

# Invisible AI-driven HCI Systems – When, Why and How

InvAI'20 – A NordiCHI 2020 workshop proposal

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## ABSTRACT

The InvisibleAI (InvAI'20) workshop aims to systematically discuss a growing class of interactive systems that invisibly remove some decision-making tasks away from humans to machines, based on recent advances in artificial intelligence (AI), data science, and sensor or actuation technology. While the interest in the affordances as well as the risks of hidden pervasive AI are high on the agenda in public debate, discussion on the topic is needed within the human-computer interaction (HCI) community.

In particular, we want to gather insights, ideas, and models for approaching the use of barely noticeable AI decision-making in systems design from a human-centered perspective, so as to make the most out of the automated systems and algorithms that support human activity both as designers and users. Concurrently, these systems should safeguard that humans remain in charge when it counts (high stakes decisions, privacy, monitoring lack of explainability and fairness, etc.). What to automate and what not to automate is often a system designer's choice (Kindberg & Fox, 2002). By taking the established concept of explicit interaction between a system and its user as a point of departure, and inviting authors to provide examples from their own research, we aim to stimulate dynamic discussion while keeping the workshop concrete and system design-focused. The workshop especially directs itself to participants from the interaction design, AI, and HCI communities. The targeted scientific outcome of the workshop is an up-to-date ontology of invisible AI-HCI systems and hybrid human-AI collaboration mechanisms, and approaches. Additionally, we expect that the workgroups and the roundtables will provide starting points shaping continued discussions, new collaborations, and innovative scientific contributions that springboard from the workgroups' findings.

The focus of the proposed workshop involves the bridging of two spaces of computational research that impact user experiences and societal domains (HCI and AI). Thus, the proposed workshop topic aligns well with the theme of this year's NordiCHI conference which is *Shaping Experiences, Shaping Society*.

## CCS CONCEPTS

- Human-centered computing

## KEYWORDS

Human-computer interaction, artificial intelligence, human-machine collaboration.

## 1 A scheduled overview of planned activities

Prior to the conference we will make all accepted short workshop papers (2-4 pages) available to the participants. Main themes will be identified among the submissions and used as discussion anchors in the group work sessions. The preliminary workshop schedule follows:

9:00-9:45	Invited keynote(s) and Q&A (may be virtual)
9:45-11:00	Short presentations by participants (5 minutes each, depending on number)

11:00-11:30	Coffee break
11:30-12:30	Group work: discussion (predetermined topics based on accepted papers)
12:30-13:30	Lunch
13:30-14:00	Group work: preparing presentation
14:00-15:00	Group work: presentations and discussion
15:00-15:30	Coffee Break
15:30-16:30	Identify two overarching themes of interest to the participants and discuss these (structured as two larger roundtables)
16:30-17:00	Wrap-up and summarizing

The organizers expect that the workshop will lead to a submitted HCI publication of an invisible AI systems ontology for HCI researchers and practitioners. We will adjust the schedule above based on the conference-wide coffee and lunch breaks. Additionally, we have a virtual fallback plan in case the COVID-19 pandemic enforces that we run the workshop virtually instead of face-to-face.

## 2 Draft of call for workshop participation

### Invisible AI-driven HCI Systems – When, Why and How

Workshop date: October 25 or 26, in conjunction with NordiCHI 2020 (<https://nordichi2020.org/>)

Interaction with digital systems traditionally exhibit an explicitly noticeable character: The system informs the user about the current state upfront (e.g. through a dialogue box on a visual display) and the user responds with a decision manifested in evident mechanical action (a mouse movement and click, etc.). As indicated by the significant interest in alternative modes of interaction in recent years from within the HCI community, e.g. Peripheral Interaction (e.g. Bakker, 2013), Lived Informatics (e.g. Rookbsy et al., 2014), Mindless Computing (e.g. Adams et al., 2015), Ambient Displays (e.g. Hausen, 2014); Subtle Gaze Direction (Bailey et al. 2009), Implicit HCI (e.g. Schmidt, 2000) as well as from the AI communities, e.g. Mixed-Initiative Interaction (e.g. Horvitz, 1999; Yannakakis et al., 2014), Human-centered ML (e.g. Fiebrink and Gillies, 2018), humans in the loop interactive AI approaches; there are strong reasons for system designers to revisit and rethink the idea of the classic interactive structure between system and user. Furthermore, there is a joint understanding from within the HCI community (e.g. “Intelligibility”, Belotti & Edwards, 2001) and the AI community that transparency challenges associated with deep learning systems is problematic. Acknowledging this complexity, researchers within HCI advocate a shift towards designing for a lived experience rather than focusing mainly on user behaviour and instrumental goals. This workshop observes:

1. Interaction with intelligent digital systems has become so pervasive in everyday life that much of it does not involve giving it a second thought, thanks to the human mind’s tendency to automate routine tasks (habituation).
2. New ways of communicating information between system and user, in both directions, emerging from recent developments in AI, data science, and sensor or actuation technology invisibly moves decision-making tasks from humans towards machines.
3. Evidence shows positive results from taking a collaborative approach to interaction between humans and AI in, for instance, complex creative tasks, if compared to non-hybrid approaches.

Human decision-making will increasingly be invisibly influenced by pervasive AI through various forms of existing and new kinds of HCI, often without users being aware of the AI system ‘under the hood’. The growing field of explainable AI (XAI) involves the transparency, interpretability, explainability, and control of AI algorithms, although more focus is needed on how to make AI transparently under the control of the end user, while balancing the engagement level of the user experience (Zhu et al., 2018). The human-centered perspective fostered within HCI could contribute here. Also, HCI provides methodologies that can boost AI system evaluation in terms of these constructs. The workshop will also explore how system designers are designing human-AI collaboration today, and what our ideas are for tomorrow in order to make this collaboration more transparent, interpretable, and explainable for the end user.

