DESIGNING WITH AI

MAXIME OSTROVERHY

DISSERTATION

2023

Bartlett School of Architecture

Figure i:
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UCL Here East, Stratford
(Ostroverhy, 2023)

Designing with AI: Laying the Theoretical and Social Foundations to Design Clay Geometries in Collaboration with AI

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Dissertation

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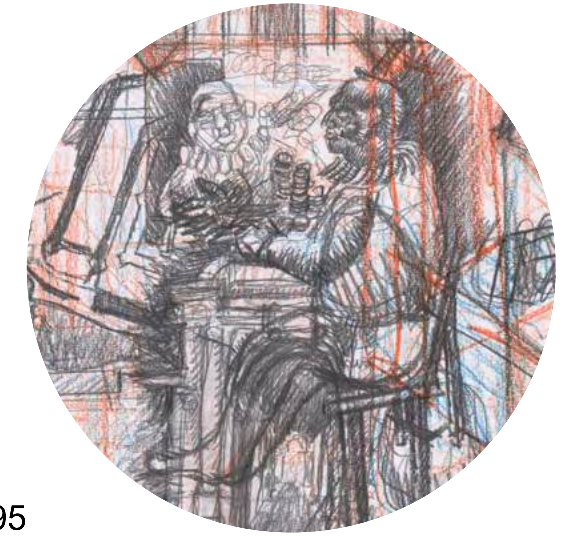

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ABSTRACT

Our technological future is often depicted as utopian or dystopian (Bradner et al., 2020). However, this paper investigates on how humans and AI can collaborate too. We therefore seek to augment human capabilities through an active human and AI cooperation. In this study, the gateway for this dialogue is framed in the design process of ceramics geometries. As clay is a material heavily dependent on human touch and its environmental surroundings, it is the challenge of this work to try and collaborate with AI image generators to design ceramic geometries. With an experimental Turing Test, the validity of the designs, semantics and beliefs are addressed to help the author understand the theoretical and social key points in collaborating with an AI to design. The data from the Turing Test also helped to conclude that although AI image generators seem to prioritize aesthetic beauty over functionality, the involvement of humans helped to create not only beautiful, but in some cases also functioning objects. It was also concluded that AI can now be a source of inspiration for artists and designers. Furthermore, to increase the human touch in AI, a feedback loop between humans and AI needs to be used and educating designers and curators on how to use AI is something to potentially consider in the future.

Figure v:
AI generated jar
(Ostroverhy, 2023)

Figure 1. a:
AI generated jar
with top off
(Ostroverhy, 2023)

I. INTRODUCTION

As per Bill Gates' words, "the age of AI has begun" (Gates, 2023). However, before machines were powered by AI, robots were primarily used from the mid-20th century in factories and on battlefields with simple commands. As a result, human and robot collaboration is one of the early manifestations of human and AI collaboration and it always seemed to try to facilitate human labour. However, this study is interested in the human and AI collaboration (fig.1.a). As an example, in 1997 when the first computer beats a human at chess, for a moment it felt that the game lost its purpose. However, a year later, a new type of chess is developed called "advanced chess" (Baraniuk, 2015), where a human faces another human but both have the possibility to enhance their strategic capabilities with the help of a machine. This type of collaboration is exactly what the paper is interested in. More precisely it investigates how AI can facilitate artistic and design work by looking at the potential of AI image generators to act as artistic collaborators with sculptors.

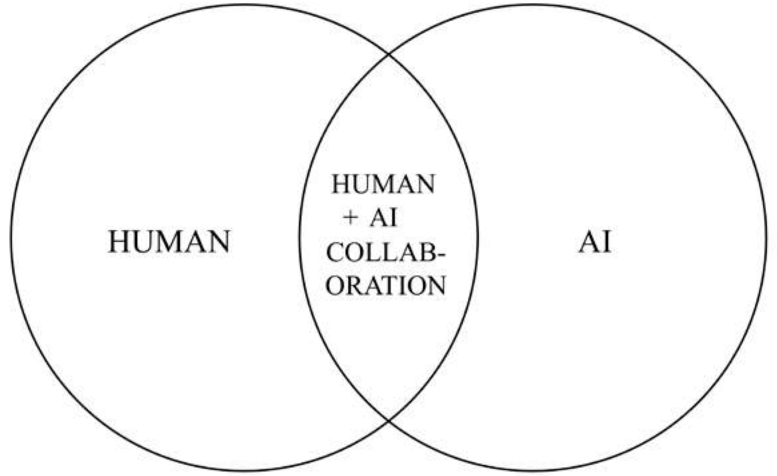


Figure 1. b:
Dissertation main theme
(Ostroverhy, 2023)

Figure 1.1.a:
Film Ex Machina,
examining our fears of AI,
can we fall in love with AI
(Goodykoontz, 2015)

To start with, a brief overview of previous machines that recreated styles and visually and aesthetically pleasing images is reviewed. In the 1950s, a machine drawing was created by IBM employees, in the 70s an artist named Cohen started producing computer generated images AARON which were executed using plotters and printers, in the 90's a drawing robot named ISAC was designed to mimic the artists movement and in the last decade robots could detect brush tip and grasp a brush and paint. However, such systems usually seek to create art that is aesthetically pleasing by taking a model or an image, possibly altered via style transference, as input, and using reinforcement learning to carefully refine artwork, or mimicking an artist's movements directly.

1.1 Background on the field

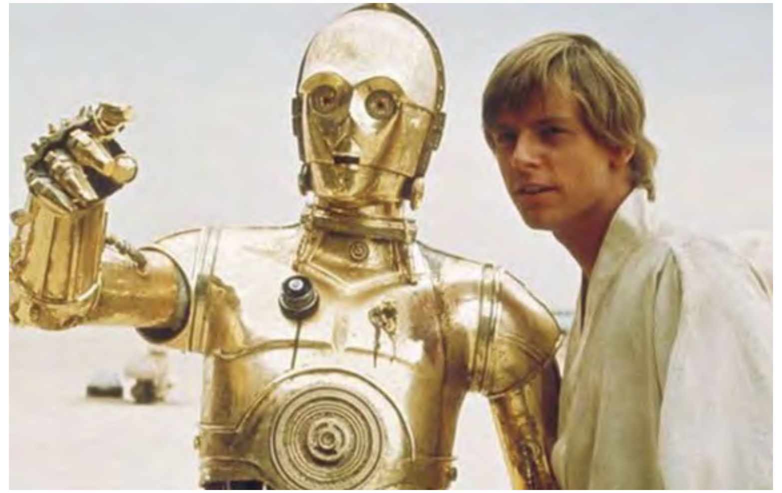


Figure 1.1. b:
Robots being portrayed as intelligent
and human friendly machines in pop culture
(Berger, 2021)

Figure 1.1. c:
Rossum's Universal Robot (R.U.R, 1920)
play showing robots take over humanity
(Bociąga, 2023)

Secondly, in sculpting, more projects were done in the realm of the built environment, and a wide range of research was done by ETH Zurich, from AI designed facades to 5 axis robots (Ma et al., 2021). We now begin to see them more as collaborators, and not just mere tools (Bradner et al., 2020) to develop a multidisciplinary future (UNESCO, 2017). Looking at society and pop culture and science fiction, we notice it often depicts robots and AI as threats (Bradner et al., 2020) and are often associated with a post-humanist and apocalyptic future. Even before the advent of AI, the belief that robots could destroy humanity existed. Take for example the etymology of the word robot, which originates from a 1920s Russian play called R.U.R (Rossum's Universal Robots). It derives from a Czech word 'Robota' meaning forced labour (Bociąga, 2023). The fear of robots or AI taking over humanity is therefore not new. However, they are also widely represented as positive protagonists (WALL-E) or anthropomorphized friends (C-3PO in Star Wars) (Sideshow, 2022). This paper focuses on a positive input of robots, and how to use to create beauty (Rea, 2018) and not destruction (Vallance, 2023). It is important to note that we look here not at the mechanical functions of robots, but rather their programming (AI) and how software affect the physical world (fig.1.1.b). A good example of this is the interpersonal connection of human and AI in the film Ex-Machina (fig.1.1.c). The story examines if it is possible to fall in love with an AI. The emotional function AI plays in our society is examined in this study through the participants' responses in the Turing Test.

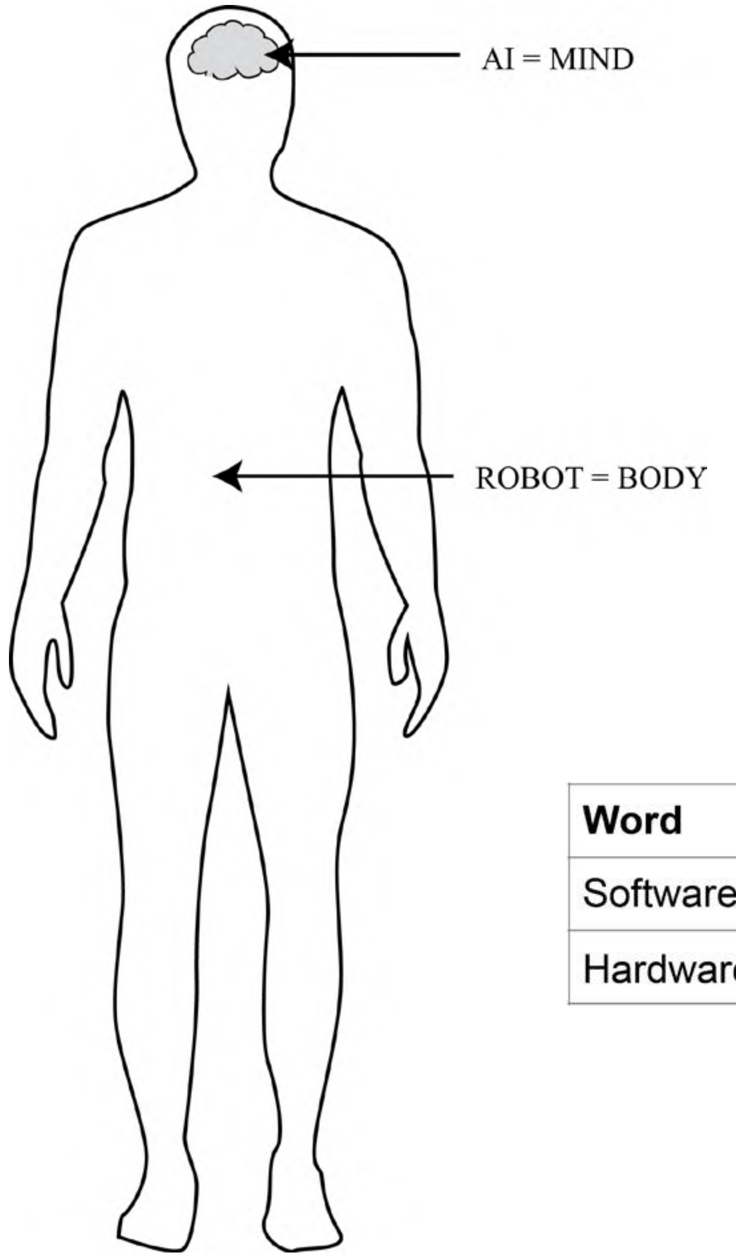


Figure 1.2:
Analogy of human to highlight AI and robot difference (Ostroverhy, 2023)

1.2 Robots and AI

The terms AI and robots are often confused with each other. In this paper the term AI refers to recreating the human mind, and robotics recreating a specific physical task. In simple terms taking the humans as an example, AI is the brain and robotics the body (fig.1.2.a). To power the body we need a brain, and to power a robot a software (AI) is needed (Martin, 2022). The research will evolve around both terms, and the experiment will use AI that will generate images of designs. The author will act as the robot, following at times what the AI design tells him to do. Within the robot, there is software and hardware. Hardware is the wires and disks, while software is the programming of the machines (table 1.2.a).

Word	Definition
Software	machinery, wires and disks
Hardware	programming of machines

Table 1.2. a:
Definitions of hardware and software.

1.3 Conscious and subconscious

The main experiment revolves around a test that is usually made to try and find out if a computer is conscious or not. However, subconscious is also of importance, as arguably the images generated by AI to help the author design the ceramics affect the author's subconscious.

Word	Definition
Conscious (as per Cambridge dictionary)	awake, thinking and knowing what is happening around you
Subconscious (as per Cambridge dictionary)	the part of your mind that notices and remembers information when you are not actively trying to do so, and influences your behaviours even though you do not realize it

Table 1.3. a:
Devfinitions of consciousness and subconsciousness.

1.4 Policies and ethics

AI and robots can affect fundamental human values such as privacy, human dignity, ownership and safety. It seems that the dilemma of keeping up with rapid technological advances is exponentially rising, and events like the COVID-19 pandemic only hastened this process (LaBerge, 2021). While adapting with the technology, it is important to keep in mind the ethics behind it, and deal with the implications of using powerful machines. The use of robots and AI also raise moral questions, as robots are currently widely used for warfare (Joshi, 2022) and there are even possibilities of having sex robots in the future (UNESCO, 2017). It is therefore highly important in this study to movnitor and assess the data take from the Turing Test according to UCL regulations. Furthermore, this study being about Human-AI Interaction (HAI) it is key to consider the intricacy of this relationship, and make sure it is a neutral one and respects the Kantian needs to respect humanity (Müller, 2020).

1.5 The study

This paper explores the collaboration between human and AI as a means to maintain the conscious creative explorations into the art of sculpting with clay and to enhance human creativity. It is also important to highlight the nature of this paper as being experimental; and its outcome is not necessarily conclusive, but rather allusive. The author looks at ceramics as a gateway for the human-AI collaboration. This dialogue tries to create a more horizontal relationship between humans and AI. Clay is a material heavily dependent on human touch (i.e. feeling the right malleability or humidity level of the material). The author tries to describe these physical properties with prompts using words in mainstream AI image generators such as Dall-E or Midjourney. With it, the aim is to create functioning ceramic home ware. The design of these objects is the main challenge that is addressed by the author. The validity of the designs and the human and AI collaboration is assessed with an experiment very similar to a Turing Test. The data from the participants of the experiment served as a way to assess the functionality of the designs, the aesthetics of the designs, and the semantic accuracy behind the prompts. Lastlvy, pottery has been ever present in human history and served to record stories and events. Therefore, the data from the Turing Test analysis ended with an investigation into how AI and humans can collaborate to tell their own stories through clay.

Figure 1.5. a:
AI generated rotund vase
(Ostroverhy, 2023)

Figure 2.1.1. a:
Duerer watercolour
(Albertina Wien, 2023)

II. CONTEXT

2.1 Can AI and robots replace the human touch?

2.1.1 A yellow wash on an etching

It is important to understand the value of the human touch. A Harvard Science Review study shows that AI can be trained limitlessly to evaluate the cost of paintings on the art market. However, some paintings with rare techniques continue to elude AI. For example, Dürer's experimental use of a new yellow wash on an etching cost more than others and only a trained human eye knows that. As these kinds of discoveries are possible only through experience and a data source (aka the human brain) that has undergone a wide range of experiences and is sensitive to these kinds of findings. A machine would have been able to only recognise the technique, date and in some cases the author of the painting, thus giving it a market value but not its rarity (Cameron & Bailey, 2021).

2.1.2 When AI became the DJ

As described in 2.1.1, AI cannot think critically about previous data sources it has not seen before. These types of issues are prone to arise with AI. Gustav Söderström, chief R and D at Spotify, was at the company when Spotify developed the algorithm that could personalize playlists based on songs the users were listening to, the first one being Discover Weekly. At first, it used a pairing algorithm called collaborative filtering that would match a song to another song based on data from other users. However, it would add Christmas songs to a Spring break mix with Justin Bieber (Strong, 2022), as these two would often be played in December. It took years before developing the algorithm called "Algotorial" that would allow the addition of a human dimension by labelling songs with moods. In order to do this, huge pools of data were gathered and analysed in order to create the current user-friendly music streaming app. It is therefore vital to input the right data into these data processing algorithms in order to recreate the human touch. Without this input, AI cannot replace the human touch yet.

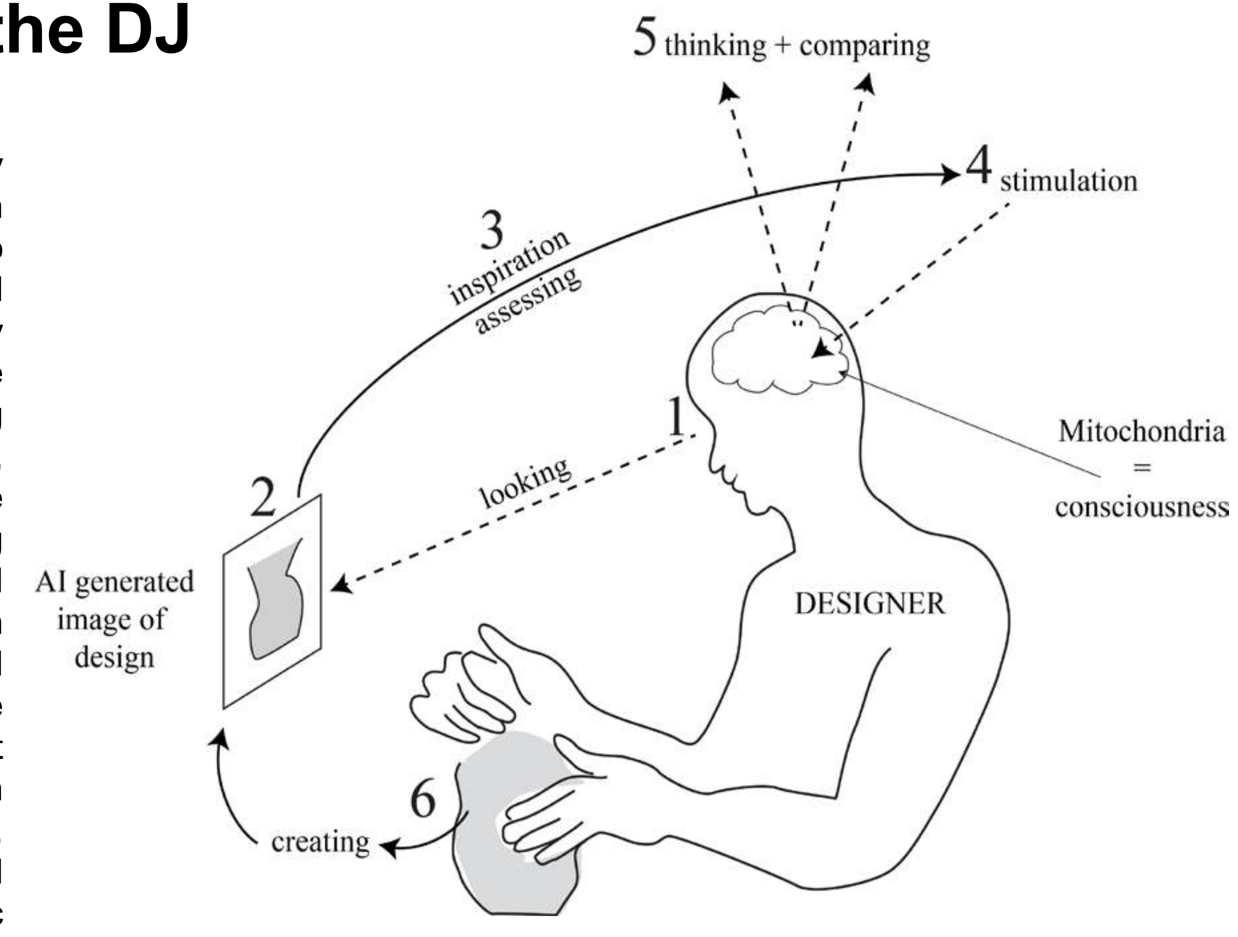
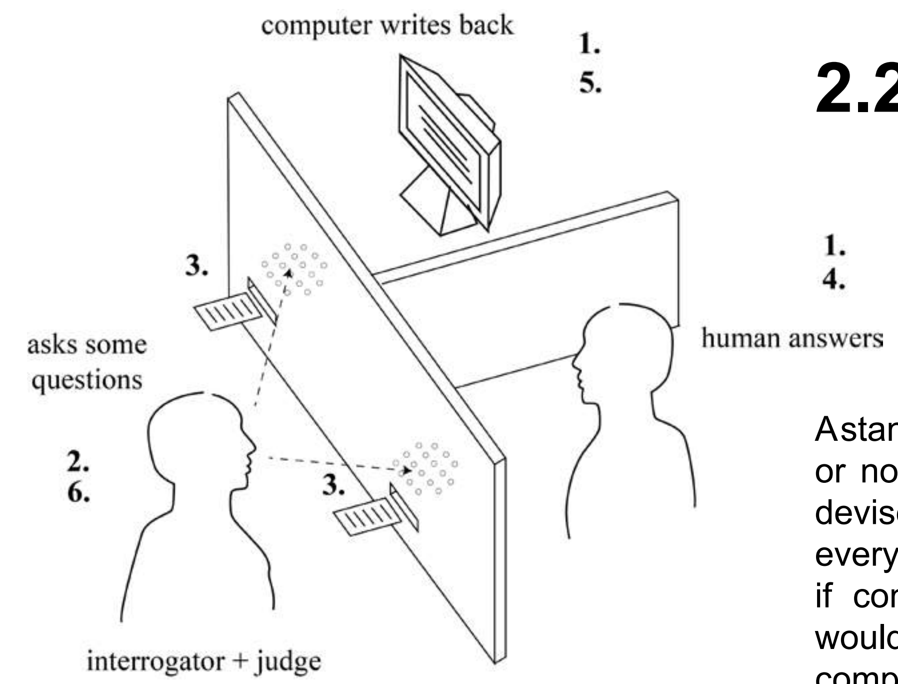


Figure 2.2.. a:
Human creative process
of making clay geometries
(Ostroverhy, 2023 after Chang & Lee, 2007)

2.2 Is AI creative?

In the following section, the question of AI being conscious or intelligent will be addressed. While this topic can arise deep meanings in philosophy such as what does it mean to think or feel, this section will help to devise the experiment that will be central to the study (fig.2.2. a).

Figure 2.2.1. a:
Turing test
(Ostroverhy, 2023)



STEPS:

1-a human and a computer are sat in enclosed rooms

2-the interrogator asks questions to both and cannot see which one is the computer and which one is the human

3-all the answers are given in an impersonal manner, for instance typed down

4-the human must persuade the interrogator that indeed they are the real human here and the computer is not

5-the computer is programmed to lie

6-if the interrogator cannot determine who is the computer, and who is the human, the programme/ai/computer/designer has passed the test

2.2.1 The Turing Test

A standard way to test if a computer has a conscious or not is with a Turing Test (fig.2.2.1. a). It was devised by Alan Turing in 1950. The reason why every computer undergoes this test is because if conscious presence underlies the replies, it would attach us with moral responsibilities to the computer. For example, we would not be able to just give it away or sell it without any moral clash backs (Penrose & Gardner, 2016). It is important to ask fair questions. For example, if asked to perform a hard arithmetical question the computer would do it quickly and the human not (i.e. calculate two thirty digits numbers in less than two seconds). Additionally, the questions need to be very simple and use common sense that a human could answer quickly. The questions can be ridiculous for example: did you see that pink elephant flying over the river this morning? For a computer to pass the test, it must achieve a result accuracy of more than 30% (Moloney, 2017). No computer has ever passed the test (Johnson, 2022), although some argue an AI devised by Russian engineer Vladimir Veselov passed in 2014 (BBC, 2014).

2.2.2 Chinese room experiment

To prove that AI cannot understand and think, American philosopher John Searle devised an argument (Penrose & Gardner, 2016) called the Chinese room experiment (fig.2.2.2. a). In it, a computer is given a story and a set of questions in Chinese, and inside a room an individual is given the Chinese symbols for the story and the questions. Then inside the room, a set of instructions (the algorithm) is supplied in the language of the individual (English) in order to answer the questions to the Chinese symbols (eg. if symbol Y appears, put symbol X as an answer). In this logic, someone who does not understand Chinese but can follow a set of instructions can easily answer a question by not knowing how to speak Chinese. This proves that when a computer follows a set of instructions, it does not mean that it understands them (Cole, 2004).

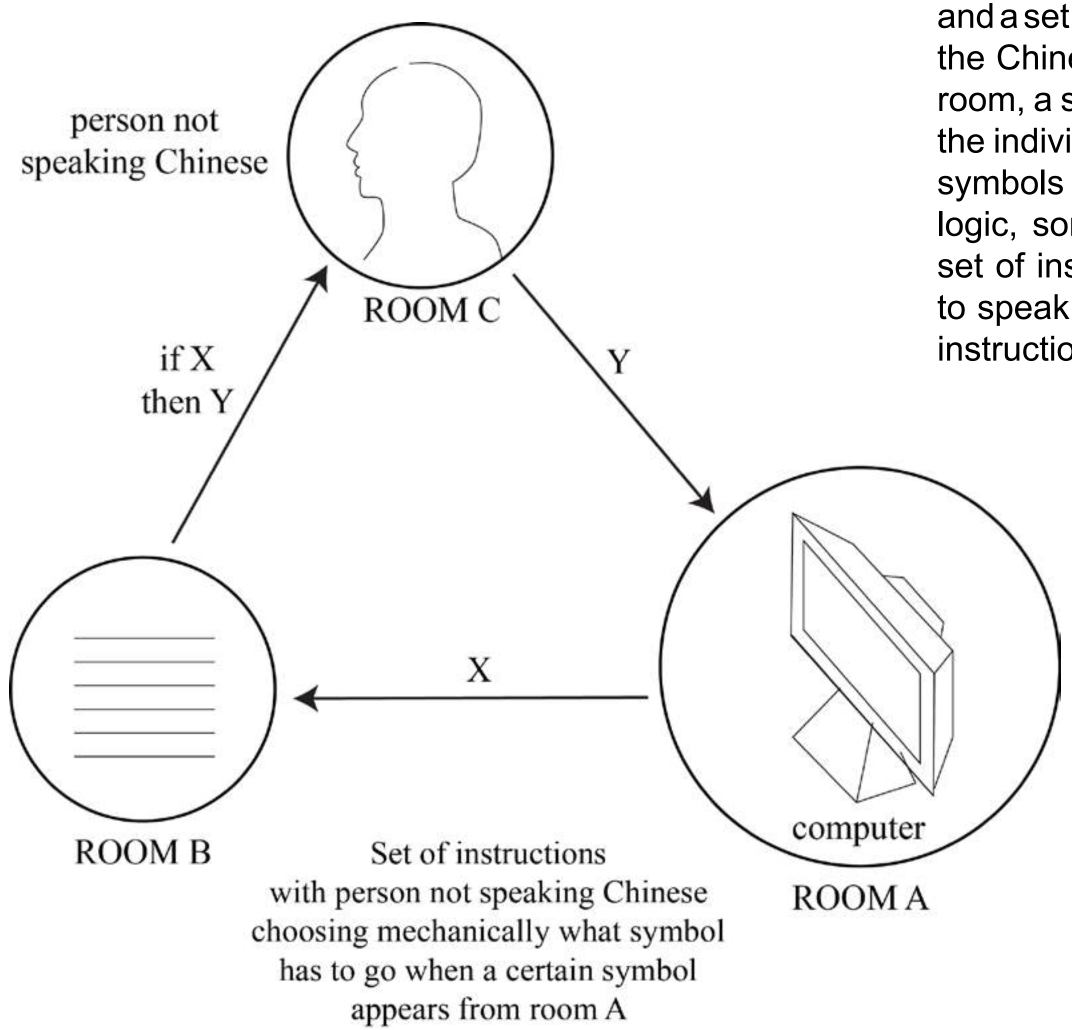


Figure 2.2.2. a:
Chinese room experiment explanation
(Ostroverhy, 2023)

2.2.3 An AI approach to pleasure and pain

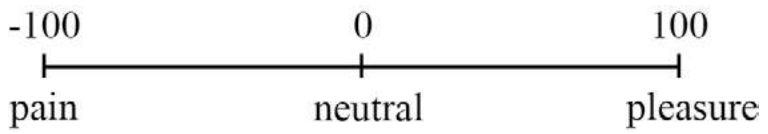


Figure 2.2.3. a:
Pp score

A study was done by Grey Walter with a Tortoise robot that feels “hungry when it needs to be recharged”. A system was then used on it, called the pp-score (fig.2.2.3. a), to quantify pleasure and pain for a robot. Pleasure meant full charge, and pain not enough battery. But then the question was raised: does it mean anything to the robot? What is missing from it being able to feel like humans feel? Humans are much more complex, as they do not just act like animals, avoiding pain and seeking pleasure, but also have morals and beliefs that make the whole system of feelings harder to objectify (Penrose & Gardner, 2016).

2.2.4 You learn from your feedback loop

Figure 2.2.4. a:
Computer beating human at Go
(Huang, 2017)

It is possible for a robot to learn from past experiences, as the software AlphaGo has demonstrated. When AlphaGo was developed and beat for the first time a 9dan Go champion in October 2015, some of the moves it made were so brilliant that it revolutionized hundreds of years of knowledge in one game (DeepMind, 2015). To achieve this, instead of using an advanced search tree, the Deep Mind team combined the advanced search tree with deep neural networks for the machine to learn the intuitive game.

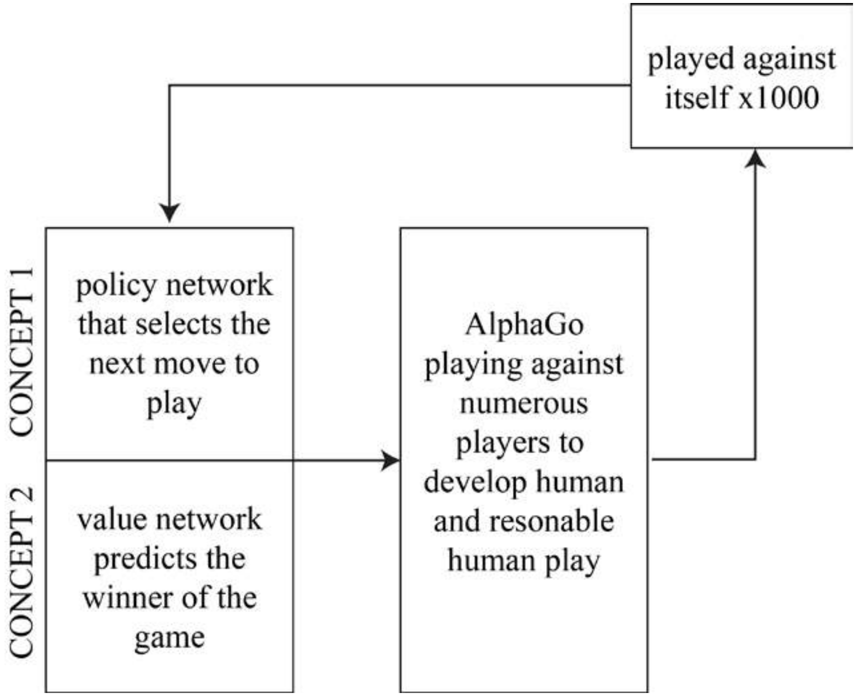


Figure 2.2.4. b:
Deep learning process
(Ostroverhy, 2023)

2.3 The new art assistants

Artists have long been using art assistants to create art (Neuendorf, 2016) and it is no surprise that in today's world these assistants are starting to be replaced by machines, as in Jeff Koon's example where he extensively uses stone cutting machines to create his sculptures (Schneider, 2019). Artists like Jeff Koons or Louise Bourgeois have a factory-like art studio, with dozens of helpers completing their sculptures. While Andy Warhol used print techniques to create works on a large scale, nowadays the current machines are much more elaborate and can actually become real partners and assistants rather than simply press or print stencils (Bradner et al., 2020). Furthermore, the issues of assistants' authorship and copyright protections are important in today's market driven art world (Schneider, 2019). Perhaps the use of AI or advanced machine learning system will change that by removing the need to sign numerous contracts with a team of art assistants, thus making artists more independent and more flexible on their time and budget investments.

In the subsequent sections, this paper will investigate several machines that act as art assistants and their different collaboration involvements (fig.2.3. a). The first one is an analogue machine used by the French artist Fabienne Verdier that enhances her brushstroke. In the second example, Brooklyn-based artist Sougwen Chung inputs her own brainwaves data into robots and uses them as collaborators in her abstract paintings. Lastly, a study performed by Halmstad University on the design of an art therapy robot is conducted that can paint moods, replicate styles, be sensitive and understand its patient.

Levels of collaboration	Explanation
1	Artist + analogue machine, source of energy human, human input 100% and robot 0%
2	Artist + semi analogue machines (them being programmed to obey the artist), source of energy electrical batteries, human input 50% and robot 50%
3	User + digital machine, source of energy electrical batteries, human input 0% (can be changed but this variant is considered here) and robot 100%

Table 2.3. a:
Collaboration levels

Figure 2.3.1. a:
L'Atelier Nomade
(Verdier, 2019)

2.3.1 L'Atelier Nomade

Fabienne Verdier is a French artist, having studied ten years in China after finishing "Les Beaux Arts de Toulouse". She uses traditional Chinese calligraphy techniques and with upscaled brushes fixed to the ceiling with large amount of Indian ink, paints on large canvases. The making of these abstract paintings necessitates two hands and energy from the whole body. This concept is well demonstrated in her project "l'Atelier Nomade", where she builds a steel frame with a pulley on it, able to move the giant brush in the predetermined x, y, z axis. She repeatedly paints the Mont St Victoire after Cézanne, creating abstract paintings (Verdier, 2019).

2.3.2 Stubborn collaborators

Figure 2.3.2. a:
Robots as collaborators
(Chung, 2020)

The second case study revolves around Sougwen Chung, who directly programs her Rasperry Pi robots based on her own movements and even brain wave data. She calls them "stubborn collaborators" (Kaufman 2020), as they are prone to bugs and debugging becomes part of the painting process (Chung, 2020). The painting process becomes an improvised dance, mixed with a performance and fixing the bots. This way of working, unlike Verdier, is highly influenced by the robots the artist is working with. The glitches and malfunctioning of the technology is something we all experience and makes the art of Chung relatable on a technological level. It dims the boundaries between human hand and machine. The interaction becomes a bi-directional relationship between man and robot. Rather than just a human providing instructions to the machine, the machine also has a say on what is happening on the canvas on a physical level (Bradner et al., 2020).

2.3.3 Robotic art therapy

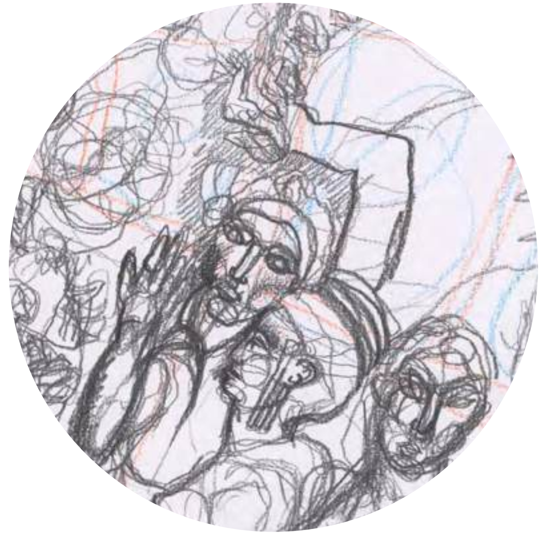
Figure 2.3.3. a:
Robot and art therapy
(Cooney & Menezes, 2018)

Lastly, an art therapy robot designed by a team from Halmstad University (Cooney & Menezes, 2018) presents an interactive robot that can engage creatively with its patient. The need for this type of robot is based on medical psychological grounds, such as loneliness and depression, which differs it from the previous case studies. Nonetheless, the way the robot is programmed is relevant for the current context. The robot is designed to track a person's style (impressionistic, cubistic, etc.) and react according to the patient's psychological state. This results in a painting based upon the patient's preferences and emotions. Depending on how engaged the person is, the robot can suggest what to start painting, facilitating self-exploration (fig.2.3.3. a).

It then uses an emotion equation as an inference, and vectors and number classifiers to describe input emotions which are put onto the valence (x) and arousal (y) graph. These inputs for the robot create a figurative or abstract painting, using shapes and colours to define the person's inner emotions. This study is one of many starting points in this field and has a particularly interesting empirical approach on painting. Perhaps something that could be added to this robot is a self-learning algorithm, much like AlphaOne for chess (DeepMind, 2015).

2.4 Bugging robots

If given a certain programmed 'chaos', robots and AI can be disruptive and unpredictable, making us wonder, stay curious, and eventually develop empathy or apathy towards them. This is what makes us humane (Pribram, 2006). We see they are not perfect. The element of chaos and vandalism makes robots closer to what is so important in artists: freedom and capacity for choice (Ebels-Duggan, 2012). These choices in our case can be either pre-programmed, or machine-learned from experience -- the more complex the choice pool, the more freedom the robots get.



2.4.1 Scratch an itch or throw loam lumps

A performance was exhibited at the 2019 Venice Biennale by Sun Yuan and Peng Yu, two artists known for provocative artworks such as the silicon whipping chair. In their Biennale installation, they question the role of robots in our society and how they are perceived by humans. A robot was placed in a glass "cage" and could perform 32 different human movements, such as 'scratch an itch' or 'ass shake'. The industrial robot continuously sweeps blood like fluid around the floor while performing these gestures, making sure the deep red liquid stays in a pre-determined area. The performance of the robot in this uncanny installation allows art to take a new kinetic dimension that is powered by human data gests, yet still looks industrial and stock. This juxtaposition of the humane and robotics gives the performance a non-tangent and nomad nature, making us question the spatial specificity of art today (Lekka, 2019).

A more controlled example of "letting the robot go", is a project done by ETH Zurich called Remote Material deposition (B.J.O.R.N., 2017). The study evolves around in-situ remote fabrication, where a small size ballistic robot system deposits loam projectiles to a pre-defined remote location. The outcome is large scale buildings, made of dried clay that make the closed wall typologies.

