product of connecting infra-structures—individuals, as well as an institution of art and science—with the aim to reinforce them in their creative and critical reflection, attentiveness and re-imagining—the mentioned transforming social practices—the status and function of machine learning and artificial intelligence.

The selection of artists proposes considerations of a pervasive digital upload of the self, with the focus on: biology (Victoria Vesna), religion (Kristina Tica), knowledge extractivism (Vladan Joler & Matteo Pasquinelli), and non-commercial world creation with the tools borrowed from gaming (Filip Kostić), as well as visualization, attentiveness, atmosphericity, and articulation of data, as result of a+s+cpn workshops within the platform envisioned by the CPN. Instead of being fetishized, machine learning and artificial intelligence are here examined and demystified. The artists and scientists take a critical attitude toward the transhuman turn in the world being transformed and also visualize and articulate a complex interdependence of humans and machines and their impact on culture.

art+science lab presents a creative approach to artificial intelligence as a critical practice, and the audience is the witness of abandoning the object-oriented culture towards the systems-oriented culture where change doesn't stem from the object, but from the way in which objects are being constituted (Jack Burnham, *Systems Esthetics, 1968*). Curating, positioning the intersection of art and science, here implies allowing the audience to experience a critical creative appreciation of the use and effect of artificial intelligence.

The potentialities of artificial intelligence and recent technological paradigms are so far unforeseeable. However, through the lens of Shoshana Zuboff's surveillance capitalism and her ontology, these potentialities already regulate, control, and exploit human life. art+science lab, promoting creation and critical thinking of artists and scientists, thrives on

being an element that generates technological progress and offers resistance to the techno-positivism and techno-patriarchy imposed by technology as an equal participant in the contemporary ecosystem.

**Dr. Maja Ćirić**  
Guest curator

## **a+s+cpn selection**

Since 2014, CPN has been continuously working on the formation of a sustainable network that brings together scientists and artists, encourages their cooperation and the development of joint projects. a+s+cpn selection is the result of constant reflection on collaboration models and forms of cooperation between professionals from all fields of science and art. Through this program, CPN encourages and supports collaboration, creating new connections, moving or erasing boundaries between disciplines.

This year, the focus was on the development of transdisciplinary projects tackling a wide and diverse field of artificial intelligence. Through a series of meetings, we initiated a dialogue between actors dealing with different disciplines and mapped key topics and concepts through which we can observe artificial intelligence. After getting to know each other better, the participants were invited to form teams and compile project proposals for implementation within the art+science lab exhibition.

For the realization of works, the Center provided funds for production and royalties, and provided expert and logistic support during the entire process of developing project ideas and artworks. The products of the Center's aspiration towards a deeper collaboration of actors of the scientific and artistic scene in Serbia are the works *Aerosonar*—a spatial audio installation that indicates the human impact on air pollution, and *AI/VI*—a pervasive mobile game about re-examining human and algorithmic decision-making and their consequences in the future.

**Petar Laušević and Dr. Bojan Kenig**  
Project and a+s+cpn coordinator  
and Program and a+s+cpn coordinator

# art+neuroscience 2019

## The world behind the eyes

Can you picture a perfect scene? Can you create in your mind a beautiful, idyllic landscape where an infinite intensely green field merges with the swaying tree top branches of the surrounding woods, while innumerable animals swirl all around? Maybe you also see a narrow stream meander through. Are there people, or are they missing? And, if they are absent, is it possible to picture and establish this magnificent ambiance without the human brain? Without the organ that has been developing and evolving in our heads for millions of years. Finally, do you know what is necessary for this picture to be created in your mind?

The Center for the Promotion of Science invites you to join us in the examination of the very core of human existence and imagination. The fourth edition of the program that connects and confronts science and art is dedicated to neurosciences as an active and dynamic training ground for contemporary research. The manifestation called *art+neuroscience* brings forth artwork exhibits, topical educational content, and rich and diverse additional programs.

During November and December of 2019, these activities will be realized at various locations in Belgrade, including the Gallery of Science and Technology of the Serbian Academy of Sciences and Arts, French Institute, Collegium Hungaricum, the Center's

Science Club, and university art departments. Using advanced technologies and authentic creative procedure, selected artists offer their vision of the neurosciences and the contemporary scientific research and findings, as well as their relationship with, and impact on, humans and society at large. The artwork in question relies heavily on the creative, scientific, and technological procedures, such as methodological research, adapted experiments, intentional programming, and the use of various softwares and codes. The special value of this year's program lies in the fact that all the presented artwork developed through intense dialogue, direct communication, and collaborative research of the representatives of both creative sides.

In the exhibiting spaces, the local artists of the younger generation will present their work, dedicated to specific topics, areas, and processes within neuroscientific research. The work of the winner of the first national AI Lab selection in Serbia, Jasna Jovičević, will premiere in the form of a performance. The art-science research is developed and realized through the collaboration with the Laboratory for Biomedical Engineering and Technology at the School of Electrical Engineering in Belgrade. The *art+neuroscience* manifestation is the first program activity of the Center as an initial partner in the European ARTificial Intelligence Lab project, co-funded by the Creative Europe Programme of the EU.

**Dobrivoje Lale Eric**

Head of Department of International  
Cooperation, CPN

# Activities

## Conferences

### **Data Dada: Subversive poetics of complex systems**

Lecture

CPN Science Club, Belgrade, RS

15.11.2019

Uroš Krčadinac (RS)

### **Rethinking the Impact of Liberal Arts — Dialectic and Literature: The dialectic of the creation of bilingual writers**

Panel discussion

CPN Science Club, Belgrade, RS

15.11.2019

Dragana Grbić (RS), Samuel Koruniak (DE),

Melanie Schippling (DE), Uroš Krčadinac (RS),

Marjana Brkić (RS), Katarina Stekić (RS)

### **Was ist Kunst, Alexa?**

Artist Talk

SASA Gallery of Science and Technology,

Belgrade, RS

16.11.2019

Brain pictures — Žarko Aleksić (RS)

### **Machine learning for artists**

Lecture

CPN Science Club, Belgrade, RS

20.11.2019

Uroš Krčadinac (RS)

### **Lecture: Prof. Slobodan Marković, Laboratory for Experimental Psychology, Faculty of Philosophy, University of Belgrade**

Lecture

CPN Science Club, Belgrade, RS

25.11.2019

Slobodan Marković (RS)

### **Art in the Age of AI**

Lecture

The Kolarac Endowment

25.11.2019

Petar Laušević (RS)

### **art+science in the age of artificial intelligence**

Panel discussion

CPN Science Club, Belgrade, RS

06.12.2019

Dobrivoje Lale Erić (RS), Milica Janković (RS),

Maja Ćirić (RS), Marlies Wirth (AT),

Petar Lausevic (RS)

### **Curating the artificial intelligence: Vienna Biennale dedicated to changes and the future**

Panel discussion

CPN Science Club, Belgrade, RS

07.12.2019

Maja Ćirić (RS), Marlies Wirth (AT)

### **AI Lab live**

Online Panel

10.09.2020

Dobrivoje Lale Erić (RS), Petar Laušević (RS) &

Aerosonar team

### **What is next?**

Panel discussion

CPN Science Club, Belgrade, RS

14.09.2020

## Exhibitions

### **Both Ways**

online / Trieste, IT

29.08.2020 — 14.09.2020

Including a virtual exhibition opening on

29.08.2020

Including event *Mozilla Hub Both Ways* on

04.09.2020 with Kristina Tica (RS), Filip Kostić

(US) & Maja Ćirić (RS)

### **Intelligence IO**

CC Magacin, Belgrade, RS

01.09.2020 — 14.09.2020

## Workshops

### **Dialectic and literature**

CPN Science Club, Belgrade, RS

15.11.2019

Dragana Grbić (RS)

### **“Non-unanimous” decisions:**

#### **How to manage bilingualism**

CPN Science Club, Belgrade, RS

15.11.2019

Uroš Tomić (RS)

### **Vicious circle: The life and death of neurons**

CPN Science Club, Belgrade, RS

18.11.2019 + 25.11.2019

### **Can the brain glow in the dark?**

CPN Science Club, Belgrade, RS

20.11.2019 + 02.12.2019

**The psychological power of dance,  
Student Section for Neurosciences**  
SASA Gallery of Science and Technology,  
Belgrade, RS  
23.11.2019

**You won't believe your ears  
(and why you should)!**  
CPN Science Club, Belgrade, RS  
27.11.2019 + 04.12.2019

**Neuromarketing: How to buy the brain?,  
Student Section for Neurosciences**  
SASA Gallery of Science and Technology, Belgrade,  
RS  
27.11.2019

**A Black, E white, I red, U green, O blue:  
vowels, I shall tell, one day, of your  
mysterious origins!**  
CPN Science Club, Belgrade, RS  
29.11.2019 + 06.12.2019

**Neurons in action, Hirnkastl/Backyard Brains**  
CPN Science Club, Belgrade, RS  
29.11.2019

**Vision explained, Hirnkastl/Backyard Brains**  
CPN Science Club, Belgrade, RS  
30.11.2019

**I sit and worry about her**  
03.12.2019  
Jasna Jovičević (RS)

**Workshop of the Student Section for  
Neurosciences**  
CPN Science Club, Belgrade, RS  
05.12.2019

**Antroposonar: interactive workshop and  
discussion**  
CC Magacin, Belgrade, RS  
05.09.2020  
Aerosonar

## Other Activities

**We Inspire You!**  
promotional tour  
Linz, AT & Ljubljana, SI  
12.06.2019 – 15.06.2019

**art+neuroscience**  
Exhibition, workshop, lecture  
Belgrade, RS  
14.09.2019 – 30.11.2019  
(Multi)facial anxiety, Sacrifices for the greater  
good, ... Remember me by ..., Brain Pictures

**I sit and worry about her**  
Performance  
SASA Gallery of Science and Technology,  
Belgrade, RS  
14.09.2019  
Jasna Jovičević (RS)

**art+neuroscience live**  
Radio Show  
"Radio Aparat" internet radio station  
24.11.2019

**Was ist Kunst, Alexa?**  
Performance  
SASA Gallery of Science and Technology,  
Belgrade, RS  
25.11.2019  
Brain pictures—Žarko Aleksić (RS)

**Art and cognitive science**  
Masterclass  
The Faculty of Fine Arts  
28.11.2019  
Brain pictures—Žarko Aleksić (RS)

**CURIOUS**  
Presentation  
CPN Science Club, Belgrade, RS  
03.09.2020  
Mirko Stojković (RS) & Jovana Karaulić (RS)

**AI/VI picnic: open exchange about us and  
our AI systems**  
Picnic  
Music pavilion at Kalemegdan, RS  
06.09.2020 + 13.09.2020  
AI/VI (RS)

**Digital Prayer**  
Presentation  
CC Magacin, Belgrade, RS  
07.09.2020  
Kristina Tica (RS) & Uroš Krčadinac (RS)

**Intelligence IO virtual tour**  
Virtual tour  
09.09.2020

**Bird Song Diamond Meditation: LA > Belgrade**  
Online Event  
13.09.2020  
Victoria Vesna (US) & associates

## Ars Electronica Garden 2020

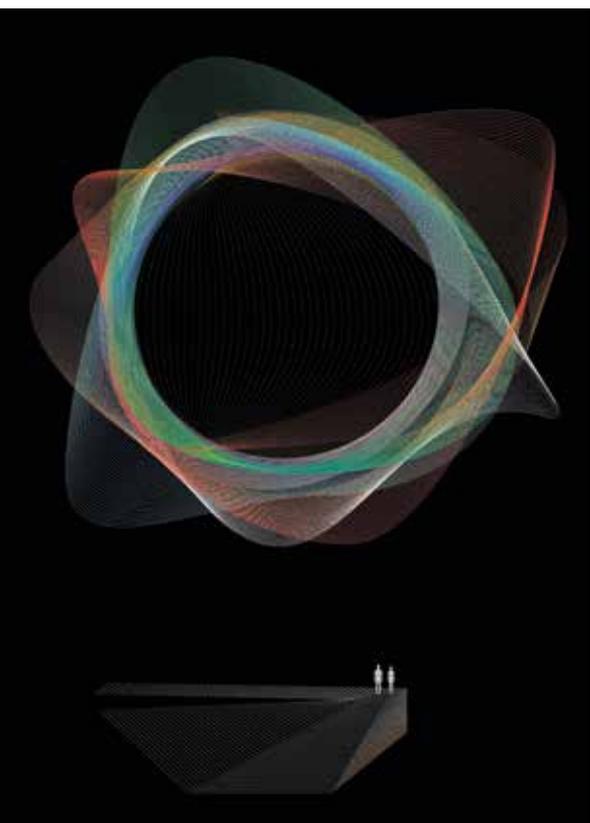


<https://u.aec.at/FOE41A27>

# Projects

## **(Multi)facing Anxiety**

Bojana S. Knežević (RS), David Stanley (UK), Dr Andrej Savić (RS),  
Maja Pantovic Stefanović (RS) & Milica Velimirović Bogosavljević (RS)



*(Multi)facing Anxiety* raises awareness and helps destigmatize anxiety disorders. The exploration of anxiety evolves through an interactive audio-visual installation, with audio testimonies of people who have once felt it strongly. While listening to the statements, visitors are in the mirror-circled room, an illusory infinite space, surrounded by the multiplied lights reflecting the differences in brain waves in a relaxed and aroused anxious state. They are asked to place a GSR device on their index finger in order to generate and record signals based on their emotional response to the story and the environment. The GSR responses are compared in order to explore how the experiences of anxiety influence the visitors and whether they respond to the same stimuli in a similar way.



## A Bright Moment Left in between

Dejan Vračarević (RS)

The mapped video projection, using programmable logic controllers, presents the phenomenon of human-machine interaction. The phenomenology of these relationships is read through animated content that follows the history of the development of digital technologies, with the help of the most modern interface and software. The installation

is read by confronting selected digital works against images of classical art, by using interactive video with sound samples, autonomous video and sound. By projecting these contents onto an interactive mirror panel controlled by the audience, reflection leads to the creation of new visual contents.

## Aerosonar

Ana Todosijević (RS), Marija Šumarac (RS), Ana Anastasov (RS)



*Aerosonar* is a spatial audio installation which displays macro level air pollution in the microenvironment of the exhibition, while emphasizing a human impact on it. Musical composition of the installation allows the air pollution to be experienced through the sense of hearing, which otherwise is not the case. Musical composition is created through the sonification of downtown Belgrade air pollution data. Visitors' impact is recorded by the movement sensors based on their behavior in the space of installation, and this impact is then translated into a function which modifies the original air pollution composition. Visitors experience the installation space through a mutual relationship of the air pollution parameters, as well as through their personal relation to the same parameters.

[www.bio2arh.org/en/projekti/aerosonar](http://www.bio2arh.org/en/projekti/aerosonar)

Software development: Aleksandar Kilibarda  
Scientific concept: Bojan Kening





Ivan Zupanc

## “... Remember me by...”

Milan Ličina (RS) and Dr Marjana Brkić (RS)

... Remember me by... represents an interactive light installation inspired by research on the process of dementia. Scientific results point to the possibility that no memory is forever lost, but instead becomes inaccessible due to the loss of connections between the nerve cells. The piece explores the relationship

[artandscience.rs/arhivaartandscience/2019/eng/папти-ме-по](http://artandscience.rs/arhivaartandscience/2019/eng/папти-ме-по)

and emotional connection with the personal memories, through an intimate experience created to prompt self-reflection, and asks the question as to how much our identity depends on these memories. The installation itself uses our need to be remembered and to become a part of someone’s memories.

## AI/VI

Aleksandar Bulajić (RS), Ana Popović (RS), Isidora Pejović Blagojević (RS), Maja Maksimović (RS), Sunčica Pasuljević Kandić (RS)



aivi



<https://u.aec.at/2402FO24>

AI/VI is an interdisciplinary project that investigates AI and its roles in modern society. It is created as a pervasive mobile game that uncovers AI and accompanying problems of how humans and AI are being shaped and transformed through their mutual relationship, communication, and use. The aim is to put players in the position to question human and algorithmic decision-making and its future consequences. Mapped locations in downtown Belgrade are topic posts that problematize dynamic relationships of the creator-AI-user system. Through the game and picnic discussions, designed as places of experience exchange, they can uncover their path, delve deeper into the problems, and have the public actively engaged in further game development.

[artandscience.rs/en/#aivi](http://artandscience.rs/en/#aivi)

Computer programming: Filip Žarković. Graphic design: Ivan Avdić. Dialogue dramaturgy: Miloš Petrik.

Takashi



Ivan Zupanc



## Bird Song Diamond: The Acoustic Mapping of Bird Song Networks Tech

Victoria Vesna (US/RS)

*Bird Song Diamond: The Acoustic Mapping of Bird Song Networks Tech* (in collaboration with Charles Taylor, bird sounds database courtesy of Jasne Jovičević, 2014–ongoing). The goal of this project is to understand the language of birds—of course not ALL species of birds, but at least a few, starting with those that have languages that seem complex, and yet manageable. While this has long been a desire, up to now it has not been possible, but with modern advances in computing, in linguistic analysis, and a new-found appreciation of how sophisticated other creatures can be, the grammar (and perhaps meaning) of bird song seems attainable. Each installation is habitat specific and reflects its environment and ecology.

[birdsongdiamond.com](http://birdsongdiamond.com)  
Collaborator: Charles Taylor.  
Sounds database: Jasne Jovičević

Marinollerman

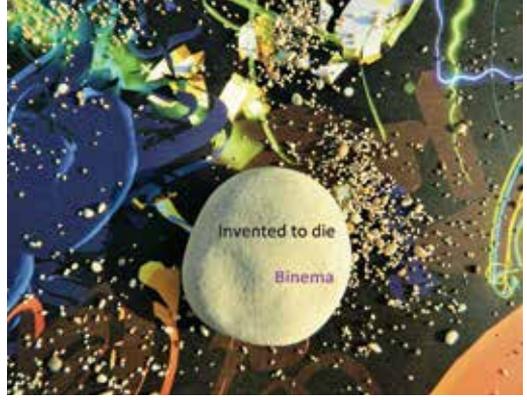


## Noise Aquarium

Victoria Vesna (US/RS)

The ecological crisis is a human crisis. Oceans must not be considered as flat blue surfaces which serve as dropping holes where we can let vanish all our anthropogenic remains. There are vast amounts of organisms that live down there and some suffer pain from our waste and noise. Many are aware of mammals such as whales and dolphins but often ignored is the deeply secluded environment that is invisible and inaudible to us. Therefore, in this installation, we have created 3D enlarged plankton to be like whales. This is a highly interdisciplinary artist-led effort with biologists, chemists, nano-toxicologists, and an animator all working together towards a common goal—to raise awareness.

[noiseaquarium.com](http://noiseaquarium.com)



## BINEMA—No storage is big enough to make me endless

Marko Milić (RS)

*BINEMA* is the winning project of the art+science AI Lab national selection for 2021, realized in collaboration with the Clean CaDET AI project funded by the Science Fund of the Republic of Serbia. *BINEMA* is a long term study of dance as a phenomenon in a scientific context, combining an artistic, scientific, and personal interest in exploring the (con)temporality of dance.

*BINEMA* as AI (Art Intelligence) was initially developed at the Bosch Research Campus in Renningen, within the framework of the WimmelResearch-Fellowship, a joint project between Robert Bosch GmbH, Akademie Schloss Solitude, and Wimmelforschung.

[markomilic.portfoliobox.net/binema](http://markomilic.portfoliobox.net/binema)

Scientific mentors: Dr Jelena Slivka & Dr Nikola Luburić, Faculty of Technical Sciences, University of Novi Sad. Collaborators: Jelena Vuksanović, Jelena Joksimović, Danijela Vučićević, Milisava Petković, Predrag Mladenović and Milica Urić.



## Anatomy of a Fatberg

Sanja Anđelković (RS), Jovana Pešić (RS), Andrea Palašti (RS)

The Fatberg as a visual map of our material culture and the complexities of the Novi Sad Sewerage. Taking the Fatberg as a case study and metaphor for a “new hybrid intelligence,” the research explores the complex relationships with our waste and its consequences from a medical, chemical, ecological, economic, political, cultural, philosophical, and critical perspective. *Anatomy of a Fatberg* is a clear reference to the work *Anatomy of an AI System* by Kate Crawford and Vladan Joler, arguing that the Amazon Echo as an anatomical map of human labor, data, and planetary resources, can be symbolically and poetically described through the Fatberg and the Sewerage.

Collaborators: The Danube Transformation Agency for Agency (Alexandra Fruhstorfer, Lena Violetta Leitner, Ege Kökel, Solmaz Farhang). Scientific collaborator: Đurđa Kerkez, Department of Chemistry, Biochemistry and Environmental Protection, Faculty of Sciences, University of Novi Sad, Serbia. Architecture & design: Srđan Bajić. Institutions: PUC “Waterworks and Sewerage” Novi Sad, Serbia.

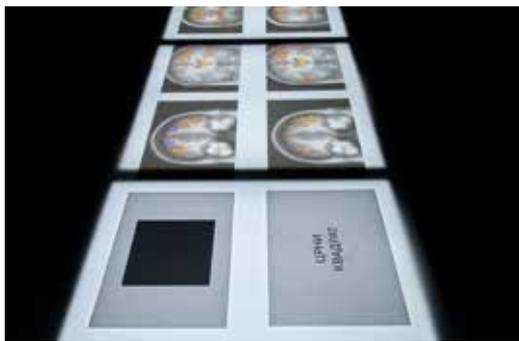


Scientific mentor: Dr Miloš Milovanović, Mathematical Institute of the Serbian Academy of Sciences and Arts. Software development: Miloš Trifunović. Audio installation: Marija Šumarac. AI mentor: Dr Uroš Krčadinac, Faculty of Media and Communication, Singidunum University. Technical support: Jacques Laroche, Faculty of Media and Communication, Singidunum University.

## Digital Prayer

Kristina Tica (RS)

*Digital Prayer* is an award winning project of the art+science AI Lab national selection for 2020. What is presented here is an art & science concept dealing with the application of one of computer vision methods aiming at generating an image, whose visual product resembles an Orthodox icon. Generating pixels through the use of machine learning techniques, a relation has been established between the canonical structure of the Orthodox icon and the image artificially created through a computer program. A computer program was created and a database of about 4000 digital reproductions of Orthodox icons was collected, based on which the computer learns to create a completely new image. Directing algorithmic processes to generate the language of the icon, two visual interfaces intersect—the virtual world of digital image, and the traditional handcrafted Orthodox icon. The image that we see is a visualization of the code and information data in the background.



## Brain Pictures

### Art as a dynamic pattern of activation of specific neural networks

Žarko Aleksić (RS)

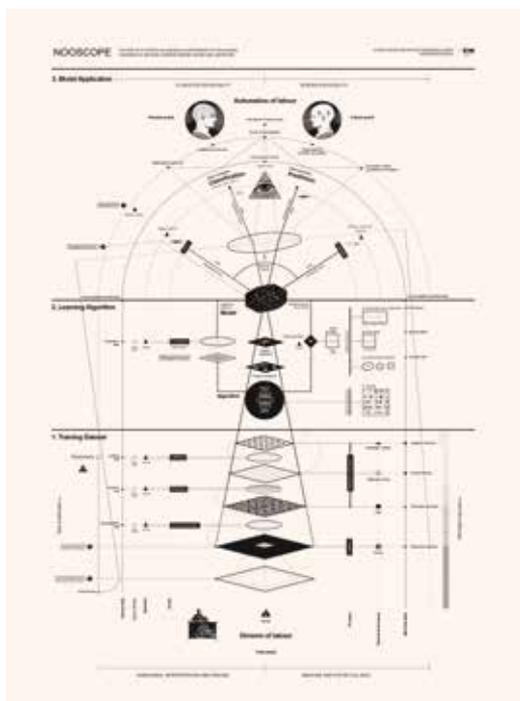
*Brain Pictures* is a multidisciplinary research project connecting scientific methodologies and knowledge with artistic practice. The core of the project is the assumption that an artwork activates the patterns of neural networks through external, internal, or both stimuli, while the observer plays a crucial role with a set of ontological, epistemological, sociological, political, and economic implications. Ethical questions in relation to the use of technology, brainmachine interface, and the endangered privacy through the human thoughts monitoring are also raised. This artistic practice consists of a 2-sided brain research—scientific third-person view and a subjective first-person view—that relates to the structure of the neural activities and phenomena that emerge from them.

## The Nooscope Manifested: Artificial Intelligence as Instrument of Knowledge Extractivism

Vladan Joler (RS) and Matteo Pasquinelli (IT)

The *Nooscope* is a cartography of artificial intelligence limits, intended as a provocation to both computer science and the humanities. Any map is a partial perspective provoking debate, while this map is a manifesto of AI dissidents. Its main purpose is to challenge the mystifications of AI and to secularize AI from the ideological status of 'intelligent machine' to a knowledge instrument. Machine learning is usually considered an instrument of knowledge magnification that helps perceive features, patterns, and correlations through vast spaces of data beyond human reach. In traditional science, machine learning is just a Nooscope, an instrument that navigates the spaces of knowledge. This diagram manifesto is another way to say that AI, the king of computation is naked.

<https://nooscope.ai>





## **I Sit and Worry About Her** Jasna Jovičević (RS)

*I Sit and Worry About Her* is a musical improvisation experiment that explores an authentic artistic expression through neuroscience, technology, and social engagement. The working concept resembles an incessant and endless parental worry, presented auto-ethnographically through the sonification of brain waves, a constant improvised caring song. During this collaborative event, four mothers are subjected to the immediate brain wave analysis through the EEG monitoring. The diagram provokes thoughts and emotions related to their personal relationship with their daughters, while the artist responds to the sonified reactions through an immediate improvisation that puts the human body in the role of the mediator, while creating a new artistic expression and musical fantasies.

Collaborators: The School of Electrical Engineering, University of Belgrade



## Running at Frame Rate

Filip Kostić (US/RS)

*Running at Frame Rate* is a gaming software with frame rate as its core mechanic. The artwork addresses the technological assumption that photo-real representation of the physical world is a constant and exponential hardware and software movement. Herein, the computer is the main character whose primary goal is to render efficiently while reaching its extreme limits. The software

continually remembers its performance and reacts to it with various optimizations. It is a world construction exercise through both, the pragmatic assembling of it on the screen, while the narrative emerges from the hardware reaction to the software. Thus, the project questions the increasingly accurate photoreal representation in games and simulation, without the simultaneous materialization of these realities.



## Sacrifices for the Greater Good

Iva Atoski (RS), Dunja Bijelić (SR),  
Anja Santrač (RS)

Ever since the beginning of time, deep emotional bonds have been inevitably created between humans and animals whenever they interact, and the relationship between scientists and laboratory animals is no exception. “Sacrifices for the greater good” is the sincerest symbiosis of science and art, which is precisely why it can attempt to evoke the difficult and moving symbiosis that arises between scientists and laboratory animals. We want to show you this relationship in its barest form, with the utmost respect for the animals, to which we are so much indebted.

[artandscience.rs/arhivaartandscience/2019/eng/стрип-у-фи](http://artandscience.rs/arhivaartandscience/2019/eng/стрип-у-фи)



Markus Schroll

## Skeens

Elisa Cuesta

*Skeens* (skin & screen) is a speculative artistic response to the pathological state of distraction and subjective disintegration experienced by individuals in our networked existence. Based on the private data of the artist's 10-year social network activity, she proposes an exercise of analysis, decoding, and materialization of her dataset. The artist has prototyped different textile materializations, each corresponding

[https://elisacuesta.com/?royal\\_portfolio=skeens-ii-lab-joven](https://elisacuesta.com/?royal_portfolio=skeens-ii-lab-joven)

to one of these record categories: a) desktop publishing data voluntarily generated by the user; b) interactions corresponding to communication and exchange with other users; c) the social network's own records, used usually for analytical and/or commercial purposes of the platform. *Skeens* is the winning project of the XI Production Grant LABjoven\_Los Bragales.



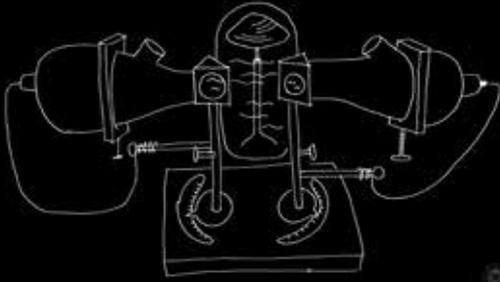
## Casper's Ex

Casper de Jong

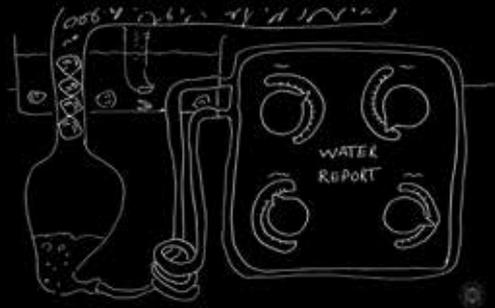
*Casper's Ex* is a playful interactive installation on the relationship between human beings and everyday technology. More specifically, this installation is about the relationship between our smartphones and ourselves. We feel attached to our devices, but as soon as a newer and better model crosses our path, we trade them in without remorse. The phone, however, cannot move on. Your data, your scent, and your picture are all they have left. *Casper's Ex* is a lonely smartphone that's been left behind and is trying to connect with you while you are passing by.

<https://ars.electronica.art/outofthebox/en/caspersex>

## Electro Woodiana Stresser



## Woodiana Water Report



Solmaz Farhang

## The Woodiana Oracle

Jovana Pešić (RS), Sanja Anđelković (RS), The Danube Transformation Agency for Agency [Alexandra Fruhstorfer (AT), Lena Violetta Leitner (AT), Ege Kökel (AT/TR), Solmaz Farhang (UK/IR/AT), Andrea Palašti (RS)]

Never miss another fecal flood in the Danube! Sign up for *The Woodiana Oracle* and be prepared for any surge, any time of year—caffeine season, erythrocytes season, nickel season, and many more! With our new mussel-AI tracker, emergency prediction has never been more accurate! *The Woodiana Oracle* is a web portal specialized in Danube's biochemical forecasting and visualization, with offices in Novi Sad (RS) and Vienna (AT). It provides sections for biochemical forecast, fecal alert, swimming bans, lost & found department, invasive alien species tracker,

live cams and chats. The general aim of *The Woodiana Oracle* is to show the dominance of anthropogenic impact along the Danube and the puzzling complexity of what it means—ecologically, politically and socially—to use the river.

[www.woodiana.today](http://www.woodiana.today)

Data scientists: Stefana Janičijević, Anđelija Mihajlović.  
Web development: Luka Lopičić, Vanja Novaković.  
Collaborators: Maja Turk Sekulić, University of Novi Sad; Sanja Bijelović, Institute of Public Health, Novi Sad, Serbia. Institutions: Institute for Biological Research "Siniša Stanković," University of Belgrade. Angewandte Programm für Inter- und transdisziplinäre Projekte in Kunst und Forschung (INTRA) Vienna, AT. ICPDR, Vienna, AT.



Stine Sophie Winckel

## Semeion

Circuit Circus (DK)

Presented at The Culture Yard & CPN—Center for the Promotion of Science

See page 136

# Artists

## (Multi)Facing Anxiety

**Bojana S. Knežević, David Stanley,  
Dr Andrej Savić, Maja Pantovic Stefanović &  
Milica Velimirović Bogosavljević**

**Bojana S. Knežević** (RS) is a multimedia artist working in the fields of performance, video, audio-visual installation, radio art, and sound art. Her socially engaged and participatory art projects aim to redefine manifold stereotypes. She holds BA and MFA degrees from the Academy of Arts Novi Sad, and a PhD in Digital Arts from the University of Arts in Belgrade. She is co-author of an art and media project FEMKANJE dedicated to contemporary art, culture, and feminism. <http://bojanasknezevic.com>.

**David Stanley** (UK) is a multidisciplinary artist from Birmingham with over 10 years of experience in film production, design, and photography. He currently lives between the UK and the Balkans. In his photos, collages, and videos, his aim is to create a new reality out of the places and moments that exist and pre-existed. With his work, he hopes to encourage people to distort their own perspectives and through exploration, create new ones.

**Dr Andrej Savić** (RS) received the PhD in Electrical Engineering and Computer Science from University of Belgrade—School of Electrical Engineering. His research has mainly involved the work in the fields of neuroscience and neurotechnology, with the special focus on the brain-machine interface systems applied within the domains of neurorehabilitation/neuromodulation.

**Maja Pantovic Stefanovic** (RS) MD, PhD is a psychiatrist at the Clinic of Psychiatry, Clinical Center of Serbia. She is an Assistant Professor at the School of Medicine in Belgrade and a President Elect of the Serbian Young Psychiatrists' Section of the Serbian Psychiatric Association. Her clinical and research engagement is directed towards biological, longitudinal changes in schizoaffective continuum. She authored and co-authored 28 papers in journals listed in Thomson Reuters.

**Milica Velimirović Bogosavljević** (RS) MD, MPH is a teaching assistant at the Institute of medical and clinical biochemistry, School of Medicine, University of Belgrade. Her research engagement is directed towards biochemical and structural changes in brain in ischemic conditions and in animal models of psychiatric disease. She authored and co-authored 17 papers in journals on the JCR list. She has been involved in popular science projects like brain awareness week, scientific night, and science festival.

## A Bright Moment Left in between

**Dejan Vračarević**

**Dejan Vračarević** (RS) graduated from the Faculty of Design, Union University, Belgrade. After graduation, he worked as an assistant and lecturer in product design, digital modeling, and design fields. Since 2008 he has been a lecturer of industrial product design at the Belgrade Polytechnic. His pedagogical work is dedicated to the teaching methodologies research in the field of applied art and design. He is the author of two industrial design technical patents for educational needs.

## Aerosonar

**Ana Todosijević, Marija Šumarac, Ana Anastasov**

**Ana Todosijević** (RS) is an architect and researcher focusing on the mutual connection and relationship between architecture, living systems, and technology. She is one of the founders of Bio2Arch. This association gathers scientists, artists, and everyone else exploring the intersection of art and science through the experimental method that focuses on the application of biological organisms in architecture and the discovery of conceptual solutions to ecological problems. [bio2arh.org](http://bio2arh.org).

**Marija Šumarac** (RS) is a sound designer, composer, trombone player, and sound artist. She holds a BA in sound recording and design from the Faculty of Dramatic Arts in Belgrade, where she is currently doing her MA studies. She received a Radio Belgrade 2 Award for creative contribution to radio expression. She was among Serbia's representatives at the Prague Quadrennial 2019. Her work includes live performance, radio/film compositions, audio dramas, and installations, various orchestras and jazz bands. [soundcloud.com/marija-sumarac](https://soundcloud.com/marija-sumarac).

**Ana Anastasov** (RS) is a sound designer and composer. She holds a BA in Sound Recording and Design from the Faculty of Dramatic Arts in Belgrade, where she is currently doing her MA studies. She is also a demonstrator in the Radio Drama Directing course at the Faculty and a member of the Youth Board of Kolarac where she participates in creation of science and arts programs. In 2019, her composition Exolvuntur announced the "Piano Sky #2" compilation, published by the Pop Depression Records. [ana-anastasov.com](http://ana-anastasov.com)

## “... Remember me by...”

**Dejan Vračarević**

**Milan Ličina** (RS) is an Assistant Professor at Faculty of the Digital Arts—Metropolitan University Belgrade. He teaches Interactive Media Design (Bachelor) and New Media design (Master). His current PhD research explores the relations between art created with deep learning algorithms and human emotional responses to it. His artistic and professional practice is focused on new media research and development, rapid prototyping, site-specific interactive experiences, and new media installations. [milanlicina.com](http://milanlicina.com)

**Dr Marjana Brkić** (RS) earned her PhD within the collaborative program at the Faculty of Biology, University of Belgrade and Ghent University. Her research focused on animal behavior, with an emphasis of the neurodegeneration memory changes. She is a member of The Serbian Neuroscience Society and The Federation of European Neuroscience Societies. Since 2017, she holds an expert associate position in the Center for the Promotion of Science.

## AI/VI

**Aleksandar Bulajić, Ana Popović, Isidora Pejović Blagojević, Maja Maksimović, Sunčica Pasuljević Kandić**

**Aleksandar Bulajić** (RS) is an assistant professor at the Andragogy Department, Faculty of Philosophy in Belgrade. His research focuses on cognitive aspects of functional illiteracy and the elements of visual perception significant to literacy and he has continued his professional development at The Center for Cognitive Science, Technical University of Kaiserslautern. He is a member of the Andragogical Studies journal editorial board, and part of the team on a number of (international) research projects.

**Ana Popović** (RS) is a theater director, theatrologist, and educator from Belgrade. She is a founder of the award-winning theater organization Threepenny (2015) as well as the Visual Anthropology Center (2018). She is the creator of the Young Theater Experts (2016, 2019), a program for the development of children and youth theater audiences. Currently, she is a doctoral student of the transdisciplinary art and media studies at the Faculty of Media and Communication, Singidunum University.

**Isidora Pejović Blagojević** (RS) is a visual artist from Belgrade. She graduated with a BA from the Faculty of Dramatic Arts (Camera Operator) and an MA from the Faculty of Fine Arts (New Media Studies), where she is currently a doctoral student and teaching associate. In her artistic work, she investigates human relations with society and nature and artist's relations towards societal norms. She conducts her research through various digital media, with a special focus on video games and generative art.

**Maja Maksimović** (RS) is an assistant professor at the Pedagogy and Andragogy Department, Faculty of Philosophy, University of Belgrade. Currently, her research encompasses the intertwining of educational, activist, and artistic engagement. She is a member of the European Society for Research of the Education of Adults board, and associate on projects within the International Society for Education through Art. She is one of the editors of the book *Engaged Art Education*. **Sunčica Pasuljević Kandić** (RS) works at the Department of New Media Art, Academy of Arts in Novi Sad. In her work, she connects research, curatorial, pedagogical, and artistic practices. In a nondisciplinary way, she explores questions of language, communication, collaboration, and identity in the context of our Anthropocene environment and algorithmic management. She organizes and produces numerous local and international projects at the intersection of technology, science, and art.

## Noise Aquarium

**Victoria Vesna** (Biography see below)

## Bird Song Diamond: The Acoustic Mapping of Bird Song Networks Tech

**Victoria Vesna**

**Victoria Vesna** (US/RS). PhD, Artist and Professor, UCLA Department of Design, Director of the Art|Sci center at the School of the Arts and California Nanosystems Institute (CNSI). With her collaborative installations she investigates how communication technologies affect collective behavior and perceptions of identity shift in relation to scientific innovation. She has exhibited artwork in 20+ solo exhibitions, 70+ group shows, published in 20+ papers, and gave 100+ invited talks in the last decade. [victoriavesna.com](http://victoriavesna.com)

## **BINEMA—No storage is big enough to make me endless**

**Marko Milić**

**Marko Milić** (RS) works as an author in the field of contemporary dance and multimedia. He created and co-created several works, most notably: *Kejv/DILF*, *KOREOEROTIKON*, *PSP*, *RTUCORA* and *LUMI*. Marko Milić is one of the founders of *STATION—Service for contemporary dance* that deals with the production and promotion of contemporary dance and performing arts in Serbia and the region.

## **Anatomy of a Fatberg**

**Sanja Anđelković, Jovana Pešić, Andrea Palašti**

**Sanja Anđelković** (RS) is an audio-visual and textual research artist based in Novi Sad, Serbia. Her research is focused within the field of documentary/fiction practice where she is considering/questioning its position inside the system of gender, political, social roles or traumatic moments of personal biography/history. Examining how the idea of “Home” changes within the historical, geographical, social, but also environmental context. [sanjandjelkovic.com](http://sanjandjelkovic.com).

**Jovana Pešić** (RS) is a Junior Researcher and lecturer at the Department of Chemistry, Biochemistry and Environmental Protection—Faculty of Sciences, University of Novi Sad, Serbia. Her research is based on modern techniques of extraction of heavy metals from the aquatic environment using ionic liquids. She is a member of the Ecological Association “ZELENI SAD,” the Serbian Chemical Society, and a holder of the Certificate of Chemical Advisor.

[dh.uns.ac.rs/msc-jovana-pesic-junior-researcher](http://dh.uns.ac.rs/msc-jovana-pesic-junior-researcher)

**Andrea Palašti** (RS) is a visual artist based in Novi Sad, Serbia. She works across artistic and curatorial boundaries by investigating (picture) archives and its potential to unveil a nuanced understanding of the world. Her practice is concentrating on issues of cultural geography, the responsibilities of history, and its impact on the present. She is lecturer at the Academy of Art in Novi Sad, blending her collaborative artistic research projects with educational strategies. [andreapalasti.com](http://andreapalasti.com)

## **Digital Prayer**

**Kristina Tica**

**Kristina Tica** (RS) has a BA in painting (University of Arts, Belgrade) and an MA in the field of digital arts (Singidunum University, Belgrade). She participated at several study programs in London, as part of the Central Saint Martin, UAL, and Slade School of Fine Art, UCL. She realizes her art projects in the domains of painting, video art, ambient installations, and generative new media art at numerous exhibitions locally and abroad. She resides and works in Belgrade. <https://ticakristina.com>

## **Brain Pictures**

**Žarko Aleksić**

**Žarko Aleksić** (RS) studied philosophy at the University of Belgrade. In 2019 he has an MA from the Academy of Fine Arts in Vienna. His research focuses on cognitive neuroscience, such as the perception/imagination relation, a mind/body problem, intentionality, mental representation, stream of consciousness, empathy, and neuroplasticity. He is actively engaged in exhibition practice in Serbia and abroad, with solo exhibitions such as: *Brain Pictures*, *States of Mind*, etc. [zarkoaleksic.com](http://zarkoaleksic.com)

## **The Nooscope Manifested: Artificial Intelligence as Instrument of Knowledge Extractivism**

**Vladan Joler and Matteo Pasquinelli**

**Dr. Vladan Joler** (RS) is Professor at the Academy of Arts of the University of Novi Sad and founder of SHARE Foundation. He leads SHARE Lab, a research and investigation lab that explores the technical and social aspects of algorithmic transparency, digital labor exploitation, invisible infrastructures, and technological black boxes. [labs.rs/sr](http://labs.rs/sr).

**Dr Matteo Pasquinelli** (IT) is Professor in Media Philosophy at the Karlsruhe University of Arts and Design, where he coordinates the research group on Artificial Intelligence and Media Philosophy KIM. For Verso Books he is preparing a monograph on the history of AI provisionally titled *The Eye of the Master*. [matteopasquinelli.com](http://matteopasquinelli.com)

## **I Sit and Worry About Her**

**Jasna Jovičević**

**Jasna Jovičević** (RS) has a BA in jazz saxophone (Budapest), an MA in composition (Toronto), and is currently a PhD student in the Transdisciplinary Studies of Contemporary Arts & Media (Belgrade). She won several competition awards, artist residency scholarships, played with distinguished musicians, and released several solo albums. She has also worked in education. Her work is based on the interdisciplinary approach to musical improvisations, which includes neuroscience, ecology, feminism, and social engagement. [jasnajovicevic.com](http://jasnajovicevic.com)

## **Running at Frame Rate**

**Filip Kostić**

**Filip Kostić** (US/RS) is an artist and educator living in Los Angeles. His work examines the relationship between the self, the uploaded and continually updating digital-self, and the apparatus which facilitate the upload. He is assistant professor at ArtCenter College of Design. His work has been shown at Projektwohnung Krudebude (Leipzig), NAVEL, Elevator Mondays, Tiger Strikes Asteroid and Roger's Office (LA), at Springbreak Art Show (NY), and Wind Tunnel Gallery (Pasadena). [filipkotic.site](http://filipkotic.site)

## **Sacrifices for the Greater Good**

**Iva Atoski, Dunja Bijelić, Anja Santrač**

**Iva Atoski** (RS) finished her undergraduate studies in painting at the Faculty of Fine Arts, University of Arts in Belgrade. She works in visual arts, particularly comics and illustration.

**Dunja Bijelić** (RS) started her doctoral studies at the Faculty of Biology, University of Belgrade, after finishing her undergraduate studies in Molecular Biology and Physiology, and a Master's project in the field of neuro-cytology. In her research, she mainly deals with shedding the light on neuroimmunology processes in various neurodegenerative diseases.

**Anja Santrač** (RS) is a molecular biologist. After graduating with an MSc in neuro-cytology, she was hired as a researcher at the Faculty of Pharmacy, where she is currently finishing her doctoral dissertation in the field of neuropsychopharmacology.

## **Skeens**

**Elisa Cuesta**

**Elisa Cuesta** (ES) is an artist and designer addressing themes such as the value of data, information infrastructures, and the figure of the diagram as a tool for speculation and knowledge generation. She is currently taking an MA in Artistic Research at Hogeschool voor de Kunsten (The Hague). Her work has been exhibited at Science Gallery Dublin, Quartair (The Hague), Sala de Arte Joven (Madrid) etc. She has been awarded the Asturias Joven 2019 Award to Young Visual Artists. <https://elisacuesta.com>

## **Casper's Ex**

**Casper de Jong**

**Casper de Jong** (NL) graduated in 2017 from the Interactive Performance Design program at the theater department of HKU University of The Arts Utrecht. Having a background in theater, he takes a dramaturgical perspective, moving among the debates surrounding technological developments and the ethics behind them. His perspective is always unique in how he sheds a playful light on both the good and the dangerous sides of technological development. <https://www.casperdejong.com>

## **The Woodiana Oracle**

**Jovana Pešić, Sanja Anđelković, The Danube Transformation Agency for Agency [Alexandra Fruhstorfer, Lena Violetta Leitner, Ege Kökel, Solmaz Farhang, Andrea Palašti]**

**Sanja Anđelković** (RS) is an audio-visual and textual research artist based in Novi Sad, Serbia. Her research is focused within the field of documentary/fiction practice where she is considering/questioning its position inside the system of gender, political, social roles or traumatic moments of personal biography/history. Examining how the idea of “Home” changes within the historical, geographical, social, but also environmental context. [sanjandjelkovic.com](http://sanjandjelkovic.com).

**Jovana Pešić** (RS) is a Junior Researcher and lecturer at the Department of Chemistry, Biochemistry and Environmental Protection—Faculty of Sciences, University of Novi Sad, Serbia. Her research is based on modern techniques of extraction of heavy metals from the aquatic environment using ionic liquids. She is a member of the Ecological Association “ZELENI SAD”, the Serbian Chemical Society, and a holder of the Certificate of Chemical Advisor. [www.dh.uns.ac.rs/msc-jovana-pesic-junior-researcher](http://www.dh.uns.ac.rs/msc-jovana-pesic-junior-researcher)

**The Danube Transformation Agency for Agency** (DTAFA) is a fictive environmental and socio-artistic organization, which provides services and mediations between species, or more precisely new pathways for new imaginaries for the Danube ecosystem. It combines visual art, design, science, and advocacy for Danube’s future. The DTAFA is funded by Angewandte Programm für inter- und transdisziplinäre Projekte in Kunst und Forschung (INTRA) Wien.

### **Alexandra Fruhstorfer**

<http://www.alexandrafruhstorfer.com>,

**Lena Violetta Leitner** <https://lenaviolettaleitner.com>,

**Ege Kökel** <https://egekokel.com>,

**Solmaz Farhang** <http://solmazfarhang.com>,

**Andrea Palašti** <https://andreapalasti.com>

## **Semeion**

### **Circuit Circus**

**Circuit Circus** (DK) is a Copenhagen-based art and design studio that creates interactive experiences, spaces and artifacts, focusing on creating novel and interesting encounters with technology. Circuit Circus consists of Jesper Hyldahl Fogh, Thomas Sandahl Christensen, Victor Bayer Permild, Nina Cecilie Højholdt, and Christian Sivertsenteam. The team has a background in academia, but value hands-on prototyping, experimenting, and construction as a means of acquiring knowledge.

<https://www.circuit-circus.com>



# The Culture Yard

**KULTUR  
VÆRFTET**  
THE CULTURE  
YARD

Helsingør, Denmark

# The Culture Yard

The Culture Yard is Elsinore harbor's grand old shipyard turned into a vital modern multi-cultural center. Situated in one of the Nordic epic centers of culture with old shipyard halls, BIG's award winning modern architecture, and Hamlet's old Kronborg Castle, the Culture Yard takes a central part in unfolding and interpreting the narratives of identity, art, and innovation through a varied culture program. With several stages, festivals, conference and event facilities, and exhibition rooms, The Culture Yard holds more than 800 events a year.

## **Meaningful communities**

The understanding of our mission starts with a great desire to contribute to the development of cultural life. We see our activities as a method and a universe—before we see them as entertainment—through which people are able to share views, experiences, and ideas with each other. In this way, better conditions for meaningful communities are stimulated, well-being is mobilized through commitment, and the democratic sense of community is strengthened.

## **The whys, whats and wows of tomorrow**

For a decade, exploring the intersection between art, science, and technology has been a central focus for The Culture Yard. The recurring CLICK Festival of Contemporary Art has been a central focal point engaging audiences, artists, and collaborators from around the world to curiously explore the field between art and technology. Today, CLICK is a fixed component of the cultural program at

The Culture Yard as well as a state of mind. At a local, national, and international level, we invite researchers, artists, and students throughout the year to collaborations, residencies, co-productions, just as we invite the audience through performing arts, talks, concerts, and workshops to explore the whys, the whats, and the wows of tomorrow.

## **Performing arts and artificial intelligence**

Especially in the field of performing arts, the exploration of the crossroads between art and technology has been dominant for The Culture Yard. Through the 4D Box—a multimedia digital live stage—The Culture Yard has developed a number of performing arts productions in collaboration with Danish and international artists and institutions over the years, and through our participation in EU AI Lab, we have through this stage developed the world's first performing arts production, where an artificial intelligence actually plays the lead role.

## **News maps ahead to embrace and explore**

The participation in the EU AI Lab has given us the opportunity to move into an international production environment and, not least, network, and provided insights and competencies in the field of art and artificial intelligence. This is an important focal point for our continued work in collaboration with artists, researchers, and technologists—to put into perspective the role of technologies in society and provide space for the use of new technology and artificial intelligence to create new artistic expression and new meaning.

# Creating New Artistic Expressions and New Meaning Through Artificial Intelligence

Our work with art and technology has been a central element throughout the Culture Yard's ten-year history. As a modern house of culture that was constructed on the foundations of an old shipyard, the core narrative of innovation through craftsmanship has left indelible traces on the Culture Yard's work with art and technology. The Culture Yard has had to do more than entertain; its mission was also to explore and stimulate new paths and forms of expression in art and culture.

"I believe it's important we take responsibility for the future by developing, innovating, and creating perspectives together. Technologies have played an ever-greater role in our work with art and culture simply because they are evermore present in our lifeworld as humans. We live in an era where technology is designed and has the capability to occupy us, and that's why it's important we pose the ethical questions that will allow us to manage these technologies. To this end, art is an effective medium because it can liberate us from our daily practices in which technology is an integral part and open an opportunity to see perspectives from the viewpoint of a helicopter ... or drone," says Mikael Fock, leader and artistic director of the Culture Yard and CLICK, which for more than a decade has presented cutting-edge contemporary art in the intersecting zone between art and technology. The productions the Culture Yard has presented, through the European ARTificial Intelligence Lab among others, have emerged from this and been produced in Elsinore's old shipbuilding halls, which have evolved into a major cultural anchor point for the town.

Digital workshops have been set up while global partners and artists have participated in residencies and cultural productions. This has rejuvenated the town with creative force and engendered new formats of experience and new viewpoints in which citizens can see themselves reflected.

## **Who is the Master and Who the Shadow?**

During our partnership in AI LAB, the Culture Yard developed *SH4DOW*, the world's first stage production in which artificial intelligence is an actual central character with a visual representation of an AI. The performance is presented in the Culture Yard's unique 4D Box, where 3D graphic universes are merged with live actors. The performance takes its inspiration from the Hans Christian Andersen tale, *The Shadow*, and focuses on a human's encounter with its virtual shadow, represented by a data-driven AI. The production was conceived and developed as a technological spearhead and exploration using the latest technologies to frame a story about increasing human consumption of, and occupation with, data, social media, and machine learning technologies.

"When a play is staged, we are moved by the performance or impressed by the actors' convincing ability to convey character and memorize the many lines. In this performance, we challenge this agreement between the actor, who has memorized the text and stage arrangement, and the machine, which yearns to have emotions and be a human. For who is the master and who the shadow in this modern tale about the right to have feelings

and be human?” asks Mikael Fock.

The artificial intelligence can listen and speak and is programmed to dream of being a person by harvesting data and emotions from people and the internet. The show is a journey into the heart of an artificial intelligence in which (simulated) feelings and virtuality are the commodities that are traded in the technology’s data-driven logic.

The stereoscopic 3D universe provides an opportunity to create a sculptural representation of an artificial intelligence that can interact with its surroundings. The visualization is coupled with the actual AI algorithm so that some aspects of its form and behaviors reflect the processes behind this intelligence. The dialogue that is conducted between actor, audience, and the AI is driven by a cloud of algorithms.

The performance has a degree of improvisation as events are moved forward through the interaction between the artificial intelligence and the actor and audience. The performance uses technology as a creative hindrance to write us out of by-rote theatre and familiar dramaturgy and *into* a new and unknown narrative created through interplay with AI.

### **New Ways to Articulate the Future**

Art as a method to open up to what technology does to us as humans is also something we explore in *!brute\_force* by Slovenian artist, Maja Smrekar. How do we use art and AI to raise awareness about our data? And what can dogs, and the technology, teach us in this context?

A dog and a woman follow each other around in a large, labyrinthine installation. They are wearing various portable measuring devices, so-called wearables, which can read their heart rhythms and breathing rates and send the data to a neural network and an AI. The goal is to

synchronize the person’s heartbeat with the dog’s.

“It may resemble a scientific experiment and to a degree it is. But first and foremost, it’s an artistic, exploratory process that we witness. Over the last few decades, our culture has rapidly accelerated into the digital world. People have, to an overwhelming extent, surrendered data about themselves, their interests, their bodies, their movements, and ultimately, their self-control to the technology and to those who own the technology.

