



10th International Workshop on Human Activity Sensing Corpus and Applications (HASCA)

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ABSTRACT

The recognition of complex and subtle human behaviors from wearable sensors will enable next-generation human-oriented computing in scenarios of high societal value (e.g., dementia care). This will require large-scale human activity corpus and much improved methods to recognize activities and the context in which they occur. This workshop deals with the challenges of designing reproducible experimental setups, running large-scale dataset collection campaigns, designing activity and context recognition methods that are robust and adaptive, and evaluating systems in the real world. We wish to reflect on future methods, such as lifelong learning approaches that allow *open-ended* activity recognition.

KEYWORDS

Large Scale Human Activity Sensing Corpus, Activity Recognition, Wearable Computing, Open-Ended Activity/Context Recognition, Smartphones, Mobile Sensors, Participatory Sensing, Open Lab Nursing Activity Recognition Challenge

ACM Reference Format:

Kazuya Murao, Yu Enokibori, Hristijan Gjoreski, Paula Lago, Tsuyoshi Okita, Pekka Siirtola, Kei Hiroi, Philipp M. Scholl, Mathias Ciliberto, and Kenta

Urano. 2022. 10th International Workshop on Human Activity Sensing Corpus and Applications (HASCA). In *Proceedings of the 2022 ACM International Joint Conference on Pervasive and Ubiquitous Computing (UbiComp/ISWC '22 Adjunct)*, September 11–15, 2022, Cambridge, United Kingdom. ACM, New York, NY, USA, 3 pages. <https://doi.org/10.1145/3544793.3560377>

1 OBJECTIVE OF THE WORKSHOP

The objective of the workshop is to bring together researchers and practitioners both from academia and industries with the goal to discuss, identify and share experiences surrounding the construction of human activity sensing corpuses and their applications. Similarly to other human-related information processing areas, such as speech recognition and image recognition, real-world activity recognition requires large-scale corpuses of data. Some initiatives set reference datasets for the use by the community, such as OPPORTUNITY [5], HASC [4], or SHL [1], but more work on larger scale and richer datasets are clearly required. Scenarios of high societal value — such as a memory prosthesis for people with dementia — are likely to require a more complete and subtle understanding of the user’s activities and the context in which they occur, beyond what is currently available in “off the shelf” datasets. Similarly, activity recognition methods will have to be further improved to tackle real-world challenges.

In addition, we are looking to evolve the workshop style towards increasing collaborations within the community on larger scale tasks and challenges. Many domains have seen fruitful improvements with such community-wide collaborations, e.g., collecting joint datasets across researchers all over the world, using the same sensors, targeting the same tasks, and harmonizing these results. One example is the CVPR challenge. At the end of the workshop, the

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UbiComp/ISWC '22 Adjunct, September 11–15, 2022, Cambridge, United Kingdom

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ACM ISBN 978-1-4503-9423-9/22/09.

<https://doi.org/10.1145/3544793.3560377>

participants will discuss the next year's collaborative work based on the entered projects and aim for significant improvements of HASCA for the next year.

2 TOPICS OF THE WORKSHOP

The objective of this workshop is to share the experiences among current researchers around the challenges of real-world activity recognition, the role of datasets and tools, and breakthrough approaches towards open-ended contextual intelligence. We expect the following domains to be relevant contributions to this workshop (but not limited to):

- (1) *Data collection / Corpus construction*: Experiences or reports from data collection and/or corpus construction projects, such as papers describing the formats, styles or methodologies for data collection. Cloud-sourcing data collection or participatory sensing also could be included in this topic.
- (2) *Effectiveness of Data / Data Centric Research*: There is a field of research based on the collected corpus, which is called "Data Centric Research". Also, we solicit of the experience of using large-scale human activity sensing corpus. Using large-scale corpus with machine learning, there will be a large space for improving the performance of recognition results.
- (3) *Tools and Algorithms for Activity Recognition*: Activity recognition researchers could be more focused on their research theme with good tools for management of sensor data. In this workshop, we solicit development reports of tools and algorithms for forwarding the community.
- (4) *Real World Application and Experiences*: Activity recognition "in the Lab" usually works well. However, it is not true in the real world. In this workshop, we also solicit the experiences from real world applications. There is a huge gap/valley between "Lab Environment" and "Real World Environment". Large scale human activity sensing corpus will help to overcome this gap/valley.
- (5) *Sensing Devices and Systems*: Data collection is not only performed by the "off the shelf" sensors. There is a requirement to develop some special devices to obtain some sort of information. There is also a research area about the development or evaluate the system or technologies for data collection.
- (6) *Mobile experience sampling, experience sampling strategies*: Advances in experience sampling approaches, for instance intelligently querying the user or using novel devices (e.g. smartwatches) are likely to play an important role to provide user-contributed annotations of their own activities.
- (7) *Unsupervised pattern discovery*: Discovering meaningful repeating patterns in sensor data can be fundamental in informing other elements of a system generating an activity corpus, such as inquiring user or triggering annotation crowd sourcing.
- (8) *Dataset acquisition and annotation through crowd-sourcing, web-mining*: A wide abundance of sensor data is potentially in reach with users instrumented with their mobile phones and other wearables. Capitalizing on crowd-sourcing to create larger datasets in a cost effective manner may be critical

to open-ended activity recognition. Online datasets could also be used to bootstrap recognition models.

