# Empathic Technologies Shaping Innovative Interaction: Future Directions of Affective Computing

Esther Bosch
esther.bosch@dlr.de
German Aerospace Centre
Germany

David Bethge
david.bethge@ifi.lmu.de
Ludwig Maximilian University of Munich
Germany

Marie Klosterkamp
marie.klosterkamp@uni-kassel.de
University of Kassel
Germany

Thomas Kosch
kosch@informatik.hu-berlin.de
HU Berlin
Berlin, Germany

## ABSTRACT

Affective computing became a prominent research area for modeling empathic Human-Computer Interaction (HCI) to design interfaces that react or respond to their user's emotions. However, several challenges remain in emotion recognition, adaptive interface intervention, real-world evaluations, or ethical implications before affective and empathic interfaces will be commonplace. In this workshop, we will discuss the current challenges of empathic and affective computing within the HCI community, including sensing, design of emotional adaptivity, and real-world evaluation. By bringing the community together, we envision ideating and creating new research directions in this field that will lead to a new generation of affective and empathic interfaces. This workshop aims to bring together researchers interested in these topics through open discussions, presentations, and an interactive prototyping session.

## CCS CONCEPTS

• **Human-centered computing** → **Ubiquitous and mobile computing**; *Empirical studies in HCI*; • **Computing methodologies** → *Machine learning*.

## KEYWORDS

Emotions, Affect, Sensing, Adaptive Interfaces, Communication

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## 1 INTRODUCTION AND BACKGROUND

Emotions are a communication channel to convey information between humans [14] implicitly. Empathic and affective communication occurs voluntarily and unnoticed through different channels, including spoken words, facial expressions, behavioral patterns, or physiological responses [17]. Such cues can be recognized by other persons, who in turn can react to develop empathy and react to emotions accordingly [15]. In contrast to humans, however, we interact more daily with computing devices. Although these devices are excellent in estimating the user's context [16], emotion-sensing and empathic applications remain challenging in the scientific community.

Consequently, the research fields of affective and empathic computing aim to understand and develop emotion-aware systems, for example, in assessing driver emotions to regulate them [4, 6, 19]. Other use cases include the communication of emotional engagement [9] or communication of emotions between partners [8]. Yet, ubiquitous affective and empathic sensing poses a major research challenge. Previous research successfully recognized user emotions using multimodal data collections through cameras, physiological and cortical data [1, 3, 4, 7, 10, 11, 19]. Another stream of research looks at the affect recognition as a general purpose learning scheme, where machine learning algorithms are employed to encode affective input into low-memory latent representation that can be used in multiple purposes and shared easiliy across systems [2, 5]. Although current research results look promising [13, 18], the successful deployment of empathic and affective faces several challenges: (1) sensing affects and emotions are highly person-dependent, hence susceptible to individual noise. (2) Next, empathic and affective data must be interpreted on-the-fly to provide user interventions. However, it is unclear how interface interventions must be designed to communicate affective states with the user. (3) Most state-of-the-art research evaluates their sensing techniques in controlled lab settings, neglecting challenging real-world parameters. (4) Finally, emotion-aware systems can induce placebo effects for perceived adaptiveness, letting users perceive a novel system as beneficial [12].

The workshop "Empathic Technologies Shaping Innovative Interaction" lays the foundation for a research field concerning integrating emotion-sensing capabilities in devices. The workshop invites submissions concerning novel emotion-sensing techniques,

the presentation of affect-adaptive interfaces, and the demonstration of proof-of-concept prototypes in real-world environments. We connect recent research revolving in this field with the workshop to start, grow, and foster a community around empathic interfaces in human-computer interaction research. This includes presenting, demonstrating, and discussing existing sensing techniques and demonstrators. Consequently, the workshop encourages the presentation and demonstrations of empathic interfaces.

## 2 WORKSHOP STRUCTURE

We plan a one-day workshop for approximately 20 participants and the following schedule:

(1) Workshop introduction (15 minutes)
(2) Ice breaker activity (15 minutes)
(3) Keynote (60 minutes)
(4) Coffee break (30 minutes)
(5) Pitches Part I (60 minutes)
(6) Lunch break (90 minutes)
(7) Prototyping and Demo Session (90 minutes)
(8) Pitches Part II (60 minutes)
(9) Coffee Break (30 minutes)
(10) Closing and Feedback Session (15 minutes)

## 3 ORGANIZER BIOGRAPHIES

**Esther Bosch** is pursuing a Ph.D. degree in Human Factors at the German Aerospace Center (DLR) in Braunschweig, Germany. Her particular interest lies in (automated) recognition of a traveler's state to make innovative mobility solutions attractive to use.

