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Designing (with) AI for Wellbeing

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ABSTRACT

Designing with data and Artificial Intelligence (AI) can bring significant value to the development of systems and technologies that promote personal wellbeing. However, there are also unaddressed challenges and risks connected to designing (with) AI for wellbeing, such as the difficulties in ensuring that the generated feedback or proposed interventions are relevant considering the large interpersonal variations between the current, desired and achievable level of physical and mental wellbeing of different individuals. In this one-day hybrid workshop, we aim to bring together design and HCI researchers and practitioners interested in the intersection of design, AI, and wellbeing beyond clinical applications. We will discuss challenges in designing with AI for wellbeing originating from a) the domains of design and b) general issues in developing AI systems, and uncover new potential directions that emerge when coupling design, AI and wellbeing. Our aim is to bring together researchers and practitioners from various fields and backgrounds who use data and AI when designing for wellbeing. Through this workshop, we aim to create a conceptual framework that enables the emergence of rich, meaningful, and ethical solutions for designing (with) AI for wellbeing, while also providing handles to mitigate the emergence of negative consequences.

CCS CONCEPTS

• **Computing methodologies** → **Artificial intelligence**; • **Human-centered computing** → **Human computer interaction (HCI)**; • **Applied computing** → **Consumer health**.

KEYWORDS

Designing with data, Artificial intelligence, Wellbeing

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1 MOTIVATION

The pandemic and its aftermath have emphasized the critical importance of health and wellbeing. Maintaining a healthy lifestyle has proven essential in preventing severe illness. However, this extended crisis has significantly impacted the wellbeing of many individuals, accentuating preexisting issues, particularly in mental health and physical activity.

Many in the Design and HCI field have focused on addressing these challenges by designing for wellbeing [39, 50], with focus ranging from behavior science to personal informatics and environmental impact [5, 24, 38]. Much of this work emphasizes the need for highly personalized solutions, as different people and varying circumstances require tailored applications to be effective [2, 17]. In recent years, we have seen an increasing focus on collecting data to capture and better understand individual uniqueness. As such, using data and smart solutions can bring significant value to the development of systems and technologies that promote physical and psychological wellbeing [40, 48]. Rapid developments of Artificial Intelligence (AI) capabilities open new opportunities for the development of systems and technologies for wellbeing [48]. Examples of AI-based applications for wellbeing range from technologies for personalized sleep improvement advice **[15]** and fatigue detection [14] using data from wearables, to conversational agents that provide support for healthy eating or mental health problems [9, 27]. Still, we expect that more recent developments in AI - and particularly Generative AI - have the potential to radically transform this.

However, as we ride the wave of AI, there is a need to examine how to enhance the discourse on designing with data and AI in a way that enables the emergence of rich, meaningful, and ethical solutions, while also considering the challenges and risks [26, 35]. In this workshop, we aim to explore these challenges in the context of *designing (with) AI for wellbeing*. While there have been significant efforts towards promoting HCI research for advancing AI in healthcare [36, 37], these efforts have focused more on clinical applications. Examples include works exploring the opportunities and challenges that medical practitioners face in human-AI collaboration related to medical diagnosis [4], and decision-support systems for multidisciplinary treatment [57]. Much work has also focused on algorithm development, addressing, for example, technical challenges related to designing AI-enabled systems for disease prediction [34].

While this body of work paves the way towards a healthier future, there is still a need to explore opportunities and challenges in designing AI applications for wellbeing beyond clinical healthcare. "Wellbeing" is a broad and much-used term referring to the overall state of an individual's health and happiness. It includes social, psychological and physical dimensions, but also hedonic and eudaimonic aspects that differentiate it from the concept of "health" [13]. Encompassing diverse factors such as physical fitness, nutrition, stress management, emotional resilience, social connections, and the ability to adapt to life's challenges, *wellbeing* signifies a positive, optimistic, and holistic approach to health, going beyond the absence of illness and aiming to optimize quality of life by proactively addressing health-related issues, promoting positive behaviors, and focusing on prevention rather than treatment [7, 21, 54].

