Ai - Da: The World's First Humanoid AI artist. Will AI Become Art's Next Medium?

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Abstract

In this dissertation which was written as part of the MSc in Art Law and Arts Management at the International Hellenic University, I am going to discuss how robots from fiction stories became reality and the uncanny feeling they invoke to people. Furthermore, I am going to refer to Ai - Da, the first humanoid robot artist has ever existed and the impact that robots will have for human artist. As artificial intelligence might be a new medium, we have to consider that mediums bring the potential for good and evil, just like Marshall McLuhan had claimed. In addition, I am going to discuss the gender dynamic behind Ai-Da and other feminine bots, like Sophia the Robot and Sex Bots. In the art industry where women artists are still less than men, in prime institutions universally, could female humanoids harm the development of female artists? A vast change is coming into our world. With the impact of recent technologies coming through at an unparalleled rate, these alterations are similar to an extent to the industrial revolution or the printing press. My aim in this dissertation would be to encourage readers to think about the ethics and how new technologies can be used.

At this point, I want to personally thank my supervisor Dr. Themis Veleni for her valuable guidance and assistance. Through her advice she inspired me the most. My friends who have always been there and patiently tolerated the thousands conversations about artificial intelligence and my family for their unconditional love and support.

Keywords: Ai - Da, artificial intelligence, gender, robot

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Introduction

Digital art is considered to be a relatively new field, but the lineage can be traced back much further. It has been sixty years, since artists were trying to create artificial systems for generating artworks that could not been possibly be created using traditional media. Nicolas Schöffer made *Cysp 1* in 1956, which was the first "spatiodynamic sculpture" having total autonomy of movement, as well as axial and eccentric rotation.[1] A few years later, in 1959, Jean Tinguely created his *Métamatic* sculptures, which were machines that produced artworks inspired by the industrial revolution aesthetics.

The idea of automaton, has its roots back in Greek mythology, when Hero of Alexander, a Greek mathematician and engineer, constructed statues that could be animated by water, air and steam pressure, in the second century B.C.[2] A few centuries later, Hephaestus, an ingenious, talented craftsman, known for the remarkable weapons he made[3], introduced Talos, a towering bronze robot. Talos was the gift of Zeus to his son Minos, which was charged with the defence of Crete, marching around the island three times a day.[4] Another example is a mechanical device that looked like an armoured knight, which was possibly constructed by Leonardo da Vinci, in 1495.[5] Not only scientists and engineers were dreaming of artificial creatures that could possibly surpass human beings, but also fiction writers.

In the 19th century, Mary Shelley, wrote the novel "*Frankenstein, or The Modern Prometheus*". According to Greek mythology, fire came to humanity by Prometheus and because it was a symbol of progress he was punished by Zeus. Prometheus was chained to a cliff and his liver was eaten everyday by an eagle and since he was immortal, this was repeating everyday. His efforts to improve human existence turned out into a tragedy, just

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[1] https://www.olats.org/schoffer/archives/cyspe.htm, (Accessed: 17 November 2019)

[2] Govardhan, A., Murty, M.R., Raju, K.S., Rani, B.P. and Sridevi, R. (2018). *Proceedings of the Third International Conference on Computational Intelligence and Informatics*, pp. 135.

[3] Herath D., Kroos C., and Stelarc. (2016). Robots and Art: Exploring an Unlikely Symbiosis, Singapore: Springer, pp. 69.

[4] Mayor A. (2018). *Tyrants and Robots*, History Today, pp. 51.

[5] Behnke S. (2008). *Humanoid Robots – From Fiction to Reality?,* KI-Zeitschrift, 4/08, pp. 5.

like with Dr. Frankenstein happened, who brought a monster into the world that eventually threatened to destroy humanity.

Over a century later, Karel Čapek in his theatrical play R.U.R. (Rossum's Universal Robots), made a significant variation: the bungled attempt to create man gives the opportunity for the successful attempt to create robots.[6] The term "robot" comes from the Czech word "robota", which means "drudgery", or "servitude".[7] But Rossum's robots prove to be more destructive than Dr. Frankenstein's monster. Whereas Frankenstein's monster only destroys those who love its creator, the robots of R.U.R. inevitably developing "souls" and consequently human emotions like hate, involve in a worldwide massacre, systematically eliminating the whole human race.[8]

In 1940, Isaac Asimov, started to write Robot stories with a different approach. Asimov overcomes the horrendous, pessimistic attitude toward artificial life introduced by Mary Shelley, Čapek, etc.[9] His robots would never react to his creator for no purpose, to prove Faust's crime and the punishment. Those robots were responded along the logical boundaries that existed in their "minds" from the time of construction. In his book, "*I, Robot*", Asimov demonstrates the famous Three Laws of Robotics[10]:

1. A robot may not injure a human being, or through inaction, allow a human being to come to harm.
2. A robot must obey the orders given it by human beings except where such orders would conflict with the First Law.
3. A robot must protect its own existence as long as such protection does not conflict with the First or Second Law.

There are multiple problems descending from those laws. First of all, laws are formed to restrict conscious beings who can choose how to act. How can a robot has a choice, since there is no judgement? Furthermore, according to Dr. Susan Calvin, who is the first robo-

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[6] Beauchamp G. (1980). *The Frankenstein Complex and Asimov's Robots,* Mosaic: An Interdisciplinary Critical Journal Vol. 13, No. 3/4, pp. 83.

[7] Jerz, D. G. (2002). *R.U.R. (Rossum's Universal Robots),* Volume, DOI.

[8] Beauchamp G. (1980). T*he Frankenstein Complex and Asimov's Robots,* Mosaic: An Interdisciplinary Critical Journal Vol. 13, No. 3/4, pp. 84.

[9] Ibid.

[10] Asimov I. *I, Robot* series, *Runaround*, copyright © 1942 by Street and Smith Publications, Inc.; copyright ©1970 by Isaac Asimov.

psychologist in the world, physically, and to some extent, mentally a robot surpass human beings. So, what makes him a slave to people?[11] Another aspect comes from Aaron Sloman, the Professor of Artificial Intelligence and Cognitive Science at the University of Birmingham, who always thought that these laws are a type of racial discrimination. He supports, that if a robot is as smart as you or I, then it doesn't need any different ethical laws from those that constrain you and me.

The author, Roger Clarke, has also proposed a procreation law. This would be applied if a robot constructs another robot.[12] The constructing robot must have the ability to understand that is involved in the creation of another robot and have the capability to affirm whether the robot it is constructing complies to the laws. So, the robot when it is ready to be used, it will be tested, before being fully operational.

Even thought it was a primary effort, Asimov's three Laws have affected real Roboticist's and AI researchers oath, who need commit personally that they take the full responsibility for their creations. Their oath is saying that every artificial intelligence they will create, will follow the character of the subsequent rules[13]:

1. Do no harm to humans either directly or through non-action.
2. Do no harm to itself either directly or through non-action unless it will cause harm to a human.
3. Follow the orders given it by humans through its programming or other input medium unless it will cause harm to itself or a human.

It might be frightening but the fiction has started to become reality. Researchers should be really careful with their creations, not to have unpleasant results for the whole humanity. The ethical implications are huge, this is the reason why deep learning is developing to link decisions to inputs. Pandora's box has been opened and we have to ensure that artificially intelligent systems are built to contribute to the public good, with fairness, reliability, security and most of all transparency and privacy.

Robots also made their appearance in the cinema, starring in famous films. They have reflected the current mood, social and cultural issues and technological advances of their

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[11] Beauchamp G. (1980). *The Frankenstein Complex and Asimov's Robots,* Mosaic: An Interdisciplinary Critical Journal Vol. 13, No. 3/4, pp. 86-87.

[12] McCauley L. (2007). *The Frankenstein Complex and Asimov's Three Laws*, FedEx Institute of Technology, University of Memphis, pp.12.

