Smarticipation - Intelligent Personal Guidance of Human Behavior Utilizing Anticipatory Models

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Abstract

In today's fast paced environment, society is confronted with information overload, stress, and health issues. These are generally caused by accelerating technological evolution, increasing time pressure, and physical inactivity. So-called *anticipatory systems*, which guide users or intervene in their daily life, are seen as a very promising solution to overcome these issues. This workshop aims to share experiences of current researches on anticipatory systems in order to understand the extent of how such systems could be a solution and how they could provide personal guidance given the discovered traits of human behavior. We invite the submission of papers in the emerging research field of *anticipatory mobile computing* that focus on understanding, design, and development of such systems. We also welcome contributions that investigate underlying prediction models or give an insight into human behavior. The expected workshop outcome is a summary of recent challenges of anticipatory applications and interventions.

Author Keywords

Anticipatory Mobile Computing; Personal Assistance; Mobile Sensing; Pervasive Environment

ACM Classification Keywords

H.4.0 [Information Systems Applications]: General; J.4 [Social and Behavioral Sciences]

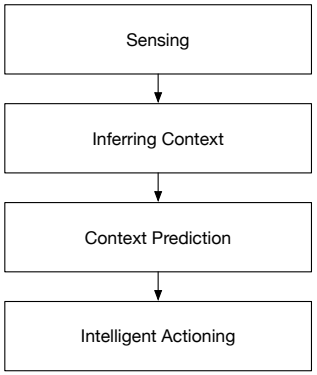

Figure 1: Key processing stages in *anticipatory mobile computing*

Introduction

In 1991, Weiser had the vision of ubiquitous computing where pervasive technologies unobtrusively support humans [13]. Even 25 years later, his vision has not come to fruition [2]. Indeed, a major step forward in pervasive technology is being carried out with modern mobile devices like smartphones or IoT devices that are able to sense and change their and the user's environment [4]. However, unobtrusive user support has not yet been achieved.

The emerging research field of *anticipatory mobile computing* is a promising way to achieve unobtrusive and intelligent personalized guidance through its interdisciplinary nature [9]. Figure 1 illustrates required processing stages for such anticipatory systems: (1) sensing, (2) inferring context, (3) context prediction, and (4) intelligent actioning. However, most state of the art research applications are limited to the first three processing stages. These apps range, among others, from mobile sensing [4] over mobility prediction [1], app usage prediction [7], inference of psychological or health issues (e.g., depressions [3], or panic attacks [11]) to accurately forecast students GPA [12]. But, none of these mentioned approaches cover the last crucial processing stage, namely intelligent actioning, to support users, i.e., a mechanism to change user behavior has not been addressed.

There are only a few research works that provide intervention or anticipatory assistance and, thus, also address the last processing stage in this field exist, e.g., [10, 6, 5]. Especially, this last processing stage treats required topics like intelligent decision making or learning from mistakes (*reinforcement learning*) for unobtrusive user support. This workshop aims to assess the current state of the art in this field of *anticipatory mobile computing*, identify the most recent challenges for human behavior changes (*persuasive computing*), and encourage researches to exploit their prediction models for providing the next step, namely proactive intervention or guidance of current human behavior.

Workshop Objectives

The objectives of the workshop are to provide a structured space where people can discuss *anticipatory mobile computing*, the state of the art and its challenges. Further, we want to discuss how exactly can such anticipatory systems unobtrusively guide a user and trigger changes in human behavior. On this basis, our vision is to find ways to exploit current prediction models to provide intelligent interventions and encourage researchers to think more in that direction.

We believe that *anticipatory mobile computing* is the next emerging research field after mobile sensing, activity recognition, and context prediction. Thus, the workshop topic is timely and highly relevant for the ubiquitous computing community and hopefully acts as inspiration for the community. This workshop strongly targets to promote this research field and should be part of this year's *UbiComp2016*.

Workshop Plan

In the 1-day workshop, we will bring together people from academia and industry who are active in areas like anticipatory mobile computing, context prediction, social computing, psychological computing or persuasive computing. Through a planned invited open keynote presentation, presentations of participants, and discussions we want to state the recent challenges in this research field and potential ways for further research to overcome them.

For that, we do not mainly intend to invite standard research papers with novel findings, but also papers that describe design, development, challenges or limitations of their works. The objectives of these papers is to support,

inspire and encourage researchers in the field of *anticipatory mobile computing*. For the review process, we invite well-chosen experts in areas of workshop topics of interest. Therefore, all accepted papers should be part of the supplemental proceeding of the conference and ACM Digital Library. In addition, these papers will also be published on the workshop website.

Since the workshop will take place the first time, we target to accept at least 8 submissions and around 20 participants actively engaging through the workshop.