While designing for wellbeing may concern applications at different levels, from the individual level to a neighborhood, community or society [20], in this workshop we focus on personal wellbeing. Using data and AI to design for personal wellbeing involves leveraging technology to provide personalized, data-driven insights and solutions that empower individuals to make informed choices, adopt healthier habits, and maintain a balanced and fulfilling life, thereby reducing the risk of future health issues. The vast amount of data generated by devices enabling continuous monitoring in the wild, such as wearable activity trackers, creates a new reality where individuals have increased agency in maintaining a healthy lifestyle, empowered by data [51].

However, data-driven technologies for healthy lifestyle promotion generate insights that can be interpreted differently or even misunderstood, depending on the user's data literacy [8]. This issue can be amplified by the absence of a healthcare professional in the loop, a characteristic which differentiates technologies developed for the advancement of personal wellbeing from healthcare applications. In interactions with technologies such as mental health chatbbots [9, 27], suggestions generated by AI are presented directly to the user, without interference from an expert. Furthermore, the large interpersonal variations between individuals create the need to significantly adapt the generated feedback to ensure its relevance and appropriateness. Technologies designed to promote wellbeing could also be misused; for example, a device developed for mood tracking could be used in the future as a surveillance tool for monitoring workplace attitudes [29].

Some of these issues also concern the Personal Informatics (PI) [24] community, which also examines (typically individual) engagements with personal data. Recent efforts within the PI community have stressed the need to understand the impact of AI on PI systems, identifying challenges such as the difficulties of providing accurate recommendations based on limited data, and the need for AI outputs to represent marginalized communities [28]; however, we argue that it is important to acknowledge and map specific challenges related to designing for wellbeing - which is not necessarily the focus of PI solutions. Technologies for maintaining and advancing wellbeing can also include interactions with data and AI that do not incorporate the elements of self-tracking and reflection upon the collected data which are core characteristics of PI systems [24]. For example, a chatbot may momentarily collect user input for stress relief [9], or promote the exchange of messages between friends to boost social interaction [32]. There is a need to understand the unique challenges and opportunities characterizing the design space of designing with AI for wellbeing, and create an agenda that can drive future research in this area.

We identify three overarching themes that encompass challenges and opportunities emerging from the intersection of topics related to AI, wellbeing and design: a) *Challenges Related to Designing (With) Data and AI*, b) *Open Problems for AI in Designing for Wellbeing*, c) *Opportunities for AI in Designing for Wellbeing*.

1.1 Challenges Related to Designing (with) Data and AI

There is an expanding community of researchers and practitioners exploring how data and AI can be used as design material [6, 11, 56], generating insights that inform design decisions at several stages of the design process [3, 19, 22, 23, 43, 46, 52] as well as in design solutions [41, 42]. While there is much potential in adopting methodologies that actively use data and AI as design material when designing for wellbeing, core challenges related to designing with data and AI complicate this process. Designers still face difficulties in brainstorming, ideating and designing interactions when designing with AI, due to challenges in envisioning AI capabilities and anticipating all the possible outputs of an AI system [56]. These challenges hinder creativity and affect designers' capacity to *imagine all possible AI failures, contextualize them and design appropriate interactions for mitigating negative consequences* [35, 56]. The difficulty in anticipating and mitigating AI failures becomes particularly important when the design process is driven by an algorithm [46], or when designing systems that can evolve and modify their behavior based on collected data, therefore having increased unpredictability. *Designing data-driven systems that can serve multiple users with different roles and responsibilities* is also difficult when different stakeholders have conflicting data needs [44]. When designing for wellbeing, such stakeholders could be family members or others within the social circle of an individual, sharing experiences related to data - e.g. exercising together, and afterwards discussing their data. These relationships can complicate the design of AI-enabled systems for wellbeing, as they can create situations where an individual wants to selectively share information in specific contexts but hide private moments, or cases where the opinion of others could influence data interpretation. Depending on the

nature of the data, *designing with it could also create privacy risks*, especially when limited transparency makes it unclear what data is collected by whom and for what purpose [46, 48].

