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HHAI2022: AUGMENTING HUMAN INTELLECT

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HHAI2022: Augmenting Human Intellect

Proceedings of the First International Conference on Hybrid Human-Artificial Intelligence

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Preface

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1. Introduction

This volume contains the proceedings of the 1st International Conference on Hybrid Human-Artificial Intelligence (HHAI2022), held during June 13–17, 2022, in Amsterdam, The Netherlands. HHAI2022 was the first international conference focusing on the study of Artificial Intelligent systems that cooperate synergistically, proactively, responsibly and purposefully with humans, amplifying instead of replacing human intelligence.

Scholars from diverse fields (from AI, to human computer interaction, cognitive and social sciences, computer science, philosophy, and others) were invited to submit their best original, new as well as in progress, visionary and existing work on Hybrid Human-Artificial Intelligence. This editorial presents the highlights from this fruitful conference.

Hybrid Human-Artificial Intelligence is a new research area that is concerned with all aspects of AI systems that assist humans and vice versa, emphasizing the need for adaptive, collaborative, responsible, interactive and human-centered artificial intelligence systems that leverage human strengths and compensate for human weaknesses, while taking into account social, ethical and legal considerations. This novel and timely field of study is driven by current developments in AI, but also requires fundamentally new approaches and solutions.

The first edition of what is intended to become a series of HHAI conferences welcomed research on different challenges in Hybrid Human-Artificial Intelligence. The following list of topics is illustrative, not exhaustive:

- Human-AI interaction and collaboration
- Adaptive human-AI co-learning and co-creation
- Learning, reasoning and planning with humans and machines in the loop
- User modeling and personalisation
- Integration of learning and reasoning
- Transparent, explainable and accountable AI
- Fair, ethical, responsible and trustworthy AI
- Technical and critical perspectives on human-AI interaction
- Meaningful human control over AI systems
- Values and politics in the design and use of human-AI interaction
- Law and policy challenges around human-centered AI systems

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- Societal awareness of AI
- Multimodal machine perception of real world settings
- Social signal processing

We welcomed contributions about all types of technology, from robots and conversational agents to multi-agent systems and machine learning models.

2. Contributions

To stimulate the exchange of novel ideas and interdisciplinary perspectives, three types of papers were accepted: i) full papers, which presented original and impactful work, ii) working papers, which presented work in progress or new and visionary ideas, and iii) extended abstracts, which presented existing, pre-published work of relevance to HHAI. For evaluating the novelty and impact of these contributions, the support of our PC members was key, who brought a diverse broad range of experiences, perspectives and backgrounds (ranging from theoretical AI, to law, policy, philosophy, and others). With the exception of 4 abstracts of previous work, every paper was reviewed by at least 3 reviewers.

Overall, we received a total of 96 submissions. The wordcloud presented in Figure 1 presents an overview over the most prominent topics of the accepted contributions. Analysing the most emerging topics in the submissions we saw that the most technical side of human-AI interaction and collaboration, together with learning, reasoning and planning with humans in the loop, was similarly prominent at this first edition of HHAI as the responsible AI line of work (fairness, ethics, transparency, etc.), with many papers at the intersection of these domains. The conference also featured significant amount of work on adaptive human-AI co-learning and co-creation, user modelling and personalisation, technical and critical perspectives of human-AI interaction and meaningful control over AI systems.

The conference program included presentations of 16 full research papers, 12 working papers and 5 extended abstracts. This volume includes the full papers and the abstract of a subset of working papers.

For the main research program two awards were presented. The paper *Challenges of the adoption of AI in High Risk High consequence time compressed decision-making environments* by Bart van Leeuwen, Richard Gasaway and Gerke Spaling was chosen as best working paper, while the best research paper award went to *HyEnA: A Hybrid Method for Extracting Arguments from Opinions* by Michiel van der Meer, Enrico Liscio, Catholijn M. Jonker, Aske Plaat, Piek Vossen and Pradeep K. Murukannaiah.

