Will artificial intelligence make designers obsolete?
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Introduction

Artificial intelligence is a topic that is perceived between great euphoria and pure dystopia, and on the technical level between surprising functionality and frustrating technical failure. Especially in design, we as users have probably all been surprised by the functionality of a good AI interface – and at the same time desperate about things like supposedly intelligent speech assistants. As in practically all disciplines, there is a growing debate in design as to whether and how the use of AI will change not only the perception but the professional practice itself: Will artificial intelligence play a decisive role in the design process – or even make the human designer obsolete?

Especially the described uncertainty (outside of AI research) about the technical state of AI and also the emotionality of the debate (which is also reflected in popular scientific literature) makes it necessary to consider the use of AI systematically and under consideration of the actual current performance of algorithms. In the following, we will first explain how an AI algorithm achieves its intelligence[1] and then discuss what the decisive abilities of designers are.

How does an AI algorithm learn?

In order to be able to discuss the capabilities and potentials of artificial intelligence, it is necessary to understand how an algorithm becomes an intelligent algorithm. According to the current state of the art, three things are crucial: computing power, data and the ability to learn. The data must be of high quality and available in extremely large quantities. An AI algorithm learns from a large amount of data (deep learning): For example, if you train the algorithm with a large number of cat photos, it can learn what a cat looks like.[2] Based on the data, an algorithm can not only identify things, it can also reproduce new, similar artefacts: If an algorithm is trained with images of a certain artist, it can create its own work in the same style based on this data. A famous example from AI research is an algorithm that created its own painting based on 346 paintings by Rembrandt. The result reveals both, the enormous strengths of the algorithm (on a visual level, the painting is – at least for non-professionals – indistinguishable from an original) and its first weaknesses. The algorithm has produced a work that is based on Rembrandt's data – it is therefore a portrait of a white man who is depicted with a serious look in typical clothing (see, for example, Dollens 2019). Whether an algorithm would be capable of creating a surprising work based on the data will be discussed later.

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[1] The detailed definition of the term would go beyond the scope of this paper, which is why it is not discussed here.
[2] Typically it is not disclosed from which criteria an algorithm learns – the so-called "black box" phenomenon.

Thus, an AI algorithm learns from a large amount of data and can – depending on the quality of the data – learn and reproduce something from it. A deep learning algorithm can thus continue any existing design in a consistent way – only in a consistent way – just by analyzing a large amount of data. In music, the ballad "Break Free" (with currently more than two million YouTube clicks) from the album "I AM AI" can be cited as an example: Apart from the lyrics and human vocals (by Taryn Southern), the song (like the entire album) was composed and produced by an AI named Amber – based on the analysis of existing pop music (Webb 2019: 26).[3]

Thus, especially a design context in which a large amount of data can be gathered from possible examples, and where many recurring elements (in the example of music: chord and harmony sequences, rhythm, etc.) are present, is a simple task for a deep learning algorithm.

Design in the context of AI

In order to define and evaluate the role of AI in the design context, however, it is first necessary to discuss what design actually is, which leads to the realization that, surprisingly, there is no clear definition of the term (Erlhoff, Marshall 2008). Depending on the language area and context, design can mean both, the construction of complex systems and the painting of fingernails: it is simply not an unambiguous term.

However, it can be stated that design is generally characterized by transforming an existing state into a future, desirable state (Fezer 2018) and thereby solving a more or less complex problem. This requires a creative process whose results can be ideas and concepts on the one hand and artifacts on the other – or even lead to inactivity because the process cannot confirm the originally formulated problem as a real problem. In this sense, design is not an action that necessarily has to produce something – the focus is primarily on analysis, understanding, and decision. Furthermore, design always has a form of context: since design interacts with the world, design always has consequences for individual or social behavior. Ideally, the creative process is thus characterized by empathy and understanding and also has an ethical and moral dimension. Especially the history of design shows that design has always tried to act exactly in this socio-political space: Again and again, design trends or epochs focused on solving existing social or political problems (which unfortunately partly resulted in the creation of new problems, which confirms Bazon Brock's thesis that problems cannot be solved, but simply replaced by new ones [1988 quoted by Schiepek 1991: 28] on a very applied level) – the quality of many designs is not to be seen in their form, but rather in their vision, idea or attitude.

The design process can be described as a kind of prism: In the process of problem-solving (the term "problem" can also be used to refer to profane scenarios), the search space is first enlarged. Through the combination of creative knowledge and intuitive

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[3] Especially considering the fact that the reception of music by streaming providers creates huge amounts of data, such an AI could of course still be adapted to the listening habits or preferences of a possible target group.

processes, designers can enlarge the search space and shift problem definitions (Nestler Et al. 2020): The design process is characterized by the fact that not simply an artifact is produced, but rather, perhaps also through forms of research, initially characterized by know-how and knowledge, an attempt is made to understand the context – for example, on the situational or socio-political or ecological level – and the background of the problem. The often fragmentary work of design, which can oscillate between intuitive work and systematic testing, is characterized by a multi-perspective view that is able to identify and understand problems and then produce artifacts or – think of the field of service design, for example – processes or ideas in return. Moreover, design can help to look at the really complex problems – what Horst Rittel calls "wicked problems" (Rittel 1971).

Algorithms in design

In contrast, algorithms are currently playing out their strengths in the design area wherever patterns can be quickly identified.[4] If we take the editorial design, and here specifically the design of magazines, as an example, this can be explained in a simple way: There is – of course depending on the topic – a simple system of a repeatedly similar arrangement of text elements on a large cover photo above which the magazine title is written. Based on a large data set of cover photos, an AI could thus (probably faster and not worse than humans) create its own cover photo and – based on the current developments in image and text generation – also generate own photos and headlines. The repetition of known design patterns is thus a task that an AI can perform.

