Out-of-the-Lab Pervasive Computing

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The radical societal changes we are witnessing as a result of COVID-19 are giving rise to not only new challenges but also new opportunities for pervasive computing and its researchers. As social distancing measures are making it harder to conduct lab-based user studies and in-person observations, researchers are now faced with the challenge of designing and conducting studies remotely.

Many examples of out-of-the-lab research exist from the time before COVID-19, in particular, leveraging pervasive technologies, such as mobile phones[2] and smartphones,[3] public displays[4], smart watches,[7] smart glasses,[1] and VR glasses,[5] to just name a few examples.

Yet, the past two years witnessed pervasive computing technology having become an enabler for such remote research also in other areas: an ever-increasing number of disciplines and application domains now embrace these opportunities of pervasive computing, including but not limited to education, health, housing, transportation, work, and entertainment.

Early community efforts to deal with research challenges imposed by COVID-19 included running online talk shows[a] and courses at conferences[b] as well as sharing best practices and approaches.[6] Since then, the community has seen many research examples, where concepts for novel approaches to out-of-the-lab research were created, implemented, tested, and applied.

The aim of this special issue is to surface such novel approaches to and examples of out-of-the-lab pervasive computing. The accepted articles address a variety of topics, ranging from adapting multidevice deployments during a pandemic, tackling challenges that emerge when doing out-of-the-lab research (such as data labeling), collecting reliable human behavioral and emotional data, achieving zero-touch pervasive computing, relying on crowd sensing for living lab experimentation, or leveraging ubiquitous technology to support research with chronic disease patients.

The authors of the articles featured in this special issue come from four continents (Asia, Europe, North America, and Oceania) and represent a variety of fields, including computer science, engineering, nursing, education, neuroscience, and medicine.

The first article, "Obtaining Labels for In-the-Wild Studies: Using Visual Cues and Recall," addresses challenges related to labeling data collected in the field. Specifically, the authors propose a privacy-preserving workflow, employing EOG glasses, a wearable camera, and a data-tagging software, that supports data labeling by considering cognitive state changes inferred from eye gaze.

The second article, "Crowd Sensing and Living Lab Experimentation Made Easy," presents an open-source software platform designed to support various aspects of outdoor experimentation on smartphones, such as dealing with noise, bias, privacy concerns, ethics, remote moderation, experimental control, and high-quality data collection.

The third article, "A Retrospective and a Look Forward: Lessons Learned from Researching Emotions In-the-Wild," provides a reflection of a series of field studies on emotion, identifies the strengths and weaknesses of different methods, and provides suggestions for enhancing research rigor and exploring new directions.

The fourth article, "Out-of-the-Box Deployment to Support Research on In-Home Care of Alzheimer's Patients," presents a set of tools which is meant to support research in the medical domain as no person-to-person meetings are possible. The article describes the design, lessons learned, and surveys users of the toolset.

Given the special circumstances of this special issue with a global pandemic, our final article, "Adapting Multidevice Deployments During a Pandemic: Lessons

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[a]How to do HCI research if your users are off-limits? [Online]. Available: https://amp.ubicomp.net/users-off-limits/
[b]CHI Course "Evaluation in Human-Computer Interaction—Beyond Lab Studies." [Online]. Available: https://hci-lecture.org/methods/

Learned from Two Studies," provides a reflection on core challenges as researchers need to move their research out of the lab. The authors suggest ways in which researchers could design for flexibility, responsiveness, and empathy in future studies.

The collection of articles in this special issue illustrates the wide range of ways in which pervasive computing technology can contribute to shifting research out of the lab. The articles contribute methodological insights, deliver tools, and provide reflections on the challenges of this shift. We hope they will inspire new work, spark novel ideas, and help establish new directions in thinking about how technology can support research beyond the lab.

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