[13] Ibid. pp.12-13.

time. The first humanoid robot which was starring in the movies, was Maria in the silent film *"Metropolis"*[14] by Fritz Lang, in 1927, which is a film about society, classes and industrial revolution.[15] Then, another famous robot was Gort from the movie "*The Day The Earth Stood Still*",[16] by Robert Wise, in 1951, which was discussing an anti-nuclear war message during the Cold War. During the technological advancements of the 1980's, it followed the movie "*Star Wars*"[17] by George Lukas, which presented the robot C3-PO and one decade later, in 1987, the tv series "*Star Trek - The Next Generation*"[18] by Gene Roddenberry, which featured the humanoid Data.

Asimov's three Laws from literature have affected real Roboticist's and AI researchers oath. The science fiction stories became real and this is a critical moment in our history. Within the next years, robots will be everywhere, in the hospitals as nurses, in the businesses as secretaries and in our houses as domestic helpers. Designers need to apply machine ethics and make sure that autonomous systems are going to be able to interact with humans, without any deviant behaviour. Technology evolves and we need to ensure that this will not lead to a dystopian future.

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[14] "*Metropolis*", Directed by Fritz Lang. Germany: UFA, 1927.

[15] Behnke S. (2008). *Humanoid Robots – From Fiction to Reality?*, KI-Zeitschrift, 4/08, pp. 5.

[16] "*The Day The Earth Stood Still*", Directed by Robert Wise. United States: 20th Century Fox, 1951.

[17] "*Star Wars*", Directed by George Lukas. United States: 20th Century Fox, 1977.

[18] "*Star Trek - The Next Generation*", Directed by Gene Roddenberry. United States: Paramount Domestic Television, 1987.

1. Humanoid Robots & The Uncanny Valley

Fiction stories have started to become reality, all those imaginative robots became real and humanoid robots appeared. Humanoid robot is an autonomous or semi-autonomous device with different technologies to permit it to interact with its surroundings. It may look like a human, and is usually designed to interact like us in an environment designed for the human body.[19] All those innate functions human have, like walking, talking, are duplicated by them almost perfectly. Regarding on the more complicated actions, like critical thinking, decisions and beliefs, artificial intelligence continues to evolve, which is an effort that started in the 1950's and until today robots can easily perform human tasks. In this chapter, we are going to have a retrospection in humanoid robots history and discuss that feeling which is being created between human and robots, and frightens you, "*The Uncanny Feeling*".

The first humanoid robot was called "*Elektro*" and was created by Westinghouse Electric Corporation, in Mansfield, Ohio, in 1940. Its functions were quite limited, it could only move its arms and head and its speech was recorded. It could also distinguish between red and green light, since it was consisted of photoelectric sensors.[20] Nowadays, those functions may seem totally simple, but it was the primary effort of the first humanoid robot. The difficult part was in programming the robot and making it act like human, the robot needed to communicate and take decisions. The answer came from a mathematician named Alan Turing, who during the World War II, broke the Nazi encryption machine "*Enigma*" and helped the Allied Forces win. He changed the history by asking a simple question: "Can machines think"? He made an experiment to answer that. His theory consists of a human interrogator, A, an interface controlled by the experimenter in the middle, which it might be a typewriter like or tv-terminal, and the sources B and C, of which one of them is human and the other is a machine. The interrogator A is informed that one terminal is being managed by an apparatus and that the other one by a person whom A has never seen. That means there was no prior connection between the human beings. A is to guess which of B and C is the apparatus and which is the person. If A cannot distinguish one from the other with

[19] Alesich S., Rigby M. (2017). *Gendered Robots: Implications for Our Humanoid Future*, IEEE Technology and Society Magazine, pp. 1-2.

[20] Denny J., Elyas M., D'costa S. and D'Souza R. (2016). *Humanoid Robots – Past, Present and the Future, European Journal of Advances in Engineering and Technology,* 3(5): 8-15, pp. 10.

undoubtedly more than half percent certainty and if this result continues to hold no matter what people are involved in the experiment, the apparatus is said to reproduce human intelligence.[21] There are some requirements for the machines to pass the experiment. First of all, the machine needs to process several languages, to enable it to speak fluently in English, in addition, it needs to have knowledge representation to save what it knows, or hears. Moreover, the machine needs automated reasoning to use the saved information in order to give a feedback and, last but not least, in order to adapt to new circumstances and to find and deduce patterns, it needs to have machine learning.[22] In 1991, a couple of elements came to be added to make the "*Total Turing Test*", which consists of a video signal so that the interrogator can question the subject's perceptual skills, as well as the chance for the interrogator to pass physical objects "through the hatch."[23] The machine is going to perceive objects through computer vision and manipulate them through robotics for the test to be successful. These six prerequisites compose most of the artificial intelligence theory and Alan Turing was a real pioneer for inventing a test that remains relevant almost seventy years later.

In 1973, "*Wabot-1"*, was created by Waseda University, which could move on two legs, interact with people and carry items. The bipedal locomotion by that time, was a huge discovery, the robot had self - balance, could walk on uneven surfaces, climb and descent stairs, but this was not sufficient, a force came to be added later on, to push the robot and manage auto - balancing, which was called Bipedal Push Recovery. Using hydraulic actuators, the Bipedal Push Recovery was achieved and implemented on the Big-Dog Quadruped system, which uses a power combustion engine.[24] The bipedal locomotion, was based on two theories, the Zero Moment Point (ZMP), which the famous humanoid robot ASIMO from Honda used for its walking operation and the simple control and energy efficiency. The ZPM is a point on the ground, which sum of all forces active equal to zero. As the simple control and energy efficiency concerns, without any use of actuators and power, robots might easily

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[21] Jackson, Jr. P. C. (1985). *Introduction to Artificial Intelligence: Second, Enlarged Edition,* Dover Publications, New York, pp. 3.

[22] Russell S., Norwig P. (2009). *Artificial Intelligence: A Modern Approach, Third Edition*, Pearson, London, pp. 2.

[23] Ibid. pp. 3.

[24] Denny J., Elyas M., D'costa S. and D'Souza R. (2016). *Humanoid Robots – Past, Present and the Future, European Journal of Advances in Engineering and Technology,* 3(5): 8-15, pp. 11.

go down a hill.[25] In 2001, Sony presented a robot named "*Qrio*", which could recognise the movements of face and hands.[26] It could use speech and body language to express its own emotions. The expression and identification of emotions, balancing, environment perception and intelligence were significant challenges in the field of Humanoid Robots. In 2003, Osaka University, took robots one step further and created "*Actroid*", a robot with realistic silicone "skin". A few years later, in 2010, NASA and General Motors introduced "*Robonaut 2*", a highly sophisticated humanoid robot, which is made up of multiple component technologies and vision systems, image recognition systems, sensor integrations, tendon hands, control algorithms, and much more. Their target is to help human's work and explore in space, collaborate with them, or going where the risks are too great for people.[27]

All those technological developments lead to the feeling that Sigmund Freud had introduced, in 1919, the uncanny feeling. The key word to explain his thought, is the German word unheimlich and its opposite, heimlich. Through the many unheimlich definitions, the word transforms and reaches a point where it means its exact opposite, without changing the word itself. Unheimlich means "familiar" and "unfamiliar," and translates as "uncanny" in English language. This is a condition, according to Freud, while causing us fear and disgust is essentially so familiar as we reflect on ourselves in it. The feeling of the uncanny, this vague fear, is being caused by the long familiar but repressed feeling of death. The familiar feeling that we would all be dying after we were born, accompanied by the fear and the uneasy feeling of uncertainty that is precisely the very condition. This is why we may feel it in fairy tales, but is does not make us feel uncomfortable, we think it is an imaginary world, totally separate from our own. The uncanny effect, according to Freud, is produced when there is the distinction between imagination and reality is not clear. He uses dolls as an example for this, when an inanimate object becomes almost animate.[28] Children pretend that their toys or dolls are alive, because they can't distinguish the difference between life and death. Adults understand the difference, this is why they step into the "uncanny valley". Another example in my opinion, is the "déjà vu" effect, when the feeling of helplessness and the sense that your thoughts or actions are controlled by some outside force causes an uncanny

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[25] Denny J., Elyas M., D'costa S. and D'Souza R. (2016). *Humanoid Robots – Past, Present and the Future, European Journal of Advances in Engineering and Technology,* 3(5): 8-15, pp. 11.

