

# BandReader - A Mobile Application for Data Acquisition from Wearable Devices in Affective Computing Experiments

AKADEMIA GÓRNICZO-HUTNICZA IM. STANISŁAWA STASZICA W KRAKOWIE  
AGH UNIVERSITY OF SCIENCE AND TECHNOLOGY

Krzysztof Kutt

Grzegorz J. Nalepa

Barbara Giżycka

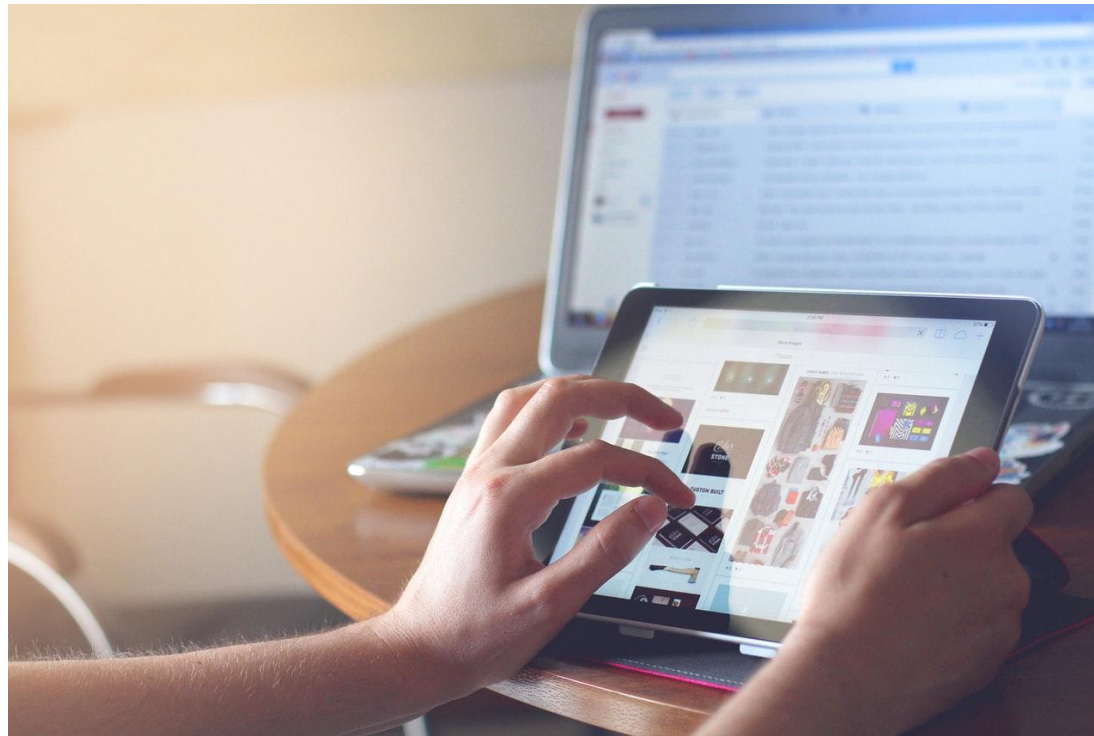
**Paweł Jemioło**

Marcin Adamczyk



# Introduction

Modern technology - ubiquitous, wearable and **affective**

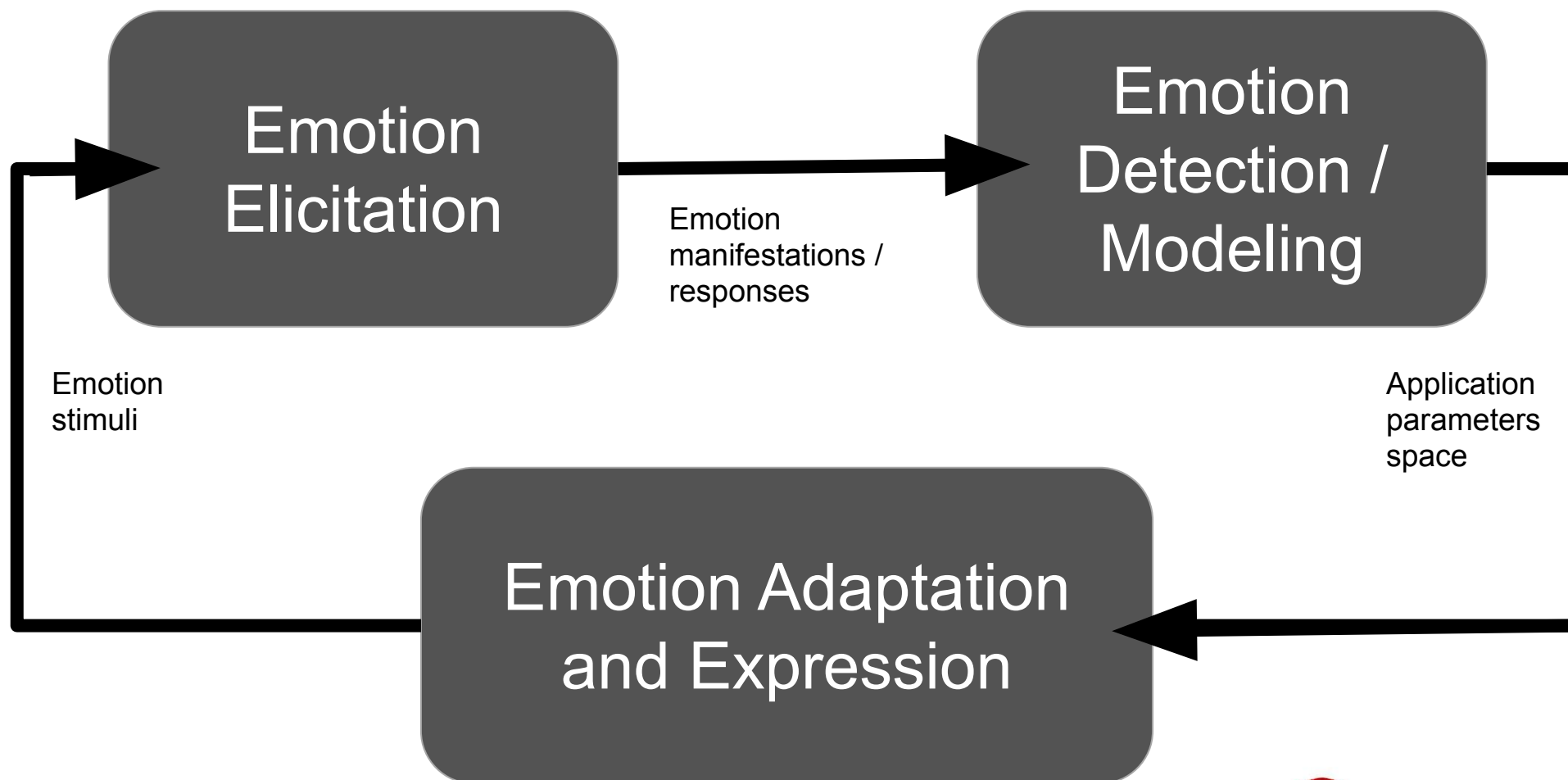