Topics of Interest

Through the interdisciplinary nature of *anticipatory mobile computing* and the required processing stages (cf. Fig. 1) [9], the workshop invites a wide range of submissions that study the workshop topic from various perspectives. We also welcome researches from diverse disciplines including data mining scientists, developers, human-computer interaction and data visualization experts. Further, we appreciate any submissions that suggest and investigate design solutions, concepts or development practices how to proactively support users and trigger human behavior changes in unobtrusive ways, e.g., [8, 10]. Overall, we accept two kinds of submission differing in the evaluation part: (1) full research papers, and (2) short technical papers.

The following list gives an overview of relevant key topics for the workshop:

- Anticipatory Mobile Computing, Human Behavior Changes, Persuasive Computing
- Understanding Human Behavior, Complex Activity Recognition, Social and Psychological Computing
- Intelligent Actioning, Decision Making, Intervention Mechanisms, Proactive Guidance
- Infrastructures, frameworks, and design for development of anticipatory systems

Organizers' Backgrounds

The workshop organizers are all active researchers in the interdisciplinary field of anticipatory mobile computing.

Christian Meurisch is a lecturer of several ubiquitous computing courses at Telecooperation Lab (TU Darmstadt). He develops and researches in anticipatory mobile systems for large-scale behavior changes and daily life support, which covers his PhD topic and a special awarded project.

Usman Naeem is a senior lecturer at the ACE (University of East London, UK) and received his PhD from Queen Mary University of London in 2009. His research focus is on assistive technologies to support independent living for elderly community, which includes machine learning techniques, mobile computing, and ambient intelligent environments.

Muhammad Awais Azam received his PhD degree from the Middlesex University (London, UK) in 2012. He is an assistant professor at UET Taxila (Pakistan). He researches and leads a research team in the area of pervasive computing including network architecture, ambient intelligence, wireless communications, and recommender systems.

Frederik Janssen completed his PhD in heuristic rule learning at the Knowledge Engineering Group (TU Darmstadt) in 2012. He currently works as coordinator for industry cooperations and researches in machine learning on sensor data, predictive maintenance, and inductive rule learning. He has chaired 1st SenseML workshop at ECML 2014.

Benedikt Schmidt received his PhD from TU Darmstadt in 2013. He was researcher at SAP and head of a research group focusing systems for personal assistance. Now he

works as scientist for predictive applications at ABB. His research interests are data analytics and anticipatory models.

Max Mühlhäuser is a full professor in ubiquitous computing and head of Telecooperation Lab (TU Darmstadt) since 2000. He has chaired or co-chaired several workshops (recently, Interacting with Smart Objects at IUI2016) and has served on the program committee of several conferences in ubiquitous computing (recently, PerCom2016).

Expected Outcomes

Since *anticipatory mobile computing* has potentials to become one of the next emerging research fields after mobile sensing, activity recognition or context prediction, we plan to promote this field through the proposed workshop. Further, we will illustrate concepts and principles as well as state recent challenges and limitations of proactive support, intervention mechanisms and human behavior changes. All accepted papers will be published on the workshop website for inspiring and encouraging future research.

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Call for Papers

Scope and Aims

In today's fast paced environment, society is confronted with information overload, stress, and health issues. These are generally caused by accelerating technological evolution, increasing time pressure, and physical inactivity. So-called *anticipatory systems*, which guide users or intervene in their daily life, are seen as a very promising solution to overcome these issues. We believe that *anticipatory mobile computing* is the next emerging research field after mobile sensing, activity recognition, and context prediction. Thus, this workshop aims to share experiences of current researches on anticipatory systems in order to understand the extent of how such systems could be a solution and how they could provide personal guidance given the discovered traits of human behavior. We invite the submission of papers in the emerging research field of *anticipatory mobile computing* that focus on understanding, design, and development of such systems. We also welcome contributions that investigate underlying prediction models or give an insight into human behavior.

Areas of Interest

Relevant workshop topics include but are not limited to:

- Anticipatory Mobile Computing
- Persuasive Computing
- Social Computing
- Psychological Computing
- Understanding Human Behavior
- Complex Activity Recognition
- Context Prediction
- Human Behavior Changes
- Personal Guidance
- Intervention Mechanism
- Intelligent Actioning
- Decision Making
- Personalization
- Assistance Systems
- Human Computer Interfaces
- Proactive Support
- Daily-life Support
- Ambient Assisted Living
- Activity Recognition

Important Dates

June 7, 2016 Submission Deadline

June 28, 2016 Acceptance Notification

July 2, 2016 Camera-ready due

Submission

We invite two kinds of submissions:

Full research papers up to 8 pages

Short technical papers up to 4 pages

All papers must be in the SIGCHI Extended Abstract format[1].

[1] https://github.com/sigchi/Document-Formats