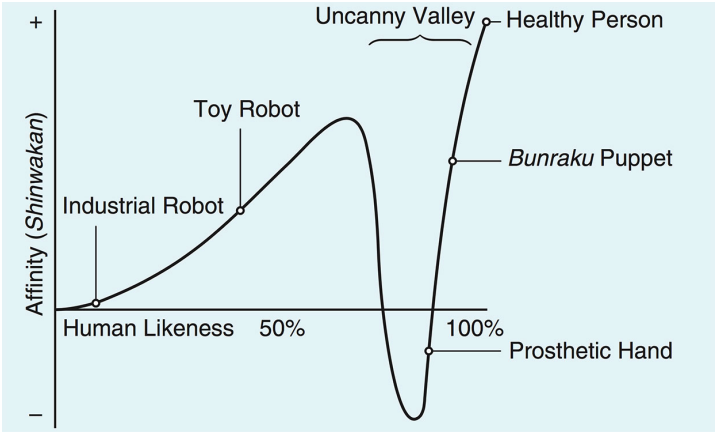
[26] Ibid.

[27] https://robonaut.jsc.nasa.gov/R2/ (Accessed: 10 December 2019)

[28] Freud S. (1919). *The Uncanny*, pp. 5.

effect. Furthermore, Freud introduces the "double", with mirror images, shadows, guardian angels, with the belief in the afterlife and the fear of death.[29] As a person grows, this idea changes. For a child, the "double" is "immortality assurance," but an adult understands the "double" as a "death harbinger".[30] For many people, the idea of death, particularly the idea of being buried alive, is regarded as the most uncanny feeling of all.[31]

In 1970, Masahiro Mori, a robotics professor at the Tokyo Institute of Technology, wrote an article on a journal called "*Energy*", trying to explain the uncanny response people have towards humanoid robots. In his paper, refers that roboticists discourage the creation of robots so realistic that they risk falling into the valley, offering the example of hands on a Buddha statue as an alternative robot design approach: "The hand has no finger print, and it resembles the natural colour of wood," he wrote. "But we know it is beautiful and there is no the uncanny sense."[32] The problem arises when a robot behaves almost like a human being, it is not either a robot, or a human, so it is familiar and unfamiliar the same time. To explain this with a better way, he creates a graph that depicts the uncanny valley, , the proposed relation between the human likeness of an entity, and the perceiver's affinity for it. The lowest affinity happens when it comes to a prosthetic hand, which is something totally different from our perspective to human and the biggest affinity happens when it comes to a healthy person. In the last paragraph of his paper, he probably concludes having in his mind the theory about the origins of the uncanny valley. He writes: "As soon as we are dead, we fall into the uncanny valley trough. Our body gets cold, our colour changes, and motion stops." Human models fall into the uncanny valley, reminding us of death. "Perhaps this is important for our self-



[29] Freud S. (1919). *The Uncanny*, pp. 9.

[30] Ibid.

[31] Stekel. W. (1923) *Conditions of Nervous Anxiety and their Treatment, K. Paul, Trench, Trubner & Company, pp. 287.*

[32] Mori M., MacDorman K. F. and Kageki N., (2012). *The Uncanny Valley [From the Field]*, *IEEE Robotics & Automation Magazine*, vol. 19, no. 2, pp. 100.

preservation," he concludes.[33] Mori, followed Freud's explanation, linking the uncanny valley to a notion of death that was "human-specific".

A few years later, in 2009, Asif Ghazanfar, an American neuroscientist, comes to reject the all of the above. He believes that the uncanny valley response is due to the evolutionary inclination of an animal, human or non-human to develop an expectation of what members of its species should look like.[34] His theory is strengthened by some experimental evidence. Surveys with children have shown that babies do not negatively respond to human-like robots at a very young age. As infants grow older, they start to develop an image of how a human should look like.[35] Ghazanfar tried to test his theory with monkey experiments, but the results were not as straightforward as he was expected them to be. But even though Ghazanfar can prove his theory to be correct, Freud or Mori will not automatically be disproved by this. We simply do not know enough about the uncanny valley to be sure that it can be traced back to just one cause. Karl F. MacDorman says: "Due to perceptive mechanisms or more psychological mechanisms, things can be uncanny. So I don't believe the uncanny valley is actually a kind of single phenomenon."[36] Ghazanfar hopes that his research will help answer these concerns in the near future, but for now the uncanny valley it is the same thing it declares, it is familiar and unfamiliar at the same time.

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[33] Mori M., MacDorman K. F. and Kageki N., (2012). *The Uncanny Valley [From the Field]*, *IEEE Robotics & Automation Magazine*, vol. 19, no. 2, pp. 100.

[34] https://www.seedmagazine.com/content/article/uncanny_valley/P2/, (Accessed: 13 December 2019)

[35] Ibid.

[36] Ibid.

2. Robotic Art & Ai - Da

In 1987, Jasia Reichardt, in her abstract for the journal "*Machines and Art*", was wondering what would happen when machines would make their own art, since progress is inevitable. Would the audience recognize that form of art and accept it?[37] In 2019, artificial intelligence in art is gaining ground and all evidence show us a very promising future. In this section, we are going to analyze the very first art from machines, from Jean Tinguely's emblematic "*Homage to New York*" (1960) to the first humanoid AI artist called Ai - Da, and her first robot exhibition that took place at the Barn Gallery at St John's College, on June 12, 2019.

A cold winter night in the back yard of the Museum of Modern Art, in the 1960's, art critics and art lovers were gathered to admire Jean Tinguely's self - destructing sculpture. They surprisingly faced engines, bicycle wheels, a go-cart, a piano, an addressograph, a bathtub, and other abandoned stuff. The performance lasted twenty seven minutes and during its short operation, a meteorological trial balloon inflated and exploded, coloured smoke was released, paintings were created and destroyed, and bottles smashed to the ground. A player piano, metal drums, a radio broadcast, a recording of the artist describing his work, and a competing high-pitched voice correcting him provided the disharmonic soundtrack to the sculpture's self-destruction, until the fire department stopped it.[38] With "*Homage to New York*", Jean Tinguely wanted to make an ironic social and political comment about the industrial revolution and capitalism. All this overproduction of goods that would finally be gone, just like his artwork.

2.1 Robot K- 456, Nam June Paik

In 1963 Nam June Paik had the idea of creating a radio - controlled robot to use as a "mechanical performer". Along with Shuya Abe, an electronic engineer, made "*Robot K- 456*", named after a Mozart's piano concertoi (Köchel number 456), in 1964. This comical humanoid figure could walk, lift its arms, play recorded sounds, and even urinate. "It was

[37] Reichardt J. (1987). *Machines and Art*, Leonardo, Vol. 20, No. 4, 20th Anniversary Special Issue: Art of the Future: The Future of Art, pp. 367.

