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Does AI need designing? Exploring the contribution of designers in clinical AI development

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Conversation: Does AI Need Designing? Exploring Design in Clinical AI

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Abstract: This Conversation at DRS2024 in Boston, attracting around 30 participants, centered on the evolving role of design within multidisciplinary AI teams, particularly in the context of the development of clinical AI applications. As AI is entering healthcare, questions are being raised if and how designers can contribute to AI-driven clinical solutions and whether they need to develop potential other skills and responsibilities. Drawing from ongoing research and insights from various workshops and interviews, the conversation highlighted the importance of the negotiation of agency between humans and machines in clinical settings, translational design for patients, data hierarchy and its impact on design, and finally the importance of language and storytelling in framing interactions mediated by AI.

Keywords: AI; Design Challenges; Human-centered AI, Clinical

1. Organizing questions

1. In what ways does the design process for artificial intelligence (AI) systems differ from that of other technological products?
2. What are the primary challenges that designers encounter when developing Clinical AI products and systems?
3. Can we provide examples of Clinical AI products and systems currently under development, and what specific challenges are being faced by designers and design researchers in these contexts?

2. Context

The transformative progress of Artificial Intelligence (AI) in product development has prompted a profound re-examination of the roles of participants within multidisciplinary development teams, particularly in the context of design's evolving significance. Multidisciplinary discourse surrounding artificial intelligence (AI) and the need for effective collaboration between teams from various academic institutions and industry settings have been explored in different domains and academic research (Yang et al., 2020; Rattay et al. 2022) and raise an important question: how can collaboration occur in real product development settings where teams are responsible for designing and building AI?

In a clinical context, challenges persist with integrating AI solutions into healthcare, highlighted by the recurrent failure of solutions to transition from research settings to practical clinical use. Factors contributing to these failures include the absence of HCI considerations, revealing a disconnect between product design and the collaborative nature of clinical work (Yang et al. 2019).

The basis for this Conversation is our ongoing research project, part of the EU DCODE project (https://dcode-network.eu/), looking at how clinical AI products and systems are developed. We have conducted multiple workshops and interviews with multidisciplinary AI teams, exploring the contribution of designers in the development of clinical AI solutions. Our ongoing research aims to explore how designers navigate these challenges and leverage AI's unique qualities to drive desirable human-centered outcomes while mitigating unintended consequences in a clinical setting.

3. Set up of the session

The event, held in Boston, brought together 30 in-person participants and 9 online attendees, creating a diverse and collaborative environment. The room was set up as a casual sitting area, promoting a relaxed atmosphere for open dialogue, with three organizers present on-site and two joining remotely via Zoom. Participants included researchers and scholars from institutions such as Georgia Tech, Harvard, Oxford, Eindhoven University, and the National University of Mexico, among others. The intentional design of the event fostered an informal yet focused discussion, allowing attendees to engage freely with one another while maintaining a clear emphasis on the main topic: "Designing for Clinical AI". This structure encouraged a rich exchange of ideas, blending academic approach with practical insights, ultimately advancing the conversation on how to effectively design for clinical AI solutions.

Figure 3. The room at Northeastern University in Boston, where the Conversation took place. Of the Conversation conveners, Somayeh Ranjbar (front, left), Peter Lloyd (front, center right) and Elisa Giaccardi (front right) presented in person, while Somaya Ben Allouch and Jeroen Raijmakers presented online.

4. Introductions by organizers

To set the context for the Conversation there were four introductions to the topic area by the conveners. The session started with a short introduction to the DCODE network by Elisa Giaccardi. Elisa is the principal investigator for DCODE, a Horizon 2020-funded research and training program that brings together 40 researchers from 20 different countries with diverse disciplinary backgrounds looking at new practices and technologies for design. She highlighted that when approaching artificial intelligence (AI) from various perspectives—such as interaction design, service design, and data science—the understanding of AI's role varies significantly. Within the network there is an emphasis on a critical approach to AI, rejecting its perception as a deterministic or moral tool meant to replace human decision-making. Instead, the focus is on how tasks are distributed between humans and machines, how this distribution can be negotiated post-design, and the broader implications of human-machine collaboration in shaping agency and decision-making.

Figure 1. The second introduction, by Jeroen Raijmakers, highlighted the challenges and opportunities of integrating AI into clinical decision-making, emphasizing that while AI has clear technical potential, integrating it into clinicians' workflows remains difficult. Drawing from AI innovations at Philips, he underscored three key design principles: identifying areas of added value, designing for calibrated trust, and addressing workflow and behavior changes. These principles highlight the crucial role of designers in ensuring successful AI adoption in healthcare. images © Royal Philips N.V.

