

On-Body User Interfaces for Security, Privacy and Safety

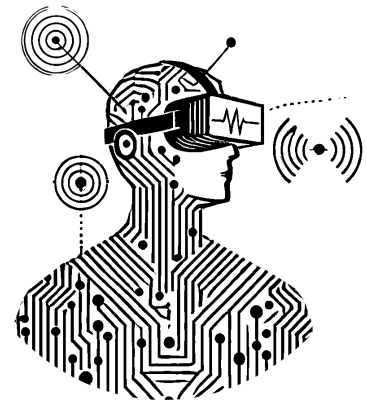
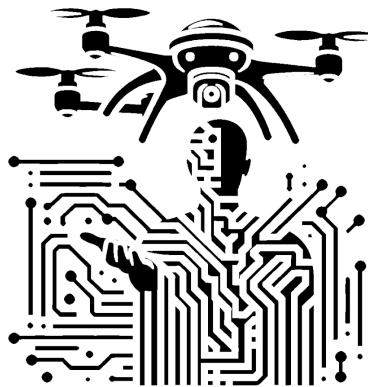
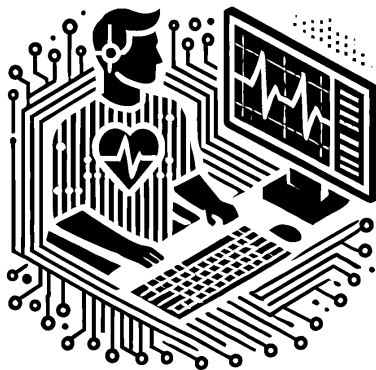
Oliver Hein
oliver.hein@unibw.de

University of the Bundeswehr Munich
Munich, Germany

Yomna Abdelrahman
yomna.abdelrahman@unibw.de
University of the Bundeswehr Munich
Munich, Germany

Alia Saad
alia.saad@uni-due.de
University Duisburg Essen
Essen, Germany

Florian Alt
florian.alt@unibw.de
LMU Munich
Munich, Germany



Abstract

With the rapid integration of wearable sensors and head-mounted displays (HMDs), ensuring security and safety in human-computer interaction has never been more critical. The *On-Body Security and Safety Interfaces* workshop explores the intersection of biometric authentication, safety- and privacy-preserving wearables, physiological sensing, and safety- and security-driven augmented interfaces. Key topics include novel authentication methods for wearable devices, privacy-preserving techniques for continuous physiological monitoring, secure interaction paradigms for AR and VR environments, and adaptive safety mechanisms that enhance user trust and system reliability. Through discussions and collaborative sessions, this workshop aims to foster new ideas and interdisciplinary approaches to ensuring secure, safe, and user-friendly on-body computing. By addressing both emerging challenges and future opportunities, this workshop seeks to pave the way for more resilient, privacy-conscious, and intelligent wearable and augmented

systems that prioritize user well-being while maintaining seamless interaction experiences.

CCS Concepts

• Security and privacy; • Human-centered computing → Human computer interaction (HCI);

Keywords

Security, Privacy, Safety, Mixed Reality, Physiological Sensing, Interface Design

ACM Reference Format:

Oliver Hein, Alia Saad, Yomna Abdelrahman, and Florian Alt. 2025. On-Body User Interfaces for Security, Privacy and Safety. In *Proceedings of ACM Augmented Humans International Conference (AHs '25)*. ACM, New York, NY, USA, 3 pages. <https://doi.org/XXXXXXX.XXXXXXX>

1 Introduction

As wearable sensors and head-mounted displays (HMDs) become more widespread, ensuring security and safety in human-computer interaction is crucial. This workshop explores biometric authentication, privacy-conscious wearables, physiological sensing, and security-driven augmented interfaces. Key topics include secure authentication, privacy-preserving physiological monitoring, safe AR/VR interactions, and adaptive safety mechanisms. Through discussions, demonstrations, and collaboration, the workshop fosters innovative, interdisciplinary solutions for secure, user-friendly

Permission to make digital or hard copies of all or part of this work for personal or classroom use is granted without fee provided that copies are not made or distributed for profit or commercial advantage and that copies bear this notice and the full citation on the first page. Copyrights for components of this work owned by others than the author(s) must be honored. Abstracting with credit is permitted. To copy otherwise, or republish, to post on servers or to redistribute to lists, requires prior specific permission and/or a fee. Request permissions from permissions@acm.org.

AHs '25, Abu Dhabi, United Arab Emirates

© 2025 Copyright held by the owner/author(s). Publication rights licensed to ACM.
ACM ISBN 978-1-4503-XXXX-X/2018/06
<https://doi.org/XXXXXXX.XXXXXXX>

wearable systems, addressing current challenges in on-body computing.

2 Organizers

Oliver Hein is a PhD candidate at the Bundeswehr University Munich, focusing on human-computer interaction, mixed reality, and physiological sensing. His work focuses on integrating biometric and physiological data into interactive systems, enhancing both security and usability in digital environments. A key aspect of his research involves developing privacy-conscious and safety-driven interaction paradigms, particularly in virtual and mixed reality spaces.

Alia Saad is a PhD candidate at the University of Duisburg-Essen. Her work focuses on making technology more secure and user-friendly, especially in the areas of behavioral biometrics, authentication, and mixed reality. Her research explores how people interact with technology naturally and securely. A common theme in her work is finding ways to make digital systems more intuitive while maintaining high levels of security.