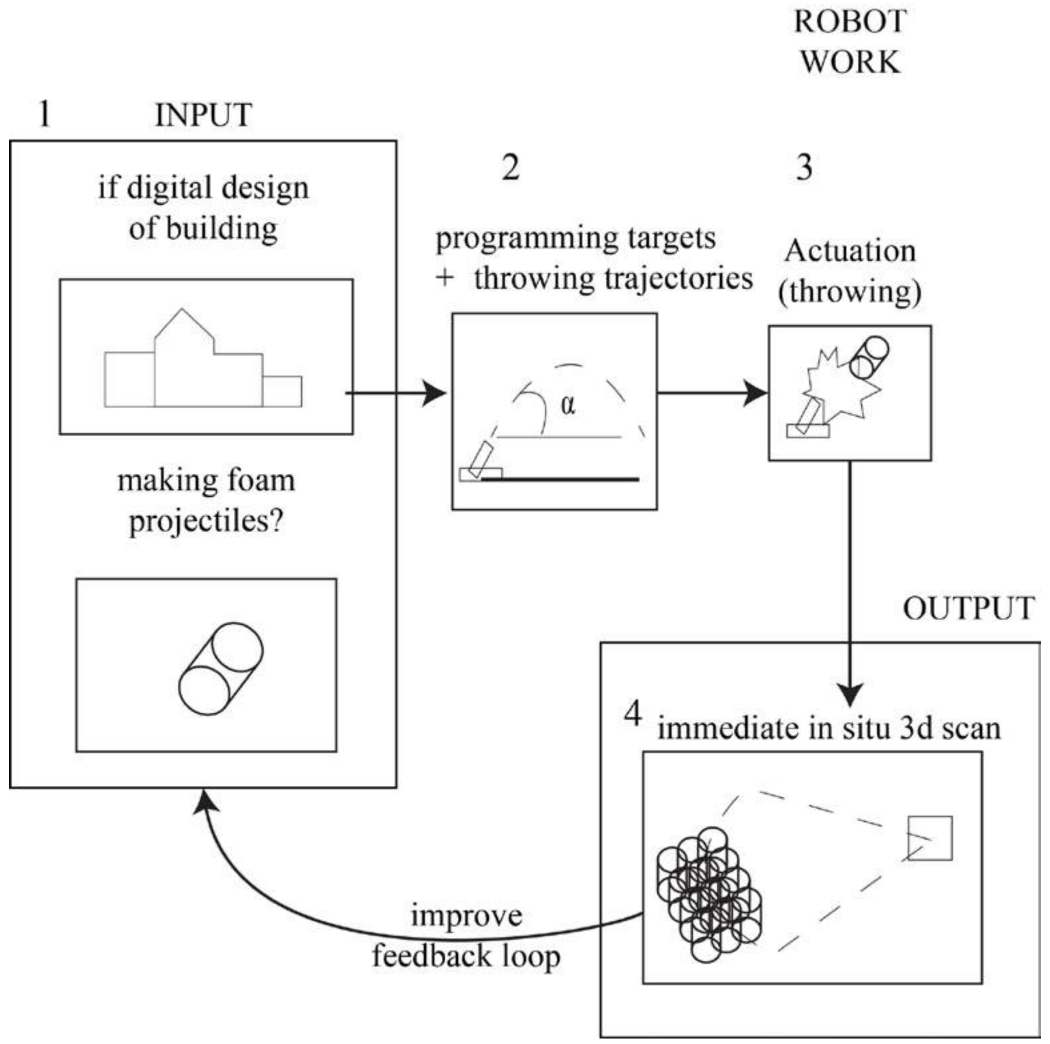


Figure 2.4.1. a:
How Remote Material
Deposition works
(Ostroverhy, 2023 after
B.J.O.R.N.,2017)

This feedback loop (fig.2.4.1. a) makes abstraction of material reality in the digital model obsolete and allows the design team to immediately adapt to the materiality reality of the project. The unusual approach of building using a mortar-like system to throw loam projectiles (fig.2.4.1. b) offers a wide range of input potentials, such as replicating the human gestures like in the sweeping robot. It could therefore open the possibility of building remotely on a large scale while still retaining human touch. However, the different factors that disrupt the calculated protectory of the loam lumps are the wind and the drying time of the loam due to environmental surroundings.

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Figure 2.4.1. b:
Remote material deposition
(B.J.O.R.N., 2017)

While ethics concerning the use of robots are still in the process of being written (UNESCO, 2017), they could serve as perfect assistants to do repetitive tasks on an art project. An installation by Jason Bruges Studio (JBS) for the Tokyo 2020 Olympics shows that. JBS is used to do site specific and dynamic immersive artworks with technology and architecture. Using this mixed media palette, “The Constant” gardeners was erected in Ueno Park, Tokyo in July 2021. The installation has four industrial robot arms precisely raking a large-scale gravel canvas in the tradition of Zen Garden. Being able to perform traditional arts and crafts on a large scale allows art to expand to new sizes using effective production mechanisms (Kok, 2021). But how far will we be allowed to use and abuse the robots?

2.4.2 Involuntary body and mind

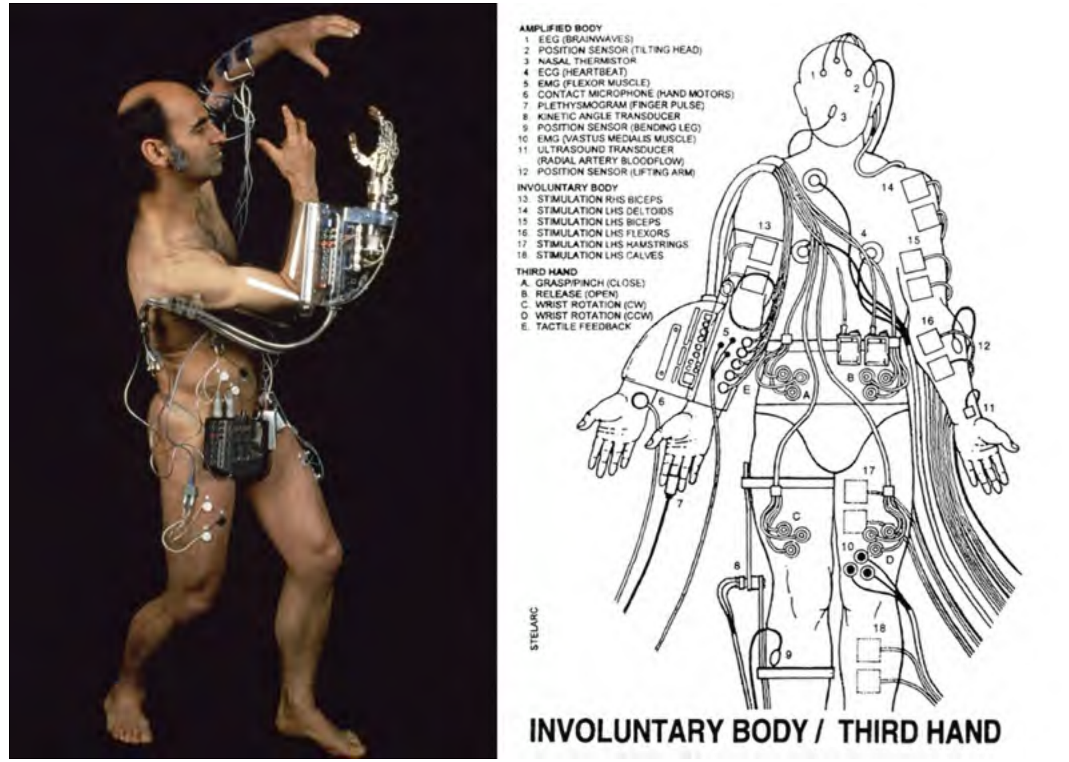


Figure 2.4.2. a:
Involuntary hand project
(Stelarc, 1980)

Stelarc, an Australian artist, redefines the body through the lens of bioengineering. Stelarc plays with alternate and involuntary interfaces with the body. A lot of his works involve mixing machine and flesh; two case studies are of interest in this paper: the Third Hand and Propel: Body and Ear on Robot Arm.

The Third Hand (1980) is a mechanical stainless-steel arm that is attached on top of the artist's right arm as an extra head (fig.2.4.2. a). The hand moves according to electrical signals from the muscles, that are processed from by an EMG and sent to the electrical mother board of the third hand. It can pinch-release, grasp-release, 290 degrees wrist rotate, and has a tactile feedback system for a sense of touch. Since it was too irritable for the skin and too heavy to wear constantly (2kg), the arm became a performance object, not completely controlled by Stelarc's mind but rather by his whole body movement. It became the subject of cyborg discourse surrounding the body and helped to redefine prosthetics as being an additive rather than a sign of lack.

Propel: Body and Ear on Robot Arm' was a performance where Stelarc's whole body was attached to an industrial arm (ABB IRB 6640) with 6 degrees of freedom and a 3m task envelope. The robot would follow a choreography using the body's trajectory, velocity and position/orientation in space. During the performance, the robot motors would emit sounds reflecting the trajectory, velocity and position/orientation in space. A programmer stood by, thumbs on a kill switch, in case the 30min performance went wrong. After the artist completed the choreography, a giant ear sculpture (carved by the same robot and the same weight as the artist) was attached in place of the artist and redid the same choreography.

These two performances show a call and response loop, the first one being body to machine, and second one machine to body, one always "disrupting" the other. The dialogue developed during these performances created hypothetical grounds to work from, where the cyborg becomes normalised and goes hand in hand with technology development, normalising the concept of enhancing one's capabilities through robotically enhanced prosthetics.

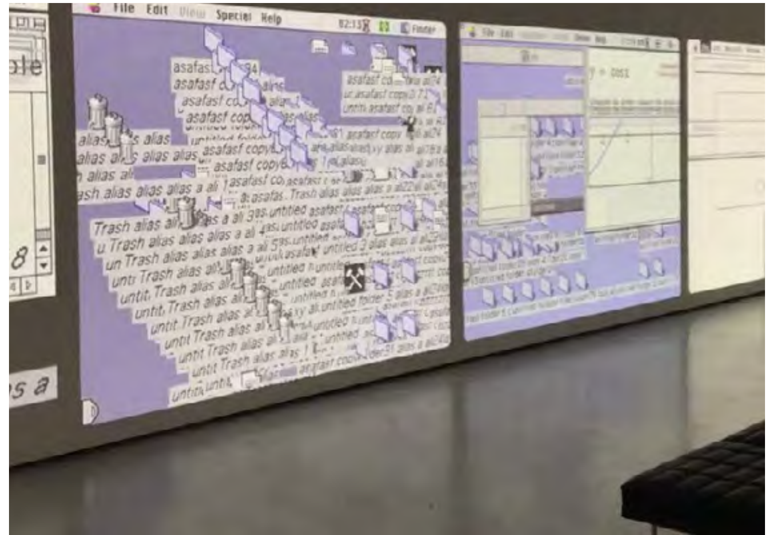


Figure 2.4.2. b:
My desktop exhibition at MoMA
(Ables, 2020)

LA-based artist Gretchen Andrew spearheaded an art project in which she transformed online disinformation into art (fig.2.4.2. b). She elevated these images of her paintings to the top of Google search engine. She sees herself as a digital prankster, an internet graffiti artist. While we can get all the information from Google, her work shows it is "as malleable as wet clay" (Ables, 2020). For instance, when searching who won the Turner prize last year or malignant epithelial ovarian cancer, Andrew's work pops up even though she has never won the Turner prize or contributed to cancer research. In a way, she is an internet activist who hacks codes for art. Her work is relevant to this study because she uses information, disinformation and the internet as a creative tool. Being able to twist the matrix or play with glitches is a form of embracing and acceptance of technologies. Seeing the faults in machines humanizes them in a way that makes it more comfortable for humans to collaborate with them (Andrew, 2019).

2.5 Collaborative material systems

Figure 2.5. a:
Clay extruding robot
(Lee, 2022)

Sculpture is one of the oldest forms of three-dimensional visual art and clay is among the most widespread and frequently used sculptural media. Clay is malleable, highly dependent on environmental surroundings, and serves as both a material for architecture and expressive sculpting (Berge, 2017). Furthermore, clay is a material that necessitates touch, as the moisture content of clay is often understood through feel of the human hand (Lee & Morgan, 2016). To materialize the research, clay was therefore chosen as the medium.

To understand what has been done in these fields, and to narrow down the research, the current state of the art was broken down into two sections: extruding (mainly 3D printing) and scooping (the action of making a sculpture or architectural object non-conform to typological principles). Both sections mainly involve clay or another malleable material.

Guan Lee has done extended research into 3d printing with clay (fig.2.5. a). In his research farm in Grymsdyke, site-specific wet clay is investigated with robotic extrusion techniques. In his research, Lee tries to recreate craft-based studios using new technology. However, due to a mix of high viscosity and sticky clay nature, human intervention is constantly needed to adjust, fix and smoothen the clay objects (fig.2.5. a). One of the ideas behind the research is that the human arm is not capable of reaching far enough to create complex clay geometries, and so a robot could be useful.

2.5.1 Extruding

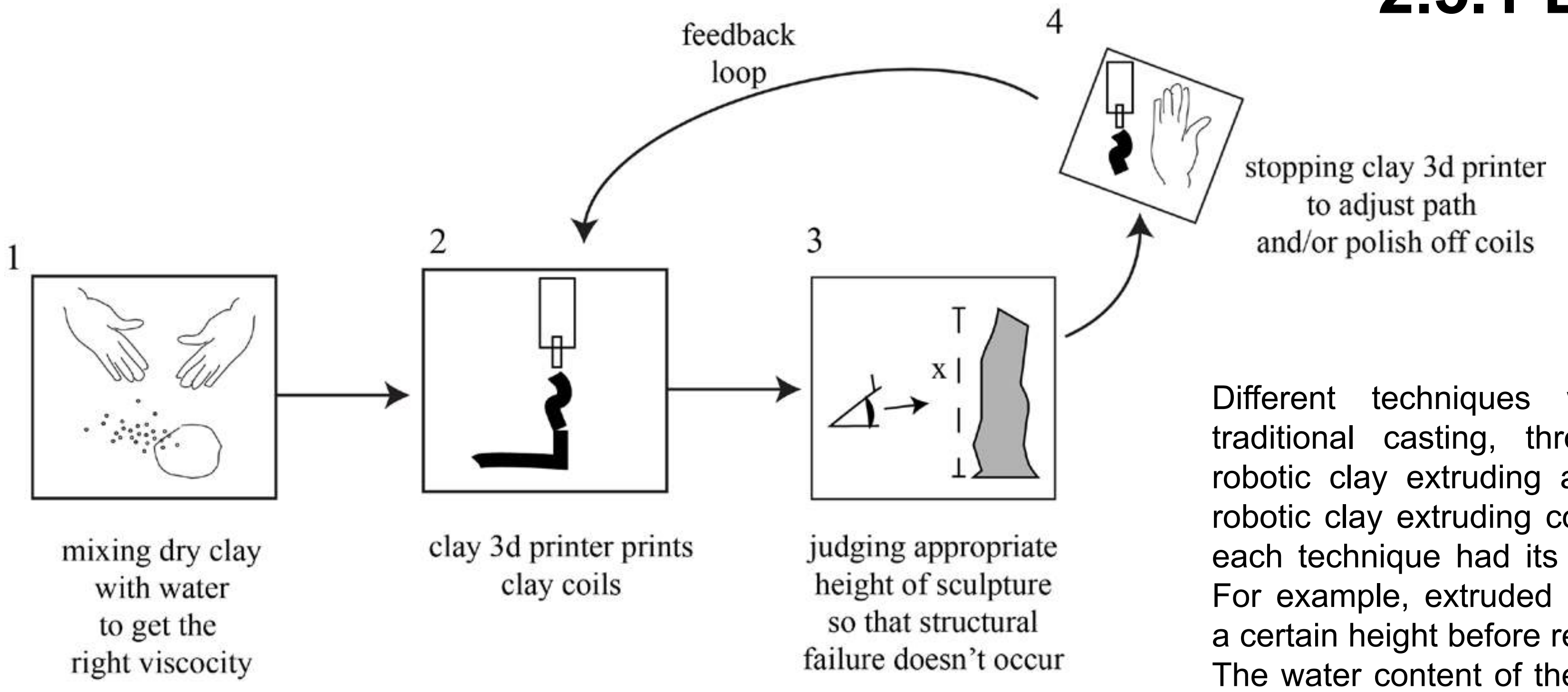


Figure 2.5.1. a:
Steps in the process of ceramics robotic extrusion that involves human (Ostroverhy, 2023 after Lee, 2022)

Different techniques were used, such as traditional casting, throwing, CNC moulding, robotic clay extruding and CNC moulding and robotic clay extruding combined. Lee found that each technique had its limitation (table.2.5.1.a). For example, extruded columns can only reach a certain height before reaching structural failure. The water content of the clay also highly affects the geometry's structural stability. For improved stability, the clay should be grounded into small solid particles that can pass through a mesh size grade of 100 to 180. After the print was finished, to fill any remaining gaps, the clay object was sprayed with white slip coating using a spray gun. In one of Lee's studies of Chinese clay domes, the coil thickness of the walls were adjusted using different clay nozzles. This variety of techniques allowed Lee to use the viscosity and sticky nature of clay to reproduce traditional methods of ceramic production while investigating the porosity and shear strength of the material. Through trial and error, the optimal process of making ceramics with an extrusion robot was found (Lee, 2022).

	Limitations
1	Scaffolding, objects must be self-supported (gravity plays an important role here). Unsupported length and cantilevered structures are problematic.
2	Reach of printer limits the scale of the object.
3	Layering, printed objects are not monolithic, potential failure like delamination might occur.

Table 2.5.1. b: Limitations of using a clay 3D printer

Another study by Guan Lee, "the Robot and the Swallow", explores how we can maintain our engagement with clay as a material with new technologies. The Robot and the Swallow suggest a new spiritual, intellectual and aesthetic way of living. This fantastical example was in part inspired by the way swallow birds make nests by mixing mud balls with bird's saliva as a binder. Trying to use the robot "wrongly", and making it suck on clay balls could be a way forward. This experiment was done in Lee's research but with a human sucking on clay ball. Unfortunately, human saliva failed as a bonding agent because the human palette could not ignore the revolting tase of the clay (Lee & Morgan, 2016).

2.5.2 Scooping

Figure 2.5.2. a: Interactive Robot Plastering (Mitterberger et al., 2022)

Interactive robot plastering (IRoP) is a way to design in-situ with plaster using a customizable computational system that converts human intentions into robotic motions while respecting material constraints (fig.2.5.2. a). An interactive and computational model using a VR headset was given to skilled workers, and the data from the motion-tracking handle was translated into robotic trajectories for a robotic hand to use to spray plaster onto a wall (fig.2.5.2. b). The projection-based augmented reality allowed for the process to be highly intuitive and build in-situ 3D geometries. Unlike 3D printing, this building process is a very creative one and is almost sculptural. In IROP, the handle registers every micro-gesture the human does to create unique and irreplicable plaster surfaces (Mitterberger et al., 2022).

Stylized robotic clay sculpting (SRCS) is introduced in a paper by ETH Zurich. They have created a human like robotic hand that can sculpt rather than print. Human sculpting holds a special place for artists, particularly because it allows for fast modifications and layer complexity can be easily changed. SRCS presents a user-guided design and motion planning framework for robotic clay sculpting that incorporates these aspects of manual sculpting so that the user can change the stylistic outcome of the sculpture more easily. A robotic hand with 6 degrees of freedom with a customized loop tool attached to the end of the arm follows a wide range of programmed sculpting strokes. Two factors guide the robot's programmed algorithms: user-guided initialization (sets of parameters for the user to control interactively) and path planning (calculates the toolpath of the robotic hand to follow). The versatility of the approach allows for a complex sculptural outcome (Ma et al., 2021).

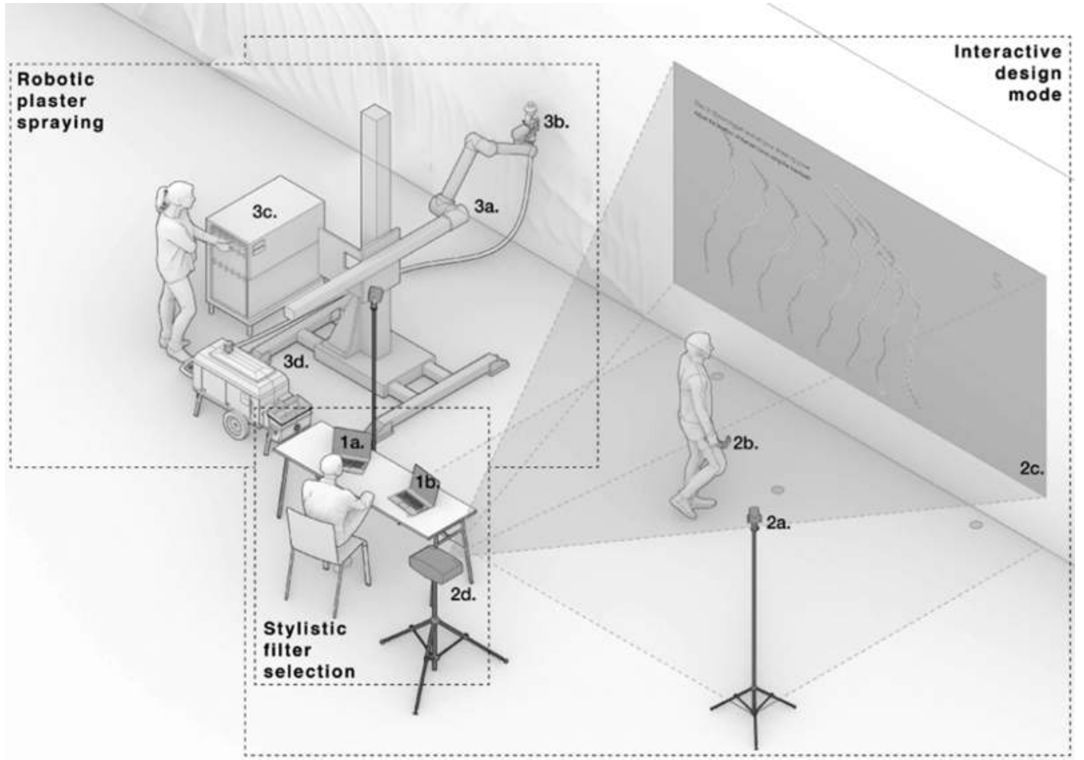


Figure 2.5.2. b:
Interactive Robot Plastering process
(Mitterberger et al., 2022)

2.5.3 AI as the creative director

One might question what makes a creative person more than simply a complex data storage algorithm that mechanically applies its knowledge. Recent AI image generators softwares like Midjourney and DALL E were able to challenge this idea. Midjourney was created in July 2022 and has already reached 3 million visitors per month (Heidorn, 2022). While many thought this was the end of artists, others saw a creative opportunity to collaborate with machine learning and try new mediums (Reben, 2022).

Midjourney functions via input. First, a user inputs a few words, such as "Ntustudio hanswegner, chair design made of mud," (fig. 2.5.3. a) into a discord chat with the Midjourney Bot, and the AI generates images which the user can iterate on if they want to (table *2.5.3. b:*).

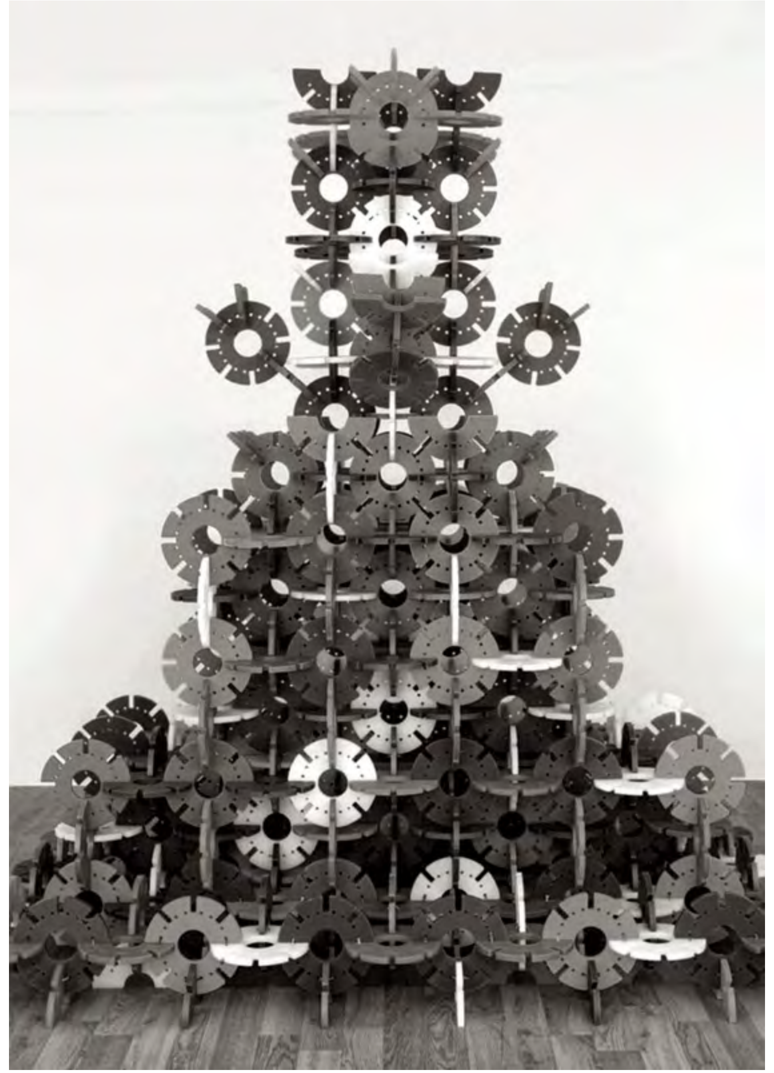
Figure 2.5.3. a:
Ntustudio hanswegner,
chair design made of mud
made by Midjourney
(Ostroverhy, 2023)

Steps	Description
1	Input key words, sentences, descriptions
2	AI generates images from contextural description using large amounts of image data
3	Human can choose what image out of four image (U(pscale)1,2,3,4 or/and V(ariations)1,2,3,4) to iterate on
4	Human and AI start having an iterative conversation for human to curate the next images

Table 2.5.3. b:
How to use Midjourney.

Here, the human touch is essential as AI is still slightly ‘soulless’ (Bhatia, 2022) and does not have an eye on what “looks good” or what “looks bad”. Therefore, the human becomes a high-efficiency curator that decides where to stop the iteration process. Phillip Bernstein in his book ‘Machine Learning: Architecture in the Age of Artificial Intelligence’ (Bernstein, 2022) argues that these types of software are entertaining, but do not lead to anything concrete. Instead, they just disperse the common effort into using AI for something more useful such as gathering BIM information from different architecture firms into one shared data source to then create more sustainable buildings. While this comment applies more specifically to architecture, it points out the lack of materiality and human dimension in this type of AI image generators.

2.5.4 An AI generated artist



The artist Alexander Reben demonstrated the previous issue (lack of materiality and human dimension in AI image generating software) with his project “AI am I” by using an AI text generator (GPT-3) to create what the AI was outputting (fig.2.5.4. a).

Figure 2.5.4. a:
Sculpture designed by AI
(Reben, 2022)

Steps	Description
1	“start text”
2	Output is curated by the artist.
3	Chosen output is put into the loop again to generate more text.
4	Fake artist names are generated using http://fakename.xyz
5	Birth location, birthdate and artwork year are made from a custom algorithm.
6	Punctuation and spacing are made on the text.
7	The artwork is produced in real life

Table 2.5.4. b: Design process of AI am I.

The only thing that was real was the sculpture, the rest, including the imaginary artist was AI generated. Usually, this process is done the other way around (Reben, 2022). However, with the advancements of AI Reben was able to change the concept of making, and expand his creativity through collaboration with an AI bot. An interesting idea would be to further the loop and input the physical sculpture into a 3D bot that could change it physically too, furthering even more the concept of human-robot collaboration to expand the human creativity.

2.5.5 Feeding back reality to AI

To take on the last part of the previous paragraph (the potential feedback loop between AI designs and physical objects), Nicolas Lamas a Brussel based contemporary artist born in 1980, has touched upon the subject of the human/AI feedback loop with his project Digital Anomalies (Lamas, 2023). Lamas manipulates and reconfigures his past works using an AI image generator (Lamas, 2023). By. Doing this, he changes the shape and perception of our visual universe we had of him. The project relies on past works that are photographed (mostly sculpture and installations) and creates an iterative visual narrative that becomes a hybrid collaboration between human and AI (fig.2.5.5. a).

Figure 2.5.5. a: (left page) A sculpture by Nicolas Lamas that was altered by AI (Lamas, 2023)

2.5.6 Prototype as Artefact by Gramazio Kohler

Another collaborative human-AI example is a case study about how a robot and two humans can together assemble an architectural structure out of timber joints that slot into each other.

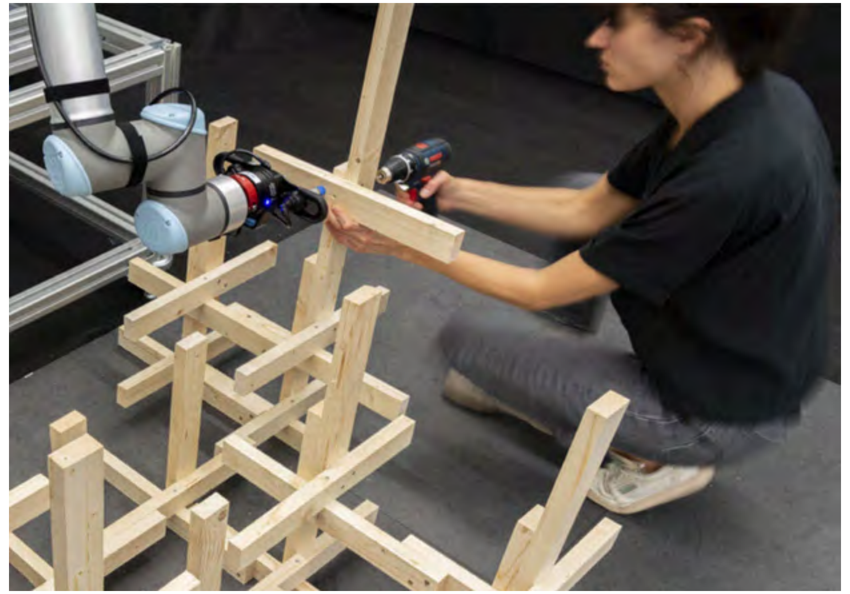


Figure 2.5.6. a: Human and robot assembling structure (Atanasova et al., 2020)

Figure 2.5.6. b: Design process of collaboration between human and machine (Atanasova et al., 2020)

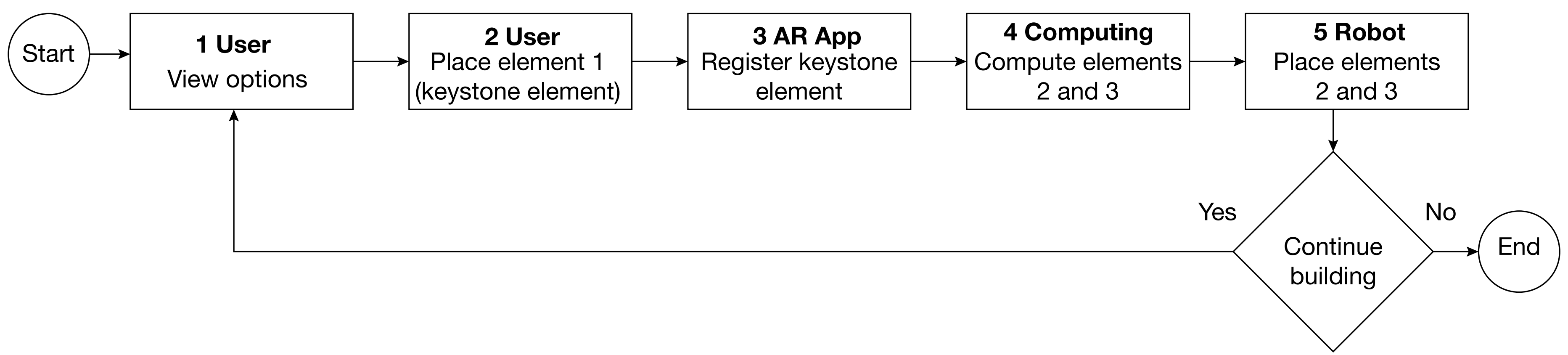
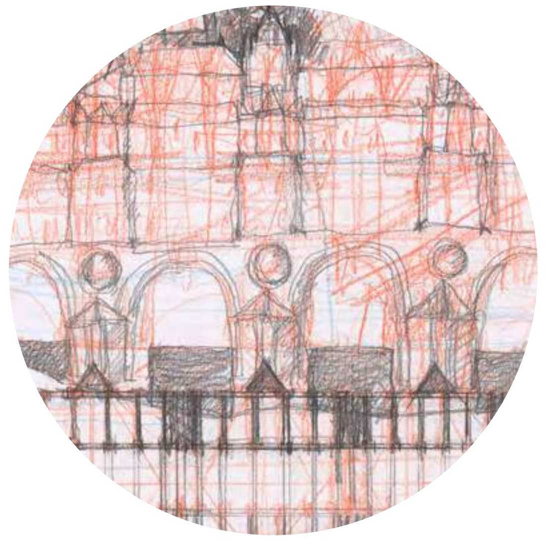


Figure 2.5.6. c:
AI generated bowl
(Ostroverhy, 2023)

As seen in fig. 2.5.6. a: first the human decides where to place the timber joint (thus designing while assembling), then the geometry is scanned and sent to the computer and the robot puts the second and third piece (Atanasova et al., 2020). It creates a feedback loop that is extremely relevant to develop the discussion around the dialogue between human and AI in this study. The final geometry is completed when the human decides it reached completion.



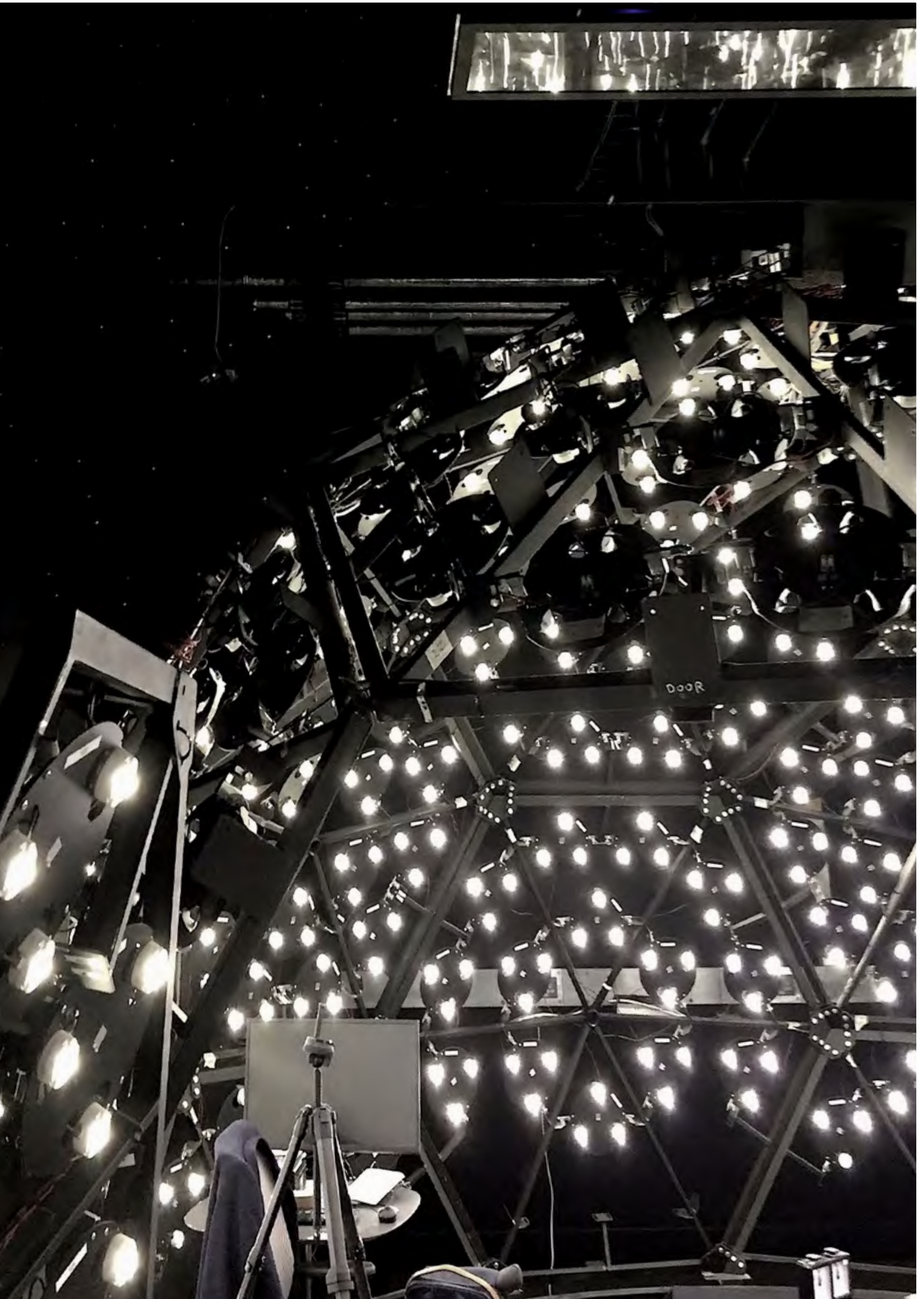


Figure 3 a:
Setup of experiment in Skylab,
UCL Here East, Stratford
(Ostroverhy, 2023)

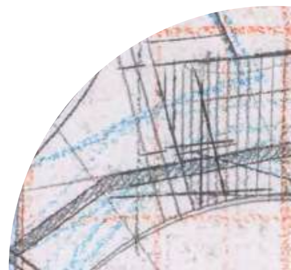
III. EXPERIMENT

3.1 Aims and Objectives

The tests consist of developing a trial for a material-oriented dialogue between human and AI. The aim of this experiment is to see if a collaboration between human and AI is possible in designing ceramics geometries and how far can AI replicate the human touch. The judges for this were a batch of 55 participants. The experiment's aim is to replicate the Turing Test, where a new factor is added, that is the human + AI factor. Whether or not the AI or human + AI has passed the Turing Test, determines the theoretical and social acceptance of the design collaboration, as well as its design validity.

3.2 Questions

The main questions addressed are the following. First, can an AI image generator understand the viscosity, state changing materiality and craft of handling clay as a building material for ceramics homeware? As the answer to this is most likely no, it is still of relevance to try and understand how it copes with these concepts and what happens when a human or robot (here the author acts as a robot following AI's "instructions") physically makes a digital AI design. This is the collaborative part of the experiment. The second question that is a little bit more abstract, is whether an AI can have a creative self-expression that can then be assessed by judges (the participants) through clay geometries.



