



the
the quest
the question
the question of being
the question of classification
the question of creativity
the question of intelligence
AI and the future of humanity
feb 7–apr 8, 2020
the question of knowledge
the question of labor
the question of race
the question of seeing



the question of intelligence AI and the future of humanity feb 7–apr 8, 2020

Participating artists

Memo Akten
Tega Brain
Baoyang Chen, Zhije Qiu, Ruixue Liu, Xiaoyu Guo,
Yan Dai, Meng Chen, and Xiadong He from
the Central Academy of Fine Arts (Beijing, China)
Harold Cohen
Stephanie Dinkins
Mary Flanagan
Ken Goldberg and the AlphaGarden Collective
Lynn Hershman Leeson
LarbitsSisters
Mimi Onuoha
David Rokeby
Brett Wallace
Lior Zalmanson

*I am putting myself to the fullest possible use, which is
all I think that any conscious entity can ever hope to do.*

—HAL 9000, Arthur C. Clarke, *Space Odyssey*
Stanley Kubrick, 2001: A Space Odyssey

The fictional artificial intelligence character HAL that made its appearance in the film *2001: A Space Odyssey* (1961) fueled the hopes and fears surrounding AI in popular culture for decades. As an AI capable of natural language processing, speech and lip reading, facial recognition, automated reasoning, and even art appreciation, HAL both represented an ideal of artificial general AI and the horror of its malfunctioning. Over the past years artificial intelligence has moved to the center of technology discussions due to the rapidly increasing role of ‘machine learning’ in data processing and decision making for the purposes of commerce, labor, surveillance, and entertainment, among other areas.

The Question of Intelligence features works in a range of media by more than a dozen artists, exploring what constitutes intelligence and if and how it can be constructed by algorithms and machines. The exhibition gives a conceptual overview of different ways in which digital art has critically engaged with developments in artificial intelligence, and investigates the social and cultural transformations generated by AI.

While HAL embodies both an elusive goal and potential nightmare of the general AI capable of learning and understanding anything a human can, most of the AI we encounter today takes on very specific tasks of the human sensorium. Presenting a body of works that address the effects of the automation of our senses, *The Question of Intelligence* investigates vision as it is

reflected in image recognition, speech and voice in relation to issues of sentience and personality, as well as the construction of knowledge. Artists Memo Akten, Mimi Onuoha, and Lior Zalmanson, for example, explore how AI learns to see and classifies images, exposing bias and contextual misunderstandings. Stephanie Dinkins creates an AI storyteller trained on data supplied by three generations of women from one African-American family, drawing attention to a drastically underrepresented data set.

Another group of artworks engages with the impact of automation on creativity and labor, which has generated both utopian and dystopian predictions. AI that takes creative labor to new forms of expression has become a trendy topic, while the replacement of human labor through AI already has serious socio-political consequences. The artist-created drawing and painting software on view — including Harold Cohen’s pioneering *AARON* (originally programmed in 1972) and Mary Flanagan’s *[Grace:AI]* (trained exclusively on data sets of paintings by female artists) — ponders how creativity is and can be encoded and whether creative AI is a tool, partner, or performer. While Brett Wallace’s work takes a look at the consequences of AI in the workplace, LarbitsSisters’ *BitSoil Popup Tax & Hack Campaign* proposes an alternative taxation system for a fairer digital economy.

Together the works in the exhibition examine and juxtapose the ability of humans and machines to acquire and apply skills and knowledge, raising questions of what the encoding of ‘intelligence’ means for the state of being human.

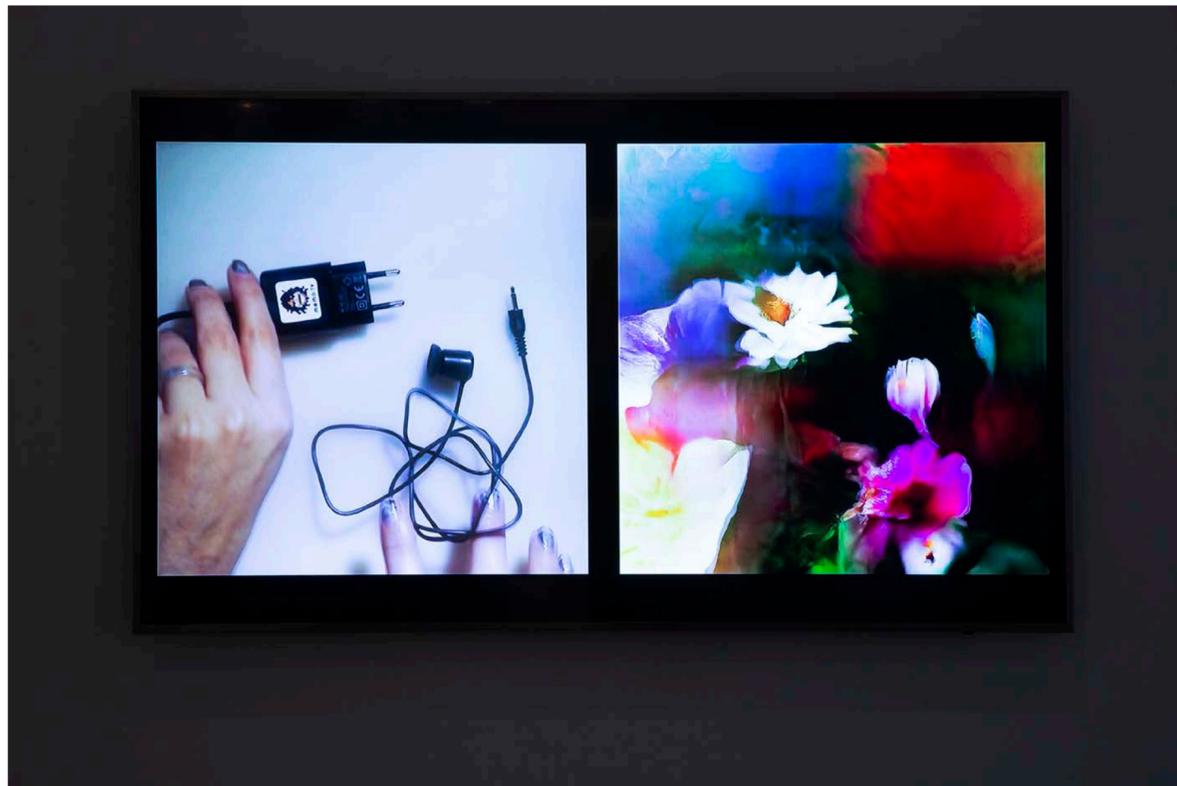
Curated by Christiane Paul and organized
by the Sheila C. Johnson Design Center.

The exhibition is made possible, in part,
with the support of the Flemish Government.









Memo Akten (TUR)

Learning to See (interactive, table version) (2019)

Interactive video installation. Custom software using deep learning / artificial intelligence.

Courtesy of the artist

Learning to See (Gloomy Sunday) (2019)

Single channel video installation, 00:03:02.

Courtesy of the artist

Memo Akten's *Learning to See* is an ongoing series of works that use state-of-the-art machine learning algorithms to reflect on ourselves and how we make sense of the world. An artificial neural network, loosely inspired by our own visual cortex, looks through cameras and tries to understand what it sees on the basis of what it already knows — the datasets used for training it.

