



3rd International Workshop in conjunction with the 2016 ACM Joint Conference on Pervasive and Ubiquitous Computing (UbiComp 2016) and the 20th International Symposium on Wearable Computers (ISWC 2016) on

Collective Adaptation in Very Large Scale UbiComp: Towards a Superorganism of Wearables

The 2016 ACM International Joint Conference on Pervasive and Ubiquitous Computing (UbiComp 2016) is a premier interdisciplinary venue in which leading international researchers, designers, developers, and practitioners in the field present and discuss novel results in all aspects of ubiquitous and pervasive computing. This includes the design, development, and deployment of ubiquitous and pervasive computing technologies and the understanding of human experiences and social impacts that these technologies facilitate.

UbiComp 2016 will be held in conjunction with the International Symposium on Wearable Computers (ISWC). ISWC is a conference dedicated to cutting-edge research in wearable technologies, and is the premier forum for wearable computing and issues related to on-body and worn mobile technologies. Every year, ISWC brings together researchers, product vendors, fashion designers, textile manufacturers, users, and related professionals to share information and advances in wearable computing.

Workshop

The 3rd workshop (after the 2014 WS in Seattle and the 2015 WS in Osaka) asks questions on the potential and opportunities of turning massively deployed wearable systems to a globe-spanning superorganism of socially interactive personal digital assistants. While individual wearables are of heterogeneous provenance and typically act autonomously, it stands to reason that they can (and will) self-organize into large scale cooperative collectives, with humans being mostly out-of-the-loop. A common objective or central controller may thereby not be assumed, but rather volatile network topologies, co-dependence and internal competition, non-linear and non-continuous dynamics, and sub-ideal, failure-prone operation. We refer to these emerging massive collectives of wearables as a "superorganism", since they exhibit properties of a living organism (like e.g. 'collective intelligence') on their own. Collected ideas of the previous Workshops can be found at <https://www.pervasive.jku.at/ubicomp14/> and [.../ubicomp15/](https://www.pervasive.jku.at/ubicomp15/)

One essential aspect of such globe-spanning collective ensembles is that they often exhibit properties typically observed in complex systems, like (i) spontaneous, dynamic network configuration, with (ii) individual nodes acting in parallel, (iii) constantly acting and reacting to what the other agents are doing, and (iv) where the control tends to be highly dispersed and decentralized. If there is to be any coherent behavior in the system, it (v) has to arise from competition and cooperation among the individual nodes, so that the overall behavior of the system is the result of a huge number of decisions made every moment by many individual entities.

In order to properly exploit such superorganisms, this workshop concerns itself with the development of a deeper scientific understanding of the foundational principles by which they operate. To this end, the workshop attempts to address the following **foundational research concerns**:

- Understanding the trade-offs between the power of top-down (by design) adaptation means and bottom-up (by emergence) ones, also by studying how the two approaches co-exist in modern wearable ICT systems, and possibly contributing to smoothing the tension between the two approaches.
- Understanding the "power of the masses" principle as far as participatory wearable ICT processes are involved. In particular, this implies understanding how and to what extent even very simple collective phenomena and algorithms - when involving billions of wearables - can express forms of intelligence much superior than that of more traditional AI techniques.
- Understanding the issue of diversity and of diversity increase in complex systems and in service/data systems and how diversity of structure and behavior is currently accommodated in wearable ICT systems. As of now, most studies focus on a limited number of different classes, which is far from approximating the diversity of existing systems.
- Laying down new foundations for the modelling of large-scale Human-ICT organisms and their adaptive behaviors, also including lessons from applied psychology, sociology, and social anthropology, other than from systemic biology, ecology and complexity science.
- Identifying models and tools by which individual organs of the systems can influence and direct "by design" the emergent adaptive behavior of the whole system, or at least of substantial parts of it.

Further, the workshop attempts to address the following **systems research concerns**:

- Opportunistic information collection. Systems need to be able to function in complex, dynamic environments where they have to deal with unpredictable changes in available infrastructures and learn to cooperate with other systems and human beings in complex self-organized ensembles.
- Collaborative Reasoning and Emergent Effects. Reasoning methods and system models are needed that combine machine learning methods with complexity theory to account for global emergent effects resulting from feedback loops between collaborative, interconnected devices and their users.
- Social Awareness. Whereas today's context-aware systems are able to make sense of the activity of single users and their immediate environment, future systems should be able to analyze, understand and predict complex social phenomena on a broad range of spatial and temporal scales. Examples of the derived information could be: shifts in collective opinions and social attitudes, changes in consumer behavior, the emergence of tensions in communities, demographics, migration, mobility patterns, or health trends.

The workshop will be held in Heidelberg, Germany on Monday, September 13th. It will be co-located with UbiComp 2016 and ISWC 2016.

Full Papers

Regular paper submissions must present original, highly innovative, prospective and forward-looking research in one or more of the themes given above. Full papers must break new ground, present new insight, deliver a significant research contribution and provide validated support for its results and conclusions. The workshop solicits (i) conceptual papers describing proposals for novel methodologies, theories and principles that might be used in order to design, develop and build, analyse and operate massive collectives of wearables, (ii) observational, epistemological and user study papers to deliver evidence for possible future scenarios, and emerging platforms and technologies as well as (iii) system-development papers proposing ingenious, novel HW/SW platforms.

Suggested topics include (but are not limited to)

- Novel complex adaptive system theories and operational principles.
- Novel design principles for building complex adaptive systems.
- Insights into evolutionary and emergent complex adaptive system properties
- Methodologies, Models, Algorithms, Frameworks and Tools for studying, analyzing and building complex adaptive systems.
- Case-studies / very large scale scenarios that can serve as reference case for future superorganisms of collective wearables.

Submission

Each paper must be submitted as a single PDF file in SIGCHI Extended Abstract format (not longer than six pages in length) using the OpenConf workshop paper submission system on the workshop webpage. Submissions to this workshop must not be under review by any other conference or publication during the workshop review cycle, and must not be previously published or accepted for publication elsewhere.

Word Template:

http://www.sigchi.org/publications/chipubform/sigchi-paper-format-2016/at_download/file

Latex Template:

<https://github.com/sigchi/Document-Formats>

Reviewing Process

The selection of workshop participants will be carried out by means of a peer review process. To guarantee fair decisions, experts from related research fields will serve as reviewers. Submissions need not to be anonymous, however reviews will be realized anonymously using the evaluation form provided by the submission system. Please refer to the paper submission link at the workshop website (<http://www.pervasive.jku.at/ubicomp16/>). Questions about papers and late submissions should be directed to ubicomp16ws@pervasive.jku.at.

Publishing

Accepted papers will be included in the printed UbiComp 2016 adjunct proceedings. The best workshop contributions will be invited to be included in an upcoming Special Issue of the International Journal of Pervasive Computing and Communications (IJPPCC) or a Special Issue of the ACM Transactions on Autonomous and Adaptive Systems (TAAS).

WORKSHOP COMMITTEE

Workshop Co-Chairs

Alois Ferscha (Johannes Kepler University Linz, Austria)
Paul Lukowicz (DFKI, Germany)
Franco Zambonelli (Universita di Modena e Reggio Emilia, Italy)

Workshop Administration

Bernhard Anzengruber (Johannes Kepler University Linz, Austria)
Michael Matscheko (Johannes Kepler University Linz, Austria)

Web and Publicity

Michael Matscheko (Johannes Kepler University Linz, Austria)

IMPORTANT DATES

Submission Deadline	June 7 th , 2016
Notification of Acceptance	June 21 st , 2016
Camera Ready Version	June 28 th , 2016
Workshop	September 13 th , 2016