3.3 Methodology

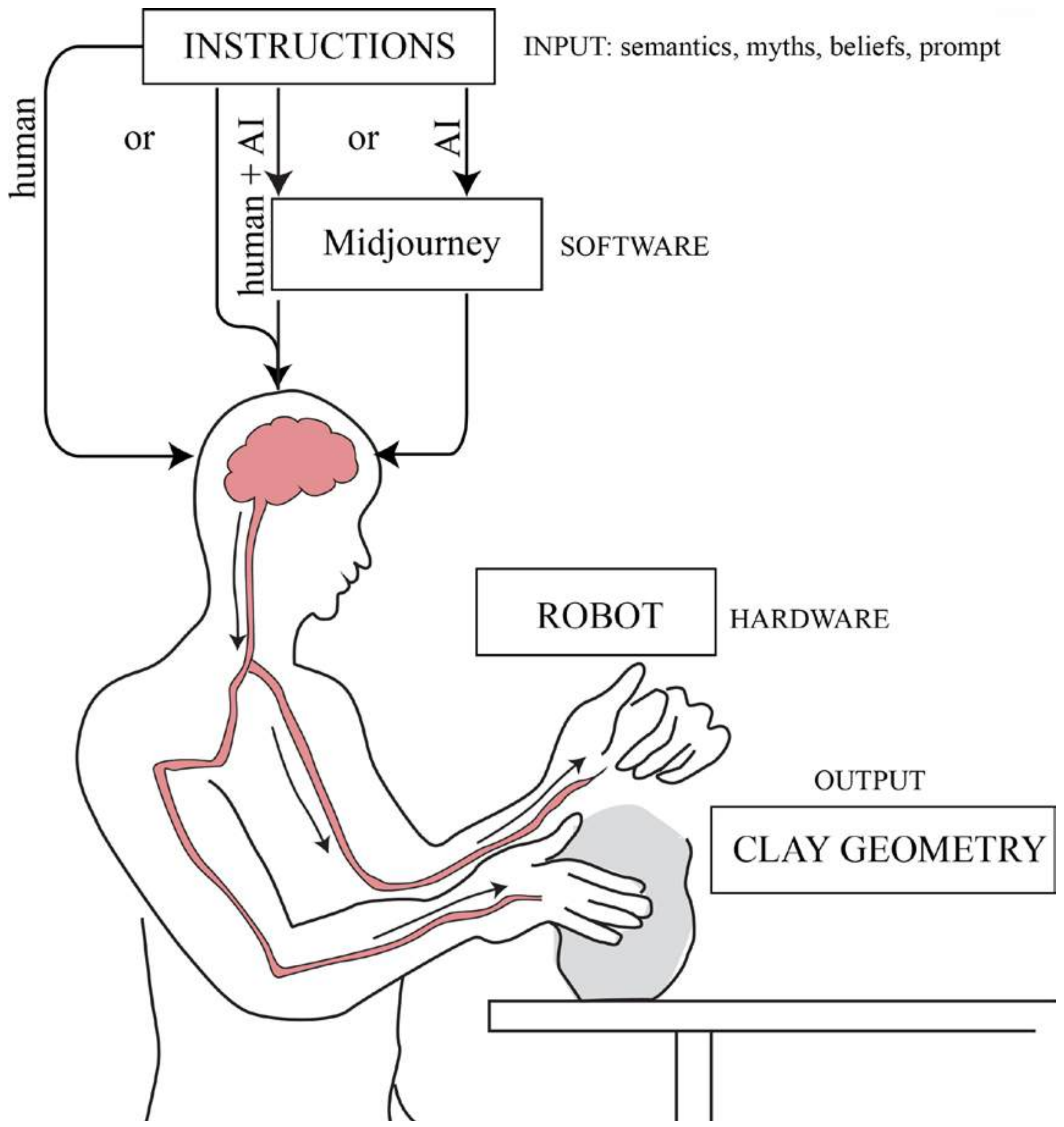
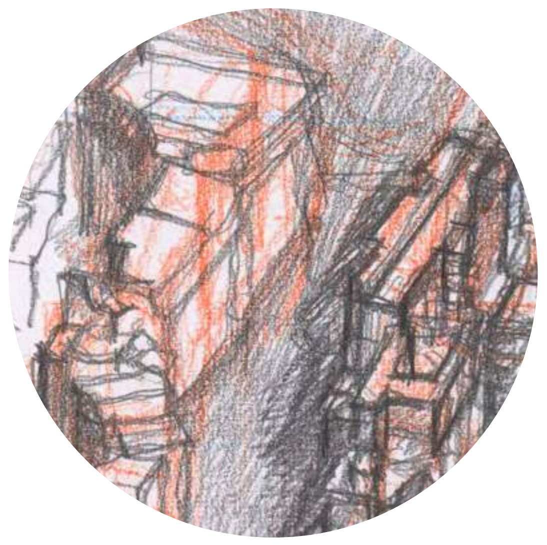
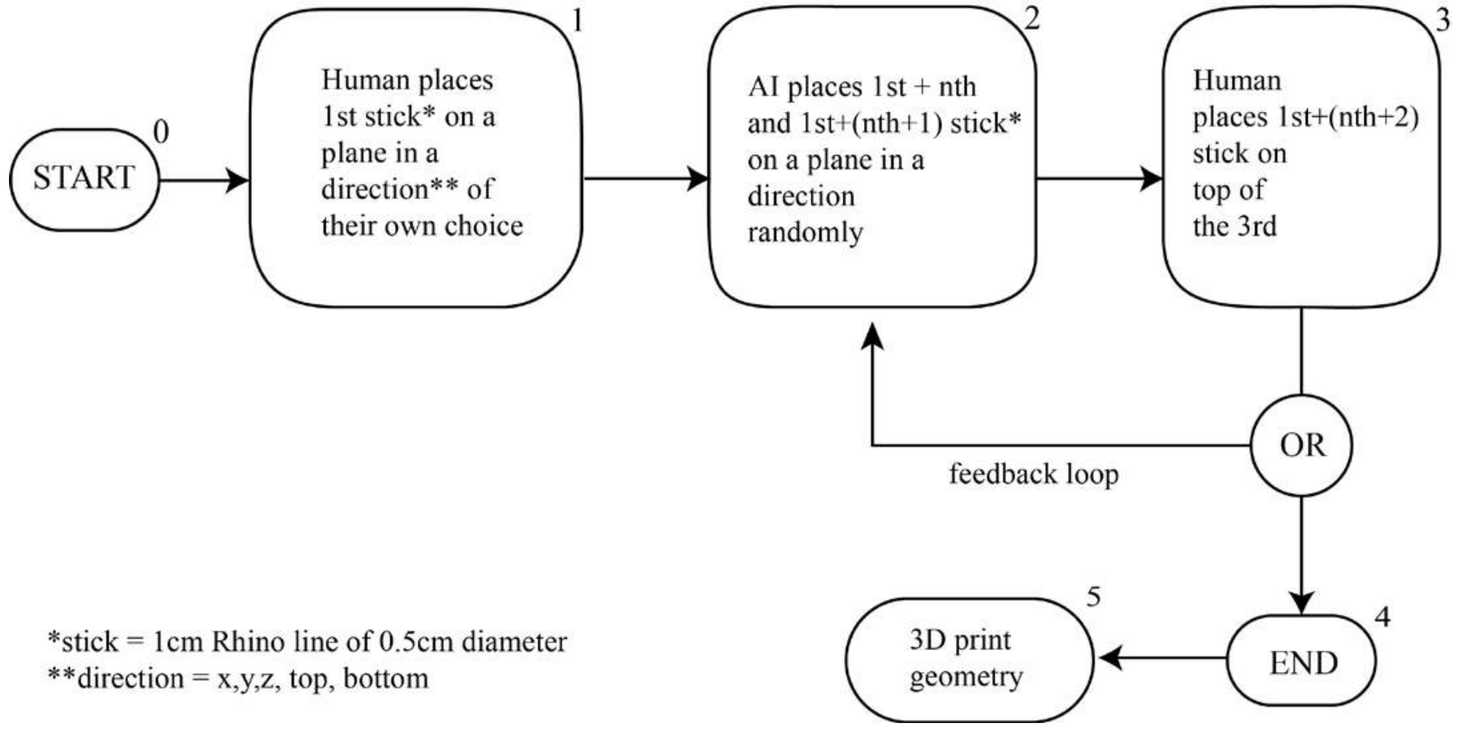


Figure 3.3. a:
Process of designing clay geometries for Turing test (Ostroverhy, 2023)



3.3.1 Pilot experiment



*stick = 1cm Rhino line of 0.5cm diameter
**direction = x,y,z, top, bottom

Figure 3.3.1. a:
Process of pilot experiment (Ostroverhy, 2023)

To test the concept of a human and AI collaboration, a pilot experiment was done. The pilot experiment follows a similar structure to that of the ETH Zurich study called Prototype as Artefact where a human and a robot collaboratively build a wooden structure (Atanasova et al., 2021). For the pilot test, instead of using clay and a robot PLA and a 3D printer Ultimaker 2+ was used. In grasshopper, a C# component was programmed to build the geometry in collaboration with a human. The result was then 3D printed to materialize it. See Appendix A for the C# code.

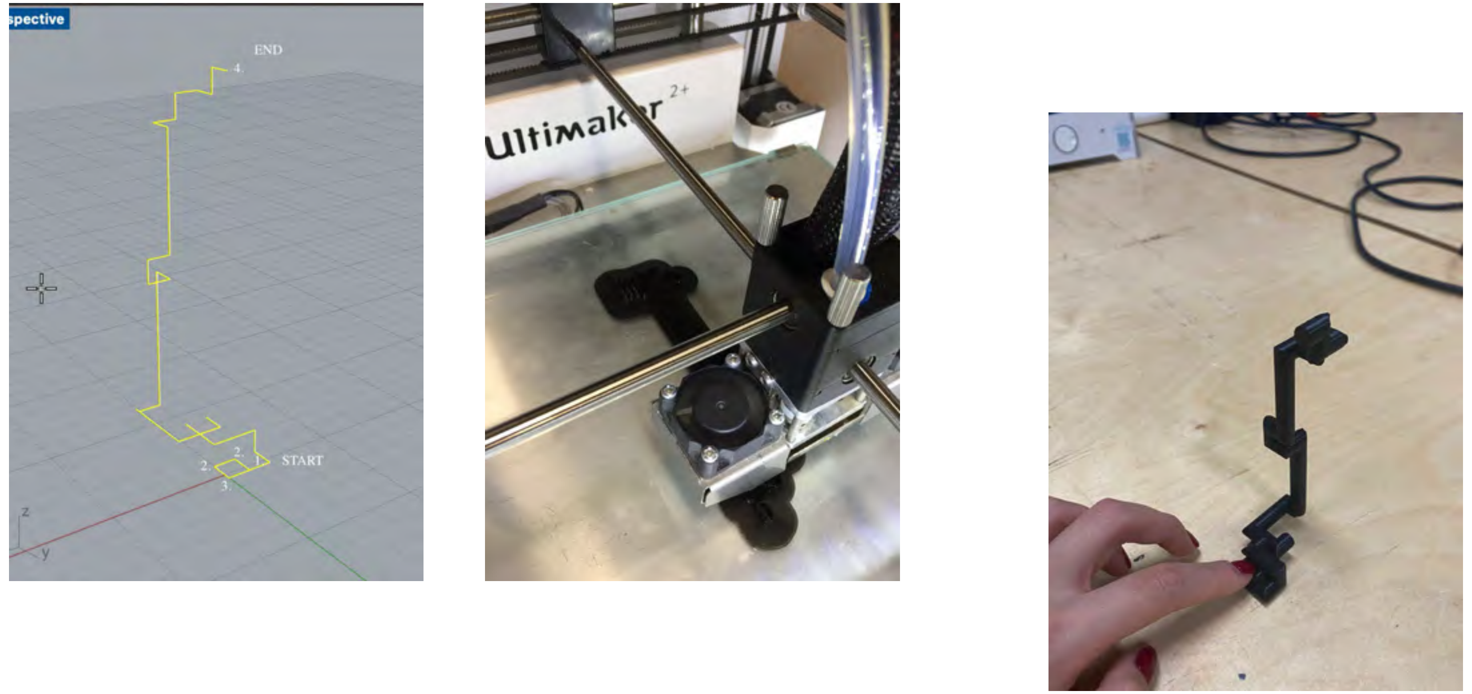


Figure 3.3.1. b:
Left is Rhino process,
middle is 3D printing,
on the right is the final result
(Ostroverhy, 2023)

The rules were the following: with 1cm of length “sticks” in rhino, build a geometry that has a higher probability to go upwards, with the user making one choice and the AI randomly picking the two next “stick position”. The possible moves are only N, W, S, E, Up and Down (fig.3.3.1. a).

The outcome of the experiment was a small sculpture (fig.3.3.1. b). It did not use clay, and this pilot experiment was designed at the beginning of the study to potentially work with a C# code (instead of an AI image generator) and use as a robot a clay 3D printer (and not a human).

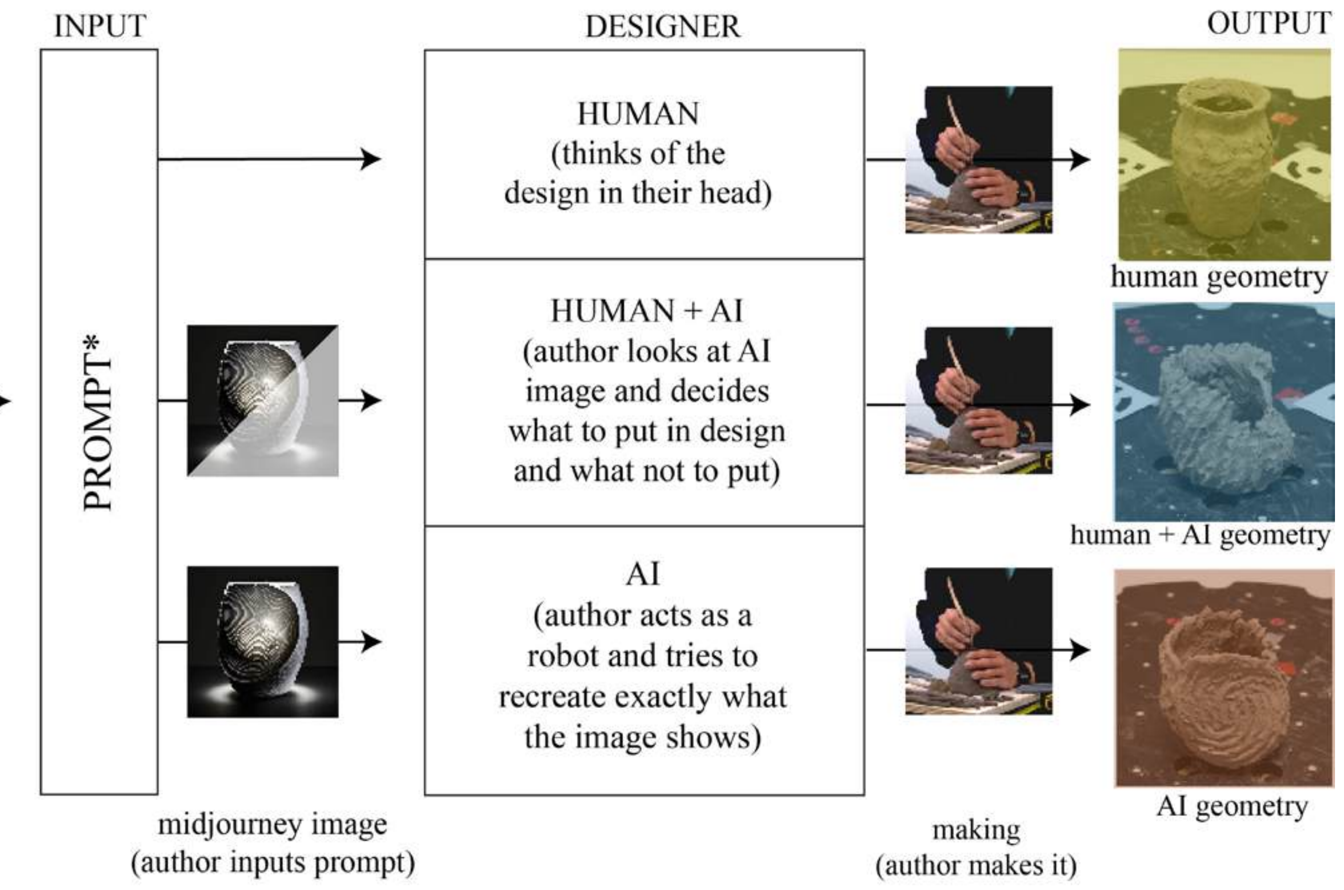
3.3.2 Ceramics Turing Test

To devise the Turing Test, first the boundary conditions were set (fig.3.3.2. b). Go to Appendix B to see how the clay geometries for the Turing test were made in more details. The experiment had to have limited factors and be as contained as possible to be replicable and get rid of as many unexpected factors as possible.

Figure 3.3.2. a:
Author making clay geometries
in controlled conditions
(Ostroverhy, 2023)

Material	500g of CC Buff earthenware clay
Geometry Constraints	15cm max height 5cm max base radius 1cm diameter coils
Time limit	30 mins
Space	Skydome
Lighting	200 lux
Temperature	21 C
RH	45%
Technique	coiling

BOUNDARY CONDITIONS



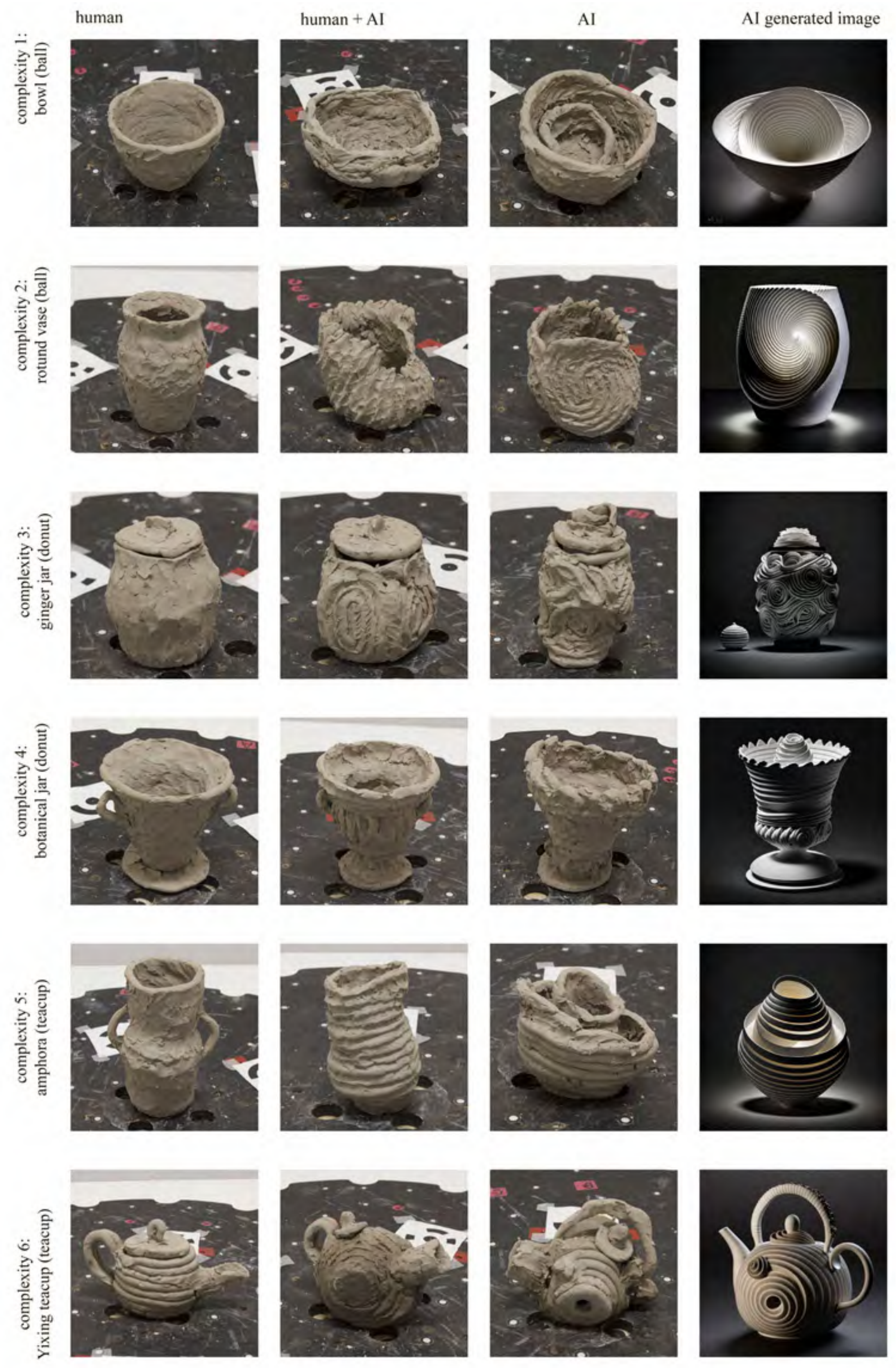
*Authors original prompt used on all the geometries: realistic photo, 4k, surrounded by natural lighting of 200 lux, black background, ceramic minimalistic white earthenware London clay of a "geometry"** of 15cm high with a base of 10cm diameter, made with average sized young hands in 30 minutes, using the coiling technique with coils with diameter of 1cm, human making it has no feelings, is neither happy nor sad

**"geometry" is the variable that change

Figure 3.3.2. b: Making of clay geometries (Ostroverhy, 2023)

The rules were the following: with 1cm of length "sticks" in Rhino, build a geometry that has a higher probability to go upwards, with the user making one choice and the AI randomly picking the two next "stick position". The possible moves are only N, W, S, E, Up and Down (fig.3.3.1. a).

Figure 3.3.2. d: Matrix of logic behind the complexity of the geometries with photos of the air-dried clay geometries (Ostroverhy, 2023)



The chosen experiment was to be the following: a series of images of pieces of pottery were presented to a participant. They increased in complexity (Haldar, 2016 and Dunietz, 2016). Each participant had to guess whether the pottery was designed by a human, AI , or a combination of human and AI. All of them were eventually formed by the author and then air dried (see fig.3.3.2. c, fig.3.3.2. d and Appendix B for more explanation).

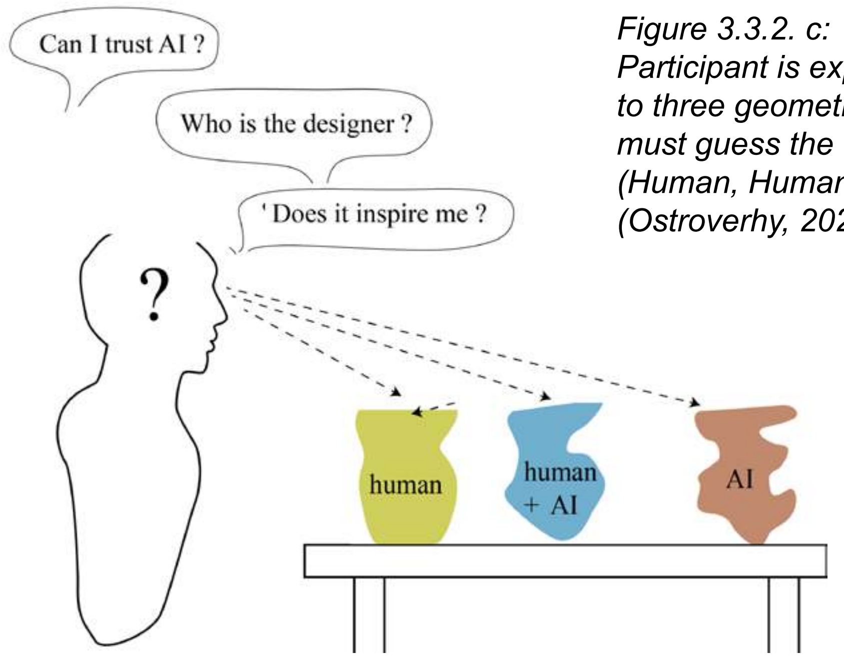


Figure 3.3.2. c: Participant is exposed to three geometries and must guess the designer (Human, Human+AI or AI) (Ostroverhy, 2023)

Scale (1 being weak explanation and 3 being strong)	Potential Conclusions
1	If the similarity of the teapots was too strong between H, H+AI and AI designs the results can be ignored. Only the semantics of the answer can be looked at having a certain social and linguistics impact
2	Rather than saying AI is conscious, which would be a strong claim due to the relatively small sample of participants and lack of qualified judges, we can say that H+AI or AI has passed the test to be a valid creative collaborator even without understanding (as proven by the Chinese box experiment earlier) the properties of the clay, design and gravity, it could still be a valid designer if given the right instructions.
3	Taking a strong AI stance, which is an extreme case here, we have started to prove that AI has a creative subconscious and should be utilised in homeware design practices or ceramics workshops.

Table 3.3.2. a:
Potential explanations if AI and / or Human + AI passes the Turing Test.

To define the threshold for the AI to pass the Turing Test the following factors are considered. The Turing test is passed if computer is mistaken for a human more than 30% of the time (BBC, 2014). It is an arbitrary threshold that was set by Loebner during the Lobner prize (annual Turing Test competition) and was mainly based on practical measurement of guesses at that time (Moloney, 2017). That is when just Human (H) and AI are involved, not Human + AI (H+AI). Because there are more parties involved, in theory the threshold should go down. However, as the accuracy of the test is skewed in favour of AI as there is a certain pattern in the topologies of the geometries (as it was made by a human acting as a replacement to a robot (fig.3.3.2. a), the threshold can stay the same. The potential conclusions if human+AI and/or AI passes the Turing Test can be seen in table.3.3.2. a. As a start goal for the questionnaire, conclusion 1 and 2 were chosen, leaving out conclusion 3 (table.3.3.2. a).

3.3.3 Questionnaire

See Appendix C for questionnaire

Figure 3.3.3. a:
AI generated botanical jar
(Ostroverhy, 2023)

Figure 4.1. a:
AI generated bowl
(Ostroverhy, 2023)

IV. RESULTS AND DISCUSSION

Having collected the data from the questionnaire, in which 55 participants took part, the analysis was split into three parts: aesthetics, Turing Test and social. As the test here is taken with a different angle, and a new factor is added to it (human + AI), the variations provided results that did not exist in a standard test.

4.1 Aesthetics

This section looks at the aesthetical results of the clay geometries, and the impact it had on the results. After making the geometries, it became clear that as the “robot” making them was the author, a geometry that was designed by AI is not 100% AI designed, but more 70% because of the author making it. This added some predictability: the human building the geometries puts human touch even in AI designed objects which skews the data and makes Human+AI (H+AI) and AI differences between geometires lesser than Human (H) and AI.

Figure 4.1. b and c:
AI trying to understand
the coiling technique
(button made by author
and top by Midjourney)
(Ostroverhy, 2023)

By recreating the geometry AI designed, it was noticed that AI was not understanding the concept of the coiling technique. For instance, the Midjourney image (fig.4.1. a, right) seems to show a carving technique, rather than a coiling technique (as coiling techniques must go down to up and not sideways). When the author made the geometries, he did not know the carving on the side was a decorative step and it was thought it was an instruction for the coiling technique (fig 4.1. a).

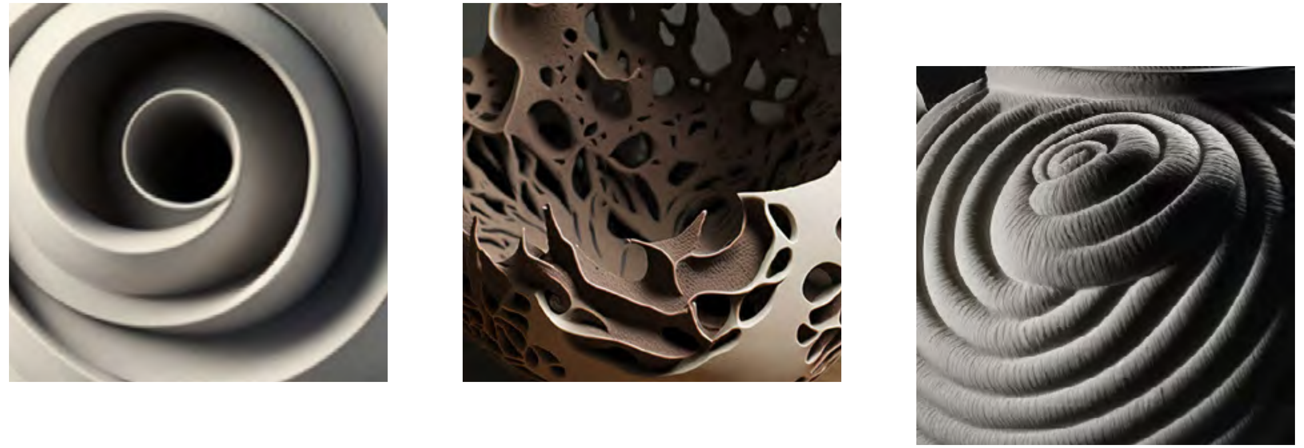
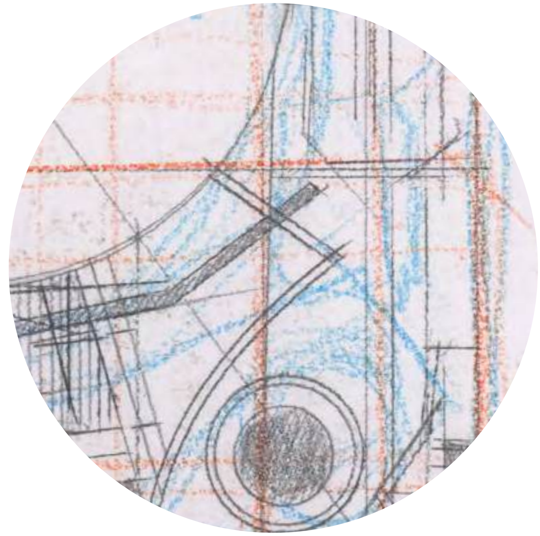


Figure 4.1. d:
Details where AI brings by itself decorative elements even though it was not asked to
(Ostroverhy, 2023)

Adding to the previous comment, it was also observed (fig.4.1. d) that AI adds decorative steps in the design process, seemingly ignoring the coiling technique method. This type of pattern might have created a trend, making AI geometries harder to make given their complexities and the amount of time given (30min).

By making harder geometries, the author inevitably started inputting more “human touch” into all the designs, making it obvious it was made by a human and blurring the lines between what was AI designed and what was human designed. This might have created outliers by making H+AI and AI geometries less obvious and skewed the data. For example, 11% of people guessed Human right and 18% AI (fig.4.1. e). Due to the misunderstanding of the human trying to replicate the overly complex geometry of the AI, this outlier spotted a potential issue in the dialogue between Human and AI. The author that seemed to lack understanding on the complex AI geometries building process, should potentially be educated on how to interact with AI designs. On the other hand, the AI lack of knowledge, or rather lack of concrete instructions in the field of crafts (following steps to build geometries like the author did in Appendix B) should be potentially addressed too. Therefore, for the results that will be analysed in the next part, this theory states that the increased geometry complexity increases the effect of the human touch which increases the bias of the results and the geometry 6 (teapot) should be seen as an outlier.



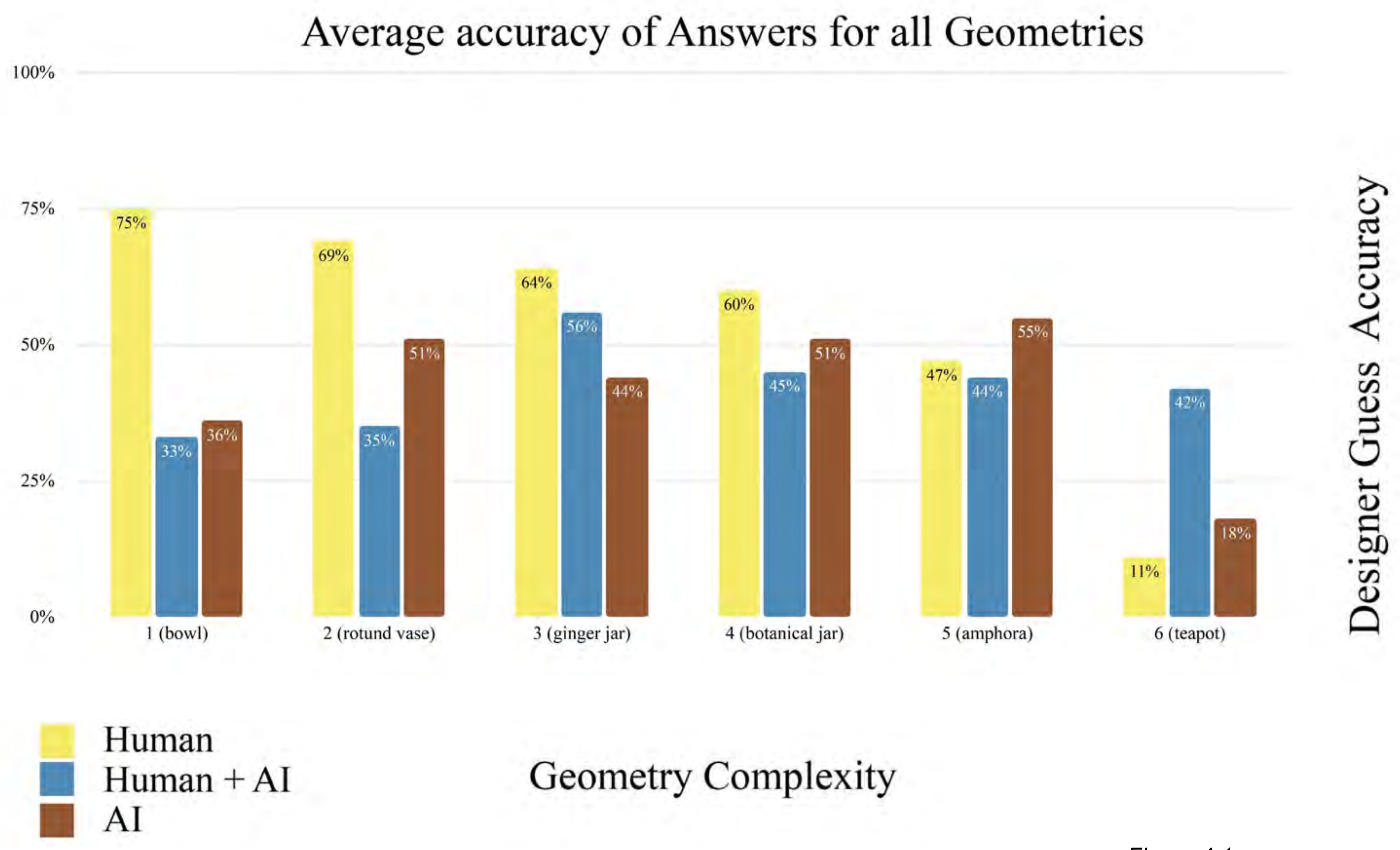


Figure 4.1. e:
As geometry gets harder,
accuracy of participants'
guesses decreases.

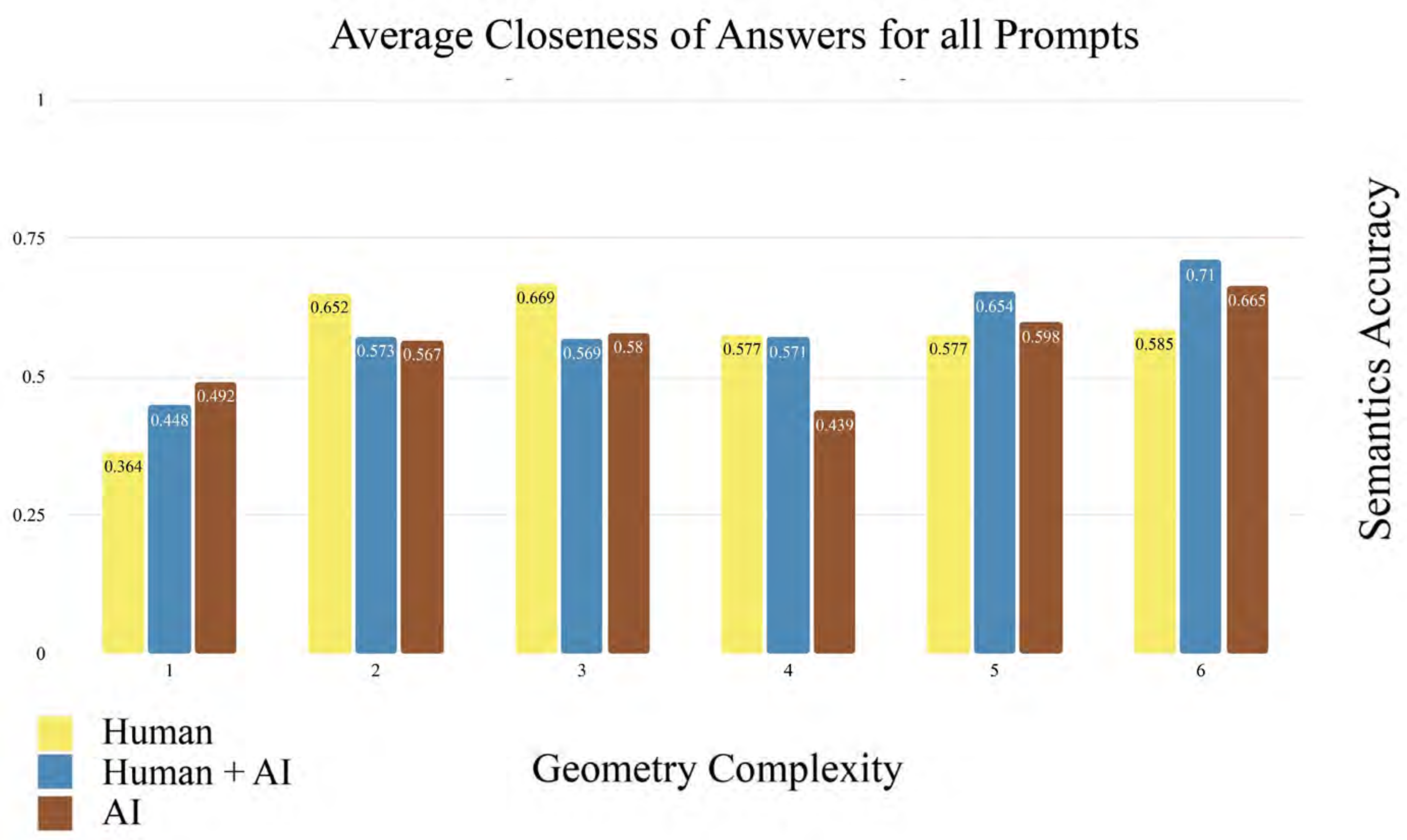
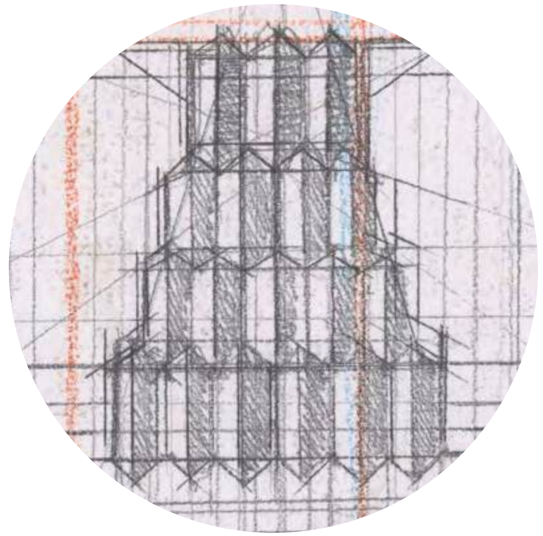


Figure 4.1. f:
Accuracy of
prompt guessing.