Yomna Abdelrahman is a PhD researcher at the Bundeswehr University Munich, specializing in human-computer interaction, thermal imaging, and vision extension. Her research interests include behavioral biometrics, social engineering, physiology-based security interfaces, and security in mixed reality environments.

Florian Alt is a professor in the Media Informatics Group at LMU Munich. He is interested in the design of secure systems that adapt to the way users interact with computing devices. In particular, he researches user behavior in security-critical contexts, the development of security mechanisms based on user behavioral biometrics, the use of user physiology to both improve existing security mechanisms and to develop new security mechanisms, and threats posed by new ubiquitous technologies.

3 Topics of Interest

We invite submissions, discussions and demonstrations on (but not limited to):

- Biometric and Physiological Authentication (e.g. [7])
- Privacy-Preserving Wearable Security (e.g. [4])
- Haptic Feedback & Sensory Warning Systems (e.g. [5])
- Personal Security Drones (e.g. [1])
- Physiological and Cardiovascular Sensing (e.g. [2])
- Mixed Reality for Enhanced Perception (e.g. [6])
- New Interfaces for Secure Authentication (e.g. [3])
- Augmented Reality and AI-Driven Threat Detection (e.g. [8])

4 Example Scenarios

4.1 Security Drone for Personal Protection

A wearable-controlled autonomous drone follows the user, monitoring the environment for threats. The drone provides real-time surveillance, issuing haptic warnings through the user's wearable interface when detecting anomalies. In an emergency, it can alert authorities and stream live footage.

4.2 Physiological and Cardiovascular Sensing for Adaptive Security

Wearable sensors continuously monitor heart rate variability, stress levels, and fatigue, adapting security protocols dynamically. For instance, in high-stress situations, the system can lock sensitive data access or trigger biometric re-authentication.

4.3 Mixed Reality to Advance Human Perception

Head-mounted displays (HMDs) overlay real-time security information, enhancing situational awareness. Augmented reality elements highlight potential security risks, such as identifying unauthorized personnel, visualizing encrypted communication channels, or enhancing thermal vision with AI-driven enhancements.

5 Call for Participation

We welcome position papers, demos, and interactive discussions on innovative approaches to on-body security and safety interfaces.

5.1 Submission Guidelines

- Short Papers (4 pages max) presenting original research or concepts.
- Demos & Prototypes showcasing interactive security and safety systems.

Submissions can be submitted by mail to secured.augmentation@gmail.com until Friday, March 14, 2025 (AoE).

6 Workshop Schedule

Time	Activity
09:00 - 10:00	Welcome & Introduction
10:00 - 11:00	Keynote: Future of On-Body Security
11:00 - 11:15	Coffee Break
11:15 - 12:00	Panel Discussion
12:00 - 13:30	Ideation, Presentation & Feedback
13:30 - 14:00	Closing Remarks & Next Steps

References

- [1] Victoria Chang, Pramod Chundury, and Marshini Chetty. 2017. Spiders in the sky: User perceptions of drones, privacy, and security. In *Proceedings of the 2017 CHI conference on human factors in computing systems*. 6765–6776.
- [2] Francesco Chiossi, Thomas Kosch, Luca Menghini, Steeven Villa, and Sven Mayer. 2023. Senscon: Embedding physiological sensing into virtual reality controllers. *Proceedings of the ACM on Human-Computer Interaction* 7, MHCI (2023), 1–32.
- [3] Sarah Delgado Rodriguez, Sarah Prange, Lukas Mecke, and Florian Alt. 2024. Act2Auth—A Novel Authentication Concept based on Embedded Tangible Interaction at Desks. In *Proceedings of the Eighteenth International Conference on Tangible, Embedded, and Embodied Interaction*. 1–15.
- [4] Sarah Delgado Rodriguez, Sarah Prange, Christina Vergara Ossenber, Markus Henkel, Florian Alt, and Karola Marky. 2022. Prikey—investigating tangible privacy control for smart home inhabitants and visitors. In *Nordic Human-Computer Interaction Conference*. 1–13.
- [5] Sebastiaan M Petermeijer, David A Abbink, Mark Mulder, and Joost CF De Winter. 2015. The effect of haptic support systems on driver performance: A literature survey. *IEEE transactions on haptics* 8, 4 (2015), 467–479.
- [6] Sarah Prange, Ahmed Shams, Robin Piening, Yomna Abdelrahman, and Florian Alt. 2021. Priview—exploring visualisations to support users' privacy awareness. In *Proceedings of the 2021 chi conference on human factors in computing systems*. 1–18.

- [7] Alia Saad, Kian Izadi, Anam Ahmad Khan, Pascal Knierim, Stefan Schneegass, Florian Alt, and Yomna Abdelrahman. 2023. Hotfoot: Foot-based user identification using thermal imaging. In *Proceedings of the 2023 CHI Conference on Human Factors in Computing Systems*. 1–13.
- [8] Roop Kumar Yekollu, Tejal Bhimraj Ghuge, Sammip Sunil Biradar, Shivkumar V Haldikar, and Omer Farook Mohideen Abdul Kader. 2024. Securing the Virtual

Realm: Strategies for Cybersecurity in Augmented Reality (AR) and Virtual Reality (VR) Applications. In *2024 8th International Conference on I-SMAC (IoT in Social, Mobile, Analytics and Cloud)(I-SMAC)*. IEEE, 520–526.

Received 23 January 2025