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Narratives of Love

爱的阐释

Narratives of Love
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Preface

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Evolving scenarios of AI in the design practice

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Abstract

This contribution concentrates on how the design work may be enhanced by generative Artificial Intelligence (AI) tools as well as the roles that designers and AI play in their collaboration, considering ethics of human-machine interaction. Recent developments in AI tools foreshadow fundamental changes in the future of the design practice, with concurrent effects including both an increase in the efficiency of creative professionals, and the democratisation of producing creative outputs by non-experts. While AI can be a component of designed solutions, this research focuses the design process itself, examining how AI can be a transformative force of not only for content generation, but also user research and conceptual development. Therefore, we aim to analyse existing generative AI tools for designers and describe potential "AI + Designer" strategies within currently widespread workflows. Initially, this article explores the potential of AI in creative fields, where the authors identify possible roles of AI to improve design work, such as AI as mediator between creative languages, or AI as a facilitator of user participation. Subsequently, the research describes a mapping and benchmarking activity of available AI tools for Designers, categorised by output type (3D, Graphics, Raster, Text, Utility, Vector, Audio & Video) and critically assessed according to the stages of the Design thinking process (Empathise & Define, Ideate, Prototype & Implement, and Validate). The mapping is organised to provide a multi-level perspective, and is divided into four main sections: a list with output-based clusters, info sheets (a product specification document), a map (a visual summary of the tools), and an introduction page. To evaluate the effectiveness of the AI tools during the design process, these were tested by replicating the processes of several projects and their output obtained by repeating tasks using AI tools. Thus, the mapping and testing showed interesting potential of AI tools in some phases of Design Thinking, but also a limited utility in the phases of empathising and validation.

Ultimately, the study focuses on the opportunities and issues of human-machine interaction and raises questions about ethics and copyright, bias and discrimination, errors and the impact on creative processes. The potentially transcendental power of AI over the thinking process poses urgent risks and opportunities, evident already today in various creative domains. Therefore it is crucial to build a strategic foresight and hence a positive vision of AI-enhanced design in order to understand how the role of the designer will change. Among possible scenarios, we conclude with the hope that the innovation model of "AI + Designer" can alleviate technical tasks, help connecting knowledge areas, and understand better people, this enforcing the Designer in the role of "sensemaker" who shapes the culture of everyday life.

Author keywords

Generative AI; Design Thinking; Creative skills; Design tools; Mapping; Benchmarking.

Introduction

The recent developments of Artificial Intelligence tools anticipates a significant change in future design, starting with an apparent democratisation of the creative process, giving non-experts an opportunity to produce creative content, while also facilitating certain tasks in the professional design process. Such phenomena can be seen as an opportunity for a more widespread diffusion of design efforts, but also as a menace to certain professional roles, raising issues about how effective (and meaningful) the "efficient" AI-enabled Design is.

These advances open up opportunities for generative AI to become trusted teammates alongside Designers (Figoli, Rampino and Mattioli, 2022), as experimented also within the ideation process of fashion design (Jeon et al. 2021). AI can be beneficial not only in the initial phases of the design process but also in the prototyping through monitoring and forecasting based on data coming from sensors and equipment (Arinez et al. 2020), such as real-time error detection and correction in 3D printing (Brion and Pattinson, 2022). In a similar vein, designers can leverage AI to enhance user experience, thereby fostering technology drive innovation at both the system and service levels (Yildirim et al. 2022). It is crucial that design works aided by generative AI are adequately aligned with human interests, including not only the short-term interests of a designer or client, but even more importantly the long-term interests of humanity, such as sustainable development or social justice, therefore, this contribution focuses also on potential ethical issues and mitigation strategies of collaboration between design and technology. In particular, we aim to offer a better understanding of currently available Generative AI tools that are useful to design work, evaluating how they can be integrated into the design process, and critically assessing the potential of the innovation model of "AI + Designer".