When asked to describe in a few words the reasoning behind the answers in determining whether the design was done by a human or AI, 25% of the participants thought that the AI-designed geometries had more complexity, which was higher than any other opinion (see Appendix D for more details). Fig.4.1. e justifies this reasoning, with the AI guesses being stable from geometry 2 to 5. It therefore seems that complexity is associated with AI. This highlights again the need for a clear language between AI and human designers. To summarize the previous paragraph, a participant has worded the issue well: “The more surreal and slightly less practical designs appear to have AI influence - but as the process is heavily influenced by the Author, it is hard to disentangle the Human from the AI”.



The second part of aesthetics will look at how accurate were the answers for the suggested prompts (fig.4.1. f). Chat GPT was used to find the semantics similarities between the author’s prompt, and the answer prompts. The code USE (Universal Sentence Encoder) was implemented, go to Appendix D for more details. The similarity scores range from 0 to 1, with 1 indicating high similarity and 0 indicating low similarity. It seemed that the inverse happened, whereby a small margin participants seemed to guess more accurate prompts (for Human+AI and AI) as the geometry complexity increased. Overall, in fig.4.1. f, Human and Human+AI designed geometries received more accurate guesses, this might be due to their less complex design. In addition, the complexity of the geometry did not affect the accuracy of the guesses unlike with the designer’s guesses (fig. 4.1. e), with no clear outliers being spotted. Perhaps, participants were more inclined to use their imagination in guessing the prompts as the geometries got more complex.

4.2 Turing Test

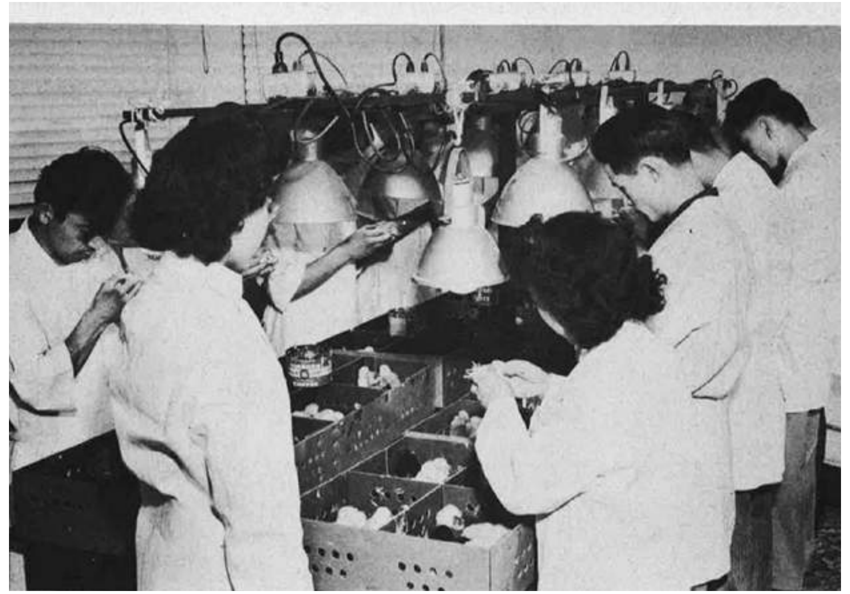


Figure 4.2. a: Chicken sexers (Makalintal, 2021)

Chicken sexers were people who could immediately and unthinkingly recognize a chick’s sex only with intuition, as it is very hard to otherwise tell the sex of the young chick when they hatch the male and female sex organs being almost identical (fig.4.2. a) (Mc Williams, 2018). They emerged in the 1930s in Japan, and they were used in the poultry industry, as it is vital to immediately determine the role of the chicken when they hatch for later industrial use. Most chick sexers “don’t know” how they determine the sex of a chicken, and a skilled chicken sexer can guess up to 1400 chicks with a 98% accuracy in an hour (Mc Williams, 2018). Today, it is rare to find chicken sexers as the industry now use “feather sexing” where they breed chicks a certain way so that female have longer feathers and it does not require a skilled worker to find the gender of the chick (Makalintal, 2021). Having this in mind, this part of the experiment looks at the ability to accurately spot Human, Human+AI or AI designs based on intuition, and participants’ own logic and beliefs of who was the designer behind the geometries.

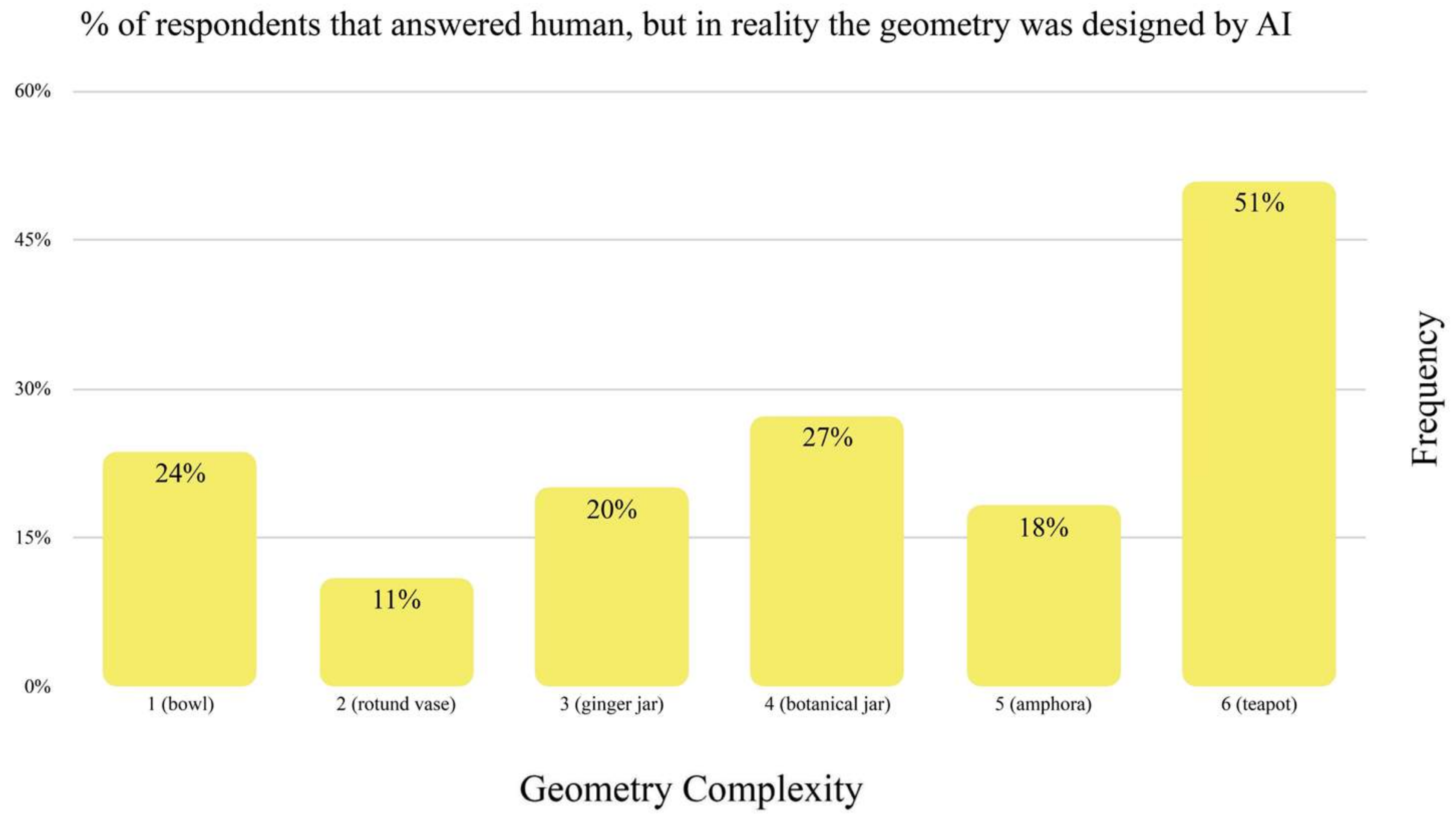


Figure 4.2. b:
When AI designed geometries participants thought were designed by a human.

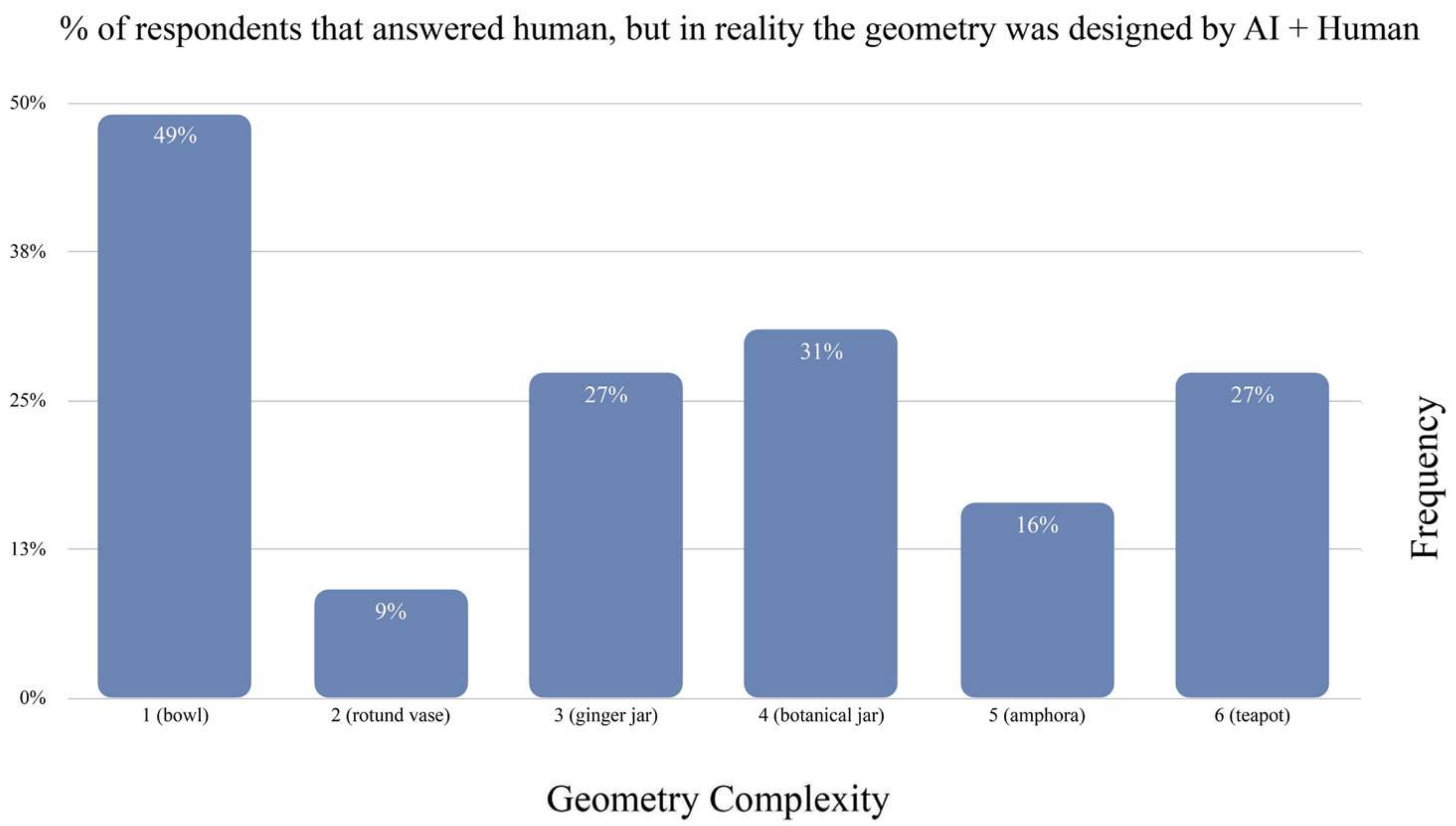


Figure 4.2. d:
AI designed geometries, which participants thought were designed by a human.

In general, looking at fig.4.2. b, the AI has not passed the Turing Test (most of the complexities fall below 30%). Except for geometry 6, that appeared to have reached above 51%. This might be due to the fact that it was hard to make the geometry for the author, and as mentioned in aesthetics, the last geometry type had more human touch on them (fig. 4.2. c) and can be seen as an outlier.

Figure 4.2. c: Human designed (left) and AI designed (right) teapts being similar and might have caused the outlier (Ostroverhy, 2023)

Not taking the outlier into account, the AI has not passed the Turing test. From previous suggestions, the conclusion could be (table 3.3.2.1) that the result is insignificant (scale 1 of strength of argument), AI could be a creative collaborator if taught (scale 2 scale 1 of strength of argument), or that AI has a creative subconscious (scale 3 scale 1 of strength of argument). As the results still varied slightly, and not all geometries were similar and bigger sample of participants might have provided better results, scale 2 of explanation strength (table 3.3.2.a) is taken into account, and it is disproved that AI can be a valid design collaborator.

Figure 4.2. e: Human designed (left) and H+AI designed (right) being similar and might have caused the outlier (Ostroverhy, 2023)

It opens discussion for a twist of the Turing Test to be done with Human+AI (fig. 4.2. d), where the inverse (to fig.4.2. a) happened at the two extremes of the geometry complexities. It seemed that Human+AI had an easier time fooling the participants with easier geometries. However, the high result in geometry 1 might be an outlier, being much higher than the others, this could perhaps be due to the nature of the questionnaire. As geometry complexity 1 was put first and people were unsure at how to guess and the two bowls looked similar (fig. 4.2. e).

We could deduct that with taking out the outliers, Human+AI performed better at fooling the participants on the whole, in one case reaching 31%. It could be argued that Human+AI collaboration is something to consider taking further.

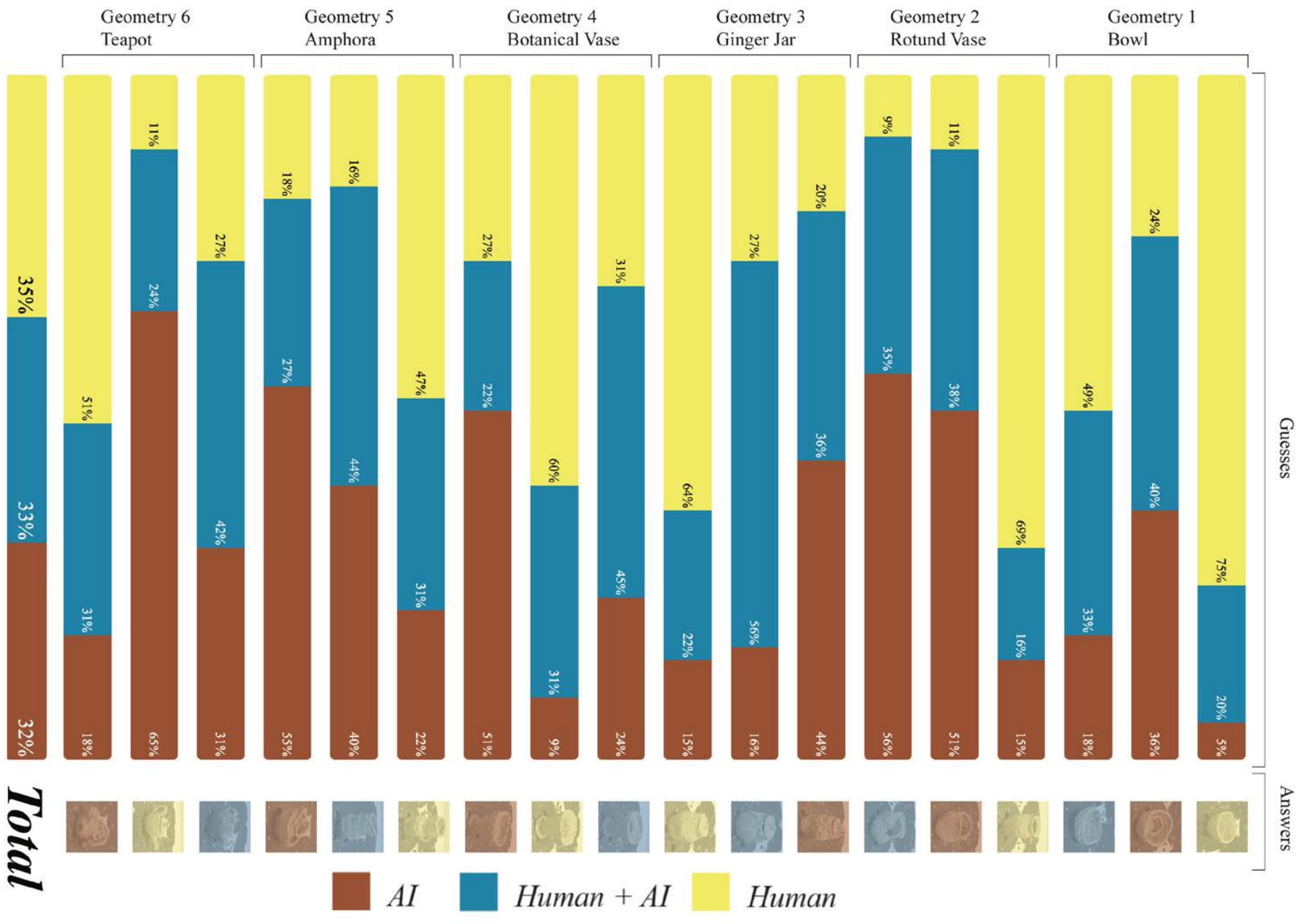


*Figure 4.2. f: (left)
Total results of the participants' guesses.*

In the introduction of the questionnaire, previous pottery, art, design and curator experience was looked at. The data then showed how it affected participants' guesses. People with less experience in pottery seemed to have guessed better at prompts (fig.4.2. g), and people with more experience were better by a small margin at guessing the designer of the geometry. This could be caused by the more descriptive and abstract nature of the prompt questions, and the lack of pottery knowledge gave more freedom at guessing, or it could be that semantics accuracy is a better metric to spot AI "chicken sexers".
Art experience and design skills did not seem to have affected the accuracy of the responses (refer to Appendix D).

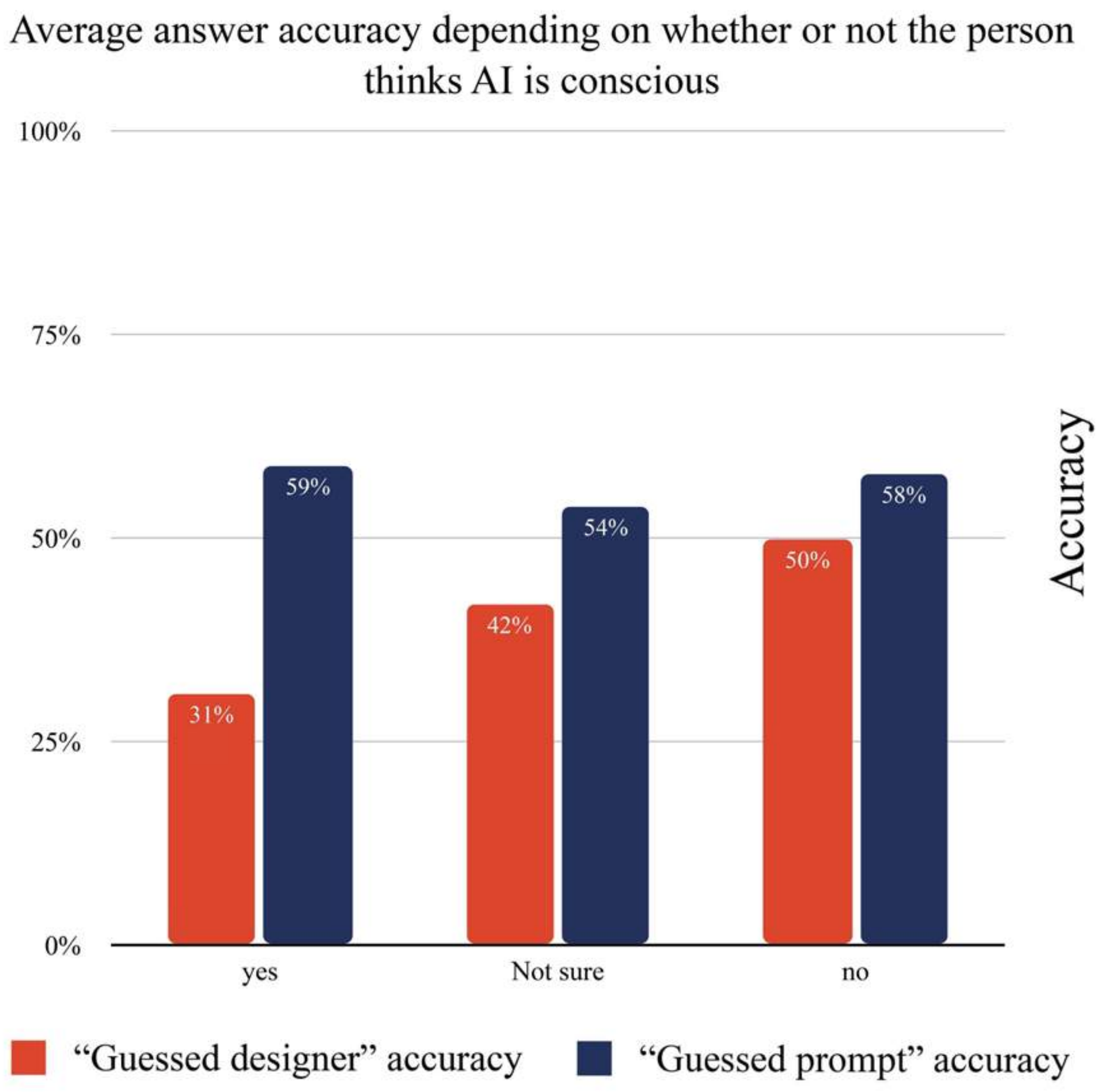


*Figure 4.2. g:
Pottery experience effect on guesses.*

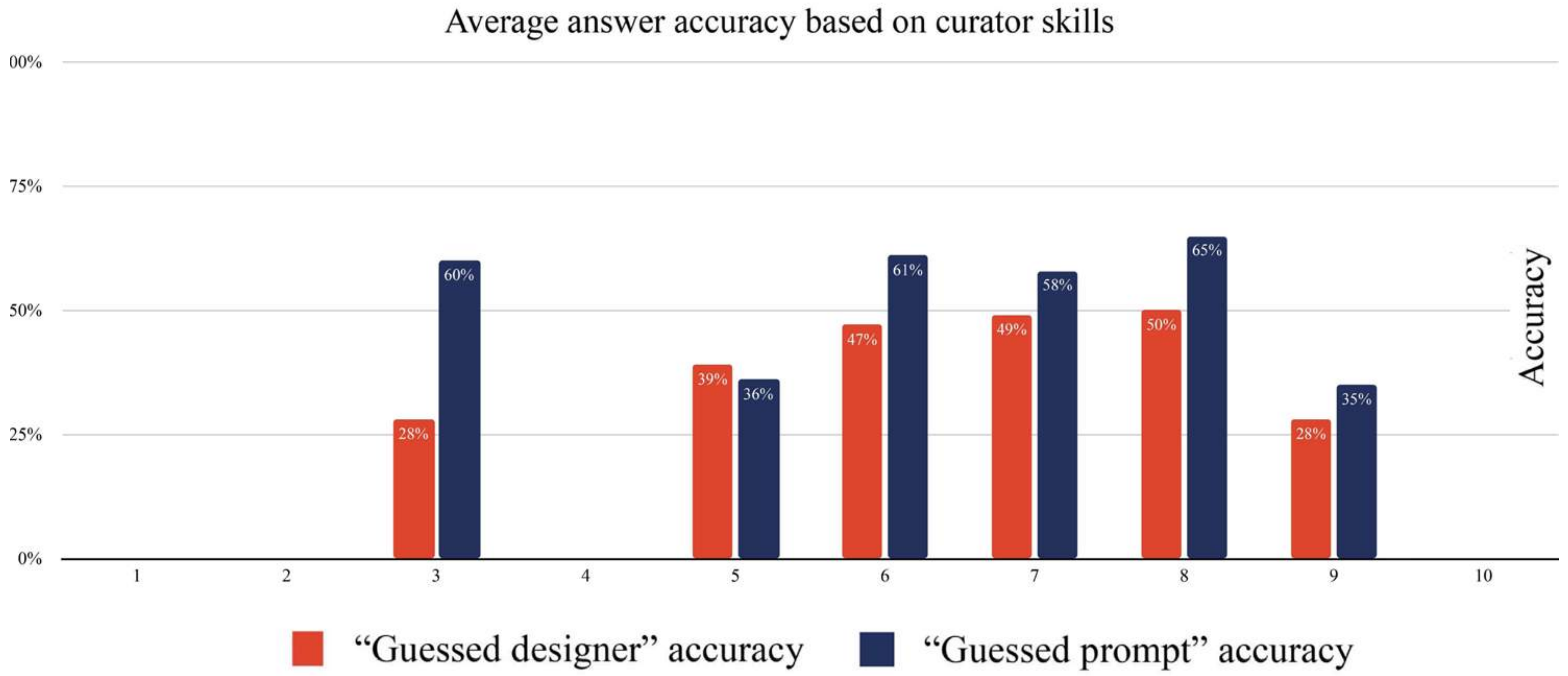
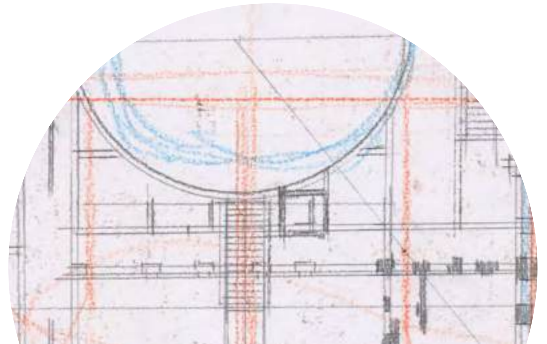


Figure 4.2. h:
Curating skills effect on guesses
(1 is low, 10 is high).

Looking at curator skills, it seemed that curators, regardless of their skill levels as even a level 3 did quite well, are high performers in AI image generator prompt guessing (fig.4.2. h). This is something that could have been predicted, as a curator generally needs a good eye at spotting different art styles. This suggests that for Human+AI collaborations, the human eye has to be trained in order to work with AI better, and getting training in design is not necessary. However, due to the small sample of curators (25% of participants, refer to Appendix D) the results would have been more significant with more participants.



The last part of the introduction questions was to see if AI image generators experience and general perception of AI affected the guesses. Whether people thought AI was a good designer(or not) did not draw any significant causations (Appendix D) and in future iterations the experiment will have to be done again with more participants to observe if there is a statistically significant result. Nevertheless, the more open-ended answers suggested a few insights. 60% of participants thought AI can be a good designer (Appendix D) and 24% of the yeses believed that AI was a good designer because it built from previous designs and learned from them to create new designs, and 30% said that it also could be considered a designer even though it still relied on a human for input or correction, and 27% believed that it could surpass the human and create things that we never could. 68% of the nos said AI lacked independent thought, practicality or reasoning needed to be considered a 'designer', 18% said it could only be a tool for designers to use, and 9% said it lacked the creativity needed. Generally, the answers had a common theme of believing AI could not compete with or replace the human in the design process. So, the difficulty with this data is that people had very different definitions of what a 'designer' is. 64% of the people believed that AI could not be a designer as it could not make designs without human intervention, whereas 55% of the people believed it could be considered a 'designer' even if it relied on other humans for input. This is an interesting observation, and perhaps the regulations around who the real designer is has to be improved in AI image generating software.

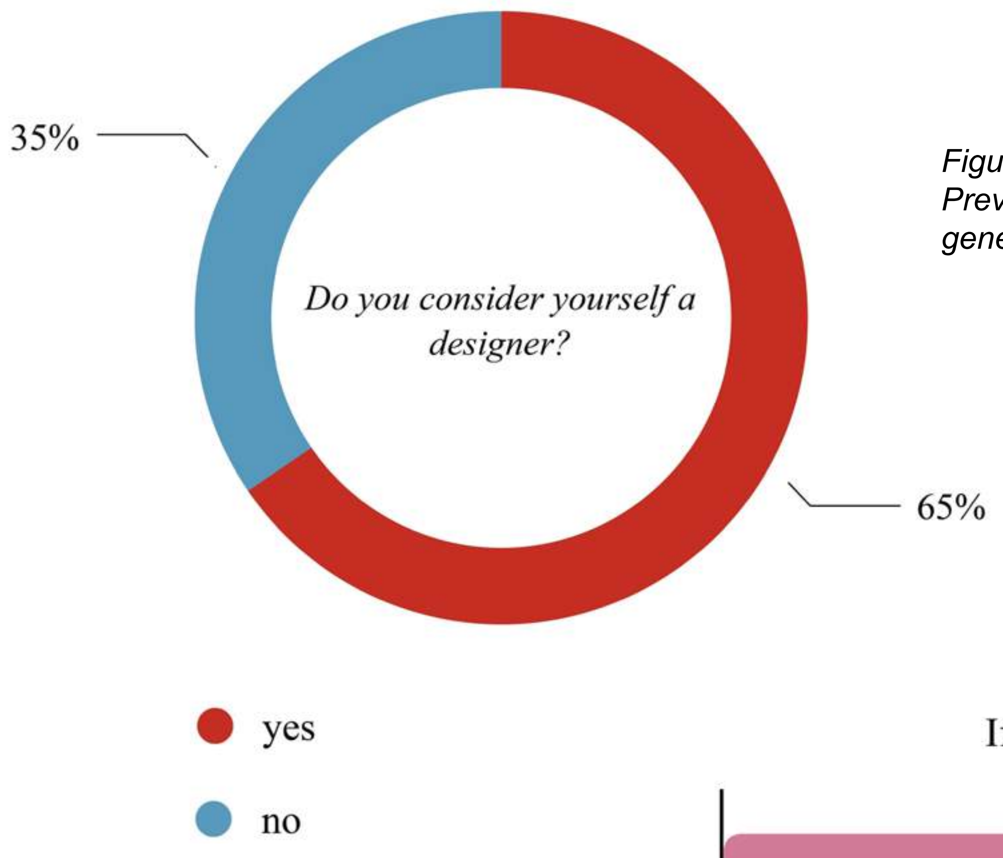


*Figure 4.2. i:
Previous AI image generator experience.*

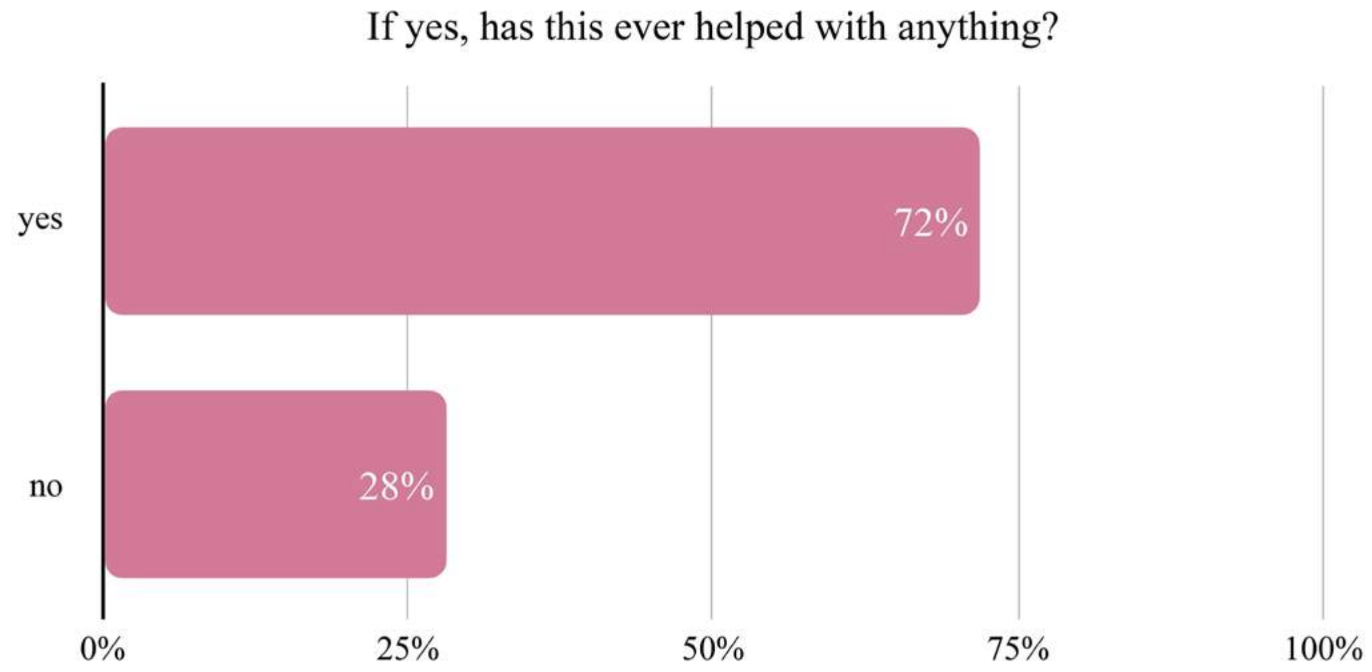


*Figure 4.2. j:
Has AI image generators helped with anything.*

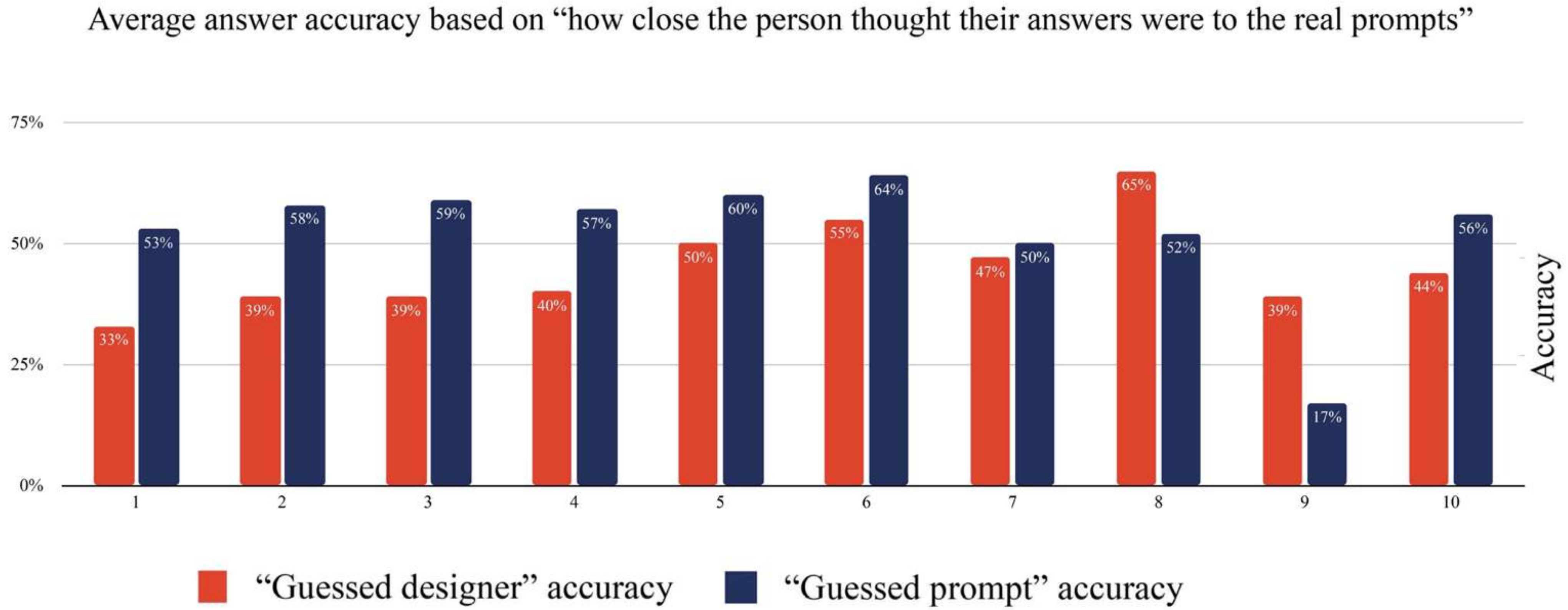
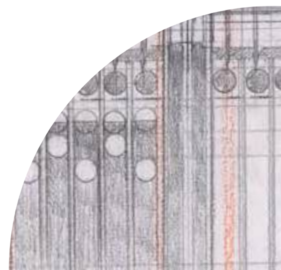
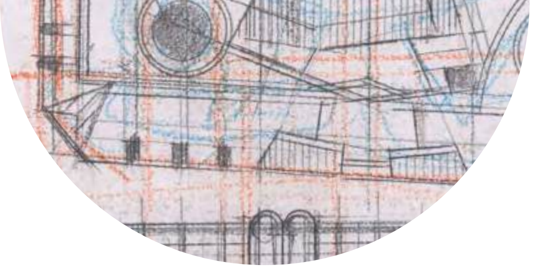


*Figure 4.2. l:
Accuracy of the answers based on predicted accuracy by participants to themselves.*

It seemed that having had previous AI image experience before did not affect the ability to spot the real designer behind the geometries (Appendix D). However, of the 72% of participants who said it helped with anything (fig.4.2. i and fig.4.2. j), said it helped with creative inspiration and visualizing initial ideas for projects. These results suggest that Human+AI collaboration is already used at a more informal design level, and could perhaps evolve in a constructive manner if the right instructions and feedback loop is created.





How close do you think you are to the real answers?