# Affective Computing

1. Detect and Collect - affective data
2. Process the data - according to a model



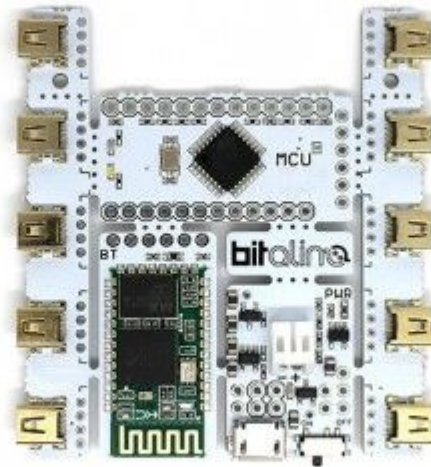
# Affective Loop



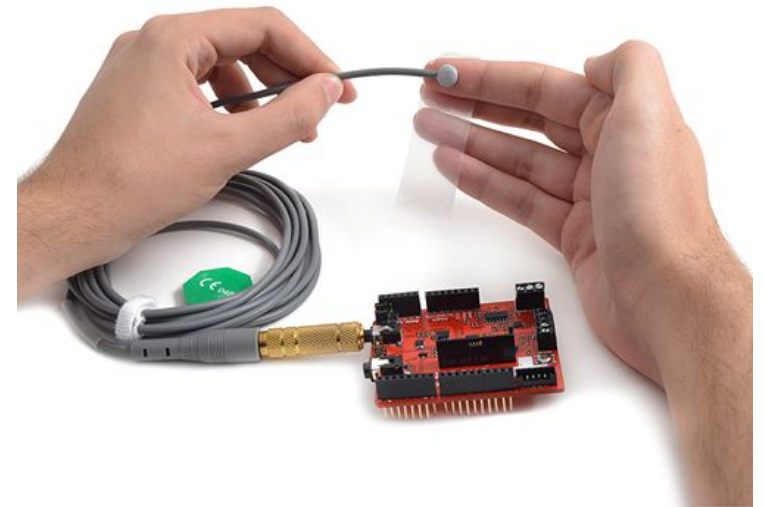
# Devices in Affective Computing



NeXus-10



BITalino (r)evolution kit



e-Health



# Wearable devices



Microsoft Band 2



Apple Watch



Xiaomi Mi Band 3



# Data acquisition: challenges

- » multiple sensors and complex platforms
- » multimodal data
- » data synchronization and integration