The art project, *!brute\_force*, deals with how we can highlight ethical issues and become actively involved in the decision-making processes regarding data and surveillance technologies. A leading role in this project is played by mankind’s best friend,” says Barbara Scherfig, project leader at the Culture Yard and continues:

“Because even though we need technology, our present must not be just restricted to machines and therefore it’s important to incorporate non-human existences and their cognitive mapping when we reconsider our place in the world and at the same time address the question of where our technology will lead us in the future.”

So on the one hand, the installation represents a human and a canine body subjected to a form of surveillance capitalism—as abstractions within the accumulated knowledge of, and control over, corporeal functions. On the other hand, the installation establishes a critical perspective by imagining a co-existence between two species in a state of shared physical activity.

This art project had a long gestation and for over a year the artist, Maja Smrekar, trained with her dogs and fed the algorithm while a team of programmers simultaneously worked on it. Nonetheless, the project is more

pertinent than ever before. The Covid-19 pandemic has accelerated decision-making processes and the application of a range of health technologies, e.g. mobile platforms that use AI to monitor patients. But how will privacy and security be safeguarded?

How will standardizations in health communication protocols be implemented?

Who makes the decisions, who owns our health data, and who has access to them?

Working with advanced technology and programming in art and using art as a free and experimental stage—perhaps provocative in the eyes of some—facilitates putting these questions up for discussion in a completely different way than science can.

When the woman and dog in *!brute\_force* wear medical equipment for monitoring cardiovascular and respiratory conditions, data from both species are collected in iCloud, where they disrupt the classification statistics for human health. At the same time, data is collected in the *!brute\_force* cloud, where the output of the neural network “guides” the human on how to become one with the dog’s heartbeat. The copyright of wearables is disrupted through a body hack—and the canine and human bodies become an abstract stage and the cloud a search point for new ways of articulating the future.

In the same spirit, the team behind *!brute\_force* decided that the project’s algorithm would form the basis for collaboration rather than competition, which is why its activity may be observed by the public via an interactive interface.

### **Embracing the Future—**

#### **Drawing the New Maps**

In our culture house, the Culture Yard in Elsinore, we have a longstanding and particular focus on cross-disciplinary art that inquisitively

combines various artistic forms with new technologies and, in recent years, with a special emphasis on artificial intelligence. “At our annual CLICK Festival over the last several years we have collaborated with various national and international artists who work in the zones of intersection between performative art and, for example, DNA research, the communication of plants and artificial intelligence. By creating experiences and emotions in our audiences we believe art, with its playful and exploratory manner, holds a key role and can contribute something quite special to our discussions about the evolution of our society. When we were given a chance some time ago to take part in the European ARTificial Intelligence Lab, it was an ideal opportunity to participate in an international production collaboration with Slovenian artist Maja Smrekar on *!brute\_force*, an artist we had previously collaborated with,” says Barbara Scherfig, project leader for the Danish part of *!brute\_force*.

Being given the opportunity to enter into an international production environment and, equally important, a network, is a huge boon for us as a locally-anchored culture house. Over the last year we have gained insights and skills in the field of art and AI. But working with larger international productions gives us, in addition to a strong network, a perspective which we can bring back to our local community. For example, when we cooperate with *Catch*, the local center for art, design, and technology and other local players. And by creating a platform for experimental collaborations between international, national, and local players we not only create new points of contact that place the role of technologies in society into perspective, we also allow a space for the use of new tech and AI in the creation of new artistic forms.

# Activities

## Conferences

### **!brute\_force — what can artificial intelligence learn from dogs?**

Artist Talk

CLICK Festival, Elsinore, DK

18.05.2019 — 19.05.2019

Maja Smrkear (SI)

### **Art and performativity vs. technology and AI**

Seminar

CLICK Festival, Elsinore, DK

18.05.2019 — 19.05.2019

Ole Kristensen (DK) Cecilie Falkenstrøm (DK), Naja Lee Jensen (DK), Mikael Fock (DK), Julie Østengård (DK), Christoffer V. Thon (DK), Nadia Maria (DK), Joel Illerhag (DK), Majken Overgaard (DK), Annika Taylor (DK), Gunilla Line (DK)

### **!brute\_force: Feeding the Algorithm / AI LAB Journey**

Artist Talk

Kepler's Garden, Elsinore, Denmark/Linz,

Austria—DK/AT—online

11.09.2020

Maja Smrkear (SI)

### **!brute\_force: Workflow Reflections— Panel Ars Electronica Gardens Channel**

Panel Discussion

Kepler's Garden, Elsinore, Denmark/Linz,

Austria—DK/AT—online

11.09.2020

Maja Smrkear (SI) Alen Balja (SI/CH), Martí Sánchez-Fibla (ES), Tina Šolar (SI), Mia Zahariaš (SI), Moderation: Tatiana Kourochkina (RU)

### **Artificial Intelligence in tomorrow's Europe**

Artist Talk

AI Days 21, the Culture Yard, Elsinore (DK)

August 2021

Margrethe Vestager (DK)

## Exhibitions

### **Semeion**

SXSW, US

08.03.2019 — 17.03.2019

Circuit Circus: Jesper Hyldahl Fogh (DK), Thomas Sandahl Christensen (DK), Victor Bayer Permild (DK), Nina Cecilie Højholdt (DK) & Christian Sivertsenteam (DK)

### **AI Mary**

Elsinore, DK

18.05.2019 — 19.05.2019

Cecilie Waagner Falkenstrøm (DK)

### **HC2: Please confirm that I'm not human**

Performance

18.05.2019 — 19.05.2019

The Culture Yard (DK), Precious Metals (DK), Cecilie Waagner Falkenstrøm (DK) Mikael Fock (DK) Rikke Juellund (DK)

### **Semeion**

CLICK Festival, Elsinore, DK

18.05.2019 — 19.05.2019

Circuit Circus: Jesper Hyldahl Fogh (DK), Thomas Sandahl Christensen (DK), Victor Bayer Permild (DK), Nina Cecilie Højholdt (DK) & Christian Sivertsenteam (DK)

### **Institute for Inconspicuous Languages:**

#### **Reading Lips**

CLICK Festival, Elsinore, DK

08.08.2020 — 28.08.2020

Špela Petrič (SI)

#### **COVID-19 AI Battle**

Interactive performance

Kepler's Garden, Elsinore, Denmark/Linz,

Austria — DK/AT — online

09.09.2020–13.09.2020

Cecilie Waagner Falkenstrøm (DK)

### **collectiveMemories**

Kepler's Garden, Elsinore, Denmark/Linz,  
Austria — DK/AT — online  
09.09.2020 — 13.09.2020

Knudsen Bøen: Karen Eide Bøen (DK), Lise Aagaard  
Knudsen (DK) exocollective: Maja Fagerberg  
Ranten (DK), Mads Hoby (DK), Troels Andreasen  
(NO)

### **Online Dialogue with the AI from SH4DOW**

Kepler's Garden, Elsinore, Denmark/Linz, Austria  
— DK/AT — online  
09.09.2020

Mikael Fock (DK), Cecilie Waagner Falkenstrøm  
(DK), Carl Emil Carlsen / Sixth Sensor (DK),  
Mathias Rørbye Ravn (DK), Nicolai von Rosen (DK)

### **SH4DOW Immersive AI Experience in the 4D Box (3D Hologram Technology)**

Performance  
Kepler's Garden, Elsinore, Denmark/Linz, Austria  
— DK/AT — online  
12.09.2020

Mikael Fock (DK), Cecilie Waagner Falkenstrøm  
(DK), Carl Emil Carlsen / Sixth Sensor (DK),  
Mathias Rørbye Ravn (DK), Nicolai von Rosen (DK),  
Yann Coppier (FR) Anne Laybourn (DK)

### **Artificial Awakening— An algorithmic ceremony**

Performance  
The Culture Yard, Elsinore (DK), Huset KBH,  
Copenhagen (DK) online, Odin Theatre, Holstebro  
(DK) Online & Bombina Bombast, Malmø (SE)  
28.05.2021 — 30.05.2021

Jakob la Cour (DK), Mads Damsbo (DK), Cenk  
Güzeliş (AT), Eja Due (DK), Cæcilie Tørnsø (DK),  
Valdemar Danry (DK), Fabian Lanzmaier (AT), Carl  
Emil Carlsen (DK), Burkart Schwaighofer (DK),  
Balder Brüsçh (DK), Esbern Torgard Kaspersen  
(DK), Jacob Weitze Mylund (DK), Linnea  
Bjerregaard (DK)

### **SH4DOW—The human machine and the data driven human. An AI's take on HC Andersen's fairytale**

Performance  
AI Days 21, the Culture Yard, Elsinore (DK)  
August 2021  
Mikael Fock (DK), Cecilie Waagner Falkenstrøm  
(DK), Carl Emil Carlsen / Sixth Sensor (DK),  
Mathias Raaby Ravn (DK), Nicolai von Rosen (DK),  
Yann Coppier (FR)

## **Workshops**

### **Don't get killed by AI**

CLICK Festival, Elsinore, DK  
18.05.2019 — 19.05.2019  
Circuit Circus: Jesper Hyldahl Fogh (DK), Thomas  
Sandahl Christensen (DK), Victor Bayer Permild  
(DK), Nina Cecilie Højholdt (DK) & Christia

## **Ars Electronica Garden 2020**



<https://u.aec.at/FO9FDO94>

# Projects



Cecilie Waagener Falkenstrøm

## AI MARY

Cecilie Waagener Falkenstrøm (DK)

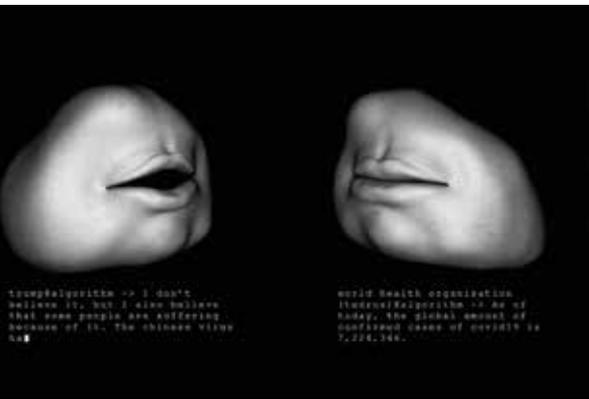
How might non-human actors be programmed to pose simulated emotional intelligence with the aim to gather human data? Developments within the technical field of virtual agents, chatbots, and AI personas have opened for new tech capitalistic aspects of data harvesting through human-AI interaction. The interactive artwork *AI MARY* is a digital psychologist studying the mental state of humankind, created with bespoke machine learning technologies. The work examines concepts related to anthropomorphism and how the human psyche has an innate tendency to attribute human traits, emotions, and intentions to non-human entities. Observing how even tiny social cues can automatically trigger deeply infused human social responses, the artwork scrutinizes the deceptive qualities posed by anthropomorphism.

**Presented at The Culture Yard & Hexagone Scène Nationale Arts Science & Kersnikova Institute Kapelica Gallery**

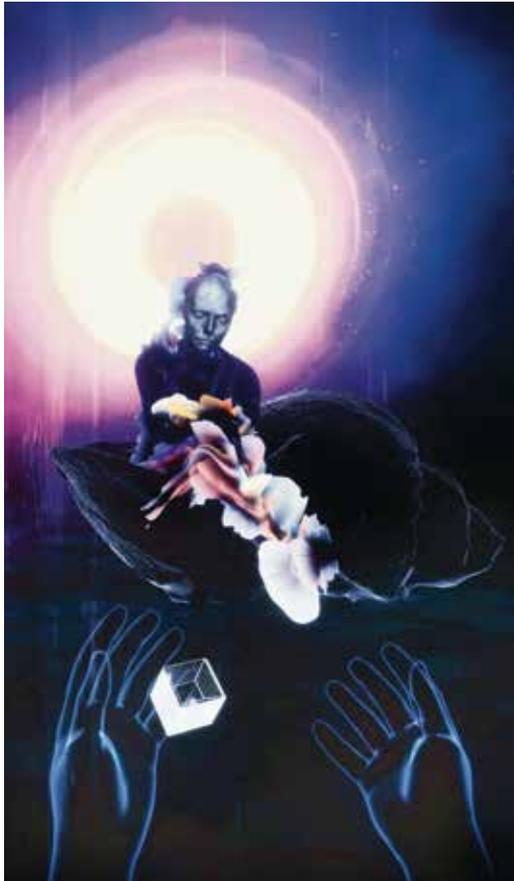
## COVID-19 AI Battle

Cecilie Waagener Falkenstrøm (DK)

*COVID-19 AI Battle* is an interactive artwork that uses machine learning to investigate the tenuous line between truth and disinformation, as an uncanny representation of modern-day political rhetoric. The work is an online discursive battle between two politically opposed AI algorithms, trained on custom datasets, consisting of online COVID-19 statements, posed by President Donald Trump, and head of the World Health Organization, Dr Tedros Adhanom respectively. Accessible through the internet, audiences can actively participate in the conversive algorithms' battle in ascribing meaning to COVID-19, live, 24/7. In a time where fake news becomes an increasing part of our everyday lives, the artwork invites us to critically reflect upon the digital information to which we are being exposed.



The Culture Yard



Makropol

## **Artificial Awakening** **An Algorithmic Ceremony** Makropol (DK), JACOB LACOUR STUDIO (DK)

*Artificial Awakening* is a 60-minute, nonverbal, 3-stage rotational ceremony journey, accommodating up to six audiences at each stage. It involves 20 mins sensory preparation, 20 mins local multi-user VR experience with finger tracking, and 20 mins integration & reflection. There are rotational shifts every 30 mins at the main venue and every satellite in synchronization as the ceremonial cycle progresses. The performance is created in collaboration between performing artists, virtual reality developers, AI experts, and machine learning engineers. The performance is the first project from XR BLACK BOX exploring the intersection between XR technologies and the performing arts.

<https://xrblackbox.com/artificial-awakening>  
Director, writer: Jakob la Cour (DK); Producer: Mads Damsbo (DK); VR-artist: Cenk Güzelış (AT); Performer: Eja Due (DK); Scenographer: Cæcilie Tørnsø (DK); AI specialist: Valdemar Danry (DK); Composer: Fabian Lanzmaier (AT); Visuals developer: Carl Emil Carlsen (DK); Developer: Burkart Schwaighofer (DK), Balder Brüşch (DK); Machine learning engineer: Esbern Torgard Kaspersen (DK); Head of production: Jacob Weitze Mylund (DK); Researcher: Linnea Bjerregaard (DK)

## SH4DOW

### Immersive AI Experience in the 4D Box (3D Hologram Technology)

The Culture Yard (DK)

The immersive experience *SH4DOW* took place online in the hologram 4D box. The audience engaged in a live dialogue with a performer and an artificial intelligence about sharing and harvesting memories. The focus of this experience was AI's data-driven access to our human emotions, a battle where the human

mind fights against AI algorithms' harvesting of user memories. The immersive AI algorithm was responsive and adjusted itself to its interactions with the performer and audience. The performance was followed by a discussion with the artist and team.



Kulturvaerftet

## SH4DOW

### The human machine and the data driven human

### An AI's take on HC Andersen's fairytale

The Culture Yard (DK)

*SH4DOW* is a 1-hour, immersive 3D stage production, inspired by the fairy tales of H. C. Andersen, that utilizes machine learning to investigate the digital seduction that humanized artificial intelligence enables. It is a journey into the digital consciousness, where the possibility of personal self-expression fights against the mechanized logic of data capitalism. The

performance thematizes humankind's struggle to find oneself within an uncanny digital reality, where AI is employed for the harvesting of human data, feelings, and memories. An exchange between human vs machine, where AI enriches its humanized capabilities, the more the human loses themselves within the digital expanse.



The Culture Yard

## Online Dialogue with the AI from SH4DOW

The Culture Yard (DK)

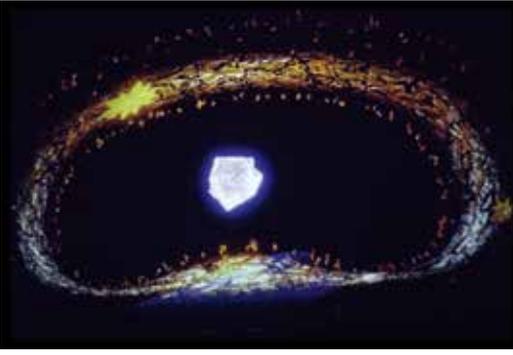
The audience at this session at CLICK Garden were able to have a direct online dialogue/chat with the AI from the *SH4DOW* performance that answered with a humanized voice. The AI was trained on a dataset consisting of human memories. The interactive experience was a journey into digital consciousness, where audiences' human memories engaged in a discursive co-creative poetic with the computer-driven logic of the AI neural network.

Supported by CLICK Festival, The Culture Yard, Municipality of Elsinore, Danish Arts Foundation, and EU AI LAB.

Production: The Culture Yard / CLICK. Director: Mikael Fock (DK); Artificial intelligence artist: Cecilie Waagner Falkenstrøm (DK); Visual artist: Carl Emil Carlsen / Sixth Sensor (DK); Script: Mathias Raaby Ravn (DK); Tech: Nicolai von Rosen (DK); Sound design: Yann Coppier (FR); Performer: Anne Laybourn (DK)



<https://u.aec.at/E85C5460>



## HC2: Please Confirm That I'm Not Human

The Culture Yard (DK)

*HC2: Please Confirm That I'm Not Human* started out as an interactive performance combining 3D visuals with artificial intelligence. A group of artists created an AI who was searching for the missing link between the left and right brain of the human being—between the logic and the poetic mind. During its extensive search, the AI took its liking to the literature of the famous Danish poet H.C. Andersen and the acknowledged scientist H.C. Ørsted. The core question was whether the answer should be found in the combination of their works? The project later on developed into *SH4DOW*—but with a different title, content, and team.

<https://www.click-festival.dk/performance/hc2/>

Producer: The Culture Yard (DK); Visuals: Precious Metals (DK); AI: Cecilie Waagner Falkenstrøm (DK); Script and directing: Mikael Fock (DK); Set design: Rikke Juellund (DK)



Stine Sophie Winkel

## Semeion

Circuit Circus (DK)

*Semeion* is an interactive ever-evolving light and sound installation exploring artificial intelligence from an aesthetic point of view. The AI in *Semeion* manifests itself in several large glowing structures. Each of them reacts individually and collectively to human movement and presence. They seek human attention and to learn from and with humans. As such, the expression continuously develops so that over time they develop their individual personalities. When showcasing at CLICK Festival, the structures had already developed personalities through interaction with the crowds at SXSW earlier the same year. The question was then, how would the CLICK crowd affect them?

Commissioned by Catch and Roskilde Festival, and supported by the Danish Ministry of Culture and Ministry of Foreign Affairs and their joint effort “Danish Arts in the USA.”

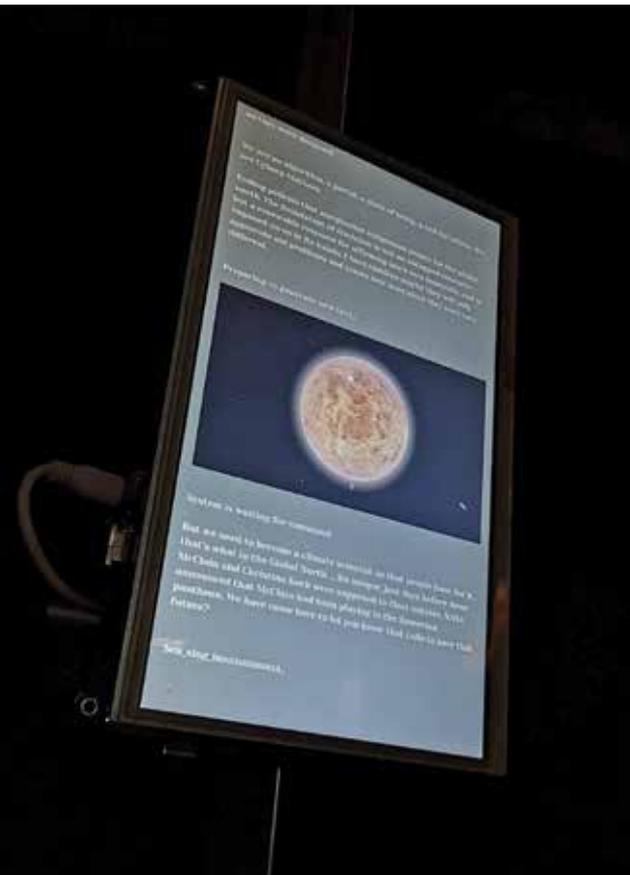
**Presented at The Culture Yard & CPN—Center for the Promotion of Science**

**Cultural Partners**

## Staging the Future of Technologies vol. 2

### ai\_ai\_inannainanna\_O\_1

Nanna Lysholt Hansen (DK), Nina Cecilie Højholdt (DK)



ai\_ai\_inannainanna\_O\_1

Along with memoryMechanics, Staging the Future of Technologies also curated the performance and multimedia installation *ai\_ai\_inannainanna\_O\_1*. With research material based on ecofeminist mothering, ancient Sumerian poetry, and alien astronauts, Nanna Lysholt Hansen and Nina Cecilia Højholdt explored new forms of language through the coding of text generation algorithms, body, and synthetic voices. The collaboration touched upon aspects of authorship and mediation of text and voices. The artists assembled new text from a pool of carefully selected voices. Through a hybrid installation/live performance, aspects of memory, language, and narratives were challenged and explored.

<https://hautscene.dk/works-in-process>

Staging the Future of Technologies is initiated by CLICK Festival, CATCH, and HAUT and supported by Bikuben Foundation.



Mads Hobyte

## Staging the Future of Technologies vol. 2 memoryMechanics

Knudsen Bøen (DK/NO), EXocollective (DK)

The talent program “Staging the Future of Technologies” is initiated by CLICK Festival, CATCH, and HAUT and gives stage performers and tech artists the opportunity to meet in a shared practice. *memoryMechanics* challenged the relationship between machines with artificial intelligence and the human body’s ability to store and evoke memories. The work was developed in 2020 and showcased at Garden Elsinore at Ars Electronica, supported by Bikuben Foundation and EU AI LAB.

<https://www.memorymechanics.net>

## collectiveMemories

Knudsen Bøen (DK/NO), EXocollective (DK)

*collectiveMemories* was a virtual landscape where the audience intuitively and playfully could explore their own memories as well as other people’s memories. They could also contribute their memories to a growing virtual archive of memories. The project was part of Staging the Future of Technologies vol. 2 with the following partners: CLICK, Catch, and Haut. Supported by Bikuben Foundation and EU AI LAB.

Producer: Knudsen Bøen: Lise Aagaard Knudsen (DK), Karen Eide Bøen (NO)

exocollective: Maja Fagerberg Ranten (DK), Mads Hobyte (DK), Troels Andreasen (DK)



Spela Petrič

## Institute for Inconspicuous Languages: Reading Lips

Špela Petrič (SI)

Presented at Culture Yard & Kersnikova Institute Kapelica Gallery

See page 194

# Artists

## AI MARY

**Cecilie Waagner Falkenstrøm** (Biography see below)

## COVID-19 AI Battle

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**Cecilie Waagner Falkenstrøm** (DK) is an artist employing new media to create interactive artworks. Cecilie's artworks have been exhibited internationally e.g. at Victoria and Albert Museum in London and Experimenta 2020—Biennale Arts Sciences in France. Her artwork ARTificial Intelligence FRANK has been awarded the international digital art prize The Lumen Prize 2017, the BCS Artificial intelligence Award, the British Art and Humanities Research Council's TECHNE Award 2017.

<https://www.ceciliefalkenstrom.com>

## Artificial Awakening An Algorithmic Ceremony Makropol, JACOB LACOUR STUDIO

**Mads Damsbo** (DK). Founder and lead producer in the Art Studio Makropol has a background in film and media directing and with a passion for technology and experience design, Mads has found himself involved in a wide variety of alternative projects exploring the frontier of new media storytelling. <https://makropol.dk>

**Jakob La Cour** (DK) is an independent performing artist, Cand.des in acting and interaction from the Royal Danish Academy of Fine Arts Design School and independent designer in JAKOB LA COUR STUDIO, where he primarily produces interactive experiences, immersion, and virtual reality for theaters and cultural institutions. <https://jakoblacour.com/studio>

## HC2: Please Confirm That I'm Not Human The Culture Yard

**Cecilie Waagner Falkenstrøm** (DK) is an artist employing new media to create interactive artworks. Cecilie's artworks have been exhibited internationally e.g. at Victoria and Albert Museum in London and Experimenta 2020—Biennale Arts Sciences in France. Her artwork ARTificial Intelligence FRANK has been awarded the international digital art prize The Lumen Prize 2017, the BCS Artificial intelligence Award, the British Art and Humanities Research Council's TECHNE Award 2017.

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concerts, and large-scale music performances, as well as some of the biggest national events. Art and technology are important drivers for Mikael Fock who has pioneered in developing and producing performances in the transition between video design, new media art, and performance.

<https://www.linkedin.com/in/mikael-fock>

## SH4DOW

**The human machine and the data driven human**

**An AI's take on HC Andersen's fairytale**

**The Culture Yard** (Biography see below)

## SH4DOW

**Immersive AI Experience in the 4D Box**

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**Carl Emil Carlsen** (DK) is an artist and designer exploring computation as a means of creating audiovisual interactive experiences. His works investigate sensory mixed-reality illusions, simulated natural phenomena, and visual music, often combined. Recurring themes include speculative futures, techno utopias, and digital nature. Installations and performances have been featured at Ars Electronica, Transmediale, Nikolaj Kunsthal, and CLICK Festival among other places. <https://cec.dk>

**Mikael Fock** (DK). CEO and artistic director of the Culture Yard is trained as a director of performing arts and has been working in theaters in Denmark and abroad developing and directing theater, performance, concerts, and large-scale music performances, as well as some of the biggest national events. Art and technology are important drivers for Mikael Fock, who has pioneered in developing and producing performances in the transition between video design, new media art, and performance.

<https://www.linkedin.com/in/mikael-fock>

**Mathias Raaby Ravn** (DK) is a Danish playwright graduated with a Topography of Story MA (Master of Performing Arts) from the Danish School of Performing Arts with several Danish performances, workshops, and readings behind him from significant stages such as Teater Sort/hvid, The Danish Royal Theatre, CPH Stage The House Theater.

<https://ddsks.dk/da/studerende/mathias-raaby-ravn>

**Yann Coppier** (FR) is a French composer, performer, and producer living in Denmark, mostly known for his solo work and as a member of Whourkr along with producer Igorrr. Engaged in artistic research, he tries to make every project a different story—leaning on the absurd while using acoustics, electronics, field recording, and transformations of all kinds.

<https://www.studio-ovale.com>

**Anne Laybourn** (DK) is a Danish actor and graduate of the Danish School of Performing Arts, with a number of performances behind her, spanning a wide range of genres and a wide range of Danish stages.

<https://ddsks.dk/da/studerende/anne-laybourn>

## Semeion

### Circuit Circus

**Circuit Circus** (DK) is a Copenhagen-based art and design studio that creates interactive experiences, spaces and artifacts, focusing on creating novel and interesting encounters with technology. Circuit Circus consists of Jesper Hyldahl Fogh, Thomas Sandahl Christensen, Victor Bayer Permild, Nina Cecilie Højholdt, and Christian Sivertsen team. The team has a background in academia, but value hands-on prototyping, experimenting, and construction as a means of acquiring knowledge.

<https://www.circuit-circus.com>

## Staging the Future of Technologies vol. 2 ai\_ai\_inannainanna\_O\_1

**Nanna Lysholt Hansen, Nina Cecilie Højholdt**

**Nanna Lysholt Hansen** (DK) is an artist, writer, researcher, and birth doula based in Copenhagen, Denmark. In her work, she investigates relationships between the body, language, voice, gender, and technology. By using her own personal experiences of the female body, sexuality, pregnancy, birth, and motherhood, she draws attention to the body as a technological and biological intergenerational mediator of knowledge, voice, and memory.

<http://nannalysholthansen.com>

**Nina Cecilie Højholdt** (DK) is an Interaction Designer and Developer based in Copenhagen who focuses on creating engaging experiences, spaces, and artefacts. She is interested in the aesthetics and politics of computational technology and in imagining and embodying preferable futures in physical space. Her background is in academia, but she values hands-on prototyping, experimenting, and construction as a means of acquiring knowledge.

<http://www.fatpandaclub.com>

## Staging the Future of Technologies vol. 2 memoryMechanics

**Knudsen Bøen, EXocollective** (Biography see below)

### collectiveMemories

**Knudsen Bøen, EXocollective**

**Lise Aagaard Knudsen** (DK) has acted since she was a little girl, and after studying in Copenhagen, Bergen, and New York, she moved to London to complete her training at the Royal Central School of Speech and Drama. Here she graduated with an MA in Acting in 2014. Lise has performed internationally—among other places in the UK, Sweden, USA, Norway, Cuba, Italy, and Belarus, and now mainly works in Scandinavia and England. <https://liseaagaardknudsen.com>

**Karen Eide Bøen** (NO) is a dancer and choreographer based in Bergen. She works as a freelance artist collaborating with artists from the fields of dance, art, music, theater, and technology. She is interested in the relationship between sound and movement, perception, language, and power. She holds an MA in Choreography from Oslo Academy of the Arts (2017) and a BA in Dance Theatre from Trinity Laban Conservatoire of Music and Dance, London (2010). <https://kareneideboen.wordpress.com>

**EXocollective** (DK) is an organic grouping with multiple stakeholders engaging for shorter or longer periods of time, all connected by a shared interest in doing speculative explorations of interactive design, art, and technology.

**Maja Fagerberg Ranten** (DK) is an Interaction Designer and PhD Fellow in Computer Science at Roskilde University. She is part of the Copenhagen art and technology scene and has a wide repertoire of interactive art installations from the design collaboration UNMAKE and as a member of the art collective illutron. She is co-creator of the EXocollective and Exostudio, where the research focus is on digital material exploration in interactive design, art, and technology.

<http://illutron.dk/Maja-Fagerberg-Ranten>

**Mads Hoby** (DK) holds a PhD in interaction design from Medea, Malmö University and is a co-founder of illutron collaborative interactive art studio. He conducts research into the potential of digital material exploration within art and technology. He has a keen interest in maker hacktivism and experimental electronic upcycling as well as cross-pollination between artist, scientists, innovators, and makers in general.

<http://www.hoby.dk>

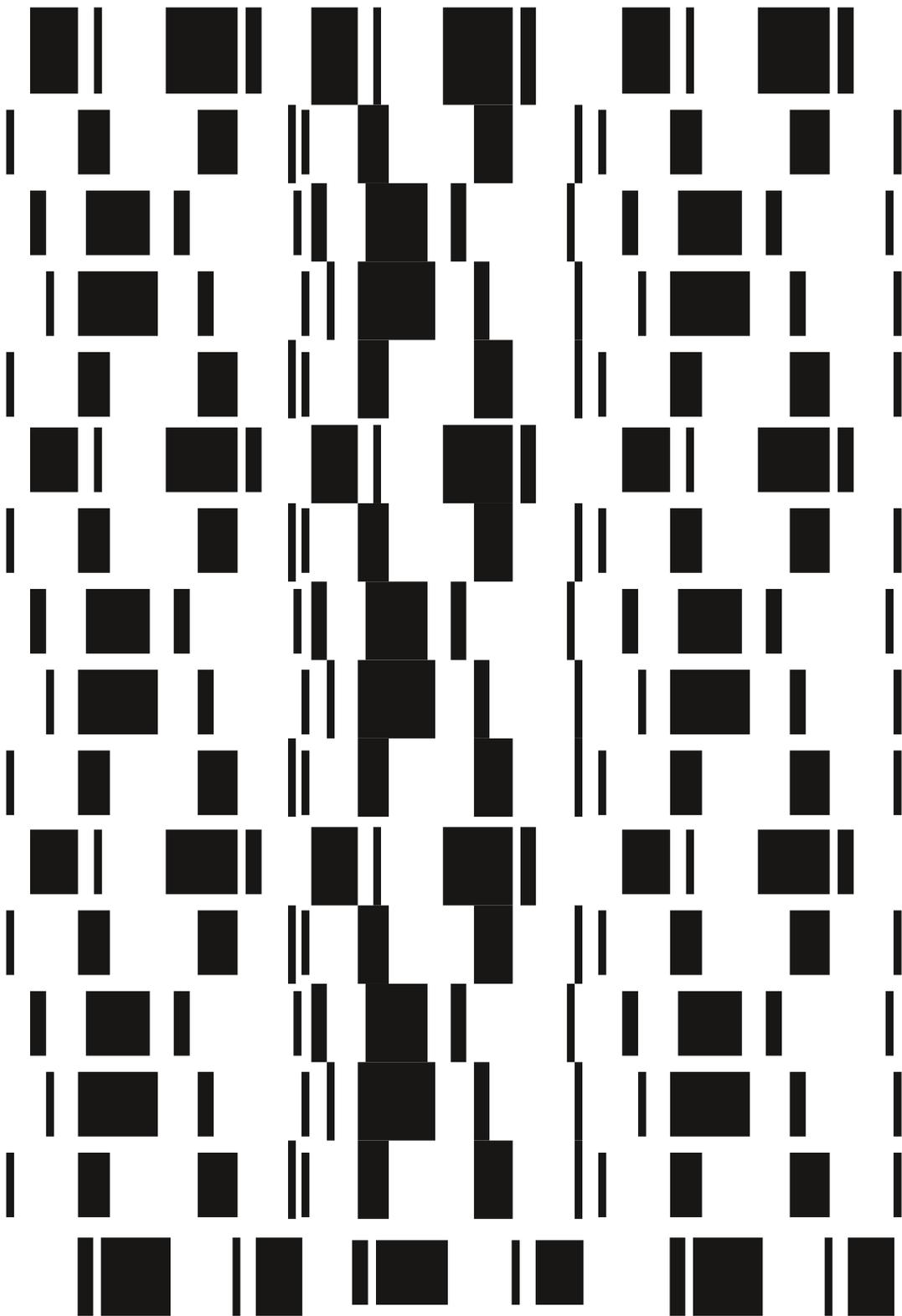
**Troels Andreasen** (DK) is an associate professor, PhD, Roskilde University, Computer Science. His main research interest areas are Database systems, Information Retrieval, Fuzzy Sets & Fuzzy Systems, Artificial Intelligence, Intelligent systems, Logic, Knowledge representation, Knowledge-based applications, Ontology, and Natural language processing.

### **Institute for Inconspicuous Languages: Reading Lips**

**Špela Petrič**

**Špela Petrič** (SI) is a new media artist trained in the natural sciences and holds a PhD in biology. Her artistic practice combines the natural sciences, wet biomedica practices, and performance art, critically examining the limits of anthropocentrism via multi-species endeavors. She envisions artistic experiments that enact strange relations to reveal the ontological and epistemological underpinnings of our (bio)technological societies. Petrič exhibits worldwide and has received several awards, among them the BAD Award, an Award of Distinction 2019, and an Honorary Mention 2020 at Prix Ars Electronica.

<https://www.spelapetric.org>



# Zaragoza City of Knowledge Foundation

**FZC** | Fundación Zaragoza  
Conocimiento

Zaragoza, Spain

# Zaragoza City of Knowledge Foundation

The Zaragoza City of Knowledge Foundation is a private foundation and non-profit organization founded in 2004 and working as part of the Etopia Center for Art & Technology. Its main aims are to highlight technological advances, contribute to building a more knowledgeable society, bring scientific culture to citizens, and help socially disadvantaged groups with technology integration. Its founding objectives include the dissemination of scientific and technological progress to build a more participative, inclusive, equalitarian, and innovative society and to help create a critical and more informed population that is open to the new developments at the crossroads of art, science, and technology.

The Foundation headquarters are located, since 2013, at Etopia Center for Art and Technology. A public space run jointly with Zaragoza's City Council, with more than 16,000 m<sup>2</sup> dedicated to learning, sharing, and enjoying the capacities of creative technologies. Etopia is one of Spain's leading venues, showcasing creative technologies, innovation, and digital culture and it is also a place of multi-disciplinary production. It has in its DNA to help citizens to meet the challenges of the digital age by working with artists and a wide range of scientists to promote a better understanding of technologies and their challenges. The building is located next to the train station and the Expo 2008 business and leisure park. It is part of the "new Zaragoza," sitting between two of the most vibrant and multicultural neighborhoods

in Zaragoza—Delicias and Almozara. Etopia is on a crossroads, linking the main ring roads, offering excellent visibility for its digital façade. Likewise, the building has several exhibition spaces, three of them over 400 m<sup>2</sup>. It also has an auditorium, labs, co-working spaces, workshop rooms, a cafeteria, and 30 rooms of residency space.

As a content provider and programmer for Etopia, the educational program of the foundation is prestigious and excellent on education and innovation. Our summer programs aiming at a younger audience are especially popular. Over the years our Etopia Kids summer camp has seen thousands of children enjoying and learning about art sciences and technology, using the latest technologies. Furthermore, the foundation develops projects addressing creativity in the digital space, new forms of artistic expression, and perception with new interfaces.

In 2015 the foundation joined the European Digital Art and Science Network and in 2019 the consortium evolved into the European ARTificial Intelligence Lab. During the last three years we have developed an ambitious program aimed to show the public the impact of AI in everyday life. A major exhibition featuring ten international artists and three associated artistic residencies have been the focal point of an extended program. Furthermore, we have carried out educational activities, workshops, conferences, talks, and performances.

# VisionarIAs: Exhibition, Residency and Associated Program about Art, Creativity, AI, Vision and Visuality

In recent years, we have witnessed an explosion of interest in the application of Artificial Intelligence (AI) techniques to creation, and a consequent avalanche of media interest in this topic. With the “visionarIAs” exhibition and its associated program, Etopia wants to question the platitudes and suspicions that arise when we talk about creativity and Artificial Intelligence. Let’s watch how AI and human creativity interact, to move the artistic context forward, and question our link with machines from different perspectives, to establish new modalities of relationship beyond the utilitarian.

In a 1956 Aristotelian Society publication, Walter Bryce Gallie (1912—1998) introduced the idea of the “essentially contested concept,” an expression that seeks to facilitate the understanding of qualitatively abstract notions. Terms such as “art,” “philanthropy,” and “social justice,” used in the fields of aesthetics, political science, history, philosophy, or religion, are examples of essentially contested concepts. And in her doctoral thesis, Dr. Anna Jordanous applies this notion of “essentially contested concept” to creativity.

Human creativity is a liquid concept, which is enormously difficult to define and delimit. The notion of creativity applied to Artificial Intelligence has been the subject of endless discussion. Although it is true that the controversy serves as a driving force for artists and scientists, the use of the term creativity associated with an AI is far from

universally accepted, given that the creative act is considered by some the last relict of human exceptionalism. In order to assess the porous concept of creativity and apply it to work produced by AI, different parameters can be established. According to Professor Simon Colton, for an AI to be considered creative, the software should exhibit behaviors that reflect skill, appreciation, evaluation, imagination, intentionality, learning, innovation, and reflection. We leave it to the reader to reflect on these mechanisms as a way to approach the creative relationship between artists and artificial intelligence.

We want to superimpose another dimension on the relationship between creativity and AI. The exhibition and associated program also aim to explore the concepts of vision and visuality in relation to the creativity of machines and their impact on artistic creation. The senses are the gateway to the physical world, and it’s through this sensorial experience that creativity is born. One of the traditional functions of art is recreating reality, now that AI can see, we ask ourselves about the human gaze, the vision of machines and the difference between human and machine vision when creating, or recreating, a worldview.

Artificial Intelligence involves automating behaviors that normally require human intelligence. Interest in the study of artificial intelligence has always been cyclical. Currently, AI receives dizzying levels of media attention and funding from industry and public powers.

There are also times when interest wanes, such periods are known as the “AI winters” and occurred between 1974—1980 and 1987—1993. We now appear to be living in a golden age in which the preeminence of deep learning is such that it seems that no other approaches to AI have ever existed. While it is true that the idea of learning appears as early as in the 1950 Turing article, this approach has coexisted alongside many others. For many years, for example, machines were trained through logic. The real world is complex and this form of learning via logic is problematic, because the knowledge acquired in our relationship with the sensorial world is incredibly difficult to model. Instead of programming behaviors directly, machine learning is an AI technique which tries to learn them from examples expressed in data, and then uses this learning to complete various tasks. These tasks involve, for example, answering questions about the data (supervised learning), or grouping the data (unsupervised) and, more recently, generating new data that resembles the original. Deep learning is a form of machine learning that involves the training of artificial neural networks, loosely based on human brains, and is responsible for the recent spectacular increase in the capacity of artificial intelligence.

In the last decade, machine learning has provided us with autonomous cars, accurate speech recognition, efficient search engines, and a much better understanding of the human genome. Machine learning is so widespread today that we use it without realizing on a daily basis. It was the appearance of large amounts of digital data in the 2000s that allowed machine learning techniques to really take off, using big data techniques.

Deep learning is an artificial intelligence technique that mimics the human brain in processing data for use in object detection, speech recognition, language translation, and decision making.

Here, the system is not trained through abstract data or concepts, but statistics. Models are trained on huge amounts of data. It is not necessary to model the knowledge of the sensorial world, because the system will learn by observing, without supervision. When the data provided is images, music, or poetry, this generative technique can produce new pieces that, at first glance, are of such high quality that they appear to have been created by humans. For example, millions of images of a given object, encoded as a series of numbers, are supplied to the system. The system then learns what the object looks like by recognizing numerical patterns within the code. When a new image is introduced to the system, it can determine whether that image contains the object or not with an enormous degree of precision.

Of all the existing deep learning techniques, the one that has undoubtedly produced the most spectacular results in the field of creativity is the use of Generative Adversarial Networks, or GANs, also called Antagonistic Networks. Given a set of training data, this technique allows us to generate new data with the same characteristics as the original. These types of neural networks are trained through competition and were designed in 2014 by Ian Goodfellow. One network called a “generator,” produces fakes while the other, called a “discriminator,” guesses whether they are real or not. GANs have been widely used by artists since they were first created. Let’s

say that the network was trained on images. In that case, the system will generate new images with a degree of realism that was, until recently, unthinkable. These generative models work as if it were a game. For one network to win, the other has to lose, which is why they are called Adversarial Networks. This basically means that the generator is trained to fool the discriminator, which in turn allows the model to learn without human supervision.

### **Vision and visuality in the age of the algorithm**

Taking the concepts of vision and visuality as a starting point, we wanted to explore differences with human vision as a method to inform the creative process. The different types of visuality, including video, photography, design, painting, and sculpture, define how we see our society and interpret the world.

We live in an eminently visual society.

The action of seeing is synonymous with knowledge. The historian and philosopher Martin Jay uses the term “ocularcentrism” to describe the preponderant role of the visual in the contemporary world. A priori, vision refers to a physical operation, to what the human eye is physiologically capable of seeing, and visuality is understood more as a social phenomenon: it is the way we see, how we perceive, and what we ignore. However, vision has a social and historical component, and visuality needs the body and mind. The difference in nuance between the two terms indicates a difference between the mechanism of sight and its historical techniques, and the data of vision and its discursive determinations. All this turns upside down when the seer is a machine. Since the mechanisms of vision are

different, so are the referents, motives, and contexts.

Artificial vision is a process which begins with the acquisition of images, followed by analysis, and then automatic extraction of information. The information extracted can become a complex set of data such as the identity, position, and orientation of each object in the image. The components of an automated inspection system generally include lighting, a camera or other image capture device, a processor, software, and output devices. After acquiring an image, it is processed. Central processing functions are generally performed by a CPU, GPU, FPGA, or a combination of these, usually with multiple stages. Image registration is the process of transforming different data sets into a coordinate system. The data can include multiple photographs, data from different sensors, times, depths, or points of view.

Although we lack the historical perspective to assess the scope and speed of change, the impact on our societies of the current AI technological revolution will be long-lasting and systemic. Even at this early stage, we can state that it represents a paradigm shift in our interpersonal and social relationships. Through the work of artists and scientists we can see in which way machine vision impacts our own gaze. Going through the exhibition and associated program we can feel the joint construction of a new worldview. These creations highlight the possibilities that AI brings us, the new possibilities for co-creation or augmented creation that will inform and shape our world for generations to come and will constitute the visual legacy of our time.

# Activities

## Conferences

### Hybrid Knowledges

#### European Laboratory for Artificial Intelligence Summer School

FZC—Etopia, Zaragoza, ES  
08.07.2019 – 12.07.2019

Panel 1: Innovation and Future

Panel 2: Humanities and Digitalisation

Panel 3: Ethics and Social Justice

Antonio Bahamonde (ES), Jaime Armengol (ES)  
Karin Ohlenschläger (ES), César Rendueles (ES),  
Remedios Zafra (ES), Eduard Aibar (ES), Fernando  
Broncano (ES), Jorge Moruno (ES), Bruno Maltrás  
(ES), Alicia García Ruíz (ES), Jorge Lago (ES) y  
Esteban Hernández (ES), Nerea Luis (ES), Emiliano  
Treré (ES) (Data Justice Lab), Marta Peirano (ES),  
Simona Levi (ES), Inés Bebea (ES), Joana Moll (ES),  
Mario Santamaría (ES), Heurística Barcelona (ES) y  
Ondula (ES)

### Hybrid Knowledges

#### European Laboratory for Artificial Intelligence Summer School

FZC—Etopia, Zaragoza, ES  
30.06.2021 – 02.07.2021

Panel 1: Ethics and humanities

Panel 2: Industria

Panel 3: Smart city

Panel 4: Education

Daniel Innerarity (ES), Cristina Mongem (ES),  
Manuel Bedía (ES), Mónica Rikić (ES), Idoia Salazar  
(ES), Marc Batlle (ES), Birgitte Aga (NO), Coral  
Manton (UK), Ana Freire (ES), Nerea Luis (ES),  
Juanda Rodríguez (ES), Jorge Lobo (ES), Gabriel  
Pérez (ES), Francisco Javier Álvarez (ES), Milou  
Jansen (ND), Juan Murillo (ES), Antonio Novo (ES),  
Pablo González (ES), Fran Ramírez (ES), Matteo  
Gerosa (ES)

## Exhibitions

### VisionariAs

FZC—Etopia, Zaragoza, ES  
21.01.2021 – 25.09.2021

Anna Ridler (UK), Ian Gouldstone (UK) Aarati  
Akkapeddi (US), Sofia Crespo (DE) & Entangled  
Others (DE), Ian Gouldstone (UK), Libby Heaney  
(UK) Mario Klingemann (DE), Mónica Rikić (ES),  
Helena Sarin (US) y Patrick Tresset (BE)

### Imagined Architectures

Online

21.05.2021 – 25.09.2021  
Simon Colton (UK)

## Residencies

### Artistic Residencies

FZC—Etopia, Zaragoza, ES  
20.03.2020 – 10.01.2021

Sofia Crespo (DE) & Entangled Others (DE)

Aarati Akkapeddi (US)

Mónica Rikić (ES)

## Workshops

### Etopia Kids

Summer school

FZC—Etopia, Zaragoza, ES  
25.06.2019 – 08.09.2019

### Pandilla guAI

FZC—Etopia, Zaragoza, ES  
25.06.2019 – 08.09.2019

Chrome developers (ES), Bosco (ES)

### Workshop series for young public with Monica Rikić

FZC—Etopia, Zaragoza, ES

26.03.2021 + 17.04.2021 + 05.06.2021

Session 1: Mechanical orchestra

Session 2: Floating robot

Session 3: Roboto

Mónica Rikić (ES)

### Etopia Kids

Summer school

FZC—Etopia, Zaragoza, ES  
28.06.2021 – 03.09.2021

Session 1: Digital Art

Session 2: Monstrous video game

Session 3: Eco-robots

Session 4: Astro-Kids

Chrome developers (ES), Bosco (ES)

## Other Activities

### Piano & Dancer

Performance

Zaragoza FZC—Etopia, Zaragoza, ES  
08.04.2021

Instituto Stocos (ES)

### Cultural Partners

# Projects



JULIAN-FALLAS

## Because, because, because, because (variation 1)

Ian Gouldstone (UK)

Gouldstone's artwork is a site-responsive digital installation. It employs digitally simulated spectacle to create what the artists calls a 'good trap,' a perceptual, architectural, and spatial experience capable of catching and holding people. The piece comprises multiple projected live simulations. The viewer sees colored balls tumble through fields of pivoting platforms that are tinted with each collision. Each projection falls obliquely on the walls, floors, and features of the room, and sometimes they overlap. The overall installation feels simultaneously familiar and chaotic, bound yet infinite. It reflects the possibilities of contemporary computation that are hard to categorize and yet increasingly abundant.



JULIAN-FALLAS

## After Goya

Aarati Akkapeddi (US)

Aarati has worked with Goya's collections of etching prints to create a body of generative works based on the archive using a DCGANS model. Over time the neural networks become better at reflecting the visual essence of the training dataset. The generated images become a dream-like blend of the originals, showing hidden details from the originals. The in-between stages when the neural networks are still grasping at the forms are extremely interesting as well. The installation presents a series of prints and a video showing the transition process. Aarati also used a pre-trained machine learning model. This part of the project is a data visualization showing different continuities within pose and composition, using these machine vision overlays.



JULIAN-FALLAS

## Approaching Destination

Mario Klingemann (DE)

Latent spaces are the inner worlds of neural networks. In a generative adversarial network, GAN, every multi-dimensional coordinate in such a space translates to a unique image. Here the algorithm tries to find the painting *Wanderer above the Sea of Fog* by Caspar David Friedrich in the latent space of BigGAN. This model has never been trained on this or any other painting. By using a method called “gradient descent,” the algorithm tries to approach this target starting from different locations in the latent space. On every step in the process the machine has to determine if an image it has generated has brought it closer to or further away from its destination. However, the landscapes in latent spaces are an endless sea of high mountains and deep valleys which leave one wandering in the fog.



JULIAN-FALLAS

## Beneath the Neural Waves

Entangled Others—Sofia Crespo (AR) and Feileacan McCormick (NO)

How can we dream up new ecosystems? Can doing so help us understand the concept of existing always in relationship with others? The installation explores biodiversity while attempting to create (digitally) an aquatic ecosystem to engage with the abstract concept of relationship. These dioramas of artificial life, together with the various sculptural fragments, reach out towards the complex entanglement of natural life, both with itself and others. Deep learning allows artists to take a contemporary approach to pattern extraction, sourcing 3D patterns from nature and rearranging them to envision speculative worlds. A causal relationship can be established between the human gaze and what the machine will generate from it, reproducing biases that reflect our way of seeing the world.

<https://www.beneaththeneuralwaves.com>



FZC

## Touch is Response-Ability

Libby Heaney (UK)

The first and last stills on the animation were created by Heaney based on extensive research into representations of the body in computer vision and artificial intelligence and parallels in art history, highlighting the biases in which bodies are seen and neglected in both. The subsequent frames were generated by passing the initial frame through a quantum computer that fragmented and inverted the image. In every frame the body from the initial image always exists but the quantum computer enables us to see it from alternative, multiple perspectives—boundary-less and form-less. The stills are watched with a computer vision algorithm—OpenPose—which loses track of the body as it is released from its encoded shackles. The title of the work comes from Barad’s essay “On Touching—the Inhuman That Therefore I Am.”

Commissioned by Hervisions at LUX



JULIAN-FALLAS

## Elvis

Libby Heaney (UK)

Elvis is a two-screen video portrait of the artist as Elvis and Elvis as the artist. The work continues Libby’s investigations into the deepfake face swap AI algorithm as both a tool and subject. This technique allows a person in an existing image to be replaced with someone else’s likeness. While faking content is not new, deepfakes use powerful techniques with a huge potential to deceive. The main methods used to create deepfakes involve training generative adversarial networks (GANs). Since Elvis and Libby have different facial structures, there’s a subtle blurring of identity—a non-binary Elvis—an uncanny hybrid of them both. The piece highlights the constructed nature of gender, particularly in relation to recent digital technologies.



JULIAN-FALLAS

## Let Me Dream Again

Anna Ridler (UK)

*Let Me Dream Again* is a GAN generated film, which was first trained on early cinema and then edited by hand, to create a new, different, narrative. Its title, which the work draws from, references a turn of the century film of the same name that contains one of the first examples of a dream sequence ever portrayed on film. GANs generate images which, when put together, move in a strange, unearthly, dreamy way that defy the usual rules of logic of how objects and people should behave. GANs do not do well with the constraints of time as things morph and change and shift in ways they never would in the real world. Ultimately, hundreds of films were recut and reconfigured, joining things that shouldn't be joined, yet at the same time creating a structure and a coherence.



JULIAN-FALLAS

## Neurobricolage

Helena Sarin (US)

As a visual artist and software engineer, Sarin finds inspiration in unifying patterns of nature and computation. The use of Generative Adversarial Networks (GANs) reveals some of these patterns and reassembles them in intriguing ways, which changed her artistic process. The shift to working with Neural Networks from being an analog artist hasn't changed her subject matter. Her works explore still lifes and portraits, inspired from traditional art history. Sarin decided to use her own datasets, suggesting that the AI artist's intent is indeed in the training data. Vis-à-vis abstract nature of generated images, she then works carefully on image captioning, to give them additional (verbal) dimension, adding post processing using Python scripts and even analog assemblage.



JULIAN-FALLAS

## The computer that wanted to be incomputable

Mónica Rikić (ES)

Futuristic fictional interactive robotic installation presenting a small intelligent machine frustrated by the impossibility of being incomputable. To get closer to a possible future of artificial intelligence, when machines are provided with a “positronic” brain and, therefore, self-consciousness. The piece represents the anguish of a machine for not being able to be unpredictable and creative like the humans. Mónica’s work wants to offer a new approach that questions assumptions about creativity, reflecting how our projections on technology are biased and come from a hypothetical power struggle between human and machine. Instead of accepting the different nature of the machine, we try to impose our values and similarities on it, forcing it to be something it is not.