While these problems complicate the process of designing with AI in general, it is necessary to understand and address their implications in the context of designing for wellbeing, where errors or improper behaviour (including inability to gain real understanding of the situation, which can lead to malfunctions; inability to deal with deviations from the standard routine; and lack of "transparency, traceability and accountability" [49]) can hinder the capability of an individual to maintain or improve their healthy habits, or even have adverse effects; for example, an AI-based application for coaching individuals in running could give wrong feedback resulting in overtraining and injuries.

1.2 Open Problems for AI in Designing for Wellbeing

Adopting a human-centered, ethical, and responsible approach to developing AI systems has become increasingly crucial, as the intensive use of data and AI has shown its worrying downsides in different areas, from misinformation spread to marginalization and exclusion of certain groups of people [33]. It is essential to consider how AI systems for wellbeing can be designed in ways that promote positive experiences and address issues contributing to negative consequences. For example, while AI systems have the potential to revolutionize healthcare, *the lack of transparency [30] and trust [12] can be a barrier to the adoption of decision-support systems.* Designing explainable AI systems also requires *considering how different levels of data and AI literacy may impact the way that individuals make sense of AI outputs* [25]. Designing for wellbeing often also involves personal data [24], increasing the need to *consider ethical issues in personal data collection and processing* [10]. The implications of the emergence of generative AI [31] also need to be understood in the context of designing for wellbeing. While Generative AI opens new possibilities in this domain, such as translating numeric AI outputs into comprehensible insights and recommendations for maintaining and promoting wellbeing, *the difficulty in controlling the quality and appropriateness of the output may lead to harm.* This challenge is more prevalent when designing systems to be used without the involvement of a person with knowledge relevant to wellbeing, as happens in clinical applications. Practical issues also complicate the design of AI systems, such as the *difficulties of long-term data collection in the wild*, resulting in limited and possibly biased data for algorithm training [45]. Currently, there is a lack of knowledge on how these issues affect the design of AI applications concerning wellbeing, and how problems emerging from these issues can be mitigated in ethical, responsible and fair ways.

1.3 Opportunities for AI in Designing for Wellbeing

The use of AI in designing for wellbeing can also bring new opportunities for designers. AI-enabled systems allow for *high levels of personalization and can adapt to varying contexts or circumstances, enhancing the user experience* [18]. When coupled with remote monitoring systems, AI capabilities can also give a more dynamic character to design solutions, allowing for *continuous insights for designers and continuous improvements that can often be implemented remotely* [23, 53]. These characteristics enhance the process of iterative prototyping, even after full implementation. The adaptability of AI-enabled design solutions also makes them more future-proof and sustainable [55], increasing their *capability to include atypical user groups.* Opportunities also emerge when considering how AI-enabled design solutions can *improve wellbeing in the moment, or bring long-term positive changes* benefiting from AI capabilities in creating personalized and contextualized solutions.

1.4 Objectives

These issues call for innovative design strategies that leverage the power of designing with data and AI while also incorporating the considerations that designing for wellbeing brings. Motivated by this need, in this workshop we will map opportunities and challenges related to *designing (with) AI for wellbeing* and discuss possible approaches to mitigating negative consequences. Our aim is to create a conceptual framework that can guide HCI researchers and practitioners in designing (with) AI for wellbeing. The workshop will focus on human wellbeing, from the perspective of designing applications and systems related to promoting, achieving and maintaining a healthy lifestyle at an individual level, considering psychological, physical and social dimensions [7, 13]. However, we also welcome papers that critically connect this theme with research on designing AI systems in healthcare, or other concepts of wellbeing beyond the individual, such as wellbeing in the context of human-nature interaction [47].