Participation and Creative Work with AI

While Generative AI in design is still in its infancy, we could already outline four interesting roles it may fulfil in the creative process, ranging from AI as an intermediate between creative languages and the democratisation of visual quality to a facilitator of user participation.

Firstly, AI can serve as a mediator between creative languages, and translate from one creative language to another. Creative languages in this context assume various means of expressing creativity; in design there are mainly visual (such as images, drawings, sketches, diagrams, renderings). However, with the emergence of AI, it became possible also to translate text into visual content without special design knowledge.

This leads to another possible role of AI in the creative field, namely AI as a means of democratisation of quality visual content through direct "prompting" and advanced non-expert design tools. This trend is enabled by low-code and no-code AI as a result of recent advances in the conversational AI sector, driven by interest in improving human-machine interaction. New projects are emerging also to make AI more understandable to users, such as eXplainable AI for Designers (XAID), which can be supplemented by a human-centred approach to focus on a specific user group (Zhu et al., 2018). In addition to the technical availability of AI, the work of the professionals themselves has become more accessible, because AI has made some of the design duties easier to perform, therefore their work will require less time.

The democratisation of AI, in turn, leads to the possibility for non-experts to co-produce creative AI output (e.g. graphics), allowing economic actors or social groups on tight budgets to have decent quality design interventions, even if limited in terms of originality.

The last role is the use of AI as a facilitator of participation in the design process, especially during user research. Initially, AI can function as a user research agent, interacting directly with people and using standard

methodologies such as interviews, questionnaires, and so on. After collecting user data, designers can benefit from AI that processes user generated content and identifies their needs and preferences, such as patterns of user behaviour. Based on these patterns it will be possible to develop a user simulator for designers to receive quick feedback during the design process, so follow the Human-centred approach in all the phases.

Mapping AI Tools for Design

As already mentioned, this paper aims to provide an overview and critical reflection about the current state of Generative AI tools useful for creative design activities.

There are numerous methodologies to conceptualise the structure of the design work, but, due to its widespread popularity, Design Thinking has been chosen as a way to structure the mapping of Generative AI tools.

As promoted by IDEO founders and later Stanford University, Design Thinking is a problem-solving approach structured in 5 steps: empathise, define, ideate, prototype, and test.

Due to the overlap observed between the first and second, the final four groups of the AI tools are Empathise & Define, Ideate, Prototype & Implement, and Validate.