HHAI highlighted 4 invited keynotes, which together provide an overview of how diverse and multidisciplinary this field is:

- *With whom do we hybridise? Principle Agents of AI*, by Joanna Bryson (Professor of Ethics and Technology at The Hertie School of Governance). Abstract: Artificial Intelligence is a set of techniques facilitating our capacity to navigate the information spaces afforded by substantial improvements in digital technologies and infrastructures. But whose is this "our" – who is gaining in capacities and at what costs? In this talk I will review a sampling of AI impacts in the individual, national, and global spheres. I will present my recent research in trans-

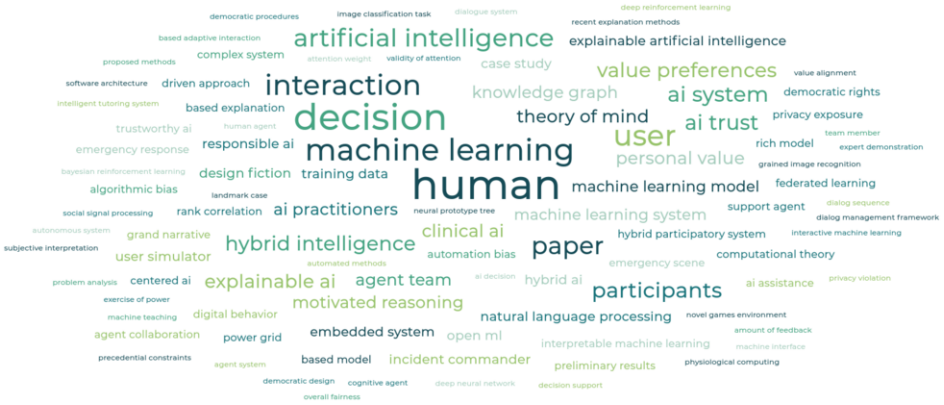

Figure 1. Wordcloud based on the titles and abstracts of accepted contributions, highlighting the interdisciplinary aspect of HHAI2022.

parency for and through AI, governance of those that produce AI, and the transnational dynamics that may be obscuring and even compromising our agency. I use this evidence to suggest that ultimately ethics and responsibility are only sensible framings for relationships between peers, and artefacts are never true peers with organisms.

- *Creating Human-Computer Partnerships*, by Wendy Mackay (Professor of Human-Computer Interaction at Inria Paris-Saclay). Abstract: Despite incredible advances in hardware, much of today's software remains stuck in assumptions that date back to the 1970s. As software becomes ever more 'intelligent', users often find themselves in a losing battle, unable to explain what they really want. Their role can easily shift from generating new content to correcting or putting up with the system's errors. This is partly due to the assumptions from AI that treat human users primarily as a source of data for their algorithm – the so-called "human-in-the-loop" – while traditional Human-Computer Interaction practitioners focus on creating the "user experience" with simple icon and menu interfaces, without considering the details of the user's interaction with an intelligent system. I argue that we need to develop methods for creating human-computer partnerships that take advantage of advances in machine learning, but also leave the user in control. I illustrate how we use generative theory, especially instrumental interaction and reciprocal co-adaptation, to create interactive intelligent systems that are discoverable, appropriable and expressive. Our goal is to design robust interactive systems that augment rather than replace human capabilities, and are actually worth learning over time.
- *Designing AI systems with a variety of users in mind*, by Fernanda Viegas (Professor of Computer Science at Harvard, Principal Scientist at Google). Abstract: How should people relate to artificial intelligence technology? Is it a tool to be used, a partner to be consulted, or perhaps a source of inspiration and awe? As technology advances, choosing useful human/AI relationship framings will become an increasingly important question for designers, technologists and users. I'll discuss a series of research projects – ranging from data visualizations and tools for medical practitioners to guidelines for designers – that illustrate how AI

can play each of these roles. By providing users with a diversity of engagement possibilities, I hope to develop more responsible and effective ways to construct, use and evaluate this technology.