1.5 Workshop Themes

We call for position papers and short empirical, theoretical or methodological papers inspired by (but not limited to) the identified challenges and opportunities related to designing (with) AI for wellbeing:

- *Challenges Related to Designing (with) data and AI*:
  (1) How can we find designerly ways to avoid privacy risks in personal health (e.g. activity, fitness, sleep, stress) data collection, increase transparency regarding the purpose of data use and increase the agency of the users in negotiating (changes in) the use of their personal data?
  (2) How can we create systems that enable smooth transitions between individual and collaborative personal health data experiences?
  (3) How can we promote the capacity of designers to envision AI failures in interactions with personal health data? How can we create designerly, personalized solutions for mitigating such failures?
- *Open Problems for AI in Designing for Wellbeing*
  (1) How can we design AI-enabled systems that consider differences in personal health data and AI literacy among individuals to avoid misinterpretations?
  (2) How can we control the appropriateness of generative AI outputs in applications where there is no expert to act as an intermediary for quality checks?

(3) How can we create positive data collection in-the-wild experiences that ensure long-term adherence for the acquisition of data sufficient in volume and generalizability for algorithm training, or design creative alternative solutions?
(4) How can we ensure that the AI output is relevant considering the large interpersonal variations in personal health data and other relevant qualities?

- *Opportunities for AI in Designing for Wellbeing*

(1) How can we enhance user experience in AI-enabled systems for promoting wellbeing by incorporating the ability of continuous improvement, during product development but also after implementation?
(2) How can we bring short- and long-term positive changes in wellbeing through AI-enabled systems?

We also welcome reflections, argumentations and case studies related to (designing with) specific types of AI for wellbeing, or broader ethical issues related to this theme. For example:

(1) How might generative AI be best used to improve wellbeing across existing products and platforms?
(2) What new use cases and interactions promoting wellbeing could be enabled by embodied AI agents (such as social robots)?
(3) What are the concerns or potential risks with implementing methods such as reinforcement learning to increase the personalization of feedback related to wellbeing, considering that such methods inherently include a starting period of high algorithm uncertainty?
(4) How do we ensure sustainable diversity, inclusivity, and adaptability in AI-enabled designs?
(5) How do we manage issues of responsibility in AI failures affecting wellbeing?

2 ORGANIZERS

Dimitra Dritsa, *Eindhoven University of Technology (main contact person)*. Dimitra Dritsa is a Postdoctoral Researcher at Eindhoven University of Technology, Department of Industrial Design. Motivated by recent advances in AI and the development of sensors that allow the longitudinal collection of behavioural data in the wild, she explores how such data and AI outputs can become design material, considering challenges such as designerly data sensemaking. She brings in expertise in research and management of projects related to wellbeing, such as investigating how physiological data from wearables can be used to promote individual and urban wellbeing.

Loes van Renswouw, *Eindhoven University of Technology*. Loes van Renswouw is a Postdoctoral Researcher in the Industrial Design Department at Eindhoven University of Technology. With a background in architecture, her research focuses on enhancing the influential power of healthy active environments by integrating smart and interactive applications. She explored different perspectives on large datasets as well as persuasive technologies and how these can inform the design of intelligent solutions. Researching and designing with data, she maintains a user-centered approach towards these so-called interActive Urban Environments.

Sara Colombo, *Delft University of Technology*. Sara Colombo is an Assistant Professor of Designing Empowering AI in the Faculty of Industrial Design Engineering, Delft University of Technology. Her research explores how design can contribute to the creation of empowering AI applications, by adopting ethical, responsible, and human-centered approaches, especially in the fields of healthcare and digital wellbeing. She regularly collaborates with industry and institutions to apply and develop her research in societal contexts. She previously worked at Eindhoven University of Technology, Massachusetts Institute of Technology, Northeastern University, and Politecnico di Milano.

