

# “Designing AI for Home Wellbeing”

## World Café & AI Seminar Day

Symposium Report  
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### Background to the event

“Designing AI for Home Wellbeing” has the potential to radically change the way we think about and use AI. Given the different areas of wellbeing, such as physiological and psychological wellbeing, that have AI applications, AI has potential to influence wellbeing, including wellbeing supported by the home. Designing AI for Home Wellbeing could radically change the way AI interactions for the home are developed, in health monitoring and security for example.

“Designing AI for Home Wellbeing” was therefore proposed as a new cross-cutting research area to be explored by organising a collaborative workshop to merge wide-ranging AI expertise. The main aim was to investigate AI for Home Wellbeing’s definitions, challenges, and research priorities.

Day 1 was a face-to-face workshop in the style of a “world café”; participants were first introduced to the background of the theme and then divided into groups of no more than five to begin six 25-minute rounds of discussion for two different questions posed (three rounds per question). Questions discussed were as follows:

- (1) How can AI support Home Wellbeing for human-flourishing?
- (2) What are the key barriers to designing AI for Home Wellbeing, how do we overcome these and who has the barriers?

After each 25-minute round, participants swapped between four groups—apart from a nominated chair at each table who remained and summarised previous discussions to those joining. At the end of each Question Discussion Session (i.e., three 25-minute rounds per one question), nominated chairs also summarised the highlights from their table’s discussions. See top righthand image for an example of the workshop in action.

A 30-minute open conversation called a “Harvest Session” followed the Question Discussion Sessions to conclude the workshop where everyone openly discussed what the final outcomes from previous conversations. Insights from discussions were live captured by a professional graphic recorder as a large visual graphic (see image on page 3).

A total of 16 delegates took part in the World Café, 11 of whom were external to the University of Surrey with representation from both academia (University of Glasgow, UCL, University of East London, University of Bristol, University of Hertfordshire, University of Birmingham) and industry (i.e., IBM, Bush & Company). 10 external attendees were UK-based, and one travelled from Nairobi, Kenya. Delegates were also diverse in their expertise, and included specialisms in assistive technology, machine learning in healthcare, cognitive robot systems, computational design in public spaces, socially intelligent technologies, social change through technology, Human-Computer Interaction (HCI), knowledge discovery and data mining, ethics in robotics, and digital media in mental health.

This World Café event was followed by a “Designing AI for Home Wellbeing” AI Seminar Day on 12<sup>th</sup> July, Day 2, and featured nine speakers, eight of which also took part in the World Café event. Presented research included a range of timely topics such as, human-centred AI in robot systems, optimising user security in AI-powered smart homes, ethical trade-offs in autonomous systems, household agency and automation for wellbeing and sustainability, improving the architecture of homes through machine learning and AI, and assistive technology for independence and rehabilitation. The Seminar Day concluded with an expert panel discussion.



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### **Event themes**

To inspire and motivate emerging discussions, participants were first introduced to topical concepts “Designing AI for Wellbeing” (i.e., AI that is driven by people’s needs rather than data and supports autonomy, competency, and relatedness) and “Home Wellbeing” (i.e., the satisfaction of both basic and psychology needs through activities facilitated by the home—such as the provision of shelter and time with loved ones). This lay the foundation for the following themes that surfaced during the Question Discussion Sessions and Harvest Session.



**Question 1 Discussion Session – “How can AI support Home Wellbeing for human-flourishing?”**

- Improving safety and security—AI can support home security using specialised sensors (i.e., security cameras with facial recognition), but ethically this requires the trust and consent of all occupants, including visitors
- Personalisation—AI systems should support autonomy and choice for occupants
- Ethical use of data—AI should have mechanisms built in that respect the privacy and dignity of occupants by providing control in how and what data is collected
- Supporting physical health—AI can be employed in smart devices (i.e., smart watches and smart mirrors) to track health markers and exercise. Although, active health monitoring can carry a stigma of being weak or less able bodied, particularly for older adults
- Facilitating love and belonging—AI technology could track mood and learn occupants’ habits and routines to suggest and then implement interventions to improve emotional wellbeing and social connection with others, such as by changing lighting and playing mood enhancing sounds
- Tailoring features to occupants—any AI intervention supportive of home wellbeing must consider household differences, such as varying personalities, cultural backgrounds, and age groups, number of occupants and their relationship to each other
- Reducing food waste—AI (i.e., smart fridges) could be employed to reduce food waste by alerting to food about to go out-of-date and through suggestions of healthy recipes based on fridge contents. The AI system could also learn occupants’ eating habits and auto order food about run out as well as suggest ways of sharing excess food with other households.
- Adaptable to varying architectures—AI systems need to be adaptable to different domestic architectures and for retrofitting older buildings to remain inclusive for disadvantaged communities or inhabitants of nonmainstream housing