Key topics of this workshop include but are not limited to:

- Transparent, interpretable and explainable AI systems – establishing user awareness when desirable
- Ethics and privacy issues with invisible pervasive AI systems
- Designing for lived experiences with invisible and pervasive AI systems
- Designer-centered and/or mixed-initiative co-creativity systems
- Co-evolution of the user and AI system interaction; intelligent and adaptive UIs
- Humans-in-the-loop systems with invisible and pervasive AI
- Machine learning algorithms for hybrid decision-making with a focus on end users
- Attention-aware systems (e.g. based on eye tracking, human sensing technologies)
- Models for unconscious and conscious HCI beyond implicit/explicit input and output
- Perceptual and cognitive methods for subtle cueing and priming users (e.g. subtle gaze direction, language-based priming and interaction); persuasive technologies
- Spatiotemporal properties of emerging AI-HCI systems (wearable and context-aware systems theoretically opens for split-second hybrid decision-making everywhere)

Submit your two to four-page ACM single-column paper according to the NordiCHI 2020 formatting guidelines (<https://nordichi2020.org/instructions-authors#/>) in one of these categories: 1) a focused empirical study, 2) a demo paper with description of a system prototype, or 3) a position paper. Papers are submitted using the EasyChair submission system here: <WEBSITE>. The deadline for submission is August 3 2020. Notification of acceptance August 17 2020. Please direct questions to <EMAIL>.

### 3 Promotional strategy and recruitment and selection of participants

Apart from distributing the CFP widely in suitable HCI and AI related forums, email lists, and networks, a targeted list of approximately 30 individual researchers will be invited to submit short papers. In addition, we will invite at least one keynote speaker and additional co-organizers may be added prior to the workshop date. The extended abstracts submitted by the participants will be reviewed by a program committee comprising the workshop organisers and other researchers. Our target is around 20 participants at the workshop. Following the workshop, participants will be encouraged to expand on their extended abstracts and submit them to relevant scientific journals. For example, one of the workshop co-organizers is editing an MDPI Information Journal Special Issue on *Unconscious Computing through Emerging Wearable Systems* with a suitable deadline on November 30th 2020:

[https://www.mdpi.com/journal/information/special\\_issues/unconscious\\_comput\\_emerging\\_wearable\\_syst](https://www.mdpi.com/journal/information/special_issues/unconscious_comput_emerging_wearable_syst)

### 4 Organizers background: Short biographical notes

Four organizers are members of the Egocentric Interaction research group at Malmö University Sweden (<https://www.mah.se/egocentricinteraction/>) and two are from other institutions.

**Cecilia Ovesdotter Alm** is Associate Professor at Rochester Institute of Technology. Her research focus is human-centered AI and linguistic multimodal sensing, including for affective computing. She is PI of NSF-funded REU Site: Computational Sensing for Human-centered AI and the Human-centered AI Lead of RIT's Center for Human-aware Artificial Intelligence. She co-organized the 2018 and 2020 Workshops in Human-centered Computational Sensing, was co-advisor for the Student Research Workshop at ACL 2017, and is D&I co-chair for ACL 2020.

**Alberto Alvarez** is a PhD student at Malmö University. His research focuses on the interaction between artificial intelligence and humans within the context of exploring how AI and humans can collaborate and co-create artifacts and the collaborative impact on human creativity. His research interests are on computational intelligence in games, computational creativity and co-creativity, mixed-initiative tools, and believable agents. He was the poster chair at the Foundations of Digital Games conference (FDG) 2018.

**José Font** is Associate Professor at Malmö University and holds a PhD in artificial intelligence from the Universidad Politécnica de Madrid. His research focuses on artificial intelligence and computational

intelligence in games, exploring the ways in which AI can be a productive and creative tool during the video game development process, such as procedural content generation and mixed-initiative creative tools. He is also active in gamification, e-learning, and purposeful games. He co-organized the FDG 2018 conference in Malmö.

**Antonios Liapis** is a lecturer at the University of Malta. He does research on the crossroads of game design, artificial intelligence and computational creativity. More specifically, he explores the limits of computational input to the human-driven design process in computer-aided design tools. Beyond AI-assisted game design, his research pursuits revolve around procedural content generation, digital aesthetics, evolutionary computation, neuroevolution and constrained optimization. He has won several best paper awards. He has worked in the following FP7 projects: SIREN, C2Learn and AutoGameDesign and in the H2020 projects PRISMARCH, AI4Media, CrossCult, ENVISAGE and CoM\_n\_Play-Science.

**Thomas Pederson** is Professor in Computer Science at Dept. of Computer Science and Media Technology at Malmö University. He heads the Egocentric Interaction research group there, where he explores data-driven context-aware and wearable interactive systems that seamlessly support ongoing real-world human tasks through subtle multimodal cueing based on emerging Augmented Reality platforms. He co-chaired NordiCHI 2012 in Copenhagen and has co-organized several other workshops at NordiCHI and other HCI-related conferences.

**Johan Salo** is a PhD student at Malmö University. M.Sc Interaction design, Professional experience: Research project manager, interaction designer, and managing director at a digital design company. His research interests include personal informatics, wearables, interaction design, and human-computer interaction. He is also part of the Data Society Research Program at Malmö University. He has organized design workshops and conference workshops while working in the media industry. He has worked in the PaperWorks FP6 project and other projects such as Living Lab Malmö, PaperWorks, NiviNavi, BluePromo and Stadsfabula.

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