Kaisa Väänänen, *Tampere University*. Kaisa Väänänen is a Full Professor of Human-Technology Interaction in Tampere University, Finland, where she leads the research group of Human-Centered Technology in the unit of Computing Sciences. She has over 25 years of research experience both in industry and academia. In her research, she is focusing on user experience of Human-Centered AI and sustainable development supported by interactive technologies.

Sander Bogers, *Philips*. Sander Bogers is a Design Director at Philips Experience Design. He leads a design team responsible for the development and implementation of enterprise-level informatics, data, and AI. Working in healthcare, he is passionate about how design skills need to evolve to design more complex and intelligent solutions that can radically transform patient and staff experiences. For his PhD at Eindhoven University of Technology, he developed data-enabled design as a way to use data more creatively when designing for smart and intelligent systems, which served as the foundation for the team he leads now.

Arian Martinez, *Microsoft*. Arian Martinez is a Principal Product Designer in the Data Cloud Studio at Microsoft. Previously, he led the Human-AI Interaction team at Oracle. His work focuses on researching how to create ethical, lawful and human-centric AI implementations; defining principles, guidelines and tools to achieve that; and designing AI-infused products and reusable components.

Jess Holbrook, *Meta*. Jess Holbrook is Director and Principal Researcher of Generative AI UX research at Meta. Previously, he was Director and Head of UX Research for Responsible AI at Meta. Before that, he was a founder and lead of Google's People + AI Research group (PAIR) focused on making AI partnerships productive, enjoyable, and fair. Prior to joining Google, he was a UX Researcher at Amazon and Microsoft. He received his Ph.D in Psychology from the University of Oregon and a B.S. in Psychology from the University of Washington.

Aarnout Brombacher, *Eindhoven University of Technology, Jheronymus Academy of Data Science*. Aarnout Brombacher is a Full Professor at Eindhoven University of Technology and he currently is Professor in 'Design theory and information flow analysis' at the Jheronymus Academy of Data Science; a joint research institute of Eindhoven University of Technology and Tilburg University. In his research he focuses on the use of dynamic, often longitudinal, field data in the design and utilization process of individualized and adaptive systems for healthcare and sports.

3 PLANS TO PUBLISH WORKSHOP PROCEEDINGS

After the workshop, we plan to publish the material generated during the workshop (ideas, sketches, position papers, conceptual framework) on our website. Accepted submissions will also be

published on the website upon agreement with the authors. We will also invite authors of selected position papers to submit an extended and revised version of their contribution to a special issue of the Behaviour & Information Technology journal by Taylor & Francis.

4 IN-PERSON, OR HYBRID

The workshop will be hybrid, fully supporting remote attendance for participants. Microsoft Teams and tools for online collaboration (such as Miro) will be used for virtual participation and interaction with in-situ participants. Breakout rooms will be used in Teams for small-group discussion between remote attendees. Transcription will be used if necessary during the interactions.

Asynchronous Engagement - A Teams channel will be used for participants who have technical difficulties and wish to contribute to the discussion. The ideation material and generated concepts will also be shared with all participants after the workshop for asynchronous viewing.

Facilities - A large screen monitor with camera, audio, and microphone will be needed for engagement with remote attendees. The workshop organizers will provide material for ideation and prototyping. An online version of the same material will be created in a collaborative online platform such as Miro, to ensure accessibility and allow engagement with the material for remote attendees.

5 WORKSHOP ACTIVITIES

Organization and Participant Recruitment - Workshop candidates will be invited to submit a position paper by email to the organizers. We will advertise the workshop using social media, HCI mailing lists and communities, and by direct invitation. We will create and maintain a website for participant recruitment and community building. We aim to attract a maximum of 30 participants.