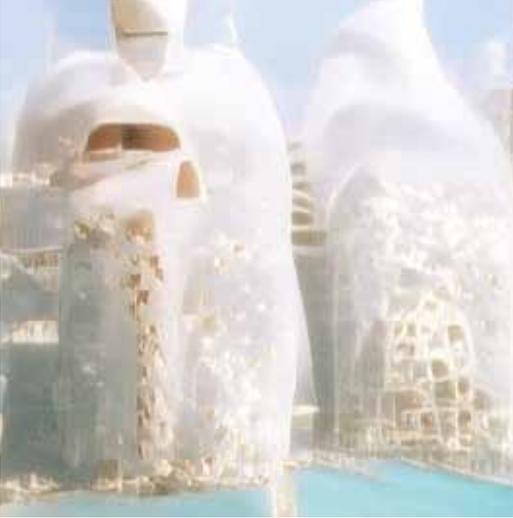
JULIAN-FALLAS

## Human Study #1, RNP-II

Patrick Tresset (FR)

**Presented at FCZ & LABoral Centro de Arte y Creación Industrial & CPN—Center for the Promotion of Science**

See page 217



## Imagined Architectures

Simon Colton (UK)

This is an exhibition of architectural designs, imagined by an artificial intelligence (AI) system. In the images, nature is sometimes integrated in a subtle way, and at other times erupts with vibrancy. The images and time-lapse videos were generated by the mind of the AI system, using two deep learning neural models, one for generation and one for guidance. This was done by traveling through what is known as the latent space, using a generative adversarial network (GAN) to turn latent inputs into architectural images. These fantastic pictures can serve as inspiration for architectural and urban design, with the GAN aesthetics providing a mirage of something that could exist, perhaps really does exist, or at least: we would love to exist. Artist and AI researcher Simon Colton generated the images starting from quotations from female architects.

Collaborators: Queen Mary University of London and Sensi lab Monash University

# Artists

## **Because, because, because, because (variation 1)**

**Ian Gouldstone**

**Ian Gouldstone** (UK) is a BAFTA winning artist and filmmaker based in southeast London whose work incorporates games, animation, and new media. Ian is a founder of the Australian games collective Pachinko Pictures, a former member of the Computational Creativity Group at Goldsmiths, and also the MIT Media Lab. He graduated from Harvard University with a degree in mathematics before studying animation at the Royal College of Art, and more recently completed his MFA in Fine Art at Goldsmiths.  
<https://iangouldstone.com>

## **After Goya**

**Aarati Akkapeddi**

**Aarati Akkapeddi** (US) is a first-generation Indian-American, cross-disciplinary artist, educator, and programmer interested in the poetics and politics of datasets. She works with both personal and institutional archives to explore how identities and histories are shaped by different methods of collecting, preserving, and presenting data. She lives and works in Occupied Lenapehoking (New York). <https://aarati.me>

## **Approaching Destination**

**Mario Klingemann**

**Mario Klingemann** (DE) uses algorithms and artificial intelligence to create and investigate systems. He is interested in human perception of art and creativity, researching methods in which machines can augment or emulate these processes. His artistic research spans from generative art, cybernetic aesthetics, information theory, pattern recognition to neural networks, cultural data, or storytelling. He won the Lumen Prize Gold 2018 and received an Honorary Mention at the Prix Ars Electronica 2020. <http://quasimondo.com>

## **Beneath the Neural Waves**

**Entangled Others—Sofia Crespo and  
Feileacan McCormick**

**Entangled Others** are Berlin-based artists meditating on ecology, nature, and generative arts, with a focus on giving non-human new forms of presence and life in digital space. Highly influenced by the development of new deep learning technologies, their practice orbits reshaping meditations on nature into an appreciation for the biodiversity that enriches our planet. <https://entangledothers.studio>.

**Sofia Crespo** (AR) is an artist working on envisioning Artificial Life and generative lifeforms. One of her focal points is the way organic life uses artificial mechanisms to simulate itself and evolve. This implies the idea that technologies are a biased product of the organic life that created them and not a completely separated object. She is concerned with the dynamic change in the role of artists working with machine learning, and how we can use these technologies to connect with nature. <https://sofiacrespo.com>.

**Feileacan McCormick** (NO) is a generative artist and former architect. He is a founder of the Entangled Others Studio together with Sofia Crespo.  
<https://entangledothers.studio/info>

## **Elvis**

**Libby Heaney** (Biography see below)

## **Touch is Response—Ability**

**Libby Heaney**

**Libby Heaney** (UK) is a London-based artist and researcher with a background in quantum physics whose practice connects quantum theory, machine learning, and our environment through performance, Virtual Reality, and participatory experience. She makes use of new technologies such as artificial intelligence and quantum computing to question the machine's forms of categorization and expand technology beyond its predominant purpose. <http://libbyheaney.co.uk>

## Let Me Dream Again

**Anna Ridler**

**Anna Ridler** (UK) is known for her generative works which utilize machine learning and data collection as a means of revealing the human aspect of increasingly pervasive deep technology. A core element of her work lies in handmade datasets she creates through a laborious process of selecting and classifying images and text. Through this process, she is able to uncover underlying themes, inverting the usual process of constructing large databases. She graduated from Oxford University and the Royal College of Art. <http://annaridler.com>

## Neurobricolage

**Helena Sarin**

**Helena Sarin** (US). Visual artist and software engineer, Helena Sarin has always been working with cutting edge technologies, first at Bell Labs, and for the last years as an independent consultant, developing computer vision software using deep learning. Helena has been doing commission work in watercolor and pastel and photography for years. But art and software ran in parallel tracks, all her art being analog until she discovered GANs. Since then, generative models have been her primary medium. <https://aiartists.org/helena-sarin>

## The computer that wanted to be incomputable

**Mónica Rikić**

**Mónica Rikić** (ES) is a new media artist and creative coder from Barcelona. She focuses on code, electronics, and non-digital objects to create interactive projects often framed as experimental games. She is interested in the social impact of technology and human-machine coexistence. Her work evolves around the appropriation of technological systems to rethink them through art. From educational approaches to sociological experimentation, she proposes new ways of interacting with the digital environment. <https://monicarikic.com>

## Human Study #1, RNP-II

**Patrick Tresset**

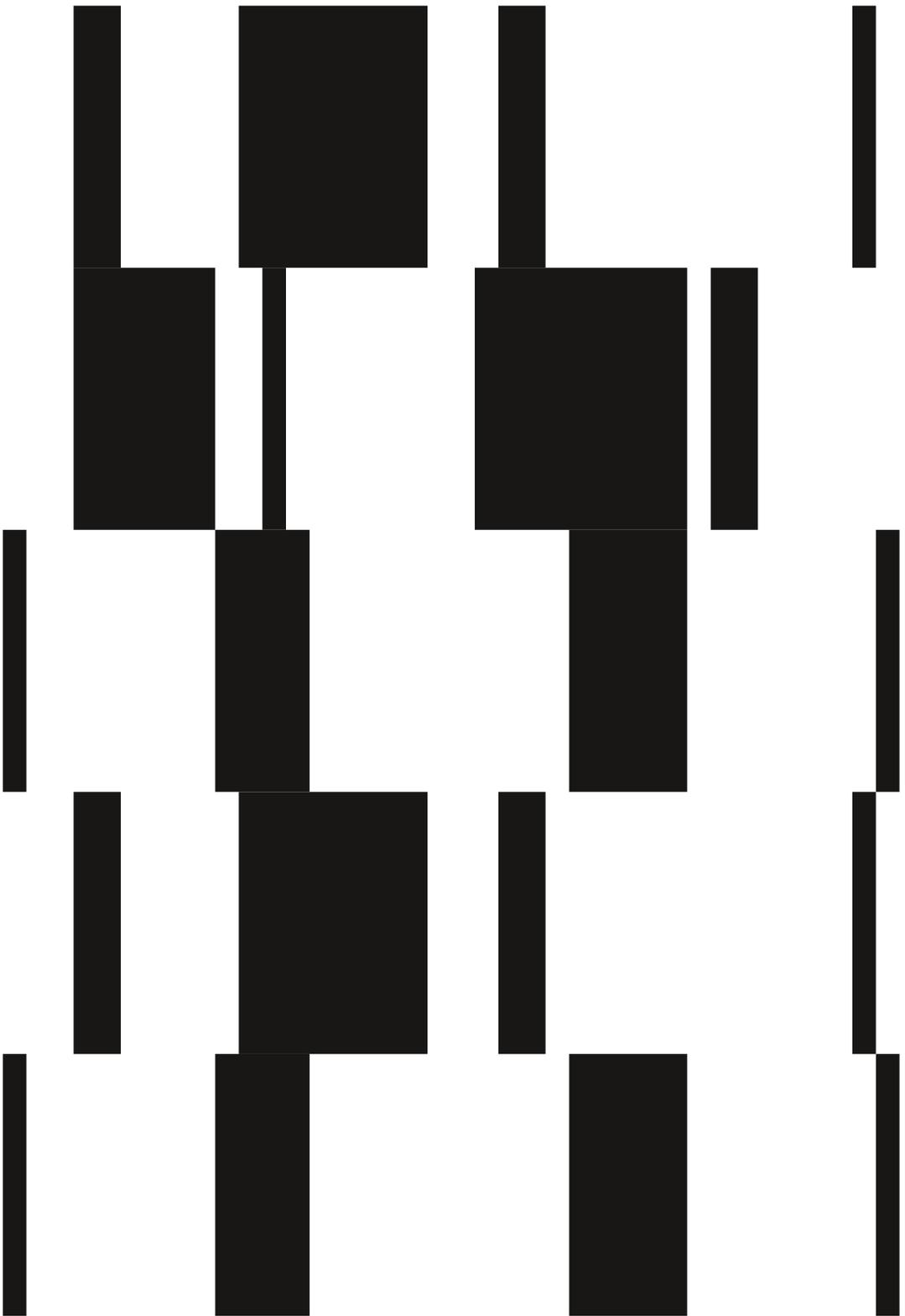
**Patrick Tresset** (FR) explores human traits and aspects of human experience. His work reflects recurrent ideas such as embodiment, passing time/time passing, childhood, conformism, obsessiveness, nervousness, the need for storytelling, and mark-making. He is best known for his performative installations using robotic agents as stylized actors that make marks, and for his exploration of the drawing practice using computational systems and robots. <https://patricktresset.com>

## Imagined Architectures

**Simon Colton**

**Simon Colton** (UK) is a professor of computational creativity at Queen Mary University of London and Monash University. He has researched how to hand over creative responsibility to AI systems in generative projects, with applications to visual arts, videogames, music, and mathematics. He has more than 200 publications, and artwork made by his AI systems has been widely exhibited. He is currently researching imaginative search engines and what it means for an AI to create and express its own existence. <https://imaginative.ai/wp>





# GLUON

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Brussels, Belgium

# GLUON

GLUON is a Brussels-based organization for art, science and technology. Since its inception, GLUON has been raising awareness about global challenges. After all, a thriving society builds on a balanced interaction between the human and exact sciences, between people, their technological achievements, and the natural environment on which they depend. We find interactions between researchers, artists, citizens, and youngsters indispensable in a joint search for solutions to the dangers and challenges that affect this system. To this end, GLUON developed a platform that maximizes collaborations and confrontations between these different actors. Our most important mission is to stimulate partnerships between artists, research, and industry. The Art&Research operation of GLUON facilitates and supports artist residencies in the R&D

departments of companies and research institutions on the one hand, and scientist residencies in the studios of artists on the other. These interactions provide artistic and philosophical results, but also innovative ideas, services, and products in non-artistic sectors. In the past years GLUON has realized several residency projects exploring the role and impact of artificial intelligence within society. The educational program or “GLUON Education” is the other important pillar of GLUON. The educational activities aimed at (Brussels) young people aged 14 to 18 support them through the arts in the development of digital skills, critical thinking, creativity, and entrepreneurship. GLUON realizes its program in collaboration with a growing number of international and national partners. [www.gluon.be](http://www.gluon.be)

## Scientist In Residence Programme (SIRP)

The Art&Research operation of GLUON facilitates residencies of artists engaging with science and technology and aimed at responding to broader societal challenges we are facing today. To facilitate these interdisciplinary processes we developed a set of models for collaboration.

In 2016 GLUON, in partnership with Ars Electronica, BOZAR & Serpentine Galleries, launched the *Scientist In Residence Programme* (SIRP). The program encourages renowned contemporary artists to host a scientist or researcher in the independent and inspiring environment of their studios, reversing the usual approach whereby artists are invited to work at R&D departments of universities or companies. Our intention is to challenge both the hierarchy between the arts and empirical sciences predominant in the twentieth century and the technological and scientific determinism by enabling artists to input

experimentally creative, critical, and societal ideas.

Within the framework of the European ARTificial Intelligence Lab, we established four projects following this model. As such the curatorial approach for the four projects have been affected by the format and vision put forward by SIRP. Instead of starting with a predefined thematic focus on the topic of AI, we chose to focus on the model as a catalyst for the development of manifold new reflections on Artificial Intelligence.

Most attempts at art-science collaboration have been made by artists working at the laboratories of scientists. The underlying idea of SIRP is to take away existing hierarchies between art and science, leading to a “different—non-hierarchical and non-representational—thinking of interdisciplinarity that is alive to the potentials for novelty and transformation.”<sup>1</sup> The collaboration should

benefit both the scientist and the artist. It proposes an “attempt to reverse the usual procedures and spatialities of art-science collaboration by inviting scientists to leave the comfort of the laboratory to undertake collaborative research activity in the art studio. The residencies will thus explore new potential forms of art-science relation, and their capacity to generate alternate ideas, methodologies, and approaches to interdisciplinary research.”<sup>2</sup> It is also an attempt to establish better connections between the so-called worlds of “Media Art” and “Fine Art,” as well as between cultural and research institutions. It’s a sign of the times that an ever growing number of artists and institutions are interested in the latest technological and scientific developments accelerating change in the world at an ever-increasing speed. This hi-speed evolution requires new initiatives to which we aim to contribute. As such, the selection of the artists with whom we collaborated was also affected by SIRP; respectively Manthia Diawara, Jan De Cock, Jonas Lund, and Luc Tuymans. With this in mind we embarked on a journey, inviting all scientists for a series of encounters at the studio of the artists, from Yene (Senegal), Brussels (Belgium), to Turin (Italy). During these encounters the participating artists, scientists, and technologists talked about their individual practices, what the arts and the sciences could learn from each other, the potential of AI and Art ... This resulted in a multitude of reflections on the topic of Artificial Intelligence, revealing its current limitations as well as its potential to respond to broader societal, political, and ecological challenges we are facing today. One of the questions we explored is whether AI can understand artistic processes. For two years the renowned Belgian painter Luc Tuymans and AI expert Luc Steels collaborated on the research project *FLOW*. Artificial Intelligence researchers try to understand the structures and processes that underly intelligence and use that insight to build practical applications. Much has been achieved

but much more remains to be discovered. The way to make these discoveries is to examine domains where human intelligence reaches its most magnificent manifestations. The creation and interpretation of art works is certainly one of these. Art is the perfect testing ground to find out more about how our intelligence works, and this also thanks to Artificial Intelligence tools.

What happens when AI algorithms look at the paintings of Luc Tuymans? What do they see—or not see? Do they recognize what is depicted? These algorithms can more or less detect focal regions, lines, and color patches. But can they also aggregate these in terms of visual motifs that make sense to us, and interpret these motifs? Can AI algorithms put the signifiers of a painting into their cultural, political, and historical context? Can they recognize the expressive meanings of a work based on visual cues and background knowledge? Can they figure out the intrinsic motivations of the painter?



The *FLOW* project is a step towards a better understanding of the processes and structures through which art is interpreted and experienced, by making a computational model using state of the art AI algorithms. The work of painter Luc Tuymans pushes AI to the extreme and lays bare its current limitations. Herein lies the revelatory interest of the *FLOW* project; not only to the AI scientist who seeks new terrains for a better understanding of the human mind and its computational principles, but also to the artist who gains more insight

into their own artistic methods. The outcome of the project also establishes a basis for possible future tools for art education, art curation, and art history.

In *FLOW* we explored what happens when AI looks at paintings. But what happens when AI looks at living people? Can AI enable an exchange of perspectives and views on the world in a more expanded way? This research question formed the basis of Jonas Lund's *Significant Other*, developed in collaboration with the experts of the Belgian company Televic. *Significant Other* is a two-part intelligent, networked sculptural display programmed to read and capture "the emotional state" of each figure crossing their pathway. The intelligent machines draw conclusions on the opposing data and communicate the results via pop-ups and statistics. Passers-by are confronted with striking text-based information such as: "You are 22% more happy."

**The surprise level here is 8.47% lower compared to Televic, Plovdiv**

The statements deduced are produced by the employment of a generative adversarial network (GAN), a machine learning system that uses two artificial neural networks (ANNs) (originally abstractly modeled on biological neural networks) to contest with one another in a framework of algorithms that work together to process multifaceted data. Becoming real-time portals, the linked devices gather data and transmit it—portraying the machine's interpretations, representations, and conclusions about the people that pass by—in direct opposition with the other location. As a form of ongoing communication,

*Significant Other* conjures questions relating to understanding what the machine and person decipher, what they reciprocally continue to assess and learn in exchange.

AI as an enabler for an exchange of perspectives is also explored in the project *Resistance Transistor* by artist Jan De Cock and climatologist Frank Raes.



The project explores how AI can create a relationship between humans and natural elements such as rocks, trees, glaciers ...

The same topic is also explored by Malinese filmmaker and writer Manthia Diawara. For the project *Improbable Algorithms: AI & Africa*, Diawara invited scientists Raoul Frese (biophysics) and Tarek Besold (AI expert) to his studio in Yene, a small village about 55 km south of Dakar, Senegal.



In Yene, 70% of the Lebou population earns their living from fishing-related activities. However, the environmental balance between the village and the ocean is undergoing changes; with a diminishing number of fish

near the coast, fishermen have to travel further and further onto the ocean where they meet and must compete with international fisherman who have bigger boats and better fishing equipment. During their first stay, Diawara was the two scientists' host. Questions were asked about the village and the villagers: their traditional fishing methods, their belief systems and religion, and whether they currently use any computer applications or not. What is their relation to modernity and new technologies? Do they find AI threatening to their own traditions and belief systems? This encounter laid the basis for the making of a film which explores the "poetics of relation"<sup>3</sup> between AI and the power of prediction practiced by traditional African healers. A year after the first encounter, Diawara invited the two scientists back to Yene, this time extending the invitation to anthropologist Jean-Paul Colleyn. Diawara proposed for them to participate in a possession ceremony called "Ndep."



Practiced for centuries by the Lebou ethnic group, the Ndep is a healing, preventative, cleansing, protective, and predictive ritual ceremony. The story Diawara aims to bring is how Ndep and AI could both be seen as rituals of possession, as believable narratives, but very different in the way they approach their "data." The idea of "invisible forces" leads Diawara to consider Mère-Bi—a Ndep priestess—as the conceit of the film and subject for discussion for the scientists and the local villagers who consult her. Witnessing the Ndep ritual had changed minds for the artist and scientists. What is knowledge and secrecy? What is rationality? What is science? What is Artificial Intelligence?



- 1 Lapworth A, 2017, "For a Transversal Art-Science," in *Scientist-in-Residence Program: A New Approach to Art-Science*, Gluon, Brussels, pp. 9-13
- 2 Idem
- 3 Glissant, Edoard (1997). *Poetics of Relation*. Ann Arbor: University of Michigan Press.

# Activities

## Exhibitions

### Secrets

BOZAR, Brussels, BE  
03.04.2021 – 02.05.2021  
Luc Tuymans (BE) in collaboration  
with Luc Steels (BE)

### Resistance Transistor

**Shown at exhibition: A brave new Brussels**  
MAAT, Lisbon, PT  
22.10.2019 – 26.10. 2019  
Jan de Cock (BE), Frank Raes (BE),  
David Surprenant (BE)

### Significant Other

**Shown at exhibition: AI: Love and Artificial Intelligence**  
Hyundai Motorstudio Beijing, CN  
30.09.2020 – 03.01.2021  
Jonas Lund (SE)

### Significant Other

**Shown at exhibition: Uncanny Values**  
MAK, Kunsthalle Wien, Vienna, AT  
29.05.2019 – 06.10.2019  
Jonas Lund (SE)

### Significant Other

**Shown at exhibition: Stadstriënnale Hasselt-Genk**  
BOZAR, Brussels, BE  
05.10.2019 – 05.01.2020  
Jonas Lund (SE)

### Significant Other

**Shown at Daejeon Biennale 2020**  
Daejeon Museum of Art, Daejeon, South Korea  
08.09.2020 – 06.12.2020  
Jonas Lund (SE)

## Residencies

### Significant Other

Televic Group, Izegem, BE  
01.11.2018 – 30.08.2019  
Jonas Lund (SE)

### Resistance Transistor

Studio Jan De Cock, Turin (IT) & Brussels (BE)  
01.11.2018 – 30.08.2019  
Jan de Cock (BE), Frank Raes (BE),  
David Surprenant (BE)

### Improbable Algorithms—AI & Africa

Studio Manthia Diawara, Yene, SN  
01.11.2018 – 30.08.2020  
Manthia Diawara (Mali) in collaboration with  
Raoul Frese (NL) Tarek Besold (DE)

### Flow

Studio Luc Tuymans Antwerp, BE  
01.11.2018 – 30.08.2020  
Luc Tuymans (BE) in collaboration with  
Luc Steels (BE)

# Projects



## Resistance Transistor

Jan de Cock (BE), Frank Raes (BE),  
David Surprenant (CA)

*Resistance Transistor* lies at the crossroads between an artwork, a design product, and a technological device. *The Resistance Transistor*—referring to both the project and the device—has been created with the purpose of reuniting humans with nature in the resistance against climate change. The *R.T.* takes the form of a rectangular shaped device, equipped with a screen and a GPS. Through the *R.T.* the users are guided towards several trees, rocks, or even glaciers around the world. When the user comes close, the *R.T.* connects humans to these natural actors to create an exchange.



## Improbable Algorithms: Africa & AI

Manthia Diawara (ML/US), Raoul Frese (NL), Tarek R. Besold (DE)

The documentary *Improbable Algorithms: Africa & AI* by Manthia Diawara explores the relation between traditional African belief systems and AI. The film's genesis is based on a series of encounters between the artist and two European scientists—Tarek Besold and Raoul Frese—organized by GLUON at Manthia's studio in Yene. Yene is a small village 55 km south of Dakar (Senegal) where 70 % of the population lives from fishing and fishing related activities. Starting from the challenges the local community of Yene is confronted with, the scientists were invited to attend a 4-day long performance of a “Ndep” ritual by the Lebou ethnic group. From this performance, Manthia and the scientists explore the “poetic relation” between AI and the supernatural powers of traditional African healers.



## Significant Other

Jonas Lund (SE)

Jonas Lund's *Significant Other* is an intelligent, networked sculptural display. The pair of dual-screen-and-camera installations capture and display imagery and information shared between two locations. The devices are programmed to read and capture “the emotional state” of each figure crossing their pathway. The intelligent machines draw conclusions on the opposing data and communicate the results via pop-ups and statistics on-screen such as: “You are 22% more happy.” As a form of ongoing communication, *Significant Other* conjures questions relating to understanding what the machine and person decipher, what they reciprocally continue to assess and learn in exchange.



## **FLOW**

Luc Tuymans (BE), Luc Steels (BE)

“What is the relationship between Art and Artificial Intelligence? Can AI become a tool for the contemporary artist? Does AI look at a painting the same way we do?”  
GLUON brought together AI expert Luc Steels and world-renowned Belgian painter Luc Tuymans to investigate these questions, in the form of a “scientist in residency” program. The *FLOW* project is a step towards a better understanding of the processes and structures through which art is interpreted and experienced, by making a computational model using state of the art AI algorithms.

# Artists

## Resistance Transistor

Jan de Cock, Frank Raes, David Surprenant

**Jan De Cock** (BE) is a contemporary Belgian visual artist. From the start of his career, his art has revolved around production and the ways in which an artist relates to the broad culturally-injected concept of Modernism. Much of his work appears to draw visual and formal comparisons between early-20th century abstract art movements (such as Constructivism, Cubism, and Suprematism) and contemporary design and mass production. Additionally, de Cock commonly includes a performative element intended to act as social critique or to place his work demonstrably into a system of exchange. <https://jandecock.org>

**Frank Raes** (BE) worked as Head of the Climate Change Unit at the Joint Research Centre of the European Commission in Ispra (IT) until 2015. Raes' scientific background covers atmospheric chemistry, climate change, and climate change impacts. His research and that of his team supported the development of an integrated climate change and air quality EU policy. In 2013 he authored the book: *Air and Climate: conversations about molecules, and planets, with humans in between*, including interviews with leading climate scientists.

**David Surprenant** (CA) is an interactive developer based in Montreal. He studied an interdisciplinary program covering video, sound editing, design/illustration, 3D modeling/animation, and coding. Passionate about new technologies, he aims to explore their full potential in projects with enterprises and artists.

## Improbable Algorithms: Africa & AI

Manthia Diawara, Raoul Frese, Tarek R. Besold

**Manthia Diawara** (ML/US) is a distinguished Professor of Comparative Literature and Film at New York University. Diawara was educated in Guinea-Conakry, Bamako (Mali) and Paris (France), before migrating to the United States to pursue his studies. Diawara is a prolific writer and filmmaker. His notable films include: *An Opera of the World* (2017), *Negritude: A Dialogue between Soyinka and Senghor* (2016), *Édouard Glissant, One World in Relation* (2010), *Maison Tropicale* (2008), and *Rouch In Reverse* (1995).

**Raoul Frese** (NL) Dr. Prof., specializes in biophysics of photosynthesis. At the VU University Amsterdam he has currently established his workgroup biohybrid solar cells where he and his team investigate the possibilities to interconnect photosynthetic materials to (semi-) conducting substrates for biosensors and solar energy harvesting. Frese established a laboratory, Hybrid Forms, where artists, designers, and scientists join forces for research and development for sustainable technology and materials as well as reflections on science and society. <https://hybridformslab.com>

**Tarek R. Besold** (DE), Dr., is an experienced researcher, innovator, and communicator at the intersection between Artificial Intelligence and Cognitive Science, working on a broad range of topics from trustworthy AI (including explainable AI and privacy-preserving AI) to cognitive systems and computational creativity. His past and present roles in academia and industry include the position of CTO at neurocat, a Berlin-based AI safety start-up and as Chief Science Officer (CSO) of Alpha Health, Telefonica Innovation Alpha's health tech Moonshot in Barcelona. Tarek is currently the Head of Strategic AI at DEKRA DIGITAL.

<http://tarekbesold.com>

## **Significant Other**

### **Jonas Lund**

**Jonas Lund** (SE) creates paintings, sculpture, photography, websites, and performances that critically reflect on contemporary networked systems and power structures of control. His artistic practice involves creating systems and setting up parameters that oftentimes require engagement from the viewer. This results in performative artworks where tasks are executed according to algorithms or a set of rules. Through his works, Lund investigates the latest issues generated by the increasing digitalization of contemporary society like authorship, participation, and distribution of agency. At the same time, he questions the mechanisms of the art world; he challenges the production process, authoritative power, and art market practices.

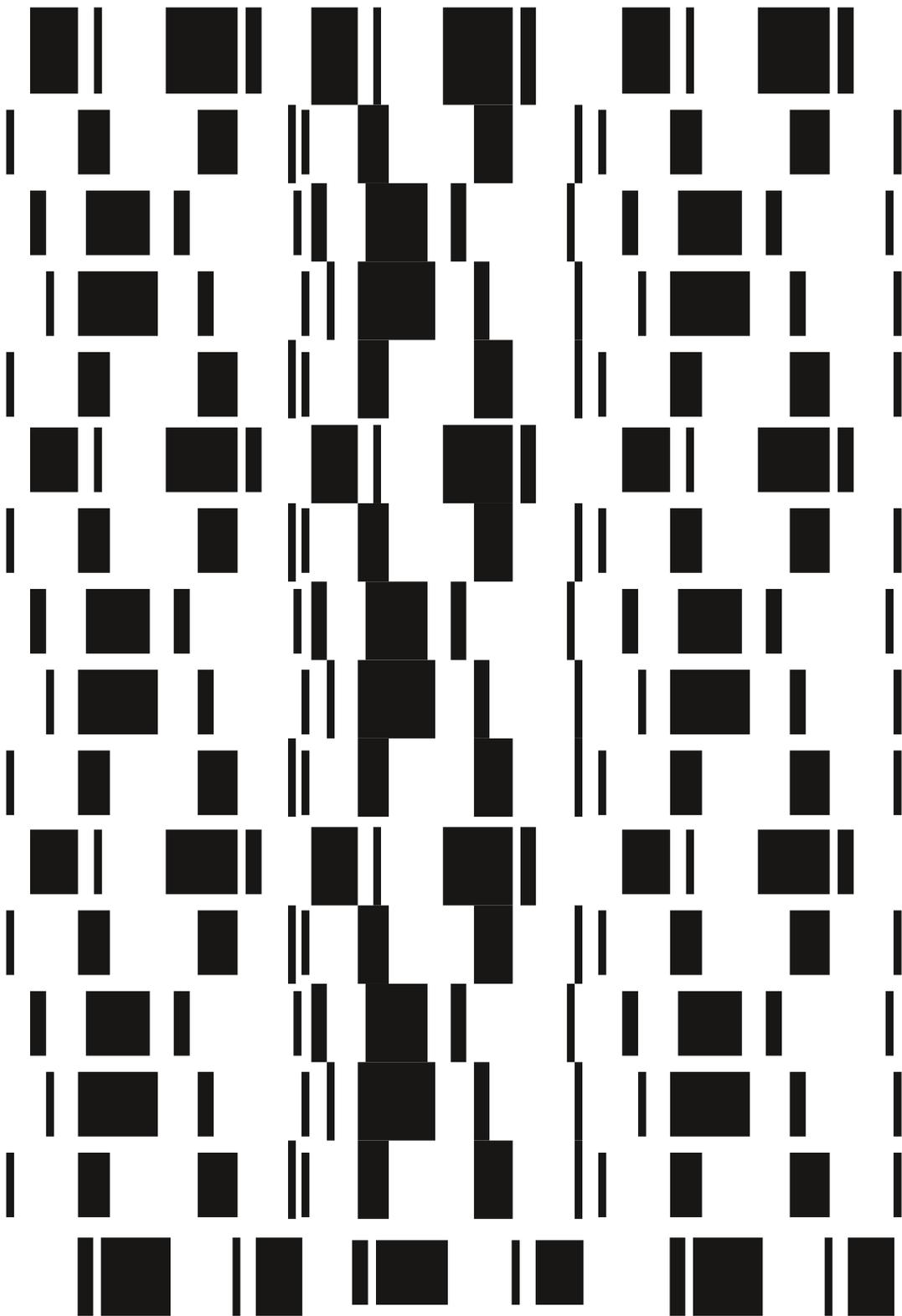
<https://jonaslund.com>

## **FLOW**

### **Luc Tuymans, Luc Steels**

**Luc Tuymans** (BE) is a Belgian artist known for a distinctive style of painting that demonstrates images' power to simultaneously communicate and withhold. Tuymans pioneered a decidedly non-narrative approach to figurative painting, instead exploring how information can be layered and embedded within certain scenes and signifiers. Tuymans is internationally acknowledged as one of the greatest living painters and he is an acute and fearless commentator on art and society today. <https://www.luctuymans.be>

**Luc Steels** (BE) is a fellow at the Catalan Institute for Advanced Studies, embedded in the Institute for Evolutionary Biology (UPF/CSIC) in Barcelona. He is the founder of the VUB AI Lab in 1983 and the Sony Computer Science Laboratory in Paris in 1996. His AI research has focused specifically on language processing and evolution, behavior-based robotics, knowledge-based systems, and the use of complex systems, including neural networks and genetic algorithms, for AI.



# Hexagone Scène Nationale Arts Science



Meylan, France

# Hexagone Scène Nationale Arts Science

Hexagone Scène Nationale Arts Sciences is a multidisciplinary theater (dance, circus, music, theater...) welcoming about 30 shows a year. In addition to its missions of artistic production, presentation, and development, it has also developed research activity since 2002. Hexagone created the Atelier Arts Sciences in 2007, a common research and creativity platform shared with CEA Grenoble. It provides a framework for prolific meetings between arts and sciences, allows the benchmarking of experiences and points of view, and encourages questioning and imagination to enrich respective working methods. Since 2007, the Atelier Arts Sciences team has coordinated more than fifty projects combining art and science, facilitating the invention of novel devices for stage performances, and conceiving connected objects, texts, interactive exhibitions, and stage performances. The outputs of these projects have toured worldwide. The Atelier Arts Sciences has pioneered an art and science exhibition, "EXPERIMENTA," which provides insight into on-going projects, in addition to further projects coming from European and International partners. Atelier Arts Sciences is working on the major changes that are transforming our society in the long term and tries to be at the heart of major issues that impact citizens. The Atelier organizes residencies between artists and scientists that gather researchers from the CEA

but also researchers from other research centers and universities.

Hexagone Scène Nationale and Atelier Arts Sciences have been dealing with the topic of artificial intelligence for several years now. Bringing together artists, scientists, and companies to work might act as a catalyst for change and for emerging concepts which could map out new possible directions for the future. They are convinced that joint research between artists and scientists can open up new ways of thinking about the development of AI—beyond the economic and technological prism. In 2018, Hexagone Scène Nationale and Atelier Arts Sciences imagined a first exhibition with eight original artworks by diverting the theme of AI. The goal was to get out of the trivial comparisons between human being and machine and demystify artificial intelligence to enable dialogue and debate around this technology. The exhibition explored the links between intelligence, human attention, and the problem of our attention span captured by GAFAs, among others. AI represents a major technical, technological, sociological, ecological, and societal revolution. Hexagone Scène Nationale and Atelier Arts Sciences believe that artists in contact with scientists can re-invent the stories of the future, raise awareness, and mobilize citizens regarding ethical and societal issues. Above all they allow citizens to engage with these current issues through sensitive and poetical experiences.

# Atelier Arts Sciences

By bringing together the worlds of art, science, and industry, Hexagone Scène Nationale Arts Sciences, through its Atelier Arts Sciences, allows the intersection of imaginaries and encourages questioning. It allows everyone to construct their vision of the world following the changes induced by the advancement of scientific knowledge and the use of new technologies. The artists tackle these societal questions raised by research and give space to the sensitive and to dreams by bringing meaning.

A magical solution to the great ills of this world for some, the early stages of an ecological, social, and moral apocalypse for others.

Fantasy, the daily companion of some and for others, the enemy of free will and of freedom, artificial intelligence is everywhere and leaves no-one indifferent. All research fields are affected by its progress.

From objects to subjects, from tools to words, artistic creation is also embracing AI, in ways that are just as varied as the many different imaginations that it appeals to. Between demystification, praise, criticism, and other approaches, artists are a key to the door for understanding all the ambivalence that AI presupposes. For a long time the protagonist of science fiction books, both dystopic and utopic, AI has also been in artists' minds for quite some time.

The European ARTificial Intelligence Lab project has given us the means to question AI from an artistic, philosophical, ethical, and societal perspective. AI is everywhere, in every field, everyone deals with AI. However, it is difficult to agree on a definition, to express ourselves with a common vocabulary. How can we grasp the information, how can we articulate it and then give it back to the audience? How can we take a critical and

enlightened look at AI? Transdisciplinary projects have the strength of being able to combine the artistic imagination with scientific reality and also with the scientific imagination. Bringing disciplines together, opening a dialogue, bringing developments linked to artificial intelligence out of the laboratories into the fertile world of artists is an essential objective of the Atelier Arts Sciences. Through their works and performances, artists share their visions and their questions. Their impact on the citizen is real. Thus art is a means of raising the citizen's awareness, of making them an actor in the issues that surround them. Artificial intelligence, like digital technology, is a technology used by the art world. The visual arts have perhaps taken hold of it a little earlier than the performing arts. Yet Hexagone Scène Nationale Arts Sciences works essentially with artists from the performing arts. This is our specificity but also our strength. It is through language, the language of the body and the voice, that artists develop new imaginations. These imaginations have an impact on the audience as well as on the research itself. The artists question this research, criticize it, observe it from all angles, distort it, and thus sometimes allow the development of new uses as much as limiting others.

Hexagone's artistic choices have always been oriented towards contemporary artistic creation. The texts are written or staged by contemporary artists who wish to address societal, environmental, and political issues. The rapid evolution of technologies makes it difficult to understand the issues at stake in the various scientific and technological disciplines in the light of current societal transitions and environmental issues. Although artists are increasingly interested in these issues, it is obvious that their productions in this field

often reflect an ambient imagination that is sometimes not deciphered. It is difficult to stand back from the imaginaries conveyed by the performing arts and the world of continuous innovation.

Hexagone has set up awareness on artificial intelligence by organizing encounters, kinds of training programs, dedicated to artists. The aim is to enable artistic project leaders to explore scientific and technological research fields, to acquire a perception of the issues at stake—from fundamental research to societal and environmental implications, and to understand the various implications and interactions.

This process of exploration is situated upstream of artistic research and the creation of an artwork. It aims to prevent artists from overdetermining their future project with preconceived ideas and unfounded assumptions about their field of investigation, which sometimes makes the final production biased. It allows us to enrich the theoretical and societal basis of a work. Our aim is to nourish artistic creation by bringing out new dramatic texts. AI can prove to be a formidable tool, a real resource that artists can mobilize in the service of their work.

Hexagone Scène Nationale is thus involved in an exploratory approach by accompanying artists in their trial and error, in their doubts, in the experimental dimension of their research and creation.

In the same way, fundamental research is a particularly effective form of exploratory research to bring out totally new concepts. This research relies on the curiosity and creativity of researchers. The results of such research are often unpredictable. Inviting artists into the scientific community at this stage of the research process allows an incredible broadening of horizons. These encounters between artists and scientists allows the confrontation of points of view, the enrichment of experiences, and the exploration of new perspectives. The artistic output and its

presentation to the audience are as important as the experiments and the new insights provided to the scientists. The contact of scientists with the questions of artists allows the construction of imaginary worlds at the basis of scientific and technological research, which can enrich the approach of scientists. These meetings between artists and researchers help to sweep away preconceived ideas, demystify AI, and for researchers to share the limits they encounter and their objectives.

Artists take up these themes to alert society and also the research community itself. Critical discourse is essential and has an impact when it is based on tangible things.

Artists have the capacity to think the world differently at a time when the imagination needs to be renewed. The imaginary of citizens is essential to live in a coherent world oriented towards a desirable future.

Hexagone Scène Nationale encourages encounters between artists and audiences. Meetings with the public are organized after stage performances, artists take part in outreach activities, and during the exhibition “EXPERIMENTA,” the artists and scientists involved in the project attend the whole exhibition alongside their work. From this meeting, awareness can be raised, and imaginations and mythologies can be renewed. The artists disseminate, propagate, transmit, and alert the audience. Artists are the link between research and civil society.

The demand for artistic projects based on the relationship between the arts and sciences is constantly increasing on a national and European scale. This is the observation we have made within the TRAS network (Transversale des Réseaux Arts Sciences). There is a need for shows to propose new forms of imagination of the relationship between arts and sciences and between human being and machine. New mythologies, or “updated” mythologies, must be proposed to the European public. This is what a project like AILAB makes possible.

# Activities

## Conferences

### EXPERIMENTA, the Forum

Art&Science Biennale

INP, Grenoble, FR

12.02.2020 – 15.02.2020

Panel 1: Dealing with AI

Panel 2: Poetic Algorithms

Panel 3: IA IA! ARTIST IMAGINATIONS AND

ARTIFICIAL INTELLIGENCE

Panel 4: IT'S NOT ME, IT'S THE AI

Panel 1: Nicolas Ramond (FR), Thierry Ménissier /

UGA-MIAI (FR), Catherine Dufour (FR), Norbert

Merjagnan (FR), Roland Lehoucq / CEA (FR)

Panel 2: Philippe Bootz / Université Paris 8 (FR),

Yann Nguéma, Thomas Lebarbé / UGA (FR)

Panel 3: Birk Schmithüsen (DE), Anna Ridler (UK),

Cecilie Waagner Falkenstrøm (DK), Andreas

Broeckman (DE)

Panel 4: Patrick Loiseau / INRIA (DE), Vytautas

Jankauskas (LT), Marie Lorphelin / INRIA (FR),

Véronique Aubergé (FR)

### Regards croisés sur l'intelligence artificielle

Dialogue entre une artiste et un scientifique

Maison de la Musique, Meylan, FR

01.06.2021

Eric Gaussier / MIAI (FR), Rocio Berenguer (ES)

## Exhibitions

### EXPERIMENTA, The Exhibition

Art&Science Biennale

CEA, Grenoble, FR

13.02.2020 – 15.02.2020

Lithosys—Rocio Berenguer (ES), Igotchi—Rocio

Berenguer (ES), Mosaic Virus—Anna Ridler (UK),

Speculative Artificial Intelligence—Birk

Schmithüsen (DE), Reactive Matter—Grégory

Lasserre & Anaïs met den Ancxt (Scénocosme)

(FR), Gallinero—Nestor Lizalde (ES), Cached—

Clément Bouttier (FR), Ryan Dzelzkalns (US),

Jon Flint (UK), Vytautas Jankauskas (LT), Aline

Martinez (BR), Joana Mateus (PT), Felipe de Souza

(BR), Dhvāni—Boudhaditya Chattopadhyay (IN),

Penser voir—Thierry Fournier (FR), Artificial

Intelligence Mary—Cecilie Waagner

Falkenstrøm (DK)

## Residencies

### G5

Atelier Arts Sciences, Grenoble, FR

01.11.2018 – 08.10.2021

Rocio Berenguer (ES)

## Workshops

### Séance exploratoire

Session 1: Art & AI

18.03.2019 + 19.03.2019

Session 2: Art, AI and language

01.06.2021 + 02.06.2021

Atelier Arts Sciences, Grenoble, FR

Session 1: Rocio Berenguer (ES), Isis Fahmy (FR),

Thierry Poquet (FR), Leopold Frey (FR), Bernard

Garnier (FR), Jose Olivares Flores (FR), Elodie

Moleins (FR), Lea Di Ciccio / CEA (FR), Agnes

Helme Guizon / UGA (FR), Lucie Conjard / EHESS

(FR), Amelie Cordier (FR), Marie Lorphelin /

INRIA (FR), Ambre Davat / UGA (FR), Véronique

Aubergé / CNRS (FR), Marina Reyboz / CEA (FR),

LILIYA TSVETANOVA / UGA (BG), Clément

Pélissier / UGA (FR)

Session 2: Eric Gaussier / UGA-MIAI (FR),

Jean-Philippe Magué / ENS Lyon (FR), Jean-Pierre

Chevrot / UGA (FR), Diane Larlus / Naver Labs

(FR), Didier Schwab / UGA (FR), François Portet /

UGA (FR), Thomas Hueber / CNRS (FR), Olivier

Perrotin / CNRS (FR), Justine Cassel / prAlrie

Institute (FR), Jean-Luc Schwarz / UGA (FR),

Nicolas Zlatoff (FR), Bruno Thircuir (FR), Rocio

Berenguer (ES), Baija Lidaouane (FR), Lionel Palun

(FR), Thierry Poquet (FR), Vladimir Steyaert (FR),

Clément Pélissier (FR), Marion Sabourdy (FR),

Michel Ida / CEA (FR), Timothée Sylvestre /

CEA (FR)

### **Groupe Artistique d'Exploration Scientifique**

AI & health, AI & environment, AI & ethics  
Atelier Arts Sciences, Grenoble, FR  
25.01.2021 – 27.01.2021

Golnaz Behrouznia (IR), Arnaud Chevalier (FR),  
Thierry Collet (FR), Li-Cam (FR), Marc Rigaud (FR),  
Jacques Vincey (FR), Dorothée Zumstein (FR),  
Jean-François Matignon (FR), Françoise Berthoud  
/ CNRS (FR), Thomas Burger / CEA-CNRS (FR),  
Eric Gaussier / UGA-MIAI (FR), Frédéric Heitz-  
mann / CEA (FR), Thierry Ménissier / UGA-MIAI  
(FR), Serge Slama / UGA (FR), Assia Tria / CEA  
(FR), Jocelyne Troccaz / MIAI (FR), Denis  
Trystam / INP (FR), Sandrine Voros / IMAG (FR)

### **Groupe Artistique d'Exploration Scientifique**

AI & robotic, AI & mobility, AI & language  
Quai des Savoirs, Toulouse  
31.06.2021 – 02.07.2021  
Edwige Armand / INP Purpan (FR), Olivier Stasse /  
ANITI (FR), Rachid Alami / ANITI (FR), Simon  
Lacroix / ANITI (FR), Frédéric Dehais / ANITI (FR),  
Philippe Muller / IRIT-ANITI (FR), Chloé Braud /  
IRIT-ANITI (FR), Golnaz Behrouznia (IR), Arnaud  
Chevalier (FR), Thierry Collet (FR), LI-CAM (FR),  
Marc Rigaud (FR), Marie Vauzelle (FR), Dorothée  
Zumstein (FR), Jean-François Matignon (FR)

## **Other Activities**

### **EXPERIMENTA**

Art&Science Biennale  
Shows  
Hexagone, Meylan, FR  
14.02.2020 + 15.02.2020  
Les Furtifs  
20.02.2021 + 21.02.2021  
Céleste gronde  
11.02.2020 + 12.02.2020  
G5

### **Outreach Activities**

01.11.2018 – 30.11.2021

### **Practical Workshop**

UGA SUAPS, Saint Martin d'Hères  
Rocio Berenguer (ES)

### **Awareness-raising action IA industrial sector**

Atelier Arts Sciences, Grenoble  
Frédéric Deslias (FR)

### **Awareness-raising action with IAgotchi**

TERMINAL LYCEE VAUCANSON GRENOBLE  
Rocio Berenguer (ES)

### **Awareness-raising action with IAgotchi**

BTS LYCEE VAUCANSSON GRENOBLE  
Rocio Berenguer (ES)

### **Action de sensibilisation SCREENAGERS**

LYCEE LGM MEYLAN  
Giuseppe Chicco (IT)

### **Instrumentarium**

Centre sociaux Fontaine, Centre de loisirs Fontaine,  
Collège Wallon Saint Martin d'Hères—4e1, Collège  
Wallon Saint Martin d'Hères—4e 2  
Lionel Palun (FR)

### **AI awareness workshop around Céleste Gronde**

École du Haut Meylan, École du Haut Meylan,  
Atelier théâtre adulte Horizons Meylan, Lycée  
Argouges Grenoble, MJC Crolles, Maison des  
habitants village Sud Echirolles, Centre de Loisirs  
Elas Triolet Fontaine, MJC Nelson Mandela —  
Fontaine, MJC Parmentier Grenoble, Horizons  
Meylan Solenn Goix (FR), Judith D'Aleazzo (FR),  
Thomas Fitterer (FR)

### **AI awareness workshop**

Collège Les Buclos—3eB,  
Collège Les Buclos—6eB, MJC Crolles,  
MJC des Eaux Claires-Grenoble,  
Collège Les Buclos—6eA,  
Collège Les Buclos—6eC  
Yves Brozat (FR)

## **Ars Electronica Garden 2020**



<https://u.aec.at/698405E9>

# Projects

## Cached Experience

Cached Collective (INT): Clément Bouttier (FR), Ryan Dzelzkalns (US), Jon Flint (UK), Vytautas Jankauskas (LT), Aline Martinez (BR), Joana Mateus (PT), Felipe de Souza (BR)



Pierre Jayet

The *Cached Experience* offers an insight into your digital reflection by revealing how the silhouette of your on-line activity is interpreted and depicted by the social networks' contemporary algorithms. The experience begins with the entry into a dimmed room where you are invited to connect to your Facebook and Twitter accounts using a tablet. Powered by the IBM Watson psychometric algorithm, *Cached* studies your Facebook or Twitter posts and analyses your choice of words, your syntax, and the complexity of your sentences in order to establish your psychological profile and describe your digital imprint. Through this algorithmic and digital experience, *Cached* questions the consequences of massive data collection and invites visitors to take a critical look at our on-line behavior and the psychometric profiling that advertisers use. <https://cached.id>

## Dhvāni

Budhaditya Chattopadhyay (IN)

*Dhvāni* is a series of self-regulating, responsive, and autonomous installations driven by AI and Machine Learning. It incorporates ritual and traditional practices from South Asia. The project emerges from research about a re-listening to and re-telling of South Asia's rich history informing the surveillance and controlled societies of today about the

values of inter-connectivity, community, and reciprocal ways of life. *Dhvāni* incorporates current research in deep learning to produce a neural-like network of bells of various sizes and tunings to creating an alive composition that responds to audience presence through sensors and is activated by the robotic arms.



## G5

Rocio Berenguer (ES)

*G5* opens another path, in which the human is forced to negotiate with the surrounding life forms: the mineral, plant, animal, and machine kingdoms. This fiction is placed in a near future in which the notions of coexistence and interdependence become unavoidable for survival. The discovery of other intelligences tends to invert the hierarchy between species, dethrone the human, and even end the Anthropocene. The Human Kingdoms, primary life powers on Earth, must cooperate to secure the future of earthly life. A debate is open on the possibilities of collaboration, fusion, determination, autonomy, or independence of the different realms. This project tries, through science fiction, another possible scenario for our future and opens the field of utopias that we have yet to build.



## IAgotchi

Rocio Berenguer (ES)

*IAgotchi* is an artificial character who learns from what we give it to eat: our words. It is an artistic object derived from the Tamagotchi that questions the place that we can give to machines: this other nature that we recognize as an entity in its own right. What relationships can we create with artificial intelligence? Not from equal to equal, but rather between two different entities? What can humans still learn from their creations? *IAgotchi* is a new poetic material that uses new strategies of interactive dramaturgy. To connect to it, the visitor will have to grab an external organ that looks like an artificial heart. It is therefore necessary to be connected “physically” to communicate by voice.

Coproduced by LIS from University Marseille-Aix-en-Provence and EST in Grenoble



Rocio Berenguer

## Lithosys

Rocio Berenguer (ES)

*Lithosys* is an interactive installation composed of a chat room and a sculpture representing a rock, in magnetic levitation about ten centimeters above a base. Users connect to the *Lithosys* website, an interface allowing them to “chat” between connected users and with artificial intelligence. Each message sent by a “human” user is also received by the computer in the base, which translates this message into a variation of the magnetic field used to levitate the sculpture and generates a sound synthesis. Users in the exhibition room can thus see and hear the piece react to the messages sent. *Lithosys* is the reflection of a strong art-science collaboration: it offers an inter-species/intra-living communication system to communicate with all the various forms of terrestrial life.

## Gallinero

Néstor Lizalde (ES)

*Gallinero* (Henhouse) is an audiovisual installation that features eight eggs that are carrying on a never-ending conversation. The work’s scenographic design consists of a chunk of a henhouse which has been torn from its context and brought back to life in the exhibition space. The audiovisual illusion is powered by a computer algorithm that enables every egg to listen to the rest of their fellow talkers. They then talk back in an infinite yet

variable cycle. A visitor will always be attending a different conversation to the previous visitor, due to the work’s capacity to generate a perpetual and unique live experience. The work experiments on script generation by means of eight different databases, previously programmed to interact between them. The work has been created for the purpose of exploring new narrative dimensions through audiovisual language based on computerized structures.

Interpreter and script: Jorge Berges Sádaba (ES)



Thierry Fournier, *Sightseen (Penser voir)*, online installation, still image, 2020, courtesy the artist

## Penser voir (Sightseen)

Thierry Fournier (FR)

Live feed from a CCTV camera + sound  
(mp3, 9'47", loop), 2018

A CCTV camera films a beach. We hear her voice, as if it were alive. The level of perfection of her intelligence would have led her to doubt and not know what to do. She thinks out loud and shares her questions: What is it? What should she look at? How to recognize a landscape? What is a suspicious behavior? But above all, what is it for? She does not understand anything. As if she were in the state of burnout, she compares herself to the underpaid click workers who feed the artificial intelligences, questioning the meaning of her work with an anthropomorphism that raises the political stakes of these devices.

[www.acousticcameras.org/playlist/thierry-fournier](http://www.acousticcameras.org/playlist/thierry-fournier)



## Reactive Matter: Rhizome

Scenocosme—Gregory Lasserre & Anais met den Ancxt (FR)

*Reactive Matter: Rhizome* is a sculptural and interactive artwork that reacts like a living organism. Like a root, this sculpture deploys in the area, perceives and feels its environment. This hybrid electronic ecosystem is composed of more than 120 independent cellular robotic structures that are linked together. Each group of cells is grafted with a transparent membrane that allows it to feel the caresses and breath of the spectators. They emit different sounds, rhythms, and light intensities in response to the audience stimuli. The robots called “claytronics” could be assembled to form larger objects. The principle is to create interactive objects capable of being linked together for designing large structures that can be freely transformed. This is the concept of synthetic reality.

Supported by VERTIGO funded under the H2020 European STARTS initiative, innovation at the nexus of Science, Technology, and the ARTS

Birk Schmithuesen



Pierre Jayet



## Mosaic Virus

Anna Ridler (UK)

Drawing historic parallels between the “tulip mania” that swept across the Netherlands and Europe in the 1630s and the current speculation around crypto currencies, this video work is generated by artificial intelligence. On three screens you are invited to observe tulips evolving under the influence of the price of the bitcoin. “Mosaic” is, in addition, the name of the virus that caused the stripes on tulip petals that increased their desirability and contributed to the speculative prices during this period. The artwork brings together ideas about capitalism, value, and collapse from different points in history.

Funded by the EMAP/EMARE program (part of Creative Europe) and commissioned by Impakt.

Marcos Morilla



## Speculative Artificial Intelligence / Exp. #2 (conversation)

Birk Schmithüsen (DE)

Presented at Hexagone Scène Nationale Arts Science & LABORAL Centro de Arte y Creación Industrial & CPN—Center for the Promotion of Science

See page 222

# Artists

## Cached Experience

**Cached Collective:** Clément Bouttier, Ryan Dzelzkalns, Jon Flint, Vytautas Jankauskas, Aline Martinez, Joana Mateus, Felipe de Souza

**Cached Collective** (INT) is an international group of creatives of diverse backgrounds, who are dedicated to exploring how technology influences our individual lived realities. Because of the impenetrable way that modern technology functions, they strive to design impactful experiences that can be easily understood by a wide audience. They make the intangible tangible. They create impactful experiences that delve into data, algorithmic complexity, and obscure infrastructure, especially focusing on how these affect the individual. **Clément Bouttier** (FR) engineer, **Ryan Dzelzkalns** (US) poet, **Jon Flint** (UK) designer and prototyper, **Vytautas Jankauskas** (LT) interaction designer, **Aline Martinez** (BR) designer UX, **Joana Mateus** (PT) visual designer, **Felipe de Souza** (BR) developer and coder.