**David Bethge** is currently a PhD student at the School of Computer Science at Ludwig-Maximilian University Munich. He is currently a visiting researcher at Meta Reality Labs, previously he worked at Porsche as a Machine Learning Engineer. His research interests lie in affective computing and contextual machine learning leveraging ubiquitous sensing technologies. In addition, his expertise in rapid prototyping, in-car empathic car interfaces, signal processing, and machine learning will benefit the workshop..

**Marie Klosterkamp** is working on her Ph.D. in the field of mobility research at the University of Kassel. She has a background in Psychology and Human Factors. She is experienced in the use of driving simulators and psychophysiological measurements.

**Thomas Kosch** is a professor in the Human-Centered Computing Group at Utrecht University and Humboldt University of Berlin. His research focuses on implicit AI-driven physiological interfaces and emotion prediction. In addition, he is experienced in designing user studies, quantitative and qualitative methods, machine learning, and prototyping. He successfully led research projects within scientific and industrial councils in this context.

## 4 WEBSITE

We will provide a website describing the scope of the workshop[1]. The website includes a workshop description, objectives, and possible submission topics. It also hosts the call for participation, a link to the submission system, the workshop schedule, further organizational information, and information about the workshop organizers. Accepted papers will be made publicly available on the website before the conference to maximize the preparation time for the workshop and foster discussions.

[1]https://sites.google.com/view/empathic-technologies

## 5 PRE-WORKSHOP PLANS

We will distribute information and materials on the workshop website. Information includes the intention, motivation, and anticipated outcomes of the workshop. Furthermore, the website serves to advertise and acquire potential workshop participants. Finally, workshop participants will regularly receive updates via email and the website.

## 6 HYBRID PARTICIPATION

We plan to organize the workshop in hybrid mode. We offer full-virtual participation, for example, via Zoom, to enable participants to engage in this workshop without attending in person. We plan to stream the in-person workshop via a camera in the virtual Zoom call. Text communication will be organized in a dedicated Slack workspace.

## 7 ASYNCHRONOUS AND HYBRID ENGAGEMENT

We will offer the presenter slides, papers, video recordings, and results on the website. Participants and interested persons can view the materials after the workshop. Additionally, we will provide a Slack workspace where participants can discuss their research, group work, and feedback about past projects. The Slack workspace will feature one channel per talk and group work project, with slides, papers, and results linked to the channels. Additionally, participants can ask questions for each talk on their respective Slack channels.

## 8 POST-WORKSHOP PLANS

After the workshop, we encourage researchers to rework their research statements and position papers based on the discussions and feedback from the workshop. We will support researchers in submitting their final statements and papers to either arXiv or preprints on our website. Additionally, we will write a workshop position paper based on the participant contributions published on arXiv. Recorded pitches and the keynote will be uploaded on YouTube after seeking the presenter's permission. Based on the group work and moderated discussion, the organizers plan to distill critical aspects and the workshop's outcomes into a position paper.

## 9 CALL FOR PARTICIPATION

We plan to invite key researchers and labs in the affective community via mail forwarding. Furthermore, we advertise this workshop on social media (e.g., Twitter). We will distribute the following call for paper:

Emotions are a communication channel to convey information between humans implicitly. Empathic and affective communication occurs voluntarily and unnoticed through different channels, including spoken words, facial expressions, behavioral patterns, or physiological responses. Such cues can be recognized by other

persons, who can react to develop empathy and react to emotions accordingly. In contrast to humans, however, we interact more daily with computing devices. Although these devices are excellent for estimating the user's context, emotion-sensing, and empathic applications remain challenging in the scientific community. The workshop "Empathic Technologies Shaping Innovative Interaction" lays the foundation for a research field concerning integrating emotion-sensing capabilities in devices. The workshop invites submissions concerning novel emotion-sensing techniques, the presentation of affect-adaptive interfaces, and the demonstration of proof-of-concept prototypes in real-world environments. We connect recent research revolving in this field with the workshop to start, grow, and foster a community around empathic interfaces in human-computer interaction research. This includes presenting, demonstrating, and discussing existing sensing techniques and demonstrators. Consequently, the workshop encourages the presentation and demonstrations of empathic interfaces.

Submissions should follow the ACM two-column format with a maximum page length of three, excluding references. Information about submitting papers can be found on the workshop website[2]. The talks and presentations will be streamed for virtually attending participants. Participants will be selected based on their contribution to the workshop. We support and encourage authors to make their research available on arXiv[3] after the workshop. At least one author of each accepted submission must attend the workshop. All participants must register for the workshop. We solicit the following submissions: position papers, research statements, and interactive demonstrations. As interactive demonstrations, we consider demonstrating an empathic or affective interface that workshop participants can try out during the workshop. The authors of interactive demonstrations are invited to present a prototype in the interactive workshop session.

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