[38] https://www.moma.org/collection/works/81174 (Accessed: 23 December 2019)

supposed to meet people in the street and give them a split - second surprise",[39] Paik said. He wanted to make technology appear closer to mankind, rather than the result of complicated and hidden processes of science. Most of the inventions were created for military purposes initially. Paik hoped to reclaim peace by making technology approachable and less intimidating. He demonstrated that it had already played an enormous part in daily life and was likely to become even more important overtime. In 1982, *K-456*, reactivated for this act, titled *The First Catastrophe of the Twenty-first Century. K-456* was taken from its museum pedestal and directed down the street by the artist to the intersection between 75th Street and Madison Avenue. While crossing the road, an automobile operated by the artist William Anastasi "accidentally" struck the robot. Paik indicated with this performance the possible problems that arise when technologies collide out of human control.[40]

2.2 Squat, Tom Shannon

Another important artwork, which stands as a landmark in the development of robotic art, was Tom Shannon's "*Squat*", in 1966. It was an early work of cybernetic, interactive art, which used an organic interface, to monitor a robotic structure, in the form of plant. By touching the plant, the user caused a voltage shift, activating the robotic sculpture's motors, which moves, retracting and extending its three legs and two arms while making sounds of humming and chirping. By touching the plant again, the user could stop the robot. The work's hybridity, uniting organic and inorganic components, set up questions about the interplay between nature and artifice, between human beings and machines.[41]

2.3 The Senster, Edward Inhatowicz

Edward Inhatowicz took Shannon's work one step further with his artwork "*The Senster*", in 1969-1970. This cybernetic sculpture, which was ordered by Philips, thanks to a radar and

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[39] Paik N. J. (1965). *Nam June Paik, Robot K-456,* Medien Kunst Netz/Media Art Net, online at http://www.medienkunstnetz.de/works/robot-k-456/ (Accessed: 24 December 2019).

[40] Kac E. (1997). *Foundation and Development of Robotic Art*, Journal, Vol. 56, No. 3, Digital Reflections: The Dialogue of Art and Technology, pp. 62.

[41] Shanken E. A. (2009). *Art and Electronic Media*, Phaidon Press; Reprint edition (September 8, 2014), pp. 143.

a computer that processed data from its surroundings and controlled the robot's behaviour, was able to respond to its audience's voices and movements. Unlike the limited reactions of Shannon's piece, *The Senster* introduced the autonomous behaviour of the robot. Looking a little like a large mammal or a prototype for a lunar surface exploration device, the robotic creature seemed to make its own decisions as it responded incessantly to the calculations made by the machine that controlled it.[42]

2.4 Mark Pauline and Stelarc

Mark Pauline and Stelarc were another two prominent artists in the 1970's, relevant to robotic art. Pauline formed, the Survival Research Laboratories, or SRL, in 1980, a collaborative team that since then has created numerous machine performances that incorporate music, explosives, liquids, radio-controlled devices, fire, violent and destructive action, animal components, and organic materials.[43] Such robotic spectacles of discomfort, fear, and actual destruction are intended as comments on social issues, especially in terms of political power, misuse of force, and technological dominance.[44] By contrast, Stelarc uses his own body for his work, just like he did with the "*Third Hand*", his best-known and longest-used performance object. In The Third Hand performance, the artist considered the option of writing The Third Hand with his right hand and his third hand simultaneously. The Third Hand has come to represent an idea that experimented the intimate interface of technology and prosthetic augmentation, not as a replacement but rather as an addition to the body.[45] With this way he declares that technology coordinates with artists for better results.

2.5 AARON, Harold Cohen

In 1973, Harold Cohen's introduced AARON, which is the definition of the coordination between artists and artificial intelligence programs. How is this coordination happening? The

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[42] https://vida.fundaciontelefonica.com/en/2013/09/11/three-directions-for-robotic-art/ (Accessed: 27 December 2019)

[43] Kac E. (1997). *Foundation and Development of Robotic Art,* Journal, Vol. 56, No. 3, Digital Reflections: The Dialogue of Art and Technology, pp. 63.

[44] Ibid.

[45] http://stelarc.org/?catID=20265 (Accessed: 28 December 2019)

artist Harold Cohen became a programmer and made a machine that draws in real time. AARON produced Cohen's ideas, it was making drawings that the artist would develop into paintings. It was intended to identify the functional primitives and differentiations used in the building of mental images and, consequently, in the making of drawings and paintings. The program was able to differentiate, for example, between figure and ground and inside and outside, and to function in terms of similarity, division and repetition. Without any object-specific knowledge of the outside world, AARON created a severely limited model of human cognition, yet the few primitives it embodied proved to be remarkably powerful in generating highly evocative images: images, that suggested, without describing, an external world.[46] AARON was one of the first examples of computational creativity, which is the software development analysis that demonstrates actions that would be considered innovative in humans.[47] Creativity in computers seems mysterious because even people when they have creative ideas it is hard to explain how they got them and they often talk about obscure notions like "inspiration" and "intuition".[48] Margaret Boden who studies computational creativity for a long time, defines creativity in her book "*Artificial Intelligence and Natural Man*": "Probably the new thoughts that arise in the mind are not entirely new, because their roots were already in there. To rephrase it in a better way, behind every creative idea lies the germ of our society, all our knowledge and our experience. The greater the knowledge and the experience, the greater the opportunity to find an unthinkable relationship which leads to a creative idea. When we interpret creativity as the product of creating new relations between pieces of information that we already have, then the more previous knowledge we have, the more creative it is."[49] With this reasoning in mind, an operational, and widely accepted, definition of creativity is: "A creative idea is a novel and useful combination of established ideas."[50] Those ideas were incorporated into AARON by its creator, Harold Cohen. Since then, it has been continuously improved and at the beginning of

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[46] Cohen H. (1988). *How to Draw Three People in a Botanical Garden*, The University of California at San Diego, Department of Visual Arts, pp. 848.

[47] Colton S., López de Mántaras R. and Stock O. (2009). *Computational Creativity: Coming of Age*, Association for the Advancement of Artificial Intelligence, pp. 11.

[48] Ibid. pp. 14.

[49] Boden M. (1987). *Artificial Intelligence and Natural Man*. New York: Basic Books.

[50] https://www.bbvaopenmind.com/en/articles/artificial-intelligence-and-the-arts-toward-computational-creativity/ (Accessed: 29 January 2020)

1990, AARON learnt how to use colours. Harold Cohen passed away on April 27, 2016 at the age of 87, leaving a great legacy behind, while he is being considered as a founder in the field of computer-generated art.

2.6 Robotic Action Painter, Leonel Moura

Leonel Moura's robots seem like AARON's younger siblings, in the late 1990s, he was experimenting with artificial intelligence and robotic art and since the 2000s, he has created mobile robots that make render colour density drawings.[51] Unlike Harold Cohen, Leonel Moura insists that machine creativity can be achieved by randomness, stigmetry and chromotaxis.[52] What do those terms mean? Robotic action painter's painting is based on two distinct behaviour modes, the first being essential random and the second reactive or of positive feedback. The initial random colour spots functions as a seed for the reactive mode emergent composition. Furthermore, the robot uses a set of nine RGB sensors turned to the painting plan in order to determine the presence, shape and intensity of colour. If colour, with considerable expression (threshold), is found, the robot changes from Random to Reactive Mode and proceeds to final composition arrangements. In this mode the robot is both attracted by colour (chromotaxis) and responds to it (stigmergy). The nine RGB sensors disposed in a grid of 3x3 make also possible for the robot to decide when the painting is finished.[53] Another significant difference from AARON is that Robotic Action Painters considered to be a collective force, rather than an individual one. Leonel Moura was inspired by swarms, which communicate through chemical messages, the pheromones, based on which they produce certain patterns of collective behaviour.[54] In his first ant - robots, in 2001, he replaced pheromones by colour. The marks left by one robot triggers a pictorial action on other robots and together they produce the final result. In 2006, the First Robotic Action Painter was created for the Museum of Natural History in New York. It is an

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[51] Audry S., Ippolito J. (2019). *Can Artificial Intelligence Make Art without Artists? Ask the Viewer.* New Media/School of Computing and Information Science, University of Maine, Orono, ME 04469, USA, pp. 2.

[52] Moura L. (2013). *A New Kind of Art*, CreateSpace Independent Publishing Platform; 1 edition (May 26, 2013), pp. 1.

[53] Ibid. pp. 3-4.

