



**Universität Stuttgart**

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Fachpraktikum: **Multimodal Interaction for Ubiquitous Computers**

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## **Exercise 3**

# **Stress and Affect Detection using WESAD dataset**

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# System overview

- To infer affective states based on multimodal wearable sensor data
- Distinguish the following:
  - Three different affective states (**neutral, stress, amusement**) - Three class classification
  - Binary case (**stress vs. non-stress**)
  - Two device locations (**chest vs. wrist**) - Evaluate accuracies by using different combinations of modalities
- Using ML techniques to classify the affective states

# ML pipeline

## Details on the machine learning pipeline

- Classical Machine Learning pipeline:
  - Dataset -> Extract features from data -> Training the ML model ->Evaluating the model
- Feature Extraction:
  - Statistical features of EDA, Temp, ECG, Resp signals
- Evaluation: Accuracy of the three class classification and binary classification

# Training and Evaluation data

Dataset from the paper below:

## **Introducing WESAD, a Multimodal Dataset for Wearable Stress and Affect Detection**

- Data collection
  - 17 subjects, dataset contains high resolution physiological (ECG, EDA, EMG, RESP, and TEMP) and motion (ACC) data sampled at 700 Hz from a chest-worn device, and lower resolution data from a wrist-worn device
- Evaluation based on same dataset

Philip Schmidt, Attila Reiss, Robert Duerichen, Claus Marberger, Kristof Van Laerhoven, "Introducing WESAD, a multimodal dataset for Wearable Stress and Affect Detection", ICMI 2018, Boulder, USA, 2018

# Current status

- Extracted Statistical features: Mean, std, min, max of EDA, EMG, Temp data with a window size of 1 second
- Read data of five subjects and trained a Random Forest classifier which resulted in Overfitting as test error is very less
- **Challenges:** Feature importance, Overfitting, Hyperparameter tuning (In RF, number of estimators, max depth of each tree)
- **Next steps:** Training using k-fold cross validation, Trying out classifiers like SVM, GMM