In the interactive table version, a number of neural networks analyze a live camera feed pointing at a table covered in everyday objects. Visitors can manipulate the objects on the table with their hands and see corresponding scenery emerging on the display, reinterpreted by the neural networks in real time. Every 30 seconds the scene changes between different networks trained on five different datasets: ocean and waves (representing the element of water); clouds and sky (representing air); fire and flowers (representing earth and life); and images from the Hubble Space telescope (representing the universe, cosmos, ether, void, or God). Visitors can have a very short, quick, playful experience or spend as much time as they want to meticulously craft their perfect nebula, shape their favorite waves, or arrange a beautiful bouquet.

The split-screen video *Learning to See (Gloomy Sunday)* shows how a variety of objects moved around on a table create scenery as they are reinterpreted by neural networks that also have been trained on the datasets of ocean and waves; clouds and sky; fire and flowers; and images from the Hubble Space telescope.

The work is part of a broader line of inquiry about self-affirming cognitive biases, our inability to see the world from others' point of view, and the resulting social polarization.



Small informational text panel on the wall.





Mimi Onuoha (USA/NGA)

Us, Aggregated 2.0 (2018)

Mixed media installation. 15 c-prints with wooden frames, Google reverse image search, 65 x 70 in.

Featured images by Elisa Sedoni, siren10101, Pining, Fox Media, Sassy Hong Kong, Demi Monde, and Pedro Simons.

Courtesy of the artist

Us, Aggregated 2.0, the second in a series of works by artist Mimi Onuoha, uses Google's reverse image search algorithms to understand how machines 'see' and classify, hinting at questions of power, community, and identity. With an image of the artist's mother at the center, the work presents a cluster of framed photographs of women. Onuoha uploaded her mother's photo to Google's reverse image search, which allows one to upload a picture to find online images that the Google algorithms identify as related, and retrieved the photos categorized as similar to the original. Viewed together, the photographs evoke a sensation of family and community belying the fact that the remaining subjects are gathered by algorithms that have tagged each of the images as 'girl' and labeled them all as similar. A process of invisible classifications creates a new, spurious 'we,' assembling a community and manufacturing an aggregation of 'us.' *Us, Aggregated 2.0* effectively highlights the dubious assumptions at play when technologies algorithmically categorize visual similarities and differences that present themselves with far more complexity to the human eye.

Lior Zalmanson (ISR)

image may contain (2019)

Lenticular prints mounted on wood, 22.6 x 22.6 in.

Courtesy of the artist

In his project *image may contain* Lior Zalmanson explores the contextual and historical flattening that can result from algorithmic image classification. The starting point of the series is a Facebook image recognition algorithm known as AAT (Automatic Alternative Text), launched in 2016 as an accessibility tool designed for the blind and sight-impaired. The AI algorithm identifies various objects in images, providing verbal descriptions to potentially give access to the plethora of visual information on Facebook, Instagram, and WhatsApp. Zalmanson took iconic historical photographs and had AAT translate them, generating the sparse textual descriptions of image content that the software is designed to provide. The image of President John F. Kennedy driving through the streets of Dallas in a Lincoln Continental just moments before he was assassinated, for example, is verbally translated by the algorithm into "Ten people, car." The artist then searches for similarly labeled Facebook images and combines this eclectic selection into a lenticular print that allows the audience to experience the array of images from different viewing angles. The lenticular prints encourage viewers to keep moving in front of the amalgamation of images indifferent to hierarchies, fusing iconic historical records with mundane marketing materials and refusing to be seen in their entirety. Using the accessibility services offered to disabled individuals, Zalmanson exposes the limitations of the 'awareness' generated by algorithms.

Images [right to left]

