

# Automated Vehicles as a Space for Work & Wellbeing

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## ABSTRACT

The objective of this CHI course is to provide CHI attendees with an introduction and overview of the rapidly evolving field of automotive user interfaces (AutomotiveUI). The course will focus on UI aspects in the transition towards automated driving. In particular, we will also discuss the opportunities of cars as a new space for non-driving-related activities, such as work, relaxation, and play. For newcomers and experts of other HCI fields, we will present the special properties of this field of HCI and provide an overview of new opportunities, but also general design and evaluation aspects of novel automotive user interfaces.

## CCS CONCEPTS

- **Human-centered computing** → *Human computer interaction (HCI); Ubiquitous and mobile computing.*

## KEYWORDS

Automotive user interfaces; non-driving-related activities; manual and automated driving; work and wellbeing.

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## 1 INTRODUCTION

In recent years, driving a car became more than the activity of maneuvering the car to a destination. In addition to the primary driving task, drivers also want to perform non-driving-related tasks [14, 19] including the operation of safety and comfort functions. Also, drivers want to be entertained (e.g., listen to music) or communicate while on the go. With the release of vehicles in different levels of automation, we expect this demand to become even more relevant and pressing. This opens the opportunity for novel activities in the car, such as work, play, and relaxation.

Already today, drivers use mobile devices in the car for these tasks. While driving manually, this can distract them from their primary driving task, posing humans at risk. Thus, the challenge for

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researchers and developers is to enable such non-driving-related tasks in the car in the transition to automated cars, while ensuring driving safety and comfort.

In contrast to our prior courses at CHI, MobileHCI, and MUM [15, 16, 18], we will now especially focus on the transition to automated driving [6, 7] and how this makes the car an interesting and novel area for HCI research and applications, e.g., related to work, play, and relaxation. We provide an introduction to automotive UIs and highlights the special properties of this HCI sub-field. By outlining the requirements, the design, and evaluation of automotive UIs, we discuss the specific requirements for in-car applications.

## 2 BENEFITS

The objective of this course is to provide newcomers to the field of AutomotiveUI with an introduction and overview of the field and show how it is different from others. An intensive discussion of the requirements, trends, and challenges will help participants to get an overview and might be the basis for new research ideas. Especially with automated driving, we see the car as a platform that becomes more and more important for interactive applications and, thus, an important focus for human-computer interaction practice and research. We want attendees to leave with a fresh perspective on the field and inspire them to build the next generation of in-vehicle interfaces or services.

## 3 INTENDED AUDIENCE

We target a broad audience including AutomotiveUI novices (students, industrial / academic researchers), but also researchers, practitioners, & designers with experiences in creating AutomotiveUIs. With driving automation, we see the car as a novel platform for interactive systems, which is interesting for attendees of a variety of backgrounds.

## 4 PREREQUISITES

The expected audience should have a basic knowledge of HCI. This could be a previously attended course or a basic university lecture or experiences from prior projects in this domain. There are no additional prerequisites.

## 5 CONTENT & PRACTICAL WORK

During the course we first provide an overall introduction to AutomotiveUI. This includes a discussion of important terms, such as driving task, driver distraction, vehicle systems, and automation levels. In this part, we also discuss the influence of in-vehicle activities on driving.

As part two, we provide an overview of best practices for the design of in-car systems, including principles, guidelines, and standards. We take this as a basis to also give deeper insights into the design process of such interfaces, enriched with practical experiences from previous projects.

In the third part of the course, the participants learn how applications and interfaces can be evaluated during design. This includes the explanation of various evaluation measures, different testing procedures (e.g., Lane Change Task, Detection Response Task, and field trials), and a variety of parameters related to designing studies.

For the fourth part, we elaborate the requirements and expected changes and opportunities for future automated driving situations. Also, based on Dagstuhl Seminars #16262 and #19132, this includes a discussion and hands-on session on the possibilities that arise when driving becomes highly or fully automated such as work, play, and relaxation.

As a concluding part, we outline current challenges and expected trends [9] with regard to AutomotiveUI and the more general topic of human mobility.

## 6 PRESENTATION FORMAT & COURSE ADVERTISEMENT

We present this course as an interactive course with slides, videos, and group discussions. We successfully used this format for AutomotiveUI courses at CHI '16 and '17 [15, 16], MobileHCI '17 [18], MUM '18, and Mensch & Computer '15. By applying active learning methods, we strive to adapt the materials to the specific (existing) knowledge and interests of the audience.

The call for participation will be distributed via HCI, UX, and AutomotiveUI related mailing lists. We will further use our personal distribution lists.

## 7 INSTRUCTOR BACKGROUNDS

**Bastian Pfleging** (<https://www.tue.nl/staff/b.pfleging>) is assistant professor for Future Mobility at Eindhoven University of Technology, Netherlands. His research interests are user interfaces for future mobility, multimodal interaction, workload [17, 20], external interfaces for automated cars (e.g., [1, 3, 5]), and non-driving-related activities [2, 4, 14, 19]. He was involved in co-organizing various workshops and courses (e.g., at AutomotiveUI, and CHI, [12, 13, 21]). Bastian is actively involved in organizing conferences like CHI, UIST, AutomotiveUI, MobileHCI and is steering committee member of AutomotiveUI.

**Andrew L. Kun** (<http://www.andrewkun.com/>) is professor of Electrical and Computer Engineering at the University of New Hampshire. His research focus is human-computer interaction in vehicles [8–11], as well as the use of visual behavior and pupil diameter measures [17] to assess and improve the design of interfaces. He is the steering committee chair of AutomotiveUI.

**Orit Shaer** (<http://cs.wellesley.edu/~mobileoffice/>) is Associate Professor of computer science and director of Media Arts and Sciences at Wellesley College. Her expertise is in designing, implementing and evaluating novel human-computer interactions including augmented reality (e.g. [23], and tangible interaction [22]. She served as program co-chair of the 2020 ACM Tangible, Embedded, and Embodied Interaction (TEI) conference.

## 8 RESOURCES

Additional details about the course as well as accompanying material will be published on our *course website* at <https://ubisys.org/chi2021-course-future-cars/>. It provides information about the course and links to related material, so that participants can get familiar with the scope of the subject and the goals of the course.

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