

A Pipeline for Multi-source Time-series Data Fusion: An Activity Classification Scenario

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(https://github.com/SCAI-Lab/ssnr_adl_classification)

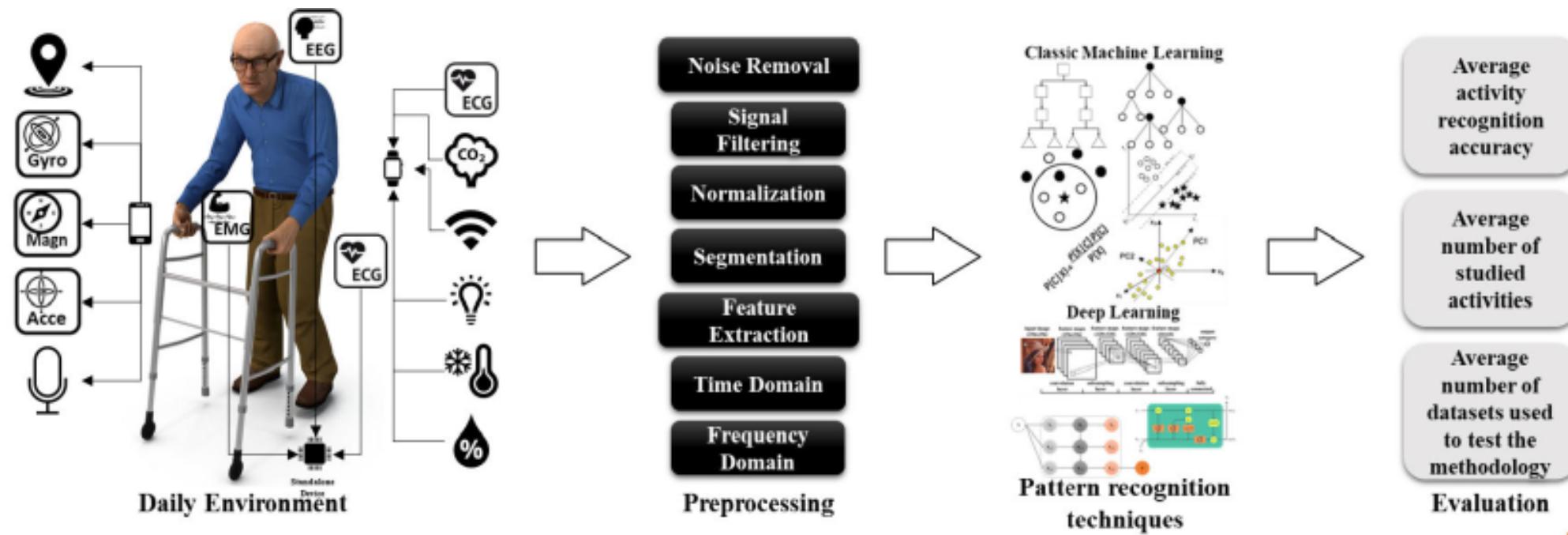


Introduction: Activity monitoring as a classification problem

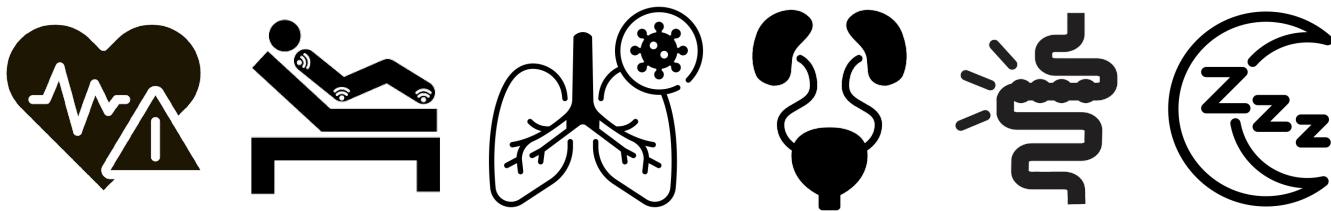
Classification is a process where an algorithm learns from a set of data with known labels to make predictions about the class of new data points.

Human Activity Recognition (HAR) is a field of study in machine learning and sensor technology that focuses on identifying and classifying human activities based on data collected from various sensors.

Health domain applications!