[54] Moura L. (2013). *A New Kind of Art*, CreateSpace Independent Publishing Platform; 1 edition (May 26, 2013), pp. 2.

independent artist, since Moura gives some space to robots to act with aesthetic free will. He sees this as a positive, and perhaps unavoidable trend, arguing that "machine autonomy is central to humanity's best interest."[55] To enhance his argument and the preoccupation with art making robots, that many believe they don't produce art, Leonel Moura compares robot art with Surrealism. André Breton had defined the concept in this way: "Pure psychic automatism by which the true function of thought is to be conveyed, either verbally or in writing. Thought dictated in the absence of all reasonable control, and beyond all aesthetic or moral concerns."[56] Surrealism grew out of the Dada movement, which was created as a reaction to World War I. It was also celebrating pure sensation through sound poems which were created complex aural textures, offering the audience a new relationship to language.[57] That state of pure, according to Hugo Ball, was derived from the so - called "primitive" cultures that Dadaists were looking for.[58] During Dada art movement there was another interesting element, that found its role in the paintings of George Grosz, Otto Dix and other Weimar artists. Even though the word "Cyborg" does not exist in German language, the term existed in Dadaists paintings. Because of the World War I there were a lot of injured veterans with prosthetic parts. Biro has pointed to *Skat Players* as an example of German Dada's interest in the cyborg, a man-machine hybrid with super human abilities, because the three men's prosthetic lower limbs blend with the legs of the table and because they appear to have new abilities due to their prosthetic parts.[59] Taking Biro's reading into account, it seems possible that Dada artists saw veterans' bodies as differently abled because of their prosthetic parts, not inherently disabled. They saw a form of a synthesis between organic and technological parts.

2.7 Ai -Da: The World's First Humanoid Artist

George Orwell's and Aldous Huxley's ideas became real in 2019, with Ai - Da, the world's first humanoid AI artist, named after the British mathematician and computer pioneer Ada

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[55] Moura L. (2018). *Robot Art: An Interview with Leonel Moura. Arts 7: 28.*

[56] Breton A. (1924). *Manifestos of Surrealism*, pp. 26.

[57] Shaw A. A. *The Mechanics of Transcendence: On the Sound Poetry of Hugo Ball and Kurt Schwitters*, pp. 1.

[58] Ibid. pp. 2.

[59] Biro M. *Dada Cyborg: Visions of the New Human in Weimar Berlin,* pp. 172.

Lovelace. The AI robot, who was invented by gallery director Aidan Meller, uses an inbuilt camera, a mechanical arm developed at Leeds University, and algorithms developed by scientists at Oxford to draw things from life.[60] The camera analyses the item in front of it and generates a virtual route, in order to draw, and then with algorithm's help produces real-space instructions for the robotic arm. Salaheldin Al Abd and Ziad Abass, have developed AI algorithms, to create human drawing style. The method involves pixel coordinates which are turned into real space coordinates.[61] Facial-recognition technology enables her to draw people's pencil portraits by scanning their characteristics with the cameras in her eyes and using the robotic arm to depict them on paper. Ai-Da's drawings are fed into AI algorithms to create paintings, which communicate with Cartesian's plane neural network readings to map them along two axes and create abstract versions of her art. The outputs are surprising because neural networks interpret the Cartesian plane very differently from humans.[62] As for the sculptures, a bee's 3D-printed sculpture was created by combining a drawing Ai-Da did of a micro-CT scan of a real-life bee made by professor Javier Alba-Tercedor. The coordinates of the drawing were interpreted by an AI Bees Algorithm that used swarm intelligence. Then, a scientist in Sweden, rendered the resulting distortion of the original bee anatomy, first 3D-printed in wax and then casted in bronze.[63] The distortion informed by Ai-Da's drawing co-ordinates and the Bees Algorithm outputs created the final works, which are imbued with process and meaning that challenges us to look at the complex interplay of technology, imagination and the natural world.[64] In addition, Ai-Da has a body called "RoboThespian" with an expressive range of movements and she has the ability to speak and answer questions. Ai-Da has a "Mesmer" head, which features integrated eye cameras, 3D Printed teeth & gums, realistic silicone skin, and individually punched hair." "Mesmer brings together the development of software mechanics and electronics in a small human-sized package to

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[60] https://www.dezeen.com/2019/06/14/ai-robot-ai-da-artificial-intelligence-art-exhibition/ (Accessed: 02 January 2020)

[61] https://www.ai-darobot.com/welcometotheaidamovement?cf_uvid=04aa5a818a3cb2beb9b6045350e5853e (Accessed: 03 January 2020)

[62] Ibid.

[63] https://www.dezeen.com/2019/06/14/ai-robot-ai-da-artificial-intelligence-art-exhibition/ (Accessed 03 January 2020)

[64] https://www.ai-darobot.com/welcometotheaidamovement?cf_uvid=04aa5a818a3cb2beb9b6045350e5853e (Accessed 03 January 2020)

create a lifelike face with lifelike gestures," Marcus Hold supported, who is a Design and Production Engineer at Engineered Arts.[65]

Sixtine Chapel from Michelangelo was completed in two faces, after a long time. The first phase was the magnificent ceiling frescos between 1508-1512 and the second was the Last Judgment executed many years later from 1535-1541. Auguste Rodin took thirty - seven years to complete the *Gates of Hell*. Ai - Da needs only forty - five minutes to draw a portrait from scratch, we would never think an artist would be that efficient! What does the invention of robot artists mean for human artists? A lot of things to consider, one of them is money, since Ai - Da needs less time to complete an artwork, her productivity is bigger and cannot compete humans. Mr. Meller does not think this is a bad consequence and he thinks that robotic and AI art has the potential to give job opportunities to artists, just like the camera created for photographers. Robotic and AI art is just the medium and artists have to consider how to use it. Just like Claude Monet pioneered impressionistic painting in response to the invention of the camera, so artists will find new ways of creating art.[66]

Ai - Da's first exhibition brings the title "*Unsecured Futures*" and took place at The Barn Gallery, St John's College, University of Oxford from 12th June to 6th July 2019. It included a selection of Ai - Da's artworks, from the fields of drawing, painting, sculpture and video art, whereas performance art, including a work that refers, to Yoko Ono's "*Cut Piece",* as a tribute. Furthermore, part of the exhibition are the pencil sketches of Alan Turing, the founder of the Turing test and Karel Čapek, who coined the term "robot". Mr. Meller said that: "We see this show as the start of a journey questioning the uses and abuses of AI and machine learning"[67]. This show invites us to think and observe, but more importantly to engage with the consequences of artificial intelligence. If we translate Ai - Da's artworks in pounds, they have already overcome one million.

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65 https://www.reuters.com/article/us-tech-robot-art/the-new-picasso-meet-ai-da-the-robot-artist-idUSKCN1Q0001 (Accessed 05 January 2020)

66 https://www.express.co.uk/news/science/1137207/Artificial-intelligence-news-AI-robot-artist-paintings-robot-painter-AiDa (Accessed 05 January 2020)

67 https://time.com/5607191/robot-artist-ai-da-artificial-intelligence-creativity/ (Accessed 05 January 2020)

3. Gender Dynamic Between Ai- Da and Other Female Robots

In the film "*Her*",[68] the main character Theodore falls in love with Samantha, an artificial intelligence system. When the 'Operating System' asked him to choose a male or female voice for its function, Theodore chose a female one. His face lightened up in surprise with a smile, when Samantha greeted him. Since artificial intelligence systems are integrating into society nowadays and there are not only in the movies, gender is of a great importance and it is likely to bring major social and cultural changes within the next years. In this chapter, I am going to refer to the gender dynamic between Ai - Da and other feminine robots, such as Sophia the Robot and Sex Bots. Even if we are moving towards to equality, those female robots promote stereotypes between genders and we need to be conscious about that. I am also going to refer if there are going to occur imbalances between male and female artists. In the art industry where women artists are still less than men, in prime institutions universally, could female humanoids harm the development of female artists?