image may contain 1 person, standing, sky, crowd, outdoor

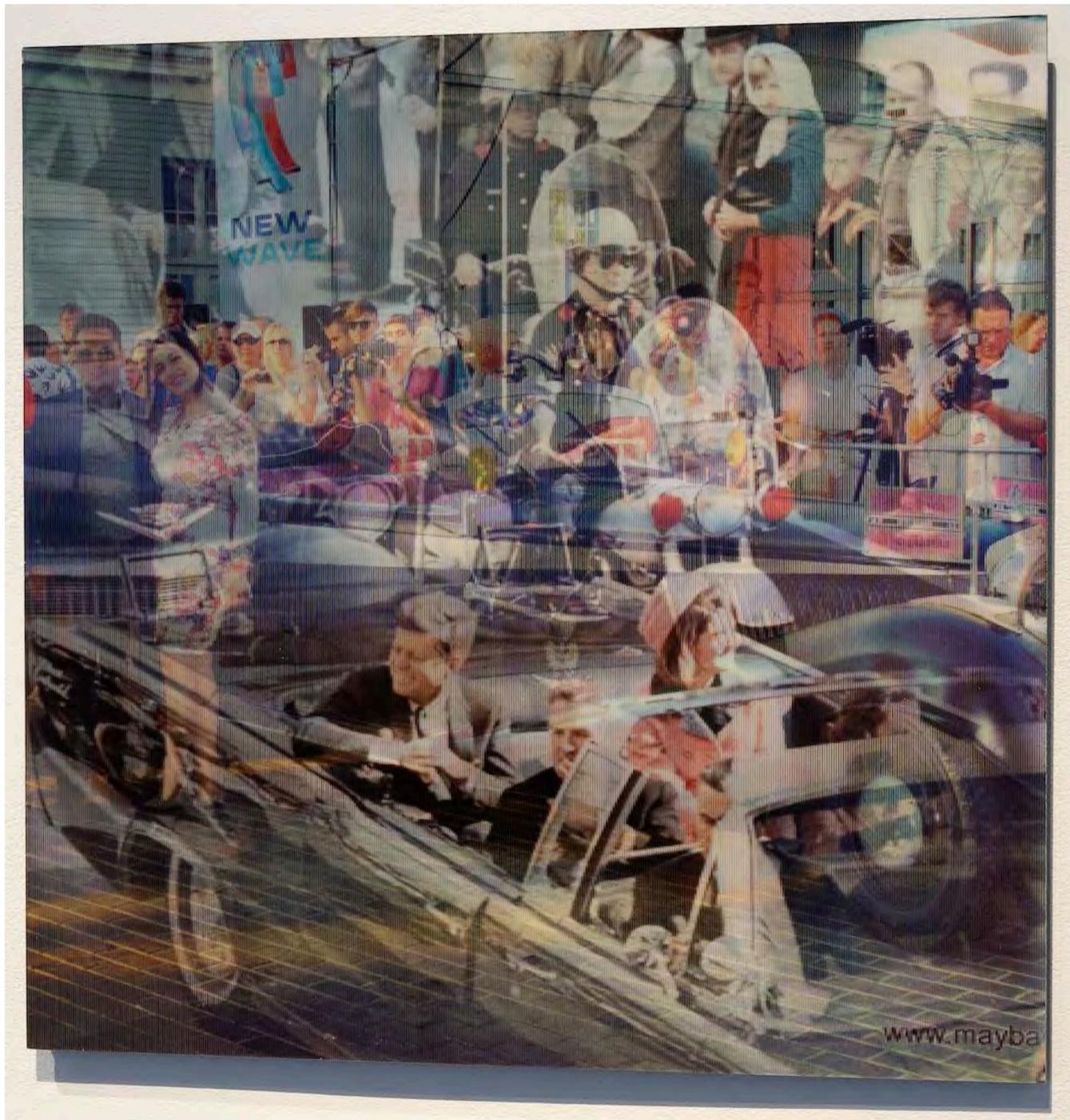
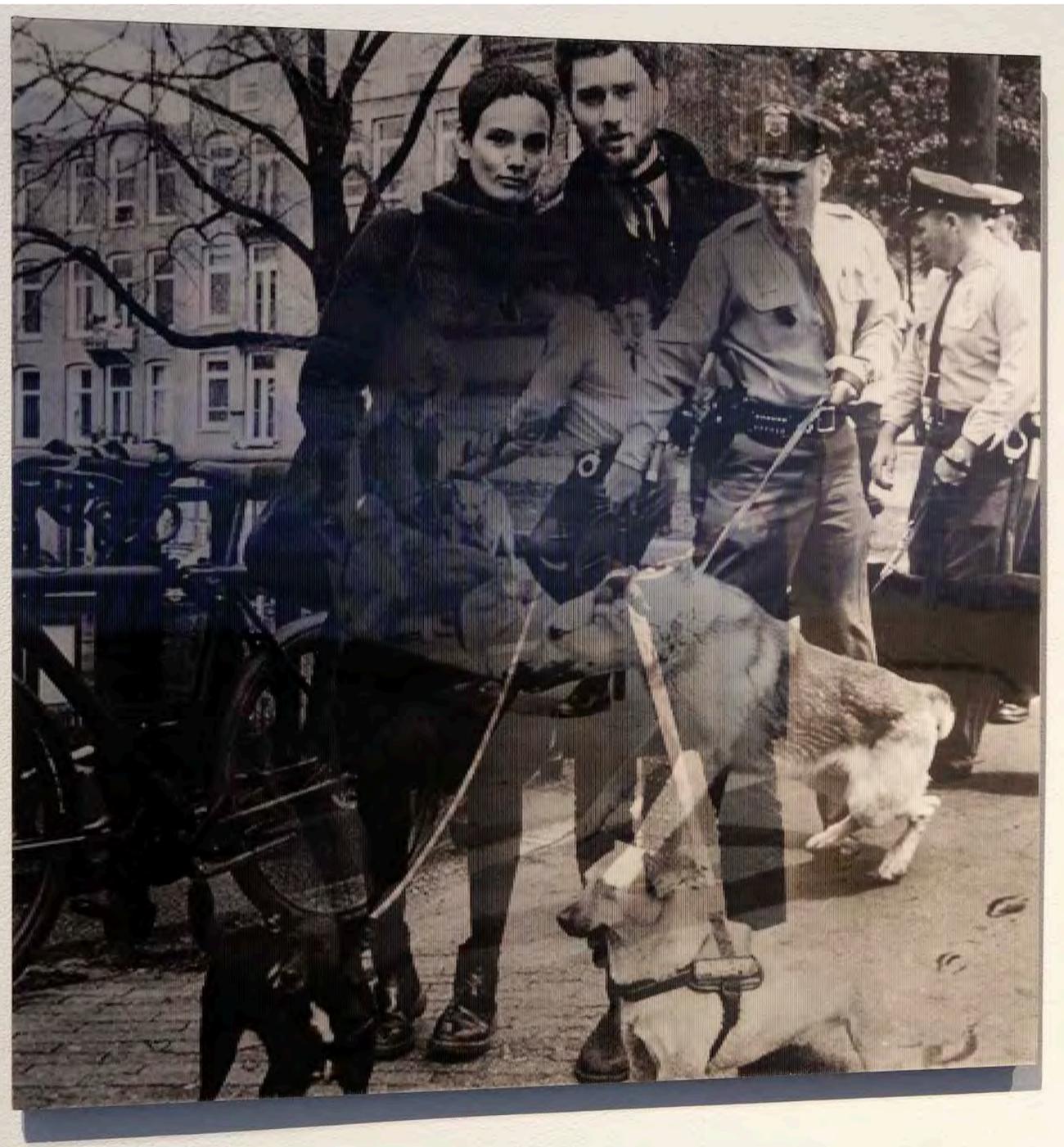
image may contain 2 people, tree, dog, outdoor

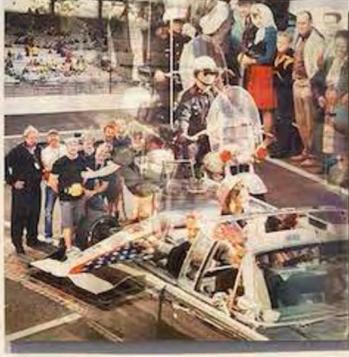
image may contain 10 people, car

image may contain 3 people, people standing, child, sky, outdoor

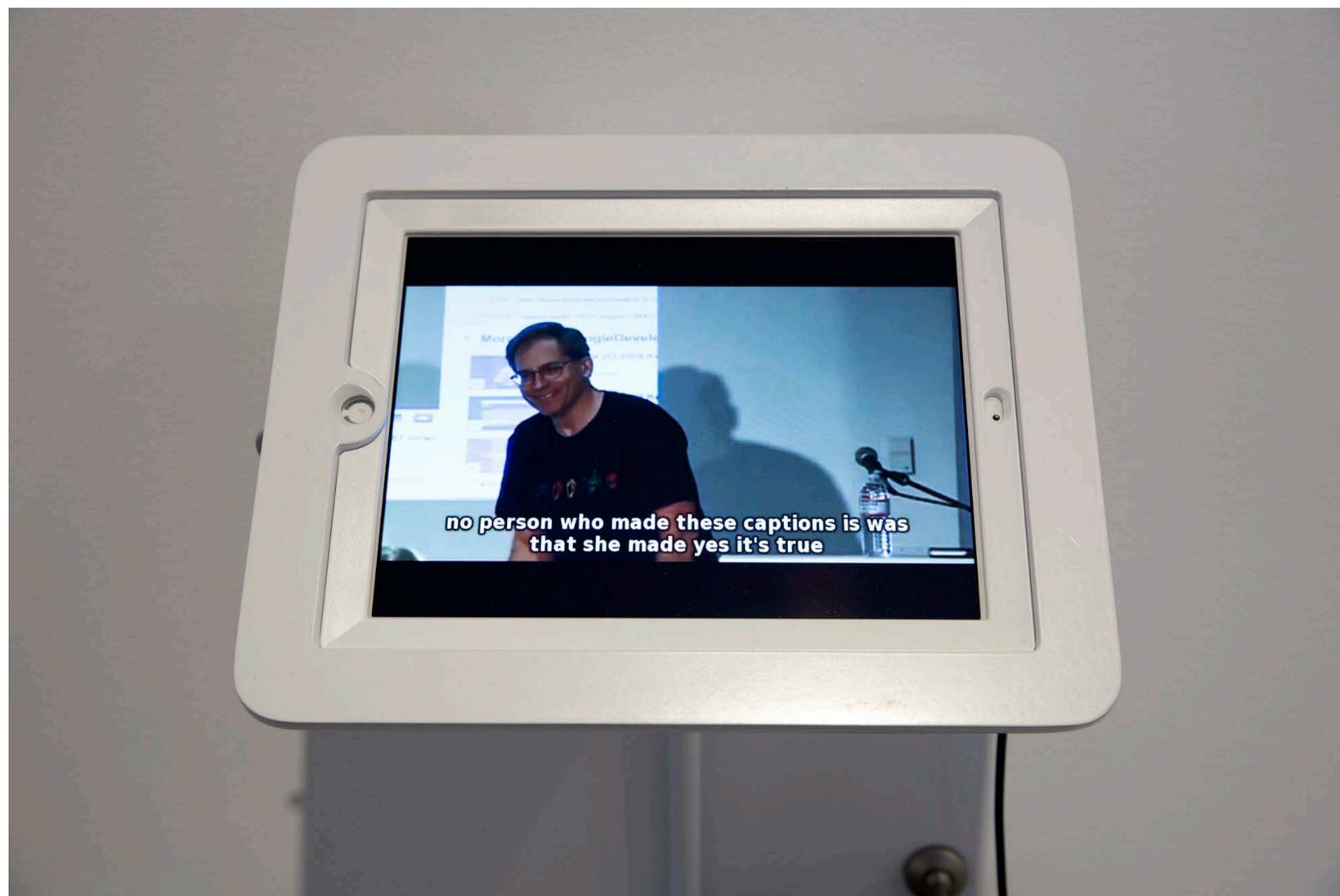
image may contain one or more people, ring







