

Guest Editorial

Citation for published version (APA):

Spitale, M., Winkle, K., Barakova, E., & Gunes, H. (2024). Guest Editorial: Special Issue on Embodied Agents for Wellbeing. *International Journal of Social Robotics*, 16(5), 833-834. <https://doi.org/10.1007/s12369-024-01150-0>

Document license:

TAVERNE

DOI:

[10.1007/s12369-024-01150-0](https://doi.org/10.1007/s12369-024-01150-0)

Document status and date:

Published: 01/05/2024

Document Version:

Publisher's PDF, also known as Version of Record (includes final page, issue and volume numbers)

Please check the document version of this publication:

- A submitted manuscript is the version of the article upon submission and before peer-review. There can be important differences between the submitted version and the official published version of record. People interested in the research are advised to contact the author for the final version of the publication, or visit the DOI to the publisher's website.
- The final author version and the galley proof are versions of the publication after peer review.
- The final published version features the final layout of the paper including the volume, issue and page numbers.

[Link to publication](#)

General rights

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal.

If the publication is distributed under the terms of Article 25fa of the Dutch Copyright Act, indicated by the "Taverne" license above, please follow below link for the End User Agreement:

www.tue.nl/taverne

Take down policy

If you believe that this document breaches copyright please contact us at:

openaccess@tue.nl

providing details and we will investigate your claim.



Guest Editorial: Special Issue on Embodied Agents for Wellbeing

Micol Spitale^{1,4} · Katie Winkle² · Emilia Barakova³ · Hatice Gunes⁴

Published online: 28 May 2024

© The Author(s), under exclusive licence to Springer Nature B.V. 2024

Our society witnesses an increase in wellbeing-related issues, such as depression and anxiety, increasing the potential impact of assistive technologies which might alleviate these conditions. Embodied agents (e.g., virtual agents, robots) seemingly hold promise as tools to help improve wellbeing and are currently being designed and evaluated for various related applications, including therapeutic interventions, and medical treatments.

Designing embodied agents suitable for promoting wellbeing presents a significant challenge. These agents must engage in social interactions with humans by communicating, cooperating, and making decisions, while also considering human social cues to facilitate more natural and smooth interactions. Additionally, they need to analyse, understand, and appropriately respond and adapt to human behaviour and affective states to connect with humans empathetically using nonverbal cues, such as facial expressions and posture, which support and add meaning to their verbal communication.

However, due to a lack of publicly available large-scale datasets obtained over longer periods of time, embodied agents are very limited in their capabilities to address those

challenges. This often poses a risk for user engagement and satisfaction, which are key factors for successful wellbeing interventions.

This Special Issue aims to deepen the understanding of human-agent interactions in the context of wellbeing, addressing how the design and use of embodied agents might impact human-agent interactions (HAI) and affect society at large. It includes extended works initially presented at the 1st edition of the workshop HRI4Wellbeing (theme: Socio-Emotionally Adaptive Robots), held in 2022, as well as new contributions specifically targeting this Special Issue. The collection of articles gathered and the variety of themes discussed highlight the extent to which HAI and human-robot interaction (HRI) communities have started to design, deploy and evaluate embodied agents for wellbeing, and identifies the trends in this research area.

Articles in this special issue of the International Journal of Social Robotics devoted to the theme of embodied agents for wellbeing build on a wide range of disciplines, including HAI and HRI, but also psychology, social signal processing, and affective computing. The issue seeks to foster cross-disciplinary collaboration by bringing together the most recent findings from diverse research groups working in these fields.

We welcomed submissions from diverse disciplines and various methodological and technological perspectives. We sought to capture the multifaceted nature of the theme inviting contributions on the following topics: Embodied agent design for wellbeing, Socially assistive robots for wellbeing, Affective robotics and virtual agents for wellbeing, Affective cognitive architectures, User studies for wellbeing (both in lab and field), Adaptation and personalization for wellbeing applications, Machine learning for wellbeing, Concept papers on embodied agents for wellbeing, Methods to measure wellbeing, Ethics, privacy, data security, and responsible innovation considerations, Modelling users and user behaviours in wellbeing interventions, Modelling robot behaviours to promote wellbeing, Methodological challenges for achieving successful wellbeing interventions via

✉ Micol Spitale
micol.spitale@polimi.it

Katie Winkle
katie.winkle@it.uu.se

Emilia Barakova
e.i.barakova@tue.nl

Hatice Gunes
hatice.gunes@cl.cam.ac.uk

¹ Politecnico di Milano, Department of Electronics, Information, and Bioengineering, Milan 20133, Italy

² Department of Information Technology, Uppsala University, Uppsala 751 05, Sweden

³ Department of Industrial Design, Eindhoven University of Technology, Eindhoven 5600 MB, The Netherlands

⁴ Department of Computer Science and Technology, University of Cambridge, Cambridge CB3 0FD, United Kingdom

HAI, and Metrics for evaluating wellbeing and agent intervention outcomes.

All submissions have undergone a rigorous peer-review process in line with the journal's high standards. Nine contributions have been accepted (43% of acceptance rate) from a total of 21 submissions. The articles featured in this issue cover various aspects within this theme, ranging from exploring the design of social robots for wellbeing, modelling robot behaviours, integrating robots into virtual environments, deploying robotic coaches that deliver wellbeing practices, and analysing multimodal affective cues in robot-human interaction. All featured papers included in this issue focus on robotics rather than virtual agents, indicating a recent growth in the field of robotics, particularly in wellbeing applications.

Two contributions investigate the design of social robots from two different perspectives. One delves into the aesthetics of soft personal robots, introducing a fresh design concept called Soft Biomorphism, which aims to enhance the inherent biomorphic aesthetic features of soft robots and use them as facilitators for human interaction. The other contribution introduces an innovative framework for designing and examining social robots that promote wellbeing.

Two contributions model robot behaviours considering various scenarios. One study focuses on robot navigation, specifically examining how robot gaze cues influence individuals' subjective perceptions of a mobile robot as a socially present entity across three navigation scenarios. The other study explores the workplace setting, introducing a robot to support taking breaks and evaluating its influence on individual users' break-taking routines during extended periods of deployment.

Another paper explores how integrating social robots into architectural spaces can shape occupants' perceptions of that environment. The authors embedded socially

interactive robotic flowers in interior spaces, using them as decorative elements, to examine their impact on inhabitants' experiences and impressions of the space.

Two of the accepted submissions conducted empirical studies to evaluate the use of robots for delivering mental wellbeing practices. One study investigates the feasibility of an autonomous humanoid social robot delivering a brief mindful breathing technique to enhance wellbeing through a pilot randomised controlled trial. The second mediated and online study investigates how prolonged interactions with a humanoid robot influence individuals' self-disclosure behaviour, perceptions of the robot, and their wellbeing.

Two studies investigate multimodal affective cues in interactions between robots and humans. One study assesses the accuracy of machine learning models that use thermal imaging and action unit data to classify affect in a gamified robot therapy setting. The second study conducts an analysis of children's data collected from multiple sources during robot-assisted assessment of their mental wellbeing.

The diverse range of perspectives included in this collection highlights the extensive impact that embodied agents can have on human wellbeing while also emphasising the importance of interdisciplinary collaboration, which enriches each work by drawing on the diverse expertise of the authors in fields such as social robotics, affective computing, design, and psychology. Similarly to the original aim of our HRI4Wellbeing workshop, this special issue not only provides a comprehensive snapshot of the current research landscape but also exemplifies how interdisciplinary collaborative efforts can create a breakthrough for the future of embodied agents for wellbeing.

Publisher's Note Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.