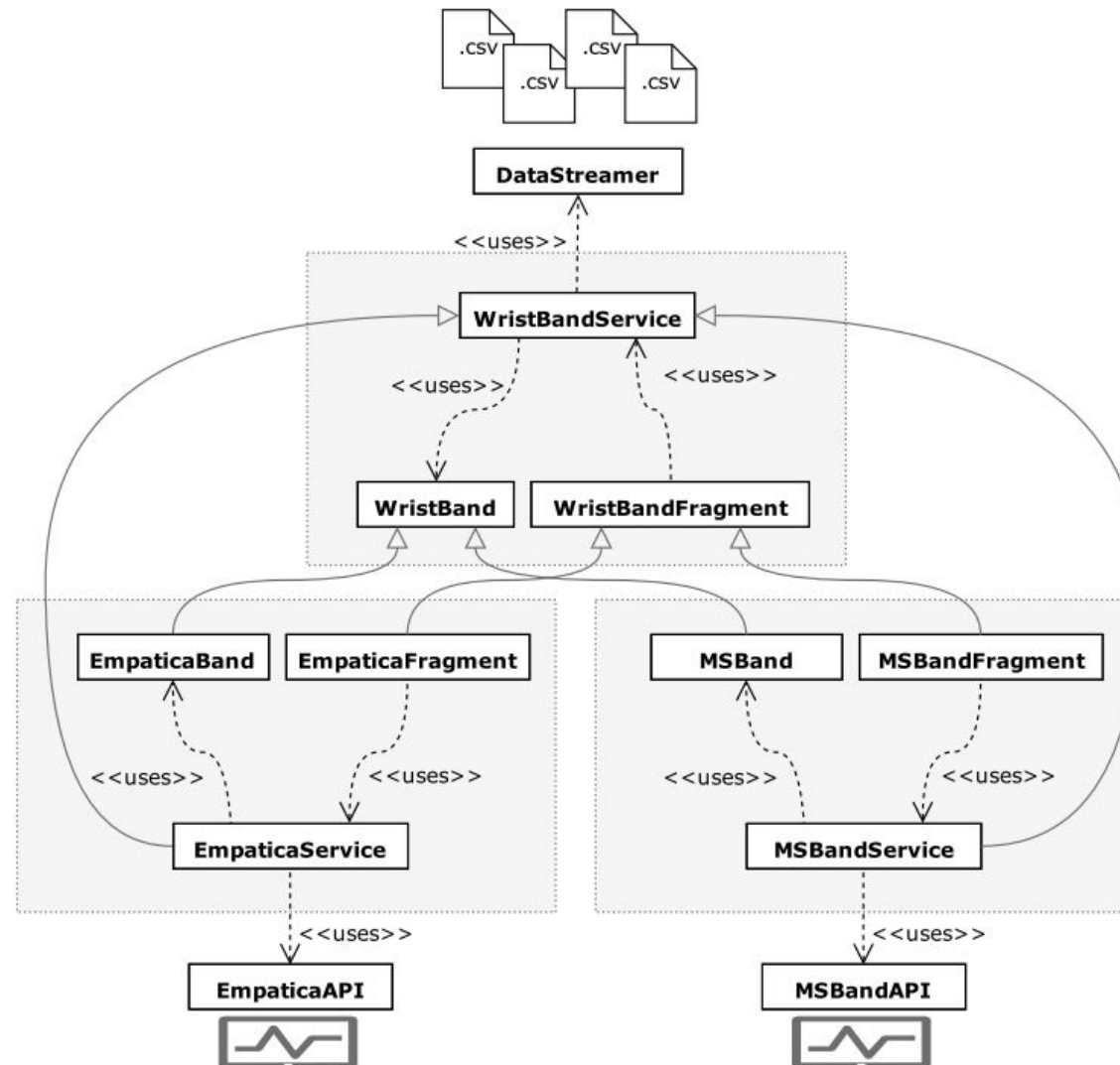


# Our solution: BandReader

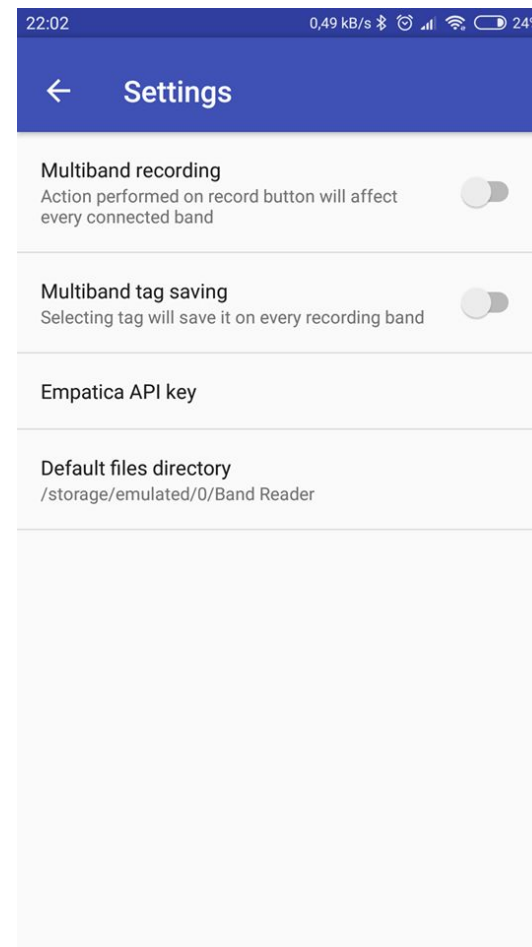
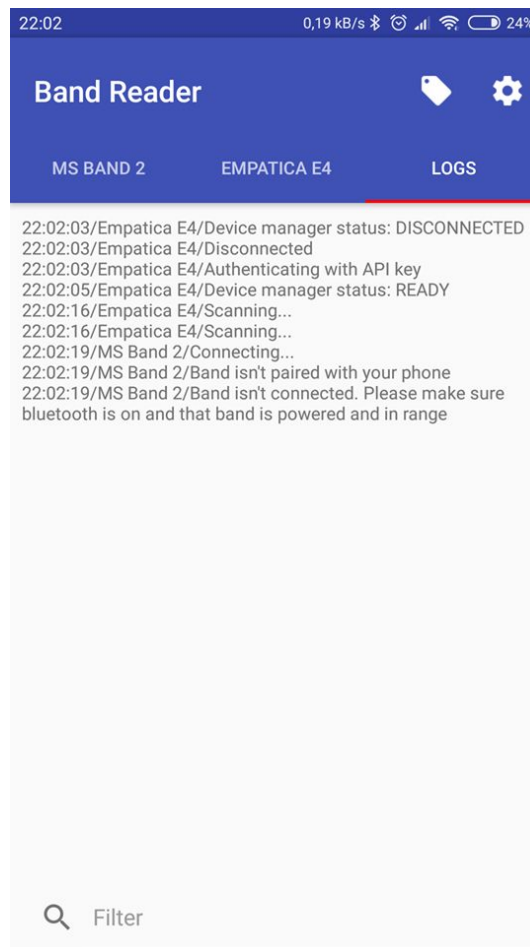
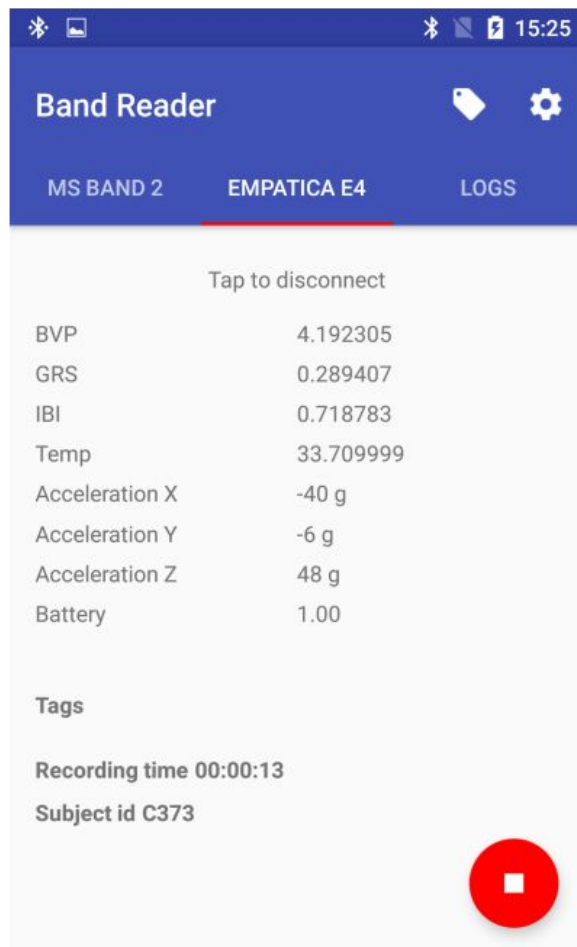
1. **modular** architecture
2. saving data from **multiple** sensors
3. saving data from several wristbands **simultaneously**
4. **synchronization** with other data sources
5. arbitrary **file naming**
6. convenient **file format**
7. data **available** for other applications
8. **raw data** as output