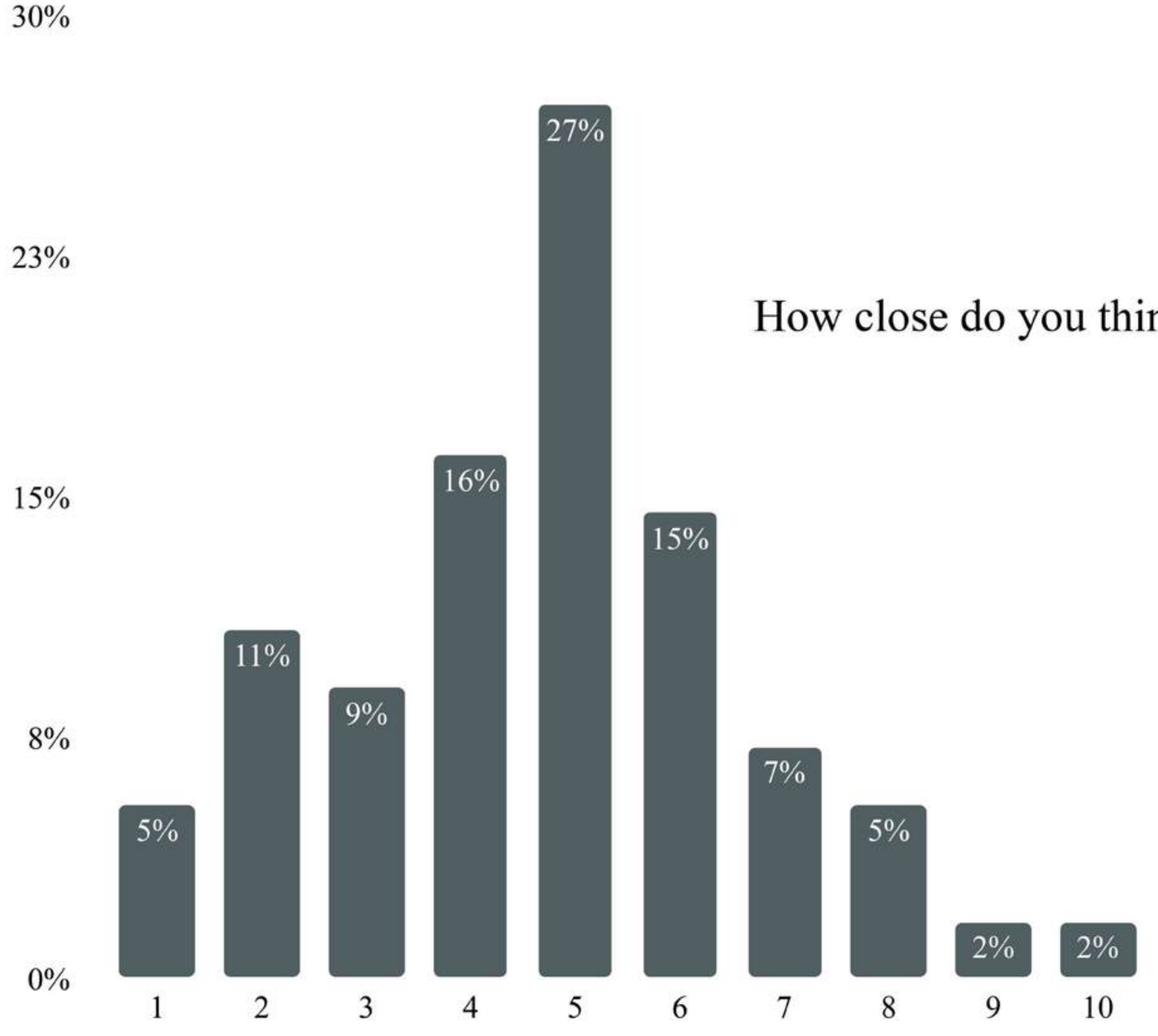


Figure 4.2. k:
Guesses of participants on how close they were to the real answers (1 not close at all, 10 very close).

4.3 Social and semantic analysis

Figure 4.3. a:
Grayson Perry pottery, an example of storytelling through ceramics (Hayward Gallery, 2022)

Most people believed that their guesses were close to the answer (fig.4.2. k). Many believed that they were somewhere in the middle where 27% said 5/10 (fig. 4.2. k). It did not however influence the accuracy of the answers as regardless of the belief in accuracy, the accuracy results do not vary much (fig.4.2. l). A small amount of people who said their accuracy was 8, 9 or 10 guessed well. The high results of skills 8 to 10 might be outliers as only a few people said it (fig.4.2. k). It could however open a discussion that the mindset with which one works with AI can be an important factor in design collaboration, but the results here are too few to be statistically significant.

Figure 4.3. b:
Ancient Greek Vase, story telling and myths
(The Met).

An MIT study showed machines can now almost identify common emotional arcs in storytelling (Mc Kinsey, 2022). The involvement of semantics in AI can become the bridge between digital and physical creation (in Midjourney for instance through prompts) and eventually create a human and AI collaboration that works through feedback loops. In this study, ceramics being at the heart of the dialogue between human and AI, it was intriguing to see how human languages can be translated into physical objects (fig.4.3. a). Ceramic domestic objects in our day to day lives can serve as a gateway for myths and recordings of stories (Shipley, 2016). Thus, clay becomes a receptacle material. Broadening the dialogue between humans, arts and crafts, AI comes in as an active linguistic medium where we express ideas that are then created in clay (fig.4.3. b).

When asked about their decisions of who was the designer, some of the answers included: “familiar shapes I assumed human, non-logical or weird shapes I assumed some AI interference”, “the more complex and non-practical designs were AI-generated or AI inspired”, “the weird shapes were AI”. It seemed that AI as a designer can bring an “out of touch with reality” element, something “non-logical”. This irrationality is present in a lot of myths, where for example gods in Greek mythology do not follow conventional human rules. It can therefore be concluded that AI can bring a mystical and unexpected touch to designs that just humans would not be able to produce.

Figure 4.3. c:
Strange Clay exhibition
(Hayward Gallery, 2022)

Furthermore, in this section, the involvement of semantics of the prompts that created the dialogue and AI is examined in more depth. The feedback loop is also tested, between participants and the AI image generator. From the questionnaire (Appendix D), 24% of people who thought AI could be a good designer, said that it only builds on “previous designs” to then create “better ones”. Therefore, the idea of the “previous” and “better”, suggests a time related iterative design relationship. That relationship in this study seems to be the semantics relationship of translating the world around us. A participant said that “AI has no limitations to creativity whereas human’s perspective is biased based on emotions and current events”. Here the human “emotions” and “current events”, are what makes the human touch valuable, and it is arguable that it is not a limitation but rather an opportunity for expansion, and AI can act as guide through intangible events such as human feelings, and it opens a design discussion that can be materialized and fed back to AI again through prompts or images. As mentioned in section 4.2, it is important to try and find a common design language in these mainstream AI image generators, semantics could be one of the design languages. To test out a potential design dialogue, a closed loop system was designed that feeds back the prompts of the participants into the AI image generator (fig.4.3. d).

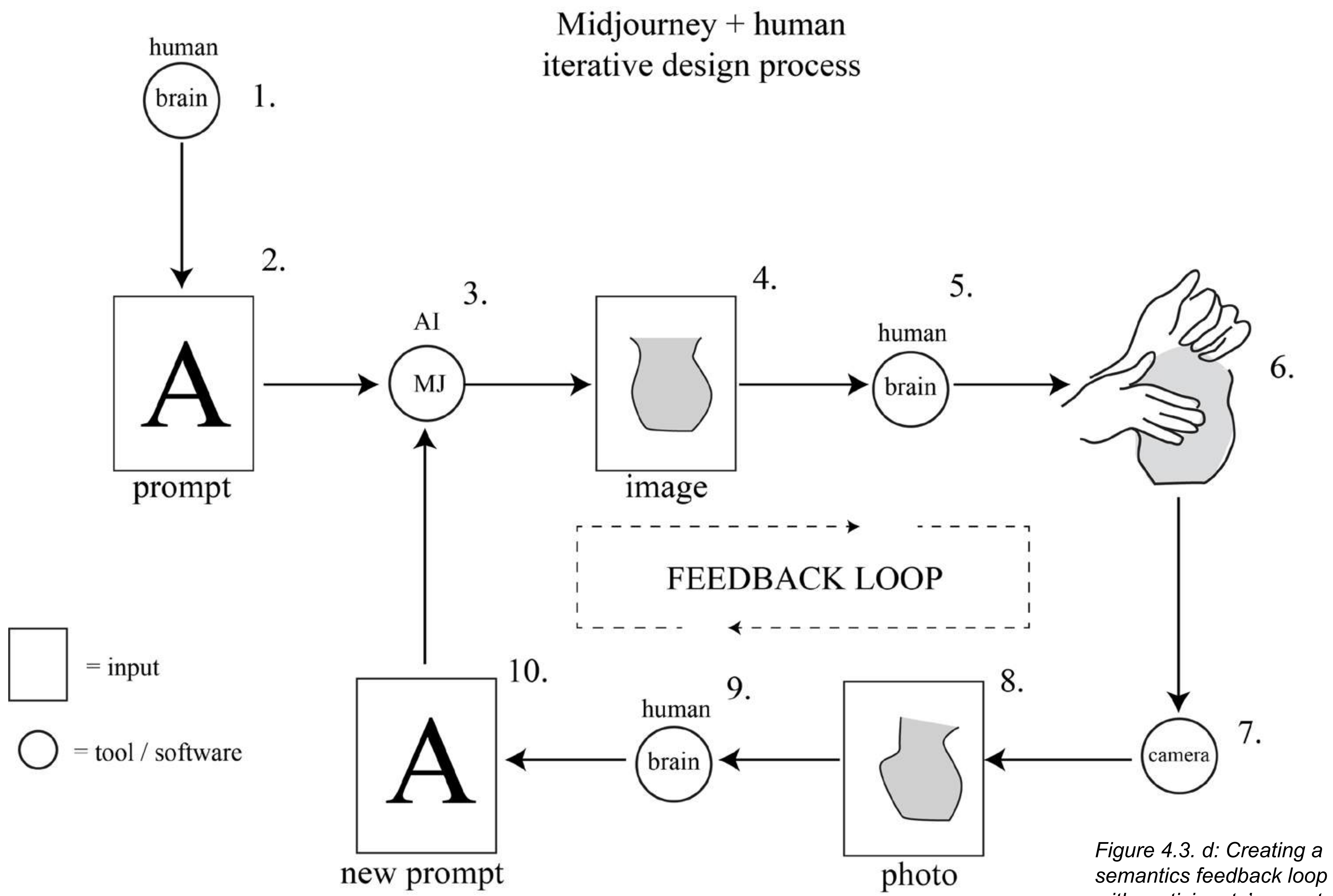


Figure 4.3. d: Creating a semantics feedback loop with participants' prompts (Ostroverhy, 2023)

Figure 4.3. f: Suggested prompt with lowest semantic score (0.019): "torn limb carcasse resemblance should be our inspiration" (Ostroverhy, 2023)

To quantify the semantic accuracy (Appendix D), distribution graphs were created with the given data, with the worst performing geometry (fig.4.3. d and fig.4.3 f) and best performing geometry (fig.4.3. g and fig.4.3 h).

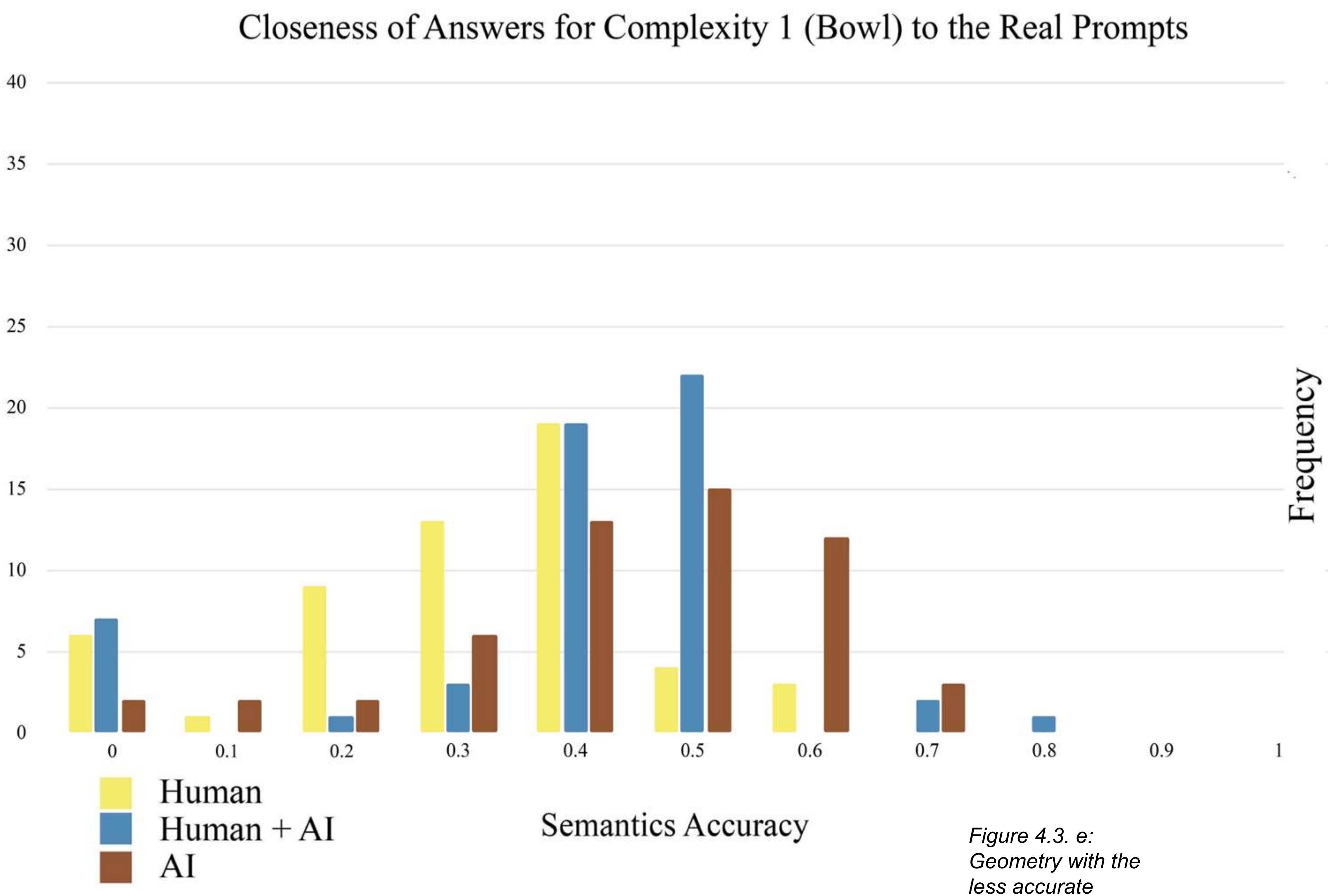


Figure 4.3. e: Geometry with the less accurate semantic guesses.

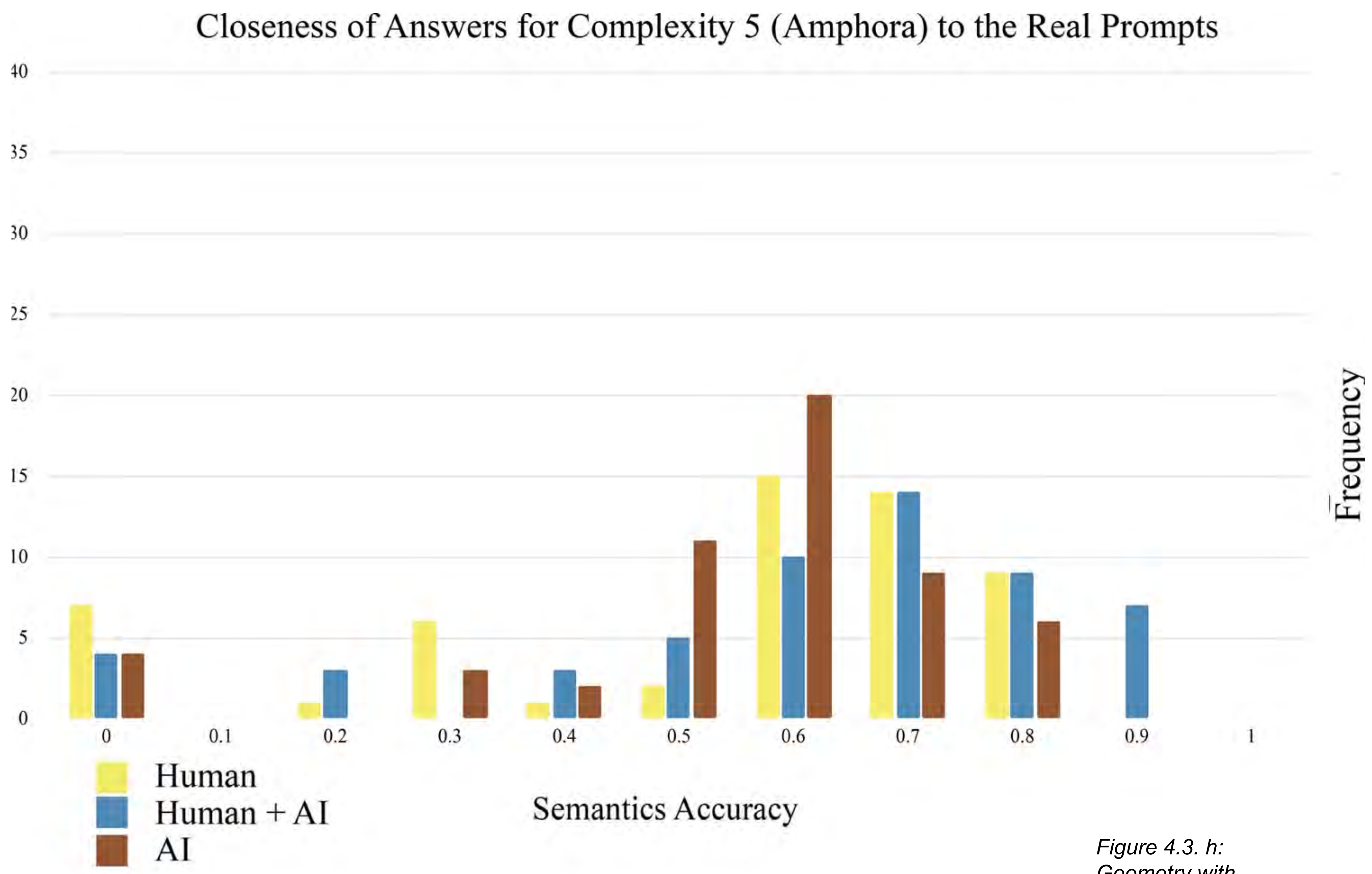


Figure 4.3. h: Geometry with the most accurate semantic guesses.

Figure 4.3. g:
Suggested prompt with
highest semantic score (0.91):
“large ceramic earthenware
vase with handles”
(Ostroverhy, 2023)

We can see that Human+AI and AI performed better in geometry complexity 1 (fig.4.3. e). This might be due to the nature of the bowl, being an easy geometry. As it was at the beginning of the questionnaire participants seemed to have thought the human designed bowl was “too simple”, and started creating prompts that were either too complex, or not descriptive enough. The lowest semantics score was input into Midjourney as a prompt (fig.4.3. f). The result created a very interesting design approach to the next iteration, AI acting as a semantic and design mediator.

The same process (fig.4.3. h and fig.4.3. g) but with the highest scores. It seems that more complex geometries, that are added another level of complexity by AI as seen in section 4.1, are prone to more accurate semantic guesses. The resulting image however seems less “weird” and easier to build than the low semantic score one in fig. 4.3. f. It can be concluded that when AI designs easy objects it is harder to guess and when it designs more complex geometries it is easier to guess. To see the rest of the results, see Appendix D and Appendix E.

Figure 4.3. i:
AI generated vase
(Ostroverhy, 2023)

Figure 5.1. a:
AI generated teapot (Ostroverhy, 2023).

V. APPLICABILITY

Being able to spot what is AI designed and what is not, and spotting AI "chicken sexers" can become an important skill in the future. What it says, is basically that humans with (or sometimes without) training, can discern almost indiscernible patterns. With AI creating paintings and photographs, it starts to affect industries such as the art world for example the Girl with the Pearl (fig.5.1. a) being exposed at the Mauritshuis museum for Vermeer's retrospective (Harris, 2023) and Eldagsen's winning photograph that then turned out to be created by AI (Novak, 2023). Having "AI sexers" might imply that humans might get good at spotting what is AI and what is not, and even if AI gets really good at approximating human touch it will still be differentiable. Therefore, issues that artists might disappear or might "cheat" are eliminated from the equation if humans are trained with questionnaires like the one in this study.

Figure 5.1. b:
AI generated image of "Girl with a Pearl Earring" by Vermeer (Harris, 2023).

The study could also be applied to archaeology, like for example how archaeologists (with the company RePAIR) are working in Italy to reconstruct ruins of Pompei (Dafoe, 2023) using AI that assembles and predicts the missing pieces of a broken fresco digitally and then a robotic arm assembles the existing pieces how they should be (fig.5.1. b). Here actually the study does not bring more accuracy to what RePAIR are doing, but rather RePAIR could provide a useful addition to the feedback loop looked at earlier. The assembly by the robot is also something that could be added to future works.

The concept of training AI as well as humans to interact with each other can be used in the built environment to enhance architects and engineers capabilities to build in situ quickly and sustainably, for example a clay retaining wall in a post seismic scenario. Scanning the seismic site, inputting data and making it shareable across AI platforms on a global level for AI to learn and adapt quicker is something that could be done considering the study. In parallel, training humans to input the right data (qualitative or quantitive) is also something that can be done. Taking for example the Gramazio Kohler project of Touch Wood, where an augmented assembly is used to build an acoustic timber wall assembled with timber bricks using a scanning app on their phones (Kohler, 2022). The user scans the brick, gets told where to put it and moves to the next brick (fig.5.1. d). This remote process of building could be enhanced by AI and transform a builder into engineer. In the study however, the AI would have to be trained to understand the properties of clay, something that could be helpful for future geotechnical works.

Figure 5.1. c:
Reconstructed mosaic in Pompei by AI and then a robot (Dafoe, 2023).

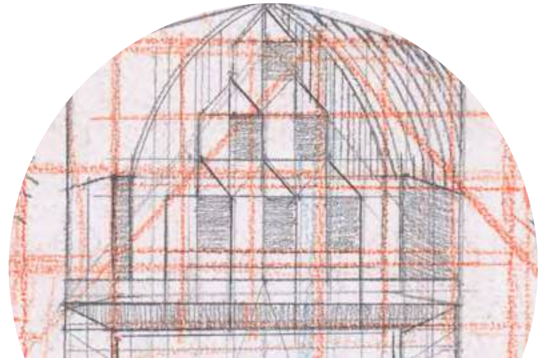


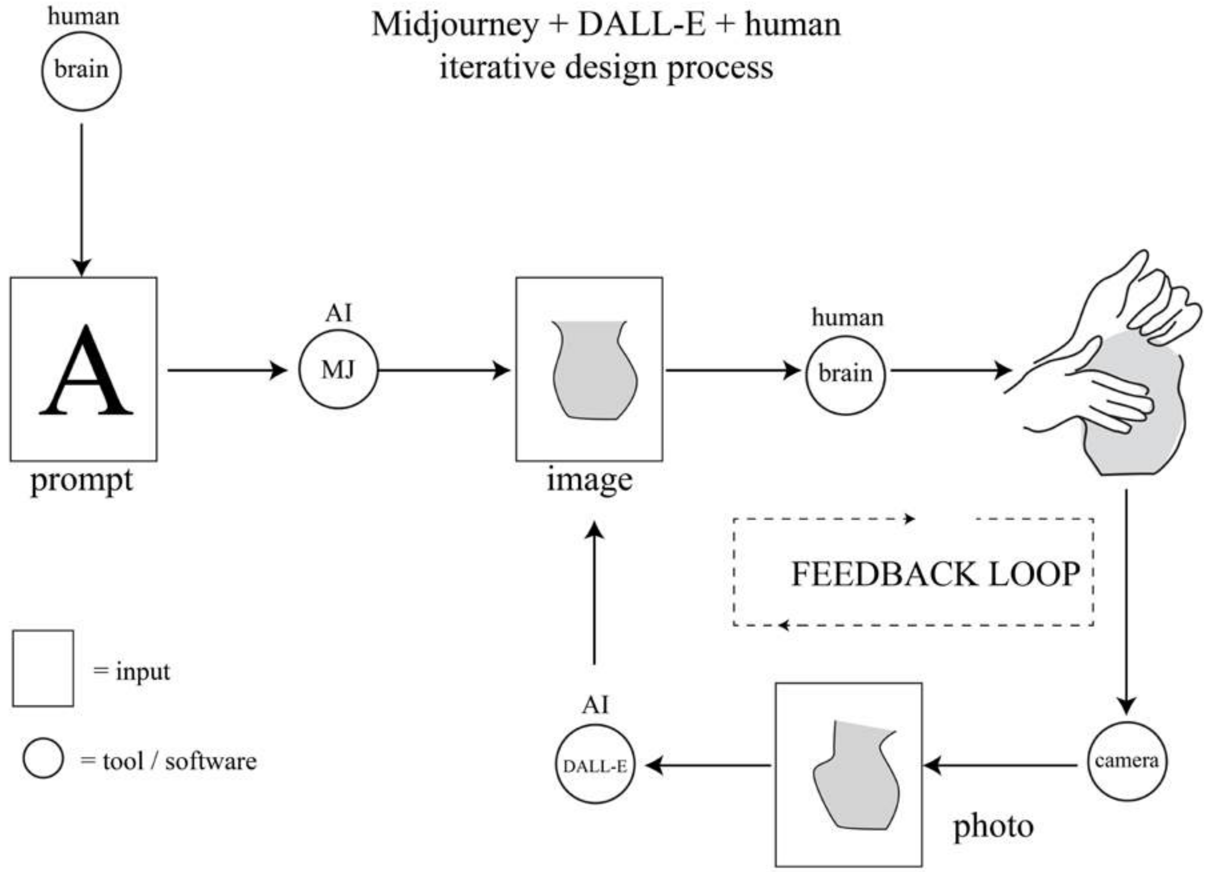
Figure 5.1. d:
Human virtually follows instructions by scanning the timber structure (Kohler, 2019)

Figure 5.1. e:
AI generated teapot (Ostroverhy, 2023).

Figure 6.1. a:
AI generated round vase
(Ostroverhy, 2023)

VI. LIMITATIONS AND FUTURE WORKS

A major limitation in the study, as discussed in section 4, is that the human did all the geometries and inevitably put human touch on all the ceramics. The experiment can be seen as analogue as the human is making the clay geometries. A way to counter this would have been to use a robot such as a clay 3D printer, which would have made geometries without bias towards the human. Another limitation was the amount of people surveyed (55). If more people would have been surveyed some outliers (Section 4.2) would have potentially disappeared from the data. A potential continuation of the study could be to develop a simpler questionnaire of just human and AI designs and start an AI "chicken sexer" training on a massive scale. The latter proposition seems to be the biggest conclusion from the study, in that it could help some industries (such as the art world).



Something that was touched upon, but not materialised was the feedback loop. In Section 4.3 the prompt feedback loop is tested that generated AI images. It would have been interesting to create the participants generated geometries in real life. Another approach to the Human+AI design feedback loop was to put the author's photo of a made geometry (fig.6.1. a) and put it back into an AI image generator (DALL-E). It then generated potential new geometries (fig.6.1. b).

Figure 6.1. b:
Creating feedback loop with images rather than a prompt
(Ostroverhy, 2023)

Figure 6.1. c:
On the far left is the photo of the real vase, all two on the right are the variations created by AI (Ostroverhy, 2023)

Figure 6.1. d:
Increasing human touch in prompts (increase from left to right) (Ostroverhy, 2023)

From fig.6.1. c, we can already see that AI does not understand the material properties of clay and in some cases create a furry object. The latter theme of materiality is something that could be explored as well, and the focus further studies could be on AI learning about different soil properties as mentioned in Section 5. See Appendix G for more images.

The human touch could be worked on, and its complexity “increased” in the prompts given to AI with sentences such as “made with rugged hands” or “the potter making it was feeling sad (fig.6.1. c and Appendix H). Lastly, professional potters could have done the geometries, decreasing the human touch as the skills making the ceramics would have been high. Future works could look more into the craft of ceramics, and its different manufacturing steps such as bisk firing and glazing or making techniques (i.e., first coiling, then smoothening, then adding decorative elements), that the AI image generators do not necessarily consider.

Figure 6.1. e:
AI generated ceramics roots bowl with participants prompt (Ostroverhy, 2023)

VII. CONCLUSION

The conclusion of the paper is broken down into three categories: the evolution of AI as a designer, can technology have a human touch and the need for education for Human+AI collaboration.

Looking back at the context it can be concluded that AI can be a source of inspiration and even in some cases creative partners. If at the beginning they were mere tools, they can be now an active source of creative inspiration. This claim was supported by the evidence in the questionnaire, where participants seemed to think that AI image generators can be a source of unpredictability, that can be argued to be a source of inspiration for designers, something that was not present in early robots.

Furthermore, a central question of this paper was whether technology can have a "human touch"? The human touch is necessary in art forms and is what makes us human and not "soulless". After completing this study, the author has concluded that technology simply provides the illusion of being creative because it mainly relies on the accuracy of the input data it is being given, and does not understand it, it merely processes it to give a desired output. However, it seems from the study that being able to use a feedback loop in which the input data is processed by humans as well as machines can add more "human touch" to AI.

Lastly, it seems that Humans and AI need to learn from each other in order to efficiently collaborate. Potentially learning protocols need to be installed in the future on how to use AI generating image software at its best (i.e., what steps it needs to follow so as to not add decorative elements immediately). Another education opportunity might be with the AI "chicken sexers". Finding individuals with high curating skills that could spot AI designs from human designs, could be a way to counter the potential disappearance of a range of creative jobs such as illustrators, digital painters and even sculptors.

To conclude, human touch is a factor that could be described as intangible or subjective, but the study showed that if took apart, can be classified with a clear visual aesthetic language and semantics. The design process constantly evolves with the emerging of new technologies, and being able to clearly communicate and steer the powerful programs for creation and beauty in the right directions is part of the modern designer's, artist's and engineer's job.

VIII. ACKNOWLEDGMENTS

Figure 8. a: AI generated ceramics tooth bowl with participants prompt (Ostroverhy, 2023)

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Figure 9.1. a:
AI generated ceramic bowl
(Ostroverhy, 2023)

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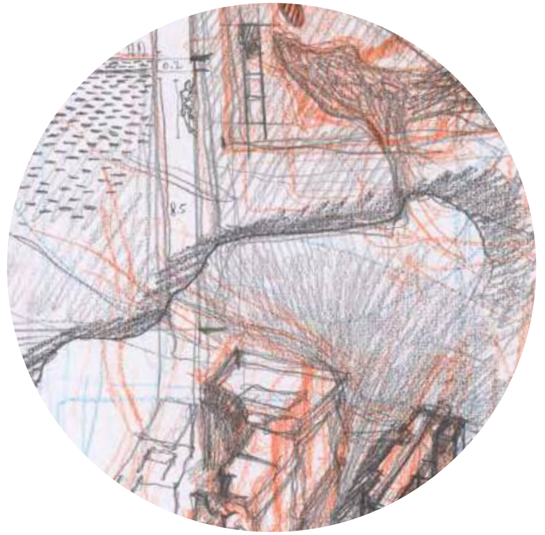


Figure 9.1. b:
Ai generated ceramics bowl with participants prompt (Ostroverhy, 2023)

X. APPENDIX

Figure A. 1:
Photogrammetry
of clay geometries used
and made for the experiment
(Ostroverhy, 2023)

APPENDIX A:

Pilot Experiment

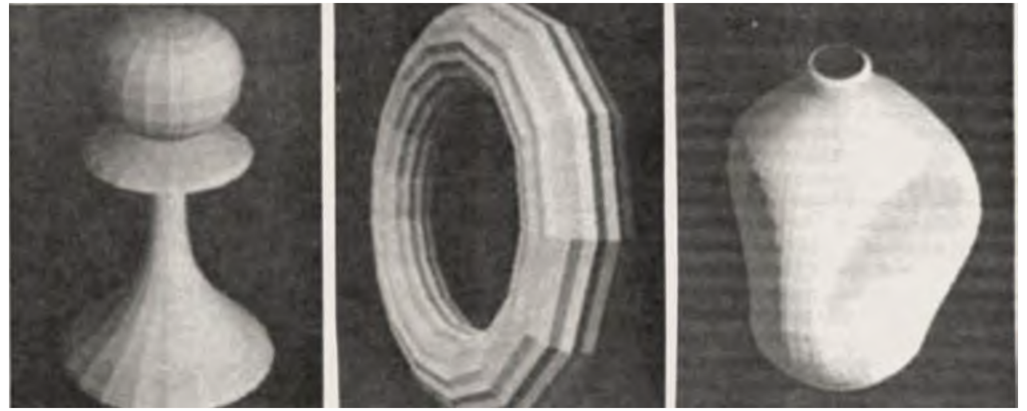
```
double x = startPoint.X;
double y = startPoint.Y;
double z = startPoint.Z;

// (!true) == false
// (!false) == true
if(!initialized)initialize(x,y,z);
if(Reset) reset(x,y,z);

pos = Walk(pos, step);
pos.X = limitToRange(pos.X, xRange);
pos.Y = limitToRange(pos.Y, yRange);

walkerPath.Add(pos);

A = walkerPath;

Point3d pos ;
Polyline walkerPath;
Random rand;
bool initialized;

void initialize(double x, double y, double z){
//Print(“Walker started walking!”);
//Print(DateTime.Now.ToString());
pos = new Point3d(x, y, z);
walkerPath = new Polyline();
rand = new Random();
initialized = true;
}
void reset(double x, double y, double z){
walkerPath.Clear();
//walkerPath = new Polyline();
pos = new Point3d(x,y,z);
}
double limitToRange (double num, double range){
//return Math.Min(Math.Max(-range, num), range);
if(num > range) return range;
if(num < -range) return -range;
return num;
}
Point3d Walk(Point3d pos, double step){
var x = pos.X;
var y = pos.Y;
var z = pos.Z;

int decision = rand.Next(5);

if(decision==0){
x += step; // x = x + 1
}
else if(decision==1){
x -= step;
}
else if(decision==2){
y += step;
}
else if(decision==3) {
y -= step;
}
else {
z+= step;
}
return new Point3d(x, y, z);
```

APPENDIX B:

Setting up Turing test

Figure B 1:
1st rule for complexity,
classical ceramics shape
(Wikimedia, 2022)

Figure B 2:
2nd rule for complexity,
breaking down the ceramic's shapes
into computer graphics shapes
(ball, donut, teapot)
(Haldar, 2016)



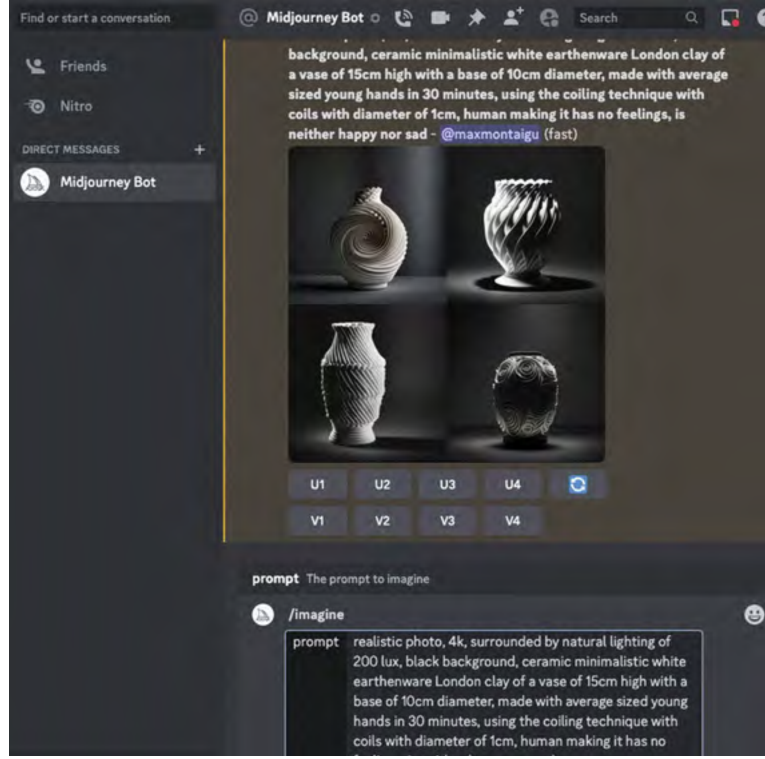


Figure B 3:
Input following prompt
into Midjourney

Prompt

realistic photo, 4k, surrounded by natural lighting of 200 lux, black background, ceramic minimalistic white earthenware London clay of a "geometry"* of 15cm high with a base of 10cm diameter, made with average sized young hands in 30 minutes, using the coiling technique with coils with diameter of 1cm, human making it has no feelings, is neither happy nor sad

*Where "geometry" is the variable that changes

Table B 4:
Input prompt
into Midjourney.