The term *humanoid robot* refers to an autonomous or semi-autonomous system with different technologies to communicate with its surroundings.[69] It may have the shape of a human, or it may closely look like a human (also called an *android*), and is typical programmed to communicate in an environment designed for the human body in similar way to humans.[70] The automata history lays back to the 16th century in Europe and Japan, where they used to have human - looking machines. But the question is why to make humanoid robots? Firstly, humanoid robots can communicate better in human-engineered environments.[71] This is for difficult tasks which are too risky for humans to perform, such as undersea systems, high-performance aircraft, and orbiting space stations. Secondly, humanoid robots may also be used in societies with declining populations to supplement humans. Designers suggest that robots can fulfil particular social tasks, such as furnishing

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[68] "*Her*", Directed by Spike Jonze. United States: Warner Bros Pictures, 2013.

[69] Robertson J. (2010). *Gendering Humanoid Robots: Robo-Sexism in Japan*, *Body and Society*, Vol. 16, No. 2, pp. 15.

[70] Ibid.

[71] Fitzpatrick P., Harada K., Kemp C. C., Matsumoto Y., Yokoi K. and Yoshida E. *Humanoids*, (2016), In B. Siciliano and K. Oussama (eds.) *Springer Handbook of Robotics*, Springer International Publishing, Berlin Heidelberg, Germany, pp 1308.

entertainment or companionship,[72] which is a habit that is being expanded the last years, in Japan.

The reason why this is happening in Japan, particularly, is associated with culture. Japanese acceptance of robots was closely linked to the concepts of life articulated by Shinto and Buddhism, which believe that living and non-living beings have a soul.[73] For instance, man-made objects are included in the Shinto religion as part of the natural world, placing humanoid robots on a par with living beings.[74] In Japan, robotic dogs were given Buddhist funerals when they reached the end of their lives, after Sony stopped producing new parts.[75] In February 2007, Japanese government launched "*Innovation 25*", a visionary idea for increasing Japanese society by 2025, with the assistance of humanoid robots, who will accommodate the family. Masahiro Yamada, who coined the phrase 'parasite single' (parasaito shinguru) in a rather disparaging reference to these women (and men), notes that the standard of living of women falls drastically upon marriage. Not only they have to deal with all the housework, but it is sure to lose two-thirds of their disposable income.[76] Japanese culture adopted humanoid robots immediately, with surveys showing that Japanese people choose robots rather than migrant workers to look after their children in a country which has opposed immigration for socio-political reasons.[77]

Since humanoid robots integrated into society, gender issues appeared. Robots are machines without an organic gender or sexuality[78], however 'cultural genitals' are invoked in attributing gender, such as pink or grey lips.[79] The gendering process if robots makes

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[72] Fitzpatrick P., Harada K., Kemp C. C., Matsumoto Y., Yokoi K. and Yoshida E. *Humanoids*, (2016), In B. Siciliano and K. Oussama (eds.) *Springer Handbook of Robotics*, Springer International Publishing, Berlin Heidelberg, Germany, pp 1309.

[73] Robertson J. (2010). *Gendering Humanoid Robots: Robo-Sexism in Japan*, *Body and Society*, Vol. 16, No. 2, pp. 12.

[74] Ibid.

[75] Suzuki M. (2015). *In Japan, robot dogs are for life – and death*, *Phys.Org*, Available online: http://phys.org/news/2015-02-japan-robot-dogs-life-.html. (Accessed: 22 January 2020)

[76] Robertson J. (2010). *Gendering Humanoid Robots: Robo-Sexism in Japan*, *Body and Society*, Vol. 16, No. 2, pp. 10.

[77] Ibid., pp. 9.

[78] Carpenter J. (2009). *Gender Representation and Humanoid Robots Designed for Domestic Use*, International Journal of Social Robotics, pp. 262.

[79] Robertson J. (2010). *Gendering Humanoid Robots: Robo-Sexism in Japan*, *Body and Society*, Vol. 16, No. 2, pp. 5.

particularly clear that gender belongs to both to the order of the material body as well as the social and discursive or semiotic structures within which bodies are located.[80] Robots may lack of sex, which is mostly a term for biological characteristics, but they are gendered according to their cultural attitudes and behaviours. This is happening for a better human - robot interaction. Jennifer Robertson, noticed differences between female and male robots: Female robots had a slender, interiorized body rounded cheeks, almond shaped eyes, a slim neck, while male robots had a muscular, exteriorized body, a sharp head, angular jaw, heavy neck and straight shoulders.[81] Robot voices are also a part of the physical form, that is normally derived from humans, and thus is gendered.[82] Sophia by Hanson Robotics and virtual assistants (VPAs), such as Siri, Alexa have female voices promoting the stereotype that a personal assistant is gendered female. Jutta Weber suggests that robots are created as female because they are viewed by users as less intimidating —it is believed that a female presence contributes to a specific type of behaviour.[83] The gender of the robot is usually connected with their tasks. For instance, female-presenting robots are being considered as front-desk concierges, caretakers and companions for the elderly, child minders and house-cleaners, as well as sex robots.[84] In 2017, RealBotix, created Harmony, the first sex robot with artificial intelligence in the world, which caused a lot of reactions. Her physical appearance reflected many female beauty standards, such as large breasts and a narrow waistline. Those sexualised stereotypes could be dangerous, according to researches that have shown that the hypersexualized portrayal of women in media are related to sexual harassment and an increase of violence against women.[85] Furthermore, sex robots will probably impact human sexual relationships, since Harmony's target is to be the ideal companion for the user and will

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[80] Balsamo A. (1997). Technologies of the Gendered Body: Reading Cyborg Women, Duke University Press, pp. 36.

[81] Robertson J. (2010). *Gendering Humanoid Robots: Robo-Sexism in Japan*, *Body and Society*, Vol. 16, No. 2, pp. 19.

[82] Alesich S., Rigby M. (2017). *Gendered Robots: Implications for Our Humanoid Future*, IEEE Technology and Society Magazine, pp. 4.

[83] Weber J. (2005). *Helpless machines and true loving care givers: a feminist critique of recent trends in human-robot interaction*, *Journal of Information, Communication and Ethics in Society*, Vol. 3, No. 4, pp. 212.

[84] Richardson K. (2016). *Sex Robot Matters: Slavery, the Prostituted, and the Rights of Machines*, *IEEE Technology and Society Magazine*, Vol. 35, No. 2, pp. 46-53.

[85] https://theconversation.com/sex-robots-increase-the-potential-for-gender-based-violence-122361 (Accessed: 23 January 2020)

pursue higher standards. Robot tasks are loaded with stereotypes and related signifiers for interaction, as Carpenter says.[86] Ai - Da is the invention of gallery director Aidan Meller and took her name after Ada Lovelace, the first female computer programmer. Her gender choice probably happened to celebrate women in robotics, a male-dominated field. Her creation also took place in Oxford University which was the first college that admitted women, in 1878. Unlike sex robots and VPA's, Ai - Da brings new standards and promotes female art. Consequently, designers need to bring social, moral and aspirational biases to their designs.[87] They need to be focused on technological progress, rather than expressing their social beliefs on their works. Gendering robots in our society is likely to both entrench and weaken traditional gender roles.[88] In a process known as "retro-tech", designers may return to an earlier era to which they feel nostalgic, with stereotyped forms and behaviours.[89] Therefore, stereotyped gender roles may be added to their designs that do not apply with current social norms. Londa Schiebinger raises the following challenge for designers: First to understand how gender becomes embodied in robots and second to design robots that promote social equality. Robots provide new opportunities to create more equitable gender norms.[90] Designers have a great power and they could affect our society by changing the status quo, designing a male housecleaning robot for example.