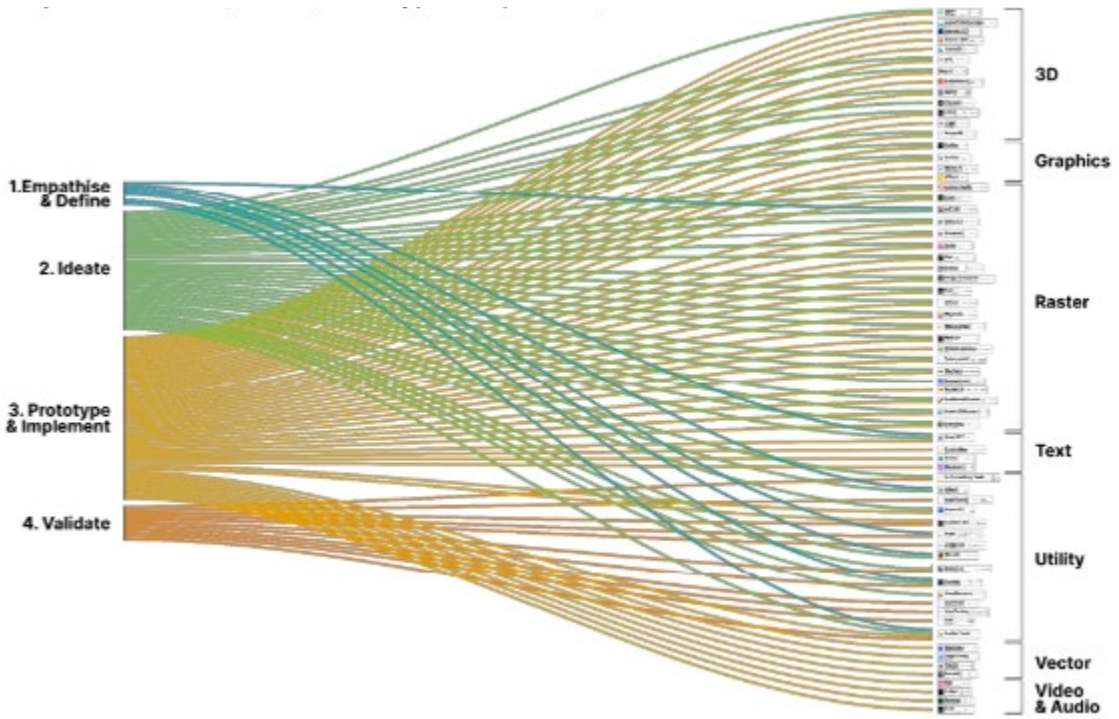

Figure 1. Map, Alluvial diagram. The collection can be explored on an open Figma board

Moreover, the possible AI outputs were classified into 7 categories:

1.3D. Topology optimisation or generating 3D models, including capabilities for texturing, rendering, and animating 3D assets.

2.Graphics. Combination of images and text, providing output suitable for UI design development and presentations, creating graphics by integrating pictures and text elements.

3.Raster. Useful to create visually captivating raster images, including the creation of mood boards, intermediate or final product pictures, as well as designing patterns and backgrounds to complement them.

4.Text. Ability to generate text content and code, making it a valuable tool for various design stages, whether it's

assisting in conceptualisation, ideation, or refining final drafts.
5.Utility. Streamlining and systematising communication within working teams, as well as optimising work processes, facilitating efficient collaboration, while including user needs investigation through Desk and Field analysis, data collection, and in-depth insights to ensure comprehensive problem-solving approaches.
6.Vector. Generation of high-quality vector images, including illustrations, icons, and logos useful to create individual images or produce whole batches of vector-based graphics, allowing for scalable and versatile designs.
7.Audio & Video. Create and edit audio and video content to support presentations or prototype demonstrations. Whether it's adding background music, voiceovers, or assembling video footage, this feature enhances multimedia production capabilities and facilitates effective communication.
To begin, we built a database to store all the tools found, tracking costs, benefits, drawbacks and input/output they produced. The final collection is organised to offer a multi-level perspective, and may be broken down into four primary sections: a list, info sheets, a map, and an introduction page. The map (Fig.1) provides a visual summary of the tools gathered about processes and outputs they offer, while dedicated simplified tool cards also display the crucial information.
Each tool is discussed in depth in the info sheet, a product specification document of each tool that includes functionality and unique characteristics, an analysis of advantages and disadvantages, and showcasing images. Finally, the list consolidates all the tools into distinct output-based clusters, enabling users to easily locate the desired tool for their intended outcomes. While omitting redundant or unproductive tools, our research at the time of writing found a total of 66 tools, and out of those is possible to identify 7 for Empathise & Define, 37 for Ideate, 51 for Prototype & Implement, and 11 for Validate, but it should be noted that some of them are useful for multiple steps.
From this subdivision emerged that there are only a few tools available that can help during the phases of process structuring, stakeholder engagement, preliminary research and final validation. Additionally, even though the majority of the tools are focused on the Prototype & Implement step, they frequently also assist the designer during the Ideate phases. Output clusters include instead 13 for 3D, 4 for Graphics, 22 for Raster, 4 for Textual, 15 for Utility, 4 for Vector, and 4 for Video & Audio. Here, it is evident that Raster outputs are among the most popular, but there is also a growing interest in Utility tools. The collection can be explored on an interactive Figma board, or in the table below.