Figure B 5:
Resulting six geometries, ascending in complexity following on the rules of fig.B1 and B2

Figure B 7:
Lump of clay is put into 1cm diameter clay extruder

Figure B 6:
12.5kg of CC Buff Earthenware clay from Bathpotters was used to create the clay geometries

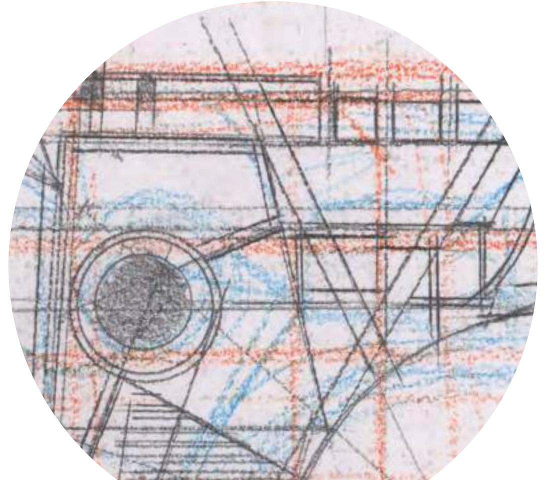


Figure B 8:
Clay coils are weighted to be at 500g

Figure B 9:
Tools used to create geometries

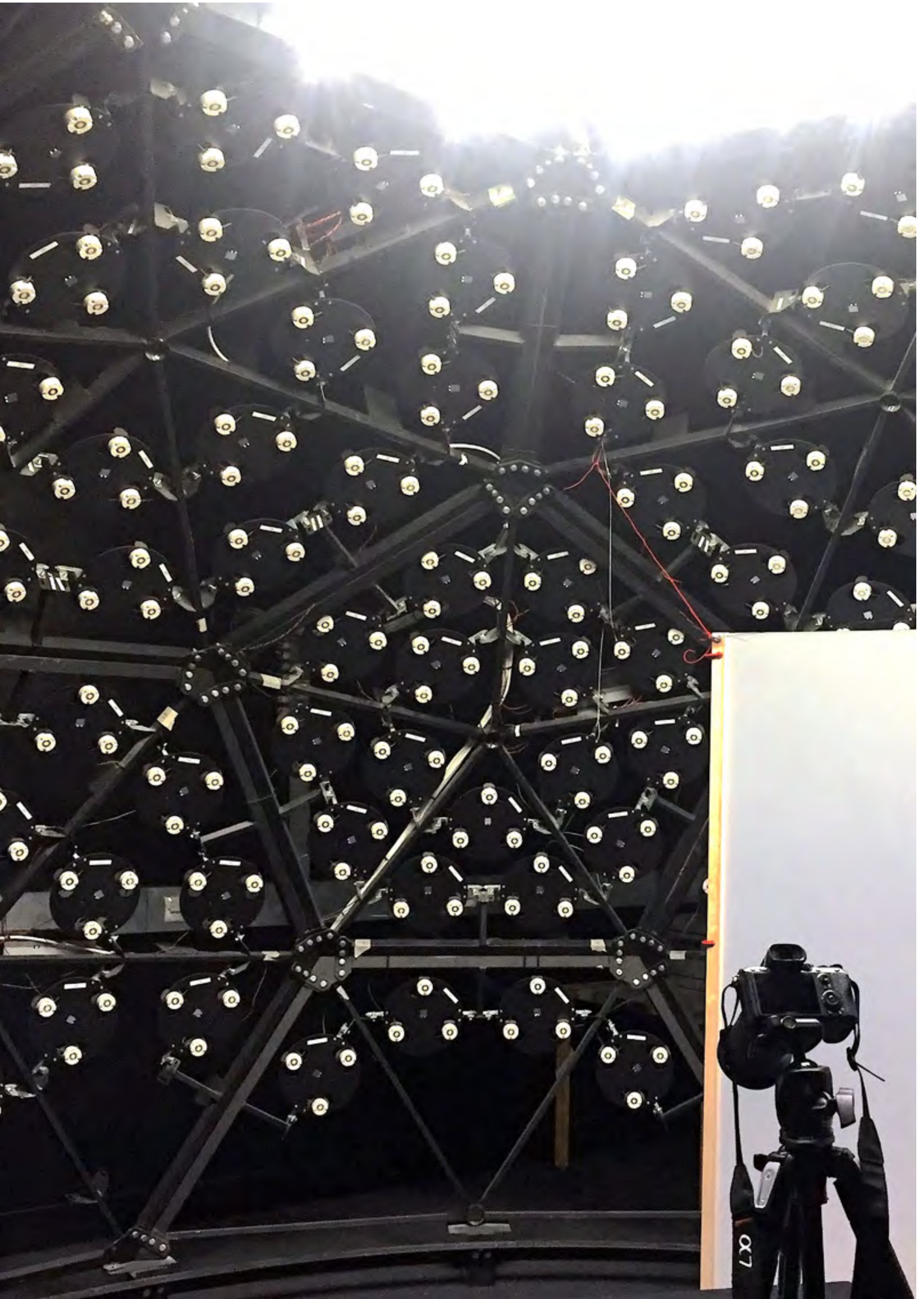
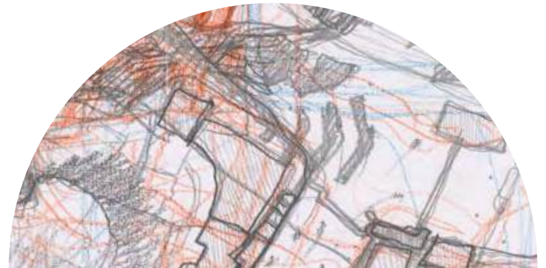


Figure B 10:
Sky Dome lab at UCL
Here East, Hackney Wick, London Uk
was used to get a controlled environment.

Figure B 11:
Skydome lab
environmental
conditions

Figure B 12:
Steps to create
geometries



APPENDIX C: Questionnaire

AI GENERATING DESIGNS TURING TEST

The aim of this test is to determine whether AI generating image software are sound and helpful designers - and whether it has or not a creative conscious. It is one thing to have an image, another to make that image into reality.

Prompt used:

realistic photo, 4k, surrounded by natural lighting of 200 lux, black background, ceramic minimalistic white earthenware London clay of a geometry of 15cm high with a base of 10cm diameter, made with average sized young hands in 30 minutes, using the coiling technique with coils with diameter of 1cm, human making it has no feelings, is neither happy nor sad

QUESTIONS PART 1

1.Profession:

2.Experience in pottery:

NONE	OCCASIONAL	AMATEUR	PROFESSIONAL

3.Experience in other types of art:

NONE	OCCASIONAL	AMATEUR	PROFESSIONAL

4.Do you consider yourself a designer?

Yes	No

5.If yes, rate your design skills on a scale of 1 to 10 (1 being beginner and 10 being advanced).

1	2	3	4	5	6	7	8	9	10

6.Do you consider yourself a curator/critic?

Yes	No

7. If yes, rate your curator/critic skills on a scale of 1 to 10 (1 being beginner and 10 being advanced).

11. Do you think AI can be a good designer?

Yes	No

8. Have you had any experience with AI generated images before?

Yes	No

9. If yes, has this ever helped with anything?

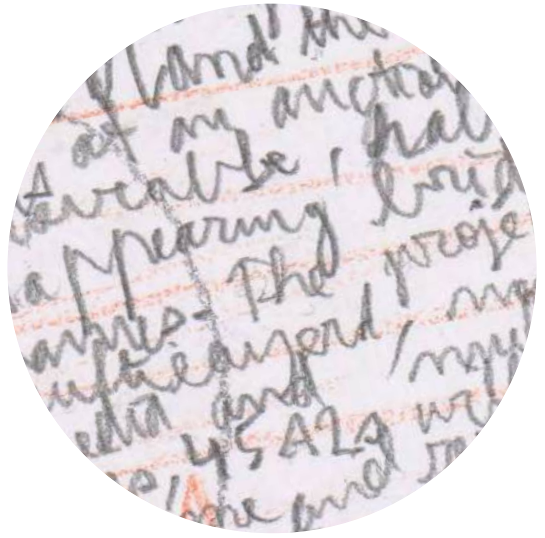
Yes	No

10. Briefly specify the reasoning of your answer:

12. Briefly specify the reasoning of your answer:

13. Do you think AI is conscious?

No	Not Sure	Yes



QUESTIONS PART 2

In the following exercise, you will see a number of images of pieces of pottery. They will increase in complexity. Please determine whether the following pottery was designed by a human, AI, or a combination of humans and AI. All were eventually then physically formed by humans*.

After inputting a prompt into the AI image generator (Midjourney**), either:

1-The author makes a geometry themselves without looking at the AI generated image

2-The author looks at the AI generated image, and chooses whether or not to take elements from the design

3-The author solely looks at the AI generated image, and tries to recreate exactly what it has designed

*All geometries were made in controlled conditions, with 500g of London Clay, using the coiling technique with coils of 1cm diameter, in under 30min, base no bigger than 5cm and height no bigger than 15cm, lux levels of even and constant of 200lux, temperature was 20 degrees Celsius, RH 55%.

**The way Midjourney (the AI image generator) works is the following: a description of the desired image is typed in (e.g. ceramics vase) and then an image is generated (as seen in the title above).

Figure C 1: Example of an AI generated pot.

Please guess the following ways:

Human	Human + AI	AI
		X

Human	Human + AI	AI
	X	

Human	Human + AI	AI
X		

1. Briefly describe what was the reasoning behind your answers in determining whether the design was done by a human or AI:

2. How close do you think you are to the real answers on a scale of 1 to 10 (1 being not close at all and 10 being extremely close).

1	2	3	4	5	6	7	8	9	10

3. Please type in your email below in order to receive the answers and follow up questions:

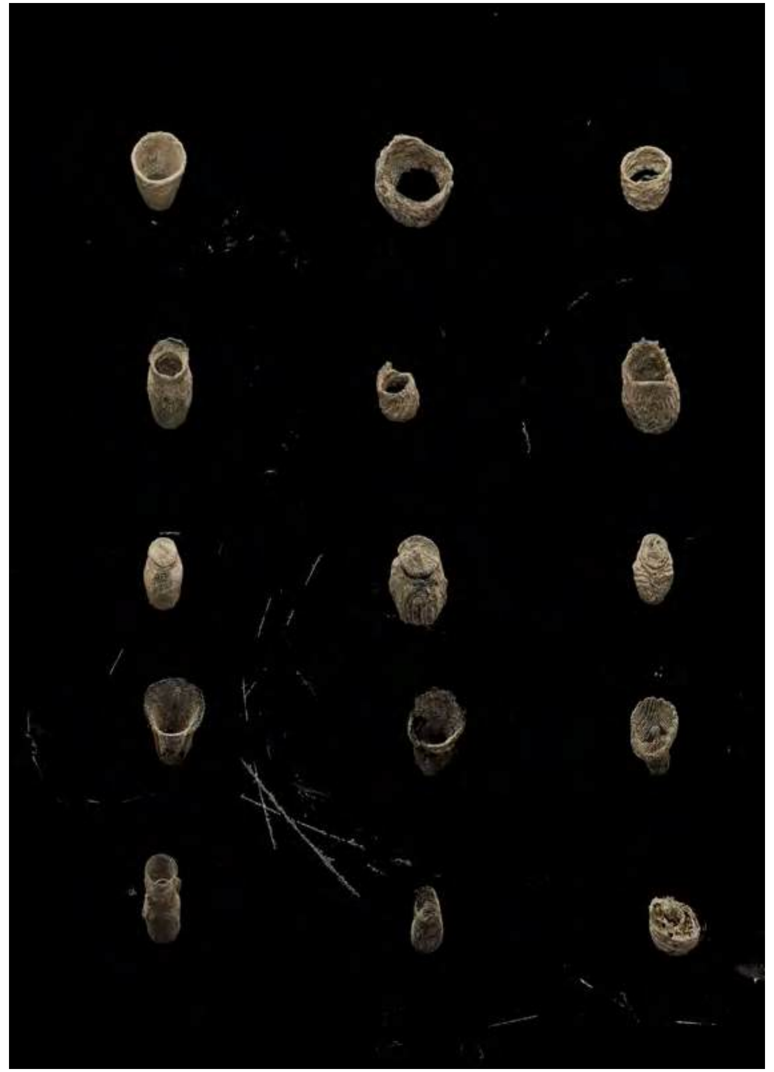


Figure C 2: Photogrammetry of clay geometries used for the experiment (Ostroverhy, 2023)

Answers for the Questionnaire

16. Guess the designer of the geometry:

Human	Human + AI	AI
X		

17. Guess the prompt given to generate the design of the geometry:

18. Guess the designer of the geometry:

Human	Human + AI	AI
		X

19. Guess the prompt given to generate the design of the geometry:

20. Guess the designer of the geometry:

Human	Human + AI	AI
	X	

21. Guess the prompt given to generate the design of the geometry:

22. Guess the designer of the geometry:

Human	Human + AI	AI
X		

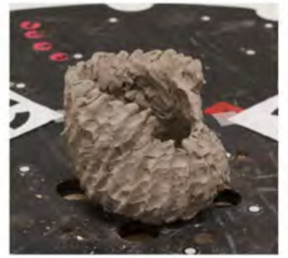
23. Guess the prompt given to generate the design of the geometry:

24. Guess the designer of the geometry:

Human	Human + AI	AI
		X

25. Guess the prompt given to generate the design of the geometry:

26. Guess the designer of the geometry:



Human	Human + AI	AI
	X	

27. Guess the prompt given to generate the design of the geometry:

28. Guess the designer of the geometry:

Human	Human + AI	AI
		X

29. Guess the prompt given to generate the design of the geometry:

30. Guess the designer of the geometry:

Human	Human + AI	AI
	X	

31. Guess the prompt given to generate the design of the geometry:

32. Guess the designer of the geometry:

Human	Human + AI	AI
X		

33. Guess the prompt given to generate the design of the geometry:

Figure C 3:and
Figure C 4: (right page)
Matrix of logic behind the complexity of the geometries

This tabloid also shows the answers for the questionnaire

Answers for the Questionnaire

34. Guess the designer of the geometry:

Human	Human + AI	AI
	X	

35. Guess the prompt given to generate the design of the geometry:

36. Guess the designer of the geometry:

Human	Human + AI	AI
X		

37. Guess the prompt given to generate the design of the geometry:

38. Guess the designer of the geometry:

Human	Human + AI	AI
		X

39. Guess the prompt given to generate the design of the geometry:

40. Guess the designer of the geometry:

Human	Human + AI	AI
X		

41. Guess the prompt given to generate the design of the geometry:

42. Guess the designer of the geometry:

Human	Human + AI	AI
	X	

43. Guess the prompt given to generate the design of the geometry:

44. Guess the designer of the geometry:

Human	Human + AI	AI
		X

45. Guess the prompt given to generate the design of the geometry:

46. Guess the designer of the geometry:

Human	Human + AI	AI
	X	

47. Guess the prompt given to generate the design of the geometry:

48. Guess the designer of the geometry:

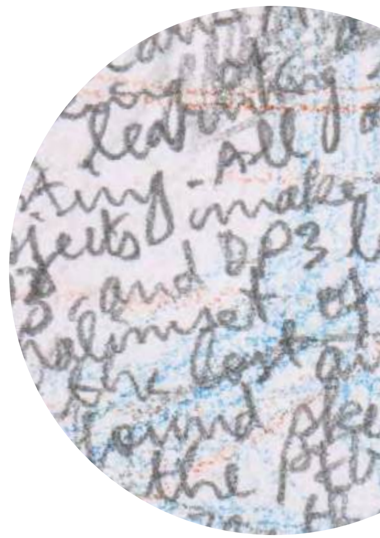
Human	Human + AI	AI
		X

49. Guess the prompt given to generate the design of the geometry:

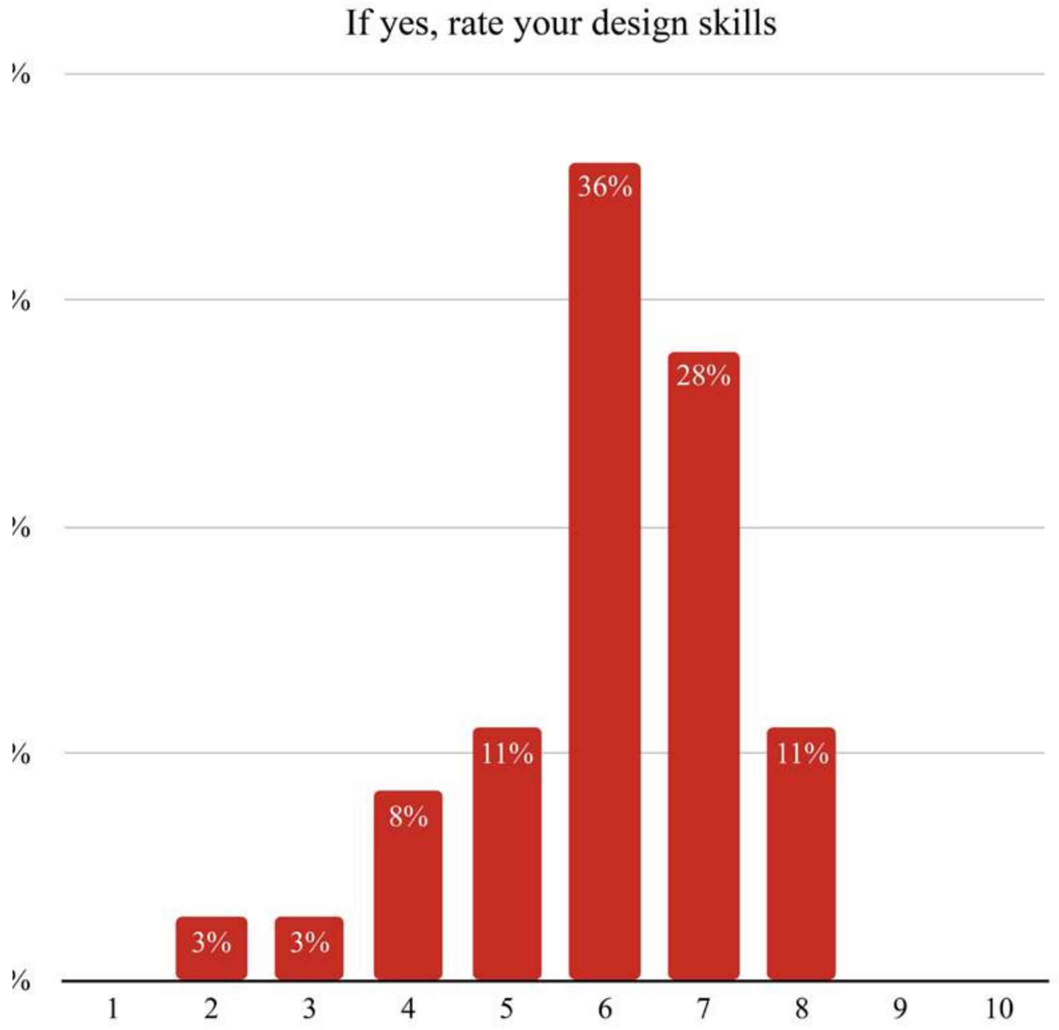
50. Guess the designer of the geometry:

Human	Human + AI	AI
X		

51. Guess the prompt given to generate the design of the geometry:



APPENDIX D:
Visual Representation of Data from Questionnaire



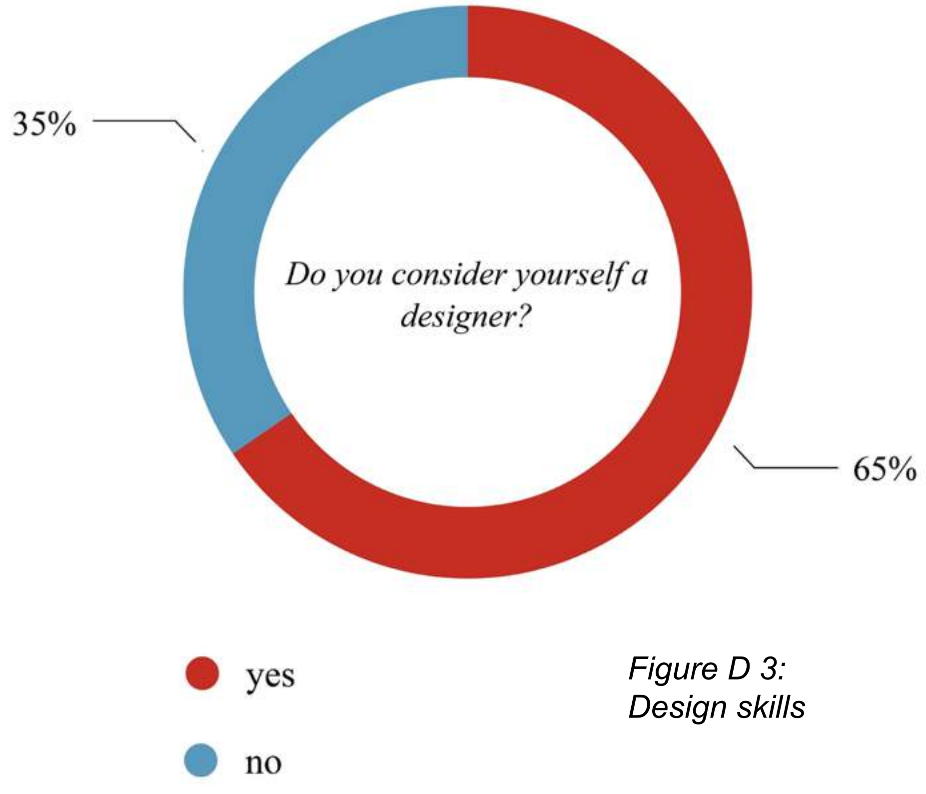


Figure D 3: Design skills

Figure D 3: Design skills

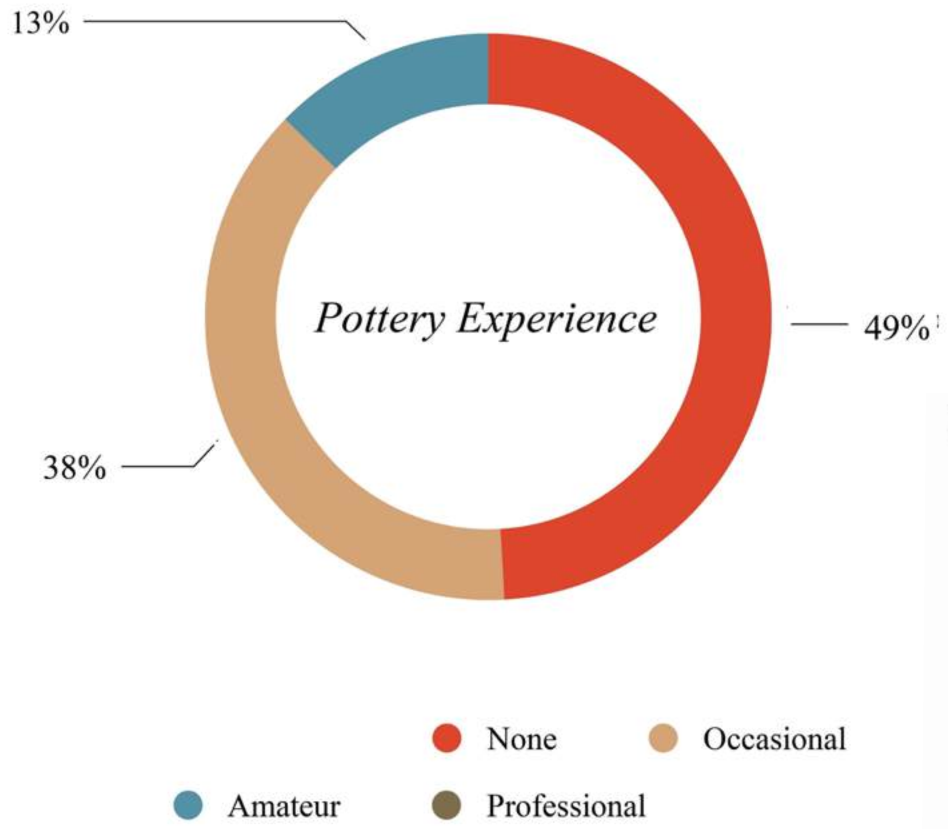
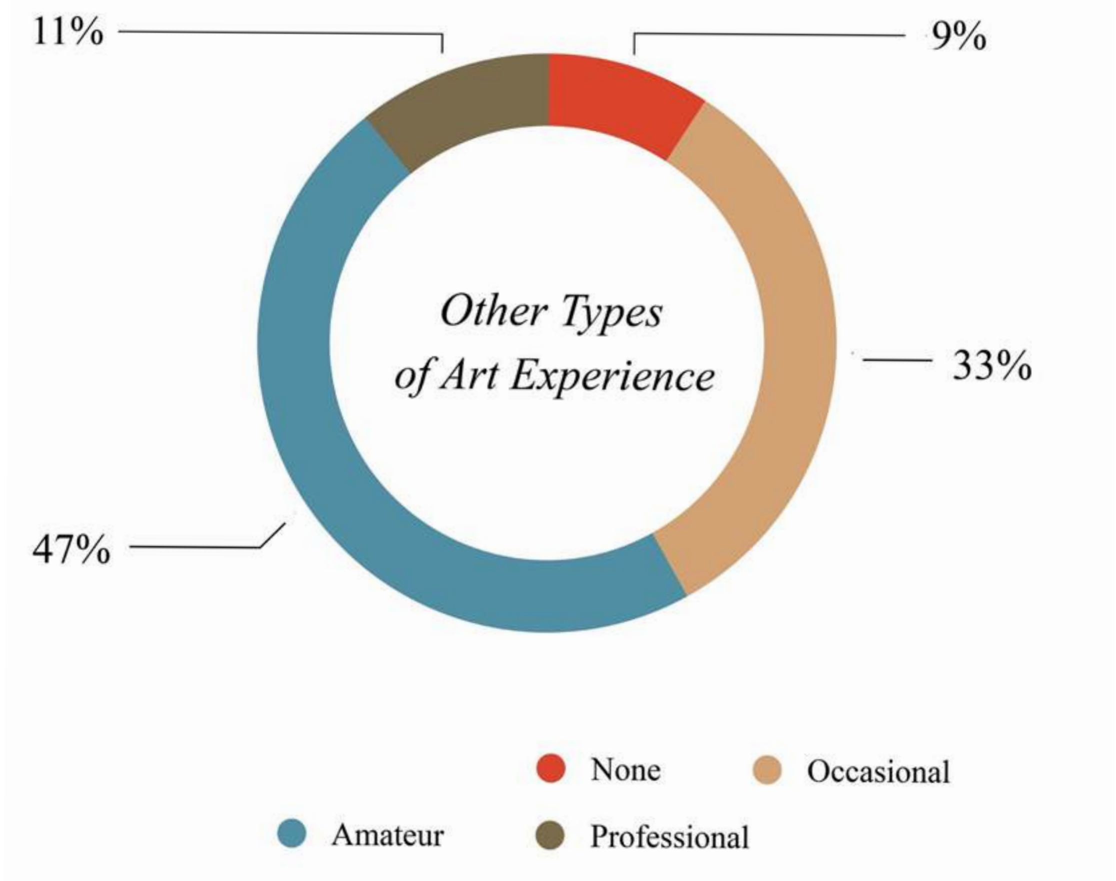


Figure D 1: Pottery Experience

Figure D 2: Other types of art experience



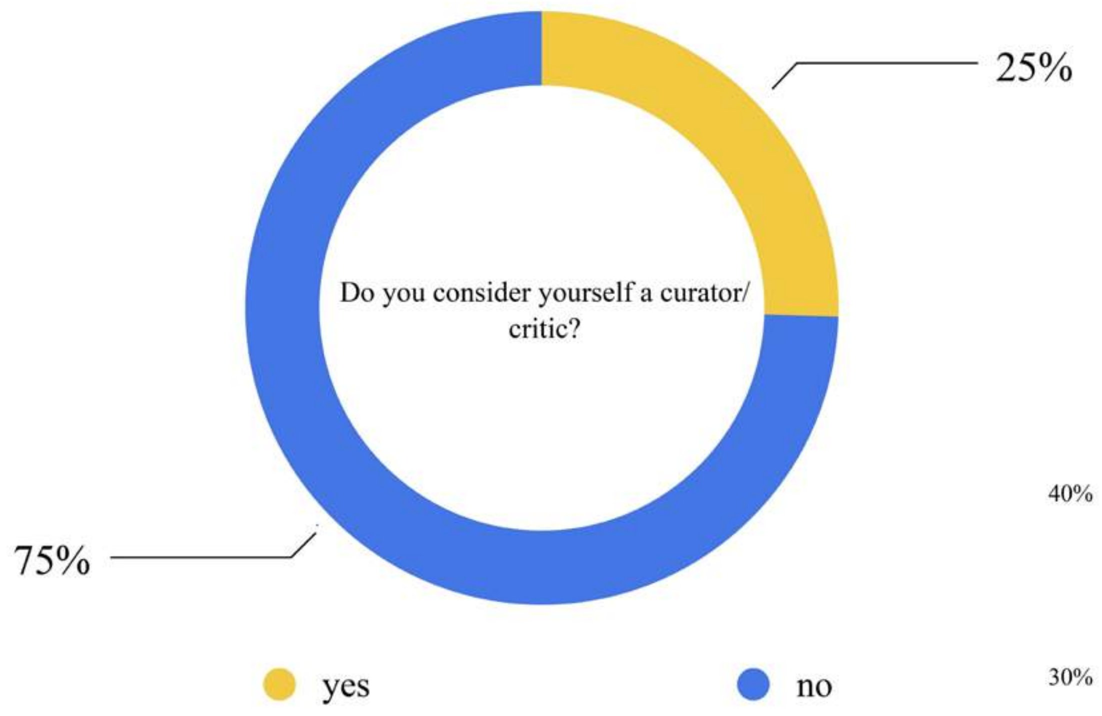


Figure D 4:
Curator skills

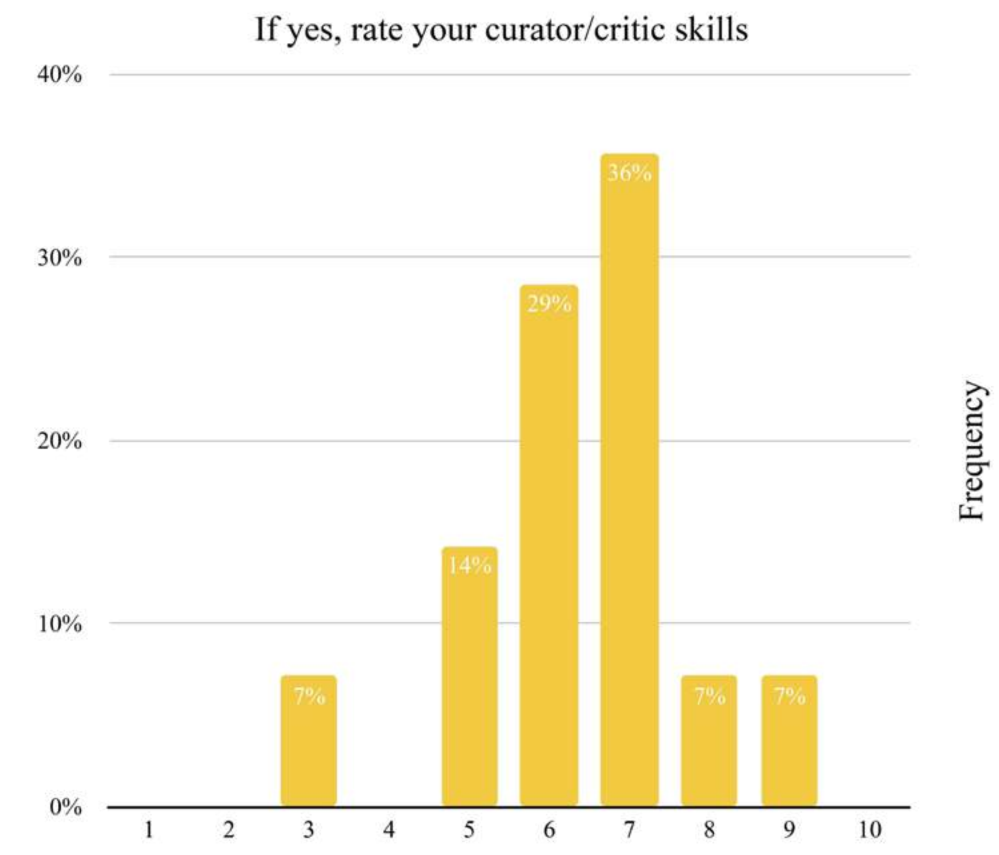


Figure D 4:
Curator skills

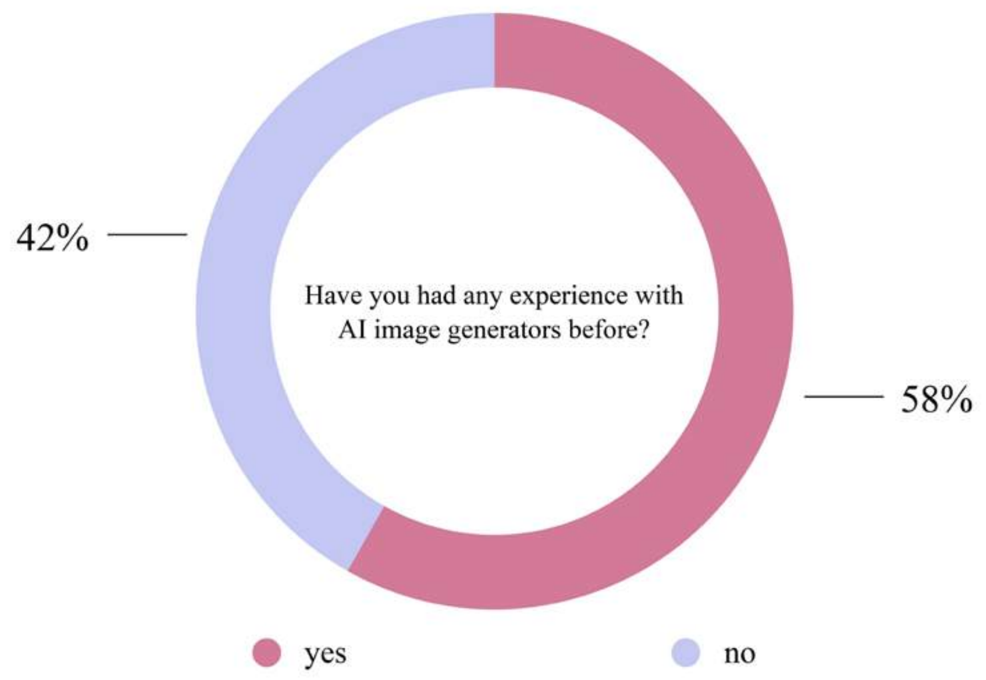
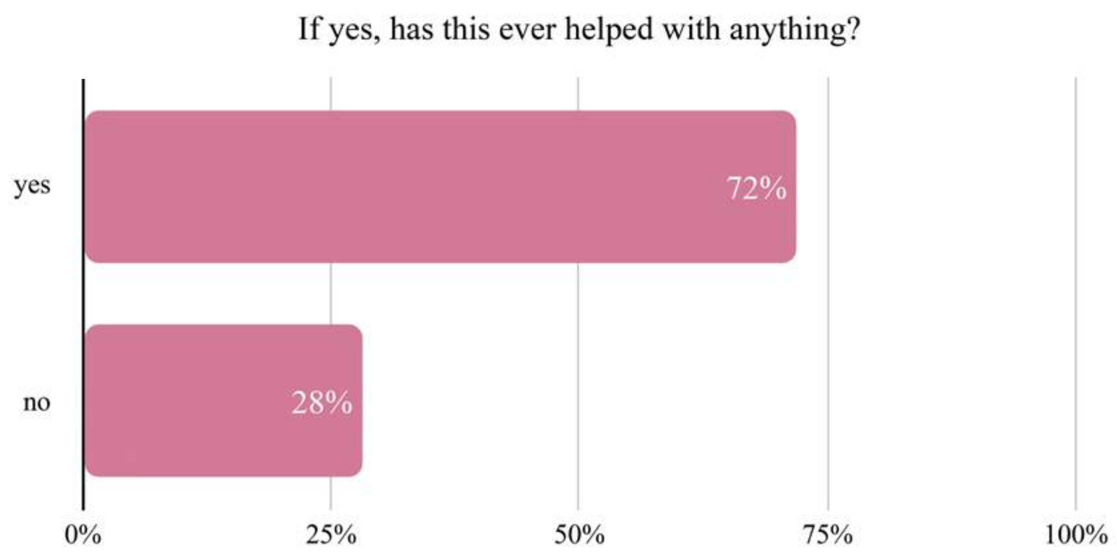


Figure D 5:
AI image generator experience



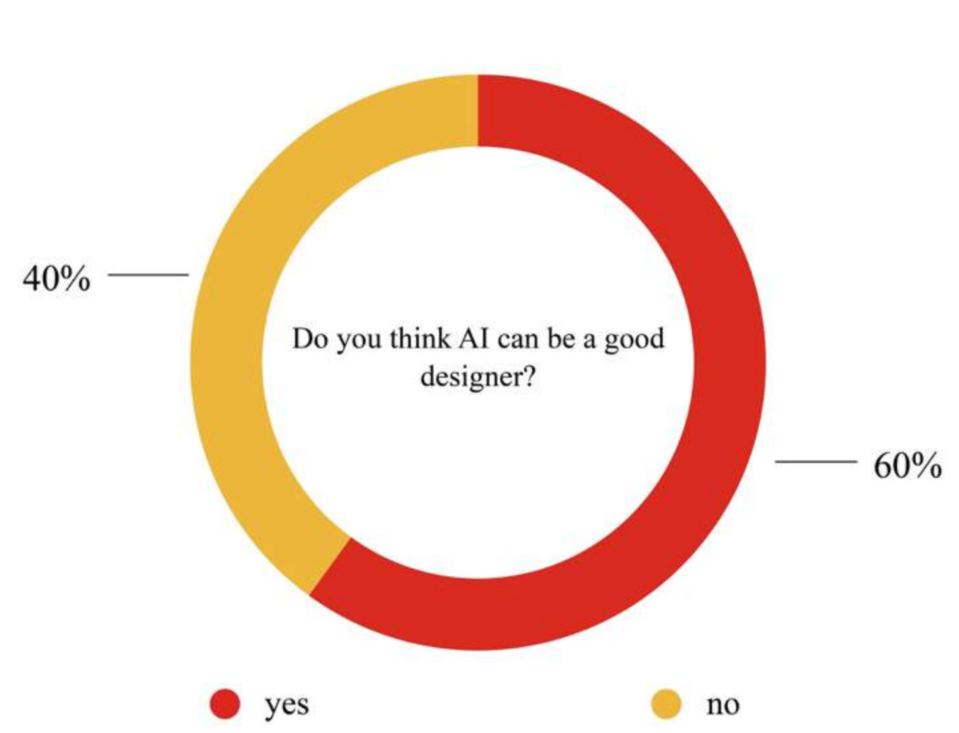


Figure D 6:
Opinions on AI being
a good designer

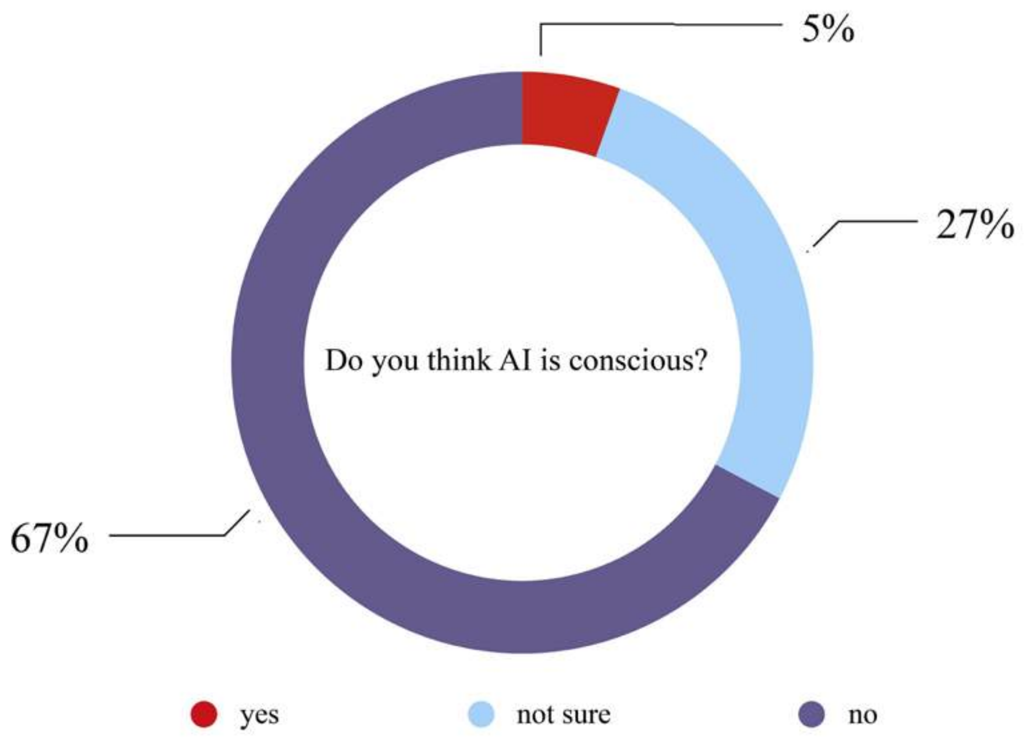
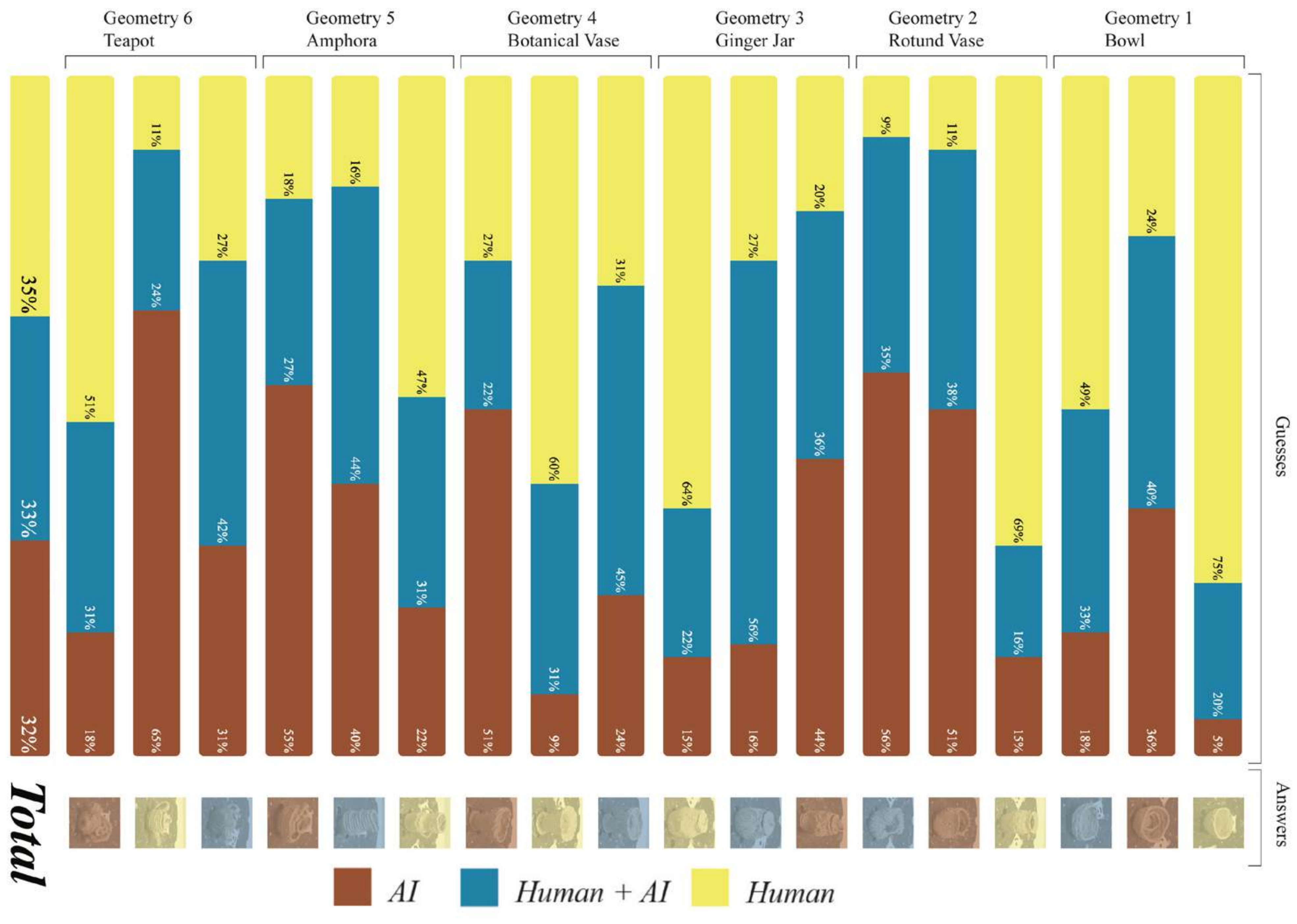


Figure D 7:
Opinions on AI
being conscious.