According to Artprice's 2019 international report on the contemporary art market, figure shows that among the top 500 contemporary artists in worldwide auction houses, only 13% are woman artists. Why is this happening? Linda Nochlin had answered this question more than four decades ago with her groundbreaking essay "Why Have There Been No Great Women Artists?" A question that still remains relevant.

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[86] Carpenter J. (2009). et al. *Gender representation and humanoid robots designed for domestic use. International Journal of Social Robotics*, Vol. 1, No. 3, pp. 262.

[87] Alesich S., Rigby M. (2017). *Gendered Robots: Implications for Our Humanoid Future*, IEEE Technology and Society Magazine, pp. 6.

[88] Van Zoonen L. (2002). *Gendering the Internet claims, controversies and cultures. European Journal of Communication*, Vol. 17, No. 1, pp. 20.

[89] Alesich S., Rigby M. (2017). *Gendered Robots: Implications for Our Humanoid Future*, IEEE Technology and Society Magazine, pp. 8.

[90] Schiebinger, L., Klinge, I., Snchez de Madariaga, I., Paik, H. Y., Schraudner, M., and Stefanick, M. (Eds.) (2011-2018). *Gendered Innovations in Science, Health & Medicine, Engineering and Environment,* pp. 646, http://ec.europa.eu/research/gendered- innovations/.

Nochlin introduces her essay by rejecting on one hand, the sexist theory that supported there were no great female artists to create anything important and on the other hand, the feminist theory that supported women were created a different kind of great art. The reason why there are no great women artists according to Nochlin, is institutional and not individual.[91] Women had fewer opportunities than men in the world of art and this had begun since the Renaissance times. Every artist had a tutor and some also had a family background of artists. These educational institutions were not available to women, only the males in the family were taught art and art schools only accepted males. Women were dealing with domestic tasks and motherhood. Only those from wealthy families were able to study art and since they would not had to support themselves with, studying art was a hobby and not a profession.

Reasons are not exactly the same in the 21st century, but they are based in the same social roots. Western civilisations dominated by ideas embedded in patriarchies. This hierarchical type benefits men and fosters the belief that one gender is natively stronger than others. In relation to changing economic and political circumstances, patriarchal societies have developed and mutated.[92] They are power-based and hierarchical relations between women and men tend to undermine women. These hierarchies of gender are often perceived as normal but are rather socially determined and are subject to change over time. They can be seen in a number of social interactions, such as labour segregation, resources, gendered ideologies and ideas of acceptable behaviour for women and men.[93] The artists' career requires exceptional sacrifices in terms of willingness to accept rejection, to live in poverty, and to be field independent. Those are traits of committed men but not of committed women, who typically prefer careers as art educators, not as artists. Girls who want to be an artist have to balance their ambition with the stereotypical gender roles of a nurturing, recessive, motherly female with that of the stereotypical unconventional artist.[94] Another important reason why there so few female artists are gender stereotypes. Heilman explained that gender stereotypes have both descriptive and prescriptive properties:

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[91] Nochlin L. (1971). *Why Have There Been No Great Women Artists?*, pp. 37.

[92] Harris J. (2001). *The New Art History*, Routledge; 1st edition, pp.108.

[93] Baden S., Reeves H. (2000). *Gender and Development: Concepts and Definitions*, Institute of Development Studies, pp. 1-38.

[94] Piirto J., (1991). *Why are there so few? (Creative women: Visual artists, mathematicians, musicians)*, Roeper Review, pp. 1.

descriptive gender stereotypes label what women and men are like while prescriptive gender stereotypes label what women and men should be like. She argues that descriptive and prescriptive gender stereotypes will undermine the career progress of a woman.[95] Those were the reasons why females are underrepresented in the art industry. Recent cross-sectional studies, however, have shown that there are changes visible over time towards greater egalitarianism and less differentiation between sexes.[96] This might mean that people's views of gender roles are changing gradually.

Could female humanoid robots damage the progression of female artists? Robertson in her article "*Gendering Humanoid Robots*", refers Actroid Repliee Q1, Ishiguro's first adult gynoid, in 2003.[97] It was not an accident that Actroid Repliee was named after the French repliquer, to replace.[98] Already the many uses (male) roboticists imagine for the gynoids include their employment 'in upmarket coffee shops, bars, information booths, office complexes, and museums to greet customers and to give directions'.[99] Those are positions that the employee could be replaced. In art we do not discuss about replacement, since every artist is unique and to my point of view, female artists could not be replaced from female humanoid robots, since they are different.

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[95] Heilman M. E. (2012). *Gender Stereotypes and Workplace Bias*, Research in Organizational Behavior 32, pp. 114.

[96] Haines E. L. (2016). *The Times They Are a-Changing ... or Are They Not? A Comparison of Gender Stereotypes, 1983-2014*, Psychology of Women Quarterly, pp. 2.

[97] Robertson J. (2010). *Gendering Humanoid Robots: Robo-Sexism in Japan*, *Body and Society*, Vol. 16, No. 2, pp. 22.

[98] Ibid, pp. 24.

[99] Ibid.

4. Will AI Become Art's Next Medium?

Over the last two decades, Apple debuted Siri, a virtual assistant that we all almost have in our smartphones, Google introduced us to Waymo, which are driverless cars and the Microsoft Beijing Research facility launched Xiaoice, an artificial intelligence chat-box that has over 660 million of users. As far as the art world is concerned, in 2018, Christie's became the first auction house to sell an algorithm-created work of art, signalling the vast change in the art industry. The painting "*Edmond de Belamy, from La Famille de Belamy,*" was sold for $432,500, over 40 times Christie's initial estimate of $7,000 -$10,000. A new era is coming, robots are definitely an integral part of our society and that creates the following thought: will artificial intelligence become art's next medium?

For almost half of the century, many artists and scientists have been exploring writing computer programs that can generate art. One of the most important example was AARON from Harold Cohen, in 1974. As time goes by, artificial intelligence evolved and is different nowadays from these examples that artists generated art by writing detailed code that was reflecting their aesthetics. Recent developments incorporate AI and machine learning technology to give more autonomy to the machine. How does this work? With the machine learning technology thousand of images are fed into the machine and with the artificial intelligence function new images are coming up according to the aesthetics it has learned. AI is a set of algorithms designed to function as parallel to human intelligence actions such as decision-making, image recognition, language translation/comprehension, or creativity[100], so the results can be surprising even for the artists themselves.

The definition of the medium - specificity can be traced back to Gotthold Ephraim Lessing's 1766 essay, "*Laocošn",* an essay about the boundaries of art in painting and poetry. Lessing believes that these media are completely different, because painting exists in space, while poetry occurs in time. For instance, a battle could only be depicted in one moment of its duration in painting, while in poetry it would be depicted in its complete duration with all the physical, psychological and intellectual context. He refers to the media as "two equitable and friendly neighbours"[101] that should not cross the line. Each medium has its own

[100] Mazzone M., Elgammal A. (2019). *Art, Creativity, and the Potential of Artificial Intelligence*, pp.8.

[101] Lessing G. E. (1984). *Laocošn*, The Johns Hopkins University Press, pp. 91.

possibilities and limitations and in order for an artwork to be successful, its own medium of specific stylistic properties should be followed.