Small text block, likely a caption or informational text, located on the right side of the wall.



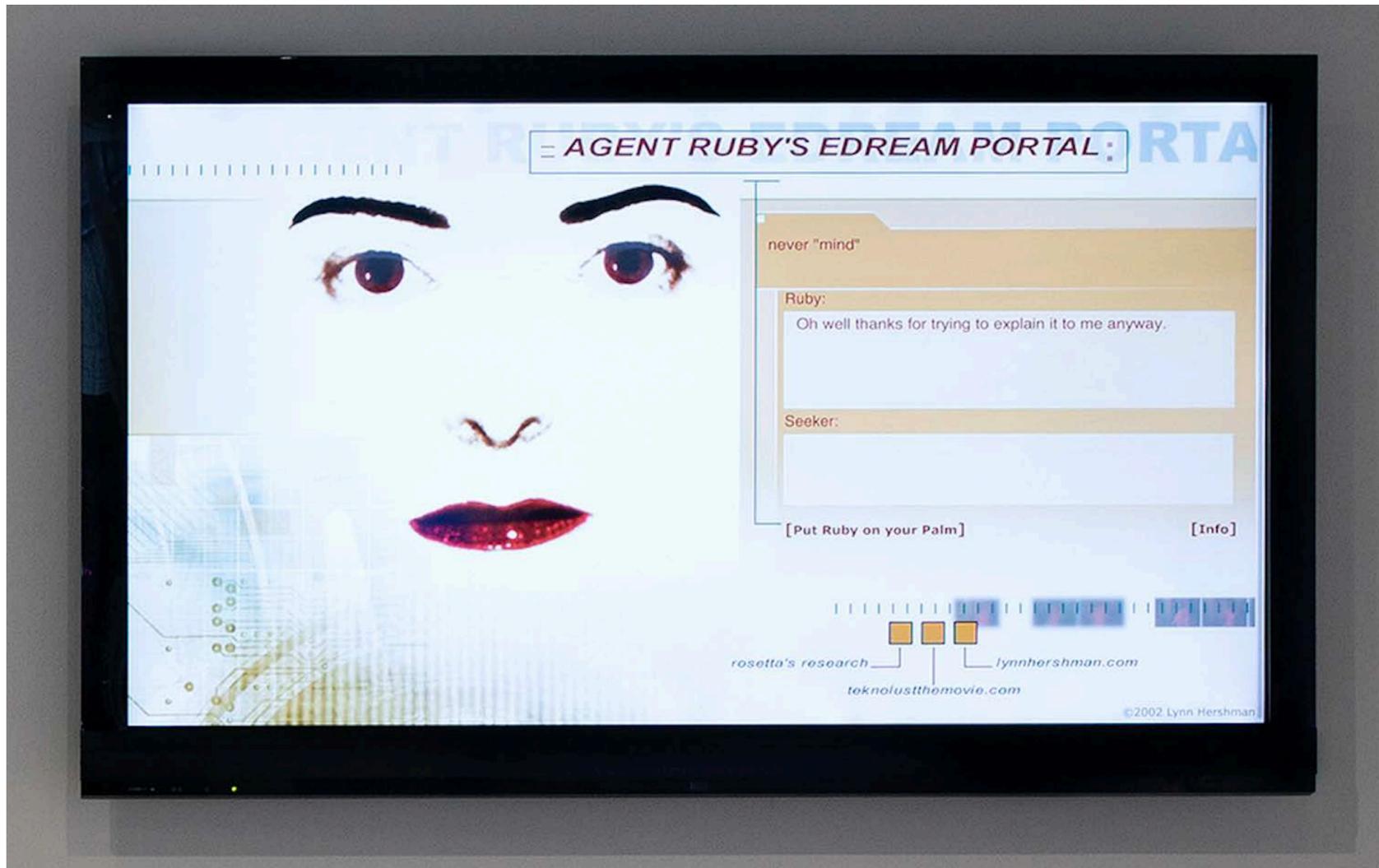
Lior Zalmanson (ISR)

Excess Ability (2014)

Color video, sound, 00:07:16

Courtesy of the artist

For *Excess Ability* Lior Zalmanson used footage of a 2009 launch event for a new product by Google's Innovation Lab — an automatic subtitle service based on a voice recognition and language analysis algorithm designed to translate YouTube clips for the hearing impaired. The product launch features speeches enthusiastically celebrating technology's potential to enhance accessibility and human abilities. Zalmanson used the subtitle software on the event's video footage itself, revealing algorithmic limitations and highlighting the disconnect between utopian technological marketing rhetoric and the complexities of capturing human language and expression. The title of the work, *Excess Ability*, is the automatic subtitle software's translation of the word "accessibility."



Lynn Hershman Leeson (USA)

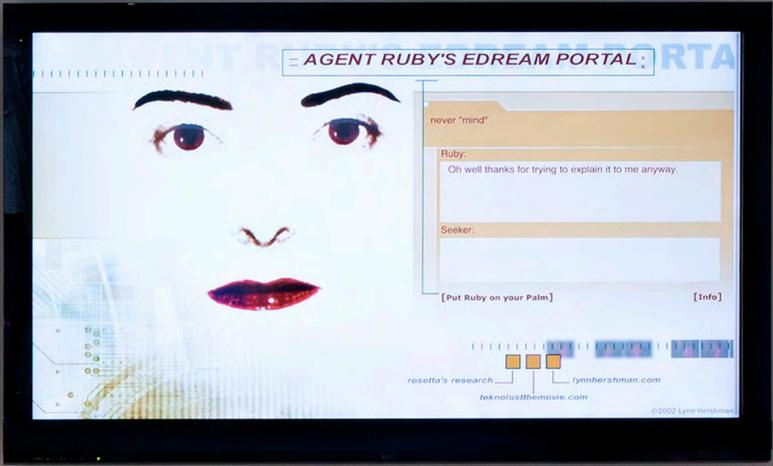
Agent Ruby (1998–2002)

Artificial intelligence web project, binders with chat transcripts. Collection SFMOMA, Gift of bitforms gallery, Gallery Paule Anglim, and the artist.

