NeuroHCI: Integrating Neuroscience and Human-Computer Interaction

Amber Maimon*
maimon.amber@gmail.com
University of Bremen
Bremen, Germany
University of Haifa
Haifa, Israel
Computational Psychiatry and Neurotechnology Lab
Ben Gurion University
Be'er Sheva, Israel

Iddo Yehoshua Wald*
wald@uni-bremen.de
The Digital Media Lab
University of Bremen
Bremen, Germany

Yudai Tanaka
yudaitanaka@uchicago.edu
University of Chicago
Chicago, USA

Yun Ho
yunho@uchicago.edu
University of Chicago
Chicago, USA

Jamie A. Ward
j.ward@gold.ac.uk
Goldsmiths, University of London
London, United Kingdom

Max L. Wilson
Max.Wilson@nottingham.ac.uk
Mixed Reality Lab
University of Nottingham
Nottingham, United Kingdom

Kristina Höök
khook@kth.se
Media Technology and Interaction Design
KTH Royal Institute of Technology
Stockholm, Sweden

Pedro Lopes
pedrolopes@uchicago.edu
University of Chicago
Chicago, USA

Rainer Malaka
malaka@tzi.de
The Digital Media Lab
University of Bremen
Bremen, Germany

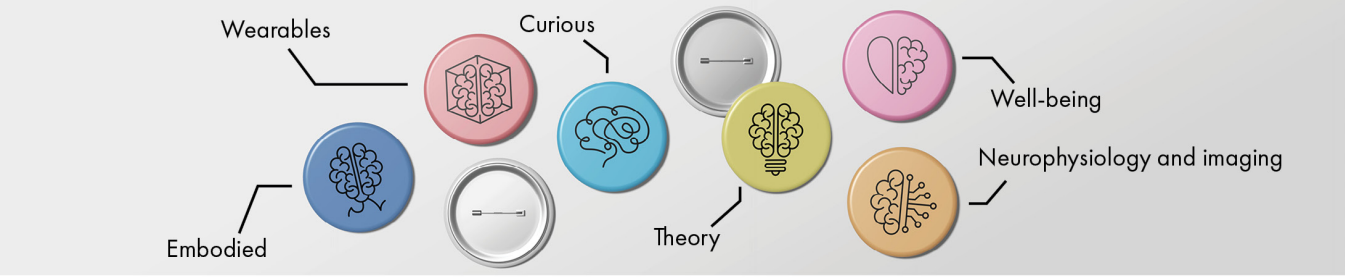

Figure 1: Example of lapel pins attendees can choose from based on their personal interests as an interest mapping ice breaker.

Abstract

This meet-up will bring together researchers and practitioners interested in the timely intersection of neuroscience and human–computer interaction (NeuroHCI). Advances in performance and accessibility of methods such as EEG, fNIRS, BCIs, and biosensing open new possibilities for design and interaction while also raising conceptual, technical, and ethical challenges. The session will employ engaging, interactive activities to maximize dialog, including an exercise that invites participants to experience embodied approaches to interaction. Our goal is to catalyze interdisciplinary collaboration, strengthen and grow the NeuroHCI community, and identify promising directions for future research and practice.

*Both authors contributed equally to this work.

CHI EA '26, Barcelona, Spain

ACM ISBN 979-8-4007-2281-3/2026/04
https://doi.org/10.1145/3772363.3778884

CCS Concepts

• **Human-centered computing** → **Human computer interaction (HCI)**; **HCI theory, concepts and models**; **Interaction devices**; **Interaction techniques**; **Interaction design theory, concepts and paradigms**.

Keywords

Neuroscience, Embodied interaction, Brain-computer interface, Neurophysiology, NeuroHCI

ACM Reference Format:

Amber Maimon, Iddo Yehoshua Wald, Yudai Tanaka, Yun Ho, Jamie A. Ward, Max L. Wilson, Kristina Höök, Pedro Lopes, and Rainer Malaka. 2026. NeuroHCI: Integrating Neuroscience and Human-Computer Interaction. In *Extended Abstracts of the 2026 CHI Conference on Human Factors in Computing Systems (CHI EA '26), April 13–17, 2026, Barcelona, Spain.* ACM, New York, NY, USA, 4 pages. https://doi.org/10.1145/3772363.3778884

1 Main Goal

The main goal of this meet-up is to bring together researchers and practitioners who explore the intersection of neuroscience and human–computer interaction (NeuroHCI). NeuroHCI is emerging as an attractive and influential field. Advances in neuroscience, combined with the increasing accessibility of methods such as EEG, fNIRS, BCIs, biosensing, and TMS [3, 12, 15, 17, 22, 23, 25, 26], are revolutionizing how we design, study, and experience interaction. This synergy also raises conceptual, technological, and ethical questions that prompt collective dialog.

The meet-up will attract people already attending CHI who work on this broad topic, while also engaging researchers at the intersection of these topics who do not usually attend CHI. We believe this is timely and could draw both existing and new visitors to CHI since: (1) it is likely the first CHI where a keynote speaker is a neuroscientist - setting the tone for this meet-up, and also potentially attracting more neuroscientists; (2) there is a thriving Neuroscience community in Europe who may find this to be an opportunity to come to their first CHI and broaden and enrich this community; (3) Spanish HCI has been at the forefront of interacting with Neuroscience, making this a fitting opportunity that resonates with the conference location. (e.g. work by Mel Slater [16, 19], Mar-Gonzalez Franco [8], and Anna Tajadura-Jimenez [20, 21] —just to cite a few); and (4) Members of the organizing team (Yudai Tanaka and Pedro Lopez) organized a panel in this domain at CHI 2024, including Olaf Blanke, a key neuroscience researcher [4, 5], which was spectacularly attended (with more than 1.6k views in a year, many streaming directly at CHI) [23]. We also aim to broaden the scope of discussion beyond neuro-data or neurotechnology, drawing in new audiences and perspectives from the wider CHI community. For example, merging third person neurophysiological methods with first person-perspectives (e.g. microphenomenology, autoethnography); and incorporating embodied and experiential approaches to both neuroscience and interaction design (e.g. soma design).