> "Medicine, our most intimately human profession, is being dehumanized by the entry of the computer into the examination room. While computers are preventing many medical errors, they are also causing new kinds of mistakes. While someday the computerization of medicine will surely be that long awaited disruptive innovation, today it is often only plain disruptive of the doctor patient relationship of clinicians, professional interaction, and workflow" (M Watcher, 2015)

To bring the context closer to everyday use, the third introduction by Peter Lloyd, shared a personal story about a growth on his chest, which highlighted both his experience with the healthcare system and the potential role of AI. After visiting a doctor, he was referred to a hospital where a photo of the growth was taken. He was eventually informed that the growth was not a problem, though he received little additional information. He reflected on how the existing practices of the hospital—such as not providing detailed explanations—remained unchanged, whether AI was involved or not. Curious, he also turned to ChatGPT for advice, which correctly directed him to consult a doctor rather than offering a diagnosis. This interaction illustrated the limitations of AI in providing medical guidance, as well as the importance of designers in setting boundaries for AI applications. He concluded by noting that while AI in healthcare is highly advanced and sophisticated, it also faces challenges that require thoughtful consideration and regulation.

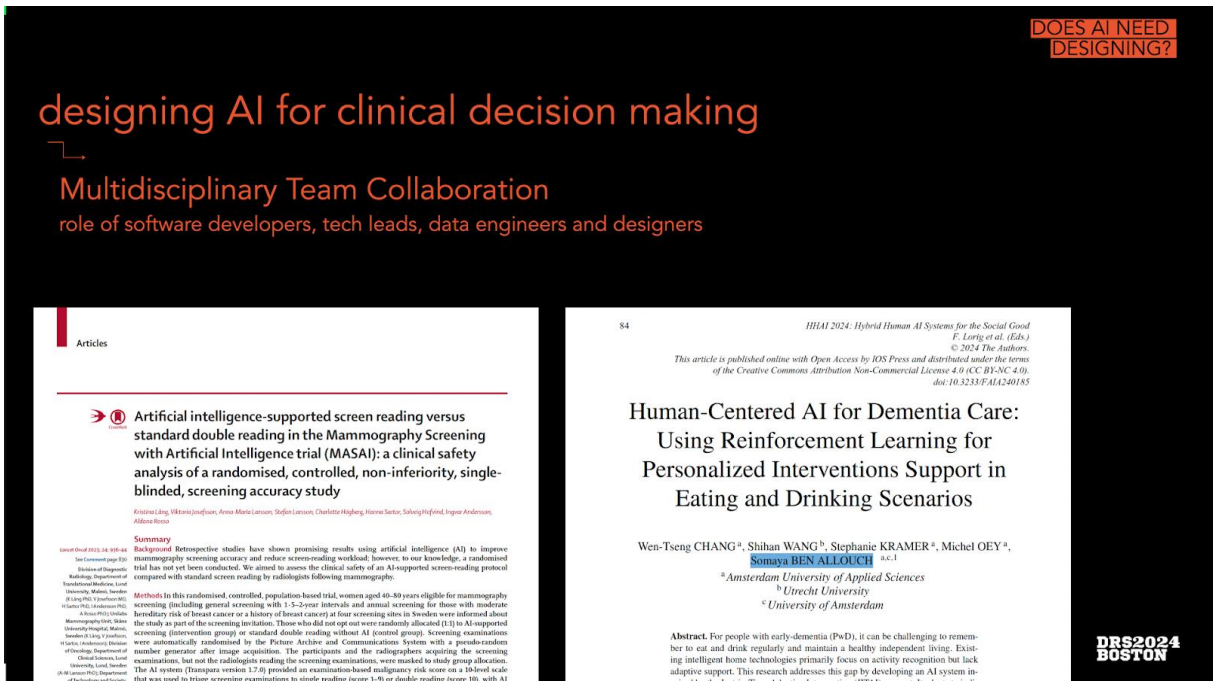

Figure 2. The third introduction, by Somaya Ben Allouch, focused on AI's potential in healthcare, emphasizing its efficacy and safety, as shown in breast cancer screening (Lång et al., 2023). It highlighted the need for large trials and diverse data to avoid bias, and pointed out gaps in AI research, such as the lack of attention to race and ethnicity. Designers were identified as key players in bridging the "clinical implementation gap" to accelerate AI adoption in healthcare.

5. Discussions

The Conversation evolved around six challenges for design based on what the participants were currently focused on in their research. After the intro and presentations by the organizers, the Conversation participants were asked to bring their own experiences of being involved with clinical AI projects. The quotes in each challenge below come from the Conversation that was conducted.

5.1 Data consistency

The first discussion brought a real-life example of AI vision systems to assist older individuals with diabetes who are at risk of developing neuropathy in their feet. Neuropathy can result in untreated wounds that may escalate, potentially leading to severe consequences, such as foot amputation. The AI system being developed aims to detect early signs of wounds, such as red or white spots, to prevent escalation. However, a challenge arises when patients take non-standardized images of their feet at home, making it difficult for the AI to accurately analyze and identify problem areas due to the inconsistency in photo quality and angles.