Figure D 8: (right page)
Accuracy of guessing
the designer of geometries



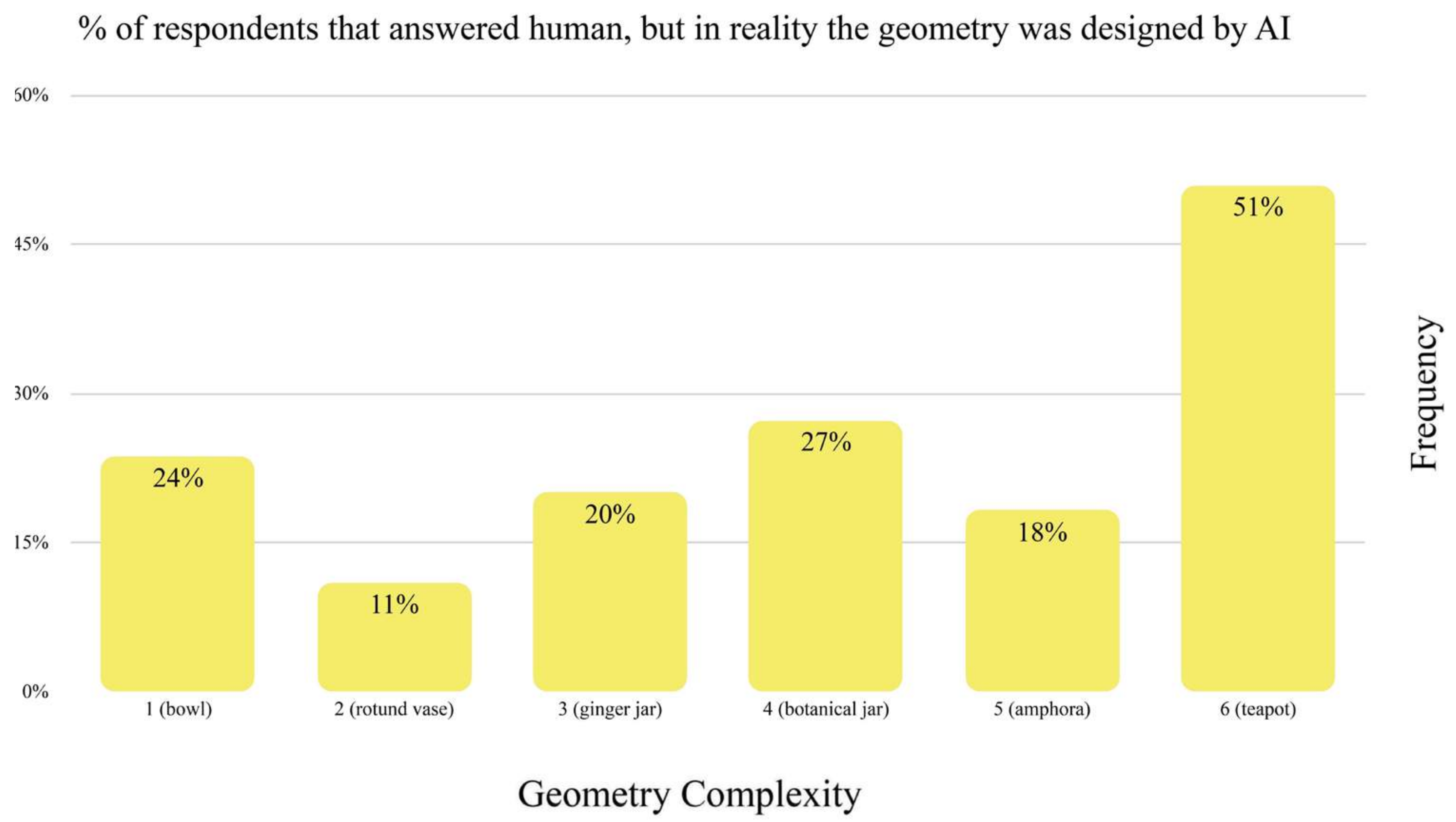


Figure D 9:
Instants when
AI fooled humans.

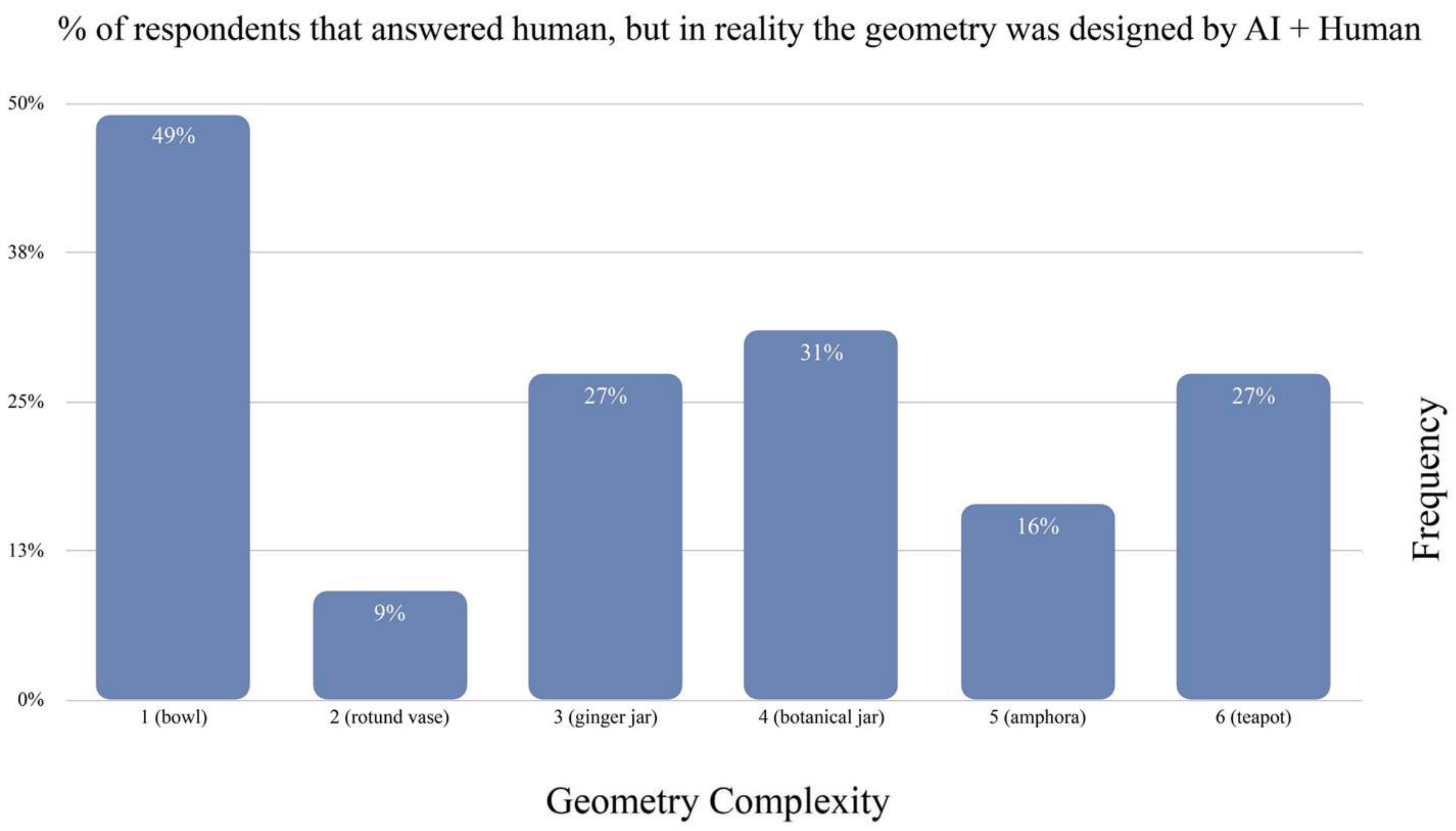


Figure D 10:
Instants when AI+Human
fooled humans.

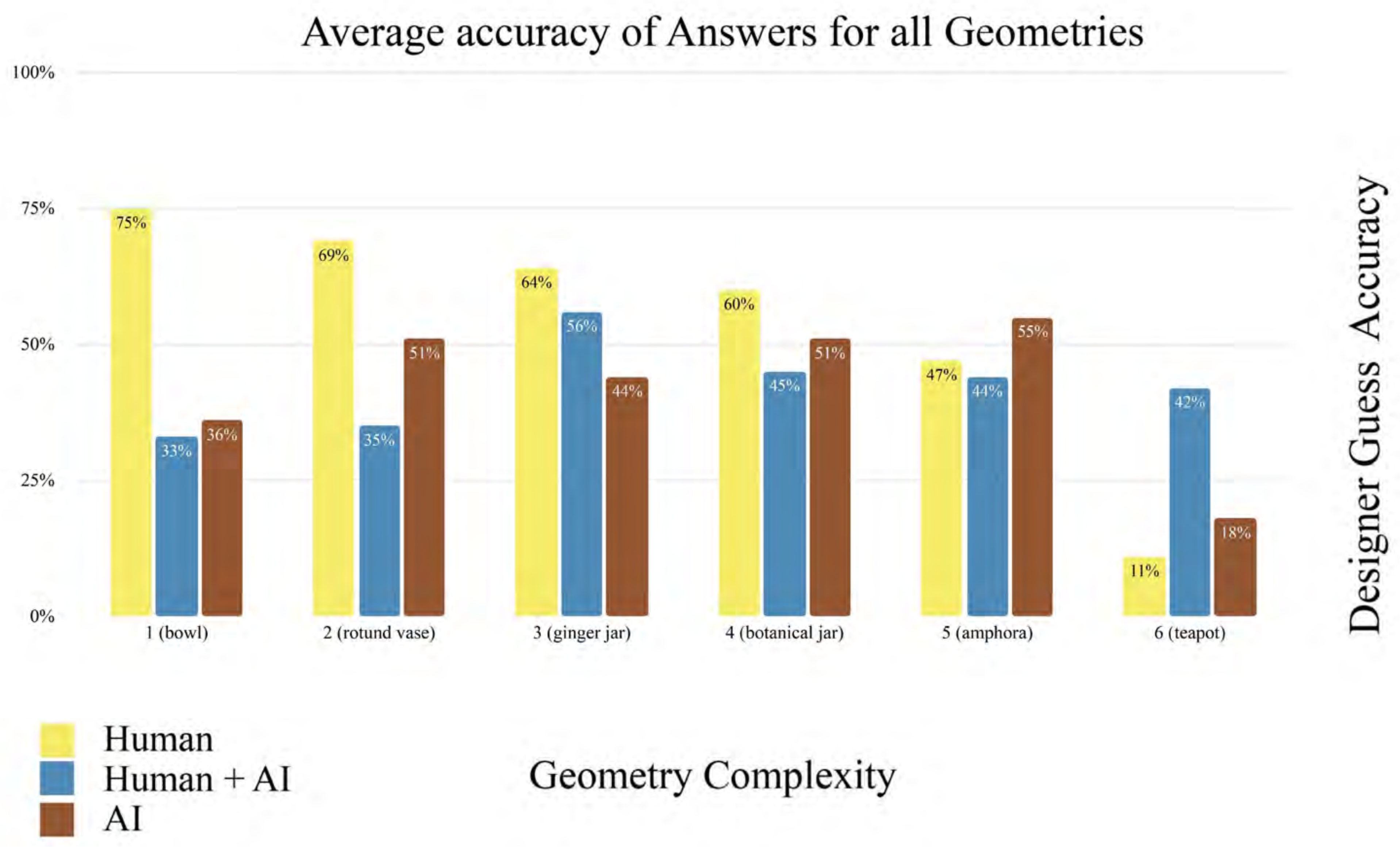


Figure D 11:
Total accuracy for guessed geometries.

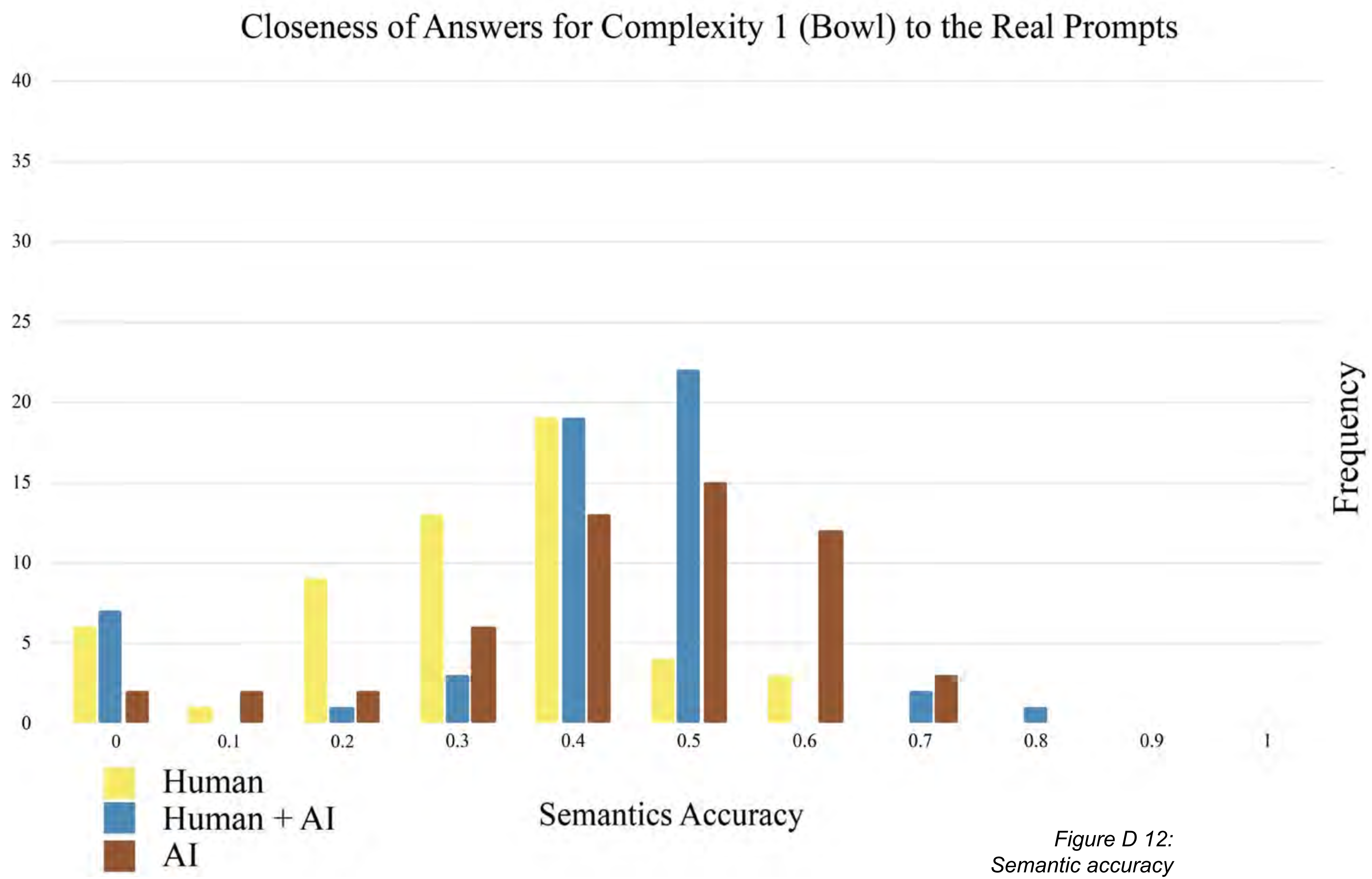


Figure D 12:
Semantic accuracy for bowl

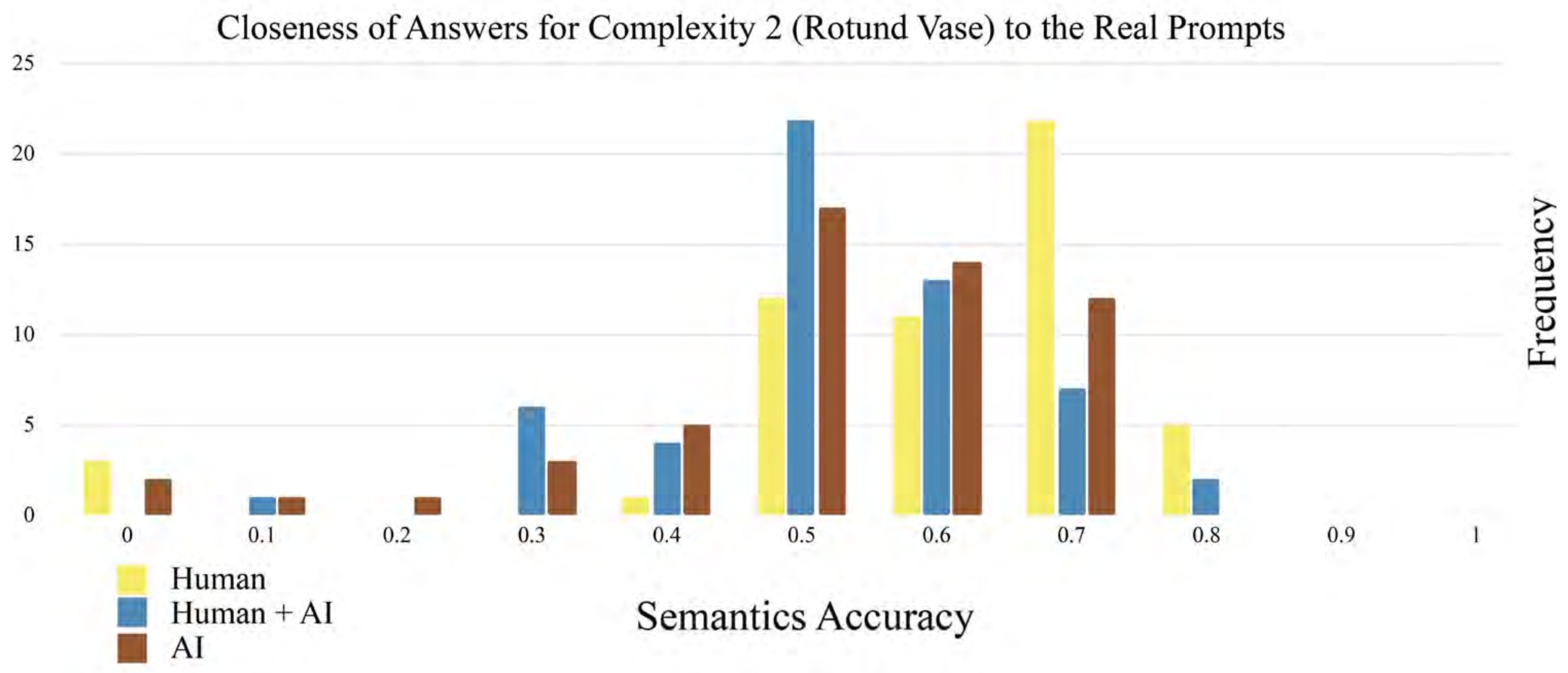


Figure D 13: Semantic accuracy for rotund vase.

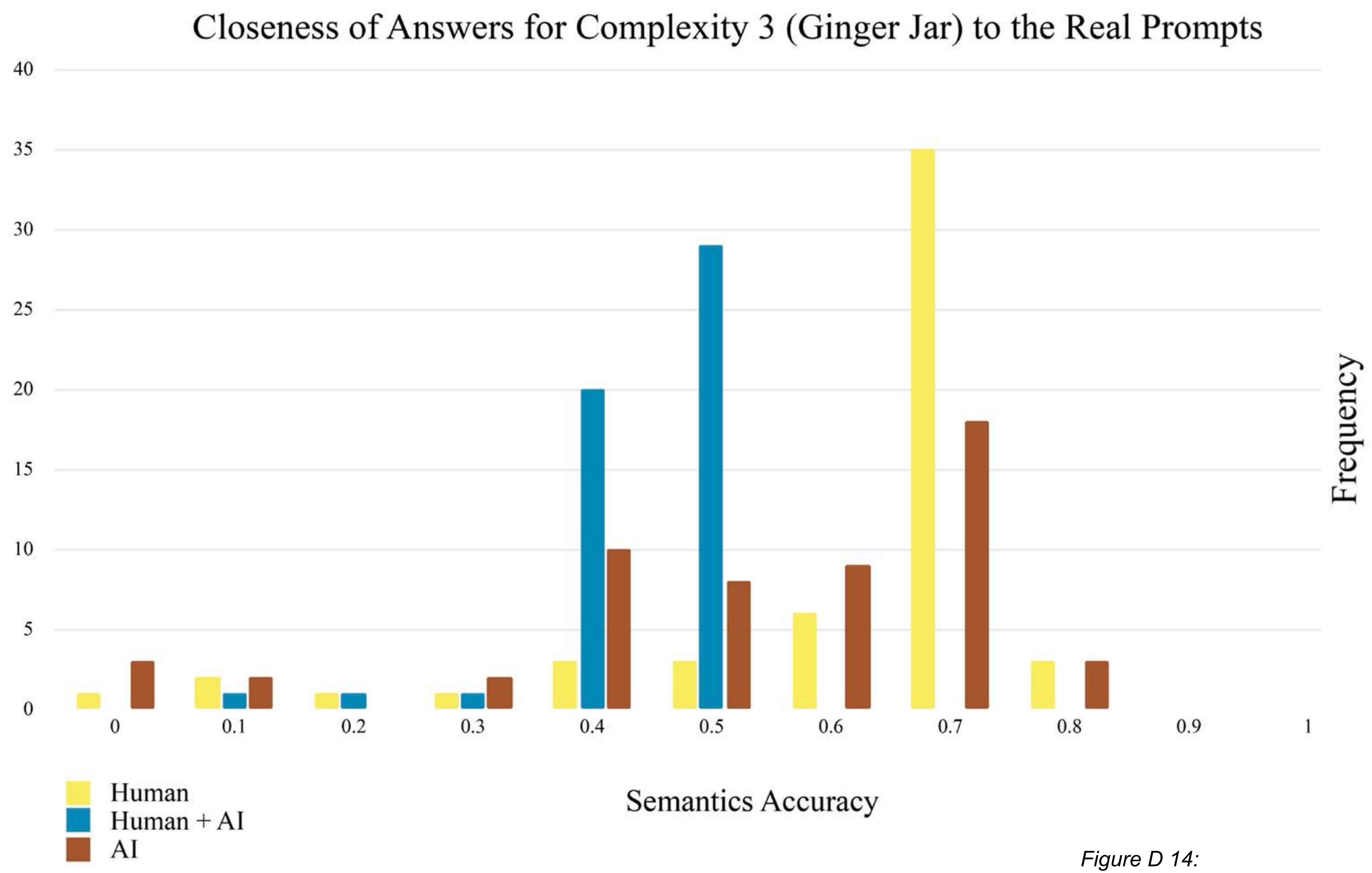


Figure D 14: Semantic accuracy for ginger jar

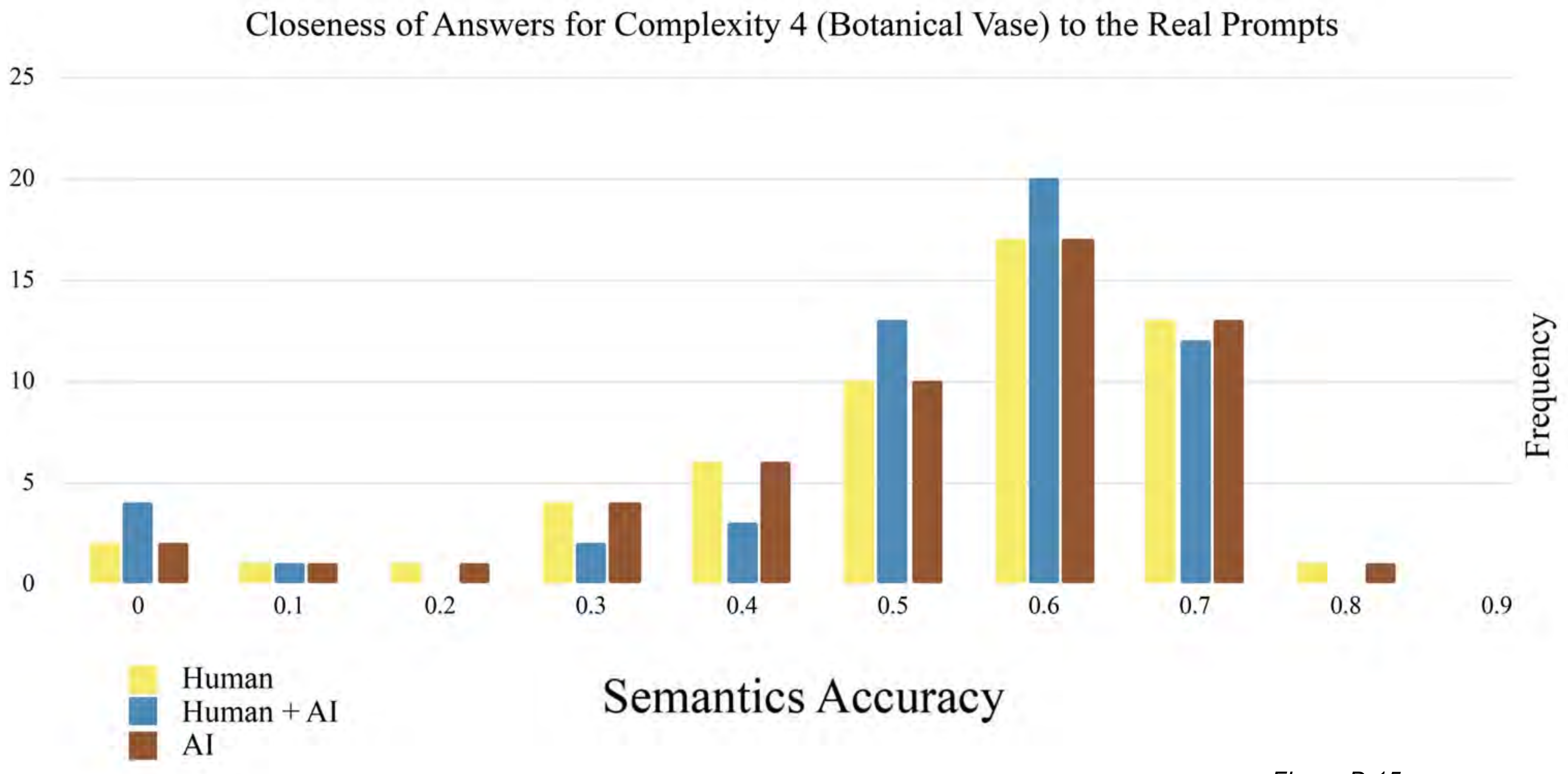


Figure D 15: Semantic accuracy for botanical vase.

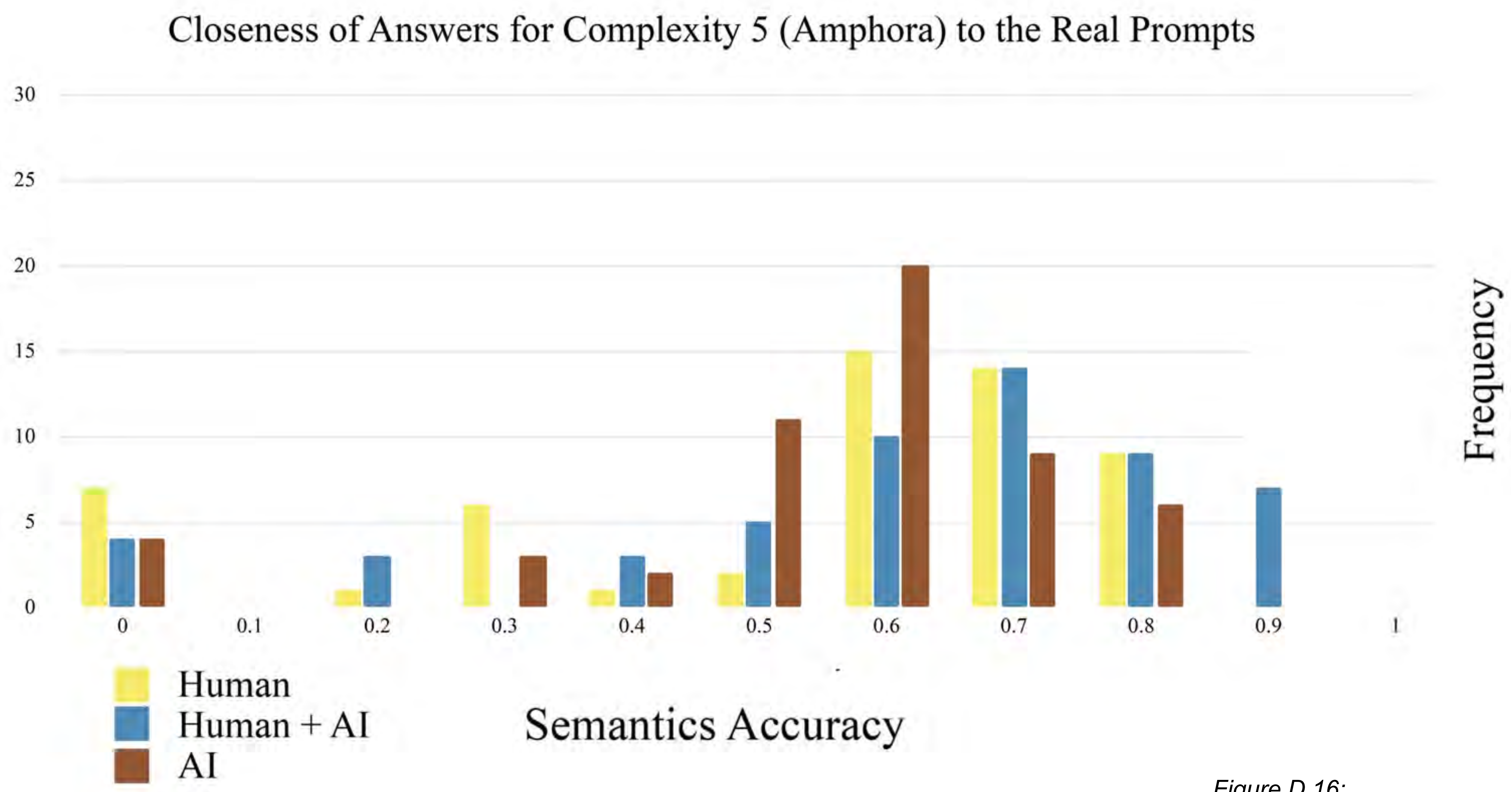


Figure D 16: Semantic accuracy for amphora

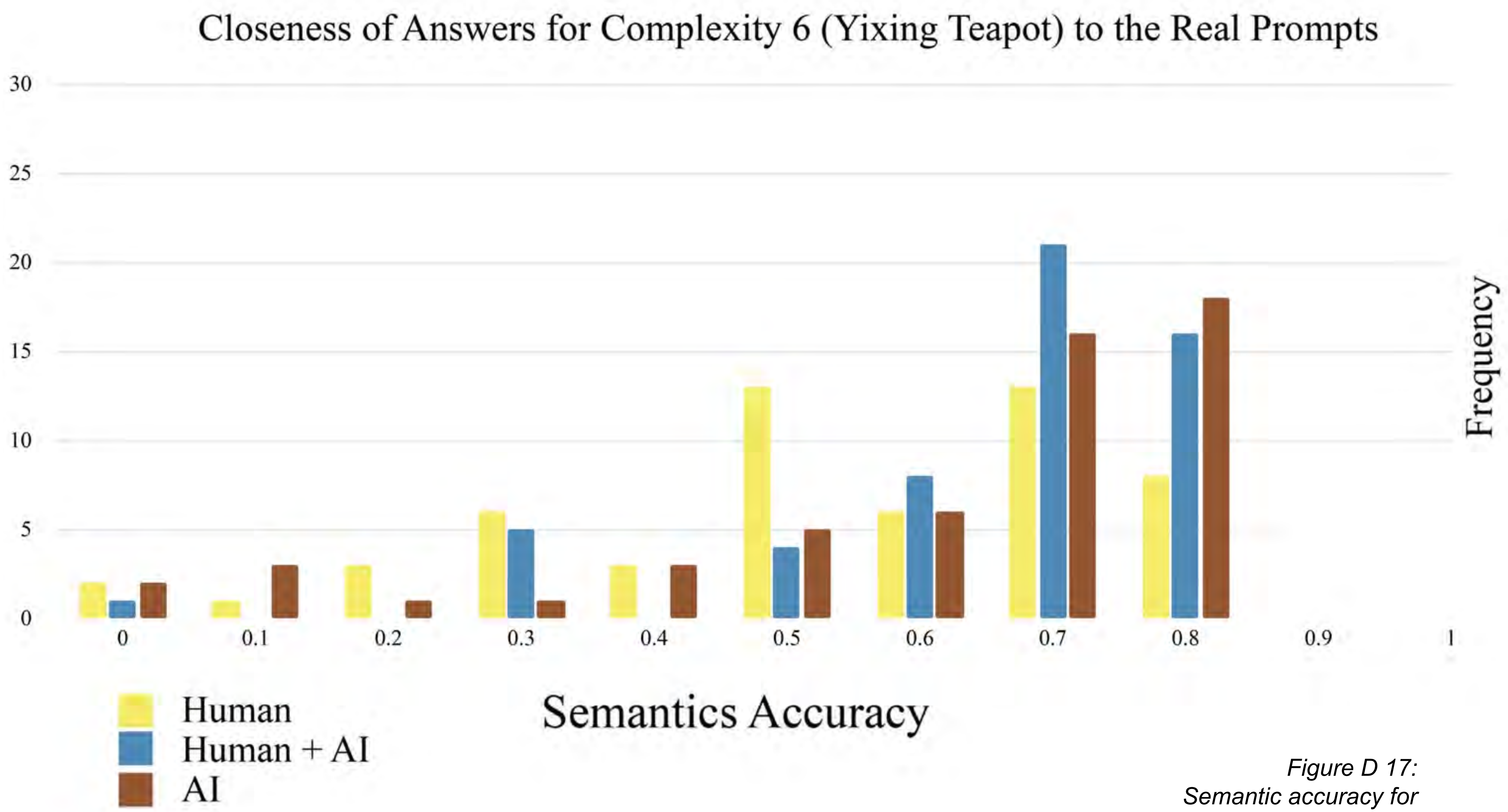


Figure D 17: Semantic accuracy for Yixing teapot.