The meet-up will be beneficial to those experienced in relevant domains and pursuing cross-disciplinary collaborations within the CHI community, while remaining accessible to attendees without neuroscience related experience. We hope this will also facilitate networking opportunities for early-career scholars and PhD students in this area. It will serve as both a social and academic gathering where attendees will share ideas, methods, and theories. Additionally, it will provide a catalyst for collaborations and help to shape the emerging identity and future direction of NeuroHCI.

2 Activities Overview

Community building: We will set up a social channel (e.g., Discord, Slack) that attendees at the meet-up can join by simply scanning a QR code that will be made widely available. This channel will be active during the session, inviting attendees to share their relevant CHI papers, job postings, discussion highlights etc. During the rest of the conference, it will open opportunities for group lunches, demo tours etc. And beyond the conference itself, it will be used for possible collaboration, sharing relevant resources and events etc.

Interest mapping icebreaker: The organizers will welcome each participant one by one and let them pick pins to add to their lapel based on their personal interests (see Figure 1). These pins are meant as fun prompts to get conversation started among strangers. Categories, each indicated by an icon, will include: Neurophysiology and imaging (e.g. EEG, fNIRS); Neuroscientific theoretical frameworks (e.g predictive processing, global workspace); Wearable devices and interfaces; Stimulation techniques (e.g. electrotactile, etc); Well-being; Embodied approaches (e.g. Soma design); and Curious- for newcomers interested in getting into or finding out more about this community.

"Mix the neurons" activity: The organizers will present a number of open ended conversation topic prompts and announce a random mixing or shuffle, akin to speed-dating, for instance "everyone with a wearable pin should talk to someone with a well-being pin." This will be repeated a few times, giving attendees a chance to meet most of the others. Hopefully, this will spur unexpected discussions between people who wouldn't necessarily have networked.

Body-mind exercise: One of the organizers (Kia Höök), will lead an exercise aimed at initially turning attention inward towards the body [7], and then socially towards one another. During this exercise, attendees will gain firsthand experience with the body mapping technique for soma-based design [2] and will be fitted with relevant technologies to familiarize themselves with body-incorporating approaches and methodologies. The exercise will align with the goal of broadening the scope of discussion beyond typical brain-centric concepts to embodied ones.

3 Communities of Interest

The NeuroHCI meet-up will be of interest to multiple synergistic communities: HCI researchers that use or are interested in using physiological and neural signals in their research and design, neuroscientists seeking to diversify and broaden their models and methods, designers and engineers creating technologies that integrate or augment human senses or cognitive faculties, researchers employing embodied and experiential approaches to interaction, researchers and industry professionals focusing on ethics, inclusion, and critical perspectives on the mind and body. Examples of communities of interest include researchers working within the domain of neuroscience frameworks (e.g., embodied cognition [18], neuroplasticity [9]) and their application in HCI; those designing or studying interfaces involving neural or physiological signals; engaged in debates on ethics, privacy, and accessibility [13, 14, 24].

This includes researchers working in domains such as human augmentation [6, 27], soma design [10, 11], neurohaptics [1], cognitive informatics [28] and many more.

4 Organizers

The organizing team includes **Amber Maimon**, Postdoctoral Researcher in Neurotechnology and HCI; **Iddo Wald**, Research Fellow at the University of Bremen; **Yudai Tanaka**, PhD Student at the University of Chicago; **Yun Ho**, PhD Student at the University of Chicago; **Jamie A. Ward**, Professor of Computer Science at Goldsmiths, University of London; **Max L. Wilson**, Associate Professor at the University of Nottingham; **Kristina "Kia" Höök**, Professor of Interaction Design at KTH, Stockholm; **Pedro Lopes**, Associate Professor of Computer Science at the University of Chicago; and **Rainer Malaka**, Professor of Digital Media at the University of Bremen.

The organizers represent the diversity of the NeuroHCI community, ranging from established professors to emerging PhD researchers across institutions in North America, Europe, and the Middle East. They bring extensive experience organizing workshops and panels at CHI and other major venues, leading large-scale collaborative projects, and pioneering innovative, award-winning research domains. Their expertise spans neuroscience, HCI, AI, robotics, and somaesthetics. Several hold senior conference leadership roles, and others lead active research communities. The team combines academic excellence with industry experience, public engagement initiatives, and proven mentoring capabilities. As such, the organizers are uniquely suited to facilitate this meet-up's interactive activities, foster meaningful interdisciplinary dialog, and develop the NeuroHCI community to welcome both experienced researchers and curious newcomers.

Acknowledgments

This work was partially supported by the German Research Foundation (DFG) through the Collaborative Research Center 1320 EASE – Everyday Activity Science and Engineering (Project-ID 329551904), and by the Klaus Tschira Stiftung (award no. 40300928) to I.Y.W. and R.M. It was also partially supported by the U.S. National Science Foundation (NSF), award no. 2047189, to P.L.

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