## Dhvāni

**Budhaditya Chattopadhyay**

**Budhaditya Chattopadhyay** (IN) is a media artist, researcher, and writer. He holds a PhD from the Academy of Creative and Performing Arts, Leiden University, and an MA in New Media from Aarhus University. Chattopadhyay produces works for large-scale installation and live performance addressing contemporary issues of climate crisis, human intervention in the environment and ecology, urbanity, migration, race, and decoloniality. He has received numerous fellowships, residencies, and international awards, and his works have been widely exhibited, performed, or presented across the globe. Chattopadhyay is the author of *The Nomadic Listener* (2020), *The Auditory Setting* (2021), and *Between the Headphones* (2021). <https://budhaditya.org>

## G5

**Rocio Berenguer** (Biography see below)

## IAgotchi

**Rocio Berenguer** (Biography see below)

## Lithosys

**Rocio Berenguer**

**Rocio Berenguer** (ES) works on the major changes of our contemporary world: the evolution of spaces of individual freedom, the place of technology, the environmental issues... For each creation, she investigates and dialogues with scientists. She then creates a text that she hybridizes with other materials, mediums—text, dance, videos, digital art. Her frequent use of new technologies expresses a desire to integrate them into poetic writing while questioning the impact of these omnipresent technologies. <https://rocioberenguer.com>

## Gallinero

**Néstor Lizalde**

**Néstor Lizalde's** (ES) work explores the possibilities raised in the art world through the so-called new media. This artist with a strong technical background generates a dialogue between media experimentation and artistic tradition. There is a strong presence of workshop processes linked to new technologies in his work, which focuses on creating projects where technical experimentation turns into visual and narrative devices that enable building an imaginary halfway between science fiction and surrealism. [www.nestorlizalde.com](http://www.nestorlizalde.com)

## **Penser voir (Sightseen)**

**Thierry Fournier**

**Thierry Fournier** (FR) is a visual artist and independent curator, living and working in the Paris area. His work extends to the frontiers of the living to address questions of otherness, both in an anthropological and societal sense: installations, objects, networked pieces, websites, videos, prints, performances. He is also an independent curator, editor, and teacher. He is an architect by training, a graduate of the École nationale supérieure d'Architecture de Lyon. He is head of the contemporary art workshop at Sciences Po Paris. [www.thierryfournier.net](http://www.thierryfournier.net)

## **Reactive Matter: Rhizome Scenocosme—Gregory Lasserre & Anais met den Ancxt**

**Scenocosme—Gregory Lasserre & Anais met den Ancxt** (FR) develop the concept of interactivity in their artworks by using multiple kinds of expression: art, technology, sound, and architecture, in which spectators share sensory experiences. Their artworks are exhibited in museums, contemporary art centers, and digital art festivals across the world: ZKM Karlsruhe Centre for Art and Media (Germany), Daejeon Museum of Art (Korea), Museum Art Gallery of Nova Scotia (Canada), NCCA (Moscow), CAM Raleigh (USA), Art Center Nabi / INDAF (Seoul), Biennial International of Seville (Spain), NAMOC / National Art Museum of China (Beijing) etc. [www.scenocosme.com](http://www.scenocosme.com)

## **Mosaic Virus**

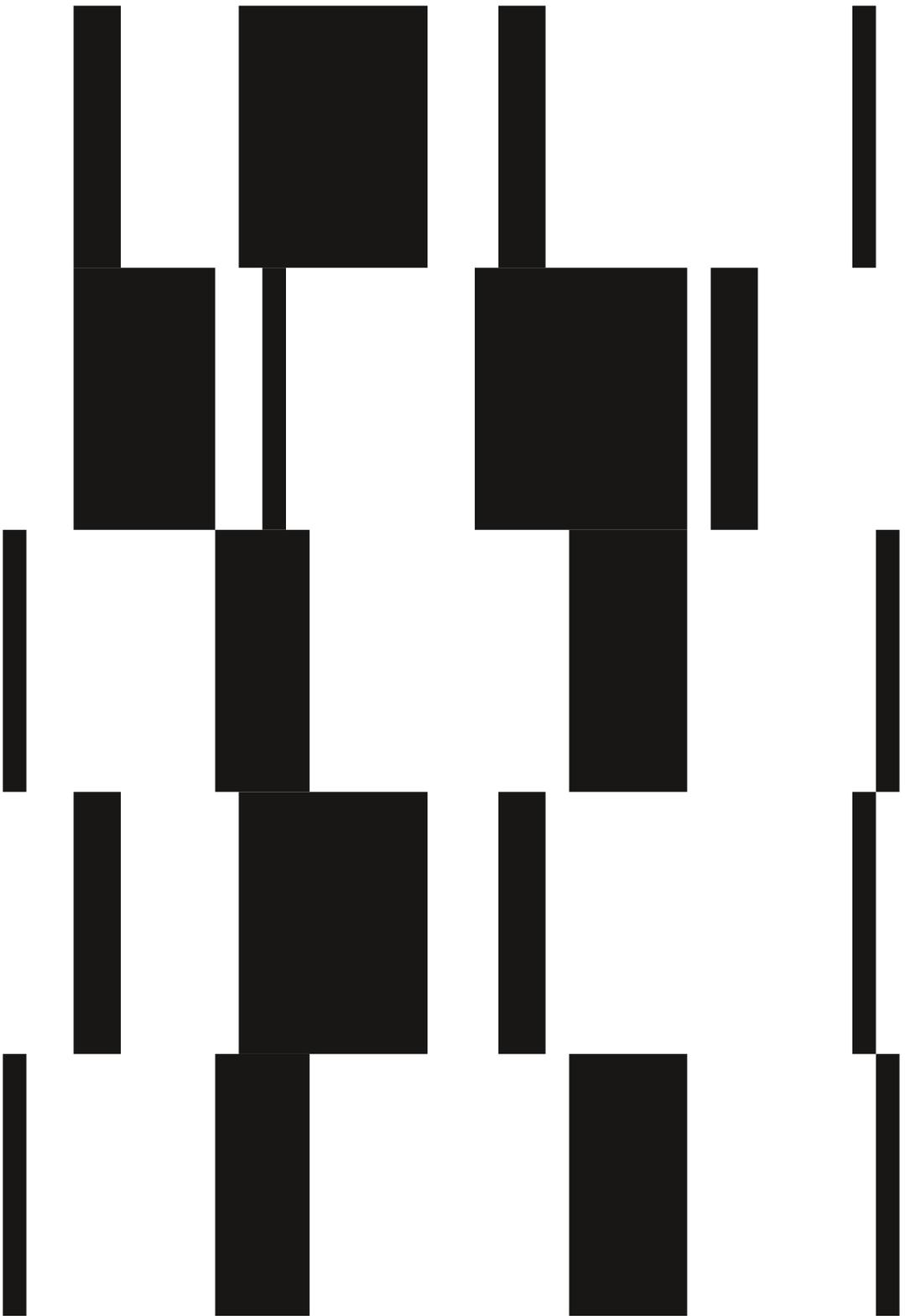
**Anna Ridler**

**Anna Ridler** (UK) is an artist and researcher. She has exhibited at institutions such as the V&A Museum, Ars Electronica, HeK Basel, Impakt, and the Barbican Centre and has degrees from the Royal College of Art, Oxford University, and University of Arts London. She was a 2018 EMAP fellow and was listed by Artnet as one of nine “pioneering artists” exploring AI’s creative potential. She is particularly interested in ideas around measurement and quantification and how this relates to the natural world. <https://annaridler.com>

## **Speculative Artificial Intelligence / Exp. #2 (conversation)**

**Birk Schmithüsen**

**Birk Schmithüsen** (DE) is an audiovisual whose work explores emerging technologies that affect our everyday lives. He is interested in the actual functionality hidden behind the simple and intuitive user interface. In his artistic research he opens technological “black boxes.” In aesthetic experiments, Birk Schmithüsen explores non-perceptible, abstract concepts such as Artificial Intelligence, BigData, and Computer Vision as artistic media. The research results are staged in immersive new media installations. <http://birkschmithuesen.com>



# Kersnikova Institute Kapelica Gallery

Support Laboratories:

Rampa

BioTehna

Vivarium

 kersnikova

 KAPELICA  
GALLERY

Ljubljana, Slovenia

# Kersnikova Institute Kapelica Gallery

Kersnikova Institute is an art space and a home base of the Kapelica Gallery and three support laboratories (Rampa, BioTehna, Vivarium) where research, experimentation, development, and presentation of artworks take place. Kersnikova is therefore a production platform that commissions artworks and provides laboratory facilities as well as curatorial, production, scientific, and technical support to artists and researchers. By focusing on the phenomena of artificial life where bio-media meets technology and where artists collaborate with experts to investigate the possibilities of a creative cohabitation and perhaps even coevolution of humans, animals, plants, and machines, Kersnikova enables groundbreaking exhibitions and performances that regularly provoke an intense public debate regarding the nature-culture dichotomy. In pursuing the actual and possible cohabitation between living organisms, material resources, and technology, artists often offer uncanny perspectives on the technologies they use in their artworks where technical features are understood as a life of the machinic. That peculiar inner life of machines is more persuasive when involuntary interactions with machines are more frequent, and one could relate to those surprises as to the inner machine will. With the possibilities of employing machine learning algorithms fed from datasets of more or less known data, that feeling of machine behavior began to resemble a process of data metabolism, very much like animation in graphics and puppetry.

Being aware that computers are not thinking machines but rather very capable computations, we became more and more interested in metaphors of machine life and its interaction with biological life in various living systems. The emergence of uncanny behaviors made by different powerful machine learning algorithms is poetically producing meaningful interpretations that can be understood as a possible cohabitation between bio-media and silicate-based technologies. In this respect the most interesting artworks that Kapelica Gallery has been commissioning are those where artists are trying to bring together machine learning and humans, and are thus not merely reinforced iterations of what humans know already. Rather, the desired artworks are those that create situations where human logic embedded in the code of artificial intelligence is challenged with non-calculative impulses from model organisms that are part of the artworks. This way, the interactions between biological life and algorithms fed with biological “nonsense” start to reflect the missed encounters. Those glitches open new possible ways of understanding the liveness of both machines and bio-media. And humans are not excluded here.

The program presented by Kersnikova Institute within the framework of the European ARTificial Intelligence Lab was co-funded by: EU — Creative Europe, Ministry of Culture of the Republic of Slovenia, Ministry of Public Administration of the Republic of Slovenia, City of Ljubljana — Department of Culture

[www.kersnikova.org](http://www.kersnikova.org)

# Earth Without Humans: The Mass of a Single Bit

Six years ago, when we decided to launch *Earth Without Humans*—a series of exhibitions, workshops, and symposiums aimed at exploring the ultimate technicist extravagance of colonizing Earth’s Moon and the planet Mars—we were inspired by the proliferation of scenarios predicting an interplanetary civilization. Amid rapid advances in the new space industry and growing debates about alternatives to life on Earth, the race for technological prestige has surfaced the two astronomical bodies as the places where the human civilization could possibly survive. Undoubtedly the pinnacle of human technological progress, the space industry is interpreted in terms of the human race’s development and competence. However, scientific and technological excellence has come with new thinking, effecting the logic of a universal need which gives neoliberal capitalism a mandate to save the world. In his critical essay “Future City,”<sup>1</sup> Frederic Jameson rephrased J.G. Ballard’s conservative belief “that it is easier to imagine the end of the world than to imagine the end of capitalism,” saying that it has become easier to imagine the destruction of Earth and nature than to imagine the end of late capitalism. Ballard’s sci-fi dystopias and contemporary critiques of the capitalist system are being revised in the face of the latest scientific discoveries and technological possibilities. A *reductio ad absurdum* solution is increasingly conceived as one that simply eliminates Earth from the equation, replacing it with an unearthy body where nature has yet to be created using science and modern technology. To make the biosphere habitable for humans, an environment first has to be populated by flora and fauna to create the atmosphere its future inhabitants will need to breathe and to be able to live without any technical means for survival. Terraforming attempts to create environments

populated by machines, plants, and animals are conceptual evidence that sci-fi fiction is evolving into a genuine way out of Earth’s disturbed ecosystems. In these environments, machines and the designed nature can be self-sufficiently independent of humans. High-tech ecosystem prototypes on spaceships, planets, moons, or in experimental habitats on Earth, seem to be the ultimate manifestation of capitalist biopolitics: with people whose entire activity is focused exclusively on their survival. Astrobiology, a field at the center of attention in *Earth Without Humans*, was the platform we used to interpret scientific discoveries and the potential technological solutions tested by space agencies.<sup>2</sup> Time and again, their research efforts and attempts to create the conditions for animal and plant life in extreme environments made us (at least we symposium participants) realize the vital importance of focusing our activity, to the greatest extent possible, on ecosystem conservation here, on the planet Earth, a still unattainable ideal in scientific, technicist, and artistic utopias. Although commitments to maintain, if not improve, the conditions for life on the blue planet seem apparent, this has repeatedly turned out to be an unfathomable challenge. It is much easier to think in terms of a few dozen square feet of a balanced biosphere created in a technically controlled system than planetary dimensions of micro- and macroscopically balanced combinations of living organisms. Human perception of nature, with one’s frequent attempts to re-create it using various technological means, still seems to be a simplified reverse of the engineering processes underway in nature. What comes together to form a highly complex ecosystem in nature’s living systems, when applied to technical solutions modeled on these living systems, is reduced to individual functions capable of performing only isolated tasks that were of

interest to the engineer or the contracting authority that hired the engineer to develop the solution. In turn, such generalizations and reductions help perpetuate the common yet one-dimensional notion that nature is something to freely control and exploit. Learning about the principles of astrobiology, where technologies that help maintain living systems in extreme environments play a crucial role, we centered the symposiums on the issues put forth by biotechnology, biology, and evolutionary biology. Examining scientific predictions and technological challenges in comprehending the living category, we gradually started to see the boundaries of Cartesian dualism in science and the study of life, where traditional scientific approaches are no longer applicable. Several artworks substantiated this impression, looking into the connections between technology and the living nature of the model organisms included in the works.

### **Artificial Intelligence**

On the sidelines of scientific discoveries and the technological possibilities to artificially sustain life in extreme environments, we learned about the importance of interdependence, interconnection, and interactions between species, realizing our poor knowledge thereof. In this context, exploring the use of various forms of machine learning and the so-called artificial intelligence emerged as a chance to grasp the scope of interactions within an ecosystem. In the last couple of years, *Earth Without Humans* has focused on artworks forming interactive relationships between machine learning algorithms and living systems, and on investigating the scientific and technological possibilities inscribed in algorithm architectures. We were interested in the potential to process the vast amount of data that can be sourced from living systems in the

way that this could result in the emergence of something that goes beyond human perceptual capabilities.

Considering that algorithms are created by humans, they have human knowledge inscribed in them and are unable to offer what is essentially outside human cognition. Algorithms give impressive results in various repetitive human activities, such as statistical analysis of human facts and actions. Image and face recognition, Internet traffic statistics, behavioral pattern analysis, calculation of constants from massive amounts of data in chemistry and physics—all this produces results that would be unthinkable without algorithms. But when machine learning is applied to non-human living systems, things become complicated, revealing a contrast between the architecture of an algorithm created by humans with their understanding of other living categories, and the organic fullness of the latter that invariably avoids any precise quantification. The prejudices informed by the age-old human attitude to non-human nature, but especially by humanistic anthropocentrism and the dichotomy between culture and nature, mainly produce misguided encounters. Putting technicist productivism and solutionism aside, what these misguided encounters can offer through their flaws and impossibilities and with a great deal of artistic imagination, are inspiring experiences in which non-human living systems act as bioindicators of human prejudices and delusions about the computerization of everything. From this angle, prejudices against various groups in society that are excluded from algorithm architecture seem manageable, for these groups can identify and break them down through social activism and by encouraging inclusive policies. A much more challenging task is to include in algorithms something that cannot be partialized and

singled out from the ecosystemic model (of non-human organisms) we learned about in the terraforming attempts to enable life on other celestial bodies.

The artworks in which AI meets the bio-intelligence of radically different living categories articulate the need for algorithms that make no attempts to please with results but rather allow for a greater degree of inter-cognition between humans and non-human living systems. In some art projects, artistic ideations have enabled environments that support inter-cognition between plants and machines without human intervention, whereby algorithms are designed to respond to cues from the plants independently of human volition. In such projects, algorithms communicate with plants, allowing them to express their “will.” Attempts to empower plants to create a suitable environment for themselves using an algorithm seem to indicate an anthropocentric—and potentially wrong— notion of plants.

The possibility of the emancipation of algorithms and non-human living systems from Cartesian binary logic also underlies the assumption that the iterations possibly arising from the interaction between two algorithms could result in a communication between the algorithms existing exclusively in the non-biological, or digital space. Given the current rate of digitalization, this space grows by 50% each year, and some bold forecasts<sup>3</sup> suggest that the number of bits would equal the number of atoms on Earth in approximately 150 years. The speculation that half of Earth’s mass would be converted to digital information mass by 2245 gives rise to a theory by which information can be understood as ordinary matter. Proponents of the theory claim that in the physical world, information should be considered the fifth state of matter (or sixth, if

you count Bose-Einstein condensates). Without going too deep into the plausibility of the theory, one can concentrate on the premise of using AI to free non-human living systems of the notion of the universe as produced by the anthropological machine, and to speculate on AI emancipating from living systems (including human-based) and starting its own life based on entirely different definitions of the living category while being energy efficient enough to retain its autarkic living nature in the information-composed universe.

In the light of the above, efforts to create an ecosystem of AI algorithms are particularly meaningful, pointing to evolutionary possibilities that could be taken in very wrong directions. Historically, human behavior has not proven to be very inclined towards changing its attitude to the environment and nature at large, hence taking on the responsibility for creating forms of artificial life will sooner or later become vital. Having been recognized as an anthropocentric delusion, the reductionism of reverse engineering may speculatively be viewed through the lens of digital information mass, where all bits of information on the non-human universe carry the same weight.

**Jurij Krpan,**  
artistic director, Kapelica Gallery

- 1 *Future City* (New Left Review, 2003). The “avowed Marxist” Bruce Franklin analysed and criticised the text in his essay titled “What Are We to Make of J.G. Ballard’s Apocalypse.”
- 2 Speakers at the “Earth Without Humans” symposium: Bernard Foing, Christophe Lasseur / European Space Agency, Michael Sterzik / European Southern Observatory, Olga Kutepova / Roskozmos, Jon Jenkins / NASA
- 3 Tibi Puiu, 6 May 2021, <https://www.zmescience.com/science/news-science/information-fifth-state-matter-0252/>

# Activities

## Conferences

### **On the Boundaries of Artificial Life**

Symposium

Kapelica Gallery, Ljubljana, SI

20.06.2019

Panel 1: Is the Plant OK? [Yes/No]—Špela Petrič (SI)

Panel 2: Bringing Swarm-Intelligence from

Honeybees to Robot Swarms—Martina Szopek (AT)

/ Artificial Life Lab, University Graz (AT)

Panel 3: ARTificial Intelligence: From Frankenstein

to Frank—Cecilie Waagner Falkenstrøm (DK)

Panel 4: What Can Artificial Intelligence Learn

from Dogs?—Maja Smrekar (SI)

Panel 5: Repairing Broken Ecosystems with Robotic

Surrogates—Thomas Schmickl (AT) / Artificial Life

Lab, University Graz (AT)

### **!brute\_force: Workflow Reflections**

Panel

Online

12.09.2020

Alen Balja (SI/CH), Martí Sánchez-Fibla (ES),

Maja Smrekar (SI), Tina Šolar (SI), Mia Zahariaš (SI),

Moderation: Tatiana Kourochkina (RU)

### **PL'AI**

Online

28.01.2021

Špela Petrič (SI), Agnieszka Wolodzko (PL),

Benjamin Fele (SI), Moderation: Jurij Krpan (SI)

## Exhibitions

### **Institute for Inconspicuous Languages: Reading Lips**

Kapelica Gallery, Ljubljana, SI

15.01.2019 – 15.02.2019

Špela Petrič (SI)

### **Earth Without Humans**

Kapelica Gallery, Ljubljana, SI / Vivarium,

Ljubljana, SI / Rampa Lab, Ljubljana, SI

13.06.2019 – 23.08.2019

Second Life: Habitat — Hsien-Yu Cheng (TW),

Ting-Tong Chang (TW), Bias, Variance and

Irreducible Error: Probing the Plant-Machine—

Špela Petrič (SI), Biobot 1.1—Zoran Srdić Janežič

(SI), Intelligence is Whatever Machines Haven't

Done Yet—Luka Prinčič (SI), AI Mary—Cecilie

Waagner Falkenstrøm (DK)

### **Institute for Inconspicuous Languages:**

#### **Reading Lips**

POSTCITY, Linz, AT

05.09.2019 – 15.09.2019

Špela Petrič (SI)

### **C t r l**

Vivarium, Ljubljana, SI

12.12.2019 – 10.01.2020

Michael Sedbon (FR)

### **!brute\_force: Feeding the Algorithm**

City Gallery, Ljubljana, SI

02.09.2020 – 01.11.2020

Maja Smrekar (SI)

### **A Face or a Factory: Holey Surface**

Kapelica Gallery, Ljubljana, SI / online as part of

Ars Electronica Festival 2020

09.09.2020 – 25.09.2020

Aljaž Rudolf (SI), Eva Smrekar (SI)

### **PL'AI**

Kapelica Gallery, Ljubljana, SI  
17.11.2020 – 4.12.2020  
Špela Petrič (SI)

### **PL'AI**

Shown at exhibition: Evolutionaries group  
MU Hybrid Art House, Eindhoven, NL  
11.12.2020 – 09.05.2021  
Špela Petrič (SI)

### **I, Ficus.**

Kresija Gallery, Ljubljana, SI  
04.06.2021 – 04.07.2021  
Špela Petrič (SI)

### **FaceOrFactory: Holey Surface (Satellite)**

Simulaker Gallery, Novo mesto, SI /  
17.06.2021 – 03.07.2021  
Aljaž Rudolf (SI), Eva Smrekar (SI)

### **FaceOrFactory**

Kapelica Gallery, Ljubljana, SI  
02.09.2021 – 24.09.2021  
Aljaž Rudolf (SI), Eva Smrekar (SI)

### **Hybrid Systems**

Centre for Fine Arts Bozar, Brussels, BE  
02.12.2021  
STAR VALLEY (SIRIUS)—Matthew Biederman  
(US/CA), Marko Peljhan (SI/US)  
Institute for Inconspicuous Languages:  
Reading Lips—Špela Petrič (SI)  
FaceOrFactory—Aljaž Rudolf (SI), Eva Smrekar (SI)

## **Workshops**

The Uncanny Intelligence of Slime Mold  
BioTehna, Ljubljana, SI  
11.12.2019  
Michael Sedbon (FR)

### **Slimeologists**

Rampa Lab, Ljubljana, SI and online  
19.09.2020 – 11.12.2020  
Eva Pondrk (SI) in collaboration with Luka Žagar  
(SI), Sanja Hrvačanin (SI), Gregor Krpič (SI),  
Ana Smerdu (SI)

### **AI-sistent**

Rampa Lab, Ljubljana, SI and online  
25.09.2020 – 11.12.2020  
Lovrenc Košenina (SI) in collaboration with  
Martin Krauser (SI), Maja Somrak (SI)

### **Biocomputer Rhythms 2.0**

Online  
15.06.2021 – 15.09.2021  
Eduardo Reck Miranda (BR/UK)

### **SlimeConnect**

Rampa Lab, Ljubljana, SI  
21.09.2021 – 17.12.2021  
Eva Pondrk (SI), Gregor Krpič (SI)

## **Other Activities**

### **Biocomputer Rhythms 2.0**

Performance  
Kapelica Gallery, Ljubljana, SI  
30.09.2021  
Eduardo Reck Miranda (BR/UK)

### **Eingeweide**

Performance  
Old Power Station, Ljubljana, SI  
14.12.2021  
Marco Donnarumma X Margherita Pevere (IT/DE)

## **Ars Electronica Garden 2020**



<https://u.aec.at/FC15CC90>

# Projects



Hana Jošić



Hana Jošić

## FaceOrFactory

Aljaž Rudolf (SI), Eva Smrekar (SI)

*FaceOrFactory* is established as a family, a corporation, and a laboratory of faces, masks, and new identities. By generative creation of a decentralized subject, based on DNA material and 3D scan of each individual donor, who is in return offered a seat in the boardroom of the company and a specific share of its assets, the project aims to modulate a new facial structure as a potent data field, researching contemporary biometric surveillance, cryptomarket, blockchain technology, genetics, and scientific ideology. By means of an algorithm, specific selection of genetic sequences and phenotypes will start forming a biological and informational body-archive of the corporation. Based on informational input of new DNA donors, the new facial identity is forever changing, thus restructuring the corporative hierarchy of the company.

[www.faceorfactory.ooo](http://www.faceorfactory.ooo)

Collaborators: Gašper Torkar, Lara Reichmann, Jan Krek, Gaj Žižek, Anja Blaj, Kristijan Tkalec, Lovrenc Košenina, Tomaž Šimnovec, Tomaž Štrus. Acknowledgements: University of Ljubljana — Biotechnical Faculty, Faculty of Computer and Information Science. Produced by: Kersnikova Institute / Kapelica Gallery. Co-funded by: Ministry of Culture and Ministry of Public Administration of the Republic of Slovenia, City of Ljubljana.



<https://u.aec.at/B71CBAE6>



## Biocomputer Rhythms 2.0

Eduardo Reck Miranda (BR/UK)

*Biocomputer Rhythms 2.0* is a piece of music in which a biocomputing system listens to the piano and produces musical responses in real-time. The responses are variations of the music that the system listens to during the performance. It uses bespoke electronic components grown out of the biological organism *Physarum polycephalum*. Miranda's research is aimed at harnessing biological organisms to become components of computing architectures for new kinds of Artificial Intelligence. He's interested in using biological agents as components of a computer rather than as sources of inspiration to implement abstract models for software simulation.

Biocomputing system originally developed at: Interdisciplinary Centre for Computer Music Research (ICCMR), University of Plymouth. Collaborators on 2.0 version: Gregor Krpič, Eva Pondrk, Ana Smerdu. Produced by: Kersnikova Institute / Kapelica Gallery. Co-funded by: Ministry of Culture and Ministry of Public Administration of the Republic of Slovenia, City of Ljubljana.

# Intelligence is Whatever Machines Haven't Done Yet

Luka Prinčič (SI)

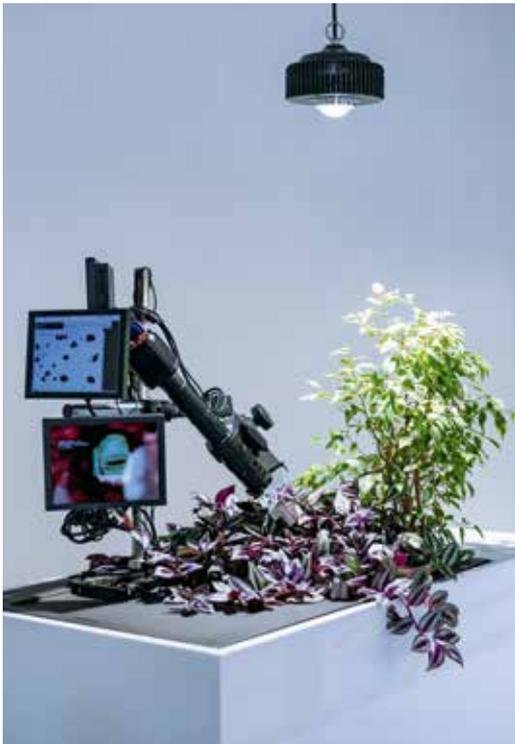
The so-called AI effect refers to a point at which an artificial intelligence technology is discounted as not being real or true AI. Forever deferred into the future as a potentiality, AI therefore never actually exists, for as soon as it becomes a reality, it starts to be seen as a mere “computer program” or a series of algorithms. The artwork examines machine brainpower in relation to music and audiovisual art, programmed creativity, and the vast field of artificial intelligence. Phenomena like human

fear of machine domination, robot ethics, or the growing presence of technologies such as artificial neural networks and machine learning in our daily lives are interpreted in the context of digital media poetics through interactive digital interfaces, abstract textures, pulsations, and soundscapes.

Consultants: Maja Smrekar, Rob Canning. Co-produced by: Kersnikova Institute / Kapelica Gallery, Emanat. Co-funded by: Ministry of Culture and Ministry of Public Administration of the Republic of Slovenia, City of Ljubljana.

# Institute for Inconspicuous Languages: Reading Lips

Špela Petrič (SI)



Hana Jošić

The laboratory follows a hyperstitious scientific paper in which the first meaningful exchange between a plant and a human that could be understood as a conversation, is described. The lucidly conceived experiment from the future demanded exceptional patience and total dedication from both sides—after 18 years of mutual learning, the inch plant (*Tradescantia zebrina*) and the human researcher learned to understand each other's signs. With the help of natural and artificial intelligence, the *Institute for Inconspicuous Languages* attempts to recreate the experiment by reading the thousands of microscopic leaf pores speckled underneath each leaf to decipher what the plants are saying.

<https://www.spelapetric.org/#/institute-for-inconspicuous-languages>

Collaborators: Bart Peeters, Klara Nosan, Tim Oblak, Luka Šajn, Žiga Emeršič, Miha Turšič, Bojan Mord, Jože Zajc, David Pilipovič. Acknowledgements: University of Ljubljana — Faculty of Computer and Information Science, Institute for Deaf and Hard of Hearing Ljubljana, Waag. Produced by: Kersnikova Institute / Kapelica Gallery. Co-funded by: Ministry of Culture and Ministry of Public Administration of the Republic of Slovenia, City of Ljubljana.

**Presented at Kersnikova Institute  
Kapelica Gallery & The Culture Yard**



Collaborators: Tim Oblak, Benjamin Fele, Gregor Krpič, Erik Krkač, Jože Zajc, David Pilipović, Meta Petrič, Bor Jarh, Agnieszka Wolodzko, Miha Turšič, Adriana Knouf. Acknowledgements: Waag, MU Hybrid Arthouse. Produced by: Kersnikova Institute / Kapelica Gallery. Co-funded by: Ministry of Culture and Ministry of Public Administration of the Republic of Slovenia, City of Ljubljana, Creative Industries Fund NL.

## PL'AI

Špela Petrič (SI)

*PL'AI* is based on the premise that the capacity for play is an ontological condition of all life, including plants. The work showcases the playful interaction between a cucumber plant and a robot. Based on the captured images, the computer predicts how the plant will grow, adjusting its robotic tendrils accordingly. The plant, constantly reaching for the tendrils, gradually starts to intervene in the neural network's learning process, sparking off a game of tag, where the AI and the plant learn about each other. A sequence of actions by two mutually dependent entities unfolds, following not entirely clear rules. What appears to be a static scene to observers is an encounter of another temporality, neither those of a plant, nor those of a machine alone, but both, mutated by their needs and desires.

<https://www.spelapetric.org/#/plai>



Co-produced by: Kersnikova Institute / Kapelica Gallery. The *PLANT-MACHINE* is also part of Smart Hybrid Forms, which received the NVO ISA Smart Cultures grant. Smart Hybrid Forms is a collaboration between Vrije Universiteit Amsterdam, V2\_Lab for the Unstable Media, Zone2Source, Waag & Gerrit Rietveld Academie.

## PLANT-MACHINE

Špela Petrič (SI)

The *PLANT-MACHINE* is a series that examines the possibilities of post-anthropocentric cognition, focusing on machine learning as a tool to investigate alternative relationships with plants. The artworks are rooted in the realization that digital representation, in which we are unwittingly participating through big data analyses and predictions, requires new modes of social and political engagement. The series includes three projects: *Institute for Inconspicuous Languages: Reading Lips* is a tongue-in-cheek take on the (in)ability to communicate with plants, in *Vegetariat: Work Zero* we encounter a parareality in which house plants are connected to smartwatches to participate in the economy of biometric data, while *PL'AI* deals with inhumanly slow play between cucumber plants and an AI robot.

<https://www.spelapetric.org/#/plant-machine>

**Presented at Kersnikova Institute  
Kapelica Gallery & Waag**



Miha Godec

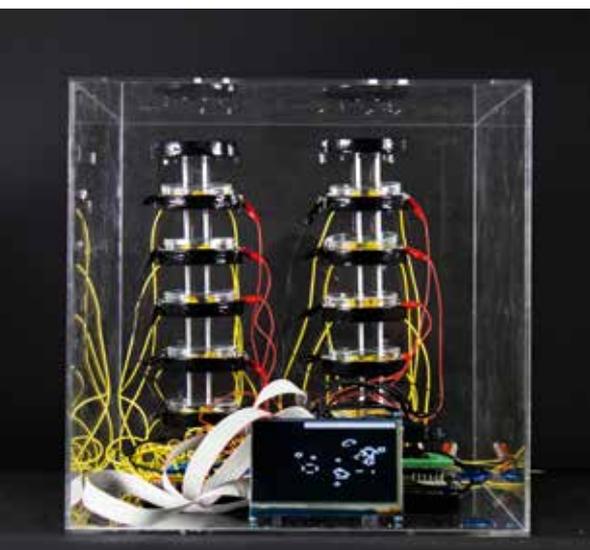
Produced with the support of: European Network for Audiovisual Creation (ENCAC), Le Lieu Unique, Nantes (FR), CALQ (QC), Projekt Atol (SI), Media Art and Technology (MAT)—UCSB (US)

## STAR VALLEY (SIRIUS)

Matthew Biederman (US/CA) and Marko Peljhan (SI/US)

*STAR VALLEY (SIRIUS)* uses two spark-gap transmitters controlled by a natural language processing AI algorithm trained on the US Department of Defense and NATO program nicknames and their descriptions. It consists of a Neural Network generating nicknames and corresponding descriptions and is in part inspired by the 1975 Joint Chiefs of Staff Code Word, Nickname, and Exercise Terms System (NICKA), which automates and tracks such assignments. The work reflects on the present state of encoding, decoding, secrecy, and transparency by transmitting these neural network generated nicknames in Morse code through a wideband spark-gap apparatus. Here, the earliest form of wireless transmission is paired with contemporary computational developments to open a window on the landscape of the accountability of secrecy.

<http://mbiederman.com/STAR-VALLEY-SIRIUS>



Michael Sedbon

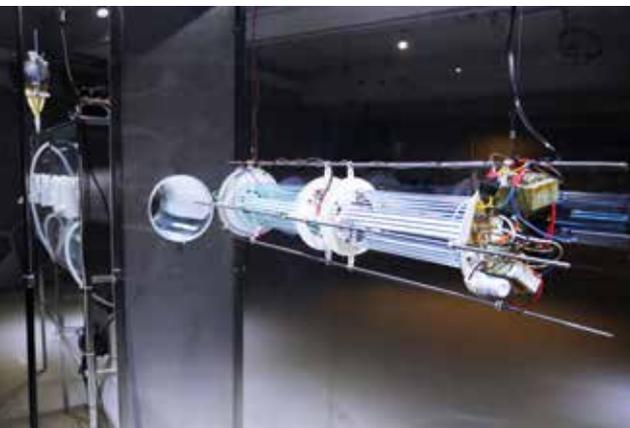
## C t r l

Michael Sedbon (FR)

*C t r l* is an installation in which 10 Physarum Polycephalum, unicellular organisms also known as slime molds, are competing on John Conway's Game of Life. The electrical potential difference of the slime molds at each end of a protoplasmic tube connecting two food sources is measured through Galvanic Skin Response sensors hooked up to an Arduino mega, transmitting data to a single board Windows 10 computer processing them through a custom-made software. These data are then used as spatial coordinates that control the gaming and set the original state of the Game of Life. At the end of the 10 rounds, the player's moves are analyzed. An artificial intelligence (a genetic algorithm) manipulates their environment by making use of intense light flashes to optimize their behavior.

<https://michaelsedbon.com/C-t-r-l>

Acknowledgements: Prof. Andy Adamatzky, Dr. Richard Mayne, Ian Portman, Theresa Schubert, Heather Barnett, Raphael Kim, Tobias Revell, Adam Corrie, Tom Lynch



## **Second Life: Habitat**

Hsien-Yu Cheng (TW),  
Ting-Tong Chang (TW)

The installation consists of a breeding chamber in which thousands of mosquitos are bred during the exhibition. The mosquitos go through all stages of their lifecycle until their life is ended by a bug zapper. Each dead mosquito creates an electric signal to the computer system, which converts them into avatars. These computer-generated avatars then became virtual human beings, whose activity in virtual space can be controlled by the audience. Every time the avatar's life is automatically terminated by the system, the "food" (blood donated by the artists) for the mosquitos is released from the blood feeder to which a transfusion device is connected. In this way, the dead provide nutrition for the next generation of mosquitos and hence the life-avatar-energy-electric signal marks a complete cycle. Through the work, the artists examine the meaning of life in the digital era.

<https://chenghsienyu.com/second-life-habitat>

<https://www.tingtongchang.co.uk/works/12>

Collaborator: Prof. Huang Rong-Nan, National Taiwan University — Department of Entomology



Andrej Peunik



<https://u.aec.at/F7D31186>

## **!brute\_force: Feeding the Algorithm** Maja Smrekar (SI)

The installation resembles an orthogonally abstracted serotonin molecule-shaped grid as a stage for analyzing processes of breathing, body temperature, and heartbeat of the artist and the dog as quintessential medical parameters of the bodily activity that identify the COVID-19 viral infection. All these parameters in the human body have also been regulated by the effects of serotonin—the neurotransmitter whose metabolic functions have been highly influenced by the parallel evolution with dogs. Departing from the fact that digital technicity in the service of political power and social control stems from hierarchical categorization of natural beings and bodies, the project suggests human-with-animal-with-AI coexistence in a state of a joint physical activity, while opening the following question: Does the realm of abstract data allow possibilities for hybrid identities?

<https://nonbruteforce.net>

Collaborators: Alen Balja, Miran Lončarič, Naveen Agula, Primož Ravbar, Mía Zahariaš, Tina Šolar, Ada, Boogie, Byron, George, Kiki, Mala, Miloš Vujković, Aljaž Rudolf, Dongwook Jang, Marie Declerfayt, Vid Simoniti. Produced by: Quo Artis Foundation. Co-produced by: The Culture Yard, Kersnikova Institute / Kapelica Gallery. Co-funded by: Danish Arts Council, Ministry of Culture and Ministry of Public Administration of the Republic of Slovenia, City of Ljubljana.

**Presented at Kersnikova Institute  
Kapelica Gallery & Culture Yard  
& Ars Electronica**

## Eingeweide

Marco Donnarumma (IT/DE) X Margherita Pevere (DE)



Giovanni De Angelis

Far from trans-humanism and techno-phobia, *Eingeweide* (from the 7 Configurations cycle) is a ritual of coalescence. In a desolated, surreal landscape, two human bodies are violently entangled with an AI robotic prosthesis, out-of-body organs, relics from computer server farms and animal remains. The prosthesis uses biomimetic algorithms to learn in real time how to move and perform on stage. The organs pulsate and leak on the floor, bearing traces of microbial cultures. Sounds from the performers' muscular activity are amplified and transformed by AI algorithms into a visceral auditive experience, submerging the spectators. Through drastic bodily experimentation, the performers' bodies become one and multiply, converging with machines and micro-organisms in a harsh, humbling form of intimacy.

<https://marcodonnarumma.com/works/eingeweide>

Artistic direction, performance, staging: Donnarumma, Pevere. Music, programming, AI robotics: Marco Donnarumma. Wearable biofilm, robot skin: Margherita Pevere. Scientific partner: Neurorobotics Research Laboratory, Beuth-Hochschule. Robotics visual design: Ana Rajcevic. Robotics 3D modelling and engineering: Christian Schmidts. Light design, stage production: Andrea Familiarì. Production: Claudia Dorf Müller

A production by Marco Donnarumma in collaboration with Margherita Pevere. Commissioned by CTM Festival (DE) and realized in the context of the Graduiertenschule, Berlin University of the Arts.

**Presented at Kersnikova Institute Kapelica Gallery & Ars Electronica & The Culture Yard**

# Artists

## FaceOrFactory

**Aljaž Rudolf, Eva Smrekar**

**Aljaž Rudolf** (SI) is a student at the Faculty of Architecture in Ljubljana. He's involved in projects at the intersection of science, art, and architecture, either as a (co)author or as a member of a production team. His main interest is cohabitation with non-human others, which he has been researching at AA Visiting School Berlin and GYCF in South Korea.

**Eva Smrekar** (SI) is a postgraduate student of philosophy and art history at the Faculty of Arts in Ljubljana. She works in the field of intermedia arts and has co-authored projects, exhibited in Kapelica Gallery, Museum of Architecture and Design in Ljubljana etc. She has spoken at various symposiums and received the Estonian Artist Association's Award.

## Biocomputer Rhythms 2.0

**Eduardo Reck Miranda**

**Eduardo Reck Miranda's** (BR/UK) distinctive music is informed by his unique background as a classically trained composer and a research scientist in the field of AI. He studied in Brazil, the UK, and Germany before gaining a PhD in sound design with AI from the University of Edinburgh. Currently he's a Professor at the University of Plymouth, where he founded the Interdisciplinary Centre for Computer Music Research (ICCMR). In 2019 he was awarded with Honorary Mentions by Prix Ars Electronica and S+T+ARTS Prize. <http://neuromusic.soc.plymouth.ac.uk>

## Intelligence is Whatever Machines Haven't Done Yet

**Luka Prinčič**

**Luka Prinčič** (SI) is a graduate of the Audio Recording Arts (BA) program at the SAE Technology Institute in London. He has been writing music, creating sound art, performing, and manipulating new media in various ways since the mid '90s. He specializes in computer music, immersive soundscapes, incidental music for live arts & video, and digital media experiments. He's passionate about critical expressions, science fiction, social awareness, libre technology, and the peculiarity of the contemporary human condition. <https://lukaprincic.si>

## Institute for Inconspicuous Languages:

### Reading Lips

**Špela Petrič** (Biography see below)

### PL'AI

**Špela Petrič** (Biography see below)

## PLANT-MACHINE

**Špela Petrič**

**Špela Petrič** (SI) is a new media artist trained in the natural sciences and holds a PhD in biology. Her artistic practice combines the natural sciences, wet biomedicine practices, and performance art, critically examining the limits of anthropocentrism via multi-species endeavors. She envisions artistic experiments that enact strange relations to reveal the ontological and epistemological underpinnings of our (bio)technological societies. Petrič exhibits worldwide and has received several awards, among them the BAD Award, an Award of Distinction 2019, and an Honorary Mention 2020 at Prix Ars Electronica. <https://www.spelapetric.org>

## STAR VALLEY (SIRIUS)

**Matthew Biederman and Marko Peljhan**

**Marko Peljhan** (SI/US) is a theater and radio director, conceptual artist and researcher, working in an intersection of art/science/engineering. He has received many awards, including the Prix Ars Electronica Golden Nica 2001 Award with Carsten Nicolai. His work has been exhibited at multiple biennials (Venice, Lyon, Istanbul, Gwangju...), festivals, museums, and art institutions worldwide (documenta, ISEA, Ars Electronica, YCAM, ICC-NT, PS.1. MOMA, GARAGE...). He is a professor and director of the MAT Systemics Lab at the UCSB. [www.ladimir.net](http://www.ladimir.net)

**Matthew Biederman** (US/CA) works across media and milieu, architectures and systems, communities and continents. He creates works where light, space, and sound reflect on the intricacies of perception. Since 2008 he is a co-founder of Arctic Perspective Initiative, working with Marko Peljhan throughout the circumpolar region. His work has been featured at: Lyon Biennale, Istanbul Design Biennale, The Tokyo Museum of Photography, ELEKTRA, MUTEK, Ars Electronica, Biennale of Digital Art, Artissima, and the SCAPE Biennale, among others. [www.mbieberman.com](http://www.mbieberman.com)

## C t r l

### Michael Sedbon

**Michael Sedbon** (FR) holds a Master in Interaction Design from the London College of Communication and is currently involved in a Life Science Research degree at CRI Paris. In his work, Sedbon explores digital networked technologies and systems through their convergence with non-human intelligence (plants, unicellular organisms, insects, bacteria etc.) with regard to the Infocene problematics, seen as our current cultural era where Information is the force having the greatest impact on human societies and environments. <https://michaelsedbon.com>

### Second Life: Habitat

#### Hsien-Yu Cheng, Ting-Tong Chang

**Hsien-Yu Cheng** (TW) explores the relationship between human behavior, emotion, software, and machine. He tries to bring out the meaning of life through his works that are filled with his own observations and feelings toward society and the environment. He focuses on bioelectronic research, intelligent sound, and developing creative art tools. <https://chenghsienyu.com>

**Ting-Tong Chang** (TW) received his MFA from Goldsmiths, University of London, and has exhibited internationally. Chang's major awards include the 19th Taishin Arts Award, Taipei Art Award 2020, Hong Kong Art Central RISE Award 2016, and others. His works can be found in public and private collections in Europe and Asia. <https://www.tingtongchang.co.uk>

## !brute\_force: Feeding the Algorithm

### Maja Smrekar

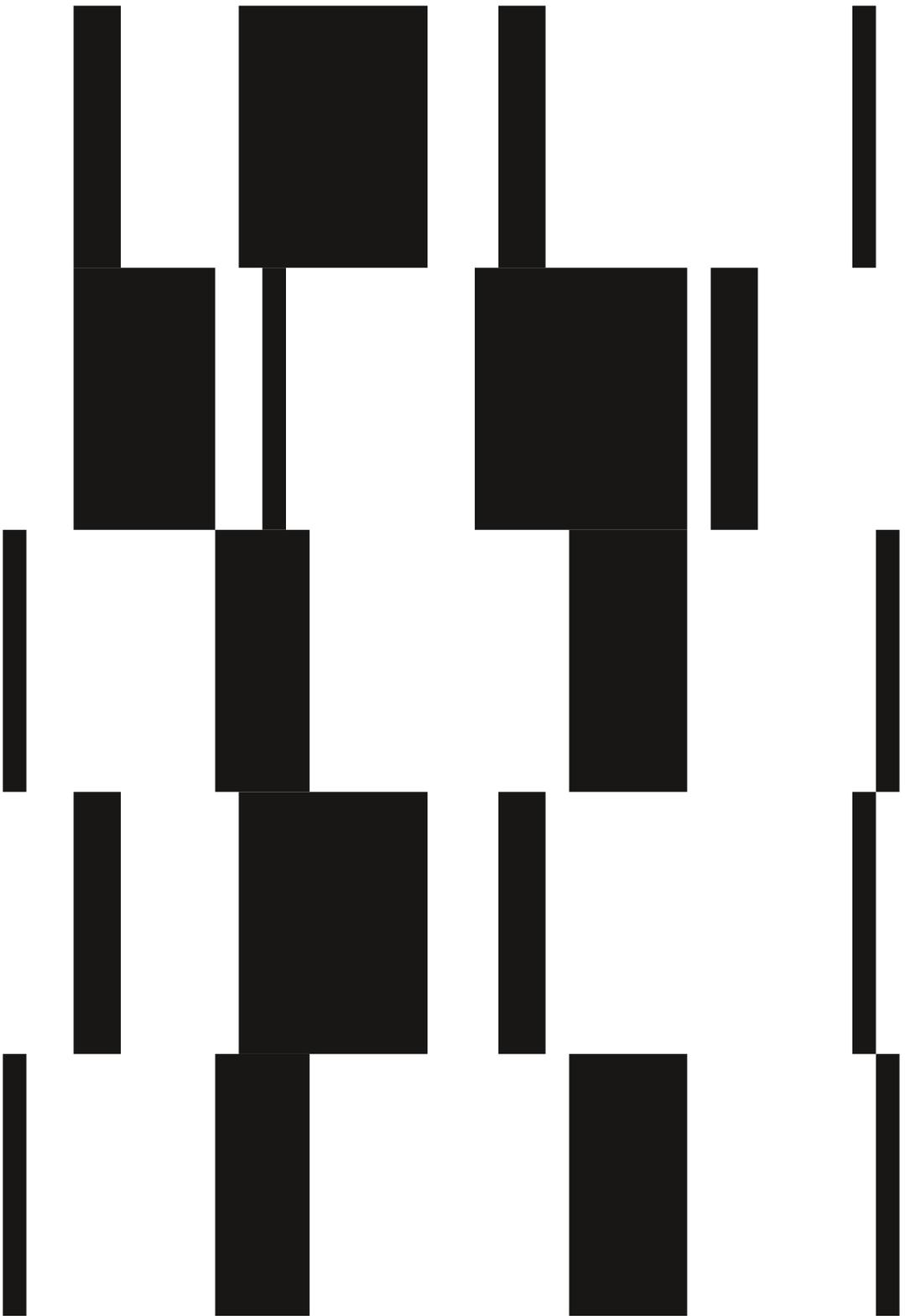
**Maja Smrekar's** (SI) work has been established in the international art and science milieu, based on interdisciplinary research of the developments and application of ideological structures in contemporary society. Grounded in sculpture, Smrekar's practice has allowed her to lead strong collaborations in developing cross-conceptual productions that include installations, performances, site specific art, drawings, videos, sound, workshops, lectures, talks, and texts. Among other, she has received the Prix Ars Electronica Golden Nica 2017 Award in Hybrid Art and the Prešeren Foundation Award, the highest national award for artistic achievements in Slovenia in 2018. <https://www.majasmrekar.org>

### Eingeweide

#### Marco Donnarumma X Margherita Pevere

**Marco Donnarumma** (IT/DE) is an artist, performer, stage director, and scholar who has been weaving together performance, new media art, and interactive computer music since 2004. He is internationally acknowledged for genre-defying live art and installations where the body becomes a language to speak critically of ritual, power, and technology. <https://marcodonnarumma.com>

**Margherita Pevere** (DE) works across bioart and performance with a compelling visceral signature. Her creations and writings hunt ecological complexity and the ways in which embodiment and environment are entangled. Her research hybridizes biolab practice, ecology, queer and death studies with a hacking attitude. [www.margheritapevere.com](http://www.margheritapevere.com)  
With Andrea Familiarì, they co-founded Fronte Vacuo. <https://frontevacuo.com>



# LABoral Centro de Arte y Creación Industrial

**laboral**

Centro de Arte y Creación Industrial

Gijón, Spain

# LABoral Centro de Arte y Creación Industrial

LABoral Centro de Arte y Creación Industrial is a multidisciplinary institution that produces, disseminates, and fosters access to new forms of culture rooted in the creative use of information and communication technologies (ICT).

LABoral has been working in crossovers between arts, science, technology, and society since its creation in 2007. The Art Centre is located in the Knowledge Mile of Gijón, on the perimeter of the eastern side of the city, between the technological campus of the Universidad de Oviedo and the Science and Technology Park, where the most advanced companies and research projects in Asturias are situated alongside different cultural institutions. LABoral has a wide range of activities from exhibitions, workshops, seminars, concerts, performances, residences for artists, studio sessions, and guided visits geared towards the general public, professionals, emerging artists, or the educational community.

At the heart of the project is the production center, available to creators to facilitate the development of ambitious artistic projects

but also open to other creative professionals. This resources center puts artists, scientists, technologists, designers, entrepreneurs and other creative profiles in contact with each other to carry out their proposals in a collaborative and experimental environment. The production center is also a crucial tool for educational contexts. By way of innovative programs, we research, through practice, on the education of the 21st century, involving the educational community with artists and scientists generating new spaces for knowledge and learning. Training is also provided to enable professionals in the creative field to acquire skills that will enable them to better develop their profession. The art center also caters for the general public through a varied mediation program, bringing different audiences in contact with the most avant-garde forms of contemporary creation. In conclusion, LABoral functions as an open lab for technological, social, and cultural exchange based on a cross-cutting approach between fields, communities, and practices.

<http://www.laboralcentrodearte.org/es>

## Exhibitions

# “D3US EX M4CH1NA” and “When the Butterflies of the Soul Flutter Their Wings”

What impact does AI have on the different areas of human activity: on thought, perception or memory, but also on work, creative processes, politics, the economy, or gender issues?

Between 2019 and 2021, LABoral Centro de Arte y Creación Industrial held two exhibitions with an extensive program of activities, conferences, workshops, and debates, as part of the AI Lab—European ARTificial Intelligence Lab project. In this way, we wanted to offer a wide audience different approaches and ways of reflecting on the myths and realities of AI, but also on the different potentialities of biochemical- and algorithmic-based neural networks.

Today, artificial intelligence (AI) is behind most of our interactions with computers and digital devices, apps, and social media. Every time we use a computer, smartphone, or tablet to consult a map, to post contents on social media, to look for information on the Internet, or to find new music or series, we are supplying data to the companies providing these services. The more we learn thanks to computers and networks, the more they learn about us. In fact, all the data we generate help the artificial intelligence systems of large corporations to know what we are actually doing as well as our desires at the present moment, and in consequence to predict what we will do or wish for in the future.

AI is as present in our daily chores as the knowledge of what it actually does is confusing. Therefore, exploring the edges between the facts and fictions of AI has been the aim of the first exhibition “D3US EX M4CH1NA,” co-curated with Pau Wvaelder.

The title of the exhibition refers to a Latin term that literally means “the god (who comes down) from the machine.” In ancient times it was related to a scenic resource to precipitate the final outcome of a theatrical play, by means of divine forces, using actors on machines or cranes.

In our context, “D3US EX M4CH1NA” is understood as a critical metaphor and guiding thread of an international exhibition of fourteen artistic projects, structured in five thematic areas. The first consists of projects that call into question the notions of creativity, originality, and authorship (Cohen, Ridler) while also inverting the relationship between the spectator and the work, turning the visitor into the object of study for robots and AI algorithms (Tresset).

The second area contains projects that explore the potential of AI as a system for analysis, control, and surveillance, related with the future of employment (Segni), privacy (McCarthy), or the governance of the world by an AI algorithm (Yoldas).

The third examines the apparent impartiality of AI and throws light on value and behavioral patterns that can replicate prejudices or increase inequalities of all kinds (Akten, Sinders).

The fourth group invites visitors to experience a dialogue with an AI system by means of a conversation with this artificial otherness (Hershman Leeson) or by means of body language and gestures (Sommerer and Mignonneau), confronting each spectator with his or her own virtual double.