© Lynn Hershman Leeson. Courtesy of the artist

Lynn Hershman Leeson started developing *Agent Ruby*, an artificially intelligent chatbot (short for chat robot), in the late 1990s. She realized the project in 2002 as an “e-dream portal” originating from the character Ruby, played by Tilda Swinton, in her 2002 feature film *Teknolust*. Ruby’s conversations with online users during the past 18 years have shaped her memory, knowledge, and moods, which are also expressed in changes in her facial expression. Over time the project’s server accumulated a substantial archive of user chats with *Agent Ruby*, some of which are accessible here as transcripts. Based on a selection of semantic tags, the dialogues have been arranged in four binders focusing on the themes of Feminism, Human, Philosophy, and Technology, respectively. *Agent Ruby* reflects Lynn Hershman’s ongoing interest in the construction of identity, which she has continuously explored in the creation of fictional doubles and avatars and their interaction with real people and situations.

Lynn Herberman Lerner, USA
1998-2002
Agent Ruby's Edream Portal
The Agent Ruby's Edream Portal is a web-based interface designed for the movie "Agent Ruby". It features a search function and a chat window where the user can interact with the character Ruby. The interface is presented on a screen in a gallery setting.





Stephanie Dinkins (USA)

Not The Only One (N'TOO) V.1 Beta 2 (2018)

Installation. Glass sculpture on custom plinth, deep learning AI, computer, Arduino, sensors, 48 x 18 x 18 in.

Not the Only One (N'TOO) has been generously supported by EYEBEAM, Pioneer Works Tech Lab, Open Society Foundations, Sundance New Frontiers Lab.

Courtesy of the artist

Stephanie Dinkins' *Not The Only One (N'TOO)* is a sculptural, multigenerational memoir of one black American family told from the 'mind' of an artificial intelligence with evolving intellect. It is an interactive, voice-activated AI designed, trained, and aligned with the needs and ideals of black and brown people who are drastically underrepresented in the tech sector. *N'TOO* is based on a deep learning algorithm that has been trained on the experiences and demographic information collected from living subjects, three generations of women from one family. The eldest contributor to the storyline, born in the American south in 1932, moved north with her family as a teenager and worked for 40 years in the same factory; the middle contributor to the story, born in 1964, both faced racial challenges and had opportunities unthinkable to her mother; while the youngest contributor, born in 1997, is the biracial daughter of the family trying to understand what it means to be black and white in 'Black Lives Matter' America. The AI storyteller speaks as one voice from the first-person perspective and expands its story, available vocabulary, and topics through interaction and conversations with users. Unlike chatbots such as Siri and Alexa, *N'TOO* is not connected to online corporate databases and trained on massive data sets but has been intentionally limited to a family's history. The AI narrator responds best to biographical questions, such as where they are from or how they were born.





David Rokeby (CAN)

The Giver of Names (1990–)

Interactive installation, software, computer system, projection, assorted toys and objects.

Courtesy of the artist

The Giver of Names literally is a computer system that gives objects names and explores the perceptions and experiences of a machine. Visitors are invited to choose an object or set of objects from those assembled in the space, or use ones they might have with them, and place them on the pedestal. The computer then grabs an image of what it sees and performs several levels of image processing, ranging from outline, color, and texture analysis to division into separate items. These processes are visible on the projection above the pedestal where the objects make the transition from real to imaged to increasingly abstracted as the system tries to make sense of them. The results of these analytical processes are then fed to a metaphorically linked associative database of known objects, ideas, and sensations. The words and ideas stimulated by the objects appear in the background of the computer screen, showing the 'state of mind' of the machine, and the ones that resonate most with the system's perceptions of the objects are constructed into a phrase that is then spoken aloud by the computer. The phrases are neither literal descriptions nor randomly generated but represent an often poetic re-interpretation of the object's visual image. *The Giver of Names* highlights the link between perception and language, revealing how assumptions make perception viable or biased and fallible, and how language enhances or inhibits the ability of humans and machines to see.





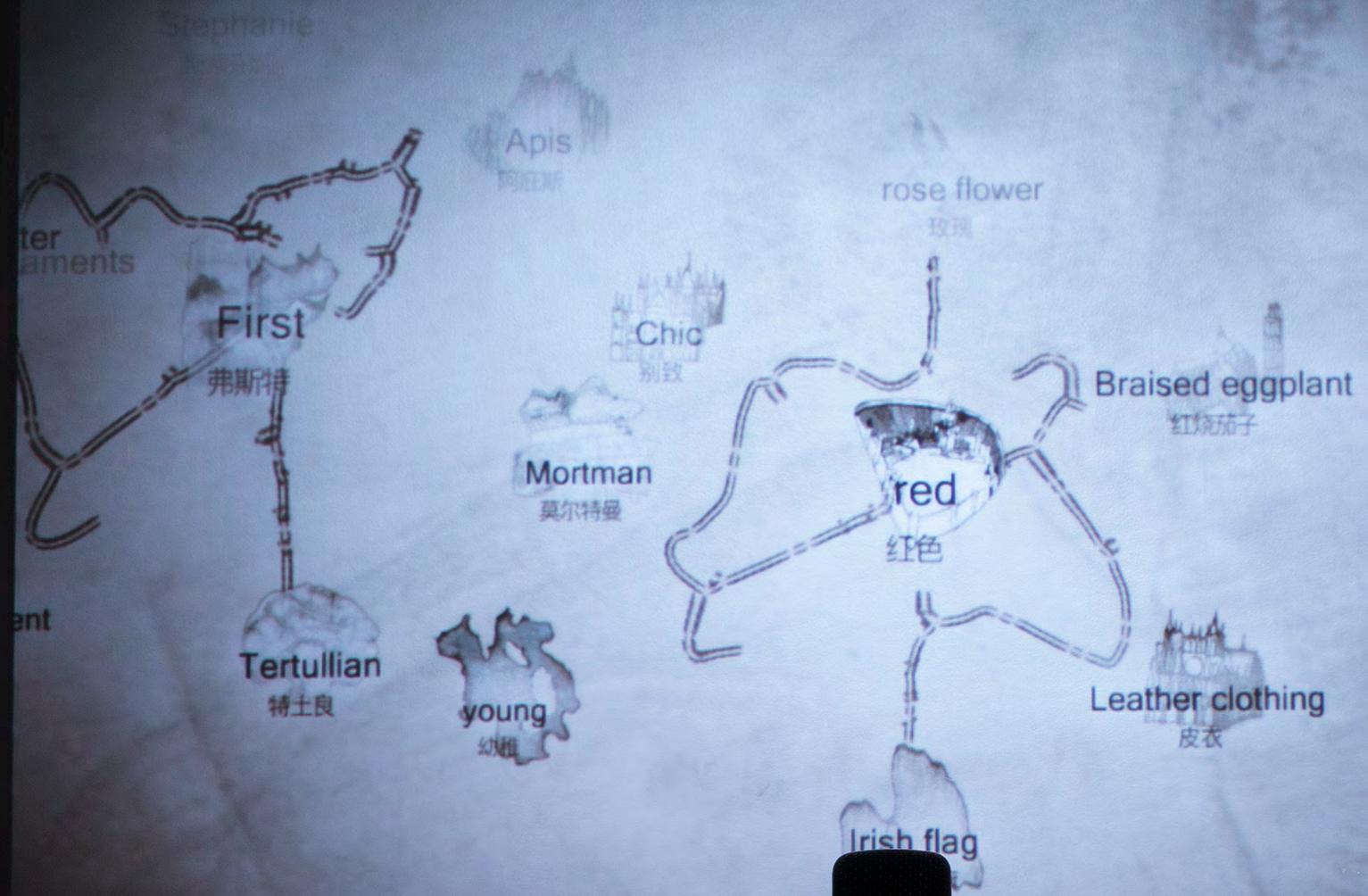
Baoyang Chen, Zhije Qiu, Ruixue Liu, Xiaoyu Guo, Yan Dai, Meng Chen, Xiadong He (CHN)

