

# THE ROLE OF AUGMENTED INTELLIGENCE IN DEBUGGING MENTAL MODELS

## ABSTRACT

As new intelligent machines evolve, new possibilities reveal and change the ways we think and behave. They not only improve the products we design. They also enable new design methods and tools for a more efficient and productive process. But how can this technology be used to get a deeper understanding of the user's perception?

## INTRODUCTION

For a long time, humans and machines have been working together. Machines helped to become more productive by performing tasks much faster and more precise than humans could. It started very simply, but as technology evolved, the machines became more complex and were able to produce products from start to finish.

For decades computers have been controlled by humans and they functioned like they were told to. Machine learning offers a new way of programming such systems. Rather than a hard-coded algorithm, the system is trained with data and builds his own algorithm for decision making. This creation is what we call today an artificial intelligence.

Where are the possibilities, advantages and barriers of working with an intelligent system in a creative process such as designing? The way how these machines can

“think”, changes the way how we work with them. Therefore it is key to fully understand the patterns of decisions and create new processes to integrate them in the workflow.

Especially in the field of design, the idea of generating designs by non-humans are intriguing and frightening at the same time. It could mean to be more productive in terms of producing higher amounts of variations or content. This paper discusses the ability to widen the perception of designers to perform a greater look into the users' interaction. Working with intelligent tools also changes the ethical and moral behaviour and takes a greater responsibility towards the user. Now there is to decide in which ways machine intelligence can support the designers.

Probably a lot of designers already use systems which are machine learning-driven without knowing. They might often start with a little search on Pinterest to get the initial spark for their design project. The search engine of Pinterest already features a deep learning algorithm for its users. The user feeds the algorithm with information. On the saved pins and searched keywords it tries to predict the best recommendations (Cristiani 2018). That means the design process already starts with bias based on the preferences of the designer.

Thinking designerly allows the designer to conquer very different topics and themes because it is key to summarize an issue, focus on mediation and not be a specialist (Romero-Tejedor et al. 2010, pp. 157–60). In the context of product development algorithms might already shape the subconscious in a direction. It does not have to be for the worse but it might compromise the originality of creativity or misses the mediation.

This paper tries to define the possibility and constraints of intelligent co-working processes in the field of design with the focus on moral and ethical correctness.

## DESIGN METHODOLOGY

Design methods have been around since the mid 20th century. One of the first ideas to establish a system for

analysing design problems were developed by the HFG Ulm (Hfg ulm, n.d.). Today well-established routines in the design process. The methods describe principles and practices to define a certain problem, create prototypes or solve use cases. They have become an important role in the design process. Structuring the process with different practices helps also other parties to follow along because the whole procedure gets more transparent. That has democratized the design process. As everybody is able to participate in them.

## AUGMENTED INTELLIGENCE

With the rise of the computer technology machines were able to perform logical tasks and operations. But still, they were not able to think as complex as humans. In fact, they were still working as a mechanic machine but on a digital base. To solve more complex operations in a human-like way, there was a need for new techniques and algorithms. The first ideas were already developed in the mid 20th century. Due to the missing computation power and hard-drive storage, machine intelligence came to bear over the last decade and opened a whole new field of possibilities for computers to take action.

The first framework to build and test intelligent systems goes back to Alan Turing. Turing's idea proposes a test: A person asks questions to an unknown person to determine whether it is a real person or a machine. If the interrogator believes a machine is a person. The machine shall be called intelligent (Anyoha 2017). Today there is a wide range of intelligent systems, but what means intelligence in that case? The intelligence describes the cognitive capability of beings, but when we speak about machines the meaning differentiates from common sense, because of the usage in a different context. So far artificial intelligence is not necessarily related to beings, that is why their intelligence is weighted differently compared to human intelligence (Neumaier 1994).

Today there are several models to create intelligent systems. All refer to machine learning. The ways how to learn is depending on the model. What they all do, is to classify data based on the given information in the form of training data. With that in mind and in relation to the Turing's Test, it could arguably be described as "narrow-minded" compared to human capabilities. Even if it is trained to behave like a human and is not (yet) capable of adapting like a human.

If we put this into perspective, we as humans, are still the architects of those systems. As we are deciding what it can and can not do (Stringer 2018). Therefore the paper proposes the term augmented intelligence (AI) to avoid misconceptions about the ability of intelligent systems.

## REFLECTION ON THE CURRENT STATE

Today already a lot of companies use AI in or for their products in a wide range of fields. This technology is often used to create variations, personalize or classify content. For example, uses Netflix machine learning for personalizing recommendations and visuals (Chandrashekar et al. 2017). They try to predict what the user likes the most to give the best possible experience and to maximise the time on the platform. In order to achieve that the system needs a lot of data about the user. This data can contain sensitive information and puts the companies in a position to build trust between their users and their product. Without trust the company can not guarantee the best experience and the product will fail (Van Kleek et al. 2018).

When a company decides to use AI technology within a service or a product, it is most likely used to build custom experiences and interaction. Besides that, it is possible to use the technology in the design process. Most design practices with AI are based on personalized experience or help to find unique designs from similar successful products. The initial idea is to enable a co-working process between the designer and the tool (Philips 2018). Airbnb has already used machine learning to enable such a process. Their tool transforms sketch wireframes into code and generates high fidelity mockups. They also predict interfaces to become more standardized (Wilkins 2017). Basic work can be done much faster because analogue Concepts can be instantly digitized. The risk of standardized interfaces that they will all look and feel the same. The more standardized designs are, the more the opportunity rises to use algorithms for that. Designs by AIs are the result of millions of concepts which have been successful could lead to the "ultimate" design and the only interface. Websites already tend to look very similar. For example Netflix and Amazon Prime. The major difference lies in the content.