# BandReader Architecture



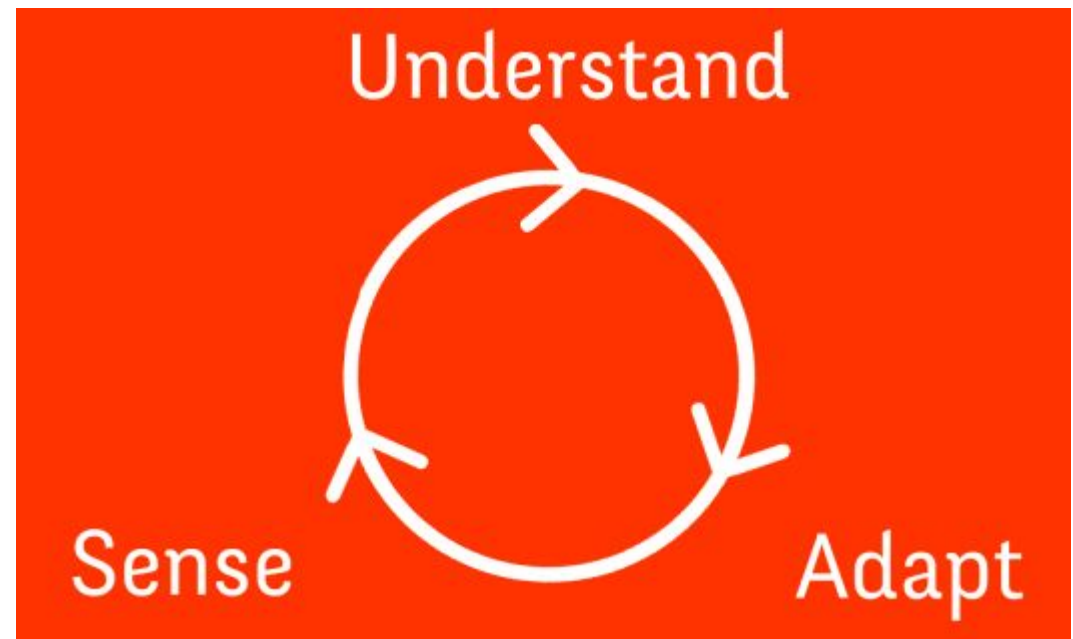
# BandReader GUI



# Use Cases

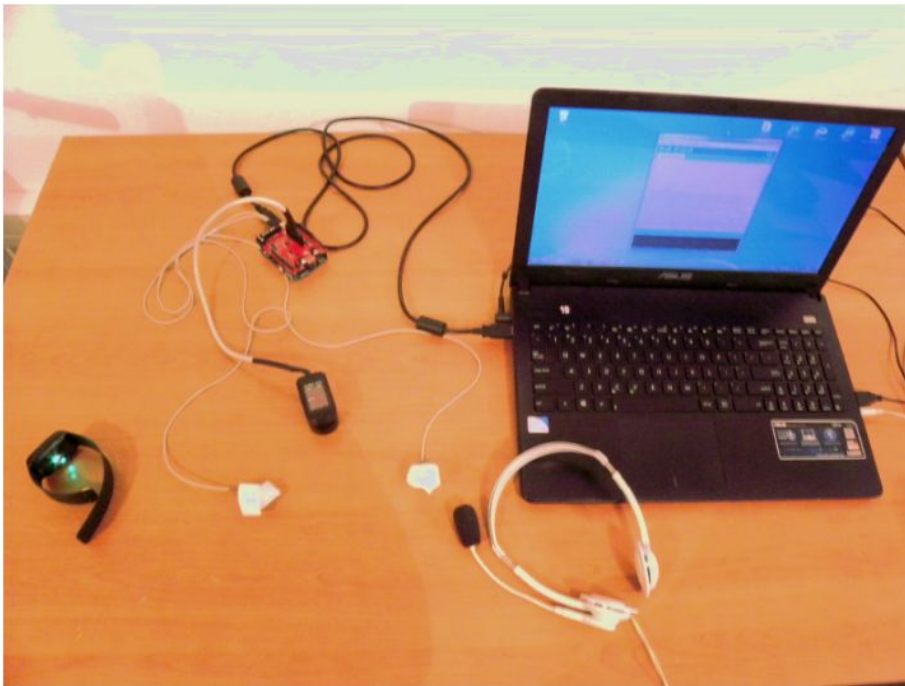


Recommender systems



Context aware systems

# Experiment Procedure



Experimental station

1. Setup
2. Arousal Self Evaluation
3. Playing  
the LondonBridge game
4. Listening to highly  
stimulating sound
5. Data analysis

# Summary of Experiments

1. BandReader reliability confirmed
  - a. stable connection
  - b. proper data recording and file generation
  
2. Core requirements successfully implemented
  - a. modular architecture
  - b. raw data output
  - c. from all available sensors
  - d. compiled in CSV files
  - e. enabled parallel recording sessions from different devices
  - f. freedom of file naming

# Related Research

Yates, Heath, Brent Chamberlain, and William H. Hsu. "A spatially explicit classification model for affective computing in built environments." *Affective Computing and Intelligent Interaction Workshops and Demos (ACIIW), 2017 Seventh International Conference on*. IEEE, 2017

Kye, Saewon, et al. "Multimodal data collection framework for mental stress monitoring." *Proceedings of the 2017 ACM International Joint Conference on Pervasive and Ubiquitous Computing and Proceedings of the 2017 ACM International Symposium on Wearable Computers*. ACM, 2017.

Preejith, S. P., et al. "Design, development and clinical validation of a wrist-based optical heart rate monitor." *Medical Measurements and Applications (MeMeA), 2016 IEEE International Symposium on*. IEEE, 2016.

McCarthy, Cameron, et al. "Validation of the Empatica E4 wristband." *Student Conference (ISC), 2016 IEEE EMBS International*. IEEE, 2016.

Ragot, Martin, et al. "Emotion recognition using physiological signals: laboratory vs. wearable sensors." *International Conference on Applied Human Factors and Ergonomics*. Springer, Cham, 2017.



# Future Work



Add new devices



Add synchronization via LSL



Thank you for  
your attention