- (9) *Transfer learning, semi-supervised learning, incremental learning, lifelong learning*: The ability to translate recognition models across modalities or to use minimal supervision would allow to reuse datasets across domains and reduce the costs of acquiring annotations.

3 WORKSHOP FORMAT

We plan for a 1-day workshop format and hold it on 11th September 2021 in Cambridge, UK. There will be a keynote talk by a practitioner. After this, there will be up to three technical paper sessions consisting of 20-minute oral presentations from each accepted paper. There will be a discussion session after all of the presentations. In short, we plan up to three technical paper sessions and keynote talk in the one-day workshop.

4 ESTIMATED NUMBER OF PARTICIPANT

We expect to bring together 40–50 participants who are working on or having interest with human activity sensing corpus and its applications. Accepted paper count for HASCA2021 [2] was 30, which is the biggest workshop in UbiComp/ISWC2020. Our workshop is open to anyone and we do not cap the number of participants because it is very important to share the experience and the information of the corpus in this field for the real-world practical applications.

5 PAPER SELECTION AND PUBLICATION

All submission will go through a light review process with one or two reviewers. All papers will be collected through precision conference system (PCS). All contributions will be included in the ACM Digital Library and supplemental proceedings of the conference. Our website will be <http://hasca2022.hasc.jp/>.

6 PROSPECTIVE OUTCOME

The workshop will provide knowledge about current state-of-the-art studies around human activity recognition with open-ended concept for UbiComp/ISWC community. Expected outcomes are:

- (1) Survey of the state of the art of "Human Activity Sensing Corpus". This includes an overview of new data collection methods, tools and algorithms.
- (2) Practical knowledge of the data collection methodologies for human activity sensing.
- (3) Recognition of the potential and the importance of the large-scale corpus for human activity recognition.

7 PRE-WORKSHOP ACTIVITIES

We have already held the past nine HASCA workshops from 2013 through 2021. Every time, there are new attendees and the community has been growing up continuously. We have created a mailing group ¹ for the community. In 2019, a book summarizing the first five workshop outcomes was published [3].

¹(<https://groups.google.com/forum/#!forum/hasca-workshop>)

8 POST-WORKSHOP ACTIVITIES

On the workshop website, the list of the current data collection activities and the information of the public corpora will be presented.

9 ORGANIZERS

Most of the organizers are from OPPORTUNITY [5] and HASC [4] group.

- Kazuya Murao is an associate professor at Ritsumeikan University, Japan. He is working on wearable computing and human activity recognition, and a member of HASC.
- Yu Enokibori is a lecturer at Nagoya University, Japan. He is working on wearable computing, elderly healthcare and human activity recognition, and also is a member of HASC.
- Hristijan Gjoreski is an assistant professor at the University Ss. Cyril and Methodius University in Skopje. His research interest include wearable computing, machine learning, artificial intelligence. His main research area is activity recognition with wearables, in which he has won three competitions.
- Paula Lago is an assistant professor at Concordia University in Canada. Her current research is on how to improve the generalization of activity recognition in real-life settings taking advantage of data collected in controlled settings.
- Tsuyoshi Okita is a research associate professor at Kyushu Institute of Technology, Japan. He is interested in AI techniques, especially deep learning, applied to HAR and other areas.
- Pekka Siirtola is a post-doc researcher at University of Oulu, Finland. He is studying how to extract useful information from wellness data. Especially he is interested in continuous learning and wearable sensors.
- Kei Hiroi is an associate professor at Kyoto University, Japan. She is working on flood analysis/prediction and spatial-temporal analysis. She is a member of HASC.
- Philipp M. Scholl currently works at the Embedded Systems, University of Freiburg, Germany. His interests are wearable computing and activity recognition.
- Mathias Ciliberto is a PhD student at University of Sussex, UK. He is studying data mining and artificial neural network.
- Kenta Urano is an assistant professor in Graduate School of Engineering, Nagoya University. His research interests include location based system, human activity recognition, and biosignal entertainment computing.

10 CALL FOR PAPERS

HASCA-2022 is the tenth workshop in this series, with a growing community of practitioners and researchers interested in the applications of human activity recognition. The goal of this workshop is to continue conversations regarding current challenges of real-world activity recognition with newly developed datasets and tools, breaking through towards open-ended contextual intelligence. This workshop discusses the challenges of designing reproducible experimental setups, running large-scale dataset collection campaigns, designing activity and context recognition methods that are robust and adaptive, and evaluating systems in the real world. This year, we wish to reflect on future methods, such as lifelong learning

approaches that allow open-ended activity recognition. Papers may include topics such as:

- Human Activity Sensing Corpus
- Large Scale Data Collection
- Data Validation
- Data Tagging / Labeling
- Efficient Data Collection
- Data Mining from Corpus
- Automatic Segmentation
- Performance Evaluation
- Human-machine Interaction
- Noise Robustness
- Non Supervised Machine Learning
- Sensor Data Fusion
- Tools for Human Activity Corpus/Sensing
- Participatory Sensing
- Feature Extraction and Selection
- Context Awareness
- Pedestrian Navigation
- Social Activities Analysis/Detection
- Compressive Sensing
- Sensing Devices
- Lifelog Systems
- Route Recognition/Detection
- Wearable Application
- Gait Analysis
- Health-care Monitoring/Recommendation
- Daily-life Worker Support
- Deep Learning
- Human activity recognition applications

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