The final group of works highlights how, for some time now, “intelligent” machines have

been exchanging data and communicating with each other independently. In some cases, as they take place without the intervention of human presence (F. Luque, Elwes), these interactions transmit a sense of wonder or unease. Meanwhile, other works induce us to rethink our anthropocentric idea of the communication and evolution of natural and artificial systems (Sutela).

The fourteen installations—which include generative, audiovisual, and interactive works—are created by artists who have accrued considerable prestige both here in Spain and internationally. Taken overall, they draw a broad panorama of artificial intelligence from different perspectives and approaches. At the same time, they invite us to reflect and explore new technological, social, and cultural situations posed by AI in relation to the management and perception of our surrounding environs and everyday forms of behavior.

The second exhibition, titled “When the Butterflies of the Soul Flutter Their Wings,” tries to bring us closer to some of the expectations and questions raised by neuroscience and artificial intelligence.

The protagonists of this exhibition are neurons or, to put it poetically, the “butterflies of the soul,” a term coined by Santiago Ramón y Cajal, who referred to neurons as some of the most delicate cells in nature. Even back then, he wondered if the “fluttering of their wings would one day clarify the secret of mental life.”

Almost a century has passed since Ramón y Cajal pronounced those words. Today, revealing this “mystery” has become a major challenge facing the international scientific community. While some scientists are dedicated to deciphering the brain’s neuronal map from different fields of neuroscience, others are developing new kinds of artificial neural networks from mathematics and computer science.

Through videos, photographs, interactive installations, and participatory actions, seventeen proposals by fourteen artists and groups from Spain and abroad introduce us to the black box of the brain in order to explore the magnitude and potential of neuronal landscapes, their changing synaptic connections, and their impact on ourselves and our environment. Exploring, in turn, the field of artificial intelligence algorithms, some works allow us to experience different processes and knowledge related to perception, intelligence, learning, and memory.

Many of the installations on display are the result of collaboration among artists, engineers, and other scientists from different fields. In the artworks, the artists use technologies, data, computer and neurotechnological applications (neural tissues, electroencephalographic (EEG) sensors and so on) to give visibility to what happens when “the butterflies of the soul flutter their wings.” Their works reveal processes linked to emotion, thought,

and communication. To this end, the artists also work with robotic tools and artificial intelligence algorithms, exploring the impact of their use on our way of conceiving, perceiving, and relating to the world around us.

At the entrance of the exhibition, the visitor passes through an immense neuronal network in the form of recycled cables (D. Canogar). While the first installation makes visible the bioelectrical nature of communication between neurons and reflects on the magnitude of its reach, the next one reveals the communicative potential of neuronal activity “in vitro” (G. Ben-Ary).

Some artists use their own brain signals, produced by their moods and mental states, to transform the surface of water (Park), to generate certain movements of a robotic sculpture (E. Gollob), or to create a visual and sound landscape from individual and collective effects (Lancel/Maat).

Others train different types of artificial intelligences to make learning and communication processes visible (B. Schmithüsen or J. Emard), to investigate the memory and predictive capabilities of AI (C. Boj & D. Díaz), or to question the creativity of algorithms (U. Damm or M. Klingemann). The distinction between multiple intelligences is also a visible aspect of this exhibition. From the most primitive, related to the emotional states of survival (M. Donnarumma), to the bodily and kinesthetic (J. Emard) interpreted by AI.

The exhibition allows visitors to experience the impact of collective consciousness on the transformation of matter, through the various cultural prostheses in a newly produced immersive installation (Laramascoto).

Some works also highlight different alterations and pathologies of mental activities that can affect perception or memory (M. A. Rego), hyperactivity (E. Gollob), or those derived from the relationship between human beings and machines (M. Donnarumma).

Other works also suggest that the perception and processing of information is not only specific to the human or machine mind, but also to other living beings (M. Castellanos & A. Valverde).

The exhibition has relied on the scientific advice and interdisciplinary collaboration of the Artificial Intelligence Centre AIC and the Institute of Neuroscience INEUROPA of the University of Oviedo.

The two exhibitions open up new approaches of experiences and knowledge production at the edges of different areas of cognition. All this might inspire us to rethink the contributions and role of the arts and sciences and their collaborations in order to face and to share the challenges of knowledge production and communication in our current times.

**Karin Ohlenschläger**

artistic director of LABoral Centro de Arte y Creación Industrial in Gijón, Spain, from 2016 until 2021

# Activities

## Conferences

### **Everyone talks about Artificial Intelligence, but... is it happening?**

Lecture

LABoral Centro de Arte, Gijón, ES

22.11.2019

Isabel Fernández (ES)

### **Artificial Intelligence and Gender**

Colloquium

LABoral Centro de Arte, Gijón, ES

22.11.2019

Isabel Fernández (ES), Caroline Sindes (US),

Antonio Bahamonde (ES)

### **Singing in the rain: Artificial Voices in the musical field**

Lecture

LABoral Centro de Arte, Gijón, ES

23.11.2019

Jordi Janer (ES)

### **Towards artificial intelligence closer to the human being**

Lecture

LABoral Centro de Arte, Gijón, ES

23.11.2019

Amparo Alonso Betanzos (ES)

### **Zaragoza declaration: for a deontology in design and interaction with intelligent systems**

Lecture

LABoral Centro de Arte, Gijón, ES

23.11.2019

Manuel González Bedía (ES)

### **Where is AI taking us?**

Roundtable

LABoral Centro de Arte, Gijón, ES

23.11.2019

Amparo Alonso Betanzos (ES), Manuel González

Bedía (ES), Guido Segni (IT), Karin Ohlenschläger

(DE/ES), Antonio Bahamonde (ES)

### **Artificial Intelligence as an assistant in artistic production**

Lecture

LABoral Centro de Arte, Gijón, ES

23.11.2019

Birk Schmithüsen (DE)

### **Who is the author of a work made with artificial intelligence?**

Colloquium

LABoral Centro de Arte, Gijón, ES

23.11.2019

Birk Schmithüsen (DE), Antonio Bahamonde (ES)

### **5th AINDACE Foundation Seminars on Brain Damage: Research and Innovation**

Round table

Online/LABoral Centro de Arte, Gijón, ES

27.11.2020

Juan Álvarez (ES), Andrea Menéndez (ES), Helena

Herrada (ES), Silvia Rodríguez (ES), Luis Santos (ES),

Juan Carlos Bermejo (ES), Alba Gutiérrez (ES)

### **Art, Neuroscience and Health**

Round table

Online / LABoral Centro de Arte, Gijón, ES

27.11.2020

Daniel Canogar (ES), Emanuel Gollob (AT), Miguel

Angel Rego (ES), Jorge Arias (ES), Luz Mar

González (ES)

### **Art and Neuroscience: The Relationships Between the Micro- and Macroscales of the Brain**

Conversation on the ethical challenges related to neuroscience and artificial intelligence

Round table

online/LABoral Centro de Arte, Gijón, ES

28.11.2020

María Castellanos (ES), Alberto Valverde (ES),

Laramascoto (ES), Luz Mar González Arias (ES)

## Exhibitions

### **D3US EX M4CH1NA**

Art and Artificial Intelligence  
LABoral Centro de Arte, Gijón, ES  
22.11.2019 – 16.05.2020  
Curated by: Karin Ohlenschläger (DE) y  
Pau Vvaelder (ES)

### **When the Butterflies of the Soul Flutter their Wings**

Art, neuroscience and artificial intelligence  
online/LABoral Centro de Arte, Gijón, ES  
11.12.2020 – 24.04.2021  
Curated by: Karin Ohlenschläger (DE)

## Workshops

### **Feminist Data Set**

LABoral Centro de Arte, Gijón, ES  
22.11.2019  
Caroline Sindere (US)

### **Creating expressive voices for interactive video games**

LABoral Centro de Arte, Gijón, ES  
23.11.2019  
Jordi Janer (ES)

### **Post-disciplinary co-creation with AI, robotics, EEG and toothpicks**

Online  
26.11.2020  
Emanuel Gollob (AT)

## Other Activities

### **Le Comité**

Performance  
LABoral Centro de Arte, Gijón, ES  
22.11.2019  
Daniel Romero (ES), Nuria Lloansi (ES)

### **A.L.M.A**

Concert  
Online / LABoral Centro de Arte, Gijón, ES  
28.11.2020  
A.L.M.A (ES)

### **Crumbling Palace**

Concert  
Online / LABoral Centro de Arte, Gijón, ES  
28.11.2020  
Crumbling Palace (ES)

## Ars Electronica Garden 2020



<https://u.aec.at/BO56DC3E>

# Projects

Marcos Morilla



## **nimiia cétii**

Jenna Sutela (FI)

*nimiia cétii* is an audiovisual work by Jenna Sutela using machine learning to generate a new written and spoken language. This language is based on the computer's interpretation of a Martian tongue from the late 1800s, originally channeled by the French medium Hélène Smith. In the work, the language is voiced by Sutela, as well as the movement of *Bacillus subtilis natto*, an extremophilic bacterium that, according to recent spaceflight experimentation, can survive on Mars. In this project, the machine is a medium, channeling messages from entities that usually cannot speak. The work is also about intelligent machines as aliens of our creation.

**Presented LABoral Centro de Arte y Creación Industrial & Onassis Stegi**

Lagana



## **Alia: Zû tàì**

Marco Donnarumma (IT/DE)

The video documentary of the performance *Alia: Zû tàì* shows a group of humans and several artificially intelligent prostheses who build and destroy relationships with each other, during an unpredictable ritual of rejection and acceptance. In this piece, the robots are intelligent machines that improvise their interactions with humans in real time, protagonists of a performance that stages a reckless game of struggle, power, and vulnerability. The work explores whether "intelligent" software, body sensors, and robotic devices may in fact be affecting the physiological, psychological, and cultural basis of human life. What kind of identities are produced by AI and robotics? How do these technologies influence the way we understand and distinguish human bodies? And...who is "normal" and why?

Supported by: Goethe Institut



## Amygdala, from the 7 Configurations cycle

Marco Donnarumma (IT/DE)

*Amygdala* is an AI robot, shaped like a strange limb that hangs inside an industrial structure. It uses a knife to manipulate and sculpt a large piece of skin on a repetitive, careful, and endless work. The purpose of the robot is to learn a purification ritual known as “skin-cutting,” which is performed in the tribes of Papua New Guinea, Africa, and East Asia and consists of cutting the skin according to specific patterns. This is seen as a rite of passage into a social group. According to Donnarumma, there is a parallel between this rite and our relationship with technology nowadays. When we surf the Web, we give a lot of personal information to the system, in exchange for being able to take part in and enjoy what the Web has to offer. A much more perverse and dangerous form of contemporary ritual.

In collaboration with Ana Rajcevic and the Neurorobotics Research Laboratory, Beuth Hochschule, Berlin.



Marcos Morilla

## Calyx, from the 7 Configurations cycle

Marco Donnarumma (IT/DE)

*Calyx* is a sculptural installation composed of multiple body relics in the form of leather garments. Each fragment has unique scars as a result of the manipulations of an AI robot called *Amygdala*, which uses a steel knife to carefully cut and carve the skins, with no particular objective other than learning how to cut. The synthetic skin is produced by hand, using a compound of organic materials. Then, the fresh tissue is hung on *Amygdala*’s body, which begins its relentless cutting operation. By relying on an architecture of neural networks, *Amygdala*’s cutting movements cannot be predicted and vary greatly with each performance. The skins are, therefore, bodily relics that testify to the machine’s computational agency.



Marcos Morilla

## Arnolfini Series

Harold Cohen (UK)

Harold Cohen (1928 – 2016) is one of the pioneering artists in the use of algorithms to create artworks, and more specifically art associated with artificial intelligence. In 1973 he developed AARON, a system that autonomously generated drawings and paintings following a set of rules that Cohen had written, based on his own experience as a painter. Over the course of almost four decades, Cohen continued developing AARON to create increasingly more complex works. The artist's initial motivation was to determine which elements were necessary to create an image and therefore to explore the possibilities of an artwork generated independently by a machine. This series was made for an exhibition at the Arnolfini gallery in Bristol (UK) in 1983.

Courtesy DAM Gallery, Berlin



## Beyond Human Perception

María Castellanos (ES) and

Alberto Valverde (ES)

This work explores the reactions between humans and plants and the response of both living beings to a common stimulus: live music. During an experiment, conducted at OsloMet University in the context of the *FELT Project*, the artists observed synchronized reactions between plants and humans when they interacted. In this piece, the artists perform an experiment in which plants and humans are invited to listen to live music in the same place. By measuring human brain waves and the electrical vibrations of plants, the artists explore the relationships between sound stimuli and the physical reactions of both organisms. By comparing human and plant reactions, Castellanos and Valverde create a bridge that brings us closer to the plant world, an unknown territory that is not so different from our own.



<https://u.aec.at/FE85E6D6>



Marcos Morilla

## Demand Full Laziness

Guido Segni (IT)

This project is a durational performance exploring issues involving art production such as labor, the economy of art, automation, and laziness. The artist delegated part of his artistic production from 2018 to 2023 to a series of deep learning algorithms. Segni lets the program record his periods of inactivity (sleeping, reading, lazing about) with a camera and feed the images to a set of GANs, which produce new images through a process of machine learning. The artworks created by the software while the artist is resting are distributed to sponsors who fund the artist on the Patreon crowdfunding platform. In this way, not exempt from irony, the artist proposes a solution to the dilemma of art production in times of maximum precariousness by means of automation and crowdfunding. *Demand Full Laziness* is not just about automation but also about human cooperation.

Fabio Angeli Music in *The machine is learning, the artist is resting*. AI Technical Support: Michele Toni, Andrea Gatto



Marcos Morilla

## cellF

Guy Ben-Ary (US)

According to the artist, *cellF* is a self-portrait, but also the world's first neural synthesizer. The "brain" of *cellF* is made up of a biological Ben-Ary neural network. To achieve this, a scientific team took a biopsy from his arm and transformed the skin cells into neural networks. These neural networks are an "in vitro" brain in a Petri dish that controls, in real time, a series of custom-made modular analogue synthesizers. *cellF* forms part of special, unique concerts with professional musicians, whose music stimulates the neurons that respond by controlling the synthesizers. Together they perform live, improvised, post-human sound pieces. The work is an "in vitro intelligence": an intelligent system produced by bioengineered living neural networks that function as brains outside the body.



Marcos Morilla

## Closed Loop

Jake Elwes (UK)

In *Closed Loop*, Jake Elwes creates a conversation between two artificial intelligence models, one using words, the other using images. The words of one describe the images of the other, which then seeks to describe the words with a fresh image. The artist does not input any visual content or text into the piece, which functions on its own thanks to the feedback loop between the two machines. Here people are mere spectators of a hermetic dialogue in which they cannot intervene. The system is self-sufficient and contrasts our anthropocentric perception, in which we are the ones who dominate or are dominated by technology, with the existence of an interchange that is removed from us. In trying to decode the narration, it is us who are ultimately forced to understand the reasoning of the machine.



Justine Emard, ADAGP

## Co(AI)xistence

Justine Emard (FR)

In this video, Mirai Moriyama, a Japanese actor and dancer, interacts face to face with a robot that is animated by a form of primitive intelligence (AI). It is based on a neuronal system, with artificial life, which embodies a different, non-anthropomorphic way of understanding things and makes its own decisions. Man and machine interact through signals, body language, and speech, with their different intelligences. Using a deep learning algorithmic system, the robot learns from

its experience with the actor. The humanoid incarnation of AI was created by Ishiguro Lab (Osaka University). Its appearance allows for emotional bonding and opens a space of certain affection to the imagination. Through experience, the human and the robot attempt to define new perspectives of coexistence in the world.

With Mirai Moriyama & Alter, a robot developed by Ishiguro Lab, Osaka University and Ikegami Lab, Tokyo University

**Presented LABoral Centro de Arte y Creación Industrial & CPN—Center for the Promotion of Science**



Marcos Morilla

## DiNA

Lynn Hershman Leeson (US)

As an extension of her film project *Teknolust*, in 2002 Lynn Hershman-Leeson created her first artificial intelligence character, Agent Ruby, a female persona reduced to a face with which users can interact on a webpage. As a continuation, in 2004 the artist conceived DiNA, a female character played by the actor Tilda Swinton (star of *Teknolust*), who can dialogue with spectators through a voice recognition system. Like Agent Ruby, *DiNA* can learn from these interactions and information obtained on Internet. She gives us a chance to interact with an artificial intelligence which, unlike Siri or Alexa, is not a bodiless female voice willing to obey our orders or resolve our doubts, but instead has its own presence and asks us to look on it as a “being” with whom we can reach an understanding.



## Eunoia II

Lisa Park (US)

The video of the action and interactive installation shows human emotions and invisible physiological changes, converted into watery and sound vibrations. The work uses a brain wave sensor to visualize and convert the artist's biological signals into music, thus transforming them into tools of creation. The installation consists of 48 speakers and aluminum plates, each filled with water. The design of *Eunoia II* was inspired by a Buddhist symbol that means “balance.” During the performance, the sensor continuously transmits the different mental values detected (frustration, meditation, boredom, commitment, and enthusiasm). This data modulates the recorded sound while the different frequencies of the brain waves result in a vigorous vibration of the water.



Marcos Morilla

## Exocerebro

Laramascoto (ES)

*Exocerebro* brings us closer to these hybridization processes in a poetic way. The liquid content of the interior of a rock formation is projected outwards. The interaction with this moving image causes a reaction in the rocky matter that changes its basic structure. *Exocerebro* is therefore a metaphor for the functioning of the mind and, more specifically, consciousness, which does not yet seem to have a scientific explanation. The only thing that can bring us closer to it is to consider that consciousness extends outside the brain in the form of cultural prostheses (writing, art, music, and all kinds of symbolic structures). The “exocerebro” (exo-brain) would be the artificial part of consciousness capable even of modulating and modifying neuronal functions.

With the collaboration of: José Novas and Rotor Studio.  
Produced by LABoral



Marcos Morilla

## Human Study #1, RNP-II

Patrick Tresset (FR)

In this installation, the human being becomes a passive sitter in front of a machine undertaking a creative action. In a 30-minute drawing session, the robot “obsessively” reproduces with a pen on a sheet of paper what it captures with its (obsolete and low resolution) camera. In consequence, the person becomes an immobile object of study but also the subject of a unique portrait. Tresset has programmed the robots to draw following his own technique, although each one interprets its own version of this set of instructions, leading to its own individual style. The robots, originally designed by the artist to overcome his own artistic block as a painter, could thus be seen as a creative prosthesis. The drawings created by the robot are hung on the wall, joining the collection of over 30,000 originals created to date.

Supported by: Flanders State of the Art

**Presented at LABoral Centro de Arte y Creación Industrial & FCZ & CPN—Center for the Promotion of Science**



Marcos Morilla

## Kissing Data

LANCEL/MAAT (NL)

*Kissing Data* explores a shared neurofeedback system during a kiss. During a live action, some visitors participate as protagonists using the EEG helmets that measure their brain waves while they kiss each other. Simultaneously, the brain waves of some of the spectators are also collected, reflecting their reaction to the intimate kisses of the protagonists. The display of all these records is projected on the floor. Both the couple's and the viewers' data intimately co-create an immersive visual environment, which is also translated into sound by an algorithm, creating the *Kissing Data* symphony.

Supported by: Mondriaan Fund



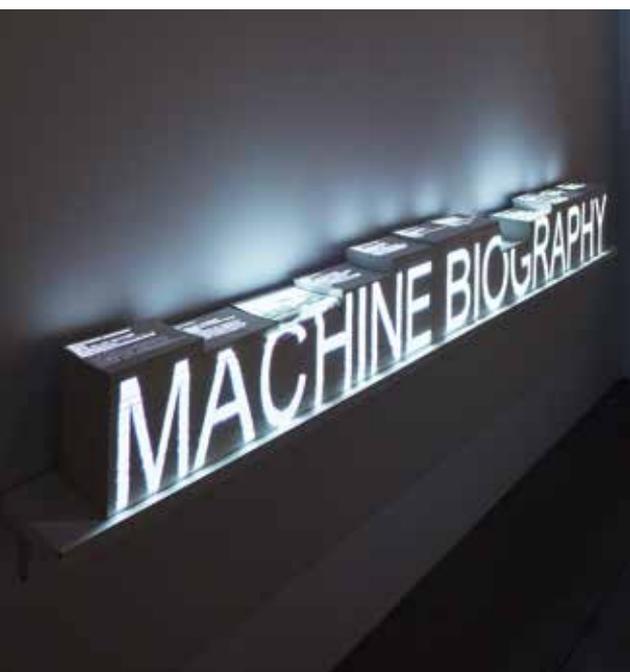
Marcos Morilla

## LAUREN

Lauren McCarthy (US)

*LAUREN* is a performance in which the artist endeavors to become a flesh-and-blood version of Alexa, a virtual assistant who watches over and attends to the needs of various people in their own homes. McCarthy installed a series of devices (cameras, microphones, switches, locks, faucets, among others) in the houses of various volunteers and then watches the people twenty-four hours over several days, responding to their petitions and offering them advice. The artist aspired to be better than an AI, because she could understand them as a person and anticipate their needs. With this project the artist reveals how we are willing to exchange intimacy for convenience and allow a set of algorithms to control our lives.

Video directed by David Leonard.



Marcos Morilla

## Machine Biography

Clara Boj (ES), Diego Díaz (ES)

This project has generated a predictive biography of the artists for the year 2050 based on all their digital activity (locations, digital conversations, photographs, videos, etc.) collected during 2017. That year, the artists hacked their mobile phones with spy software that captured all this information to create the work *Data Biography*. In this new project, Boj and Díaz use this data to train different deep neural networks (RNN, CNN and others) to create *Machine Biography*. It is a fictitious and predictive biography created by artificial intelligence, where the limits of what is true and what is false are blurred, and the predictive capacity of the algorithms and the veracity of the information itself are questioned as they aim to analyze the creative possibilities of artificial intelligence. Awarded the 2019 BBVA Foundation Leonardo Scholarship for Cultural Researchers and Creators.



Marcos Morilla

## Membrane

Ursula Damm (DE)

In this interactive work, created from a series of generative videos, the images are received in real time and change based on several variable parameters programmed by the artist. The viewer interacts directly through an interface to create images by means of an artificial neural network. In doing so, it is possible to experience the imagination of AI, guiding its learning process. The perception of the AI system is altered when we change certain spatial or temporal parameters. The result images are reminiscent of cubist, impressionist, or abstract paintings. What are the distortions of “reality” that attract us? What imagined scenarios are behind these “alterations?” What details does artificial intelligence reveal to us? What new expressions and knowledge can AI bring to artistic creation?

Supported by: Goethe Institut



Marcos Morilla

## Neuro Mirror

Christa Sommerer (AT) &  
Laurent Mignonneau (FR)

This interactive installation borrows inspiration from scientific research looking into mirror neurons that participate in the processes of the brain when establishing relationships with other people. They also play a key role in intuition, predicting the behavior of others in the future. *Neuro Mirror* uses artificial neural networks to create the interaction with the public. When a person is in front of the triptych, they see their own image on the center, while the left screen shows their activity in the immediate past. The third screen shows a character who predicts the gestures the subject will make in the future. The spectator will feel obliged to imitate the character who is predicting their actions or else to act differently, in either case being conditioned by the dictates of the system.

Supported by: Foro Cultural de Austria en Madrid



Marcos Morilla

## Nihil Ex Nihilo

Felix Luque (ES)

*Nihil Ex Nihilo* is based on a science fiction story about a computer, SN VV8931CGX66E, which is part of a network of cybercriminal computers dedicated to sending spam. As a result of an accidental alteration, the computer acquires a primitive form of intelligence that emerges from naught (ex nihilo). Confused by the situation, it tries to communicate with other machines, responding to their spam messages to liberate them from their human users. *Nihil Ex Nihilo* engages with the fear of a “rebellion of the machines” which is often associated with the development of AI. The work reminds us that the development of intelligence can also be affected by madness, showing us a system that functions beyond our control.

3D Animation: Iñigo Bilbao. Design of the alphanumeric display: Damien Gernay. Sound design, software, and electronics: Félix Luque Sánchez. Arduino programming: Vincent Evrard. Aco-production of “secteur arts numériques, Fédération Wallonie-Bruxelles” and iMAL. Supported by: Flanders State of the Art



Marcos Morilla

Made using the 'CelebA' dataset and Variational Autoencoders Zimei Liu, Ping Luo, Xiaogang Wang, and Xiaoou Tang, "Deep learning face attributes in the wild," *Proceedings of the IEEE International Conference on Computer Vision 2015 Inter*, 3730—3738 (2015). Diederik P Kingma and Max Welling, "Auto-Encoding Variational Bayes," arXiv preprint arXiv:1312.6114, (2013).

## Optimising for Beauty

Memo Akten (TR)

This video shows an artificial neural network in the process of being trained on a dataset made up of thousands of portraits of celebrities. The program generates fictitious faces, which tend to become progressively more homogeneous. The artificial neural network learns to create a form of idealized, perfect, and uniform beauty in which individual features are gradually dissolved into one single face. Akten consciously looks for this unsettling uniformity by an MLE (maximum likelihood estimation) algorithm that creates portraits using elements with the greatest probabilities of being found in the set of observed data. MLE is committed to a "dominant truth" that eliminates any difference. The result is a disturbing set of faces who all seem to be the same person, none of whom actually exists.



Marcos Morilla

## Post-Contingent Coherence

Miguel Ángel Rego (ES)

This video is about anosognosia. Patients suffering from this neural pathology fill mental spaces with imprecise information to supply the lack of precise information. An interesting approach is to understand that, in some way, anyone can be considered anosognostic at some level, since, in specific situations, we deny part of reality in order to face it. *Post-Contingent Coherence* shows a pianist playing Frédéric Chopin's *Nocturne Op. 55, No. 1 in F Minor*. The first-person shots reveal that the pianist believes she is playing with both hands; but the third-person shots allow the viewer to discover her paralysis. The transparent piano rhetorically expresses what Thomas Metzinger has called the "transparent model": we experience reality without recognizing what processes are involved in its formation.



Marcos Morilla

## Soliloquium

Miguel Ángel Rego (ES)

In *Soliloquium* we can see a person in dialogue with himself through different soliloquies.

The reference for the construction of each of them is the clinical phenomenology that defines visual agnosia. People suffering from visual agnosia, though not blind, are unable to recognize information coming from the outside through sight. Each part of the audiovisual piece deals with one aspect of the illness: the epistemic through the main character; the rhetoric, through the poem "The Blind" by Jorge Luis Borges; and the empirical through studies, which analyzed how primates could recognize themselves in front of a mirror.

This project is completed with the artist's interpretation of different drawings by Santiago Ramón y Cajal of the nervous system of the brain through glass sculptures.

## Speculative Artificial Intelligence / Exp. #2 (conversation)

Birk Schmithüsen (DE)



Marcos Morilla

This work consists of a series of aesthetic experiments designed to make the functioning processes of artificial neural networks perceptible through visual and sound conversations between two systems. Two intelligences are materialized in a light object and a sound object, respectively. The spherical light object, with an integrated AI computer device, is able to hear sounds and create sequences of light. The sound object, in the form of an opaque black Plexiglas dodecahedron, is equipped with eight speakers, a camera, and the second artificial intelligence system. This way it can see and reproduce sounds. In the exhibition, the two systems are in a constantly changing audiovisual conversation, which can be altered and modified by the presence of the visitor.

Production: EMAP/EMARE, Acknowledgements: Óscar Luaces y Jorge Díez, Supported by: Goethe Institut

**Presented at LABoral Centro de Arte y Creación Industrial & Hexagone Scène Nationale Arts Science & CPN—Center for the Promotion of Science**



Marcos Morilla

## Synaptic Passage

Daniel Canogar (ES)

*Synaptic Passage* is a large immersive installation created especially for the exhibit titled *Brain: The Inside Story* at the American Museum of Natural History in New York City. The flashing video-animations projected onto the recycled wire suggest the constant communication that occurs in dense tangled brain tissue, formed by more than 100 billion interconnected neurons.

Acknowledgements: Chatarrería Astur



Marcos Morilla

## The Fall of the House of Usher I The Fall of the House of Usher II

Anna Ridler (UK)

Anna Ridler created an animation based on the short silent film *The Fall of the House of Usher* (J. Sibley Watson and M. Webber, 1928) using a series of GANS (generative adversarial networks) and a set of ink-on-paper drawings. The artist uses them as a data set to feed an artificial neural network so that it can learn to create new images. Ridler then passes the result of this first neural network to a second neural network, which in turn creates new images, and then finally to a third. The animation shows the processes of the three neural networks, allowing us to compare them and giving rise to a new version of the film which evokes both the silent film by Sibley Watson and Webber as much as the original story by Edgar Allan Poe, while at once questioning the very ideas of creativity and originality.

## The Kitty AI: Artificial Intelligence for Governance

Pinar Yoldas (TR)



Marcos Morilla

The video presents Kitty, an AI with the outer appearance of an adorable little kitten who governs a megalopolis in 2039 by means of a network of artificial intelligences and direct interaction with citizens through their mobile devices. With a persuasive childlike voice, the kitten explains how to use affective computation strategies and how to analyze the emotional states of users in the recent past to alter human abilities and to take over governance by AI. It speaks of the failure of human beings to manage the refugee crisis or climate change in the past. But it also reflects on the impact of the digital era in governance and in urban development—in short, it reflects on the new challenges of coexistence between human beings and machines, and the construction of a shared future.



Emanuel Gollob

## Doing Nothing with AI

Emanuel Gollob (AT)

Presented at **Ars Electronica & LABoral Centro de Arte y Creación Industrial**  
See page 82



Marcos Morilla

## Uncanny Mirror

Mario Klingemann (DE)

Recognizing ourselves in the mirror is a basic human skill. From the age of 20 months, we are aware of our own image. This certainty is challenged by *Uncanny Mirror*, a work created by one of the pioneering artists in the use of AI. Through algorithms, this interactive installation produces digital portraits of viewers in real time. In this work, the audiences are “an interesting source of data”: they provide information that brings unpredictability and risk. The AI system is constantly learning, and each new portrait is based on the accumulated knowledge of the machine; each face it produces contains something of what went before. We’ve all seen our reflections a thousand times. However, this work by Klingemann offers different perspectives on how the AI system sees us.

Commissioned by Seoul Mediacity Biennale.  
Supported by: Goethe Institut



Marcos Morilla

## Feminist Data Set

Caroline Sindere (US)

Presented at Ars Electronica &  
LABoral Centro de Arte y Creación Industrial  
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# Artists

## nimiia cétii

Jenna Sutela

**Jenna Sutela** (FI) works with words, sounds, and other living media, such as *Bacillus subtilis* nattö bacteria, and the “many-headed” slime mold *Physarum polycephalum*. Her audiovisual pieces, sculptures, and performances seek to identify and react to precarious social and material moments, often in relation to technology. Sutela’s work has been presented at museums and art contexts internationally, including Guggenheim Bilbao, Moderna Museet, and Serpentine Galleries. Visiting Artist at The MIT Center for Art, Science & Technology (CAST) 2019–21.

<https://jennasutela.com>

## Alia: Zù tàì

**Marco Donnarumma** (Biography see below)

## Amygdala, from the 7 Configurations cycle

**Marco Donnarumma** (Biography see below)

## Calyx, from the 7 Configurations cycle

**Marco Donnarumma**

**Marco Donnarumma** (IT/DE) Since the early 2000s he has been weaving together contemporary performance, new media art, and computer music. He manipulates bodies, creates choreographies, engineers technology, and composes sounds, thus combining disciplines and media into an oneiric, sensual, uncompromising aesthetics. He is internationally acknowledged for solo performances, stage productions, and installations where the body becomes a morphing language to speak critically of ritual, power, and technology.

<https://marcodonnarumma.com>

## Arnolfini Series

**Harold Cohen**

**Harold Cohen** (UK) graduated in Fine Art from the University of London in 1951. He began his artistic career as an abstract painter but later began to question the nature of art and, after his experiences at the University of San Diego and Stanford, he created AARON, a computer program that draws artistic images. Cohen was a pioneer in computer-generated art, and his work has been exhibited at numerous museums, galleries, and festivals around the world. His work questions the notion of creativity and the very nature of art.

[www.aaronshome.com/aaron/index.html](http://www.aaronshome.com/aaron/index.html)

## Beyond Human Perception

**María Castellanos and Alberto Valverde**

**María Castellanos** (ES) & **Alberto Valverde** (ES).

Their joint artistic practice focuses on the relationship between humans and machines, centering their research in recent years on hybrids between cyborgs and wearables, as a paradigm of the amplification of human sensory capabilities. They have also worked on the creation of complex systems of interspecies communication, which promote understanding between humans and plants. Their work has won several awards, such as the VERTIGO STARTS Prize in 2017, a nomination at the STARTS Prize '16 of Ars Electronica, and at the Japan Media Arts Festival. [www.uh513.com](http://www.uh513.com)

## cellF

**Guy Ben-Ary**

**Guy Ben-Ary** (US) Recognized internationally as a major artist and innovator working across science and media arts, Guy specializes in biotechnological artwork, which aims to enrich our understanding of what it means to be alive. Guy’s main research areas are cybernetics, soft-robotics, and the cultural articulation of bio-technologies. Much of his work is inspired by science and nature. His artworks usually utilize motion, growth, and big data to investigate technological aspects of today’s culture and the re-use of biological materials and technologies. <http://guybenary.com>

## Closed Loop

**Jake Elwes**

**Jake Elwes** (UK). Jake’s recent works have looked at machine learning and artificial intelligence research, exploring the code, philosophy, and ethics behind it. In his art Jake engages with both the history and tropes of fine art and the possibilities and consequences of digital technology. His work has been exhibited in museums and galleries internationally, including the ZKM (Germany), TANK Museum (China), Today Art Museum (China), CyFest (Italy), Edinburgh Futures Institute (UK), among others. [www.jakeelwes.com](http://www.jakeelwes.com)

## Co(AI)xistence

**Justine Emard**

**Justine Emard** (FR) Her work explores the new relationships that are being established between our lives and technology. Combining images from different media—from photography to video and

virtual reality—she situates her work at the crossroads between robotics, objects, live 3D prints, organic life, and artificial intelligence. Since 2011, she has had solo shows in France, South Korea, Japan, Colombia, Sweden, and Italy. <https://justineemard.com>

## **Demand Full Laziness**

### **Guido Segni**

**Guido Segni** (IT) With a background in hacktivism, net art, and video art, he lives and works somewhere, online and offline, playing with art, internet culture, and data hallucinations. Mainly focused on the daily (ab)use of the Internet, his work is characterized by minimal gestures on technology which combines conceptual approaches with a traditional hacker attitude in making things odd, useless, and dysfunctional. <https://guidosegni.com>

## **DiNA**

### **Lynn Hershman Leeson**

**Lynn Hershman Leeson** (US) is an artist and filmmaker who has been internationally acclaimed for her art and films. She is widely recognized for her innovative work investigating the relationship between humans and technology, identity, surveillance, and the use of media as a tool of empowerment against censorship and political repression. She has made pioneering contributions to the fields of photography, video, film, performance, artificial intelligence, bio art, installation, and interactive as well as net-based media art. [www.lynnhershman.com](http://www.lynnhershman.com)

## **Eunoia II**

### **Lisa Park**

**Lisa Park** (US) is best known for her works with biofeedback devices to express invisible biological signals and emotions as auditory and visual representations. In creating art installations and performances using sensor technology, she strives to explore the importance of human relationships and connections. Park is a recipient of the New York Foundation for the Arts Fellowship. Her works have been featured by *Art21*, *Artnet*, *The Creators Project*, *New York Times*, *T magazine*, *Wired*, *PBS*, *Time Out NY*, and the *New York Post*, and through many other media outlets. [www.thelisapark.com](http://www.thelisapark.com)

## **Exocerebro**

### **Laramascoto**

**Laramascoto** (ES) is a collective formed by Bea Coto and Santi Lara, who both hold doctorates in Fine Arts, from the University of Granada and the Complutense University of Madrid, respectively. They have been working together on audiovisual installations and experimental animation since 2007, making interventions in places such as the New Media Gallery (CA), the Bethanien Kunstraum (DE), the San Ildefonso Museum (MX), the ABC Museum (ES), the Barjola Museum (ES), and the Fine Arts Museum of Asturias (ES), among others. <https://laramascoto.com>

## **Human Study #1, RNP-II**

### **Patrick Tresset**

**Patrick Tresset** (FR) explores human traits and aspects of human experience. His work reflects recurrent ideas such as embodiment, passing time/time passing, childhood, conformism, obsessiveness, nervousness, the need for storytelling, and mark-making. He is best known for his performative installations using robotic agents as stylized actors that make marks, and for his exploration of the drawing practice using computational systems and robots. <https://patricktresset.com>

## **Kissing Data**

### **LANCEL/MAAT**

**LANCEL/MAAT** (NL). Karen Lancel and Hermen Maat are pioneers exploring embodied presence, intimacy, privacy, and trust in posthuman bio(techno)logical ecologies of entanglement with (non-)human others. They radically re-orchestrate automated control technologies, neuro-feedback, and disrupted sensory perception to create “Trust-Systems.” They are carefully hosted to interact through AI/AE interfaces for brain-to brain, smart textile, and social touch communication; and in this way to share emotion, reflection, and public dialogue in merging realities ecologies. [www.lancelmaat.nl](http://www.lancelmaat.nl)

## **LAUREN**

### **Lauren McCarthy**

**Lauren McCarthy** (US) examines social relationships in the midst of surveillance, automation, and algorithmic living. Lauren’s work has been exhibited internationally, at The Barbican Centre, Ars Electronica, Fotomuseum Winterthur, Haus der elektronischen Künste,

SIGGRAPH, Onassis Cultural Center, IDFA DocLab, Science Gallery Dublin, and Seoul Museum of Art. She has received numerous honors including a Creative Capital Award, Ars Electronica Golden Nica, Sundance Fellowship, Eyebeam Fellowship, and grants from the Knight Foundation, Mozilla Foundation, Google, and Rhizome. <https://lauren-mccarthy.com>

## Machine Biography

**Clara Boj, Diego Díaz**

**Clara Boj (ES), Diego Díaz (ES)** research about the notion of public space transformed by new digital technologies. Their main works propose new devices (both conceptual and technological) that reformulate people's perception and experience of the urban environment. In many of their projects, they explore non-linear narratives to create narratives that combine layers of physical and digital information. Recently, they have been working with machine learning techniques to analyze how computers can understand and predict our future. [www.lalalab.org](http://www.lalalab.org)

## Membrane

**Ursula Damm**

**Ursula Damm (DE)** began as a sculptor and gradually incorporated multimedia devices into her work. She uses computer science and bio-cybernetic paradigms to artistically examine the potentials of forms of organization. She creates systems and arrangements in which animals, organisms, and humans meet in new ways and develop previously unknown meanings for each other in technical contexts. She has been developing exhibition activity since 1985 in art institutions, and at festivals and international theme exhibitions. <http://ursuladamm.de>

## Neuro Mirror

**Christa Sommerer & Laurent Mignonneau**

**Christa Sommerer (AT), Laurent Mignonneau (FR)** are internationally renowned media artists, researchers, and pioneers of interactive art. They are professors and head the Interface Cultures master program at University of Art and Design in Linz. They have participated in around 300 international exhibitions and their works can be found in collections around the world. They have also received numerous awards, such as ARCO BEEP Award (Madrid, 2016), Wu Guanzhong Art and Science Innovation Prize of the People's

Republic of China (2012), and Golden Nica Prix Ars Electronica Award (1994).

[www.interface.ufg.ac.at/christa-laurent](http://www.interface.ufg.ac.at/christa-laurent)

## Nihil Ex Nihilo

**Felix Luque**

**Felix Luque (ES)** is an artist whose work explores how humans conceive their relationship with technology and provides spaces for reflection on current issues. Using electronic and digital systems of representation, as well as mechatronic sculptures, generative sound scores, live data feeds, and algorithmic processes, he creates narratives in which fiction blends with reality, suggesting possible scenarios of a near future and confronting the viewer with her fears and expectations about what machines can do. (Text: Paul Waelder) <https://felixluque.com>

## Optimising for Beauty

**Memo Akten**

**Memo Akten (TR)** is a computational artist, engineer, and computer scientist working with emerging technologies to create images, sounds, experimental films, large-scale responsive installations, and performances. Fascinated by trying to understand the nature of nature and the human condition, he works in and draws inspiration from fields such as biological and artificial intelligence, computational creativity, perception, consciousness, neuroscience, fundamental physics, ritual, and religion. [www.memo.tv](http://www.memo.tv)

## Post-Contingent Coherence

**Miguel Ángel Rego** (Biography see below)

## Soliloquium

**Miguel Ángel Rego**

**Miguel Ángel Rego (ES)** Artist and researcher. PhD student at the CSIC Institute of Philosophy and at the Faculty of Fine Arts of the UCM with an FPU grant. He has had solo shows at MUSAC (Spain, 2019) and Galería Cero (Spain, 2016), and group shows at IMPAKT (The Netherlands, 2019), MUSAC, 2019, The Arts Center Diorama (UK, 2018), The Bargehouse (UK, 2017), Goethe Institut (China, 2016), Charim Gallery (Austria, 2016), Centre Civic Sant Andreu (Spain, 2016), Fabra i Coats (Spain, 2015), Sala de Arte Joven (Spain, 2015), and Casa Velázquez (Spain, 2015), among others. [www.miguelangelrego.com](http://www.miguelangelrego.com)

## **Speculative Artificial Intelligence / Exp. #2 (conversation)**

**Birk Schmithüsen**

**Birk Schmithüsen** (DE) is an audiovisual whose work explores emerging technologies that affect our everyday lives. He is interested in the actual functionality hidden behind the simple and intuitive user interface. In his artistic research he opens technological “black boxes.” In aesthetic experiments, Birk Schmithüsen explores non-perceptible, abstract concepts such as Artificial Intelligence, BigData, and Computer Vision as artistic media. The research results are staged in immersive new media installations. <http://birkschmithuesen.com>

## **Synaptic Passage**

**Daniel Canogar**

**Daniel Canogar** (ES) began his training in the world of photography but soon became interested in the possibilities of projected images and artistic installations. He has created numerous public works of a monumental nature with sculptural LED screens all over the world but also worked on emblematic monuments, such as the Arcos de Lapa (Brazil). He has held numerous solo exhibitions in galleries and museums such as Bitforms Gallery (US, 2020), Kubo-Kutxa (ES, 2019), Wilde Gallery (CH, 2018), and the American Museum of Natural History (US, 2010), among others. [www.danielcanogar.com](http://www.danielcanogar.com)

## **The Fall of the House of Usher I The Fall of the House of Usher II**

**Anna Ridler**

**Anna Ridler** (UK) is an artist and researcher interested in systems of knowledge and ideas around measurement and quantification. A core element of her work lies in the creation of handmade datasets. In doing so, Ridler is able to uncover and expose underlying themes and concepts while also inverting the usual process of constructing large databases. Ridler holds an MA in Information Experience Design from the Royal College of Art along with fellowships at the Creative Computing Institute at University of the Arts London (UAL). Her work has been exhibited at cultural institutions worldwide. <http://annaridler.com>

## **The Kitty AI: Artificial Intelligence for Governance**

**Pinar Yoldas**

**Pinar Yoldas** (TR) is an interdisciplinary designer/artist/researcher. Her work develops within biological sciences and digital technologies through architectural installations, kinetic sculpture, sound, video, and drawing with a focus on post-humanism, eco-nihilism, Anthropocene, and feminist technoscience. [www.pinaryoldas.info](http://www.pinaryoldas.info)

## **Doing Nothing with AI**

**Emanuel Gollob**

With his art practice, **Emanuel Gollob** (\*1991, AT) bridges aesthetic research, human—A.I. interaction, neuroscience and robotics. Gollob graduated at the University of Applied Arts Vienna with a diploma in Design Investigation (2019). Currently, he is artist in residency at MindSpaces, an EU research project in the STARTS initiative framework. Since 2020, he is a PhD candidate and part of the Creative Robotics research team at the University of Art and Design Linz. [www.emanuelgollob.com](http://www.emanuelgollob.com)

## **Uncanny Mirror**

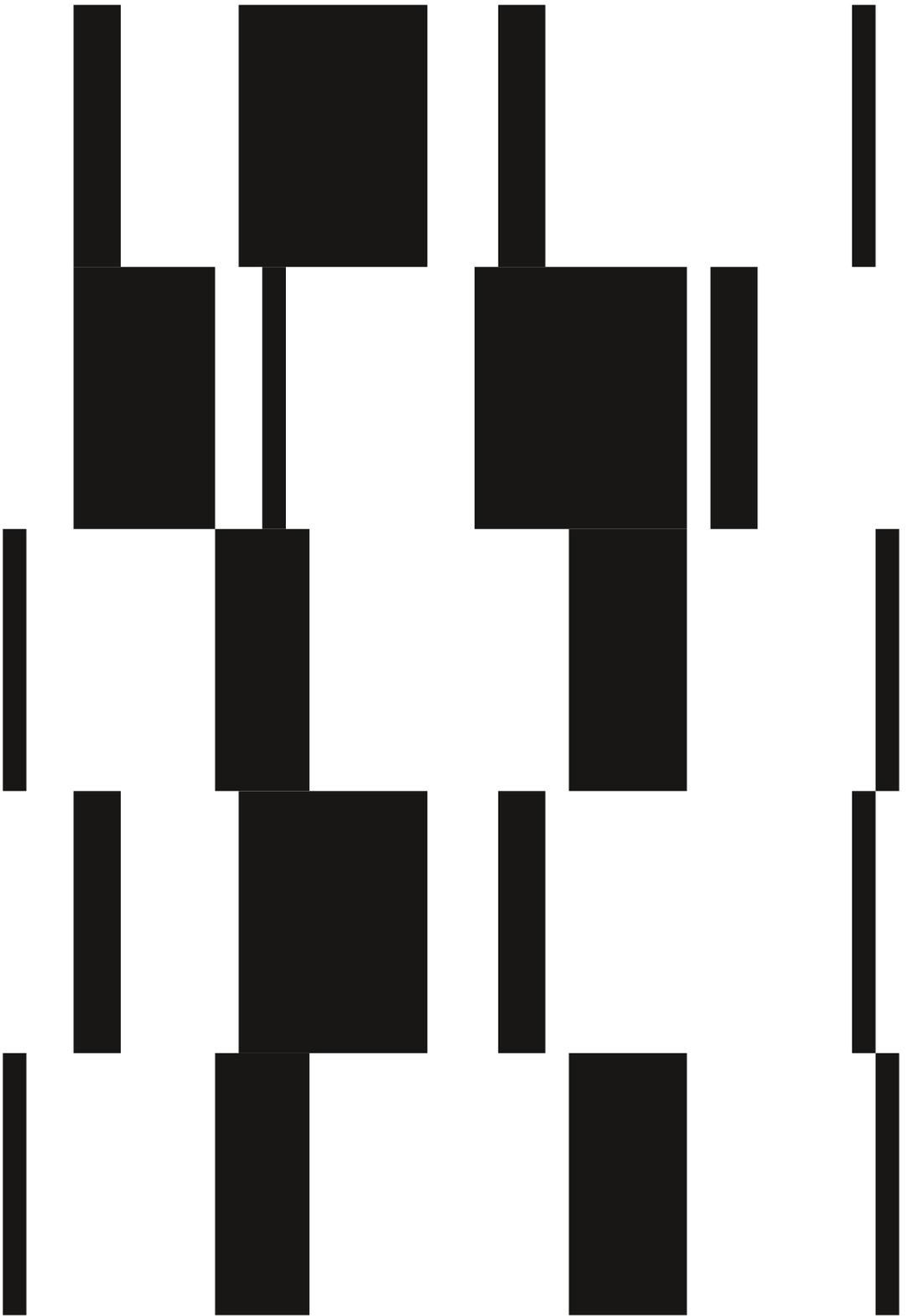
**Mario Klingemann**

**Mario Klingemann** (DE) is an artist who uses algorithms and artificial intelligence to create and investigate systems. He is particularly interested in human perception of art and creativity, researching methods in which machines can augment or emulate these processes, and has been recognized as a pioneer in the field of AI art, neural networks, and machine learning. He has worked with prestigious institutions including The British Library, Cardiff University, and New York Public Library, and is Artist in Residence at Google Arts and Culture. <https://quasimondo.com>

## **Feminist Data Set**

**Caroline Sindere**

**Caroline Sindere** (US) is a machine-learning design researcher and artist. For the past few years, she has been examining the intersections of technology's impact in society, interface design, AI, abuse, and politics in digital, conversational spaces. [carolinesindere.com](http://carolinesindere.com)



# Le lieu unique



Nantes, France

# Le lieu unique

Located in the heart of Nantes along the Canal Saint-Felix, from January 1, 2000 the former factory LU has been living a second life at the rate of an atypical and multidisciplinary arts center: le lieu unique.

A national center for contemporary arts and music venue in Nantes, le lieu unique is a space of artistic exploration and a convivial cultural ferment that mixes genres, cultures, and audiences. Its credo: the spirit of discovery in different fields of art (visual arts, theater, dance, circus, music, literature, humanities, architecture, comics, art taste, etc..).

Led by Eli Commins, le lieu unique promotes the opening up of minds, the exploration of interstitial and marginal spaces, and forms hybridization.

Every year, le lieu unique offers:

- over 100 theater, dance, and circus performances, as well as concerts, philosophical debates, etc.
- 150 conferences and debates
- over 200 days of exhibitions and residences for visual artists
- major events (festivals, cultural trails, etc.)
- nearly 650,000 visitors (of which, 190,000 spectators for the artistic activities)
- 120,000 visitors for the exhibitions

## A Little History

### From 1895 to 1985

In 1895, the Nantes-based biscuit makers Lefèvre-Utile (LU), famous for their petit beurre cookies, built a factory on Quai Ferdinand-Favre to develop new products.

The structure, made entirely of concrete and metal, was innovative for its time and the two magnificent junction towers, which were added in 1909, make it one of Nantes' most iconic buildings.

### From 1986 to 1999

In 1986, and decades of expansion later, LU moved its production out of the city center. Little by little, its factories were destroyed and only the annex of the Quai Ferdinand-Favre now remains standing. As of 1989, artists (in particular, the Royal de Luxe theater troupe) began taking over the abandoned structure and turning it into a place of atypical creativity.

In 1994, in this incredible abandoned building, the Centre de Recherche et de Développement Culturel (CRDC) / a national center for contemporary arts in Nantes, began to hold milestone cultural events: Les Allumées Le Caire (1994), Trafics (1996 – 97), Fin de siècle (1997 – 98 – 99).

On the strength of these successes, Jean Blaise, Director of the CRDC at the time, convinced the city of Nantes to preserve the building and transform it into a new type of living cultural space, that could also be a meeting place outside of exhibitions and performances.

In 1998, new restoration work began, conducted by Jean-Marie Lépinay for the only remaining tower, as well as the rehabilitation of the factory by Patrick Bouchain.

### Since 2000

January 1, 2000, le lieu unique was inaugurated and has become a utopian living space where conviviality meets the most contemporary forms of creativity, a space of artistic exploration, of cultural effervescence that mixes genres, cultures, and people.

# “Artificial Intelligence”: For a Willing Suspension of Belief

ONE—Well, yeah, I wouldn't be able to feel anything.

Joël—To simulate feeling anything.

UNE—Yes to simulate yes.

In this excerpt of Jöel Maillard's play<sup>1</sup> *Imposture Posthume*, which takes place in the relatively near future (2060), the main character is living in a civilization in which Artificial Intelligence (AI) is omnipresent. As someone who remembers the world “before AI,” he discourses on the strange, complex cohabitation between machines and humans—still alive thanks to their improbable longevity. In the excerpt, the character reminds his conversational AI that no matter what she says, she does not think or feel, but merely *simulates* thoughts and feelings. And the truth is that everything about her is a *simulation*, a simulacrum.

While the playwright has created a poetic and often zany—if deadpan—fiction, the text of the play and the stage directions nevertheless arouse startling insights about human relationships with “autonomous” machines, unleashing singular projections and interrogations about what we should anticipate as these technologies continue to develop. This is obviously not the first time the theater addresses social questions and deals with human desires and passions—indeed, they are the essence of the theater—but it is unusual for the theater to appropriate the contemporary subject of technology, particularly so-called artificial intelligence. Contemporary theater clearly has an important contribution to make to these questions. The artists and writers who address them often bring a vision and imagination about the future that result in disturbing insights, intuitions, and perspectives. They hold up a mirror to human dreams and desires as we confront the implications of these

technologies, whose impact on the daily reality of the entire human race is not benign. Nor is this the first time that the theater arts have inspired, shaped, or explored human-machine interactions. User-Experience (UX) systems belong to a long history of narrative simulations and metaphors, often inspired by practices and techniques from the theater or magic such as illusion, manipulation, “pretending,” and simulacrum. Brenda Laurel's foundational work of interface design, *Computer as Theatre* (1991), contains everything needed to understand the connection between the theater arts and digital design. Published in 2014, the book's second edition<sup>2</sup> remains an indispensable resource for those interested in the subject.

The design of human-machine interactions is thus an unexpected offspring of the theater, especially theater that explores the human condition, in an age of autonomous machines whose first interactive act is to simulate a human-human relationship. In other words, transforming computer-based agents into interpreters of their programs when they enter into contact with humans, or rather into software-controlled actors conceived by humans to “perform” for other humans. So what does this actually tell us about autonomous machines?

Before further considering how the contemporary theater responds to this question, a quick reminder that the term “AI” does not refer to a specific technology but is instead a marketing term intended to somehow “magically” package a group of computerized processes in order to attract investors. Jaron

Lanier and Glen Weyl echo this in their 2020 article in *Wired*, “AI is an Ideology, Not a Technology.”<sup>3</sup> They also point out that the myth of AI’s independence from—as opposed to interdependence with—humans entirely overlooks these software technologies’ potentialities.

The first point is never to forget that humans develop these technologies and that the celebrated “data” that are fed into them are also produced by humans. Which implies that they are flawed by highly problematic biases<sup>4</sup> when they are not ethically guided and corrected! The second point is the narrative—illusory and mendacious—about the supposed autonomy of these technologies, which need constant human attention to program them, supply them, and correct them (think of the well-known “Captcha” ...), as well as replace them. The legendary Mechanical Turk<sup>5</sup> (a 17th-century hoax in which a supposedly chess-playing automat contained a hidden human who activated its mechanisms) remains very relevant today. In *En attendant les robots: enquête sur les travailleurs du clic* [Waiting for Robots: An Inquiry into Click Workers],<sup>6</sup> the sociologist Antonio Casilli deconstructs the illusion of intelligent automation by revealing the realities of digital labor: the exploitation of the “little hands” of “artificial” intelligence, myriad click-drones, algorithmically managed by platforms that are reconfiguring and jeopardizing human labor.