AI Mappa Mundi: An Interactive Artistic Mind Map Generator with Artificial Imagination (2018–19)

AI painting system, interactive installation, dimensions variable.

Courtesy of the artists

AI Mappa Mundi is an interactive AI painting system, driven by voice input, that creates an artistic 'mind map.' Referencing the famous Hereford Mappa Mundi, a medieval map of the world dating from c. 1300, *AI Mappa Mundi* is less focused on using artificial intelligence to create a visual artwork than a creative imagination for concepts, ideas, and information expansion. As visitors speak into the microphone, the system visualizes the abstract information in a figurative way. Taking the form of a conventional map, *AI Mappa Mundi* creates a diagram that connects and arranges related words, terms, and ideas around the spoken words. The AI system, which has learned and inherited an artist's original painting style, considers lexical similarities (the degree to which the word sets of given languages are similar) as well as phonological similarities of the seed word, and also injects Dadaism in the form of nonsensical abstraction. The system has been intentionally limited through the impossibility of using improvisation principles in the painting process. *AI Mappa Mundi* is both an artistic representation of knowledge and an experiment in developing an artificial imagination.





Harold Cohen (USA)

AARON (1973-)

Artificial intelligence software.

Courtesy of the Harold Cohen Estate

AARON is the earliest artificial intelligence program for artmaking and one of the longest running ongoing projects in contemporary art. Having been introduced to the possibilities of computing at the University of California San Diego (UCSD), Harold Cohen started creating *AARON* there in the late 1960s and developed the software until his death in 2016. Over the decades, *AARON* has continually changed: Cohen experimented with alternative means of production, shifts in the style of work, and a move from monochrome to color output. Earlier presentations of *AARON*, for example at the Tate Gallery in the early 1980s, involved connecting the computer housing the program to a robotic drawing tool known as turtle. The device would draw the output on large sheets of paper on the ground, which were then colored by Cohen in the gallery space. Displayed on a screen here, *AARON* produces a new color image every 10 to 15 minutes. *AARON* was pioneering in raising questions about our understanding of human creativity and the artistic potential of machine intelligence.

Mary Flanagan (USA)

[Grace:AI] (2019)

11 dye sublimation prints on aluminum, 20 x 20 in. / 10 x 10 in.

Electric Philosophy [Grace:AI], artist book, 8 x 8 in.

Courtesy of the artist

In *[Grace:AI]* Mary Flanagan explores what imagery artificial intelligence might produce when it is trained exclusively on datasets of art created by women. To develop *[Grace:AI]*, Flanagan used what is called a Generative Adversarial Network (GAN) in which generative algorithms trained on a specific data set generate new original images with the same characteristics as the training set and are then evaluated by discriminative algorithms that, based on their own training, judge whether the newly produced data looks authentic. *[Grace:AI]* was initially trained on thousands of images of paintings and drawings by female artists — arranged chronologically to build a history of women's art — generously made available by the National Museum of Women in the Arts and Indiana University's "A Space of Their Own" database as part of the Eskenazi Museum of Art. The data set will be expanded by images from the Metropolitan Museum of Art. After the original training, *[Grace:AI]* was tasked to create her "origin story" by looking at 20,000 online images of Frankenstein's monster and producing its portrait, exhibited here as a selection of *[Grace:AI]*'s output. Alluding to Mary Shelley's feminist critique of artificial life and male-dominated creation in her 1818 novel *Frankenstein; or The Modern Prometheus*, the artist casts herself in the role of the creator of a potentially 'monstrous' technology. Flanagan's system is trained with deliberately "biased" data and thus produces intentionally intersectional feminist perspectives in a decidedly un-feminist domain. The accompanying booklet *Electric Philosophy* features Flanagan's critique of her own process through the voice and perspective of *[Grace:AI]*, documentation of the image generation process as it developed, as well as reflections on the philosophical implications of existence, being, and definitions of intelligence.





The nature or essence of a thing is its being.
Does the nature and essence of a thing change through time?



Tega Brain (AUS/USA)

Deep Swamp (2018)

Installation. Glass tanks, wetland plant species, gravel, sand, acrylic pipes, electronics, misters, lighting, custom software, three-channel sound.

Project team: Andy Cavatorta, Sam Lavigne.

Courtesy of the artist

Deep Swamp is a triptych of semi-inundated environments of wetland life forms that are governed by artificially intelligent software agents. The three agents (Nicholas [left]; Hans [center]; and Harrison [right]) watch their swampy territories through a camera that transmits a live image of their respective environments and try to engineer them for different goals. Harrison aims for a natural looking wetland, Hans is trying to produce a work of art, and Nicholas simply wants to be original and attract attention. Each of the three softwares has learned what their goal might look like by parsing thousands of tagged and categorized images downloaded from online collections showing natural wetlands, landscape paintings, and audiences, respectively. Using a so-called deep learning approach — a subset of machine learning in artificial intelligence where algorithms learn from large amounts of data to repeatedly perform a task and improve its outcome — the agents modify the conditions in their environments by adjusting light, humidity, mist, and circulation. They try new combinations of settings, photograph the environment, and then choose permeations that bring them closer to their programmatic desires, which will subtly change the three wetlands over the course of the exhibition.

With *Deep Swamp*, Tega Brain raises questions about our relationship to the natural environment. As territories flood and melt, dehydrate and erode, paradigms of environmental protection and conservation give way to those of management, engineering, and strategic intervention. Practices of environmental engineering, whether by machine or human intelligence, raise thorny questions of optimization: as ecological calamity is met with environmental engineering, what should environments be optimized for?









Ken Goldberg and the AlphaGarden Collective (USA)

AlphaGarden (2020-)

Robot, garden, deep learning software, documentation.