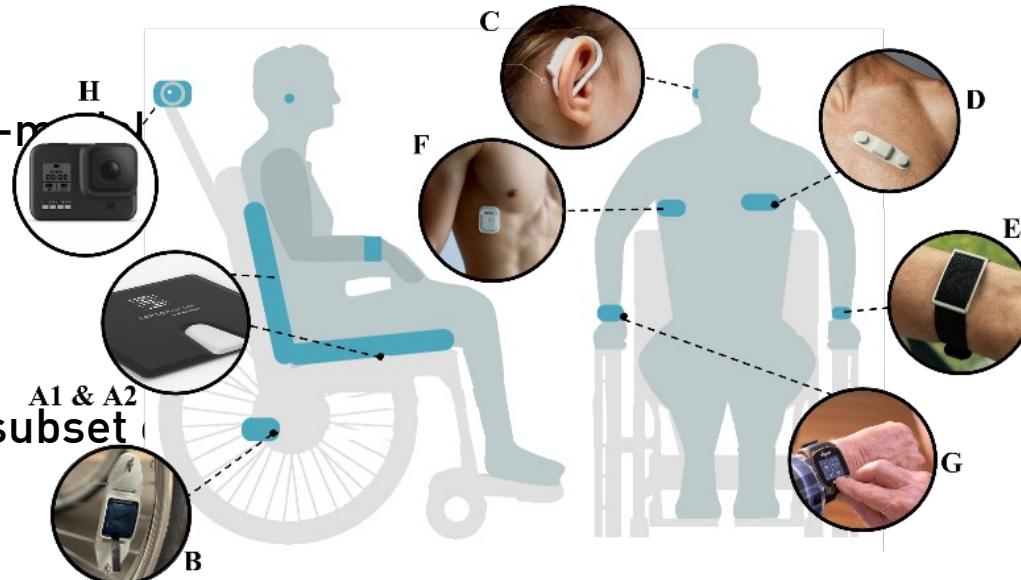


Introduction: Activity monitoring for spinal cord injury



Given:

A multi-sensor multi-mo-



Goal:

Selecting a minimal subset



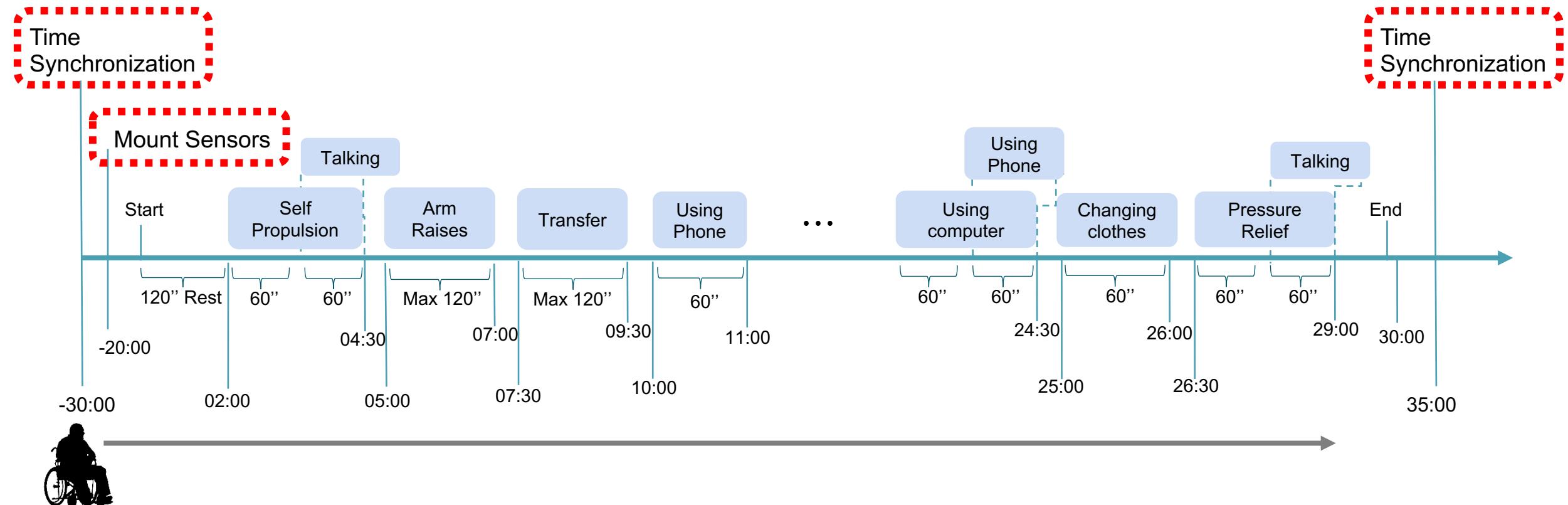
HAR challenges

- What sensor modalities to use?
- How to sample data so that the information is useful for tracking activities?
- Data from different sources might be missing at times.
- Pre-processing of the data (imputation, filtering, resampling, segmentation, windowing, etc.).
- How to fuse data from different sources?
- How to classify time-series (feature generation).
- How to evaluate classification?
- How to explain your classification?

HAR challenges

- What sensors / modalities to use?
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Experimental Protocol: SENSEI_v2



Selection of the Activities of Daily Living: SENSEI_v2

Arm Raises



Pressure Relief



Exercise

Using Phone



Using Computer



Talking



Eating



Social

Assisted Propulsion



Self Propulsion



Mobility

Transfer



Transfer

Washing Hands



Changing Clothes



Self Care

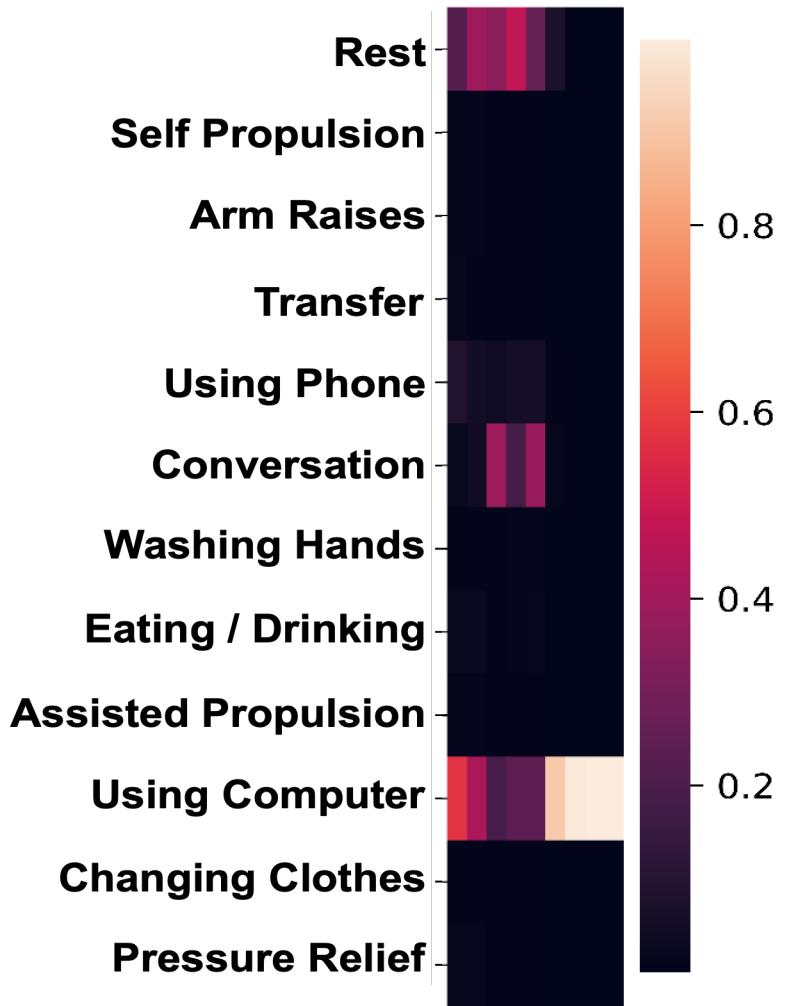
Resting



Sensors & Classes



- What activities can you classify?
- What level of confidence can you achieve?
- What is the expected frequency of each activity?



