

Learning from Cycling: Discovering Lessons Learned from CyclingHCI

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ABSTRACT

Cycling plays an essential role in sustainable mobility, health, and socializing. This workshop aims to collect and discuss the lessons learned from Cycling Human-Computer Interaction (CyclingHCI). For this, we will gather researchers and experts in the field to discuss what we learned from designing, building, and evaluating CyclingHCI systems. We will start the workshop with three lessons learned from CyclingHCI defined by the organizers and their experience in the field, which include (1) a lack of theories, tools, and perspectives, (2) knowledge about designing for safety and inclusive cycling, and (3) evaluation methods and environments. Taken together, with this work, we aim to promote interactive technology to get more people cycling, profiting from the many associated benefits.

CCS CONCEPTS

• **Human-centered computing** → **Interactive systems and tools.**

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1 MOTIVATION

Cycling plays an essential role in sustainable mobility, health, and socializing. For many people worldwide, it is becoming a comfortable, fast, and accessible transportation modality for work, leisure, and sports. With this, more cyclists tend to interact on the go, e.g., with their smartphones [29] or smart glasses [12]. Researchers and practitioners design and develop new technological advancements for cyclists by augmenting helmets, bicycles, and the environment around them [4, 8, 10, 15–18, 20, 32–35]. Recent works aimed to measure and evaluate subjective experiences [1, 3, 5, 6, 9, 11, 13, 19, 20, 23, 27], address safe and potentially realistic bicycle simulators [7, 14, 22, 25, 26, 37], and even propose self-driving bikes [24, 39]. Given the increasing popularity of bicycle research in the HCI community reflected in a high number of previous workshops and cycling events [2, 21, 30, 31, 36, 38], we believe there is a lot we can learn from these emerging research

projects for interaction design regarding cycling for researchers, designers, and practitioners. Therefore, we aim to collect and discuss these lessons learned to determine how they can be employed to advance the field of CyclingHCI.

This workshop is a follow-up to the Cycling@CHI workshop held in 2021 [30], which gathered over 35 online participants. Our workshop builds on this workshop through a hybrid format in which onsite participants can interact with online participants, e.g., on their bicycle trainers at home. For this version, we aim to collect, discuss, and explore the lessons learned from CyclingHCI. We will build our discussions on the work by Rowland et al. [28], who conducted two studies of mobile-based experiences and presented eight lessons learned focused on interactive cycling and designing mobile experiences. Since many things have changed since 2009 regarding technological advancements, such as eBikes or mixed reality, we find it necessary to put a new effort into articulating the field's lessons learned. The workshop will achieve this goal through discussions and presentations of workshop attendees during several sessions. While many lessons learned from CyclingHCI are going to be contributed by the attendees with their workshop proposals, we defined some of them to create the core of the workshop:

- (1) **A lack of theories, tools, and perspectives** regarding which theoretical knowledge we built on to develop and design technologies for cycling.
- (2) **A limited collected knowledge about designing for inclusive cycling** designing for elderly, children, and people with disabilities.
- (3) **Limited understanding of evaluation methods** to design indoor and outdoor experiments and studies to evaluate qualitatively and quantitatively the experiential, instrumental, social and societal effects of cycling prototypes.

2 ORGANIZERS

The organizers form a team of experts in the field of HCI with a strong focus on HCI for cyclists, multimodal interfaces, exertion games, navigation, and spatial orientation. Detailed information about the organizers is shown in the following.

Andrii Matviienko (main contact) is an assistant professor at KTH Royal Institute of Technology, Sweden. His research focuses on assisting technology in urban environments, particularly designing, constructing, and evaluating multimodal and mixed-reality interfaces for vulnerable road users.

Mario Boot is a Ph.D. student at the University of Twente working on methods that use wearable sensors to evaluate whether bike-HCI leads to new and better subjective cycling experiences. His research is part of the interdisciplinary “Smart Connected Bicycles” research project in which 6 PhDs from multiple universities collaborate on cycling experience, B2X communication, data analytics, control systems, and traffic safety.

Andreas Löcken is a postdoctoral HCI researcher at the Technische Hochschule Ingolstadt (THI) and the CARISMA Institute of Automated Driving (C-IAD). His current research focuses on the interaction between automated vehicles and humans, including the perspectives of passengers in the vehicle and vulnerable road users, such as cyclists, outside the vehicle.