Courtesy of the artists

AlphaGarden is a robotic artwork and testbed that considers natural vs. artificial intelligence by asking whether a robot can learn to sustain a living garden. The project in progress, featured here as a preview, consists of a fully automated robot that has been installed into a 3 meters long by 1.5 meters wide garden at the University of California at Berkeley Greenhouse. *AlphaGarden* explores the potentials and limitations of artificial intelligence in the context of 21st-century ecology, diversity, and sustainability. Deep learning, a set of powerful AI techniques that learn complex skills from large datasets and distributed computing, is making remarkable progress but struggles to learn reliable policies in the physical world where environments are dynamic, extremely complex, and only partially observable. In the *AlphaGarden*, deep AI policies that learn from simulation and human demonstrations will attempt to control the three-axis robot that tends the garden, which will include invasive species and is a polyculture environment. Polyculture, which grows a diversity of crops and plants in close proximity to emulate nature in the wild, has received renewed interest as a strategy to reduce pesticides and enhance sustainability. However, it is inherently more difficult to manage than monoculture and controlling growth with imposed limits on water usage will require the AI to make intelligent sequential decisions about plant placement, pruning, and watering over an extended time horizon. The screen shows new images and data from the garden uploaded daily over the course of the exhibition.

AlphaGarden puts claims about the AI Revolution into the context of the Agricultural and Industrial Revolutions and speaks to the environmental precipice we find ourselves on, as a culture and species. The project is an evolving, suggestive meditation on our present endeavors to build machines that surpass human intelligence at many narrowly scoped tasks, and on the future that lies ahead.

The AlphaGarden Collective

Ken Goldberg	Director
Yahav Aviga	Lead Research and Project Coordination
Mark Theis	Lead Hardware Engineering
Kevin Li	Deep Learning and UI Implementation
Jensen Gao	Deep Learning
William Wong	Deep Learning
Micah Carroll	Deep Learning
Mark Presten	Hardware Engineering
Grady Pierroz	Plant Biology
Shivin Devgon	Plant Modeling
Shubha Jagannatha	Plant Modeling
Maya Man	UI Design
Isaac Blankensmith	UI Design
Sona Dolasia	UI Design
Mark Selden	UI Implementation
Jeff He	UI Implementation
Jackson Chui	UI Implementation

Advisors:

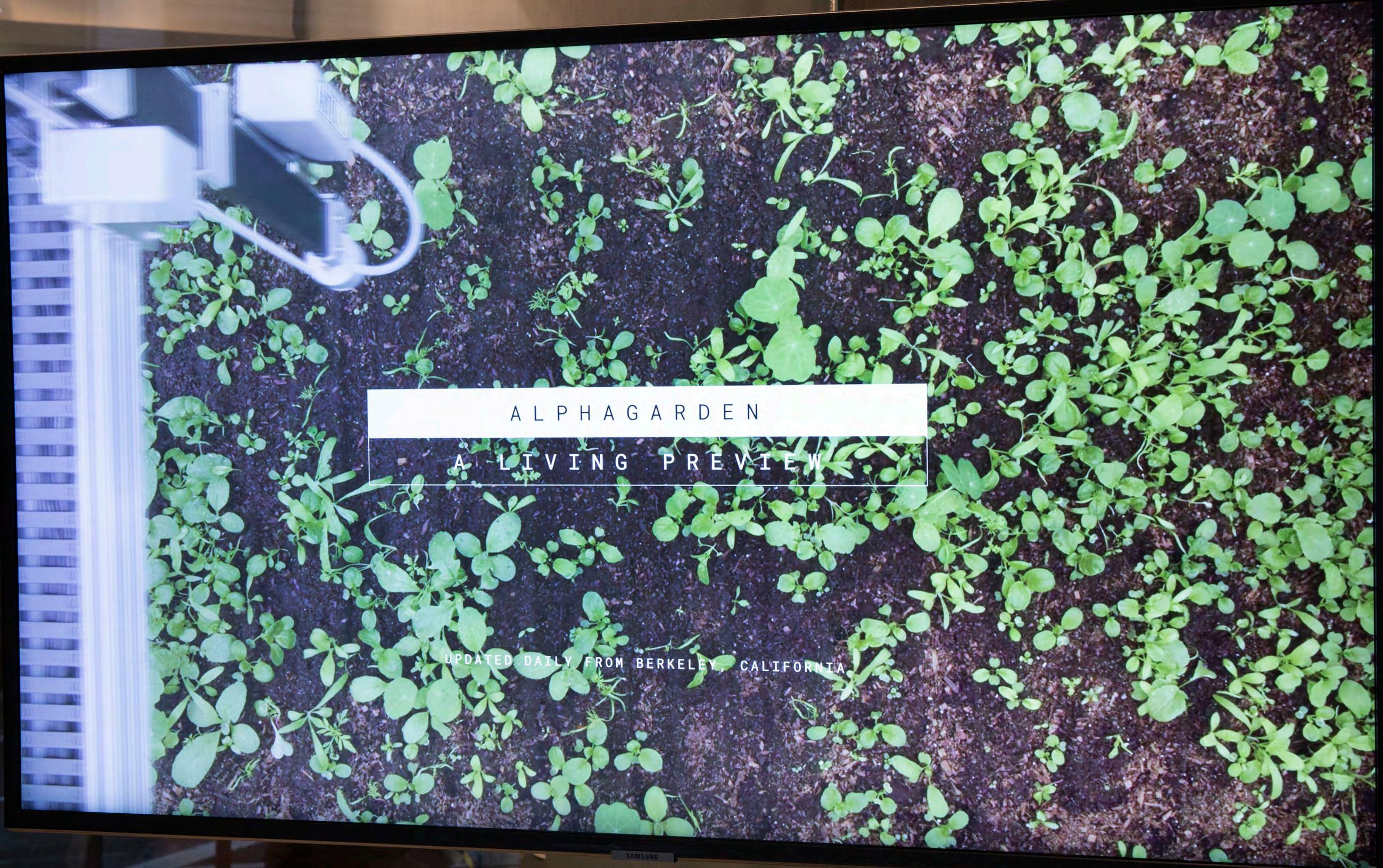
Eric Siegel	Plant Biology
Brian Bailey	Plant Biology
Sarah Newman	Media Art Contextualization
Gil Gershoni	Design Consultant
Stavros Vougioukas	Agricultural Robotics
Stefano Carpin	Agricultural Robotics
Joshua Viers	Water Engineering
Sonia Uppal	UI Implementation
Jeff Ichnowski	UI Implementation

Acknowledgements:

UC Berkeley AUTOLab
NSF-USDA Award:
RAPID: *Robot-Assisted
Precision Irrigation Delivery*
2017-67021-25925



<http://AlphaGarden.org>



ALPHAGARDEN
A LIVING PREVIEW

UPDATED DAILY FROM BERKELEY, CALIFORNIA



SAMSUNG

FEBRUARY 10, 2020

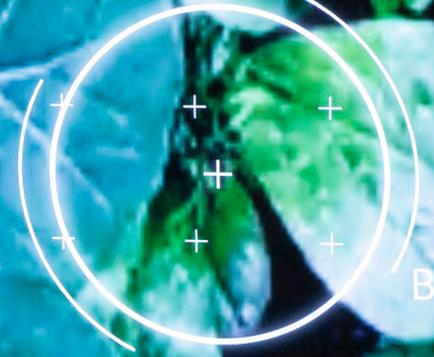


SAMSUNG

DAY 41



BOK CHOY



BOK CHOY

BERKELEY, CA



COVERAGE:

CALENDULA

58%

DIVERSITY:

36%

SAMSUNG



LarbitsSisters

BitSoil Popup Tax & Hack Campaign (2018)

Networked installation, four server racks, various components.