Table 1. List of the AI Enabled Tools selected, with clickable hyperlinks.

3D & texture	Graphics	Raster		Text	Utility	Vector	Audio & Video
3DFY	Galileo	Adobe Firefly	MidJourney	Chat GPT	Ai Consulting	Illustroke	Fliki
Agisoft	Genius	Ando	NVIDIA	Controllino	Tools	Logo Livery	Kaiber
Metashape	Slides AI	ARTSIO	CanvasPotter	Duino	Albus	Stelvio	Runway
Elevate 3D	UIZard	DALL-E 2	nedAI	Magician	AppliTools	Recraft	D-ID
Fusion 360	Design.AI	Dreamer	Playform		Canva AI		
Luma AI	Tome AI	Durer	Prompthunt		Content Bot		
poly		Flair	Rocket AI		Evolv		
Shap-E		Genus	Scribblediffus		Lookback		
SolidWorks		Image	ion		Miro AI		
Spline		Computer	Stable		Notion AI		
Vizcom		Kive	Diffusion		Sembly		
vmod		Lexica	Stockimg		User Persona		
CSM		Magestic	Clipdrop		Userbrain		
PromeAI		Mokker			UserTesting		
					VAS		
					Goblin Tools		

To test

the effectiveness of the tools during the workflow, case studies were carried out where we tried to replicate the process of two projects output in the field of Product and Interaction Design by repeating the tasks using AI tools (Fig. 2). Initially in Empathise & Define, experiments were carried out in the User Research and Desk Research phases using Albus to create a vision board while researching information and images. During the Ideate phase, Chat GPT was used to create the concept taking advantage of its work speed and adaptability, even if in some cases it lacks human empathy. Next, the User Persona tool was employed, which effectively created a Persona from the project description and then the Recraft tool for Storyboard illustrations. For the Prototype & Implement phase, PromeAI transformed sketches directly into final renderings with relevant textures and then Adobe Firefly helped to add the background to them. The Interaction Design project benefited from Controllino AI to write an MQTT enabled code, while for video presentation of both of the projects Fliki tool was useful thanks to its ability to find appropriate stock video from text and generate voice overs. Finally, during the Validate phase, Chat GPT played the role of an agent that provided feedback and possible improvements that selectively made sense. AI can already assist designers in many phases of their work, despite the fact that good quality tools have not yet been found for User Research, creation of 3D models, IoT systems and websites, which could be the basis for future projects and research.

Figure 2. Tool testing: a task is carried on with the use of AI tools. The first image is the tool info sheet, the other images illustrate the process and notes about pros and contra.

Despite the rapid growth of AI-enabled tools, it is possible to highlight some usability shortcomings. The first point of intervention is the development of a new form of incremental prompting that allows the user of the tool to make small gradual changes, instead of requiring a new prompt for each output. Secondly, for the tool to actively participate in the process, the collaboration dimension must be investigated, allowing the tools to see beyond the specific task and understand the overall context of the design process. Finally, considering the inherent empathic nature of Design, it must be taken into account that AI has limitations in understanding and expressing emotions (Bakpayev et al., 2022). The toolkit was created with educational application in mind, providing a special opportunity to investigate and put design thinking concepts supported by AI into practice.

Recent rise in popularity of AI models has opened up new perspectives for students to experience the potential of these tools in Design (Bozkurt et al., 2023). However, it is important to understand potential negative consequences and rethink the roles of technology and human educators. Our collection aims to contribute to this discussion by providing the necessary tools to explore the potential of AI in educational use.