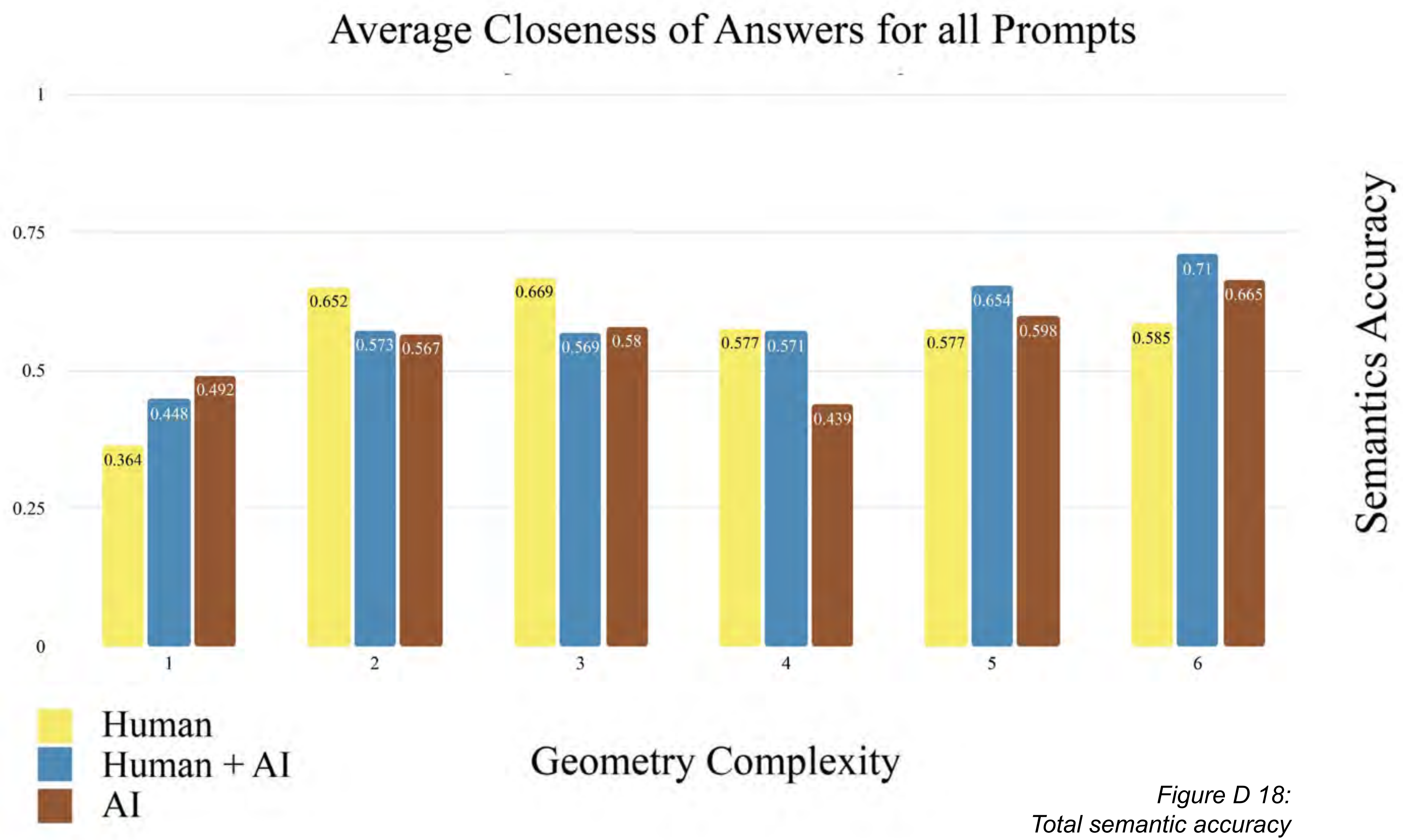
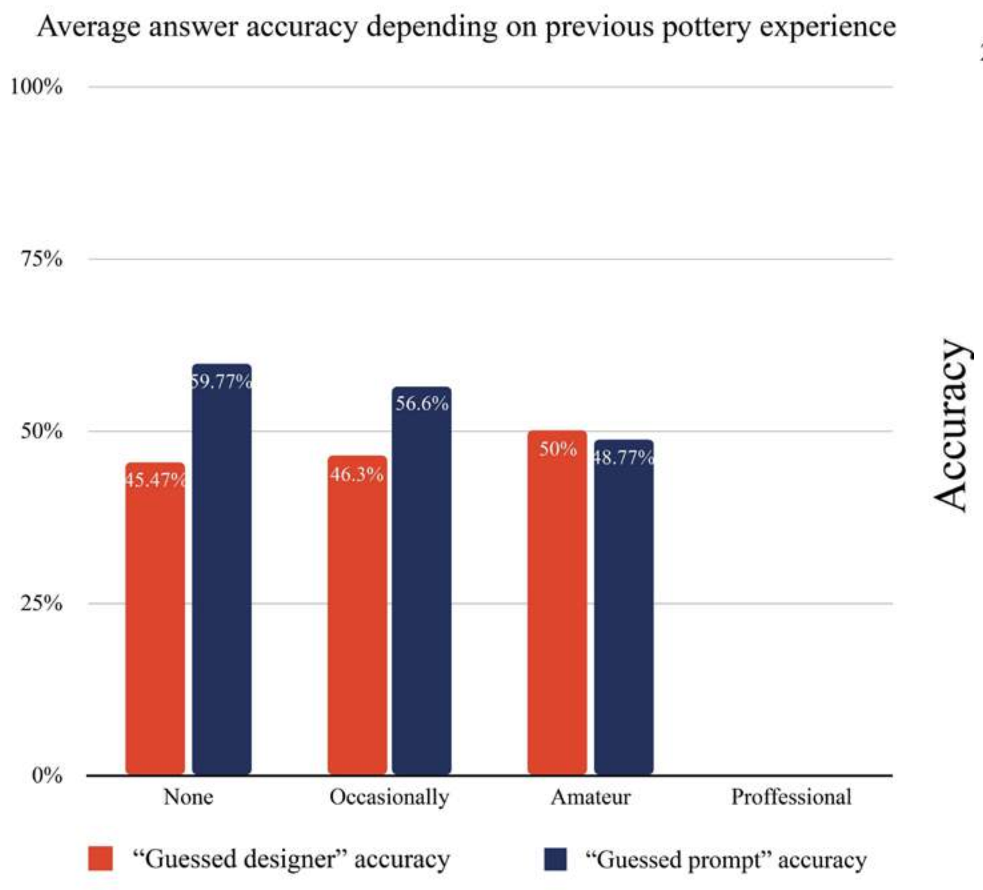


Figure D 18: Total semantic accuracy

Figure D 20:
Effect of arts experience
on answers



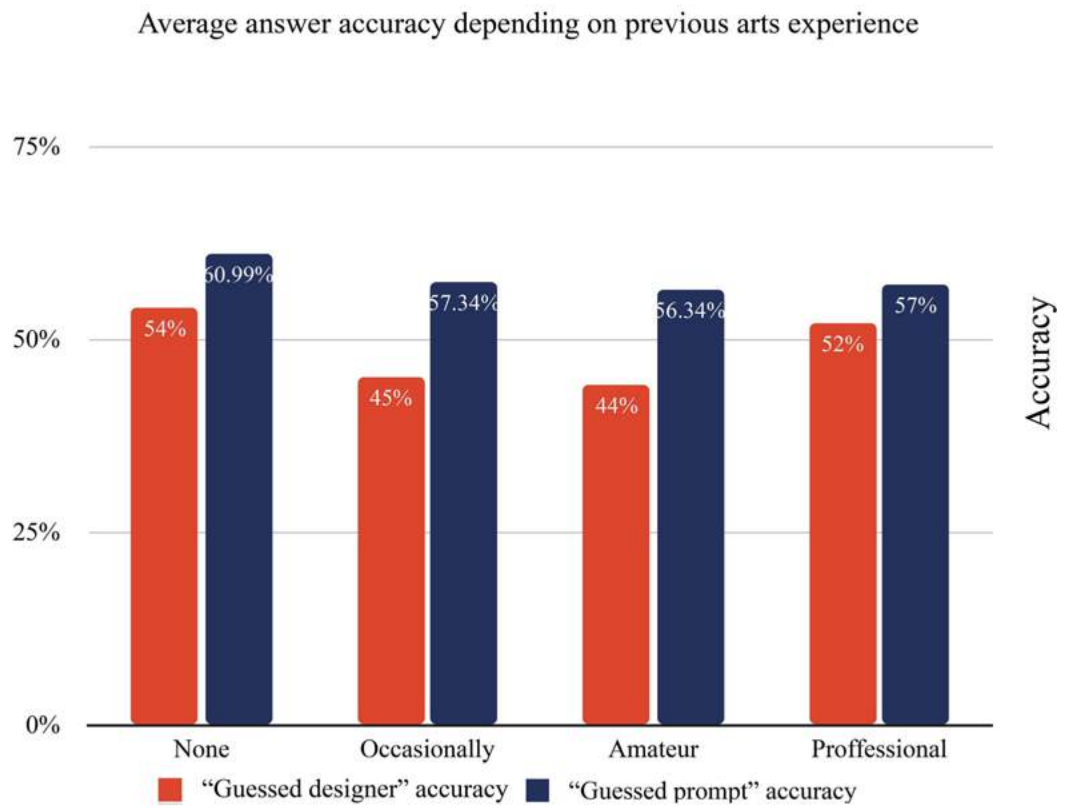
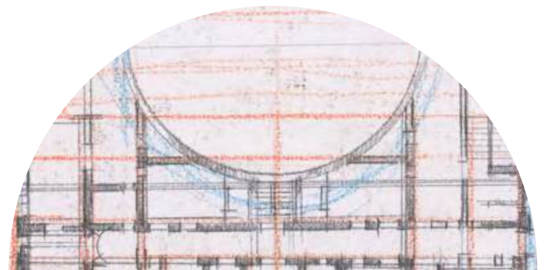


Figure D 19:
Effect of pottery experience on
answers.



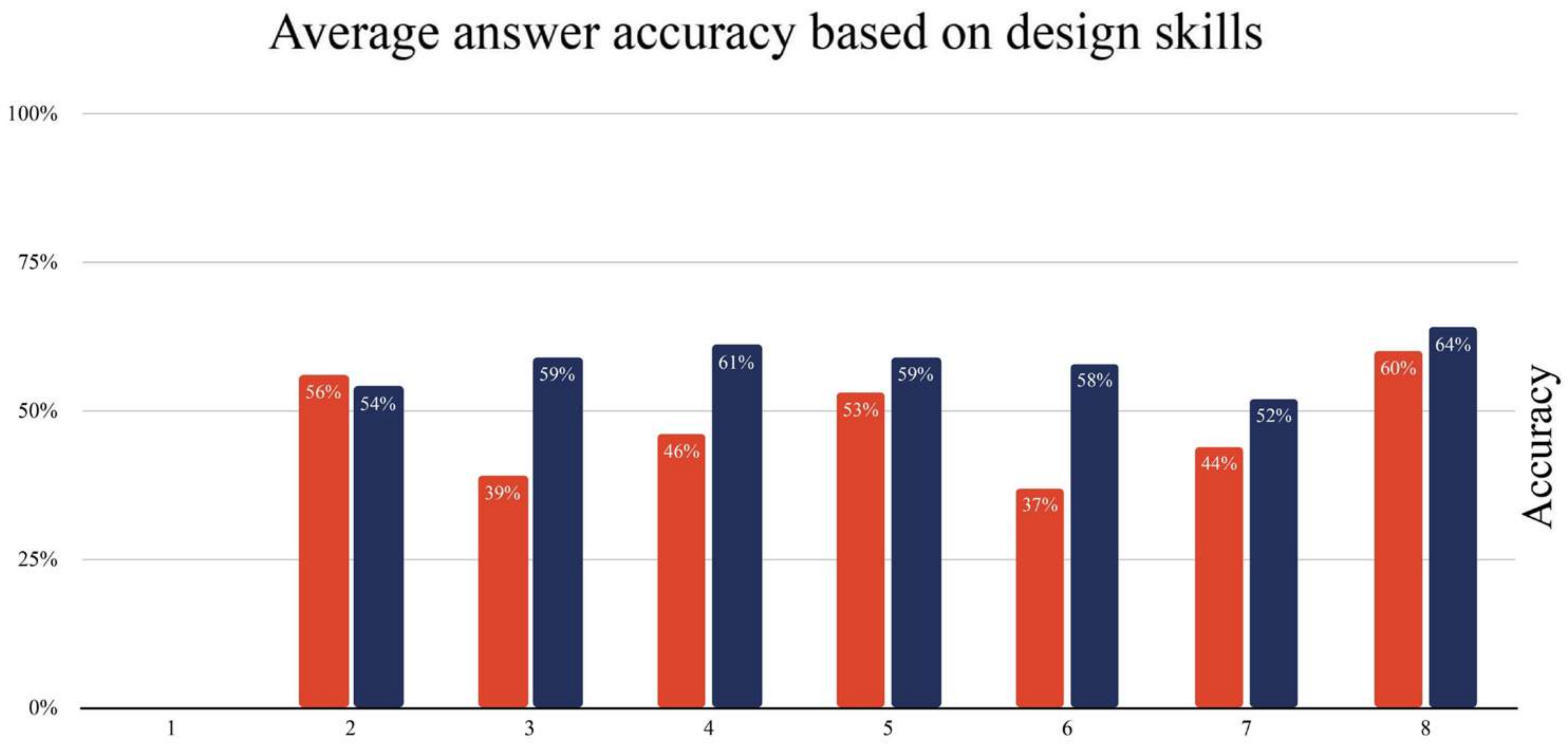


Figure D 21:
Effect of design skills on answers.

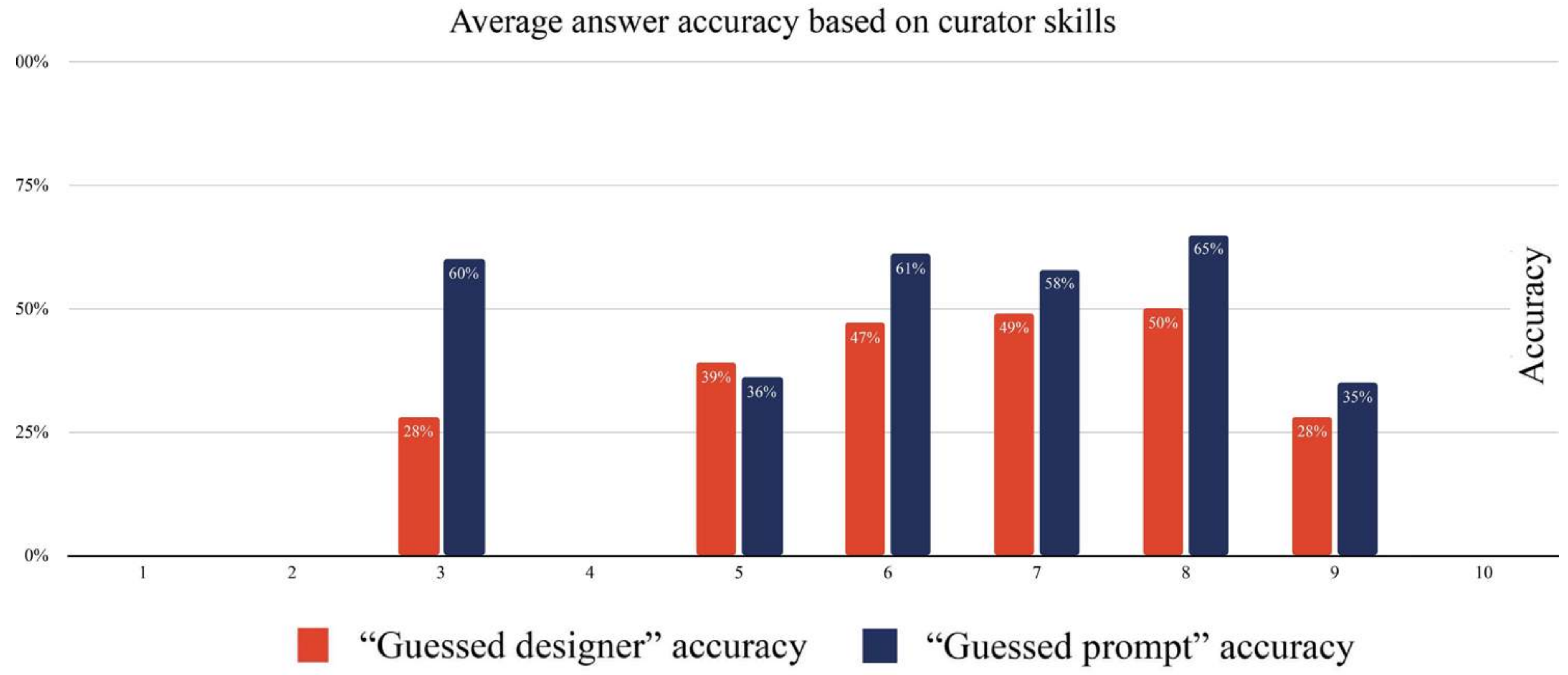


Figure D 22:
Effect of curator skills
on answers

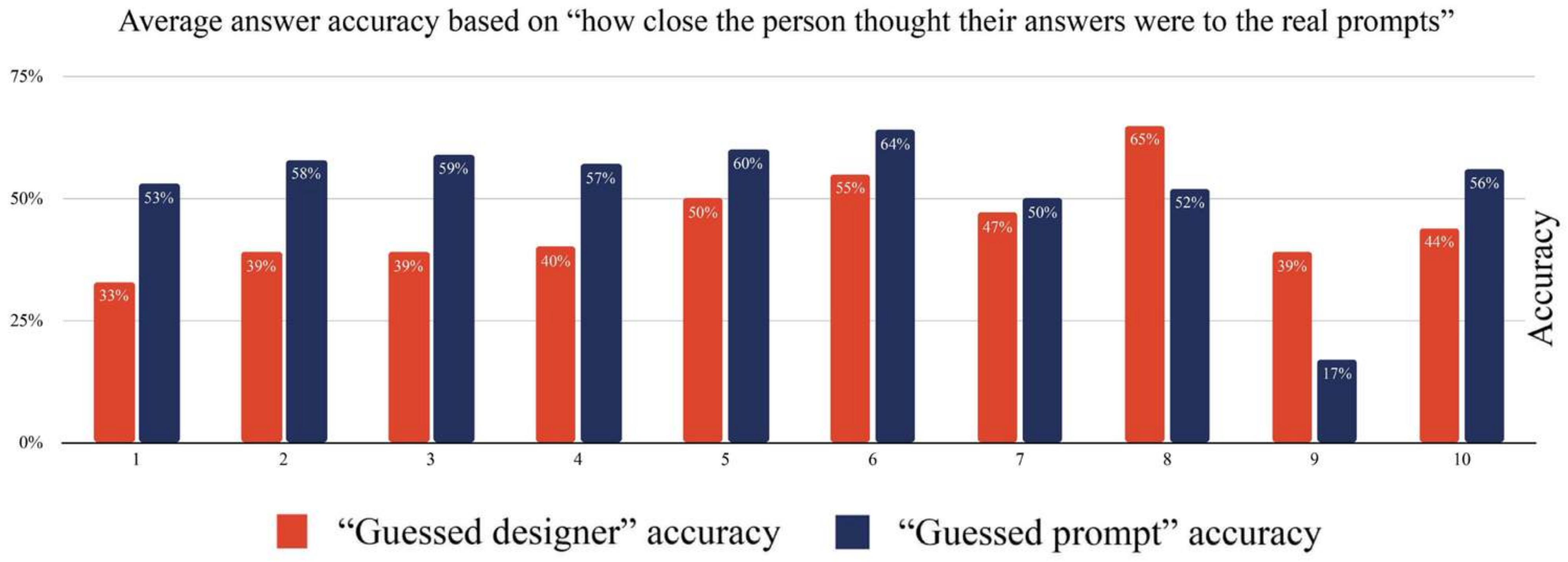
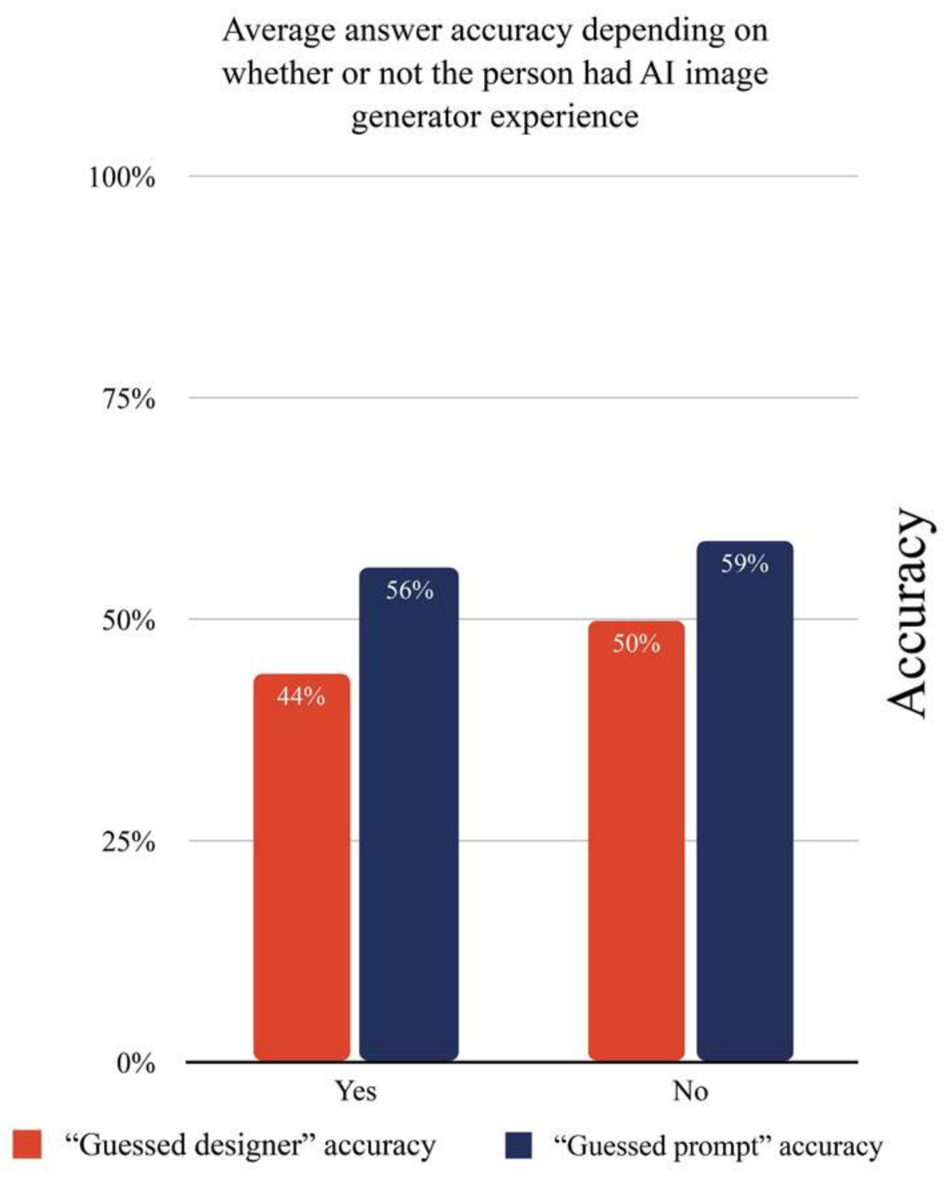


Figure D 24:
Effect of self confidence
in answers on answers

Figure D 26:
Effect of previous AI image generator experience on answers.



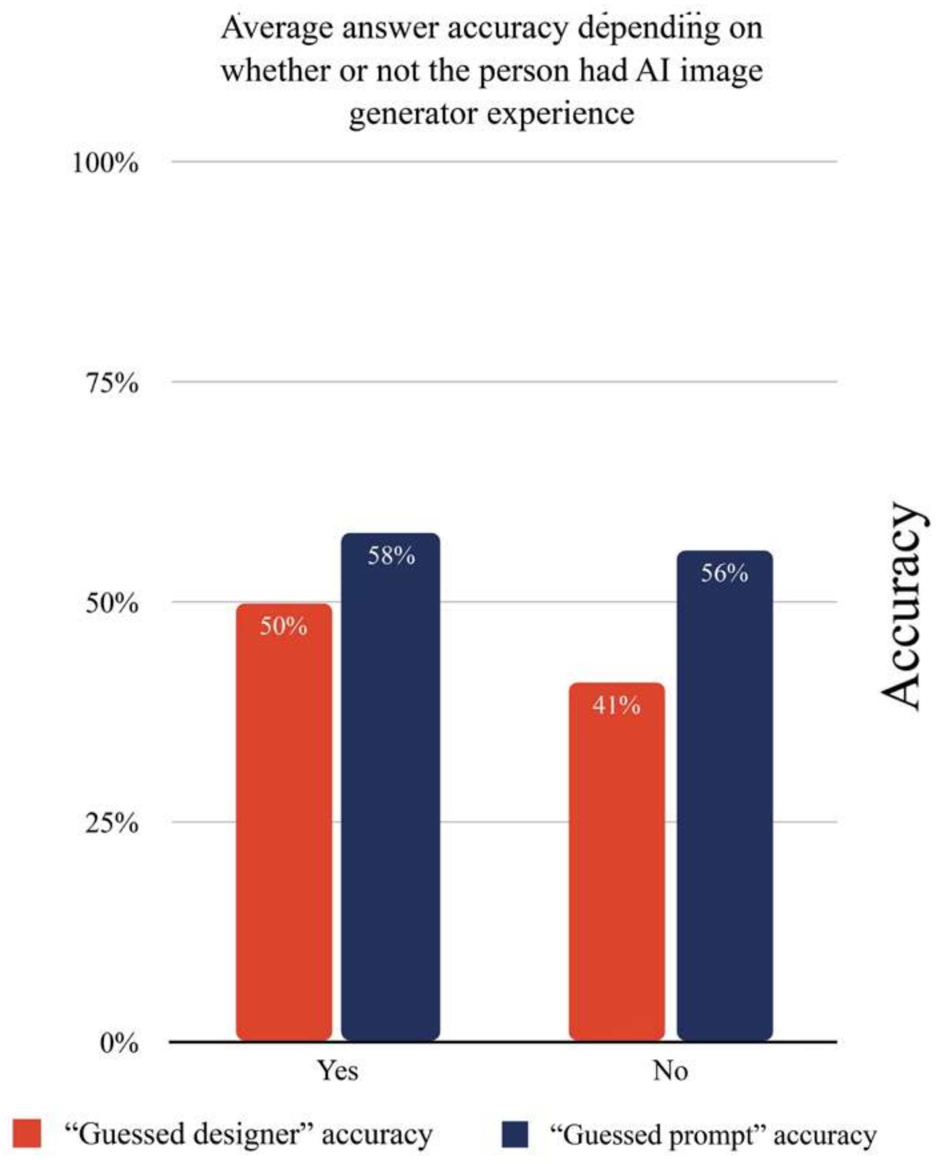
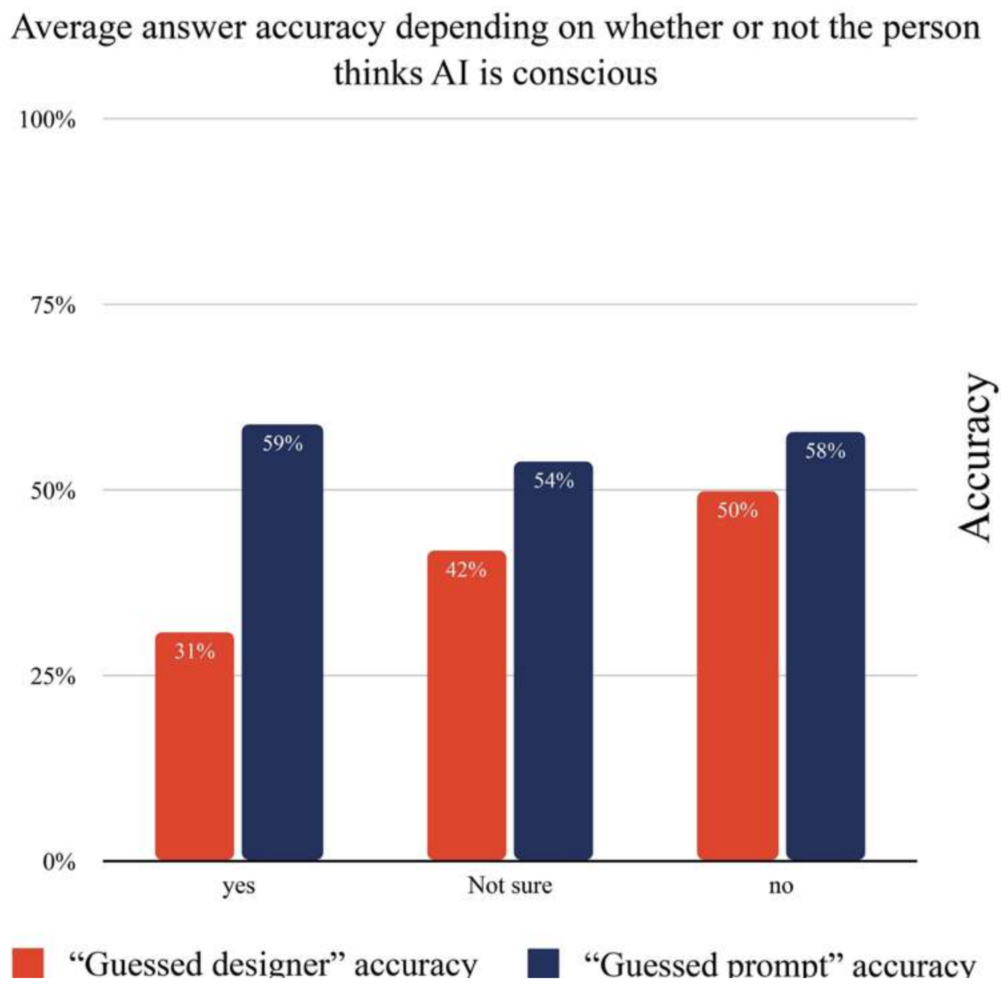


Figure D 25
Effect on answers depending whether or not the participant thought AI was a good designer.

Figure D 27:
Effect on answers depending whether or not the participant thought AI was conscious.



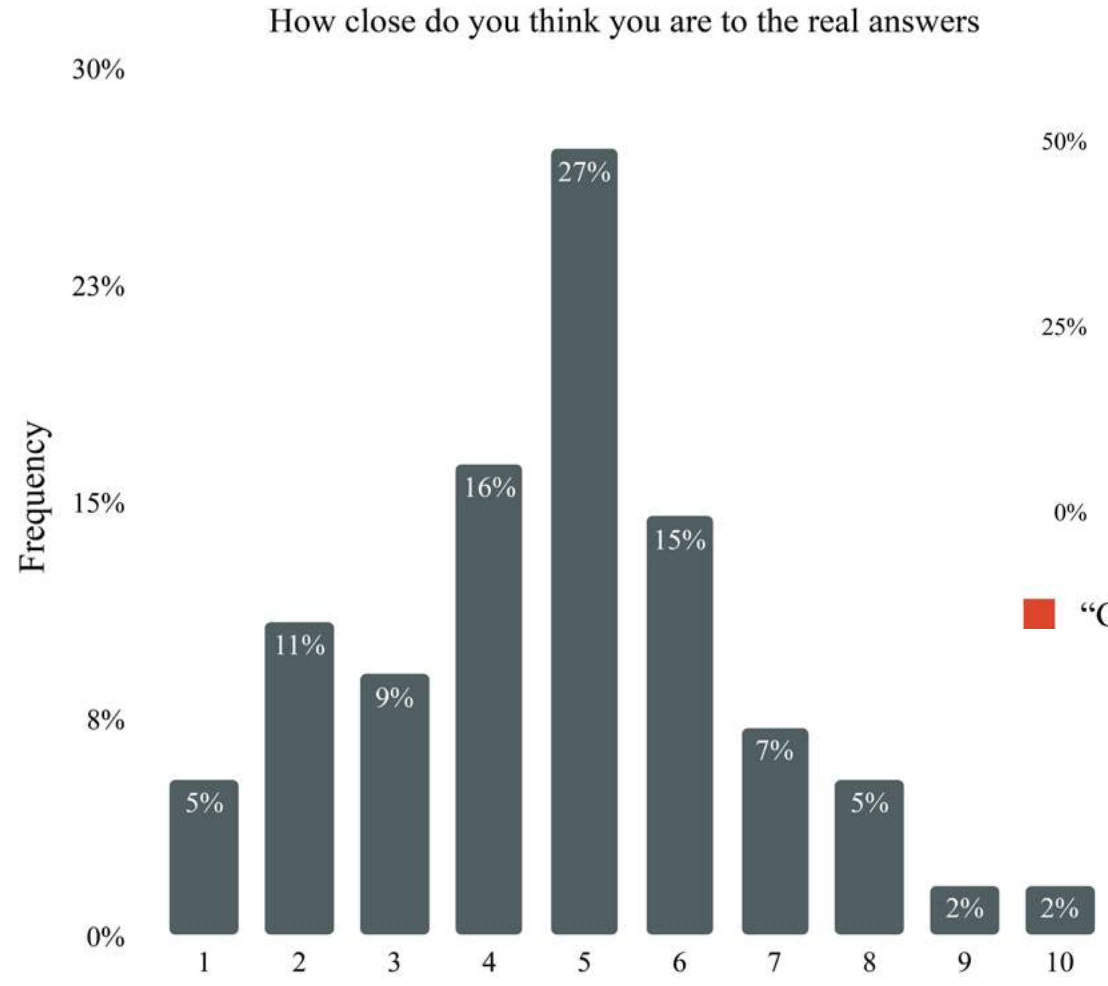


Figure D 23:
How close participants thought they were to the real answers.

APPENDIX E:

Participants' Prompts Input into Midjourney


Figure E 1:
lowest (left) highest (right) semantic score for complexity
1 (bowl)


Figure E 2:
lowest (left) highest (right) semantic score for complexity
2 (rotund vase)


Figure E 3:
lowest (left) highest (right) semantic score for complexity
3 (ginger jar)

Figure E 4:
lowest (left) highest (right) semantic score for complexity
4 (botanical jar)


Figure E 5:
lowest (left) highest (right)
semantic score for complexity
5 (amphora)

Figure E 6:
lowest (left) highest (right)
semantic score for complexity
6 (Yixing teapot)

APPENDIX F:

DALL-E Feedback Loop Results

human designed | **human and ai designed** | **ai designed**

real

put in dalle

Figure F 1:
Real geometry images input into AI to create variations.

FEEDBACK LOOP (future works)
The author put back an image of the made pot into DALL-E, that generated versions of the image of the real object.

APPENDIX G:

Increased Human Touch Prompts and Midjourney Images

Complexity 1: Bowl (ball)

Complexity 2: Rotund vase

Complexity 3: ginger jar (donut)






INCREASE IN HUMAN TOUCH V1
(future works)

Authors original prompt used on all the geometries: realistic photo, 4k, surrounded by natural lighting of 200 lux, black background, ceramic minimalistic white earthenware London clay of a “geometry”* of 15cm high with a base of 10cm diameter, made with rugged, big young hands in 30 minutes, using the coiling technique with coils with diameter of 1cm, human making is feeling creative

*”geometry” is the variable that changes

figure G 1: future works with increase in human complexity in prompts

INCREASE IN HUMAN TOUCH V2
(future works)

Authors original prompt used on all the geometries: realistic photo, 4k, surrounded by natural lighting of 200 lux, black background, ceramic minimalistic white earthenware London clay of a “geometry”* of 15cm high with a base of 10cm diameter, made with rough gestures, with rugged hands that have just been thoroughly washed, big young hands in 30 minutes, using the coiling technique with coils with diameter of 1cm, human making it is feeling nervous, has just been through a breakup.

figure G 2: future works with further increase in human complexity in prompts

Complexity 1: Bowl (ball)

Complexity 2: Rotund vase (ball)

Complexity 3: ginger jar (donut)






APPENDIX H:

Code to Find Semantic Accuracy using Chat GPT

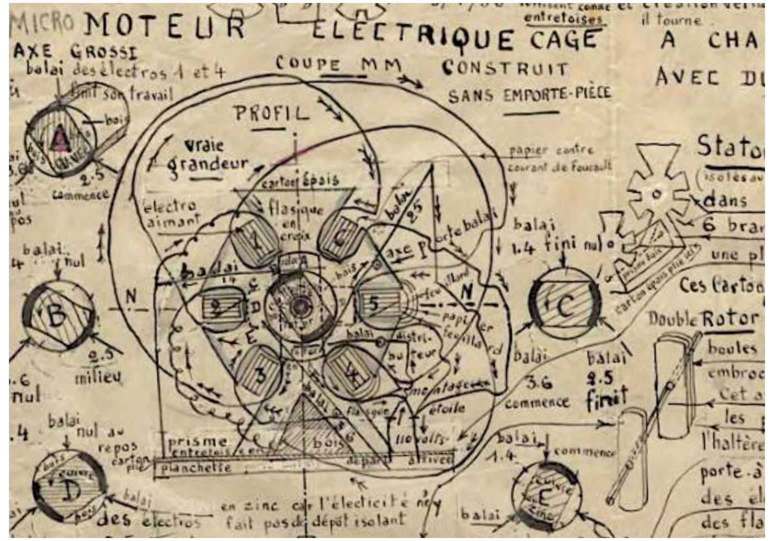
The following text was input into chat GPT
to implement the USE (Universal Sentence Encoder):

Please use the USE model to compare the semantic similarity between the phrase “realistic photo, 4k, surrounded by natural lighting of 200 lux, black background, ceramic minimalistic white earthenware London clay of a bowl of 15cm high with a base of 10cm diameter, made with average sized young hands in 30 minutes, using the coiling technique with coils with diameter of 1cm, human making it has no feelings, is neither happy nor sad” and each of the following phrases:

[paste list directly from excel here in the format of
guess
guess
guess
guess]

Don’t include the code snippets.
Present the answers in a table with the phrase in one column and the similarity scores in another column

Figure H 1:
Jean Perdrizet
Projet pour moteur pour
Table-Tracante, 1972
(detail)



XI. AFTERWORD

Figure 11.a:
AI generated
art deco amphora
(Ostroverhy, 2023)

Figure 11.b:

Maxime Ostroverhy

Born in Paris 2000
Max Ostroverhy graduated in 2023
from UCL, Bartlett School of Architecture
in Engineering and Architecture Design (MEng)
www.maxostroverhy.com

Figure 11. c:
AI generated
amphora drawing
(Ostroverhy, 2023)

Figure 11.d:
Origami Abstraction
Posca markers on paper
(Ostroverhy 2019)

It could well be be the subject of my next dissertation.

Challenging the AI-Artist

Prompt used:

geometric abstraction dark red yellow gray gold okker 9 triangles style vertical A4 compositions 4k irregular shapes oil painting poliakoff nicholson

Figure 11.e:
Origami abstraction
AI generated image
(Ostroverhy 2023)

"The most beautiful things
are those that madness prompts
and reason writes."

Sophocles

Figure 11.f:
AI generated
antique greek vase
(Ostroverhy, 2023)

Figure 11.g:
AI generated
art deco amphora
(Ostroverhy, 2023)

DESIGNING WITH AI
by Maxime OSTROVERHY
Low resolution, Online version
by Kommanda Crew
London 2023
2nd Edition