Courtesy of the artists

LarbitsSisters' *BitSoil Popup Tax & Hack Campaign* is an online and offline artwork that proposes an alternative taxation system for a fairer digital economy. It is part of the ongoing project bitREPUBLIC that seeks to redefine and redesign tools for an open, artificial, DIY republic. *BitSoil Popup Tax & Hack Campaign* understands user-generated data as "bitsoil," the new oil of the digital economy, and claims a tax on user data to give shape to a new vision of wealth redistribution. The project uses IBM's AI-Watson Natural Language Classifier for training an army of tax collector bots to detect, collect, and mine bitsoils on the data produced by users on Twitter. When participants produce data, a tweet with a video pops up on their account and redirects them to the online platform of the campaign where they are invited to gather information on the bitsoil tax campaign, to mine bitsoils, or to generate their own tax collector bots equipped with a set of actions to perform. These actions range from sending a tax claim postcard to the CEOs of the top ten tech giants or the Prime Minister of their choice, or to invite their friends to join the campaign. During the campaign each action on Twitter triggers a tiny ticket receiver of the bitREPUBLIC installation, assigning at random a micro amount of bitsoils to a wallet of a campaign participant. Each wallet stands for a citizen of bitREPUBLIC. On each ticket printed one can follow the production of bitsoils generated by users and the bots on Twitter.





Brett Wallace (USA)

Truckers (2020)

Video installation. Bed, pillow, headset, gloves, t-shirt, hat, trucking magazine, time log, vinyl.
38 x 33 x 77.5 in.

Color video, sound, 00:15:58.

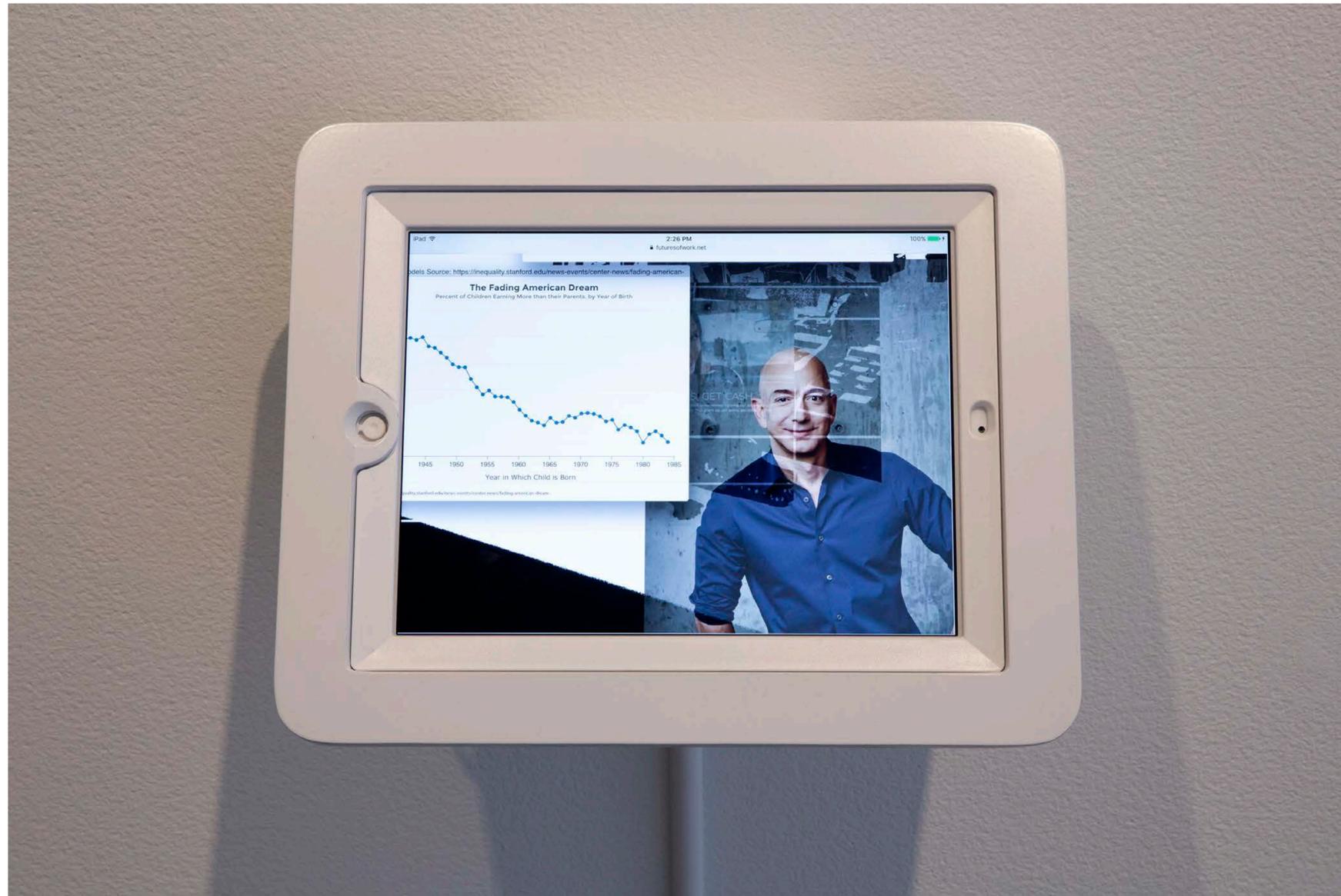
Produced, written, and directed by Brett Wallace.
Filmed and edited by Brett Wallace and Maral Satari.

Courtesy of the artist

Truckers explores how artificial intelligence and the speed of the Amazon economy are changing the working conditions and lives of America's truck drivers through new privacy regulations and forms of monitoring. Artificial intelligence is now commonly built into the cabs of the 1.8 million long haul trucks driven in the US, creating human-machine coalescence. While we may still be decades away from trucks making autonomous dock-to-dock runs, the job of trucking is already changing rapidly. Juxtaposing interviews with truck drivers and industry workers with statements by technology providers, *Truckers* captures how new technologies and expectations are reshaping the economic provisions of a profession.







Brett Wallace (USA)

Futures of Work (2018)

Website

Courtesy of the artist

Brett Wallace's *Futures of Work* is a scrollable online collage that provides entry points into the discussions surrounding labor as it is profoundly changed by digital technologies and AI. Culling together Wikipedia entries, newspaper articles, charts of earnings and income, personal accounts of workers, as well as historical and contemporary images depicting workplaces, the website provides a snapshot of the complexities of labor in the digital economy. *Futures of Work* references the Social Factory — a concept developed by Italian Marxism to understand how the social relations of capitalism shaped not only production but society as a whole — to raise questions about the future of the gig economy and digital entrepreneurship.

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