An AI can even create something disruptive, "new".[5] This disruption, the disregard of known principles, is the basis of important developments in design history, e.g. the beginning of modernity (or even the postmodernism that followed).

How do you teach design?

The decision about the quality of the disruptive or new design is again shaped by human feedback. Because no form of true self-reflection of an AI exists yet (which leads to the question of whether self-reflection without "self" is possible at all). Here we will again discuss the (current) learning process of an AI: Even if we hypothetically assumethat an AI is in principle capable of learning everything that a human being can also learn – the problem remains that there are hardly any defined criteria for the quality of design.

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[4] In the context of web design, for example, a clear creative convergence of websites can be observed (Goree 2020).

[5] An example: For the Chinese game Go, an AI (AlphaGo) was developed that learned the game based on a data set of 100,000 games and was thus able to defeat human players. In the next step, another AI (AlphaGo Zero) was developed, which was trained to exercise a kind of judgement and thus learned the game against itself within 70 hours of playing and achieved the same playing strength as AlphaGo. In another attempt AlphaGo reached a new playing strength and discovered completely new strategies in the game (Webb 2019: 58-64). The system was thus able to teach itself things that were not developed on the basis of existing data and was thus able to develop something new.

Of course, in design – unlike in other creative activities – the quality of a design can be assessed by the mere functionality, but even the concept of functionality is much more complex than it seems at first: In no case functionality is restricted to practical functionality. A chair naturally has the function of a seating furniture. But depending on the context, it also has a symbolic or even political function. Depending on the design, the symbolic function can overlay the practical function – it is worth remembering some design classics such as Philippe Starck's citrus press "Juicy Salif" (on the concept of function, see Steffen 2000). As the gap in the literature on design didactics already suggests, a concept for conveying good design is already missing in the education of humans – there is simply no definition for good design.

An AI can create things at an insane pace, but cannot develop a criterion for the quality of design without human feedback: On the one hand, because the criteria cannot be verified objectively (or at least intersubjectively) – on the other hand, because the evaluation of design goes beyond the formal criteria: "Our aesthetic values are difficult to
recognize, more difficult to put into words, and even more difficult to state really clearly" (Boden 2004: 10).

In the teaching of design and creativity feedback is crucial – this begins already in the infancy, where children form their personal learning experience on the basis of their parents' feedback and the appreciation of a creative achievement. This feedback is capable of steering the learning process – a central element, which is reflected in university settings as well. In these settings we observe that small student groups are very teacher-fixed (see also the principle of the master class).

Problem-solving AI?

As shown above, besides the creation of artifacts, the bigger challenge is to find, understand, and solve problems. To consider this problem-solving in the context of AI, it is important to get an overview on the most important skills. It is crucial that – as Michael Erlhoff and Timothy Marshall put it – only basic knowledge is necessary to solve problems: "Rather than needing to know all that there is to know in a discrete field, design needs to know 'just enough' of the multiple perspectives that frame and shape any project." (Erlhoff, Marshall 2008: 108). But even if this knowledge – between knowledge and knowing – is profound, it must be conveyed to an AI. Intuition, experience, and empathy are fundamental skills for the creation of a problem-solving design – and at the same time skills that an AI can hardly have at its disposal with the current state of the art.[6] Information density is also a problem in problem analysis and problem-solving according to the current state of the art: cultural peculiarities, site-specific problems, ecological consequences, political context – to name just a few examples – are information that can significantly change a design process.

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[6] One could still argue about "experience", since an AI is in principle capable of transferring knowledge.

If design is understood as a process of problem-solving and if the ability to handle wicked problems is recognized, then this is exactly where the great weakness of a possible AI is to be seen and, based on current structures and developments in the training of such AIs, no elimination of this weakness can be expected in the near future. If design is understood as something that goes beyond mere shaping, design will not be seen as an action or process that is replaced by an AI. The use of AI in design reaches a limit when the design process is not limited to the mere creation of artifacts and existing paradigms are to be questioned and newly developed (in unknown and undescribable ways). In this context, already the problem-finding process itself is a problem that exceeds the possibilities of AI.

Conclusion

This paper is based on the fact that the discussed topic is undergoing rapid technological change. As a consequence, the present argumentation is based on current technological capabilities and can therefore become obsolete at any time. However, the current state of the art already allows the conclusion that the use of AI will change design as a discipline and will have an impact on the professional situation of designers.

AI-based assistance systems are already used in design processes to facilitate them. It is foreseeable that especially repetitive activities, which make up a large part of the actual professional practice, can be quickly replaced by AI systems. This repeats a development that already took place during the time of industrialisation: The first step was the so-called "deskilling" – the targeted fragmentation of work steps in order to be able to automate complex processes more easily, and the next step was the replacement of human labor (Frey/Osborne 2017). From this knowledge, conclusions can be drawn for the training of designers: The competence of mastering simple design tools for repetitive exercise is negligible. Instead, even at this early stage, there is the chance to turn the capabilities of an AI into a competence in design. For example, especially the question with which data an AI has to be trained to make it act fairly (sexism and racism are major problems in the application of AIs), should be discussed in design. But also the professional training of the AI – i.e. the teaching of design skills to develop a functional assistant – should be anchored in the design process.

Nevertheless – to answer the initial question of the paper – it is argued here that the core competencies of design cannot currently be taken over by an AI: If we understand design as a competence of problem recognition and solution and accept that one of the most important abilities of design is the multi-perspective, partly intuitive and experimental and above all emphatic approach, then currently AI is rather to be seen as a fragment in a design process. The answer to this question is thus inseparably linked to the definition of design: one's own understanding of design answers whether AI will make a designer obsolete.

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