Designing Dialogue: Human-AI Collaboration in Design Processes

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Editorial: Designing Dialogue: Human-AI Collaboration in Design Processes

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With Artificial Intelligence (AI) and Machine Learning (ML) developing rapidly into usable systems already embedded in our everyday lives, the opportunities for involving “intelligent” agents in a natural design dialogue are many. By the term “dialogue” we mean any of the different types of encounters that occur during the process of design. Dialogues could be verbal, visual, physical, interactive, or even tacit. This theme track presents work studying various forms of dialogue between human and artificial actors in design processes.

Of the five papers constituting this theme track, two focus on the influence AI can have on creative outcomes when collaborating with humans. Specifically, Yun et al. (2022) report on the use of AI as a generator of creative stimuli, while van der Burg et al. (2022) explore stimuli in the way an AI interprets an image of an artefact created by the designer. In a slight contrast, Simeone et al. (2022) examine human-AI collaboration from a process-level standpoint; specifically, the ability of AI to support certain aspects of the design process such as convergent and divergent thinking. A focus on roles and representations rounds off the last two papers in this theme track. Figoli et al. (2022) examine the roles that AI assumes — or is perceived to assume — in human-AI collaborations, while Kun et al. (2022) explore the potential for AI in representing a diverse cross-section of a community.

The influence of Human-AI Dialogue on Creative Outcome.

One of the ways in which AI is expected to support the design process is by expanding the space of ideas that designers would perhaps come up with on their own. This expansion can
take several forms, such as exploring new domains originally not considered relevant, forming connections between two seemingly disparate concepts, or finding new ways to view an existing problem or concept. Two papers in this theme track explore some of these approaches.

*Ideasquares: Utilizing Generative Text as a Source of Design Inspiration* presents the eponymous system, designed to provide inspiration by responding to search queries from designers with text that is generated from a language model using the query as seed text. The paper, written by Gyeongwon Yun, Kwangmin Cho, Yunwoo Jeong, and Tek-Jin Nam, shows how this notion of generative querying was used by designers as inspiration. Designers either used phrases of interest from the generated text directly as highlights, combined them in different ways, reinterpreted them to suit different meanings, or both reinterpreted and combined them, thus either creating new ideas or extending existing ideas.

Work by Vera van der Burg, Almila Akdag Salah, Senthil Chandrasegaran, and Peter Lloyd in their paper “*Ceci n’est pas une Chaise: Emerging Practices in Designer-AI Collaboration*”, explores the role of surprise in a dialogue between a human designer and an AI “interpreter” using an off-the-shelf computer vision model to interpret a designed artefact. Of particular interest are the instances of the AI “misinterpreting” the designed object, the surprise it may spark in the designer, and subsequent creative inspiration that may result.

**Human-AI Dialogue and the Design Process.**

Designing is not just about generating promising ideas, but composed of different facets: framing the problem, recognising potential stakeholders, identifying intended and unintended consequences, and critically examining and selecting potential solutions, to name a few. When imagining human-AI dialogue, it is imperative to consider these other aspects as well. *Pushing divergence and promoting convergence in a speculative design process: Considerations on the role of AI as a co-creation partner* by Luca Simeone, Riccardo Mantelli, and Alfredo Adamo, examines the effect of AI in the divergent and convergent processes of designing. The authors use a language model trained by literary works that are amenable to selection and combination to create new patterns of narrative. The authors report that students’ use of the language model in speculative design projects indicate the use of the AI to not only generate and (re)interpret ideas, but also in converging toward a narrower set of options in later stages of their process.

**Roles and Representations in Human-AI Dialogue.**

AI Models and systems are in many ways a representation of ourselves: they are probabilistic models trained on data that are created or curated by us humans, or are representations of rules and logic systems that we formalise. However, the form in which these AI models are used in society can influence how they are perceived by people who stand to be affected by the application of said AI. Thus, AI can be seen as objective judges,
helpful assistants, or dispassionate seers of the future. Designers are not immune from such a role assignment.

The paper by Fabio Antonio Figoli, Lucia Rampino, and Francesca Mattioli, titled *AI in Design Idea Development: a Workshop on Creativity and Human-AI Collaboration* presents their examination of the dynamics of human-AI collaboration in a workshop where design students worked with different AI systems supporting research, sketching, and colour selection. The authors find that the quality of human-AI collaboration — and the role ascribed to the AI by its human collaborators — depends on whether the collaboration continuously includes AI. They also find that these roles can lead to collaborations that are either led by the AI, based on its constraints or capabilities, or those that are led by humans where the AI is perceived as an external "expert".

Peter Kun, Amalia De Götzen, Miriam Bidoglia, Niels Jørgen Gommesen, and George Gaskell delve a little deeper into the idea of AI as a representation of a collection of voices. Their paper, *Exploring Diversity Perceptions in a Community Through a Q&A Chatbot*, introduces a “diversity-aware chatbot” — an application that takes on the appearance of an AI chatbot but in reality, uses a diverse set of actors in a community as sources for potential responses to queries posted to the system. The authors use this simulation of an AI to explore users’ expectations and perceptions of diversity in the responses to their queries, and find the expectations to be complex, ranging from curiosity to task dependence to contemplativeness.

Together, the papers represent a sampling in the wide range of possibilities to explore when it comes to AI in the act of designing. Creativity and ideation remain important aspects of AI’s application to design, but nuances are beginning to emerge in the medium in which it is used and the role it is expected to perform. Diversity representation is an important facet of emerging AI systems, and one that will have a powerful influence on its development, as well as ours.

**References**


About the Theme Track Organisers:

**Dr. Peter Lloyd** is Professor of Integrated Design Methodology in the Faculty of Industrial Design Engineering at TU Delft, Chair of the Design Research Society, and Editor-in-Chief for the journal *Design Studies*. His research focuses on how designers talk in practice, and in storytelling in the design process.

**Dr. Senthil Chandrasegaran** is Assistant Professor in the Faculty of Industrial Design Engineering at TU Delft. His research focuses on using computational and data visualization approaches to make sense of how designers work.

**Dr. Euiyoung Kim** is Assistant Professor for Dynamic Stability and Chief Research of People in Transit (PiT) / Mobility in the Faculty of Industrial Design Engineering at TU Delft. His research and teaching interests involve a variety of areas of mobility, human-centric research, design thinking, new product design & development, design-driven innovation, IoT, cybersecurity, and design education.

**Dr. Jonathan Cagan** is the interim department head and George Tallman and Florence Barrett Ladd Professor of Mechanical Engineering at Carnegie Mellon University. He also co-founded and co-directed the Integrated Innovation Institute at the University. His career spans collaborative and innovative work in education, research, and industry, with his research merging AI, machine learning, and optimization methods with cognitive science problem solving.

**Dr. Maria Yang** is the Gail E. Kendall Professor of Mechanical Engineering and the Associate Dean of Engineering at the Massachusetts Institute of Technology. She is also the Associate Director of the MIT Morningside Academy of Design. Her research interests are in the product design process and the ways that design tools and representations influence the early stages of the design process.

**Dr. Kosa Goucher-Lambert** is Assistant Professor of Mechanical Engineering at the University of California, Berkeley, and an Affiliate Faculty member in the Jacobs Institute of Design Innovation and the Berkeley Institute of Design. His primary research interests focus on understanding decision-making processes in engineering design using a combination of mathematical analyses, computational modelling, human cognitive studies, and neuroimaging approaches.