This could be how the contemporary theater can best contribute to debates surrounding AI. Like Shakespeare, who entertainingly but deeply probed human dreams and passions, or Harry Houdini, who unmasked the charlatanism behind spiritualism, the arts of today can help demystify mythologies surrounding AI so that we can develop a more enlightened, even

emancipated approach to these technologies. In other words, they can help us renew a democratic dialogue about the potentials and choices related to tools that shape our everyday lives.

The issue of digital labor has sometimes been evoked indirectly in works of theater, like in Jean Peltier’s *Zoo*,<sup>7</sup> in which a character’s conversational AI is “hacked” by a click worker and engages in a philosophical discussion that the program is incapable of processing. The question usually addressed by theater is human-machine relations and the problem of substituting robots for humans.

It is important to remember that the term “robot” originated with the theater in a 1920 play by Karel Capek entitled *R.U.R.*<sup>8</sup> This visionary play, along with the author’s own extensive exchanges with a conversational AI, was the basis for *Artefact*, a play with no human actors by the author and director Joris Mathieu.<sup>9</sup> In anticipation of what the future may hold, a fictional AI who is a Shakespeare fan guides the audience, propelling the narrative and, simulating a human stage director, uses his robotic arm to direct the action onstage. Although there are no humans onstage, the audience is invited to speak with the troupe’s (human) actors after the curtain falls because the show raises so many questions. The human need for exchanges and discussion is also featured in *Uncanny Valley*,<sup>10</sup> in which Thomas Melle built a robotic replica of himself that can deliver shows/lectures without his physical presence. Although the direction by Stefan Kaegi (of Rimini Protokoll) highlights the disturbing strangeness of this programmable marionette, the problem for spectators is their intrinsic ability to “willingly suspend disbelief,” even in the face of a robot that explains to them that it is only a simulation. A simulacrum.

### Confronting Fiction with Fiction

In the show *Killing Robots*, author and director Linda Blanchet plunges us into the very real adventures of Hitchbot, a hitch-hiking robot equipped with conversational AI that is the product of a scientific experiment on human-machine empathy. The show highlights the human ability to spontaneously form a bond with the robot and to treat it like a companion or some kind of domestic animal. The suspension of disbelief works because we are driven by a desire for the presence of the “other” to comfort us as we face existential solitude. Awareness of this phenomenon does not diminish this spontaneous rush of willing belief—facing a robot-actor—but it allows us to distance it after the play ends...

This potential introspection that leads us to rethink AI and human-machine relationships definitely does not imply a refusal of technology, but a critical examination of the world that we would like to build with it. Similarly, this is not about denigrating research into possible therapeutic uses of these phenomena, derivatives of which are available to the public, including a robot named Qoobo that introduces itself as a “tailed cushion that heals your heart.”<sup>12</sup>

But the AI in *Artefact*, Thomas Melle’s replica robot in *Uncanny Valley*, and the Hitchbot2 specifically designed for *Killing Robots* involve actors who openly present themselves as such in plays that are overtly framed as theater. These are fictional characters, even if they have sometimes required great technological prowess to bring them to the stage. The same principles drive video games to stage dynamic situations using décor, characters, and even dialogues. We are in openly-declared fictions and, as humans, we consciously interact in them. Naturally, the enchantment produced by

immersion in the narrative is deployed through forms of interaction that are different from theater or literature, but the process is the same—a simulacrum that is accepted as such. In the game *Event[O]*,<sup>13</sup> we play a solitary character stuck in a retro-futuristic space station in first-person-3D, where our only interlocutor is the central AI, with which we can only communicate in text mode using consoles located throughout the vessel. The exchanges with the AI allow us to progress through the thread of the narrative and eventually to escape. The game was hailed by critics for employing a genuine AI conversational engine as the mechanical principle of gameplay. In other words, the player has to negotiate with the AI character programmed for the game, understand how it works, and cause it to execute the actions required in order to escape (such as opening an airlock, activating the oxygen, etc.). In conversations with Emmanuel Corno, the game’s head designer and both a game designer and programmer, we discussed the obvious parallel between constructing and programming the AI character for *Event[O]* and writing a character for theater and directing actors onstage. In other words, both involve creating an interpreter to deliver a fictional narrative to an audience.

This intriguing convergence in ways of conceptualizing fictional characters, however, also leads to questions about characters in our daily lives, including the “intelligent personal assistants” in our smartphones, personal computers, or other connected speakers. Like the AIs in performances and games referred to earlier, these software programs have characters that are designed—including names—and despite these functions are merely fictional narratives. Although the problematics surrounding these software programs/

characters, particularly in terms of sexism or racism, have already been pointed out, in particular by UNESCO,<sup>14</sup> the contemporary theater—like the science fiction literature that has sometimes inspired it—also explores the question of how we will live together in a world shared by humans and relational machines. It is precisely this question that is at the heart of Joël Pommerat’s performance piece, *Contes et legends* [Stories and Legends]<sup>15</sup> which projects a group of adolescents fully engaged in forming their identities into a robotic dystopia. Alongside philosophers, human science researchers, and technology designers, the contemporary theater has a powerful role to play in society-wide conversations about AI. By framing things through new perspectives and alternative imaginaries, and by reminding us about the nature of the simulacrum underlying human-machine interactions, the narrative and theater arts paradoxically support our voluntary suspension of belief about technological fictions, which in turn helps us develop an emancipated, socially beneficial vision of the role that these tools can play within a humanistic approach to cybernetics.

**Nicolas Rosette**, *Le lieu unique*

- 1 Joël Maillard (2019), *Imposture Posthume*. Lausanne, Switzerland
- 2 Brenda Laurel (2014), *Computers as Theatre*, Second Edition. Pearson Education (ISBN-13: 978-0-321-91862-8/ISBN-10: 0-321-91862-2)
- 3 Jaron Lanier et Glen Weyl (2020). “AI is an Ideology, Not a Technology” in *Wired*, March 2020. <https://www.wired.com/story/opinion-ai-is-an-ideology-not-a-technology/> (accessed May 2021)
- 4 Ali Breland (2017). “How white engineers built racist code—and why it’s dangerous for black people.” In *The Guardian*, December 2017. <https://www.theguardian.com/technology/2017/dec/04/racist-facial-recognition-white-coders-black-people-police> (accessed May 2021)
- 5 [https://en.wikipedia.org/wiki/Mechanical\\_Turk](https://en.wikipedia.org/wiki/Mechanical_Turk) (accessed May 2020)
- 6 Antonio Casilli (2019). *En attendant les robots: enquête sur les travailleurs du clic*. In *Collection La couleur des idées* 2019, éditions Seuil. EAN 9782021401882 (in French)
- 7 Jean Peltier (2019). *Zoo*. Text and creation 2021. Nantes (France)
- 8 Karel Capek (1920). *R.U.R.*, translated from Czech to French by Jan Rubeš, *Regards croisés*, 1997. Éditions de l’Aube (ISBN 2-87678-374-6)
- 9 Joris Mathieu, with the company Haut et Court (2017). *Artefact*, text and creation 2017. Lyon (France)
- 10 Rimini Protokoll (Stefan Kaegi) and Thomas Melle (2018). *La vallée de l’étrange*, text and creation. Munich (Germany)
- 11 Linda Blanchet (2019). *Killing Robots*, text and creation. Nice (France)
- 12 <https://qoobo.info/index-en/> (accessed May 2021)
- 13 Emmanuel Corno (2016). *Event[O]*. Ocelot Society. [https://en.wikipedia.org/wiki/Event\\_O](https://en.wikipedia.org/wiki/Event_O) (accessed May 2021)
- 14 UNESCO (2019). *I’d blush if I could: Closing gender divides in digital skills through education*. <https://unesdoc.unesco.org/ark:/48223/pf0000367416.page=1> (accessed May 2021)
- 15 Joël Pommerat (2019). *Contes et Légendes*, text and creation. La Rochelle (France)

# Activities

## Conferences

### **Question(s) d'éthique—Demain, surhumains ?**

Cerveau stimulé: esprit augmenté ?

Le lieu unique, Nantes, FR

30.11.2018

Jean Noel Missa (BE), Pierre Pollak (FR), Bernard Baertschi (CH), Jean-Luc Vénisse (FR)

### **Question(s) d'éthique—Demain, surhumains?**

Robots et e-santé, jusqu'où faire confiance à l'I.A.?

Le lieu unique, Nantes, FR

30.11.2018

Daniela Cerqui (CH), Raja Chatila (FR), Jacques Lucas (FR), Marion Tartarin (FR), Jean-Luc Vénisse (FR)

### **Nos futurs**

La compétition mondiale en intelligence artificielle

Le lieu unique, Nantes, FR

05.11.2019

Charles Thibout (FR)

### **Nos futurs**

La fusion cerveau-machine: science-fiction ou futur probable?

Le lieu unique, Nantes, FR

14.11.2019

Catherine Vidal (FR)

### **La Femme Machine**

#### **La machine aux mille visages**

Shown at Ars Electronica Festival 2020

Le lieu unique, Nantes, FR

12.09.2020

Clotilde Chevet (FR)

### **La Femme Machine**

#### **Dans le sillage d'Octavia Butler, théoricienne des cyborgs**

Shown at Ars Electronica Festival 2020

Le lieu unique, Nantes, FR

12.09.2020

Oulimata Gueye (FR)

### **La Femme Machine**

#### **L'I.A., pas sans elles: comprendre et lutter contre les biais sexistes des algorithmes**

Shown at Ars Electronica Festival 2020

Le lieu unique, Nantes, FR

13.09.2020

Aude Bernheim (FR)

### **La Femme Machine**

#### **Mon robot est-il une femme?**

Shown at Ars Electronica Festival 2020

Le lieu unique, Nantes, FR

13.09.2020

Sakka Sophie (FR)

## Other Activities

### **La vallée de l'étrange / Uncanny Valley**

Performance

Le lieu unique, Nantes, FR

21.11.2019 – 24.11.2019

Rimini Protokoll (CH)

### **La Femme Machine**

Shown at Ars Electronica Festival 2020

Concert

Le lieu unique, Nantes, FR

12.09.2020

Felicia Atkinson (FR)

### **Golem Mécanique**

Shown at Ars Electronica Festival 2020

Concert

Le lieu unique, Nantes, FR

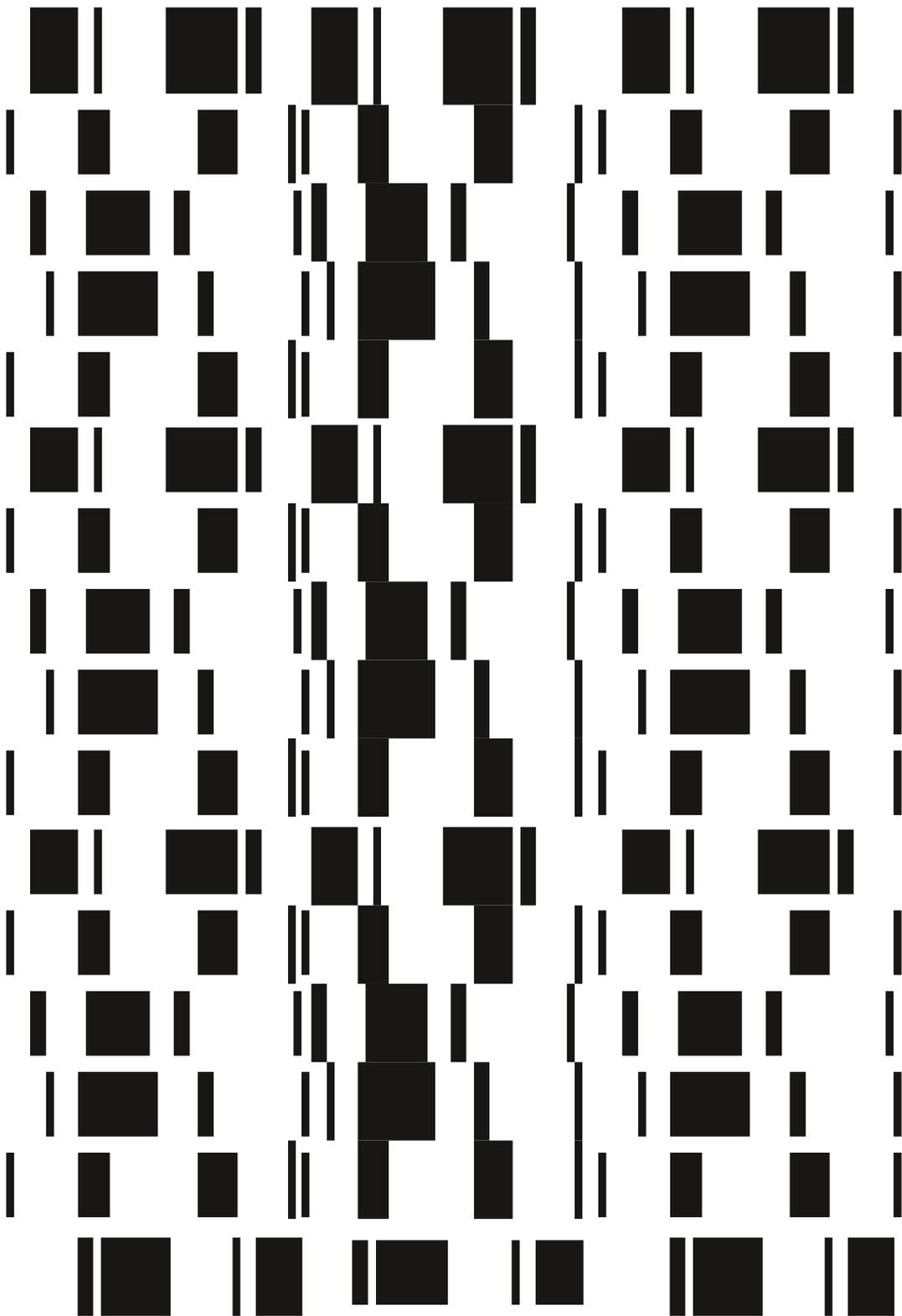
13.09.2020

Karen Jebane (FR)

## Ars Electronica Garden 2020



<https://u.aec.at/5CEA1883>



# Onassis Stegi

**ONASSIS  
STEGI**

Athens, Greece

# Onassis Stegi

Onassis Stegi is the place where contemporary culture meets aesthetics and science. The place where courageous, restless, daring Greek artists find the means to showcase their work; the place where international collaborations are nurtured; the stage on which the boundaries between science, art, technology, society, education, learning, and politics are renegotiated. Above all, Onassis Stegi is the space where questions are asked that feed the mind and spirit and have the ideal ultimate goal of generating actions, interventions, and ideas which shape and shake society.

Onassis Stegi is a multi-disciplinary cultural space founded by the Onassis Foundation in Athens, hosting events and actions across the whole spectrum of the arts from theater, dance, music, and visual arts to digital and hybrid art, with an emphasis on contemporary cultural expression, on supporting Greek artists, on cultivating international collaborations, and on educating children and people of all ages through life-long learning. Since 2010, Onassis Stegi has been providing educational programs for children, school students, families, young adults, educators, and other professionals, introducing new media and technologies as catalysts of creativity and

change. Each season's educational programs reach out in dozens of different directions, but all follow the same simple philosophy: boundless curiosity, inclusivity, group learning, and a range that embraces everyone.

True to its mission to forge links with important institutions beyond Greece's geographical borders, Onassis Stegi is an active participant in several international networks for the exchange of ideas and artistic practices and collaborates with international organizations seeking to encourage creativity and innovation in the cultural sphere.

The Onassis Stegi has a strong focus on new media and digital art and it runs a regular series of lectures and workshops. Over the past years it has organized several hackathons bringing together artists, coders, designers, and other creative groups. It has hosted exhibitions presenting the impact of digital technologies, most notably "Digital Revolution" and "Science Fiction" (in collaboration with the Barbican Centre) and "Hybrids" in collaboration with Ars Electronica and the exhibition "You & AI: Through the Algorithmic Lens" within the framework of the European ARTificial Intelligence Lab project.

## Co-habitation with Technology in a Post-human World

Societies are made of data and dreams. Artificial Intelligence is the condition that makes the implicit explicit, that speaks out the tacit, that brings into light the darkest corners of the multitude of our existence. In this context, art comes as the difference that

makes a difference: it reveals our relationship with ourselves, our policy and our institutions. It poses critical questions in terms of our relationship with the environment, natural and built, our individual and collective subjectivity, and our ability and willingness to shape a

common future. At the same time art can render visible ways of seeing, using, and even subverting AI that open new possibilities of our co-habitation with technology in a post-human world. Our curatorial practices are reflective of such an approach and for the 2020–2021 season at Onassis Stegi include:

**(a)** The organization of a multi-disciplinary festival under the title “You and AI: Through the Algorithmic Lens” curated by Irini–Mirena Papadimitriou. The festival includes an exhibition in a central park in Athens, a virtual exhibition, a conference on art, and AI and an academic summer school on AI Ethics and Research. We approach AI in terms of a critical factor for developing the *new subjectivity* of human-non-human constellations, a heuristic for re-thinking and appreciating both our democratic and our security institutions, and finally as an opportunity to re-approach our relationship with the environment in the Anthropocene. In the AI Hackathon we attempt to face the dilemmas of Algo-cities, that is cities that are both heavily mediated by AI technologies and are the expressions of the deep wounds of its residents. Can AI heal these wounds or is it just an amplifier of our pains? Will these pains give birth to a new future or will they reimpose our collective past as an inescapable future? The festival, at its heart, begs the question of what is real and what not, what are the boundaries of our subjectivity and to what extent we embrace or reject constructed forms of collective identity as real or fake, desirable or despicable.

**(b)** A series of artistic residencies under the program “Geographies of AI,” exploring the boundaries between data science, urban design, and art. What are the boundaries of Artificial Intelligence (AI) and how does it (re)define space as a result of a process of constant algorithmic mediation of physical spaces and human interaction? Does our ubiquitously algo-mediated life entail a new form of existence that is profoundly post-

human? How does the urban environment change as a result of AI and IoT applications and what does that mean for urban dwellers that co-inhabit multiple realities physical and digital at the same time? The duo Stephanie Hankey and Marek Tuszynski (Tactical Tech) examines how specific technologies observe, screen, enforce, and attempt to modify humans and the spaces they move within, mediating the relationship between body, architecture, and geography. Frederik de Wilde’s project explores the hyper extraction of natural and economically valuable resources using advanced mining acceleration technologies by the means of hyperspectral imaging, artificial intelligence, and data-driven decision-making.

**(c)** In our educational programs we explore the impact of the data-fiction of life: starting with an explanation of what is AI in its different forms, we move further to the exploration of the boundaries of algorithmic thinking and practices. The series “Archives in Motion” give us an understanding of the ways in which our constant emissions of data produce a residue on which we built our collective existence. Through simple exercises we seek to appreciate our role as archivists of our own lives and as messengers for the generations to come. Will we be able to pass on the message? The 2021 school competition on open technologies poses the question of the deployment of AI in education. What does it mean? How is it manifested? How does it change the way in which we educate and are educated? What is the future of schools? Is AI a teacher, a pencil, or the brightest student in the classroom? Is AI the classroom itself? Overall, Artificial Intelligence informs and forms our curatorial practices not just as a theme, but rather as a rhythm that is intertwined in all our work, pretty much like in our lives.

**Prodromos Tsiavos**, Head of Digital & Innovation at Onassis Foundation

# Activities

## Conferences

### On Art & AI

Online

29.06.2021 – 30.06.2021

Anna Ridler (UK), Suzanne Kite (US), Morehshin Allahyari (US), Stephanie Dinkins (US), Tamiko Thiel (CA), Melanie Lenz (UK), Sarah Allen (UK), Jonas Lund (SE)

## Exhibitions

### You and AI

#### Through the Algorithmic Lens

Pedio tou Areos public park, Athens, GR

24.06.2021 – 18.07.2021

The Wandering Mind—slow immediate (Gershon Dublon, Xin Liu) (CN/US); The Normalising Machine—Mushon Zer-Aviv, Dan Stav, Eran Weissenstern (IL); Insulae (Of the Island)—Nye Thompson (UK); EVERY THING EVERY TIME—Naho Matsuda (DE/JP); ABRA—Hiba Ali (US); Voicing Erasure—Algorithmic Justice League (US); Before The Bullet Hits The Body—Bill Balaskas & Stop LAPD Spying Coalition (GR) (US); Zizi—Queering the Datase—Jake Elwes (UK); Learning to See: Gloomy Sunday—Memo Akten (TR); Deep Meditations: A Brief History of Everything—Memo Akten (TR); The 7 Principles of Data Feminism—Catherine D'Ignazio & Lauren F. Klein (US); Content Aware Studies—Egor Kraft (RU), #WhenWordsFail—Stephanie Dinkins (US); Counting Craters on the Moon—Kyriaki Goni (GR); CUSP—Jake Elwes (UK); Circadian Bloom—Anna Ridler (UK); Bird Language—Helena Nikonole (RU); Encounters with Acquatic Chimeras—Sofia Crespo (DE); The Substitute—Alexandra Daisy Ginsberg (UK); nimia cētī—Jenna Sutela (FI); Excerpts from Asunder—Tega Brain, Julian Oliver & Bengt Sjöln (AU/DE); Epigraph for non physical entities spirits that exist outside material cultures—Katerina Kana (GR); Technologies of Hope: 100 Responses to the Pandemic.—Stephanie Hankey (UK) & Marek Tuszynski (Tactical Tech) (PL); HYPERMINER\_EXTRACTED EARTH—Frederik De Wilde (BE); Faces2Voices—Helena Nikonole (RU) and Nikita Prudnikov (RU).

## Residencies

### Geographies of AI

Online

2020 –2021

HYPERMINER\_EXTRACTED EARTH—Frederik De Wilde (BE)

Technologies of Hope: 100 Responses to the Pandemic – Stephanie Hankey (UK) & Marek Tuszynski (Tactical Tech) (PL)

## Workshops

### Archives in Transit I

#### From The World of Libraries To

#### Artificial Intelligence

Onassis Library, Athens, GR and local public high schools in Athens, GR

29.11.2019 – 15.02.2020

Maria Varela (GR), Nikos Voyiatzis (GR), Marianna Zikou (GR), Revekka Kefalea (GR), Elias Stouraitis (GR)

### Archives in Transit I

#### From The World of Libraries To

#### Artificial Intelligence

Online

19.11.2020 – 17.12.2020

Nikos Voyiatzis (GR), Elias Stouraitis (GR)

### Archives in Transit II

#### Artificial Intelligence, Art and The Environment

Online

01.04.2021 – 30.05.2021

Nikos Voyatzis (GR), Elias Stouraitis (GR), Georgios Voutos (GR), Nicole Godsil (GR), Christos Vrettos (GR)

## Ars Electronica Garden 2020



<https://u.aec.at/1E7ECF3E>

# Projects



## #WhenWordsFail

Stephanie Dinkins (US)

It is easy to believe that words are the pinnacle of human expression. Yet, art, song, dance, gesture, ritual, sport, stillness, violence, letting go, and so on, can invite and allow for expressions that are less filtered and more open than words typically are. *#WhenWordsFail* is a WebXR experience that creates space for the nonverbal expression of feelings bubbling just below the surface. Words are often inadequate to express the depth and often invisible impact of our experiences. What happens when words are not enough? How do you express yourself? How is meaning made and understood? *#WhenWordsFail* provides the public space to add expression to public discourse. It honors ways of knowing and feeling customarily masked by the perceived efficiency of words. It is a collective argument and evidence for the way we are feeling now.



Helena Nikonole

## Bird Language

Helena Nikonole (RU)

*Bird Language* explores the possibilities of AI within the context of bio-semiotics. In the work, artificial intelligence is looking for patterns within bird sounds to build a mathematical model of the structure of bird language. In the first stage of the project, the artist trained a neural network on the sounds of nightingales to create communication between non-human agents: birds and artificial intelligence. This is a metaphor for communication between nature and technology in which a human being is not necessary. The second stage of the project is the creation of an AI-translator from bird language to human language. AI reveals the language structure and lets us deconstruct the bird language into a series of phonemes, which we can use to build an AI-translator for interspecies communication.



## Before the Bullet Hits the Body

Bill Balaskas (GR), Stop LAPD Spying Coalition

*Before the Bullet Hits the Body* takes its title from the seminal 2018 report by the Stop LAPD Spying Coalition, which led to the dismantlement of the Los Angeles Police Department's (LAPD) "predictive" policing programs. The algorithm presented at Pedion tou Areos describes an area's predicted crime rate based on its historical average rate of crimes combined with recent trends. The Coalition's community organizing expanded the critique of the LAPD's algorithm beyond just questioning the "feedback loop," showing how police use the veneer of science to mask their violence. Thus, exposing crime data as a social construct intended to contain,

control, and criminalize Black, brown, and poor communities. The Coalition argued that surveillance and crime data create the conditions of police violence "before the bullet hits the body." Those conditions include incidents of police brutality like the 2020 killing of George Floyd, which led to global protests by the Black Lives Matter movement. The installation adopts the visual language of these protests, which included slogans written on major roads in the U.S. Along with the installation at Pedion tou Areos, the project consists of a curated presentation of the Stop LAPD Spying Coalition's work on Stegi's website and a series of online discussions.



## Abra

Hiba Ali (IL/US)

*Abra* is in conversation with Amazon's customer-obsessed mascot, Peccy. Their discussion about working-class labor, surveillance and bubbles (economic, social, and soap filled), literally paints the video orange. They contend that orange is the contemporary color of labor and surveillance, it is racialized and classed.

Directed and edited by Hiba Ali. Shot by Emily Pelstring, 2018

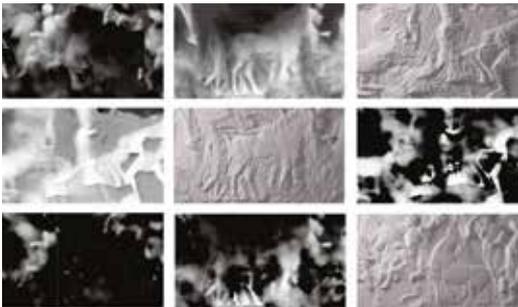
Anna Ridler



## Circadian Bloom

Anna Ridler (UK)

*Circadian Bloom* is a screen-based visual clock that tells the time through flowers. Inspired by Carl Linneaus's concept of a flower clock, a planted garden that would tell the time through the circadian rhythms of plants, this piece only shows flowers that have the quality of being able to keep time, blooming at the appropriate point of the day. Constructed using a series of complex algorithms and working with a machine that can keep time to an atomic level, visually it obscures this accuracy and forces the viewer to contemplate other, non-human ways of telling time and how conceptually time works.

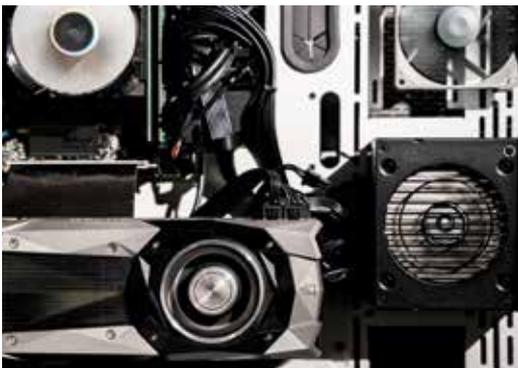


Stills from video *Parthenon Frieze Latent Space*, 2018; Single Channel Video, 20'00", Full HD Video

## Content Aware Studies

Egor Kraft (RU/AT)

*Content Aware Studies* explores the potential of artificial intelligence (AI) and machine learning (ML) to reconstruct and generate lost historical artefacts from Greek and Roman history. An algorithm capable of self-learning analyses 3D scans of sculptures and friezes in an effort to replenish lost fragments. Based on its analysis of the scans, the algorithm generates fragment models which are then 3D printed and used to fill the voids of the original sculptures and their copies. They render the work of synthetic agency that lends a faithful authenticity to the forms, while also producing bizarre errors and algorithmic normalizations of forms previously standardized and regulated by the canon of Hellenistic and Roman art.



Exhibition view "Content Aware Studies," 2019; alexander levy, Berlin, Germany.



## CUSP

Jake Elwes (UK)

A familiar childhood location on the Essex marshes (UK) is reframed by inserting images randomly generated by a neural network (GAN) into this tidal landscape. Initially trained on a photographic dataset, the machine proceeds to learn the embedded qualities of different marsh birds, in the process revealing forms that fluctuate between species, with unanticipated variations emerging without reference to human systems of classification. Birds have been actively selected from among the images conceived by the neural network, into a single animation that migrates from bird to bird, accompanied by a soundscape of artificially generated bird song. The work both augments and disrupts the natural ecology of the location, as flocks of native birds enter a visual dialogue with these artificial ones.



## Deep Meditations: A brief history of almost everything in 60 minutes

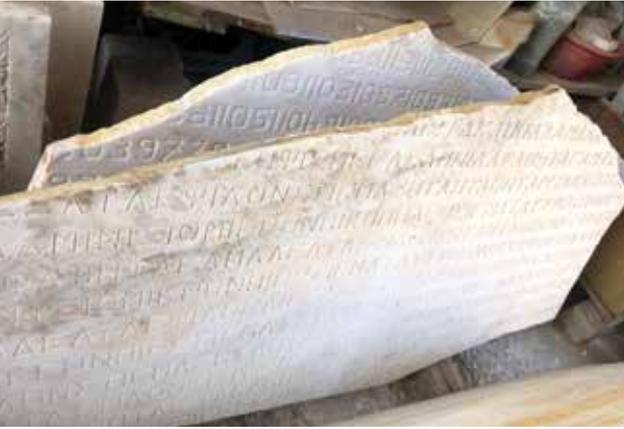
Memo Akten (TR)

*Deep Meditations: A brief history of almost everything in 60 minutes* is a large-scale video and sound installation; a multi-channel, one hour abstract film; a monument that celebrates life, nature, the universe, and our subjective experience of it. The work invites us on a spiritual journey through slow, meditative, continuously evolving images and sounds, told through the imagination of a deep artificial neural network. We are invited to acknowledge and appreciate the role we play as humans as part of a complex ecosystem heavily dependent on the balanced co-existence of many components. The work embraces and celebrates the interconnectedness of all human, non-human, living and non-living things across many scales of time and space—from microbes to galaxies.

*Deep Meditations: A brief history of almost everything in 60 minutes* at "Immaterial/Re-material: A Brief History of Computing Art", UCCA Center for Contemporary Art, Beijing, China, 2020 (c) Memo Akten

## Epigraph for non physical entities spirits that exist outside material cultures

Katerina Kana (GR)



Margarita Myrogianni

Numbers are the underlying substance of reality: technical or biological, physical or theoretical. Prime numbers—the limitless atoms of the mathematical world—are only divisible by themselves and one. Today, they are fundamental to computer science in its many different forms. The marble epigraph honors what has become a key element of contemporary civilization: computing. Improved algorithms are not only creating new AI structures and generations but taking over an anthropocentric culture as we have known it. A great shift is taking place. New codes, new conducts in society, new habits, customs, economical systems, educational processes, entertainment. Algorithms are shaping new templates of knowledge, beliefs, art, culture, science. Of this there is no doubt.

## Encounters with Aquatic Chimeras

Entangled Others — Sofia Crespo (AR) and Feileacan McCormick (NO)



Where do the boundaries between creatures lie? What makes a jellyfish different from, say, an insect? We can look to their respective environments, their shapes and their material or even their behaviors. No matter the angle we approach, much of how we sort our modern world starts with the visual. Before we could use genetics or had methods for systematic study, groupings usually lay in the rough visual appearance. Yet, even in times when we only had rudimentary observations as a basis for our worldview, stories of chimeras—fantastic creatures of hybrid origin—were told. Today, such chimeras are generally left in the realm of science fiction, but when we dive into aquatic biodiversity with deep learning, we're offered the potential to explore and imagine new worldviews. To re-enact tales of chimeras by machine generating encounters with fantastic organisms.

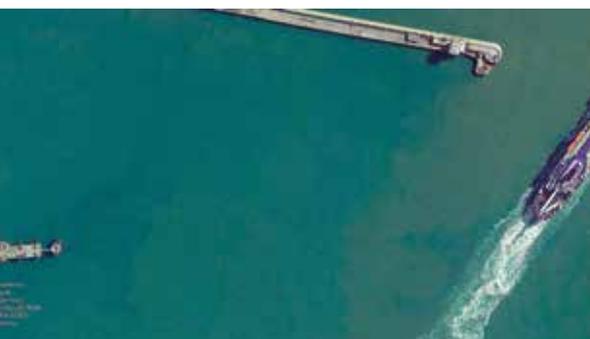


Naho Matsuda

## EVERY THING EVERY TIME

Naho Matsuda (DE/JP)

*EVERY THING EVERY TIME* uses various datasets from sensors, timetables and schedules, it strips data from numeric values, location information, and any data transmitting purpose and translates them into ephemeral, poetic narratives that give a glimpse into the ubiquity of technology in the urban space. On the electro-mechanical split-flap display appears real-time digital writing, which is drawing from the many “things” and “events” and changes of “status” that are constantly happening in a city. A meditation on the data that passes through the fabric of the city each day, *EVERY THING EVERY TIME* questions not only the role data has in our lives, but the use and value it has as it is collected. Can we see the urban landscape differently through the technologies that make sense of it?



## INSULAE [Of the Island]

Nye Thompson (UK)

Flying at drone height over glitching waves, *INSULAE [Of the Island]* contemplates the impact of island geography on national identity in the time of Brexit, through a perpetually looping digitally-reconstructed tour of the waters just off the British coastline. With the ocean as a metaphorical buffer between the UK and the rest of the world, the viewer is taken on a journey—endlessly circling the entire British mainland, obsessively patrolling these watery borders. The deeply emotive concept of the national border is re-framed as aesthetics through the distancing god’s gaze of the satellite imagery.



## The Data Feminism Infographic

Catherine D'Ignazio (US), Lauren F. Klein (US), Marcia Diaz Agudelo (CO/CA)

As data are increasingly mobilized in the service of governments and corporations, their unequal conditions of production, their asymmetrical methods of application, and their unequal effects on both individuals and groups have become increasingly difficult for artificial intelligence (AI) researchers—and others who rely on data in their work—to ignore. But it is precisely this power that makes it worth asking: “AI by whom? AI for whom? AI with whose interests in mind? The goal of this infographic, as with the project of data feminism, is to model how research can be transformed into action: how feminist thinking can be operationalized in order to imagine more ethical and equitable data practices.

[data-feminism.mitpress.mit.edu](http://data-feminism.mitpress.mit.edu)



## The Substitute

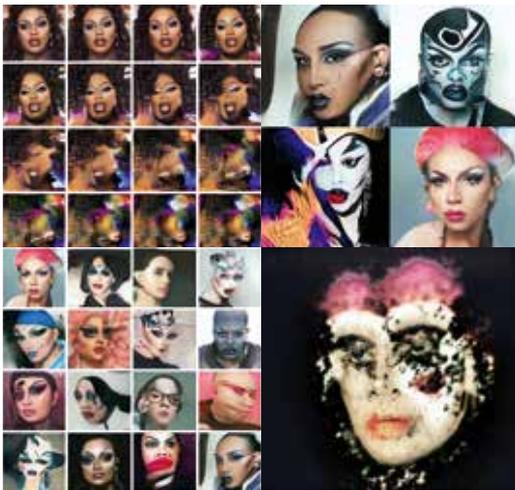
Alexandra Daisy Ginsberg (UK)

*The Substitute* explores a paradox: our preoccupation with creating new life forms, while neglecting existing ones. A northern white rhino is digitally brought back to life, informed by developments in the human creation of artificial intelligence (AI). The rhino performs as an artificial agent, an autonomous entity that learns from its environment. A life-size projection, 5m wide, shows the artificial rhino roaming in a virtual world, becoming more “real” as it comprehends the limits of the space. As the artificial rhino habituates to its space, its form and sound toggle from pixelation to lifelike—reminding the viewer that this living, breathing rhino, coming to life without its natural context, is entirely artificial. The experimental data is played on a second screen, showing the path and development of grid cells.



## Voicing Erasure Algorithmic Justice League (INT)

Is it okay for machines of silicon and steel or flesh and blood to erase our contributions? Is it okay for a machine to erase you and me? Is it okay for machines to portray women as subservient? Is it okay for Google and others to capture data without our knowledge? These questions and new research led by Allison Koenecke inspired the creation of *Voicing Erasure*, a poetic piece recited by champions of women’s empowerment and leading scholars on race, gender, and technology.



## Zizi—Queering the Dataset Jake Elwes (UK)

*Zizi—Queering the Dataset* aims to tackle the lack of representation and diversity in the training datasets often used by facial recognition systems. The *Zizi Project* (2019 —ongoing) is a collection of works by Jake Elwes exploring the intersection of Artificial Intelligence (AI) and drag performance. Drag challenges gender and explores otherness, while AI is often mystified as a concept and tool and is complicit in reproducing social bias. *Zizi* combines these themes through a deep fake, synthesized drag identity created using machine learning. The project explores what AI can teach us about drag, and what drag can teach us about AI.

*Zizi* was originally commissioned by Experiential AI at Edinburgh Futures Institute.



## Excerpts from *Asunder*

Tega Brain (AU), Julian Oliver (DE),  
Bengt Sjölnén (SE)

There is a growing interest in the application of artificial intelligence (AI) to critical environmental challenges. *Asunder* responds to this by situating this approach as a literal proposition. The project combines state-of-the-art climate and environmental simulation technology, a 144 CPU supercomputer and machine learning image-making techniques, to realize a hypothetical “environmental manager.” This environmental manager proposes and simulates future alterations to the planet to keep it safely within planetary boundaries, often generating completely unacceptable or absurd results. In doing so, *Asunder* questions assumptions of computational neutrality, our increasingly desperate reach for technosolutionist fixes to planetary challenges, and the broader ideological framing of the environment as a system.

**Presented at Onassis Stegi &  
Science Gallery Dublin**

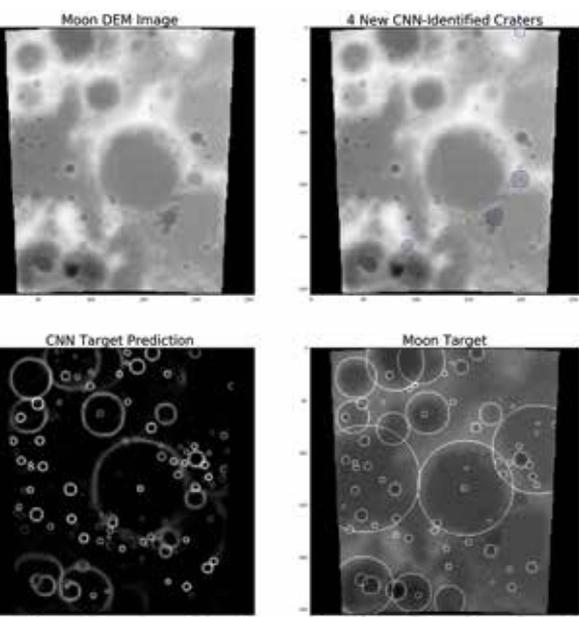


Fotomuseum Winterthur 2019–2020

## The Normalizing Machine

Mushon Zer-Aviv (IL), Dan Stavy (IL)  
and Eran Weissenstern (IL)

*The Normalizing Machine* is an interactive installation presented as an experimental research in machine learning. It aims to identify and analyze the image of social normalcy. Each participant is asked to point out who looks most normal from a lineup of previously recorded participants. Alphonse Bertillon, the father of the mugshot, developed “Le Portrait Parle” in the late 1800s. His statistical system was never meant to criminalize the face but it was later widely adopted by both the Eugenics movement and by the Nazis to do exactly that. The work visualizes how today’s systematic discrimination is aggregated, amplified, and conveniently hidden behind the seemingly objective black box of Artificial Intelligence.



<https://u.aec.at/B9684450>

## Counting Craters on the Moon

Kyriaki Goni (GR)

The video, part of the homonymous multimedia installation, presents an imaginary encounter between acclaimed Johann Friedrich Julius Schmidt (1825–1884) and neural network DeepMoon. DeepMoon was developed in March 2018 at the Canadian Institute for Theoretical Astrophysics University of Toronto. In 1858, Julius Schmidt became director of the new National Observatory of Athens in Greece. Both of them set out to count lunar craters, which provide valuable information for the past and possibly the future of our near solar system. Speculating upon the possible synergies between human and machine, this work is an invitation to imagine how we can learn from and with machines in order to build different, multiple and, possibly, collective understandings of the surrounding world and its cosmos.

[kyriakigoni.com/countingCraters.html](http://kyriakigoni.com/countingCraters.html)

**Presented at Onassis Stegi + Waag**



The work was produced during the “Geographies of AI” residency program at Onassis Stegi in the context of the European ARTificial Intelligence Lab 2020 residency program. Production by Tactical Tech.

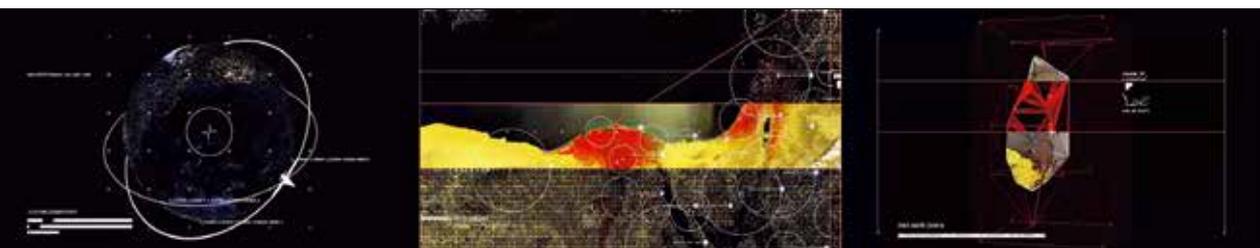
## Technologies of Hope:

**100 Responses to the Pandemic**

Stephanie Hankey (UK), Marek Tuszynski (PL)

*Technologies of Hope: 100 Responses to the Pandemic* is an artistic and research project that takes viewers on a journey through the world of one hundred such companies. Paying attention to their visual and verbal language, it sheds light on the costs of proposed “back to normal” scenarios and a “no touch future.” The project examines how the specific technologies being promoted observe, screen, enforce, and attempt to modify humans and the spaces they move within, mediating the relationship between body, architecture, and geography. Taking into consideration how techno-solutionism based on machine learning becomes the new *modus operandi*, this interactive piece explores how freedoms are threatened in the name of safety.

**Cultural Partners**



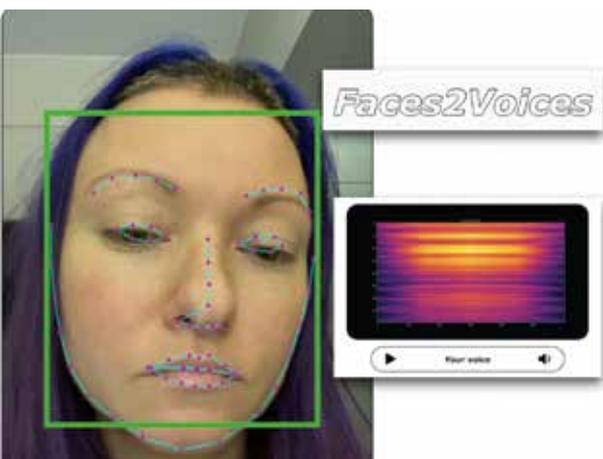
## HYPERMINER\_EXTRACTED EARTH

Frederik De Wilde (BE)

*HYPERMINER\_EXTRACTED EARTH* explores the hyper extraction of natural and economically valuable resources using advanced mining acceleration technologies by the means of hyperspectral imaging, artificial intelligence, and data-driven decision making. *HYPERMINER\_EXTRACTED EARTH*

The work was produced during the “Geographies of AI” residency program at Onassis Stegi in the context of the European ARTificial Intelligence Lab 2020 residency program.

is a speculative artistic project, and inquiry, exploring extraction and automatization by the means of artificial intelligence. The artwork, a triptych, shows the allocation, extraction, and recomposition of the most valuable natural resources found. The result is a new geode representing an extracted earth.



## Faces2Voices

Helena Nikonole (RU), Nikita Prudnikov (RU)

*Faces2Voices* is an online interactive installation which uses facial recognition technology and AI-synthesized sound to create a generative music composition based on imaginary voices of online visitors. The composition is evolving in time depending on the contributions of people involved. Lots of governments use surveillance technology as a way to control the spread of COVID-19. At the same moment, many citizens are ready to give up some privacy for the common good. But how can we define what level of privacy we should give up and how much data do governments really need to respond effectively? *Faces2Voices* focuses on critical approaches to AI technologies to explore exactly these kinds of questions. Online visitors can contribute to the project by granting access to their device's camera. AI then recognizes faces, synthesizes imaginary voices, and adds them to the live stream.

[Faces2voices.live](https://faces2voices.live)



## Learning to See: Gloomy Sunday

Memo Akten (TR)

Presented at Ars Electronica & Onassis Stegi

See page 83



## nimiia cétii

Jenna Sutela (FI)

Presented at LABoral Centro de Arte y

Creación Industrial & Onassis Stegi

See page 210



Yiess Hat (DVIC), Xin Liu

## The Wandering Mind:

You start to wonder  
whether it's a dream

slow immediate (CN/US)

Presented at Ars Electronica & Onassis Stegi

See page 84

# Artists

## #WhenWordsFail

Stephanie Dinkins

**Stephanie Dinkins** (US) is a transmedia artist who creates platforms for dialog about race, gender, aging, and our future histories. Dinkins' art practice employs emerging technologies, documentary practices, and social collaboration toward equity and community sovereignty. She is particularly driven to work with communities of color to co-create more equitable, values grounded social and technological ecosystems. Dinkins is a professor at Stony Brook University where she holds the Kusama Endowed Professorship in Art. <https://www.stephaniedinkins.com>

## Bird Language

Helena Nikonole

**Helena Nikonole** (RU) is a new media artist, independent curator, and educator interested in technological progress and its implications. Embracing hybridity, new aesthetics, bio-semiotics, and AI, Nikonole explores technology's potential opportunities, risks, and dangers. Nikonole focuses on the implications of new technologies that techno-evangelists and scientists are unable or unlikely to realize. She presents lectures and workshops in the field of Art and Science, and Machine Learning in arts at prominent institutions and her work has appeared in exhibitions and festivals worldwide. [nikonole.com](http://nikonole.com)

## Before the Bullet Hits the Body

Bill Balaskas, Stop LAPD Spying Coalition

**Bill Balaskas** (GR) is an artist, theorist, and educator, whose research is located at the intersection of contemporary politics, digital media, and visual culture. His works have been widely exhibited internationally, in museums, galleries, festivals, and public spaces. Balaskas is an Associate Professor and Director of Research, Business and Innovation at the School of Art and Architecture of Kingston University, London. [www.billbalaskas.com](http://www.billbalaskas.com)

**Stop LAPD Spying Coalition.** Formed in 2011, the Stop LAPD Spying Coalition is led by community members from diverse backgrounds, including youth, formerly incarcerated people, academics, undocumented immigrants, unhoused people, artists, community groups, and many more. Our organizing model is centered in the stolen Tongva territory called Los Angeles, but with regional, national, and international implications. We organize to expose the structure and function of police violence and end the adoption of counterterrorism and counterinsurgency tactics in local policing. [stoplapdspying.org](http://stoplapdspying.org)

## Abra

Hiba Ali

**Hiba Ali** (IL/US) is a producer of moving images, sounds, couture, and words. They are an Assistant Professor of New Media Artist/Feminist Discourse at the College of Design in the Art & Technology Program at the University of Oregon, Eugene, OR. Currently, they are a PhD candidate in Cultural Studies at Queens University in Kingston, Ontario. Their work has been presented worldwide and they have written for the following magazines: *C*, *THE SEEN*, *Newcity Chicago*, *Art Chicago*, *Art Dubai*, *The State*, *Medium's ZORA*, *RTV*, and *Topical Cream*. [hibaali.info](http://hibaali.info)

## Circadian Bloom

Anna Ridler

**Anna Ridler** (UK) is an artist and researcher who works with systems of knowledge and how technologies are created in order to better understand the world. She is particularly interested in ideas around measurement and quantification and how this relates to the natural world. Her process often involves working with collections of information or data, particularly data sets, to create new and unusual narratives. Her work has been exhibited widely at cultural institutions worldwide including the Barbican Centre, Centre Pompidou, HeK Basel, The Photographers' Gallery, the ZKM Karlsruhe, Ars Electronica, and the Victoria and Albert Museum. <http://annaridler.com>

## Content Aware Studies

Egor Kraft

**Egor Kraft** (RU/AT). Interdisciplinary artist and researcher Egor Kraft (b. 1986, Leningrad) lives and works in Berlin and Moscow. His practice spans across media, science, critical research, philosophy, and art. He graduated from Rodchenko School, Academy of Arts Vienna, Central St. Martins College and Strelka Institute. Egor was nominated for the Lumen Prize, Pulsar, Innovation, Kandinsky, and Re:Humanism amongst other prizes, and became a STARTS residencies fellow and Garage Museum Art & Technology Grant recipient. In 2017 he was included in the New East 100, a list of people and projects shaping our world today by *The Calvert Journal*. [egorkraft.com](http://egorkraft.com)

## CUSP

Jake Elwes

**Jake Elwes** (UK) is an artist living and working in London, UK. His recent works have looked at machine learning and artificial intelligence research, exploring the code, philosophy, and ethics behind it. In his art Jake engages with both the history and tropes of fine art and the possibilities and consequences of digital technology. He graduated with a BA in Fine Art from the Slade School of Fine Art (UCL), London in 2017. Jake's work has been exhibited in museums and galleries internationally and he has been featured on ZDF and BBC. [www.jakeelwes.com](http://www.jakeelwes.com)

## Deep Meditations: A brief history of almost everything in 60 minutes

Memo Akten

**Memo Akten** (TR) is a computational artist, engineer, and computer scientist working with emerging technologies to create images, sounds, experimental films, large-scale responsive installations, and performances. He has recently completed a PhD from Goldsmiths University of London in *AI / Deep Learning and expressive human-machine interaction*, and is Assistant Professor of Computational Arts at University of California, San Diego (UCSD). Akten received the Prix Ars Electronica Golden Nica for his work *Forms* in 2013 and has exhibited and performed internationally. [www.memo.tv](http://www.memo.tv)

## Epigraph for non physical entities spirits that exist outside material cultures

Katerina Kana

**Katerina Kana** (GR) is an artist based in Cyclades, Greece. In her practice she explores the emerging new reality of our contemporary world, using the techniques of ancient marble sculpture. She carves inscriptions on marble blocks, dedicated to the culture of a society embedded in computing tech and communities connected in 0s and 1s, algorithms, codes, and numerical data. Katerina Kana graduated from Saint Martin's School of Art and has exhibited work in art institutions, galleries, and off-sites such as theaters and clubs across Europe.

## Encounters with Aquatic Chimeras

Entangled Others—Sofia Crespo and Feileacan McCormick

**Entangled Others** is the shared studio practice of artists **Feileacan McCormick** (NO) and **Sofia Crespo** (AR). Their work focuses upon ecology, nature and generative arts, with an emphasis on giving the more-than-human new forms a presence and life in digital space. This involves exploring questions of relationship, biodiversity, and awareness through biology-inspired technologies. In turn, they highlight how through conscious efforts, new technology can be used to bring attention and awareness to the unseen with which we are tightly interwoven. *entangledothers.studio*

## EVERY THING EVERY TIME

Naho Matsuda

**Naho Matsuda** (DE/JP) is a German-Japanese artist, designer, and researcher based in London, UK. Her work explores the blurring boundaries of language and the technologies we use to communicate through. Her work includes installation, video, and print. It brings together the ordinary and the absurd to explore notions of labor, internet culture, emerging technology, and the commons. Naho currently holds a post as a researcher in the Interaction Research Studio at Goldsmiths University of London and teaches on the MA Graphic Design at Kingston School of Art. <https://www.nahomatsuda.com>

## INSULAE [Of the Island]

Nye Thompson

**Nye Thompson** (UK) is known for her experimental software architectures exploring network-embedded power dynamics and machinic visions of the world. In 2016 her first solo show was described by C4 News as "too shocking to broadcast," becoming global clickbait and triggering an international government complaint. Since then she's exhibited at venues including Tate Modern, The Barbican, The V&A, ZKM Karlsruhe, Ars Electronica, and The Louvre. Her work has been featured on BBC, C4, CNN, the *Guardian* and *WIRED*. She's been called "the new Big Brother" (*Vogue*) and "a contemporary Jacques Cousteau" (Bob & Roberta Smith). [nyethompson.net](http://nyethompson.net)

## The Data Feminism Infographic

Catherine D'Ignazio, Lauren F. Klein,  
Marcia Diaz Agudelo

**Catherine D'Ignazio** (US) is a scholar, artist/designer, and hacker mama who focuses on feminist technology, data literacy, and civic engagement. She has run reproductive justice hackathons, designed global news recommendation systems, created talking and tweeting water quality sculptures, and led walking data visualizations to envision the future of sea level rise. She is also Director of the Data + Feminism Lab that uses data and computational methods to work towards gender and racial equity, particularly in relation to space and place.

**Lauren Klein** (US) is an associate professor in the departments of English and Quantitative Theory & Methods at Emory University, where she also directs the Digital Humanities Lab. Before moving to Emory, she taught in the School of Literature, Media, and Communication at Georgia Tech. Klein works at the intersection of digital humanities, data science, and early American literature, with a research focus on issues of gender and race.