The more this technology gets used in the design process the risk to design on "autopilot" is higher. The more assistance we use, the more we tend to fade away from the actual work of investigating and finding new possibilities.

To overcome or prevent this scenario I propose an additional way to use AI in the design process. Of course, AI helps to be more efficient and productive, but it can also help to create more diverse and unique interactions.

## ANALYSING THE DESIGN METHODOLOGY

Designers have a huge pool of methods and practices. Some of them are taking into consideration different user-perspectives. Others help to structure interaction or user-cases. Which methods would have advantages with

an enabled AI co-working process and which tend more to be a “classic” method without any augmented perception needed?

In order to get an overview of methods that could be supported by AI Design methods from the “digital society school design method toolkit” (Design Method Toolkit 2016) were clustered in two ways. In the first step, I analyzed how much the AI could support common methods like wireframes, moodboards or persona. For that, I imagined scenarios based on the method, suggested how the AI can be involved and predicted the impact on the method. In the second step, the methods are sorted whether they are more programmatic or empathetic. These categories are defining if these techniques focus on users and their emotions towards the product, the structure or the problem itself. The results are two schematics describing the link between the amount of support of the intelligent system and focus (fig. 1, 2). The schematics are rather a subjective conclusion because everyone has probably a different approach to how the AI could exactly be supportive.

Figure 1: Clustered research methods

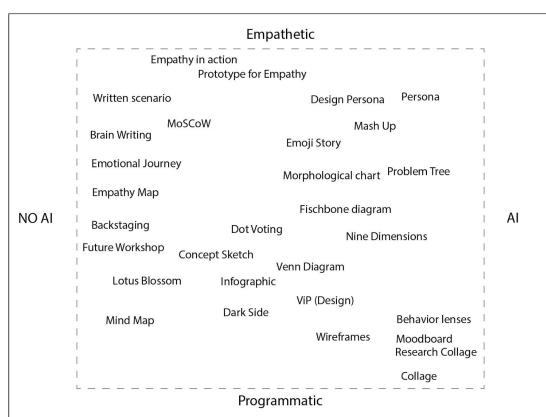


Figure 2: Clustered create methods

Analysing the result, I can conclude that I tend to suggest an AI for programmatic methods more than empathetic. Some have the obvious potential of augmented intelligence, for example, wireframes or behaviour lenses. An intelligent system could speed up

the process by sorting or digitizing. Others are there to define problems or goals for the concept or product. They help to put oneself in the position of the user but at the same time reflect on your current stage in the design process. The line between the parameters seems to be blurry. The most common goal most of these methods have is to find and eliminate blind spots in the design concept. Blind spots are hidden in our subconscious, as they are protecting us for a perception overload (Fenn 2018). Also, the sociological background has a big impact on our blind spots. In “Parteiisches Design” (eng.” partisan design”) Jesko Frezer describes the problem of different worldviews. Every designer has an idea of the ideal world and tries to project them on concepts and products (Fezer 2018). Therefore we make wrong assumptions all the time. This blindness refers to the background of how we have been socialized, which could mean culture, bias, to know better or missing empathy.

In terms of user experiences or user interfaces, that blindness describes the gap of perception and interpretation between the user and the creator.

This finding leads to the concept of mental models. The concept bundles the idea of the methods and problems described above. Jamal Nichols describes mental models as a person’s internal representation of external reality, based on their learning and experience. This representation shifts from user to user, depending on age, experience, social background, etc (UX Design Basics: Mental Models 2017).

The last big change of human’s mental models was probably the introduction of the iPhone in 2007. It accelerated the digitization, shaped the minds of whole generations and transferred our culture in a post-digital world. Since then designers created various designs based on that mental model.

## DISCUSSION

If we consider looking at mental models with the augmented perception of machines, we need to define the limits of those systems and also understand their capability. Looking through the “eyes” of AI on mental models, we able to see patterns and behaviours with an objective view. If AIs are trained with user data each action should be seen as a logical decision in the process. It could predict the paths of users with different mental models. Interpreting this prediction becomes a very important part for the designer. If the machine suggests alternatives which will be added in the design. The designer starts designing with the bias of the system because the system was trained with data, which reflects stereotypes (Buranyi 2017). Rather than taking suggestions, we can ask the system questions. It can present us correlations between actions and users mental model.

When your system predicts that 90% of your user has the correct mental model for your concept, you could ask why the last 10% failed to use your product. Did the users get lost in some actions and gave up or did the system failed to classify them, because the approach of the interface was unusual?

The possibility to build little twists in the experience to maybe change certain behaviours, mix things up to wake up all the users who are currently running on autopilot. It opens the ability to sharpen the view of the user to stay open-minded. You might also be able to overcome biases and gain more trust from your users.

## CONCLUSION

Intelligent machines have great opportunities in the design world. The machine's perception has the capability to overcome our blind spots, our biases and can represent an objective view of the humans we design for. It should not take over the designing but disclose decisions of the user and also justify the design decisions. On the one hand, we as designers can debug behaviours of mental models and on the other hand, we can reflect our own models and debug ourselves.

The research is an ongoing project and is by far not finished. The next step is to define scenarios of the workflow and possible results.

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