Issues and Mitigation Strategies

The benefits offered by Artificial Intelligence are numerous and extensive. However, there are various potential and practical issues already uncovered by past research. Algorithms often conceal risks, overlooked in the pursuit of innovation and cost-efficiency. AI's ethical implications stir debates in science and society: professionals in the creative fields feel attacked by the democratisation of AI tools that give free access to creative content to the general public, reducing their possibilities of employment; while, the scraping tools behind the generative tools appropriate their contents, raising issues with copyrights. Yet, some (Aziz, 2023) even propose to include AI as a copyright-worthy author. This complex issue deepens AI's societal disparities. However, limiting the fair use of machine learning might interfere with its progress (Sobel, 2017). Ethical principles alone will not ensure responsible AI; additional support and governance mechanisms at the organisational and social levels are required (Sanderson et al., 2023), such as the EU guidelines' aim to provide safe, transparent, traceable, non-discriminatory, eco-friendly AI, emphasising human supervision (European parliament, 2023).

A second risk in the use of Artificial Intelligence is that of bias: in fact, human-sourced data contaminated with sexism, racism, ableism, and religious prejudices result in corrupt and discriminatory intelligence. We are already witnessing tools such as chatbots, machine translation, and speech recognition, or generative tools that can encode and perpetuate gender stereotypes (Suresh, 2021) and ethnic discrimination (Buolamwini, 2016). Having diverse and representative data is thus essential for creating realistic and inclusive AI systems: responsible AI requires not only technical interventions but also changes in Societal recognition (Waelen & Wieczorek, 2022). An accurate and uncorrupted source is essential, as it is established that AI needs human-sourced data. Otherwise, the risk is the phenomenon of "AI hallucination", as illustrated by Alemohammad and colleagues (Alemohammad et al., 2023), who reached the condition of Model Autophagy Disorder (MAD) by repeatedly feeding the generative AI with cycles of synthetic data. Leaving complete control to algorithms is thus still counterproductive and unpredictable, and it is thus necessary to supervise and, most importantly, cooperate on an equal footing between users and AI (Larsson et al., 2022).

AI, like previous technological advancements, threatens employment due to its wide-ranging automation potential (Su, 2018). Creative jobs were once considered immune to AI, relying on intuition and human qualities hard to replicate (Birtchnell, & Elliot, 2018). However, as AI grows more sophisticated in generating top-tier content, concerns arise about artists and designers losing relevance, shrinking job opportunities, and devaluing man-made labour (Zhou & Nabus, 2023). Despite these risks, the authors have concluded that collaboration between creatives and AI generates fruitful outcomes, backed by research showing AI's positive impact on computer-intensive fields, boosting employment and productivity (Georgieff & Hyee, 2021). Nevertheless, AI can't replace creative minds in the present and near future, as it lacks the creative capabilities (Horton et al., 2023) and eco-spiritual values (Cooney, 2023) essential to replace humans.

Discussion and Conclusions: new designer roles

In his book "Fully automated luxury communism" (2019), Bastani sees technology as a potentially liberating force that could emancipate people from alienating repetitive work and enable them to pursue creative and cultural interests. This poses the question: In a scenario of AI-driven design, what are our creative margins and how to

shift creative capabilities and education?

With the potential of AI to participate in creative and innovative processes, it is crucial to understand how the role of the designer will change. According to Verganti and colleagues (2020), the designer-AI symbiosis may elevate the designer to the role of leader, capable of identifying a problem and providing instructions on how to solve it, thus shifting the focus on sensemaking. This strategical adaptation positions designers as vital actors in shaping the creative and general culture. Here, designers take a keen interest in how users perceive their creations and how seamlessly they integrate into users' lives and stories (Krippendorff, 2005). This perspective transforms design into a discipline that fosters not only cross-field collaboration but also between products and their users, as well as between designers and stakeholders (Cross, 1982).

The collaboration between Artificial Intelligence and Creative Intelligence (or "the acts of the imagination, ingenious reasoning and problem-solving, and curiosity, play, and exploration," (Shevlin, 2021)) will pave the road to a "Hybrid Intelligence" fostered through continuous human–AI interactions (Jarrahi et al., 2022). The authors suggest that the new competencies of designers should be associated with the ability to effectively use AI and, in addition, develop creative thinking that will allow them to operate on high-level concepts and curation.

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