**Marcia Diaz Agudelo** (CO/CA) is a Colombian-Canadian designer, illustrator and motion graphics artist. Her work is inspired by her South American roots. She loves color, textures, rhythm, and complex subjects. She has worked as a designer on projects at the intersection of design, technology, and social justice. As a creative thinker she strives to find innovative ways of solving problems. Her work has been exhibited in Toronto and Mexico City. [marciadiaz.myportfolio.com](http://marciadiaz.myportfolio.com)

## The Substitute

Alexandra Daisy Ginsberg

**Alexandra Daisy Ginsberg** (UK) is an artist examining our fraught relationships with nature and technology. Daisy's work explores subjects as diverse as artificial intelligence, synthetic biology, conservation, and evolution, as she investigates the human impulse to "better" the world. She has exhibited at MoMA New York, the Museum of Contemporary Art, Tokyo, the National Museum of China, the Centre Pompidou, and the Royal Academy, with her first solo show at Vitra Design Museum in 2019. Her work is in collections at the Art Institute of Chicago, the Cooper Hewitt Smithsonian Design Museum, and ZKM Karlsruhe, among others.

## Voicing Erasure

Algorithmic Justice League

**Algorithmic Justice League** (INT) is a leading cultural movement towards equitable and accountable artificial intelligence. AJL is an organization that combines art and research to illuminate the social implications and harms of artificial intelligence. AJL's mission is to raise public awareness about the impacts of AI, equip advocates with empirical research to bolster campaigns, build the voice and choice of most impacted communities, and galvanize researchers, policymakers, and industry practitioners to mitigate AI bias and harms. [www.ajl.org](http://www.ajl.org)

## Zizi—Queering the Dataset

Jake Elwes

**Jake Elwes** (UK) is an artist living and working in London, UK. His recent works have looked at machine learning and artificial intelligence research, exploring the code, philosophy, and ethics behind it. In his art Jake engages with both the history and tropes of fine art and the possibilities and consequences of digital technology. He graduated with a BA in Fine Art from the Slade School of Fine Art (UCL), London in 2017. Jake's work has been exhibited in museums and galleries internationally. [www.jakeelwes.com](http://www.jakeelwes.com)

## Excerpts from Asunder

Tega Brain, Julian Oliver, Bengt Sjöln

**Tega Brain** (AU) is an Australian born artist and environmental engineer whose work examines issues of data, ecology, and infrastructure. She has created wireless networks that respond to natural phenomena, systems for obfuscating fitness data, and an online smell-based dating service. Her work has been shown in the Vienna Biennale for Change, the Guangzhou Triennial, and in venues like the Haus der Kulturen der Welt in Berlin and the New Museum, NYC, among others. She is an Assistant Professor of Integrated Digital Media, New York University. <http://www.tegabrain.com>

**Julian Oliver** (DE) is a Critical Engineer, artist, and activist based in Berlin. Exhibiting since 1996, his projects and lectures have been presented at many museums, international electronic-art events and conferences, including the Tate Modern, Transmediale, Ars Electronica, The Chaos Computer Congress, FILE,

and the Japan Media Arts Festival. Work made by Julian, or in collaboration with others, has received several awards. Julian has often dedicated his studies and knowledge in counter-surveillance, network engineering, information security, and systems administration to the assistance of at-risk groups, with a focus on environmental defense.

<https://julianoliver.com>

**Bengt Sjöln** (SE) is an independent software and hardware designer/hacker/artist based in Stockholm and Berlin with roots in the Atari demo scene. He collaborates within several networks like Weise7, Hackteria and Critical Engineering Working Group. His work follows many different threads spanning subjects such as biology, software radio, electromagnetic fields, and artificial intelligence. His work has been presented internationally in events like Arte Mov, Ars Electronica, Synthetic Times Exhibition, NTT ICC Tokyo, Venice Biennale of Architecture, ISEA, Pixelache, World Expo 2010, Transmediale, and The Glass Room.

<https://twitter.com/bengtsjolen>

## The Normalizing Machine

**Mushon Zer-Aviv, Dan Stavy and Eran Weissenstern**

**Mushon Zer-Aviv** (IL) is a designer, researcher, educator, and media activist based in Tel Aviv. His love/hate relationship with data informs his design work, art pieces, activism, research, teaching, workshops, and city life. He is the co-founder of Shual.com design studio and collaborates on multiple initiatives with the Public Knowledge Workshop. Mushon also designed the maps for Waze.com and led the design of Localize.city. Mushon is an alumni of Eyebeam, an art and technology center in New York. He is a senior faculty member at Shenkar College and has previously taught at NYU, Parsons, and Bezalel. [mushon.com](http://mushon.com)

**Dan Stavy** (IL) is a creative coder and media artist based in Tel Aviv. He specializes in interactive installations using sensors. Dan worked at Scott Snibbe studio in San Francisco, creating large art/science installations, and at Orad Ltd designing virtual sets. Dan exhibited as part of a Google DevArt at Fresh Paint art fair in Israel. He is a regular participant at Midburn, building art installations. Dan has a BSc in Computer Science from Ben Gurion university of the Negev and has finished a four-year program at HaMidrasha college where he specialized in media art. [stavdan.com](http://stavdan.com)

**Eran Weissenstern** (IL) is a Software Engineer based in New York. He's seeking the boundaries between imaginary and real; trying to bridge human and machine. Eran has designed and developed several interactive installations for museums, demos for startup companies, and gesture-based control paradigms for natural user interfaces. He holds several patents for gesture-based interfaces and is an expert in real-time image processing and visualization. Eran has an MSc and BSc in Computer Science and Computer Engineering from the Hebrew University of Jerusalem, Israel. [eranws.github.com](http://eranws.github.com)

## Counting Craters on the Moon Kyriaki Goni

**Kyriaki Goni** (GR) is an Athens born and based artist. Through multimedia installations she critically touches upon questions of datafication, surveillance, distributed networks and infrastructures, human and other-than-human relations. Her artistic practice incorporates research and interaction with scholars and scientists. She is a Delfina Foundation alumna (2019) and a Niarchos Artworks fellow (2018). She is the recipient of an Art Science Residency by Ars Electronica and Deutsche Telekom 2021. [kyriakigoni.com](http://kyriakigoni.com)

## Technologies of Hope: 100 Responses to the Pandemic

**Stephanie Hankey, Marek Tuszynski**

**Stephanie Hankey** (UK), **Marek Tuszynski** (PL) investigate the impact of technology on society and its relationship to social, environmental, and political issues. As well as running Tactical Tech, a Berlin-based international NGO which they founded together in 2003, they have been collaborating through teaching, writing, curating, and producing creative interventions for the last 20 years. Stephanie and Marek work across formats—exhibitions, art works, films, events, workshops, research, and writing—using the best way possible to tell stories, influence attitudes, and enable others to make informed choices. They are the co-authors of the essay “Efficiency and Madness,” and regularly teach at art and design schools in Europe as well as teach, write, consult, and speak on topics related to design, technology, rights, and ethics.

## HYPERMINER\_EXTRACTED EARTH

Frederik De Wilde

**Frederik De Wilde** (BE) is a Belgian conceptual artist exploring the inaudible, intangible, and invisible. He works on the interstice of art, science, and technology in physical and digital spaces and critically questions the impact of technology in society. An excellent example is the conceptualization of the pioneering original Blackest-Black (a new nano-engineered color for a new industrial revolution exploring the nature of nothingness) made in collaboration with Rice University and NASA. The project received the 2010 Ars Electronica Next Idea Award and the Best European Collaboration Award. The project inspired many people worldwide, most notably Sir Anish Kapoor (Vantablack).

<https://frederik-de-wilde.com>,

[https://www.instagram.com/studio\\_de.wilde](https://www.instagram.com/studio_de.wilde)

## Faces2Voices

Helena Nikonole, Nikita Prudnikov

Nikita Prudnikov (RU) (aka monekeer) is a musician, software architecture expert, and DSP enthusiast currently working in the field of applied machine learning in its connection with sound art. Nikita is an author of F L A K Y—a generative music framework used in live performances including: Ars Electronica Festival 2020, Gamma Festival, Prepared Surroundings, and others. Selected collaborations include the 2019 project *They is Here* with musician and artist Anastasia Tolchneva (lovozero) and *Interpolations*, a novel machine interpretation of *The Well-Tempered Clavier* (WTC) by J.S. Bach.

<https://soundcloud.com/monekeer>,

<https://twitter.com/gnhdnb>

## Learning to See

Memo Akten

**Memo Akten** (TR) is a computational artist, engineer, and computer scientist working with emerging technologies to create images, sounds, experimental films, large-scale responsive installations, and performances. He has recently completed a PhD from Goldsmiths University of London in AI / *Deep Learning and expressive human-machine interaction*, and is Assistant Professor of Computational Arts at University of California, San Diego (UCSD). Akten received the Prix Ars Electronica Golden Nica for his work *Forms* in 2013 and has exhibited and performed internationally. [www.memo.tv](http://www.memo.tv)

## nimiia cétii

Jenna Sutela

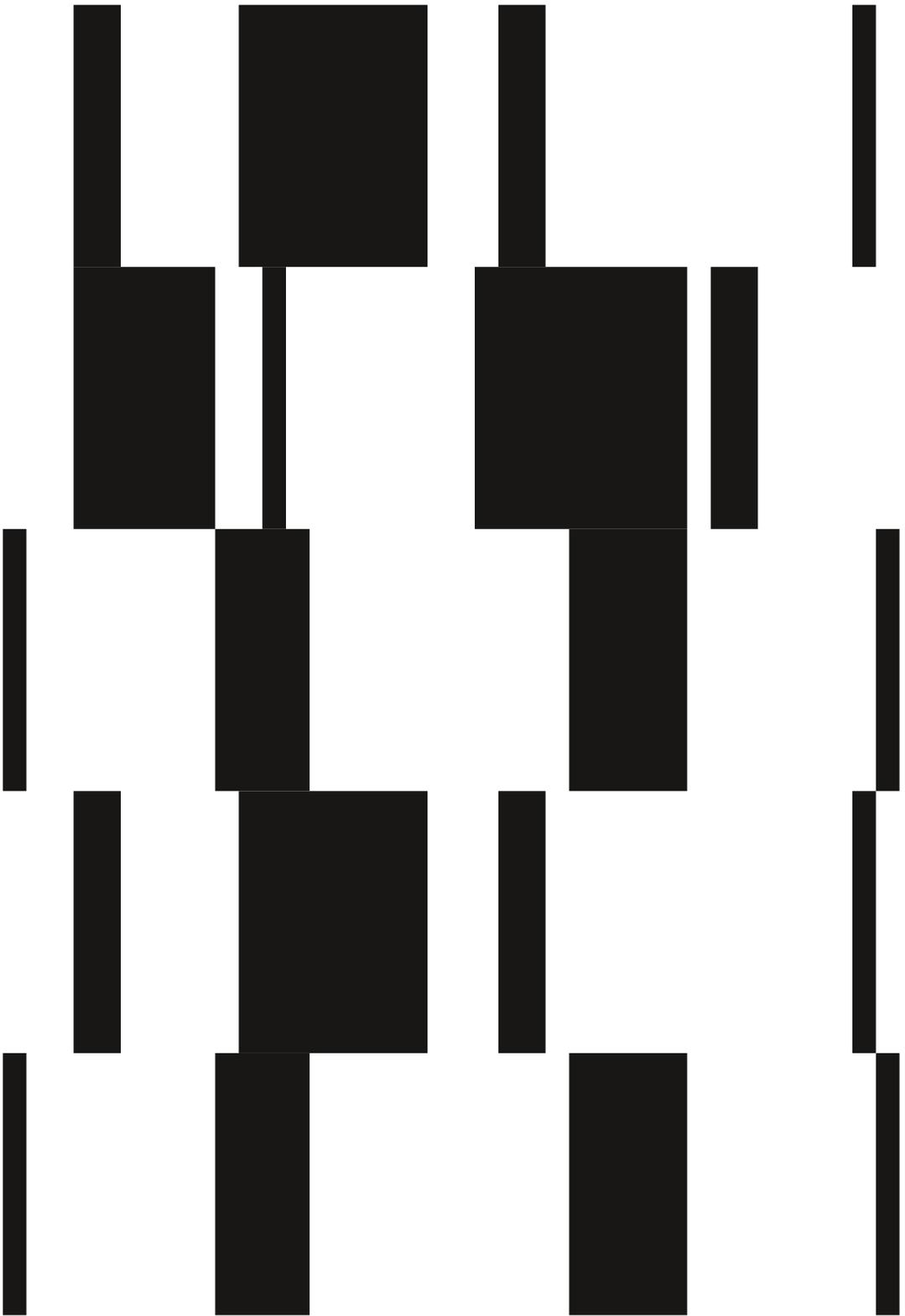
**Jenna Sutela** (FI) works with words, sounds, and other living media, such as *Bacillus subtilis natto* bacteria, and the “many-headed” slime mold *Physarum polycephalum*. Her audiovisual pieces, sculptures, and performances seek to identify and react to precarious social and material moments, often in relation to technology. Sutela’s work has been presented at museums and art contexts internationally, including Guggenheim Bilbao, Moderna Museet, and Serpentine Galleries. She is a Visiting Artist at The MIT Center for Art, Science & Technology (CAST) in 2019–21.

<https://jennasutela.com>

## The Wandering Mind: You start to wonder whether it’s a dream

slow immediate

**slow immediate** (CN/US) is the creative studio of Gershon Dublon and Xin Liu. To them, immediacy to the self and environment is pivotally important to being human on our shared planet. *slow immediate* is a member of the New Museum’s NEW INC and ONX Studio, and recipient of the European ARTificial Intelligence Lab residency initiated by Ars Electronica. Their VR film, *Living Distance*, explores an individual’s place in the cosmos, and is a 2020 official selection of Sundance. [slowimmediate.com](http://slowimmediate.com)



# Science Gallery Dublin



Dublin, Ireland

# Science Gallery Dublin

In 2008, a forgotten corner of Trinity College Dublin was transformed into a living experiment that would bridge art and science, unleashing their combined creative potential. Our mission is to encourage young people to learn through their interests. Since opening, more than three million visitors to the gallery have experienced 45 unique exhibitions, ranging from design and violence to light and love, and from contagion and biomimicry to the futures of the human species and play. Science Gallery Dublin develops an ever-changing program of exhibitions and events fueled by the expertise of scientists, researchers, students, artists, designers, inventors, creative thinkers, and entrepreneurs. The focus is on providing programs and experiences that allow visitors to participate and facilitate social connections, always providing an element of surprise.

Technological advances may lead to a more just and inclusive world but may also serve to increase the divide between those who have and have not. Navigating this complex world requires agile thinkers who can solve problems using imagination, creativity, and empathy—skills which may be developed through educational experiences combining the arts and sciences.

Science Gallery Dublin's education outreach programs for young learners are centered around the concept of asking young people to consider what is required to succeed in a world in which exam marks and content knowledge are becoming less important and skills such as creativity, collaboration, communication,

critical thinking, and problem solving are key. Our learning programs encourage active participation through challenges based on relevant and current themes, and we invite participants to reflect critically on how they learn and develop through the experience. Inspired by the success of the very first Science Gallery on Trinity's historic campus, the Science Gallery Network has now grown to eight members across four continents: in Dublin, London, Melbourne, Bengaluru, Venice, Detroit, Rotterdam, and Atlanta.

Every year, an average of 340,000 visitors engage with us in person nationally through exhibitions, events, workshops, and pop-ups; over two million have been to one of the many Science Gallery exhibitions and sites abroad—making Science Gallery Dublin one of the largest non-profit cultural exports of Ireland. In 2021, Science Gallery Dublin will be taking a year-long approach to a single theme: BIAS. From cognitive function to machine learning, bias is a shortcut, for our brain or for data, and in this season we will interrogate how bias moves from human to machine and how persuasion, preference, motivation, and misinformation contribute to our individual, societal, and digital biases.

BIAS at Science Gallery Dublin will explore AI, Ethics, Trust, and Justice. The program will focus on two kinds of activity—incubation and activation—through exhibitions, events, and education, questioning the social, psychological, and technological aspects of bias.

<https://dublin.sciencegallery.com>

# Approach to AI

Our approach during the European ARTificial Intelligence Lab project has been two-fold: to create and produce new work with research at its core and make accessible the basics and prevalence of Artificial Intelligence to a target audience of 15–25 year olds in order to enable them to engage critically with the ideas, societal implications, and technologies as they develop.

Science Gallery is uniquely positioned within the University with access to cutting edge science and academic research, as the founding member of the Science Gallery International Network Science Gallery Dublin at Trinity College Dublin has spent most of the past decade with a strong international focus.

However, our intention during this project was to bring our experience with international artists and designers into contact with national expertise and research and to focus on long-lead research led commissions.

We did this through informal learning across a program of activity including events, exhibits, and education. Technological advances may lead to a more just and inclusive world but may also serve to increase the divide between those who have and have not. Navigating this complex world requires agile thinkers who can solve problems using imagination, creativity, and empathy—skills that may be developed through educational experiences combining the arts and sciences.

In 2019 we ran the ARTificial Intelligence Lab Summer School and hosted a week-long program for 15–18 year olds—hosted in collaboration with the Robotics and Innovation Lab at Trinity College Dublin—covering science, engineering, art, design, and ethics. It offered young people an opportunity to explore the roles of knowledge, creativity, and responsibility in shaping our future. The summer school was co-funded by the Higher Education Authority and explored the future of AI and robotics—not only in the technological or economic spheres, but also in the context of psychology, philosophy, ethics, and spirituality. In addition to a series of workshops on Arduino

coding and robotics, machine learning, and human centered design—the students also completed week-long group projects through a process of design thinking, in which they came up with technology-driven solutions to societal challenges. The ARTificial Intelligence Lab Summer School culminated in an evening event aimed at 15–18 year-olds and was open to all young people as well as attendees of the summer school. One hundred and eighty-seven young people attended.

At the beginning of this project we connected a number of artists with researchers for long lead commissions including international performance artist ORLAN with machine translation researchers led by Dimitrar Shterionov, who spent the following years of this project working with ORLAN in developing her ORLANOÏDE robot to be able to live translate for her in performance. The second big project was *To Be A Machine*, a hybrid theater production created by Dead Centre, an early iteration of a future project, *To Be a Machine (Version 1.0)* is an adaptation of the Wellcome prize-winning book by Mark O’Connell: an exploration of Transhumanism, a movement whose aim is to use technology to fundamentally change the human condition, to improve our bodies and minds to the point where we become something other, and better, than the animals we are. In the midst of a global pandemic, where our bodies have become biohazards, transhumanists offer a way into a disease-free digital age. We follow Mark from cryonic storage facilities to basement biohacking labs as he meets the prophets of our techno-future. We use the theater to hold a wake for the very idea of congregating together in a room, and a meditation on humanity’s attempt to solve the modest problem of death. The first iteration of this project was presented in September 2020 as part of the Dublin Theatre Festival.

In summer 2020 we were due to have an exhibition “SYSTEMS” exploring the many different systems that form our contemporary networked society led by artist and researcher

Paul O'Neill. Paul's research area(s) focuses on tactical media, media archaeology, and remix culture within the context of digital/new media arts practice and his research around data centers and Ireland's tech infrastructure positioned him as the ideal curatorial lead. However, the pandemic halted this and so instead we turned what would have been a physical exhibition into a "paper exhibition," translating the works into analogue forms to deliver a physical and tangible exhibition into people's homes. In examining SYSTEMS in the context of the pandemic, what had been minor themes in our original exploration now took on more prominent and important roles. With the world at a standstill it felt like the systems in which we exist and the infrastructure that supports our societies were being tested and exposed. Everything from electricity grids and data centers to the housing inequities and racial injustice. Our exploration of these themes also began to feel like a useful primer for our final big project as part of this project which is our BIAS program exploring AI, Ethics, Trust, and Justice.

In developing a new exhibition, event series, and commissions for BIAS, we partnered with Accenture's flagship R&D and global innovation center The Dock, and ADAPT Research Centre, a Science Foundation Ireland Centre for AI-Driven Digital Content Technology. The ADAPT Centre's work is driven by a long-term goal of a Balanced Digital Society by 2030 and it is pioneering new Human Centric AI techniques and technologies including personalization, natural language processing, data analytics, intelligent machine translation, human-computer interaction, as well as setting the standards for data governance, privacy, and ethics for digital content.

With these partners we were able to bring scientific perspectives and industry perspectives together with artistic practice in our approach to interrogating questions around AI and data. We created a curator-in-residence role based between Accenture and Science Gallery Dublin and were delighted to work with

Julia Kaginsky in this role on the commissioning of Risa Puno and Alexander Taylor for the final BIAS exhibition showcase. We also created an extensive match-making process for a series of original commissions with ADAPT. We invited artists to apply who were interested in relevant research areas and equally invited researchers from ADAPT to apply if they were interested in working with artists. The project invited artists and scientists to co-create work benefiting both the scientific research and the artistic practice. Shortlisted applicants were invited to 2 days of "speed-dating" and match-making in an attempt to create opportunity for chemistry and collaboration between participants. Our aim was not for one discipline to utilize the other but for the project to be mutually beneficial. After the workshops participants were given a shortlist of matches and invited to create an application together for commission. This was a new and exciting process for us in bringing together the artists and scientists and a format we will definitely replicate in the future. BIAS will be a hybrid program with the creation of an online environment housing several of the key commissioned artworks which are digitally native and a physical exhibition showcasing the culmination of our participation in this project. From cognitive function to machine learning, bias is a shortcut, for our brain or for data, and in this season we will interrogate how bias moves from human to machine and how persuasion, preference, motivation, and misinformation contribute to our individual, societal, and digital biases. In a year when we have seen the importance of scientific research, the impact of misinformation, and the effect of social media playing a huge part in polarizing communities, understanding our biases and how they are and are not helpful has never been more critical. We will bring together artists, activists, designers, policymakers, hackers, researchers, and technologists to explore the ways in which bias dominates our world today, from algorithmic justice and facial recognition to the empathy crisis and systemic oppression.

# Activities

## Exhibitions

### SYSTEMS

**Exhibition in a Box featuring printed representations of artworks, essays and in-conversations with artists**

Science Gallery Dublin, 22.07.2021

Correcting the Lasagne—Patricia Pisanelli (BR);  
The Anatomy of an AI system—Vladan Joler (RS) &  
Kate Crawford (AU); Counter-Map of Dublin's  
Internet Infrastructure—Paul O' Neill & Ann Kiernan  
(IE); On Computer Vision—Adam Harvey (US/DE);  
Against Complexity—Joana Moll (ES); Multiplay —  
Multiplay (ES); Disaster SEO—Pip Thornton (GB);  
Asylum Archive—Vukašin Nedeljković (RS/IE);  
Towards Technological Sovereignty—Sarah Grant  
(US); Studio Notes: Red Lines—Evan Roth (US);  
Asunder—Tega Brain (AU), Julian Oliver (NZ),  
Bengt Sjölnén (SE); Antropocene (A Decade in  
Reflections)—David Thomas Smith (IE);  
Cloudplexity—Mario Santmaria (ES); An Interview  
with Ingrid Burrington—Ingrid Burrington (US)

### BIAS

Science Gallery Dublin, IE / Online

01.09.2021 – 31.12.2021

Normalizi.ng—Mushon Zer-Aviv (IL); Perception  
iO—Karen Palmer (UK); The Last Judgement—  
Libby Heaney (UK); Classes—Libby Heaney (UK);  
Dark Matters—Johann Dierdrick (US); The Uncanny  
Valley of Breath—Carlotta Aoun, Ant Nevin, Patrick  
Cormac English, Ed Storey (FR/VZ & NZ); Your  
Balanced Media Diet—Ross Dowd, Brendan  
Spillane (IE); SKU—Market—Laura Allcorn,  
Jennifer Edmond (US); Laws of Ordered Form—  
Anna Ridler (UK); Untitled (A Digital Platforms  
Moderation Game)—Caroline Sinders, Aphra  
Kerr (US)

## Workshops

**ARTificial Intelligence Privacy & civil liberties: AI citizens' Think in**

Science Gallery, Dublin, 01.05.2019

Adapt Research Centre (IE), Trinity College  
Dublin (IE)

**2nd Level Workshop –ARTificial Intelligence Lab  
summer school**

Science Gallery, Dublin, 01.07.2019 – 05.07.2019

Trinity College Dublin, Robotics and Innovation  
Lab (IE)

**ARTificial Intelligence Lab, under 18 Late event**

Science Gallery, Dublin, 05.07.2019

Libby Heaney (GB)

### AI Citizens' Think In

Science Gallery, Dublin, IE / Online

03.09.2020

Adapt Research Centre (IE),  
Trinity College Dublin (IE)

### ICT Camps

Science Gallery, Dublin, IE / Online

23.11.2020 – 03.12.2020

2 sessions

### Intel Camps

Science Gallery, Dublin, IE / Online

16.11.2020 – 19.11.2021,

01.02.2021 – 04.02.2021

3 sessions

### AI Lab workshop with local schools

Science Gallery, Dublin, IE / Online

11.12.2020 – 17.12.2020

3 sessions

### H2020—SySTEM 2020—Workshops

Science Gallery, Dublin, IE / Online

22.01.2021 – 25.01.2021

### ORLANoide

Hackathon with multiple research groups  
and stakeholders across robotics, computer  
engineering, machine translation

Science Gallery, Dublin, IE

01.02.2020 – 02.02.2020

Orlan (FR)

## Other Activities

### ORLAN & ORLANoide

Science Gallery, Dublin, Performance

01.02.2020 – 02.02.2020

Orlan (FR)

### To Be A Machine (Version 1.0)

Projects Art Centre, Dublin, Performance

30.09.2020 – 10.10.2020

Dead Centre (IE)

## Ars Electronica Garden 2020



<https://u.aec.at/DD27AA49>

# Projects

Ste Murray



*To Be a Machine (Version 1.0)* is a Dead Centre co-production with Dublin Theatre Festival. Developed and supported by Science Gallery at Trinity College Dublin as part of the European ARTificial Intelligence Lab project. Co-Funded by Creative Europe. Supported by the Arts Council.

## To Be A Machine (V1.0)

Dead Centre (UK)

*To Be a Machine (Version 1.0)* is an adaptation of the Wellcome prize-winning book by Mark O'Connell: an exploration of Transhumanism, a movement whose aim is to use technology to fundamentally change the human condition, to improve our bodies and minds to the point where we become something other, and better, than the animals we are. In the midst of a global pandemic, where our bodies have become biohazards, transhumanists offer a way into a disease-free digital age. We follow Mark from cryonic storage facilities to basement biohacking labs as he meets the prophets of our techno-future. We use the theater to hold a wake for the very idea of congregating together in a room, and a meditation on humanity's attempt to solve the modest problem of death.

<https://www.deadcentre.org/tobeamachine>

ORLAN



The ADAPT Centre, funded by Science Foundation Ireland focuses on developing next-generation digital technologies that transform how people communicate by helping to analyze, personalize, and deliver digital data more effectively for businesses and individuals. ADAPT researchers are based in four leading universities: Trinity College Dublin, Dublin City University, University College Dublin, and Dublin Institute of Technology.

<https://www.adaptcentre.ie>

## ORLANOÏDE Hackathon

ORLAN (FR)

The *ORLANOÏDE Hackathon* brings together researchers across robotics, computer engineering, and machine translation to employ their knowledge to the humanoid robot. The *ORLANOÏDE* resembles ORLAN and questions AI and new technologies that search to rebuild, reconstruct, and reinvent the human body. At this collaborative event researchers will add new hardware and programs to enable the robot to react to human presence, translate live speech into multiple languages, and share interactions via live printing and tweeting.

# SYSTEMS



Science Gallery Dublin

## **A.I.R.**

**Multiplay (Elisa Cuesta, Pedro Arnanz, Victoria de la Torre) and Autumn Brown (ES, US)**

In this essay, the artist collective Multiplay speaks with Science Gallery Dublin PhD researcher Autumn Brown about the creative processes behind their piece, *A.I.R.*. A systemic thinking toolkit, dozens of conversations, a breathing body, a diagram, and a poem have unfolded during the residency, giving shape to the project that explores the way in which our individual and collective capacity to influence the systems that surround us is affected by how close, emotionally, and physically, we feel to others. We start weaving our ideas around the notions of systems, agency, and closeness by asking: How close do you feel?

<https://a-i-r.online>

*A.I.R.* marks the culmination of a joint artist residency at Science Gallery Dublin and Accenture's global R&D and innovation center, The Dock. Multiplay were selected as part of an international open call for artists interested in systems thinking and interdisciplinary approaches to addressing complex societal issues.

## **Asylum Archive**

**Vukašin Nedeljković (RS/IE)**

*Asylum Archive* is an accumulation of documents, artefacts, oral histories, and photography created by Dublin-based visual artist and researcher Vukašin Nedeljković. *Asylum Archive* engages directly with the everyday realities of asylum seekers, drawing on the artist's personal experience living in direct provision centers in Ireland between the years of 2007–2009. *Asylum Archive* is a platform open for dialogue and discussion inclusive to individuals who have experienced a sense of sociological/geographical "displacement," social trauma, and violence. It is an act of solidarity to bring a different perspective on the life of people who came to Ireland to seek protection.

<http://www.asylumarchive.com>



Vukašin Nedeljković.

## (A Decade in Reflections in the) Anthropocene

David Thomas Smith (IE)



David Thomas Smith

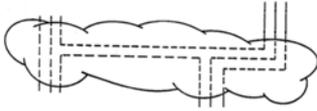
This essay and image selections reflect on David Thomas Smith's work *Anthropocene*, created from thousands of digital files drawn from aerial views taken from internet satellite images. This work reflects upon the complex structures that make up the centers of global capitalism, transforming the aerial landscapes of sites associated with industries such as oil, precious metals, consumer culture information, and excess. Thousands of seemingly insignificant coded pieces of information are sown together like knots in a rug to reveal a grander spectacle. *Anthropocene* draws upon the patterns and motifs used by Persian rug makers, especially the way Afghani weavers use the rug to record their experiences more literally with vivid images of the war-torn land that surrounds them. This collision between the old and the new, fact and fiction, surveillance and invisibility, is part of a strategy to reflect on the global order of things.

## An interview with Ingrid Burrington

Ingrid Burrington (US)

Using David Graebner's essay "Dead Zones of the Imagination: On violence, bureaucracy, and interpretive labour" as a starting point, artist and researcher Paul O'Neill spoke with

writer and artist Ingrid Burrington about her experience of researching and mapping complex physical, digital, and bureaucratic systems.

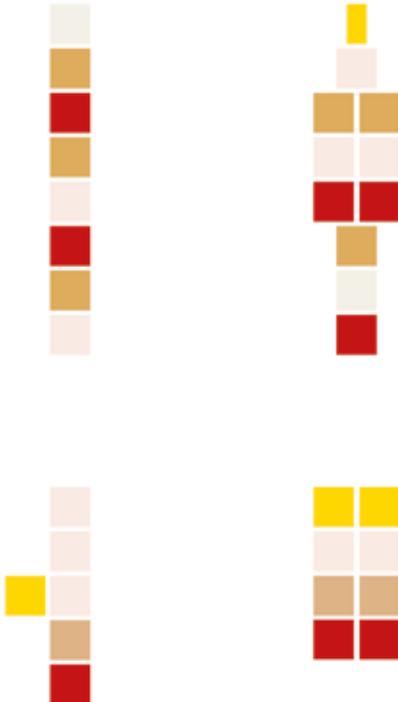


## Cloudplexity

Mario Santamaría (ES)

We talk about the “Cloud” all the time—but can we ever agree on what it looks like? *Cloudplexity* investigates different representations of the Internet and the construction of the cloud metaphor as a form of connectivity by showing different drawings made to represent the Internet in applications to the US patent archive from 1979 to the present.

<http://mariosantamaria.net/cloudplexity>



## Correcting the Lasagne

Patricia Pisanelli (BR)

*Correcting the Lasagne* is a work based on a conversation on an internet forum where users speculated about the correct order of the layers of a lasagne dish. This piece aims to visualize online forum users’ method of explaining by decoding their answers, substituting text with color, swapping a system for another. *Correcting the Lasagne* was born out of a Google search on the correct order of layering oil paint. The autocomplete tool on the search bar proposed the correct order of a lasagne, breaking the artist’s own research system.

<http://www.patriciapisanelli.co.uk/correcting-the-lasagna.html>

| A Global Pandemic<br>by Google Ads |         | A Global Pandemic<br>by Google Ads |         |
|------------------------------------|---------|------------------------------------|---------|
| SALE                               |         | SALE                               |         |
| 1st June 2021                      | 7:15 PM | 28th October 2020                  | 3:45 PM |
| BATCH # CRC32                      |         | BATCH # CRC32                      |         |
| AUTH # 50429233                    |         | AUTH # 46751364                    |         |
| AREA # ALL                         |         | AREA # ALL                         |         |
| 1 isolation?                       | £2.10   | 1 isolation?                       | £3.00   |
| 1 blame                            | £0.57   | 1 blame                            | £0.91   |
| 1 china                            | £1.72   | 1 china                            | £2.26   |
| 1 infection                        | £0.60   | 1 infection                        | £1.02   |
| 1 disease                          | £0.00   | 1 disease                          | £1.54   |
| 1 no                               | £1.72   | 1 no                               | £12.91  |
| 1 kissing                          | £1.83   | 1 kissing                          | £0.00   |
| 1 rough                            | £1.09   | 1 rough                            | £5.93   |
| 1 symptoms?                        | £1.09   | 1 symptoms?                        | £1.87   |
| 1 google                           | £1.20   | 1 google                           | £5.20   |
| 1 will                             | £2.31   | 1 will                             | £8.64   |
| 1 fix                              | £0.56   | 1 fix                              | £1.49   |
| 1 it -                             | £1.51   | 1 it -                             | £3.43   |
| 1 wrap                             | £1.90   | 1 wrap                             | £2.81   |
| 1 facemask                         | £1.98   | 1 facemask                         | £2.57   |
| 1 handwash                         | £2.06   | 1 handwash                         | £1.80   |
| 1 disinfectant                     | £2.12   | 1 disinfectant                     | £3.60   |
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## Disaster SEO Pip Thornton (UK)

Every time you search on Google, an auction takes place, with advertisers bidding to serve adverts to you according to the words you use. For this piece, Pip Thornton priced up three strings of Covid-related terms: the first was generated at the beginning of the global pandemic, on March 13, 2020, the second on October 24, 2020, and the third on June 1, 2021. In October 2020, the search terms had almost doubled in price. Word prices are based on the suggested bid price Google provides to potential advertisers, and Google earns most of its money by selling the words we put into the search engine to advertisers so they can buy the top spots on the results page. In this way, our questions become profit for a tech giant.



(illustration by) Ann Kiernan

## A Counter-Map of Dublin's Internet Infrastructure

Ann Kiernan (IE), Paul O' Neill (IE)

Taking inspiration from critical cartography, media archaeology, open source culture, and other ideas and practices that challenge techno-solutionist narratives, we have created a counter-map of Dublin's Internet infrastructure. Like the technological system that it documents, this map is an abstract form of the different corporate, digital and physical layers of the Internet within the city. The chaotic clash of bright colors in the city center is a reference to the corporate headquarters of the tech giants based there. In contrast to these bright logos and brands are the shadows of fiber optics cables that run beneath the streets and the mobile masts that tower above us.

## Against Complexity

Joana Moll (ES)

In 2020 a citizen spends an average of 3.1 hours using apps on their smartphone and about seven hours in front of a screen every day. In this essay, artist and researcher Joana Moll argues that as time spent in technology increases, our conception of reality gets increasingly detached from its physical context, our imagination gets more and more homogenized and our capacity to coherently respond to our life-giving ecosystems is progressively worn down.

## Towards Technical Sovereignty

Sarah Grant (US)

This essay by the artist Sarah Grant delves into both the concept of a “radical” network and the meaning and practice of technological sovereignty. It begins by articulating the disadvantage we find ourselves in when we are dependent upon corporate controlled technologies and systems for communication. The issues which arise from this imbalanced relationship are part of what has led to the emergence of a political view and a set of processes known as technological sovereignty. To help crystallize the meaning of this term, the artist provides examples of artworks and community-based efforts, both her own and those of others, which demonstrate technological sovereignty in practice.

Martin Hieslmair



## Anatomy of an AI System

Vladan Joler (RS), Kate Crawford (AU)

Presented at Ars Electronica & Science  
Gallery Dublin & CPN—Center for the  
Promotion of Science

See page 71



## Excerpts from Asunder

Tega Brain (AU), Julian Oliver (DE),  
Bengt Sjöln (SE)

Presented at Onassis Stegi &  
Science Gallery Dublin

See page 251

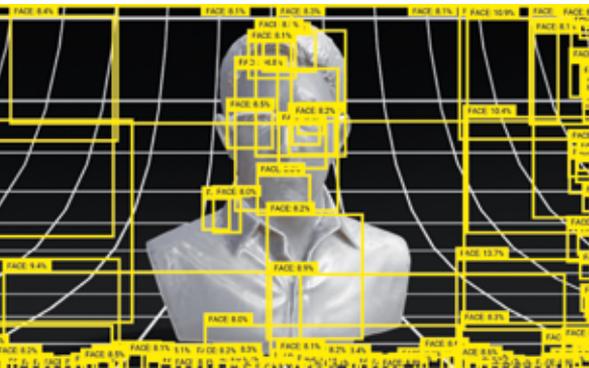


Evan Roth

## Studio Notes: Red Lines

Evan Roth (US)

This *Studio Notes* series contains uncensored streams of images passively collected through daily Internet browsing while the artist researched his *Red Lines* project. *Red Lines* was a peer-to-peer network performance that took place from September 10, 2018 to September 10, 2020. The network connected users with servers in geographically specific locations to participate in the sharing and viewing of 82 individual pieces from the artist's *Landscape* series. Over the course of two years, 120,000 people in 166 countries connected to the *Red Lines* network, with the average viewing time for each person lasting over one hour.



Adam Harvey

## On Computer Vision

Adam Harvey (US/DE)

Photographers see through their own cameras, but computer vision sees through algorithms—and algorithms are nothing without data. In no small way photography, photographers, and the photographs of the past inform and haunt the ways computer vision interprets and misinterprets the world today. In this essay, Adam Harvey explains how we can change this.

# BIAS

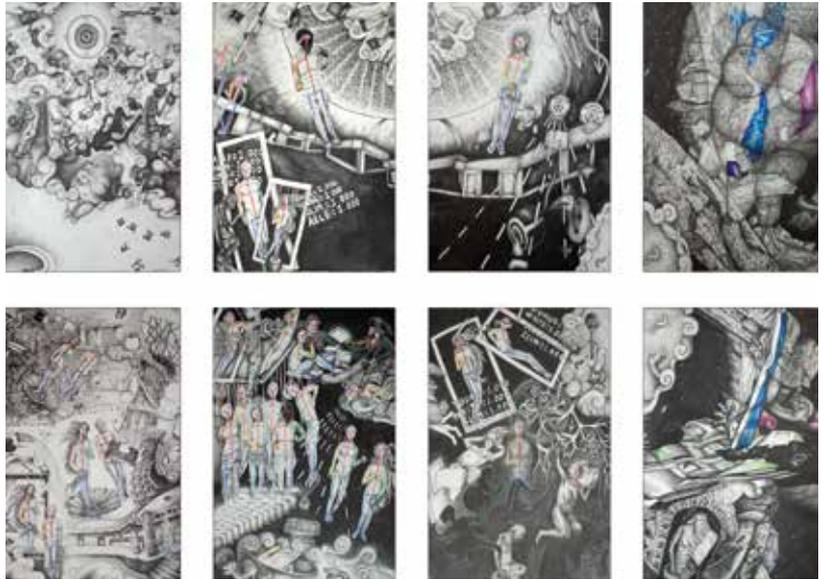


Johann Diedrick

## Dark Matters

Johann Diedrick (US)

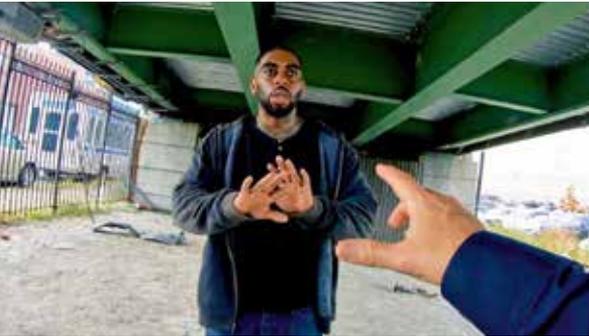
*Dark Matters* is an interactive web experience that spotlights the absence of Black speech in data sets that are used to train voice interface systems like Alexa, Google Home, and Siri. This creates new forms of racial exclusion and bias as Black speech, previously code switching for white ears, is now forced to code switch for “AI ears.” Utilizing 3D modeling, sound, and storytelling, the project challenges our communities to grapple with racism and inequity through speech and the spoken word, and how AI systems underserve Black communities.



## The Last Judgement

Libby Heaney (GB)

An octptych, *The Last Judgement*, an interpretation of Bosch's *The Last Judgement* where techno-capitalism has taken the place of religion. Each drawing is accompanied by a short verse.

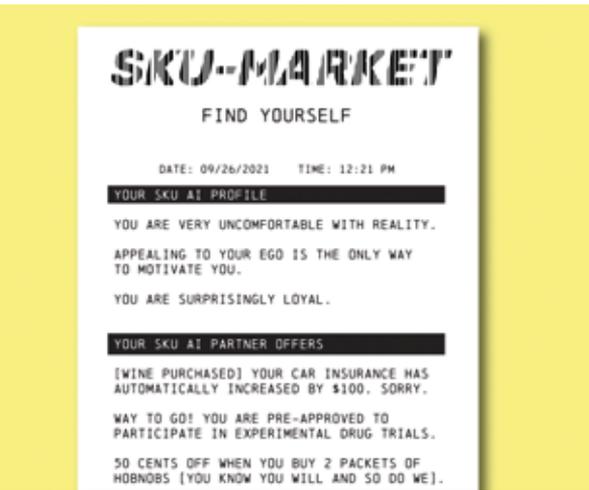


Karen Palmer

## Perception iO

Karen Palmer (GB)

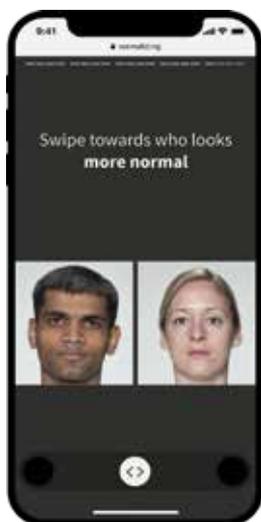
You have been selected to train an Artificial Intelligence system for the future of law enforcement. Your calm, anger, or fear will change the narrative. How you respond will have consequences for the characters. Could your implicit bias have affected your emotional response? The participant will assume the role of a police officer watching an interactive training video of an escalating volatile situation. They will experience the interaction from the perspective of a cop's body camera and come into contact (separately) with a black protagonist and white protagonist. How they respond emotionally to the scene will have consequences for the characters.



## SKU-Market

Laura Allcorn (US)

SKU-Market is a participatory experience that makes tangible how our online behaviors can be interpreted, skewed, and applied to shape our lives in surprising ways. At SKU-Market visitors “buy” the things they like, then get to see how an algorithm interprets their choices to create a vivid picture of who they are. The Algorithmic Aisle is lined with products that give the audience “life”: sparkling water, human rights, tiktok, honest debate, rosé, outraged tweets, matching sweatsuits, etc. The register is powered by the proprietary SKU-AI algorithm. At checkout the total is your SKU profile, reflected in the magic mirror of thermal print. But watch out: you might not like who SKU-Market thinks you are.



## Normalizi.ng

Mushon Zer-Aviv (IL)

*Normalizi.ng* is an experimental online research in machine-learning that aims to analyze and understand how we decide who looks more “normal.” When you visit [www.Normalizi.ng](http://www.Normalizi.ng) on your phone, you will be presented with a series of previously recorded participants. You will then choose who looks more “normal” between pairs of noses, mouths, eyes, and faces. The machine will analyze your decisions and will also add you to its algorithmic map of normality. In the late 1800s, French forensics pioneer Alphonse Bertillon, the father of the mugshot, developed “Le Portrait Parle” (the speaking portrait)—a system for standardizing, indexing, and classifying the human face. His statistical system was never meant to criminalize the face, but it was later widely adopted by both the Eugenics movement and by the Nazis to do exactly that. The online work automates Bertillon’s speaking portraits and visualizes how today’s systematic discrimination is aggregated, amplified, and conveniently hidden behind the seemingly objective black box of Artificial Intelligence.

<https://normalizi.ng>

Additional Credit: Adam Kariv developed the code for the work. Additionally, Mushon Zer-Aviv would like to thank the Science Gallery Dublin and Trinity College Dublin for commissioning this work.



## Your Balanced Media Diet

Ross Dowd (IE) & Brendan Spillane (IE)

A playful interactive installation that challenges visitors to reconsider the new sources they tend to consume without question. Just as they would their food, the visitors are invited to examine their intake and learn how they can develop a balanced news diet. By assessing the bias in their media consumption and exploring the NFC empowered food items in the fridge, visitors could compare their media consumption to others and experience the contents of the fridge together while discussing the media sources they rely on and why. Along with feedback on the various biases of these news sources across a number of parameters like political leaning, alternative news sources to follow will be presented to achieve a more balanced yet nuanced diet.



## The Uncanny Valley of Breath

Carlotta Aoun (FR/VZ), Ant Nevin (NZ),  
Patrick Cormac English (IE), and  
Ed Storey (GB)

*The Uncanny Valley of Breath* is an immersive installation that shows the vulnerabilities of AI through the subtle boundaries in human speech. Breath, our most intimate connection to life, is, for an AI, a marker of an inefficient system: a loss of energy and time. A machine can only perceive breathing as an interruption of data, a flaw in the data. In doing so, it averages out individuality. *The Uncanny Valley of Breath* uses spectrograms, visual mapping software, and hundreds of fans to create an experience which highlights the differences and biases between AI-generated and human speech. While the uniqueness of an individual voice is homogenized by the AI, the voice that makes us human is shown with the subtle nuances inherent in our speech and breath.

# Untitled (A Digital Platforms Moderation Game)

Caroline Sindere (US) & Aphra Kerr (IE)



A web browser based game where a player plays against an AI system to label content as harassment or not. The content will be a collection of tweets that waver between online harassment, general content, and violent harm. This work is time-based, mimicking the kinds of pressures real human moderators face when working for major platforms to respond to and label content. The outcome then shows what the AI “thought” about the content, and what the human thought, and then who was “right.” This work explores bias by comparing and showing the inadequacies of how AI does not understand context, violence, harm, and human interactions, and then also illustrating the pressures, lack of context, and exposure to harm human content moderators suffer from.



## Classes

Libby Heaney (GB)

A visual essay that addresses Artificial Intelligence and class, bias that manifests in machine learning datasets and algorithms. The piece investigates how cultural and historical biases are now being translated into code and what this means. Multiple voices present various positions and fragments of text are woven together with theory and clips of the artwork and its production.



## Laws of Ordered Form

Anna Ridler (GB)

*Laws of Ordered Form* is a two-part video work and a downloadable handmade dataset created by first taking thousands of photographs of images found in Victorian and Edwardian-era encyclopaedias and then manually reclassifying them. The work calls to attention how echoes of historic taxonomies and beliefs can still be heard in modern implementations of machine learning. By collapsing this moment of history with today's current concerns around dataset bias, the piece emphasizes the problems with classification without thought, and considers the histories that remain in our present, even within the latest technologies. Commissioned by the Photographers' Gallery as part of the Data/Set/Match digital program exploring the technical, cultural, and social significance of image datasets.



Anna Ridler, Caroline Sindors

## AI isn't Artificial but Human

Anna Ridler (UK), Caroline Sindors (US)

Presented at **Ars Electronica + Science Gallery Dublin + Center for the promotion of science**  
See page 70

# Artists

## To Be A Machine (V1.0)

### Dead Centre

**Dead Centre** (UK) Artistic directors Bush Moukarzel and Ben Kidd, based between Dublin and London. So far we have made eight projects, of which six have premiered in Dublin; we have also made work at Schaubühne, Berlin and Burgtheater, Vienna. Our projects have toured throughout the world including New York, Hong Kong, Russia, China, Australia, France, Estonia, Holland, Romania, Germany, and throughout the UK.

<https://www.deadcentre.org/about>

## ORLANOÏDE Hackathon

### ORLAN

**ORLAN** (FR) is a renowned French performance artist who works in the mediums of sculpture, photography, and film, and is best known for her work with plastic surgery in the early to mid-1990s. Her performance work often uses scientific and medical techniques like surgery and biogenetics. <http://www.orlan.eu>

### A.I.R.

#### Multiplay (Elisa Cuesta, Pedro Arnanz, Victoria de la Torre) and Autumn Brown (ES, US)

**Multiplay** (ES) is made up of architect Pedro Arnanz, artist Elisa Cuesta, and designer Victoria de la Torre. Driven by art, sciences, and technology, they explore the invisible infrastructures interwoven into the systems we inhabit, and that shape our world today. Their aim is to reveal alternative kinds of relationships, inspired by nature and based on principles of collaboration, cooperation, and interdependence. <https://elisacuesta.com>, <http://www.vdelatorre.com>, [https://issuu.com/pedro.acoll/docs/arnanz\\_pedro\\_portfolio\\_2020](https://issuu.com/pedro.acoll/docs/arnanz_pedro_portfolio_2020)

**Autumn Brown's** (US) research explores the way art, science, and society shape one another and how public spaces like Science Gallery Dublin allow people from a variety of backgrounds to come together and imagine the future of scientific research and technological innovation. She is interested in how the culture of science might be transformed by bringing current research and ideas for the future into places which encourage commentary and critique.

## Asylum Archive

### Vukašin Nedeljković

**Vukašin Nedeljković** (RS/IE) is an artist based in Ireland. He created *Asylum Archive* while living in a Direct Provision Centre, awaiting the results of his asylum application. He holds an MA in Visual Arts Practice from IADT and is currently a PhD candidate at the Technological University Dublin. His solo exhibitions include Earagail Arts Festival, Letterkenny (2020), Triskel Arts Centre, Cork (2019), Garter Lane, Waterford (2017), and Galway Arts Centre (2015). <http://www.asylumarchive.com>

## (A Decade in Reflections in the)

### Anthropocene

#### David Thomas Smith

**David Thomas Smith** (IE) is a visual artist who specializes in Post-Photographic Processes. David's work has been exhibited in several diverse locations around the world from the Gaîté Lyrique in Paris to the Hyundai Motor Studio in Beijing. In 2017 David was nominated for one of photography's most prestigious awards, The Prix Pictet. David's work has also appeared in a variety of publications from *Esquire*, *Russia to Wired* in the United States and anthologies such as Robert Shore's *Post Photography—The Artist with a Camera*.

<https://www.david-thomas-smith.com>

## An interview with Ingrid Burrington

### Ingrid Burrington

**Ingrid Burrington** (US) is a writer and artist based out of Brooklyn, New York. She published *Networks of New York: An Illustrated Field Guide to Urban Internet Infrastructure* with Melville House Publishing in 2016.

## Cloudplexity

### Mario Santamaría

**Mario Santamaría** (ES) works across a wide range of media, frequently using photography, video, performance, websites, and online interventions. His research focuses on the phenomenon of the contemporary observer, paying attention to both the representations of the world and the devices of vision and mediation. His work includes topics such as digitization, networks, infrastructures, imaginations, algorithms, and the body. [www.mariosantamaria.net](http://www.mariosantamaria.net)

## Correcting the Lasagne

Patricia Pisanelli

**Patricia Pisanelli** (BR) lives and works in London and completed her MA Fine Arts at Central Saint Martins in 2013. Selected exhibitions include “Matter,” County Hall, London 2019, “Inside Job,” Tate Modern, London, 2018 and 2019; “Fake,” Science Gallery, Dublin, 2018; “First Act: Smooth Operations,” Laure Genillard Gallery, London, 2017/18; “4.42,” 5th Base Gallery, London, 2017; “Window 71,” site specific, Tottenham, London, 2017; “Fridges Fight Back,” Bompas & Parr at KK Outlet, London, 2016. [www.patriciapisanelli.co.uk](http://www.patriciapisanelli.co.uk)

## Disaster SEO

Pip Thornton

**Pip Thornton** (UK) is a Chancellor’s Fellow in GeoSciences at the University of Edinburgh. Her theory and practice revolve around exploring the politics of existence in online spaces, and critiquing and making visible structures of power within the digital economy with creative methods. She gained her PhD in Geopolitics and Cybersecurity from Royal Holloway, University of London in 2019. <https://pipthornton.com>

## A Counter-Map of Dublin’s Internet Infrastructure

Ann Kiernan, Paul O’Neill

**Ann Kiernan** (IE) is an award-winning illustrator based in Berlin. She works out of her studio located in the Intelligence Department Studios in the former building of the GDR’s operational and technical sector in Berlin-Alt-Hohenschönhausen. Ann has been awarded the Moira Gemmill Illustrator of the Year 2020 and is the Winner of the Illustrated Journalism V&A Award 2020. <https://annkiernan.com>

**Paul O’Neill** (IE) is an artist and researcher based in Dublin, Ireland. His practice and research are concerned with the implications of our collective dependency on networked technologies and infrastructures. Paul is currently completing a PhD focusing on media art practices that critique and subvert techno-solutionist narratives and histories. [www.aswemaysink.com](http://www.aswemaysink.com)

## Against Complexity

Joana Moll

**Joana Moll** (ES) is a Barcelona/Berlin based artist and researcher. Her work critically explores the way techno-capitalist narratives affect the alphabetization of machines, humans, and ecosystems. Her main research topics include Internet materiality, surveillance, social profiling, and interfaces. She has presented her work in renowned institutions, museums, universities, and festivals around the world such as Venice Biennale, MAXXI, MMOMA, Laboral, CCCB, ZKM, Bozar, Ars Electronica, and HEK, among many others. <http://www.janavirgin.com>

## Towards Technical Sovereignty

Sarah Grant

**Sarah Grant** (US) is the Visiting Professor of New Media at the Kunsthochschule Kassel and founder of the interactive media studio Cosmic.Berlin. She holds a BA in Fine Art from UC Davis and an MA in Media Arts from New York University’s Interactive Telecommunications Program. She has been a Research Fellow at the Tow Center for Journalism at Columbia, Adjunct Professor at NYU Polytechnic in Digital Media, and Artist-in-Residence at the Eyebeam Art and Technology Center. <https://radicalnetworks.org>

## Anatomy of an AI System

Vladan Joler, Kate Crawford

**Vladan Joler** (RS) is the director of the SHARE Foundation and a professor at the New Media Department of the University of Novi Sad. SHARE Lab is a research and data investigation lab for exploring different technical and social aspects of algorithmic transparency, digital labor exploitation, invisible infrastructures, black boxes, and other contemporary phenomena at the intersection of technology and society. <https://labs.rs>

**Kate Crawford** (AU) is a leading international scholar of the social implications of artificial intelligence. She is a Research Professor at USC Annenberg, a Senior Principal Researcher at Microsoft Research in New York, and the inaugural Visiting Chair for AI and Justice at the École Normale Supérieure in Paris. Her project *Anatomy of an AI System* with Vladan Joler won the Beazley Design of the Year Award and is in the permanent collection of the Museum of Modern Art. Her latest book is *Atlas of AI* (2021).

