The Need for Explainability in AI-Based Creativity Support Tools

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Abstract

A long lineage of computer-assisted design tools has established interaction paradigms that give full control to the designer over the software. Introduction of Artificial Intelligence (AI) to this creative process leads to a more co-creative paradigm, with AI taking a more proactive role. Recent generative approaches based on deep learning have strong potential as an asset creator and co-creator, however current algorithms are opaque and burden the designer with making sense of the output. In order for deep learning to become a *colleague* that designers can trust and work with, better explainability, controllability, and interactivity is necessary. We highlight current and potential ways in which explainability can inform human users in creative tasks and call for involving end-users in the development of both interfaces and underlying algorithms.

Commercial computer-assisted design tools developed over the last 50 years require extensive human expertise and follow interaction paradigms that hinge on the ability to compartmentalize work (e.g. via layers) and undo recent changes. In that regard, the computer has been acting as a "slave" to the designer's process and creativity [10]. The introduction of efficient artificial intelligence (AI) and personalization algorithms have promoted a more co-creative approach, where there is a *mixed initiative* between human and computer, and both contribute to the task at hand [8].

Deep learning approaches have demonstrated an unprecedented high quality in the AI-generated output. The release of such AI libraries as open-source has energized researchers and enthusiasts alike. Deep learning, to a certain extent, has thus become available for artists and designers [3] alike. Indicatively, Adobe has included Neural Filters into Adobe Photoshop. A new wave of "AI artists" use the new technologies to produce novel aesthetic experiences.

However, these deep learning methods are far from tractable; they propose a paradigm of experimentation, serendipity, and manual post-processing. When designers and artists work with machine learning, the onus is on the human to make sense of the machine's output [14]. Several artists embrace that "our world is being created by software we hardly understand" [11] as their artist statement. However, when it comes to more market-driven design tasks such as digital design or game development, it is crucial that more explainable AI (XAI) is provided to the end-users.

Creativity support which relies on AI as a proactive colleague requires a clear channel of communication. Explainable algorithms are thus essential to facilitate that process. In general XAI research, however, there are currently no agreements over key design elements such as level of abstraction [12] and presentation format [2]. Existing algorithms such as GRAD-CAM [13] and conversational agents can add context on the causality regarding why the AI has chosen this piece of content. More research is needed to develop effective explanation support that can be integrated in designers' creative process.

In the field of game development, a number of mixed-initiative design tools [8] have been developed and evaluated, including tools that leverage deep learning [4, 9]. Common usage patterns in such tools have highlighted the need for an XAI for Designers [15], which can be an inspiration for broader

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research in the field of creativity support tools. Research on computational creativity has also studied where the creativity lies in design tools [6] and how to evaluate it [7]. Such research can also be relevant in identifying which aspects (e.g. process versus product) or which questions regarding creativity can be addressed by an explainable AI. It is our belief that computer games offers a rich area to explore issues around explainability for AI-based creativity support tools.

Finally, it is critical that the needs of creators themselves are understood. While technological optimism and corporate agendas drive most of the advances in this field, gathering user requirements is crucial for its adoption [1]. Designing and conducting user studies is thus an important complement to new XAI algorithms. More ambitiously, users (e.g. artists, game developers, fashion designers) can be involved in the process of developing such creativity support tools in a participatory design fashion [5]. As explainability will crucially have to communicate with users of the tool, understanding their needs and when, where and how they would like to receive such explanations is crucial.

In conclusion, recent developments in generative AI have a huge potential in new generations of creativity support tools. This paper argues that a crucial element of research towards this direction is user-centered explainability for the creative professionals.

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