- *The HumanE AI Net vision of Human Centric AI*, by Paul Lukowicz (Professor of Computer Science at the German Research Center for Artificial Intelligence). The EU-funded HumanE-AI-Net project brings together leading European research centres, universities and industrial enterprises into a network of centres of excellence. Leading global artificial intelligence (AI) laboratories will collaborate with key players in areas, such as human-computer interaction, cognitive, social and complexity sciences. The project is looking forward to drive researchers out of their narrowly focused field and connect them with people exploring AI on a much wider scale. The challenge is to develop robust, trustworthy AI systems that can 'understand' humans, adapt to complex real-world environments and interact appropriately in complex social settings. HumanE-AI-Net will lay the foundations for designing the principles for a new science that will make AI based on European values and closer to Europeans. Paul's talk was supported by EurAI.

HHAI2022 also featured 8 workshops, for which we specifically encouraged contributions that were likely to stimulate critical or controversial discussions about any of the areas of the HHAI conference series. These workshops were:

- 1st Workshop on the representation, sharing and evaluation of multimodal agent interaction (mmai2022)
- Heterodox Methods for Interpretable and Efficient Artificial Intelligence
- Imagining the AI Landscape after the AI Act (IAIL 2022)
- Common Ground Theory and Method Development Workshop: Exploring, Understanding, and Enhancing Human-Centricity in Hybrid Work Settings
- Knowledge Representation for Hybrid-Intelligence (KR4HI)
- HI ESDiT Collaboration on AI, Human Values and the Law
- Human-Centered Design of Symbiotic Hybrid Intelligence
- The (Eco)systemic challenges in AI

At the first HHAI Hackathon H3AI, the winning team approached the problem of fake news by providing fact checkers with a new modus of operandi, leveraging the capabilities of AI. The team's envisioned AI system would identify atomic question from a potentially fake news article, put them up for review for the fact checker and crowd source the answers, thus reducing the fact checker's workload while still leveraging human intellect.

In collaboration with Amsterdam Data Science, we also organised an Industry Meetup with around 30 participants in which researchers and practitioners met to discuss HHAI related problems.

A Posters and Demos Track, finally, complemented the conference and offered an opportunity to present late-breaking results and showcase innovative implementations. Each submission was reviewed based on their self-standing contribution to Hybrid Human-AI, by a minimum 2 reviewers from a program committee from diverse disciplines.

Out of 28 submissions, we accepted 10 posters and 7 demos to present their work in an interactive and informal context with snacks and drinks. Additionally, we also pro-

vided space for 10 posters accompanying full paper presentations from the main track of the conference.

All submissions for the Poster and Demo track competed for Best Poster and Best Demo awards based on participants votes. An honorable mentioning was given to an accompanying poster went to Mehul Verma and Erman Acar for their poster *Learning to Cooperate with Human Evaluative Feedback and Demonstrations*. The best Poster Award went to Enrico Liscio, Catholijn M. Jonker and Pradeep K. Murukannaiah for *Identifying Context-Specific Values via Hybrid Intelligence*, while the Best Demo was presented by Dou Liu, Claudia Alessandra Libbi and Delaram Javdani Rikhtehgar on *What would you like to visit next? Using a Knowledge-Graph Driven Museum Guide in a Virtual Exhibition*.

Acknowledgements

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HHAI2022 would not have been possible without the generous support of a number of additional sponsors. There were three Platinum sponsors, SIKS,[2] the Dutch Research School for Information and Knowledge Systems covered the registration fees for a large number of students, the AI Journal[3] support for scholarships, the hackathon and for a professional video to broaden the experience. Not only was TNO[4] responsible for organising the Hackathon, they also supported it financially. Our two Gold sponsors were Huawei,[5] and the Amsterdam Convention Bureau[6] that supported the Industrial Event, as well as the conference opening. We also thank our four Silver sponsors Sony,[7] IOS Press,[8] EurAI[9] and the Network Institute.[10]

Thanks to everybody, including attendees at the conference and our PC members, for making HHAI 2022 a successful event.

Stefan Schlobach (General Chair)
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[2] http://www.siks.nl/
[3] https://aij.ijcai.org/
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