**Question 2 Discussion Session – “What are the key barriers to designing AI for Home Wellbeing, how do we overcome these and who has the barriers?”**

- AI creators working independently—many AI creators are operating independently, creating silos of research. Greater collaboration is needed to create a robust framework for designing AI technology under one system (i.e., supporting interoperability of different AI technologies) that also enables personalisation for different contexts and users. This calls for

multidisciplinary working groups to create and explore interdisciplinary research questions that tackle the complexity of “Designing AI for Home Wellbeing”

- Lack of trust, time, and motivation in AI users—some users don’t have the time or inclination to engage with AI technology due to distrust and previous experiences of unmet expectations, or lack of digital literacy, or finances to afford it. Clear KPIs and metrics for success could be developed to ensure that AI systems are holistically developed for home wellbeing, including their affordability and usability
- Ignorance of decision makers—many of the key decision makers, such as policy makers, have no or a very limited understanding of how AI systems are built and deployed, including negative consequences of different approaches, and need to be involved in the discussion for “Designing AI for Home Wellbeing”
- Complex infrastructure—AI systems require large quantities of data and the right infrastructure for managing and storing this data to teach them how to perform effectively and accurately. New policies and incentives could be introduced to encourage data sharing between different companies and organisations to improve the robustness and resulting benefit of AI systems to home wellbeing
- Data quality, ownership, and purpose—a poor dataset can make AI systems inaccurate and unethical (e.g., a home security system might not recognise faces of a certain skin colour). There are also issues around who owns the data (e.g., the users or owners of the service that gathers it) and converting it to a usable format (i.e., all data needs to be labelled to make it understandable to the AI system). Also, data is often collected to profile customer personas for financial gain or for clinical records rather than academic research purposes. Government incentives could be developed to encourage organisations and companies to share their data for the benefit of meaningful research

#### *Harvest Session*

- Emotional, social, and economic significance of home—home is an emotional and private space at the centre of the economy in which the occupants may have different levels of agency depending on their socioeconomic background and/or relationships with each other (i.e., parent and child). Designers and developers of future AI systems for the home need to be very critical and carefully consider how AI technology could be used to enact control in this space, either between occupants or in wider society by businesses and government
- Fluidity with culture—AI systems will need to remain adaptable and responsive to changes in cultural norms, such as the acceptability of AI technology in the home (i.e., “Alexa” personal assistant) and the ways in which data is gathered and employed
- Need for future network—delegates concluded that a new research network is needed, including industry representatives, to create shared terminology/metrics and working groups to generate a research roadmap and lead associated activities for “Designing AI for Home Wellbeing”—as these example quotes below from delegate feedback illustrate:

*“I would like to strongly advocate that we build on the momentum generated during the workshop...I think we should create concrete opportunities (e.g., networks) for discussions and collaborative effort toward establishing a roadmap for further research on the topic”*

*“I am looking forward to supporting you and developing our UoG research on homes and wellbeing and developing a community of interest with you!”*

### **Next steps - Outcomes**

Key outcomes and next steps for this workshop are as follows:

- (1) the creation of a collaborative network with workshop participants that will look to support and encourage collaborative research on emerging themes around “Designing AI for Home Wellbeing” to build evidence and ultimately influence future related policy
- (2) sustaining, growing, and leading this network by:
  - (a) leading a follow-on World Café style event at a research event organised by one of the World Café delegates at University of Glasgow in October to expand on key research areas identified for “Designing AI for Home Wellbeing”
  - (b) applying for a EPSRC network grant to support costs of building an interdisciplinary research network for “Designing AI for Home Wellbeing”, such as funding of future workshops, steering group meetings, and associated travel
- (3) comparing of resulting themes from the World Café event with those from a World Café event run on “Designing AI for Home Wellbeing” with design experts at the biennial Design Research Society conference (DRS2022) on 29th June 2022. Themes and insights from both world café events will be used to write a positioning paper on “Designing AI for Home Wellbeing” for submission to The Design Journal. To reach a more technical audience, a complementary article introducing the “AI for home wellbeing” concept and how design methods could facilitate its development will be written and submitted to a tech audience focused publication such as IEEE Communications Magazine.

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