Clement Greenberg took Lessing's essay one step further, with "*Towards a New Laocošn"*, in 1940. In his essay celebrates abstract painting as achieving the perfect expression of medium-specificity and purity, which desired medium-specificity condition. The abstract painter by escaping of the subject matter, is free to engage with the materiality of the medium.[102] The imitation of nature is abandoned, there is not the illusion of the three - dimensional space. Since the paint, the colours and the canvas are flat, there is no point in painting a figurative image. With the way, the artists could identify what the art form is in essence. Greenberg reached in that conclusion through looking to the music, not by imitating it, but by understanding how it was operated. Music, for him, was inherently pure and abstract because no other media could explain it. Kandinsky had the same point of view, in *"Concerning the Spiritual in Art"*, which is considered to be the first manifesto for abstract painting. He writes: "With few exceptions music has been for many centuries the discipline which has devoted itself not to the reproduction of natural phenomena, but rather to the expression of the artist's soul, in musical sound".[103] Kandinsky imagines of painting using "borrowed methods" from music, but focuses on the "proper use of this encroachment".[104]

The artist should critically engage with the material of choice to be medium - specific. Just like Marcel Duchamp did with the "*Fountain*", a work that would permanently alter the way the game of art was played, in 1917. Alfred Stieglitz who photographed Duchamp's original urinal, in the manifesto of conceptual art, said: "Whether Mr. Mutt with his own hands made the fountain or not has no importance. He CHOSE it. He took an ordinary article of life, placed it so that its useful significance disappeared under the new title and point of view—created a new thought for that object."[105] Marcel Duchamp was the one who shifted the perspective of what we call art. He claimed that creating the artwork was not necessary, you could just pick an object and exhibit it. He cared about the idea that the artist had, he did not care about the craft part. Until that time, artworks were traditionally known as products of

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[102] https://lucian.uchicago.edu/blogs/mediatheory/keywords/medium-specificity/ (Accessed:14 January 2020)

[103] Kandinsky W. (1946). *On the Spiritual in Art*, New York : Solomon R. Guggenheim Foundation, for the Museum of Non-Objective Painting, pp.35.

[104] Ibid.

[105] *The Blind Man,* (1917), *No. 2*, 33 West, 67th Street, New York.

ars or *techne*; they were made according to a technical and principled practice. Etymologically, the word *'art'* is comes from the Latin *ars*, which refers to practical skill or craft involving principles, a sense probably best expressed by the Greek translation *techne*. Giorgio Vasari's "*Le Vite de' più eccellenti pittori, scultori, ed architettori"*, also described sculptors, painters and architects as *artefici* or 'craftsmen' whose occupations were *arts.*[106] If "*Fountain"* is art, then the readymades of Duchamp raise a logical paradox with regard to the ontology of an artwork: something mass-produced and commercially available is clearly not a work of trained craft. The legacy of *ars* is closely related to the Renaissance perception of the artist as a creative genius, who is the one who creates the painting or the sculpture and try to portray mostly divine figures in a human form. Therefore the artwork is elevated, and imbued with what Walter Benjamin called "aura". In contrast, the "aura" of readymades like "*Fountain"* "withers in the age of mechanical reproduction" because urinals are anonymously manufactured objects meant for a utilitarian function.[107] Yet, Duchamp made a performative distinction between the ontology of a urinal and the ontology of a *Fountain,* by choosing a particular urinal to be exhibited. As *Fountain*, the industrially produced object is lifted from its functional context and is ontologically transfigured as the embodiment of Duchamp's personal expression, the same artistic agency present in any artwork, contingent not on any skill, but to the creative processes of his mind. The artist's selectivity thus becomes part of the act of creation; a technique on its own.

Can artificial intelligence robot artists act critically and create a totally new artistic movement, just like Marcel Duchamp did? Maybe they do not have to do that and just like Duchamp's work is linked with many artistic movements, from Cubism to Dada to Surrealism and blazed a trail for later styles such as Pop Art, Minimalism, and Conceptualism, artificial intelligence could be "*The Fountain*", the medium for other kind of arts. Marshall McLuhan in his book "*Understanding Media*", which was published in 1964, coined in the first chapter that "the medium is the message".[108] According to McLuhan, media should be described as "extensions of man", and include any technology that is not found in our natural state. In his

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[106] Parcell S. (2012). *Four historical definitions of architecture,* Montreal: McGill-Queen's University Press, pp. 166.

[107] Benjamin W. (1969). *The Work of Art in the Age of Mechanical Reproduction,* translated by Harry Zohn, from the 1935 essay, New York: Schocken Books.

[108] McLuhan M. (1964). *Understanding Media: The Extensions of Man*, pp. 17.

view, "the 'content' of any medium is always another medium"[109]; the medium is thus specific through its effects, not its content. With this way, artificial intelligence could be the medium for new artistic movements, just like it happened with artificial intelligence photography. A lot of smartphones nowadays have an AI camera. Huawei was the first phone company who launched AI phones, with the model Huawei Mate 10. This used the Kirin 970 chipset, which launched the neural processing unit to the public. Camera scene instant recognition was the basic application of its AI technology. The Mate 10 could identify thirteen scene types, including pictures of dogs or cats, sunsets, blue sky photos and snow scenes.[110] It is fascinating how AI has influenced photography and through smartphones it is accessible to everyone. AI has also an important role in painting during the past years. In the previous chapter, I have already spoken about Ai - Da, who produces artworks with artificial intelligence. Furthermore, one of the most controversial paintings sold in 2018, "*Edmond de Belamy, from La Famille de Belamy,*", which is part of a group of portraits of the fictional Belamy family created by Obvious, an art collective based in Paris, consisting of Hugo Caselles-Dupré, Pierre Fautrel and Gauthier Vernier. It was created by an algorithm, called the Generative Adversarial Network algorithm (GAN). First, the system was loaded with a collection of 15,000 portraits originating between the 14th and 20th centuries. Then, the generator, the first part of the algorithm, generated new images based on this set. Subsequently, the discriminator, the second part of the algorithm, compared the generated images to the human-painted paintings. The work was over when the discriminator was incapable of telling the two apart.[111]

Artificial intelligence might be a relatively new field, but technology in art was a common practice historically that has led to great results. If you consider all of the above, the whole creative process matters, not only the final outcome. When photography was first invented in the 19th century, it was not considered art. A century later, photography became an established type of art. Today photographs are exhibited to museums and galleries and they are being sold for enormous sums of money, thinking of Andreas Gursky's photograph "Rhein II", which was sold for $4,338,500, at Christie's New York, in 2011. To my point of view, the same will eventually happen with AI art. AI artworks are a collaboration between human and

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[109] McLuhan M. (1964). *Understanding Media: The Extensions of Man*, pp. 19.

[110] https://www.techradar.com/news/what-does-ai-in-a-phone-really-mean, (Accessed: 18 January 2020)

[111] https://www.dailyartmagazine.com/ai-painting/ (Accessed: 18 January 2020)

machines, human artists do not have to be afraid of evolution, AI is a creative tool that gives potential to a bright future.

Conclusions

From the mind of the "father" of science fiction Isaac Asimov to Ai - Da, the first humanoid robot artist in the world, robots have always dealt with science and man in a variety of ways. The idea of a machine that thinks and acts as a human has always been awe-inspiring to the world.

The key point to answer the question if a machine could think, was Turing Test, which became the benchmark of AI. Alan Turing was supporting that if a computer could have a text - based conversation with a human, with such ability that the human could not tell whether they are talking to a machine or a human, then the machine can be said to have intelligence. Eighty years later, artificial intelligence is everywhere, in our smartphones, computers, cars and as Jasia Reichardt had forecast in art. Ai - Da is the first robot artist that can draw without a human input, she can draw things from life using a microchip in her eye and a pencil in her mechanical arm. This consequently leads to the question if robot artists replace human artists in the future. According to my opinion, I do not think this will happen, since each artwork depends on its originality that makes it different from everything else. But the concept of creativity is a very controversial subject according to Margaret Boden, who supported a creative idea is a novel and valuable combination of well -known concepts. As a consequence, creative ideas could be automated, but the authenticity and emotional dimension that is produced by humans could not be replaced. For that reason, human artists should not be afraid of the evolution and use artificial intelligence as a new medium to create more in the field of art.

Since humanoid robots integrated into our society lately, gender stereotypes appeared. For instance, female robots are designed for stereotype female tasks, such as the roles of secretaries, house - cleaners, as well as sex robots, while male robots usually have a more authoritative role. Our society moves towards gender equality, what is the point of referring gender norms from the 60's? Robot designers need to be conscious about that and encourage new gender roles, which are promoting gender equality.

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