Bastian Pflöging is a Full Professor for Ubiquitous Computing and Smart Systems at TU Bergakademie Freiberg, Germany. His research interests cover HCI-related aspects of future mobility, with a special focus on automated driving and cycling.

Markus Löchtefeld is an Associate Professor at Aalborg University in the Department of Architecture, Design and Media Technology. His research focuses on mobile- and wearable computing as well as sustainability in design.

Tamara von Sawitzky is a research assistant at Technische Hochschule Ingolstadt and a doctoral candidate at Johannes Kepler University. Her current research is on smart bicycle helmets and, in particular, how cyclists could be made aware of potentially safety-critical traffic situations through connected traffic technologies. The focus is on the design and impact of multimodal augmented reality messages on the cyclist (experience, performance, perceived safety).

Gian-Luca Savino is a postdoctoral researcher at the Human-Computer Interaction Group at the University of St. Gallen. His focus is on novel bicycle navigation and interaction with mobile devices, in particular for as-the-crow-flies navigation.

Miriam Sturdee is a lecturer at the University of St. Andrews. Her work centres on the design and adoption of novel interfaces, and creative approaches to HCI and computer science.

Josh Andres is a Senior Lecturer in the School of Cybernetics at the Australian National University (ANU), researching the relationship between humans, AI-enabled cyber-physical systems and the natural environment. Josh has published and organized workshops at various top-tier conferences such as CHI, DIS, CHI PLAY, IUI, TEI, KDD, and UbiComp. His PhD received the ACM SIGCHI Outstanding Dissertation Award. Before joining the ANU, he worked at IBM Research on HCI, UX, and AI, where he co-invented over 20 patents. He has also served on the SIGCHI executive committee.

Kristy Elizabeth Boyer is a professor of Computer Science at the University of Florida, USA. She is a leader in the study of collaborative dialogue for teaching and learning. In collaboration with experts in health behavior, communications, and performance analytics, Boyer has begun investigating how technology can support collaboration among both casual and competitive cyclists. Her early work has shown that real-time displays of collaborative data may be especially promising for fostering social interactions among cycling partners, potentially leading to improvements in physical activity and sense of belonging.

Stephen Brewster is a professor of Human-Computer Interaction in the School of Computing Science at the University of Glasgow. His research focuses on multimodal HCI, or using multiple sensory modalities and control mechanisms (particularly audio, haptics, and gesture) to create a rich, natural interaction between humans and computers. His work has a strong experimental focus, applying perceptual research to practical situations. A long-term focus has been on mobile interaction and how we can design better user interfaces for users who are on the move. Other areas of interest include haptics, wearable devices, and in-car interaction. He pioneered the study of non-speech audio and haptic interaction for mobile devices with work starting in the 1990's.

Florian ‘Floyd’ Mueller is a professor of Future Interfaces at Monash University in Melbourne, Australia, directing the Exertion Games Lab. Together with Josh Andres above, he has designed,

developed and evaluated interactive eBike systems and also developed interactive bicycle helmets. His research aims to promote the physically active human body in HCI. Floyd has co-organized over 10 workshops at CHI and is still trying to bring more playfulness into life through physical activity like bike riding.

3 PRE-WORKSHOP PLANS

The workshop will bring together participants from academia and industry. We will announce and publicize the call for participation on popular mailing lists (e.g., CHI-Announcements), calendars, via social media (e.g., Twitter, Facebook, LinkedIn), and link to other relevant venues, sites, and hashtags (e.g., @sigchi, #CHI24, #Cycling). In addition, we will directly contact international researchers working in bicycle interaction, user interfaces, mobility, and related fields. Since we seek collaboration between researchers and industry practitioners, we will reach out to leading players in mobile navigation, bicycle accessories, and bike-sharing. We will continuously promote the workshop in the period leading up to the deadline.

On our workshop website¹, participants will find further details about the workshop topics and how to apply by describing in up to four pages reflecting on their lessons learned from CyclingHCI, why they want to participate, what they hope to get out of this experience, and what they will contribute. These answers will help the workshop organizers tailor the content to offer an enriching experience focused on lessons learned from CyclingHCI.

4 WORKSHOP ACTIVITIES

The workshop runs across one full day. It will consist of (1) workshop paper position pitches and (2) several group discussions focused on deriving lessons learned from CyclingHCI. The workshop paper pitches will include presentations from the participants about their cycling projects and what they think they learned from designing, building, and evaluating systems for CyclingHCI. This activity will likely lead to emerging themes that will serve for further workshop exercises to discover more lessons learned.