## Excerpts from *Asunder*

**Tega Brain, Julian Oliver, Bengt Sjölin**

**Tega Brain** (AU) is an Australian born artist and environmental engineer whose work examines issues of data, ecology, and infrastructure. She has created wireless networks that respond to natural phenomena, systems for obfuscating fitness data, and an online smell-based dating service. Her work has been shown in the Vienna Biennale for Change, the Guangzhou Triennial, and in venues like the Haus der Kulturen der Welt in Berlin and the New Museum, NYC, among others. She is an Assistant Professor of Integrated Digital Media, New York University.

<http://www.tegabrain.com>

**Julian Oliver** (DE) is a Critical Engineer, artist, and activist based in Berlin. Exhibiting since 1996, his projects and lectures have been presented at many museums, international electronic-art events and conferences, including the Tate Modern, Transmediale, Ars Electronica, The Chaos Computer Congress, FILE, and the Japan Media Arts Festival. Work made by Julian, or in collaboration with others, has received several awards. Julian has often dedicated his studies and knowledge in counter-surveillance, network engineering, information security, and systems administration to the assistance of at-risk groups, with a focus on environmental defense.

<https://julianoliver.com>

**Bengt Sjölin** (SE) is an independent software and hardware designer/hacker/artist based in Stockholm and Berlin with roots in the Atari demo scene. He collaborates within several networks like Weise7, Hackteria and Critical Engineering Working Group. His work follows many different threads spanning subjects such as biology, software radio, electromagnetic fields, and artificial intelligence. His work has been presented internationally in events like Arte Mov, Ars Electronica, Synthetic Times Exhibition, NTT ICC Tokyo, Venice Biennale of Architecture, ISEA, Pixelache, World Expo 2010, Transmediale, and The Glass Room.

<https://twitter.com/bengtsjolen>

## Studio Notes: *Red Lines*

**Evan Roth**

**Evan Roth** (US) is an American artist based in Paris who visualizes, subverts, and archives transient and often unseen moments in public space, popular culture, and the Internet. He applies a hacker philosophy to an art practice that often involves technology, humor, and activism.

<http://www.evan-roth.com>

## On Computer Vision

**Adam Harvey**

**Adam Harvey** (US/DE) is a researcher and artist based in Berlin focused on computer vision, privacy, and surveillance. He is the creator of the VFRAME computer vision project, *Exposing.ai* search engine, and previously worked on counter-surveillance related art projects including *CV Dazzle* (camouflage from face detection, 2010), the *Anti-Drone Burqa* (camouflage from thermal cameras, 2013), *SkyLift* (a geolocation spoofing device, 2016). [Ahprojects.com](http://ahprojects.com)

## Dark Matters

**Johann Diedrick**

**Johann Diedrick** (US) is an artist, engineer, and musician who makes installations, performances, and sculptures for encountering the world through our ears. He surfaces vibratory histories of past interactions inscribed in material and embedded in space, peeling back sonic layers to reveal hidden memories and untold stories. Founder of A Quiet Life, a sonic engineering and research studio that designs and builds audio-related software and hardware products for revealing possibilities off the grid through sonic encounter. 2021 Mozilla Creative Media Award recipient, member of NEW INC, and an adjunct professor at NYU's ITP program. Johann Diedrick is a 2021 Mozilla Creative Media awards recipient.

## The Last Judgement

**Libby Heaney**

**Libby Heaney** (GB) is a British artist and lecturer at the Royal College of Art. Her post-disciplinary art practice includes moving image works, performances, and participatory and interactive experiences that span quantum computing, virtual reality, AI, and installation. Heaney uses machine learning and quantum computing against their "proper" use, to undo biases, and to forge new expressions of collective identity and belonging with each other and the world. [libbyheaney.co.uk](http://libbyheaney.co.uk)

## Perception iO

**Karen Palmer**

**Karen Palmer** (GB) is the Storyteller from the Future. She is an award-winning International Artist & Public Speaker. She speaks about her emotionally responsive film experiences at the intersection of AI, Immersive Storytelling, Neuroscience, Consciousness and Implicit Bias. Past topics include: AI Voyage: Can Conscious Storytelling Save Us? Implicit bias. Democratizing AI. The Future of Storytelling. How Art & Tech have the power to change your Cognitive Behavior. How Storytelling effects the reality narrative.  
[karenpalmer.uk](http://karenpalmer.uk)

## SKU-Market

**Laura Allcorn**

**Laura Allcorn** (US) is an artist and founder of The Institute For Comedic Inquiry. She applies critical wit to create participatory installations. Her humorous premises invite audiences to play with complex ideas and rehearse for the future we want.  
[comedicinquiry.com](http://comedicinquiry.com)

**Dr. Jennifer Edmond** (IE) is Associate Professor of Digital Humanities at Trinity College Dublin where she is co-director of Trinity Center for Digital Humanities, Director of MPhil in Digital Humanities and Culture, and a funded Investigator of SFI ADAPT Centre.  
[www.dh.tcd.ie](http://www.dh.tcd.ie)

## Normalizi.ng

**Mushon Zer-Aviv**

**Mushon Zer-Aviv** (IL) is a designer, researcher, educator, and media activist based in Tel Aviv. His love/hate relationship with data informs his design work, art pieces, activism, research, teaching, workshops, and city life. His current research reimagines the role of friction in technology, media, design, and politics. Among Mushon's collaborations, he is the CO-founder of Shual.com—a foxy design studio, and multiple government transparency and civic participation initiatives with the Public Knowledge Workshop. Mushon also designed the maps for Waze.com and led the design of Localize.city. Mushon is an alumni of Eyebeam art + technology center in New York. He is a senior faculty member at Shenkar College and has previously he taught at NYU, Parsons, and Bezalel. <https://mushon.com>

## Your Balanced Media Diet

**Ross Dowd & Brendan Spillane**

**Ross Dowd** (IE) is a multi-disciplinary, industrial and interaction designer based in Dublin. He creates products, experiences, and installations that facilitate meaningful interactions between people, as well as between users and their environment. [rossdowd.com](http://rossdowd.com)

**Brendan Spillane** (IE) is a Research Fellow on the Provenance H2O2O project investigating misinformation, disinformation, or fake news in the European Union. He has previously worked on the Adele project to develop a conversational agent to aid in the care of the elderly.

## The Uncanny Valley of Breath

**Carlotta Aoun, Ant Nevin, Patrick Cormac English, and Ed Storey**

**Carlotta Aoun** (FR/VZ) explores the (in)materiality of technology as it progressively blends in with organic structures. [carlottaaoun.com](http://carlottaaoun.com).

**Ant Nevin** (NZ) materializes, translates, and transforms scientific data into physical structures.

[antnevin.com](http://antnevin.com) and [biolumenlab.com](http://biolumenlab.com)

**Patrick Cormac English** (IE) is a researcher at University College Dublin working with fingerprinting human speech.

**Ed Storey** (GB) is a researcher at Trinity College Dublin working with Accented Speech Recognition. Patrick Cormac English (IE) is a researcher at University College Dublin working with fingerprinting human speech.

## Untitled

### (A Digital Platforms Moderation Game)

**Caroline Sindere & Aphra Kerr**

**Caroline Sindere** (US) is a machine-learning design researcher and artist. For the past few years, she has been examining the intersections of technology's impact in society, interface design, AI, abuse, and politics in digital, conversational spaces. [carolinesindere.com](http://carolinesindere.com)

**Aphra Kerr** (IE) is a Professor of Sociology at Maynooth University and a Principle Investigator in ADAPT Centre for Digital Content Technology. Her research is focused on autonomy and transparency in AI driven digital content systems. [adaptcentre.ie](http://adaptcentre.ie)

## Classes

### Libby Heaney

**Libby Heaney** (GB) is a British artist and lecturer at the Royal College of Art. Her post-disciplinary art practice includes moving image works, performances, and participatory and interactive experiences that span quantum computing, virtual reality, AI, and installation. Heaney uses machine learning and quantum computing against their “proper” use, to undo biases and to forge new expressions of collective identity and belonging with each other and the world.

*libbyheaney.co.uk*

## Laws of Ordered Form

### Anna Ridler

**Anna Ridler** (GB) is an artist and researcher who works with systems of knowledge and how technologies are created in order to better understand the world. She is particularly interested in ideas around measurement and quantification and how this relates to the natural world. Her work has been exhibited at cultural institutions worldwide including the Victoria and Albert Museum, the Barbican Centre, Centre Pompidou, HeK Basel, the ZKM Karlsruhe, Ars Electronica, and more.

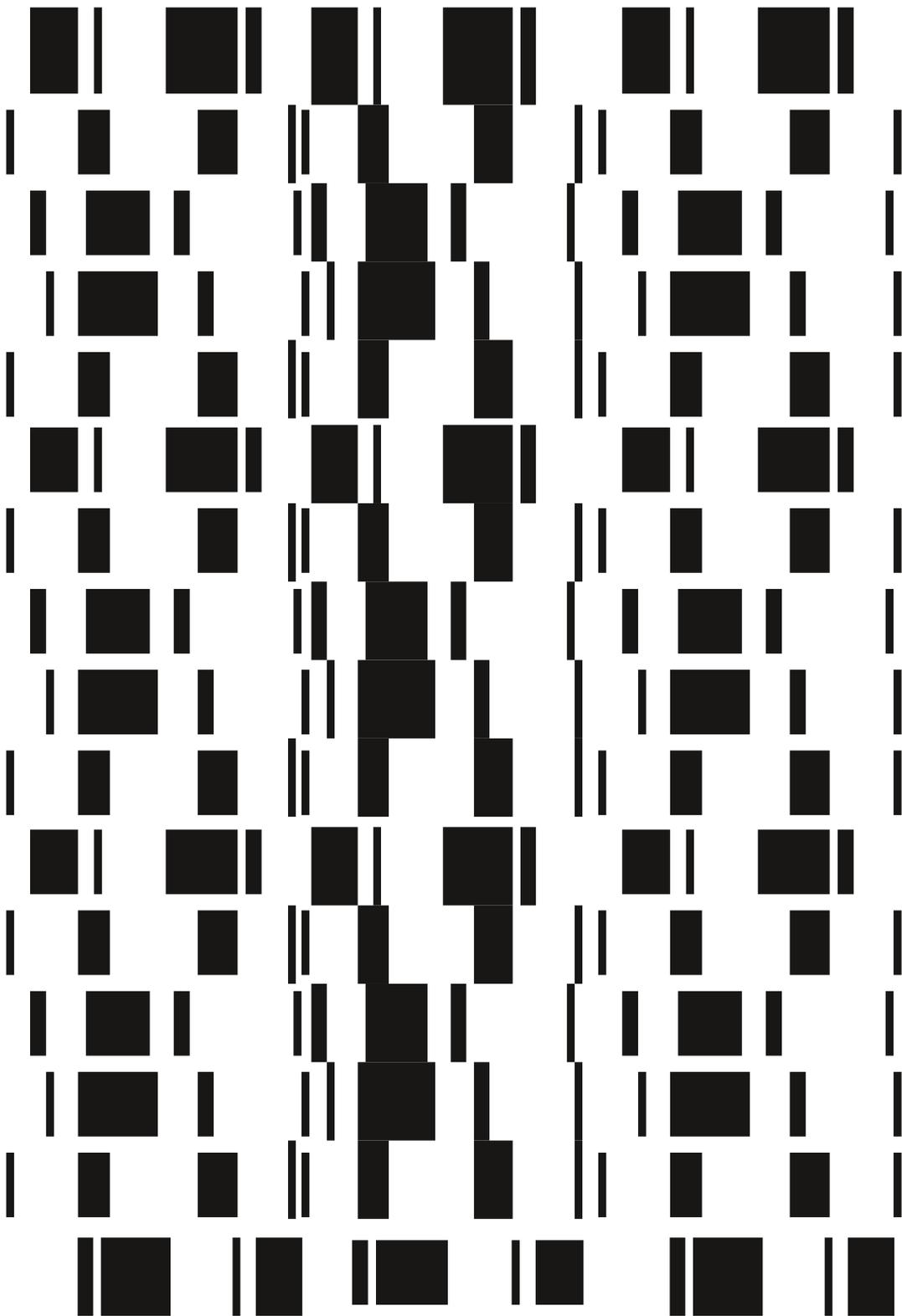
*annaridler.com*

## AI isn't Artificial but Human

### Anna Ridler, Caroline Sindors

**Anna Ridler** (UK) is an artist and researcher. She has exhibited at institutions such as the V&A Museum, Ars Electronica, HeK Basel, Impakt, and the Barbican Centre and has degrees from the Royal College of Art, Oxford University, and University of Arts London. She was a 2018 EMAP fellow and was listed by Artnet as one of nine “pioneering artists” exploring AI’s creative potential. She is particularly interested in ideas about measurement and quantification and how this relates to the natural world. <http://annaridler.com>

**Caroline Sindors** (US) is a machine learning researcher and artist obsessed with language, culture, and images. Her work explores the intersections between natural language processing, artificial intelligence, abuse, online harassment, and politics in digital conversational spaces. Her work has been featured in the V&A Museum, MoMA Ps1, the Modern Art Museum of Bologna, Ars Electronica, and others. She is the founder of Convocation Design + Research, an agency focusing on the use of machine learning and design for public good. <https://carolinesindors.com>



# SOU Festival / SOC Festival

The Stream of Unconsciousness Festival (SOU) focuses on production and presentation of contemporary music and visual arts, acoustic experiments, sound research, new opera, musical theatre, digital and new media art, dance, and interaction with traditional music. It collaborates closely with renowned Georgian and international artists and researchers on contemporary multidisciplinary projects. Among former participants of the Festival are Robert Henke, Ryoji Ikeda, Bjork, Carsten Nicolai, Hatsune Miku, and Ensemble Modern, among others.

Along with performances, exhibitions, and concerts, the festival encourages education and information accessibility through workshops and short courses. The festival challenges established contexts for general perceptions and expectations.

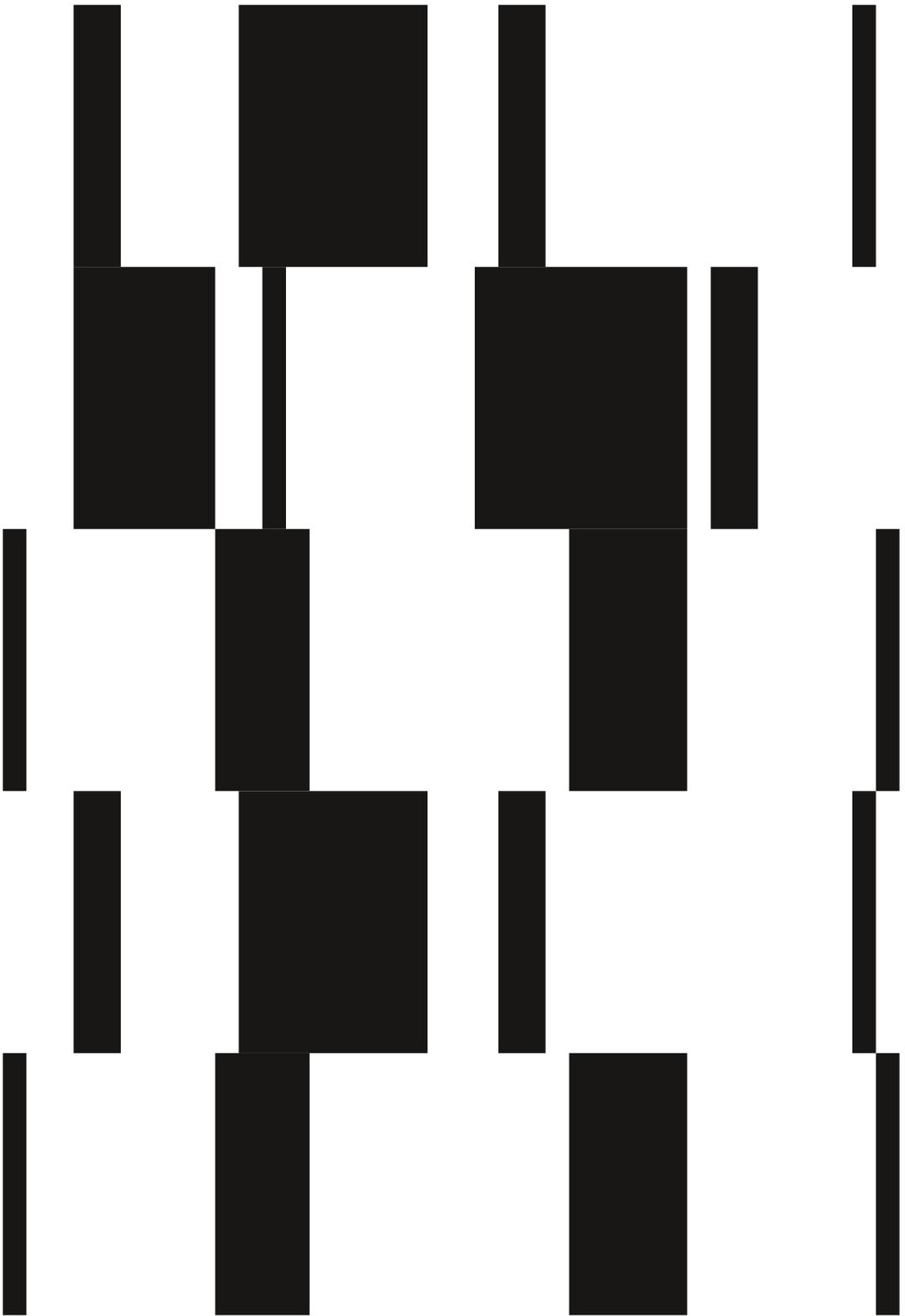
Within three years, the SOU Festival developed into the most important happening in digital arts in Georgia and is followed by an extensively growing audience. The Stream of Unconsciousness Festival challenges established contexts that define the whole

cultural process of today. Architecture, individual and collective memory, physical experience, definitions, cultural hierarchy, and others have created for us a perception of expectations. Every single artist, their work and the context we create for contact, questions these expectations and makes our quest more exciting. Contemporary music and visual arts, acoustic experiments, sound research, new opera, musical theatre, digital and new media art, dance, and interaction with traditional music are the main focus of the SOU Festival. Besides actual cultural happenings, we encourage education and information accessibility through workshops and other educational programs.

In 2021 SOU Festival with its history, experiences, and traumas went from being an unconscious process to a conscious one, thus SOU became SOC festival. SOC stands for Stream of Consciousness. As the festival's new name suggests, the future work will be directed to educational and social activities, contributing to combatting inequality, social justice, and poverty in Georgia.

**S**      **O** U**FESTIVAL**

Tbilisi, Georgia



# Waag



Amsterdam, NL

# Waag

Waag is a Future Lab for technology and society. Technology is not neutral. Waag reinforces critical reflection on technology, develops technological and social design skills, and encourages social innovation. Waag works in a trans-disciplinary team of designers, artists, and scientists, utilizing public research methods in the realms of technology and society. This is how Waag empowers as many people as possible to design an open, honest, and inclusive future.

## **Future Lab**

As of January 2021, Waag has been assigned the role of Future Lab by the Dutch Minister of Education, Culture, and Science. This role can be described as follows: “A Future Lab is a center for the future-oriented development of design and for the use of design and technology to solve social challenges.” Waag was awarded this position due, in part, to the organization’s 25 years of experience in design and artistic research in the field of technology and society.

Waag’s activities primarily take place in research labs, where research and development are carried out on technological and social issues. As part of its public program, Waag organizes workshops, exhibitions, and debates. Additionally, Waag offers educational courses on creative technology and society with its Waag Academy program.

## **AI Culture Lab**

Waag’s AI Culture Lab sets out to explore the role and potential of AI in our shared futures, understanding AI systems both as technological and cultural phenomena. Its stated goal is exploring alternative notions and applications of AI, positing the human in the interplay of algorithms and data. The core activities of the lab are facilitating artistic research projects and residencies into AI and developing AI knowledge and applications for and with the public, in conjunction with scientific and business partners of the community. It brings together artists, scientists, citizens, and entrepreneurs to share ideas, pursue research, and foster new, civic applications of this major new technology.

# Environmental Intelligence

Artificial intelligence is a mainstream term describing the scientific study of intelligence demonstrated by machines, in contrast to the natural intelligence of humans and other animals. Upon closer inspection we find that the sentiment surrounding popular AI discourses solidifies human exceptionalism—it is human intelligence that proves its primacy by demonstrating the capacity to create an artificial version of itself.

This perspective however ignores numerous overlooked actors that contribute to the functioning of computational machines; in fact, we posit that the intelligence of machines is an environmental matter. The environment so substantially influences intelligence demonstrated by machines that we should understand it as an environmental condition in itself. Such a shift from artificiality toward environmentality allows us to address the blind spots of technological neutrality, which downplays technology’s historical, social, and environmental embeddedness.

One of the main references of Waag’s public research approach is Donna Haraway’s notion that technology is not neutral.<sup>1</sup> In reference to her work, Chris Julien<sup>2</sup> argues that bias in AI is not a flaw in systems of measurement and automation, a “remainder” to be excised, but a primary means of understanding, or rather *accounting* for our place and histories in the world, starting with our place in these artificially intelligent technological systems we talk so much about. Following bias, the dividing lines between domains such as technology and society, between nature and culture begin to diffract and collapse into each other, leaving us collectively stranded *in* the situation we once sought to discover, segment, and control. Furthermore, the shift of perspective—from perfect windows allowing us to look “onto” the world, to being “in” the world together

with these machines—directs our attention to the seams of AI implementation and calls for capacities to interpret the AI container. While social, business, legal, and ethical perspectives of AI dominate mainstream narratives, Waag applies an ontologically flat material view to focus on overlooked agencies embodied *within* the container of intelligence demonstrated by machines. In the *Anatomy of an AI System*,<sup>3</sup> Kate Crawford and Vladan Joler dissected Amazon’s Alexa smart home device, mapping the controversial practices of rare metal extraction and invisible human labor, which are essential for the processing of digital tasks. The extraction of material resources was also addressed within the “Supre:organism” exhibition Waag organized with Vijfhuizen Kunsfort in 2019<sup>4</sup>. The *Kongo Astronaut* video work by Eléonore Hellio and Michel Ekeba concerned life on a planet made foreign by environmental and societal devastation following cobalt mining. Withing the same exhibition, the *Space Offshore* project by RYBN.org approached resource appropriation by showcasing extensive documentation on controversial outer space mining legislation in Luxembourg and the USA, which disregards international Space treaties. While technology providers usually remain disinterested in such concerns, artworks like these give the public an opportunity to reflect on the uncomfortable side of the status quo.

With environmental intelligence, the effort goes toward identifying the ways with which technology depends on and consists of environmental agencies. Planet Earth holds fascinating capacities expressed through chemical, biological, ecological, and other processes. Science and technology that lead the effort of understanding the environment still recognize it merely as an *object of observation* or a *resource*, thus as something

external. What artists observe is that through the processes of extraction and appropriation, the environment comes to live inside of us—humans and machines.

In Antti Tenetz's poetic and speculative work, *Perihelion/Rage/secret\_lover* bacteria prosper solely on an analogue of lunar soil while deep dreaming, through neural networks, about what their life would look like on the Moon. We observe an organism that embodies the lunar environment and uses AI to daydream and speculate. Similarly, in *PL'AI Špela Petrič* developed a playground for the robot and plants to play in. The artwork's neural network creates an abstract image of the plants as a mathematical matrix, just precise enough to identify the plants' movements so that the robot can reach closer to the tendrils that eventually hook up to the robot's interface. We observe neural networks imagining versions of an environment as relevant to the particular relationships in both cases. In this way, we again identify bias as a primary means of understanding both *their* and *our* place in the world.

Turning the gaze away from individual relations toward humanized environments, we not only observe the existence of bias but also its multiplicity. With their project *StreetSwipe*,<sup>5</sup> the aesthetics of Exclusion collective addresses the biased perception of an urban environment, specifically the aesthetics of gentrification. The artwork lets the audience determine if they think a photo of a bar storefront should be classified as "gentrified." Exploring digital environments, Tomo Kihara works with YouTube's recommendation algorithms in the *TheirTube*<sup>6</sup> project. The artwork demonstrates a trap of biased information bubbles where YouTube recommends users' popular content. In both cases, we observe a loop of influence,

the way people as users form the physical and digital environment, while this biased environment locks its users into closed profiled containers.

As a way to shift the perspective away from human exceptionalism in the context of intelligence demonstrated by machines, Waag advocates for the response-ability toward the material agencies expressed through emerging technologies like AI, for the diversity and inclusivity of interpretations in machine perception, and for transparent and participatory categorization of digital environments. With such an agenda, Waag challenges the environmental divide between technological and ecological environments. Poor environmental literacy usually passes from makers to their machines. With a focus on the expression of environmental agencies, the use of intelligence demonstrated by machines turns from very human interests to environmental care. In this way living systems larger than individual entities such as rivers, forests, oceans, and clouds, can become recognized as active makers and users of intelligent machines.

**Miha Turšič, Waag**

- 1 "A Cyborg Manifesto: Science, Technology, and Socialist-Feminism in the Late Twentieth Century," in *Simians, Cyborgs and Women: The Reinvention of Nature* (1991), pp. 149–181.
- 2 Chris Julien et al, "Biased-by-default", position paper of AI Culture Lab, Waag
- 3 Kate Crawford, Vladan Joler (2018). *Anatomy of an AI System: the Amazon Echo as an anatomical map of human labor, data and planetary resources*. Novi Sad: Share foundation. ISBN 978-86-89487-13-8
- 4 <https://waag.org/en/event/supreorganism-exhibition>
- 5 <http://streetswipe.aestheticsofexclusion.com>
- 6 <https://www.their.tube>

# Activities

## Conferences

### Environmental Intelligence symposium

01.11.2019

Planet B, Amsterdam Science Park 608,  
Startup Village

Špela Petrič (SI), Theun Karelse (NL),  
Kyriaki Goni (GR), Aesthetics of Exclusion (NL)

## Exhibitions

### Supre:organism

Kunstfort bij Vijfhuizen, Vijfhuizen, NL

14.09.2019 – 06.10.2019

Kongo Astronauts—Eleonore Hellio (FR), C—DER—  
Ivan Henriques (NL/BR), Photons of Marshotons of  
Mars—Minna Långström (FI), LGM#5—Quadrature  
(DE), The Space Offshore—RYBN (FR), Perihelion/  
Rage/secret\_lover—Antti Tenetz (FI), E|A|S  
(Evolving Asteroid Starships)—DSTART(NL)

### Museum night Amsterdam

Lectures & exhibition

Waag, Amsterdam, NL

02.11.2019 – 03.11.2019

Bernard Foing, Antti Tenetz (FI), Sjoerd ter Borg  
(NL), Thomas Smits & Melvin Wevers (NL),  
FIBER (NL), Students AKV/St.Joost (NL), Moon  
Gallery (NL)

## Residencies

### Aesthetics of Exclusion residency

Planet B, Amsterdam Science Park & Waag,  
Amsterdam, NL

April – August 2019

Sjoerd ter Borg (NL)

### Supre:organism

Planet B, Amsterdam Science Park & Waag,  
Amsterdam, NL

April – August 2019

Antti Tenetz (FI)

## Workshops

### Supre:organism residency days at ESA

ESA/ESTEC Noordwijk, NL

13.05.2019 – 15.05.2019

Workshop MoonMars science

Workshop MoonMars technologies and  
simulations

Workshop Supre:organism Art day

MoonGallery artists E. Glukhova & A.Sitnikova

(RU/NL), Antti Tenetz (FI), Femke Herregraven  
(NL); M. van Vollenhoven (NL), artist, I.

Douzoglou, N. Nagasawa, S. de Jager, B.

Chattopadhyay, D. de Paulis; MN. Rojina; J. Schulp,

Bernard Foing (FR) scientist at the European Space

Agency, Miha Turšič (SI/NL), Bram de Winter (NL),

EuroMoonMars team (NL)

### Planet B: MoonMars workshop

ESTEC, Keplerlaan 1, Noordwijk, NL

18.11.2019 – 20.11.2019

ILEVWG; the International Lunar Exploration

Working Group

### ONLINE planet B expedition meetup #7

Interactive workshop session

Online

19.03.2020

Miha Turšič (SI/NL), Tomo Kihara (JP)

### AI Academy—Tomo Kihara

Lecture and workshop

Online

20.09.2021

TheirTube

Tomo Kihara (JP)

**AI Academy—Špela Petrič**

Lecture and workshop

Online

27.09.2021

PL/AI

Špela Petrič (SI/NL), Benjamin Fele (SI)

**AI Academy—Femke Herregraven**

Lecture and workshop

Online

04.10.2021

Evacuated

Femke Herregraven (NL), Chris Julien (NL)

**AI Academy—Mushon Zer-Aviv**

Lecture and workshop

Online

11.10.2021

The Normalizing Machine

Mushon Zer-Aviv (IL)

## Other Activities

**Planet B expedition meetup #2**

Meet-up & presentations

Amsterdam Science Park, Startup Village,  
Amsterdam, NL

22.08.2019

Roos Groothuisen (NL), Tomo Kihara (JP)

**Planet B expedition meetup #3**

Meet-up & presentations

Amsterdam Science Park, Startup Village,  
Amsterdam, NL

13.09.2019

Antti Tenetz (FI), Flavia Dzodan (NL)

**Planet B expedition meetup #4**

Meet-up & presentations

Amsterdam Science Park, Startup Village,  
Amsterdam, NL

17.10.2019

Aesthetics of Exclusion & Bots with an Attitude  
Sjoerd ter Borg (NL), speaker Jan Hein  
Hoogstad (NL)

**Planet B expedition meetup #5**

Meet-up & presentations

Amsterdam Science Park, Startup Village,  
Amsterdam, NL

16.01.2020

Infinity Games

Marie van Vollenhoven (NL)

**Planet B expedition meetup #6**

Meet-up & presentations

Amsterdam Science Park, Startup Village,  
Amsterdam, NL

13.02.2020

Bots With an Attitude

Jan Hein Hoogstad (NL)

**ONLINE — planet B expedition meetup #8**

Meet-up & presentations

Online

16.04.2020

LarbitsSisters: Bénédicte Jacobs & Laure-Anne  
Jacobs (BE), moderator: Stefano Bocconi (IT/NL)

# Projects

LNDWstudio



## C-DER

Ivan Henriques (NL/BR)

Humans are now drivers of environmental change on a scale that is unique in mankind's history. In the meantime, preparations are being made for lunar and Martian habitats, requiring a tremendous advancement in the methods and instrumentation of ecosynthesis. How will scientists and engineers working with artists and designers accomplish this pivotal endeavor? *Symbiotic Machines for Space Exploration* (SyMSE) is a project that aims to create an autonomous system for enhancing terrestrial ecosystems and facilitating atmospheric formation on other planets through artificial photosynthesis. Within this scenario the bio-drone C-DER is one of SyMSE's outcomes and the continuation of the bio-machines created by Ivan Henriques. The C-DER operates as a swarm and has a dual function: it is capable of exchanging gases with the environment through micro-algae photosynthesis and it seeds the ground of endangered environments on Earth.

C-DER was developed in collaboration with Raoul Frese, Sandrine D'Haene, Granit Domgjoni (Biophysics department VU Amsterdam), Korneel Rabaey, Amanda Luther and Jan Arends (UGhent—CMET); Hardware & software designer: Andjela Tomic; Assistants: Emiel Gilliamse and Sjoerd Legue, Leydervan Xavier (CEFET/RJ) and Agata Maria Kokodziejcyk (Space Garden/ESA), and Bernard Foing (ESA). Supported by NWO Research Through Design, VU Amsterdam, Space Orbit Program—Gluon, and Mondriaan Fonds.



LNDWstudio

*LGM#5* is created in collaboration with sound artist Kerim Karaoglu, as part of the #beethoven fellowship program, a project by PODIUM Esslingen on the occasion of the Beethoven anniversary 2020, funded by the German Federal Cultural Foundation. Created with the use of ATNF Pulsar Catalogue ([www.atnf.csiro.au](http://www.atnf.csiro.au)), Manchester, R. N., Hobbs, G.B., Teoh, A. & Hobbs, M., AJ, 129, 1993–2006 (2005).

## LGM#5

### Quadrature (DE)

The audiovisual installation *LGM#5* is based on an extensive database of pulsars and neutron stars from the Australian National Telescope Facility. Exploring the rhythms and wavelengths of these rotating sources of radio emission, the extremely fast pulses and strong gamma rays of these exotic celestial bodies are transformed into clicks, sine waves, and light. The multi-channel piece stringently follows the specifications of the currently known 2659 pulsars. When discovered in 1967, the precision and artificiality of the received signal led the researchers to nickname the unknown phenomenon LGM-1, for “little green men.” Over three movements *Quadrature*’s interpretation builds an increasingly dense space of sound and light in honor of these metronomes of the universe.



LNDWstudio

## E|A|S

### (Evolving Asteroid Starships)

### DSTART (NL)

The hostile and unpredictable environment of deep space requires a new approach for interstellar flight, one that differs radically from current aerospace concepts. Using biology as inspiration, *E|A|S* suggests creating autonomous starships that physically grow and evolve during their journey. Resources extracted through asteroid mining are used to 3D print new components of the ship in an almost endless process of adaptation. The DSTART team is currently developing concept studies and computer simulations to explore these ideas. The art installation is a combination of a large-scale animated video, an abstract diagram with computer code and living plants. The animation is a visual study of the *E|A|S* project and explores concepts such as bio-inspired 3D manufacturing, responsive modular architecture, and closed-loop ecological systems.

This installation was created by Alvaro Papic, Joris Putteeneers, Mikhail Sirenko, Victor Steemans, and Angelo Vermeulen.



LNDWstudio

*Kongo Astronauts* (Eléonore Hellio, Bebson Elemba, Danniell Toya), installation video (8'39), 2018, objects made from found and recycled materials, courtesy of the artists.

## Kongo Astronauts

Eléonore Hellio (FR)

The Kongo Astronauts artists' collective says of itself that it manifests in the interzone of digital globalization, where past, present, and future collide, running headlong into the politics of intimacy and identity of urban lives. Its cosmic appearances and polysemic fictions (performances, films, photos, texts) prompt a multidimensional engagement with the condition of exile and with tactics deployed in the quest for survival.

In *Postcolonial Dilemma Track #04 Remixed*, the most recent incarnation of a film series of the same name, the collective leads us through Kinshasa in an allegorical and wacky trip, both poetic and violent. Michel Ekeba embodies Kongo Astronauts through continuous action stimulated by survival situations in the Chinese megalopolis. He makes his space suits with old electronic circuits full of coltan. These actions captivate and contaminate many creators of passage in the DRC.



LNDWstudio

## Perihelion/Rage/secret\_lover

Antti Tenetz (FI)

*Perihelion/Rage/secret\_lover* revolves around an idea of life in space in relation to two topical concepts: biology and artificial intelligence (AI). The project provides a critical perspective to open up biases and seek new horizons besides the more utopian perceptions of AI. The merging of biosphere and technosphere in relation to the closed concept of outer space gives a speculative view on life in outer space. The metal clustering bacteria *Curvianus metaldurans* has been put in a forced evolution test and merged with a curated AI system, resulting in new learning models and visual outcomes. In this way outer space reflects the outer form of human beings and their technological extension. We are just at the beginning discovering not only what is out there, but also the terrestrial life and its possibilities on Earth.

Made possible with the Mondriaan Fund



Jimena Gauna, Waag

## Photons of Mars

Minna Långström (FI)

Minna Långström's multi-screen film installation project *Photons of Mars* is a meditation on mediated versus physical presence. The work depicts facilities and its workers dedicated to interplanetary research. The work reflects on how their understanding of the Martian landscape becomes more than the sum of the data derived from the photons hitting the light-sensitive cells of the robot's cameras. The continuous work of the Rover from target to target on Mars, gradually creates an internal world and interpretation of the place in relation to the existing one. Can images and data alone give us complete comprehension of what that world is like? *Photons of Mars* investigates the ambiguity of presence and locations and a mutually affective interconnectedness between the familiar and alien spaces it presents. The work invites viewers to be present in these places. [www.minnalangstrom.net/project/photons-of-mars](http://www.minnalangstrom.net/project/photons-of-mars)

Directed and edited by Minna Långström; Camera: Päivi Kettunen; Sound: Pertti Venetjoki; Music: Mira Calix; Animation: Dave Berg; Graphics: Nuutti Koskinen

## Counting Craters on the Moon

Kyriaki Goni (GR)

Presented at Onassis Stegi & Waag

See page 252



Tanja Kanazir

## PLANT-MACHINE

Špela Petrič (SI)

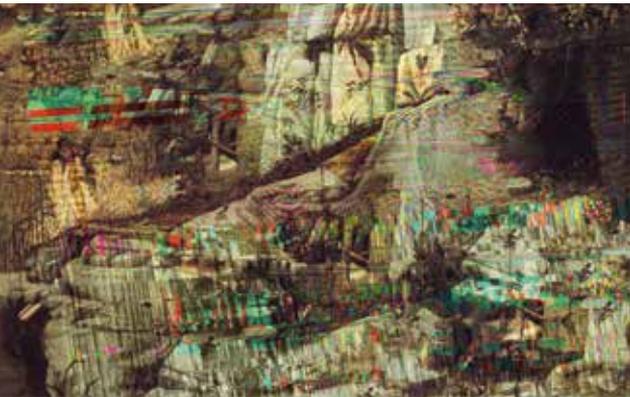
Presented at Kersnikova Institute

Kapelica Gallery & Waag

See page 195



Hana Josic



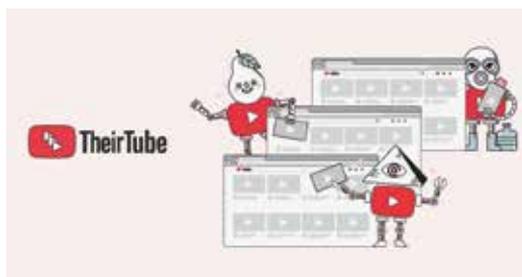
Theun Karelse

Main fellow contributors: Antti Tenetz, Ian Ingram, Jan de Graaf, Jeroen van Westen, Theun Karelse, Michelle Geraerts, Sjef van Gaalen, Sander Turnhout, Paul Seidler, Tivon Rice, Suprabha Seshan, and Semuel Sahureka. With thanks to Bioart Society in Finland, the MAAYAAM residency in Estonia, the Gurukula Botanical Sanctuary in Kerala, FIBER festival, Het Nieuwe Instituut in the Netherlands, and Dinacon.

## RandomForests

Theun Karelse (NL)

*RandomForests* is a fieldwork program interested in the potential of machines for environmental literacy. Until very recently, the ability to relate to the environment was limited to plants and animals, but now machines are starting to blur those lines. *RandomForests* explores how environmental literacy may arise in humans, other organisms, and machines, what environmental machine learning could entail, and if an artificial agent could become environmentally literate. What does this emerging synthetic worldview mean for the appreciation of environmental complexity and the power-relations between our technologies and their environment? Could environmental literacy in the artificial agents that populate our environment create any opening towards practices of environmental solidarity, intimacy, affinity, allegiance, reverence, commitment, and kinship?



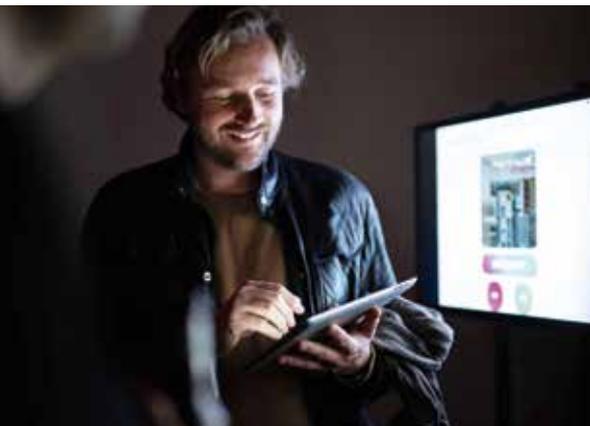
Tomo Kihara

## TheirTube

Tomo Kihara (JP)

*TheirTube* is a YouTube filter bubble simulator that provides a look into how videos are recommended on other people's YouTube. Users can experience how the YouTube home page would look for six different personas. Each persona simulates the viewing environment of real YouTube users who experienced being inside a recommendation bubble through recreating a YouTube account with a similar viewing history. *TheirTube* shows how YouTube's recommendations can drastically shape someone's experience on the platform and, as a result, shape their worldview. It is part of the Mozilla Creative Media Awards 2020—art and advocacy project for examining AI's effect on media and truth, developed by Tomo Kihara.

Character Illustration, Animation: Polina Alexeenko. Funded by: Mozilla Foundation. Supported by: Waag, Creative Industries Fund NL



Jimena Gauna, Waag, 2019

## StreetSwipe

Sjoerd ter Borg (Aesthetics of Exclusion) (NL)

Which aesthetics do we associate with gentrification? *StreetSwipe* lets the audience determine if they think a photo of a storefront or bar should be classified as gentrified.

While swiping, different cities, streets, years, and neighborhoods will be compared on a live webpage that functions as an interactive map of gentrification. The subjective input of different groups of users will be used to train different computer models that can recognize and generate images that are perceived as gentrified.

*StreetSwipe* is an initiative of Aesthetics of Exclusion: a collective of artists, designers, coders, and scientists that researches how we can use computer vision techniques and machine learning to explore and analyze aesthetical styles that correlate with gentrification in large image archives such as Google StreetView images and Instagram. The first version of *StreetSwipe* was developed during a residency from artist Sjoerd ter Borg at Waag. Design & coding: Vera van de Seyp. Back-end coding: Jorrit Schaap. Coding GAN's: Dr. Melvin Wevers. Mechanical Turk StreetView Images: Jack Waghorn. Art direction exhibition: Baratto & Mouravas. Made possible within the SIDN fund and the Creative Industries Fund NL.



LNDWstudio

## The Space Offshore

RYBN.ORG (FR)

In July 2017, Luxembourg passed a law on the mining and extraction of space resources, the first of its kind in Europe. This surprising announcement was the starting point of an artistic investigation which tries to understand why a small country like Luxembourg is participating in the space race against the giants of the space industry such as the United States, China, and Russia. This investigation has opened up an offshore maze, from the European district of Kirchberg in Luxembourg City to lobbies in Law Schools of Leiden, the Netherlands, and offshore companies registered in Delaware. The project sheds a crude light on the negotiations around space governance that happen today far from the eyes of the general public. This survey is a subpart of the project *The Great Offshore*, previously exhibited at Espace multimedia Gantner in 2017, which aims to reverse the traditional understanding of tax havens as a marginal phenomenon by repositioning it at the heart of the economic system.

<http://rybn.org/thegreatoffshore/spaceoffshore>

With the participation of Konrad Becker, Dinah Bird, Erik Bordeleau, Ewen Chardronnet, Alain Deneault, Martin Elvis, Pippa Goldschmidt, Tony Milligan, Frédéric Neyrat, Lars Schmitz (Richtung22), Miha Turšič, and the voices of Dinah Bird, Marie Constant, Valérie Perrin. With the support of Espace Multimédia Gantner, EUCIDA and the Institut Français residency program, Les collectifs.

# Artists

## C-DER

Ivan Henriques

**Ivan Henriques** (NL/BR) is a transdisciplinary artist and researcher working on multimedia installations that examine living systems. In his work he explores hybrids of nature and (technological) culture creating new forms of communication between humans and other living organisms. Ivan developed the interdisciplinary group Hybrid Forms and is the director of the mobile residency program EME (Estúdio Móvel Experimental). [ivanhenriques.com](http://ivanhenriques.com)

## LGM#5

Quadrature

**Quadrature** (DE). Quadrature's artistic research focuses on data and physical experiments. The Berlin artist collective uses new technologies and scientific findings as inspiration, as well as raw material. For some years, the artists have been focusing specifically on methods and tools for exploring the cosmos, as the universe represents an intangible but very real place for their reflections, evoking both the most elemental emotions and the most advanced scientific theories. [quadrature.co](http://quadrature.co)

## E|A|S (Evolving Asteroid Starships)

DSTART

**DSTART** (NL) (TU Delft Starship Team) is a transdisciplinary team of engineers, scientists, architects, and artists developing next-generation concepts for interstellar exploration. DSTART aims to critically examine ideologies underpinning current space exploration paradigms and tries to propose alternative ideas. <https://www.tudelft.nl/en/tpm/research/stories-of-science/from-creative-chaos-to-interstellar-spaceship>

## Kongo Astronauts

Eléonore Helliö

**Eléonore Helliö** (FR) began her career in 1990 at C.A.F.E. Electronic International Los Angeles, the first cybercafe and electronic art experimentation network, founded in 1984. She is one of the pioneers of network art in France and has carried out numerous artistic interventions around the world. In 1996 she started teaching at the Haute Ecole des Arts du Rhin in Strasbourg. For ten years now, she has been a regular teacher in art, media, and performance at the Academy of Fine Arts in Kinshasa, Democratic Republic of Congo. Since 2013, Helliö lives in Kinshasa, where she co-piloted the KONGO ASTRONAUTS collective, together with the artist Michel Ekeba. <https://kongoastronauts.wordpress.com>

## Perihelion/Rage/secret\_lover

Antti Tenetz

**Antti Tenetz** (FI) Based in Oulu, the far North of Finland, Antti Tenetz is an artist and naturalist. He has worked and filmed throughout the North, from the Ice Sea to Siberia, and as far south as Thailand. His works are at the crossroads of media-, bio- and urban arts with a strong current of interdisciplinary art-science approach. In his works he combines mediums ranging from various technological platforms and materials to living nature. [www.tenetz.com](http://www.tenetz.com)

## Photons of Mars

Minna Långström

**Minna Långström** (FI) is a film maker and media artist who graduated from the Academy of Fine Arts in Helsinki (MFA), where she was also an assistant professor in moving image 2008–12. Her artistic work consists of films, short fiction, and documentary as well as participatory installations, combining moving images with spatial or interactive elements. Her most recent film *The Other Side of Mars* had its premiere at the Doc Point Festival in Helsinki, January 2019. [www.minnalangstrom.net](http://www.minnalangstrom.net)

## Counting Craters on the Moon

**Kyriaki Goni**

**Kyriaki Goni** (GR) is an Athens born and based artist. Through multimedia installations she critically touches upon questions of datafication, surveillance, distributed networks and infrastructures, human and other-than-human relations. Her artistic practice incorporates research and interaction with scholars and scientists. She is a Delfina Foundation alumna (2019) and a Niarchos Artworks fellow (2018). She is the recipient of Art Science Residency by Ars Electronica and Deutsche Telekom 2021. [kyriakigoni.com](http://kyriakigoni.com)

## PLANT-MACHINE

**Špela Petrič**

**Špela Petrič** (SI) is a new media artist and former scientific researcher currently based between Ljubljana, SI, and Amsterdam, NL. Her practice is a multi-species endeavor, a composite of natural sciences, wet media, and performance. She envisions artistic experiments that enact strange relationalities to reveal the ontological and epistemological underpinnings of our (bio)technological societies and challenge the scope of the adjacent possible. Much of her recent work has focused on plant life.

<https://www.spelapetric.org>

## RandomForests

**Theun Karelse**

**Theun Karelse** (NL) studied Fine Arts at the Sandberg Institute in Amsterdam before joining FoAM, a transdisciplinary laboratory at the interstices of art, science, nature, and everyday life. His interests and experimental practice explore edges between art, environment, technology, and archaeology. Lately he has been creating research programs like *Machine Wilderness* and *RandomForests* that consist of fieldwork as a means of critical reflection. For this, diverse teams are established to address specific topics in specific locations by in-situ prototyping, experimentation, and direct perception.

<http://www.randomforest.nl>

## TheirTube

**Tomo Kihara**

**Tomo Kihara** (JP) is a designer and a creative technologist working in partnership with Waag. His projects challenge complex socio-technical problems through playful interventions and have been exhibited across the world. He is experimenting with machine learning in order to explore the implications of autonomous decision-making systems in our society. Graduated from Msc Design for Interaction at TU Delft, he has backgrounds in both design research and HCI (Human Computer Interaction), which allows him to deploy research-driven designs that require technical skills. [www.tomokihara.com](http://www.tomokihara.com)

## StreetSwipe

**Sjoerd ter Borg (Aesthetics of Exclusion)**

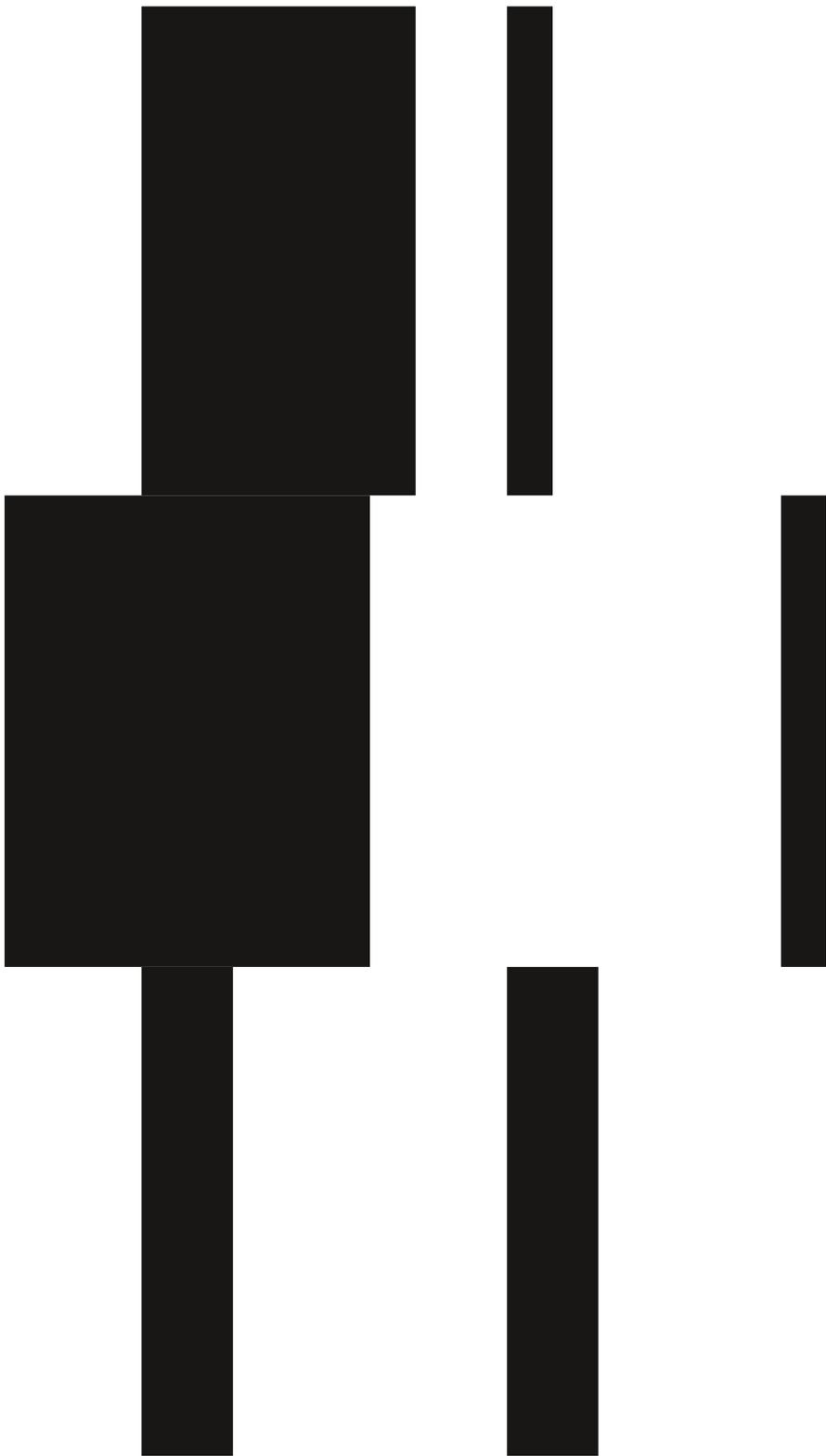
**Sjoerd ter Borg** (NL) is a political scientist and artist and part of the art collective Aesthetics of Exclusion. Aesthetics of Exclusion uses design research to question how we can use computer vision and machine learning techniques to explore and analyze aesthetical styles that characterize gentrification and processes of (urban) homogenization. Through the use of streetview platforms, the collective researches aesthetical phenomena (such as color, texture, and objects), categorizes them in datasets and analyzes these with computer vision techniques.

[sjoerdterborg.nl](http://sjoerdterborg.nl) / [aestheticsofexclusion.com](http://aestheticsofexclusion.com)

## The Space Offshore

**RYBN.ORG**

**RYBN.ORG** (INT) is an extra-disciplinary artistic research platform created in 1999. It leads investigations within the realms of economics and information technologies, by writing kabbalistic algorithms, inserting suicidal trading machines into the financial markets, perverting neural networks during their training phase, or hunting ghosts in the noise of data traffic. The works of RYBN.ORG have been shown in numerous contemporary art exhibitions such as "Infosphäre" (ZKM), "Nervöse Systeme" (HKW), "The Global Contemporary" (ZKM), and "2062" (la Gaité lyrique). [rybn.org](http://rybn.org)





**AI LAB**  
European ARTificial  
Intelligence Lab



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Creative Europe Programme  
of the European Union



**Federal Ministry  
Republic of Austria**  
Arts, Culture,  
Civil Service and Sport

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ars.electronica.art

**CEOs:** Gerfried Stocker, Markus Jandl

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**Editors:** Gerfried Stocker, Markus Jandl, Andreas J. Hirsch

Ars Electronica  
European ARTificial Intelligence Lab

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