> "How can designers address the challenge of improving AI accuracy when the input data for clinical systems is inconsistent and non-standardized?"

This part was then followed by another example of a study on fetal scanning, where consistent image capture for AI recognition is critical, but where non-clinicians perform the

scans. The focus was on training individuals to collect data properly, especially as technology like mobile phones makes image capture more accessible. The challenge lies in ensuring consistent image quality in non-clinical settings, and design may play a role in addressing this issue.

5.2 Human-machine interactions in healthcare

> "There is a significant subjective and emotional element, which is critical for fostering a strong partnership between the data, medical doctors, nurses, and the patient"

Some of the participants mentioned the complexity of the relationship between patients, medical professionals, and AI systems, noting that it is not just about technical accuracy but also about building trust and minimizing stress. People's needs and control over their care vary depending on their life stage, and older individuals may prefer to rely more on others rather than manage everything themselves. This variability complicates designing AI systems for healthcare, as designers must consider not just user interaction but also the broader care journey and emotional dynamics in different life situations.

The importance of defining whether an AI system is designed for doctors or patients was highlighted, as this distinction influences the design approach, and the type of feedback provided. For doctors, the design should prioritize data accuracy and analysis to aid decision-making, while for patients, the focus should be on simplicity and clarity to avoid confusion.

5.3 Moral responsibility of designers

The third discussion oriented around the idea of designers assuming a moral high ground, particularly in the context of interaction and service design. While algorithmic designers often focus on addressing bias at the data and algorithm level, interaction designers, who work at the user interface level, also have a key role to play. There was an idea on the role of interaction designers and their contribution in highlighting potential issues to users, helping to mitigate problems that may not be resolvable solely through data or algorithms by enhancing transparency and guiding user attention.

The discussion went on to explore whether designers should take on the responsibility of incorporating ethical considerations into the design process, particularly by imagining and addressing potential moral dilemmas. There could be a focus on presenting uncertainties in AI in a way that users can understand and accept, similar to how risks in medicine are communicated. The discussion suggested using uncertainty as a design material in machine learning to ensure people engage with AI systems without fear or rejection.

5.4 Designers' roles in tackling bias

> "AI presents an opportunity to address the gender gap in medical and clinical practice more quickly than we have in the past. Designers must take on the responsibility to ensure we do not repeat the mistakes of previous technology and diagnosis failures, advocating for diverse data representation alongside software and data engineers who may not prioritize these issues"

The fourth discussion expressed concerns about the complexity of designing AI systems, particularly in the medical field where biases persist, such as gender biases in medicine. The issue was raised of data being primarily based on male subjects, which can lead to misdiagnosis when applied to women. The participants questioned the role designers play in reflecting on and addressing these biases in data, suggesting that designers must actively shape the way AI technology is designed to prevent amplifying these biases.

A fetal ultrasound scan project was referred to as a product used in Africa. It was mentioned that during the design process, key questions about data origins and context are often discussed but remain unresolved. It was suggested that the design teams tend to focus on solving issues they can address, leaving assumptions about data and context unresolved even when the product is finalized and shipped.

It was also mentioned that there is a well-known gender gap in medical and clinical practice, where women's data has historically been overlooked. And now AI can present an opportunity to address these long-standing biases by leveraging existing data and avoiding the mistakes of the past. There is a certain need for designers to take on more responsibility in advocating for diverse data representation, as software engineers may not prioritize such issues, leaving designers to step up and address these biases.

> "We need to foster reflexive practices in data training, using that process as a way to sensitize ourselves to the biases that can enter the machine learning pipeline"

There were comments on AI's potential for de-biasing and promoting reflexivity and the growing awareness among data scientists of the need for reflexive practices in data training and curation to address biases in the machine learning pipeline. However, there is a certain belief that designers are not given the space or authority to directly address the issue. In corporate settings, designers often lack the ability to act unless they can quantify the value of addressing biases, which limits their influence in multi-disciplined teams.

5.5 Storytelling and the power of language in design

> "As humans, we are always in search of meaning. If neither the clinician nor the machine explains, there is no meaningful difference between them. But if the clinician tells a story that helps make sense of the situation, it reaffirms the value of human interaction over AI. As designers, we must focus on creating experiences that help people make sense of technology when they encounter it. "

In the fifth discussion, a central question was addressed as to whether designers act merely as translators between disciplines or contribute something deeper that integrates various perspectives. This is especially pertinent in healthcare, where clinicians rely on data-driven analysis, but struggle when faced with qualitative or unquantifiable information that does not fit within existing systems. This is where the concept of "translational design" becomes crucial, as it bridges the gap between rigid data infrastructures and more subjective human experiences.