We estimate the number of workshop participants to be around 10-15 plus twelve workshop organizers. Each participant contributes a position paper that presents the participants' interests and research area as well as one or multiple lessons learned from CyclingHCI with a justification of why it is an essential and important lesson and how it can help the community in the future. The workshop committee will review position papers, and participants will be selected based on their work's novelty and fit for the workshop.

5 PLANS TO PUBLISH WORKSHOP PROCEEDINGS AND POST-WORKSHOP PLANS

For the post-workshop plans, we plan to publish a collection of the position papers as workshop proceedings to the CEUR workshop proceedings² or arXiv³ websites. The position papers will also be published on the workshop website. Moreover, we will write a joint paper about the results from the discussion about the lessons

¹<https://exertiongameslab.org/workshops-events/chi-2024-cyclinghci>

²<https://ceur-ws.org/>

³<https://arxiv.org/>

Table 1: Workshop schedule.

Time	Topic
09:00 - 09:10	Introduction by the organizers and presentation of the workshop structure
09:10 - 10:30	Presentation of lessons learned by each participant (10-15 minutes each, depending on the number of attendees)
10:30 - 10:45	Coffee break
10:45 - 12:00	Continuation of presentations about lessons learned
12:00 - 13:00	Lunch
13:00 - 13:30	Discussion of the lessons learned regarding theoretical knowledge we employ for CyclingHCI
13:30 - 14:00	Discussion of the lessons learned regarding inclusive cycling
14:00 - 14:15	Coffee break
14:15 - 15:15	Discussion of the lessons learned regarding evaluation methods for CyclingHCI
15:15 - 16:30	Discussion of the lessons learned collected during the workshop and integration of the lessons into the overall structure
16:30 - 17:00	General discussion of the results and lessons learned with their implication for future

learned and submit it to CHI 2025. We will explore the possibility of submitting our results to special sessions on the topic at these and related conferences. We also aim to create stronger connections between researchers and practitioners working on interaction around cycling for future collaboration and define new research directions for Ph.D. students and possible start-up ideas.

6 WORKSHOP MODE

The workshop will be in the *hybrid* mode with a possibility for remote participation. With this, we aim to include people who are unable to travel to Honolulu but would like to contribute to the discussions and advance the CyclingHCI field with the community. The workshop is discussion-based and requires participants to reflect on what they have learned by designing, building, and evaluating cycling systems, which can be done remotely. Moreover, the workshop does not require prototyping or similar activities; instead, it is focused on gathering as many researchers and practitioners as possible who are working in CyclingHCI. To facilitate work among remote and on-site participants, we will use a Miro board, a synchronous Zoom connection, and asynchronous discussions over Slack. For technical support, we will only need a projector. For asynchronous and accessible participation, we will provide transcription, electronic copies of workshop materials, presentations, and handouts in accessible formats, for example, HTML, PDFs with proper tagging, accessible Word documents, and we will ensure any visuals, charts, or graphs presented are described verbally. Additionally, we will make sure the workshop's website, registration forms, and online content are accessible and comply with web accessibility standards, e.g., Web Content Accessibility Guidelines (WCAG). The primary goal of our one-day workshop is

to involve participants and organizers in an exchange of ideas and discussion around the lessons learned we will present them with and the ones they will bring to the workshop. Thus, the participants will have to submit a proposal paper with the lessons learned from CyclingHCI based on their background and the line of research they are interested in.

7 CALL FOR PARTICIPATION

For this one-day workshop, we invite submissions that illustrate and discuss lessons learned to promote new opportunities for CyclingHCI. This workshop aims to identify lessons learned as an effort from the community, collect and discuss points that researchers, developers, and designers faced when developing and evaluating new cycling systems. The submissions will be 2-4 pages long in the CHI Extended Abstract format or a pictorial showcasing a learned lesson visually. They should include at least one lesson learned from CyclingHCI with a clear justification for why it is relevant to the HCI community and a vision of how this lesson learned can advance the future of CyclingHCI. The submissions are due on February 22, 2024. We will select participants based on the requirement of presenting at least one lesson learned and a possible solution/vision of how it can advance the field of CyclingHCI. We will send out a notification to future authors by March 24, 2024. At least one author of each accepted submission must attend the workshop, and all participants must register for both the workshop and at least one day of the conference. For more information and the latest updates about the workshop, see our website.

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