Participant Engagement Before the Workshop - Before the workshop, we will create a Teams channel and invite the participants to introduce themselves. We will use this channel as a platform for communication and dissemination of information whenever necessary and keep it as a means for collaboration for joint proposals and special issue collaboration after the workshop. The participants will also be contacted to discuss if they would like to showcase any demos during the workshop, or test tools relevant to the topic.

During the Day - The workshop is organized as a one full-day workshop with two parts. The morning session will be focused on discussing and mapping methodological approaches, reflections and argumentations related to designing with AI for wellbeing based on case studies. In the afternoon session, we will use design fiction [1] activities using ideation material (e.g. inspired by tools for envisioning AI capabilities [16]) to collaboratively envision positive and negative scenarios utilizing AI-enabled systems for promoting wellbeing. Finally, we will create a conceptual framework synthesizing the discussed approaches and generated ideas. The preliminary workshop schedule is as follows:

- Morning session:
  - 9:00 – 9:15: Opening of the workshop (welcome and introduction to workshop goals)
  - 9:15 – 9:45: Keynote talk
  - 9:45 – 10:00: Ice Breaker
  - 10:00 – 10:15: Coffee break
  - 10:15 – 11:15: Small group activity (3-4 participants): Discuss position papers and emerging approaches in connection to the identified challenges and opportunities
  - 11:15 – 12:00: 2-minute group presentations, general discussion, and synthesis
- Lunch
- Afternoon session:
  - 13:00 – 13:30: Keynote talk (time to be confirmed depending on the availability of the speaker)
  - 13:30 – 14:15: Designing (with) AI for Wellbeing: group activity using Design Fiction (3-4 participants) to develop application concepts and emerging opportunities in this new domain
  - 14:15 – 14:45: "Devil's Advocate": exercise to explore (potential) down- or dark sides of these applications (e.g., dystopian future exercise)
  - 14:45 – 15:00: Coffee break
  - 15:00 – 15:45: Presentations of the created concepts and emerging opportunities and challenges: e.g., 5 do's and 5 don'ts with examples.
  - 15:45 – 16:45: Creation of conceptual framework and discussion of future directions
  - 16:45 – 17:00: Wrap-up

Accessibility - The workshop website will contain instructions related to making the position papers accessible. We will also contact the participants to inquire about concerns and access needs, to tailor the material to any specific needs that arise and provide any additional services required. Keynote talks will be recorded and subsequently captioned to increase accessibility. Recordings will be made available to all workshop participants.

Post-Workshop Plans - We aim to maintain and expand this emerging community by using a dedicated Teams and Slack workspace and an emailing list, and by proposing follow-up workshops at major HCI conferences.

6 CALL FOR PARTICIPATION

Designing data and AI can bring significant value to developing systems and technologies that promote physical and mental wellbeing. However, there are also challenges and risks connected to designing (with) AI for wellbeing, such as the difficulties in ensuring that the generated feedback or proposed interventions will be interpreted correctly depending on the user's data literacy, and relevant considering the large interpersonal variations between the personal health data of different individuals. In this one-day hybrid workshop, we aim to explore how we can design (with) AI for wellbeing, promoting meaningful and ethical solutions while mitigating possible negative consequences. We call for position papers and short empirical, theoretical or methodological papers (up to 2500 words, single-column ACM Master Article Submission Template, submitted by email to the organizers) addressing challenges and opportunities related to designing (with) AI for wellbeing (see our website https://designingwithaiforwellbeing.github.io/ for potential topics). The submissions will be selected based on their ability

to trigger discussion and coverage of diverse topics. While we focus on human wellbeing for maintaining a healthy lifestyle, we also welcome papers about other concepts of wellbeing. After the workshop, we plan to publish the accepted submissions and the material generated during the workshop on our website. Authors of accepted submissions will be invited for publication in a special issue. At least one author of each accepted submission must attend the workshop. All participants must register for both the workshop and at least one day of the conference.

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