The importance of storytelling and meaning-making in healthcare was highlighted. For example, when a patient seeks answers from a clinician but receives none, they might turn to AI for an explanation. However, if the AI also fails to provide clarity, it results in a situation where neither the machine nor the clinician is helpful, leading to confusion. The role of designers, then, is to facilitate interactions between people—both clinicians and patients—and machines in a way that makes sense to them. Designers must ensure that the human element is not overshadowed by the machine, enabling more meaningful interactions.

The use of language was further emphasized. Referring to someone as a "user" rather than a "patient" can obscure the lived experience and the human narrative. In medical anthropology, particularly through the work of scholars like Arthur Kleinman, the focus on narratives, everyday experiences, and the story behind illness is crucial for understanding the patient-clinician relationship. When AI or design frameworks rely too heavily on personas or the term "user," they risk losing sight of this deeper, more personal aspect of healthcare interactions. This dehumanization can cause machines to fail in providing meaningful assistance, highlighting the need to prioritize human experience over technological efficiency.

This part of the discussion ultimately touched on the moral implications of comparing humans and machines. If we start equating the capabilities of machines with humans, we overlook the inherent asymmetries between them. While AI might perform some tasks as well as or even better than humans, it cannot replace the nuanced understanding and empathy that human interactions provide. Designers must navigate this delicate balance, ensuring that the flow between human and machine interaction is seamless and focused on enhancing, not replacing, the human experience. The challenge lies in avoiding the trap of viewing machines as equal to humans and instead recognizing the unique value each brings to the table.

5.6 Upskilling Designers for AI: Bridging Disciplines

> “Are designers contributing to the rise of technocratic healthcare systems focused on efficiency and cost reduction, or can they adopt a more critical role by emphasizing individual experiences and empathy in interaction with AI?”
>
> “Is the challenge in healthcare AI specific to design, or does it reflect on a broader issue of how professionals–whether designers, scientists, or engineers–adapt to complex new situations?”

There was concern that designers, who often lack technological education, should be more involved in critical decision-making processes, such as determining what data is used in AI training. Currently, they are frequently excluded from these moments, not having a chance to contribute to addressing some of the main data level issues like biases in AI systems. The integration of cross-disciplinary skills is seen as vital, requiring both designers and technologists to speak a common language and understand the broader social implications of their work, such as bias, privacy, and decolonization.

There was a call to shift from training generalists to preparing individuals for specific roles, depending on where they will contribute—whether in algorithm development, human-machine interaction, or system governance. This approach requires prototyping new roles and focusing on the diffusion of design practices across different sectors, ensuring that various professionals, not just traditional designers, engage with the act of designing.

Another challenge that was brought to the discussion was around the lack of a scientific approach in design processes. Designers usually cannot control a projects' main outcomes and since they have limited expertise in scientific approaches it is difficult for designers to demonstrate their value in interdisciplinary fields, particularly in more technical or scientific domains. The need for design education to incorporate scientific methodologies, enabling designers to contribute more effectively and assert their expertise in collaborative environments were emphasized, noting that designers often struggle with concepts like positive and negative controls in experiments, which hinders their credibility and involvement in more scientific or data-driven fields. Incorporating these skills into design training could help bridge the gap and strengthen designers' roles in various industries.

6. Final notes

This report captures the key insights from the conversation session on "Designing for Clinical AI," remaining true to the conversational format that blended academic exploration with practical reflections. Some discussions, such as *Storytelling and the Power of Language in Designing for AI*, surfaced as unexpected yet valuable insights, while more familiar topics like *Tackling Bias and Data Consistency* aligned with previous studies.

Throughout the session, the evolving role of designers in AI and healthcare was a central theme. Participants recognized the significant opportunities for designers to influence AI development, particularly by addressing biases early in the process within the multidisciplinary teams and ensuring cleaner, more reliable data inputs. Additionally, designers were seen as crucial in facilitating better communication between users and machines, particularly around uncertainties, helping ensure transparency in AI interactions.

The discussion highlighted power dynamics in the design process, where decision-makers often limit the involvement of designers and other disciplines in co-creation. This raised important questions about the changing nature of design and the need for designers to adopt new roles in increasingly complex technological contexts.

A recurring theme was the importance of convergent design approaches that encourage collaboration between designers, AI developers, and experts from specific fields like healthcare. Overcoming the distinct processes and languages of these disciplines is crucial for fostering integrated and innovative solutions.

The conversation concluded by reflecting on the idea that AI serves as a mirror to human behavior. Additionally, there was an announcement about the development of a critical vocabulary for AI design, which aims to encapsulate the insights from this session and further contribute to the ongoing discourse on AI and design.

7. Suggestions for further readings

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