Feature & Source Selection

Whole Dataset

Subject-1

Subject-2

⋮

Subject-M

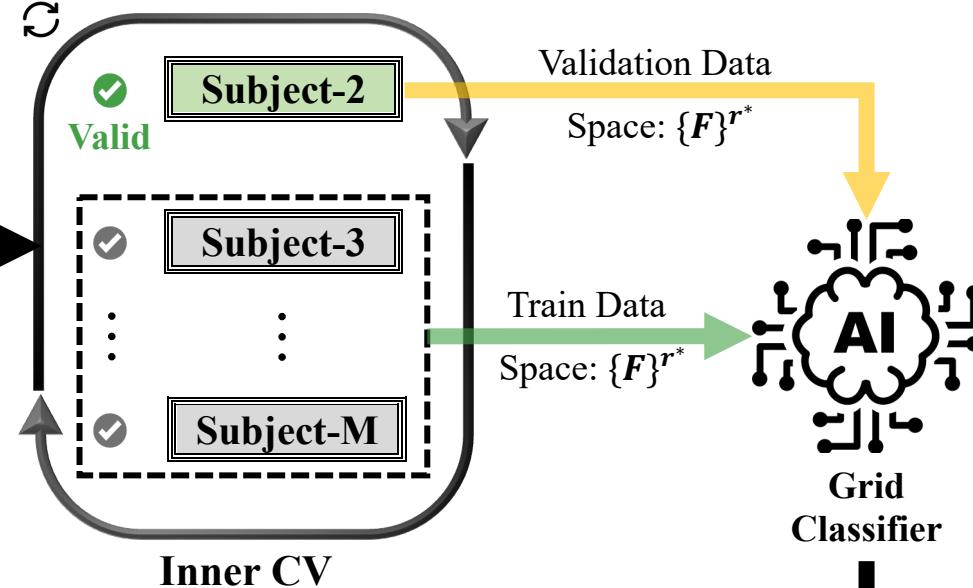
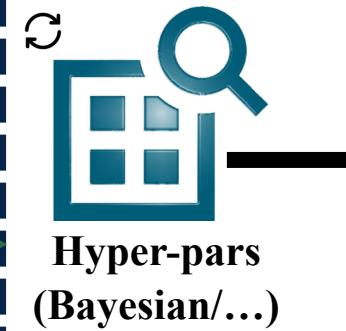
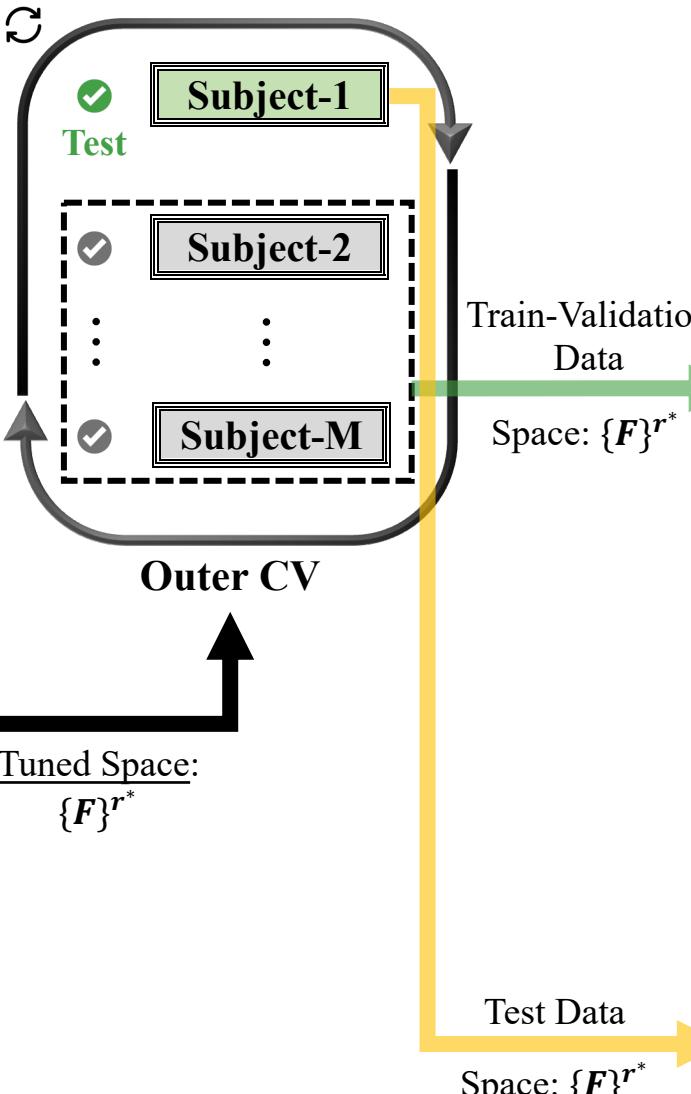
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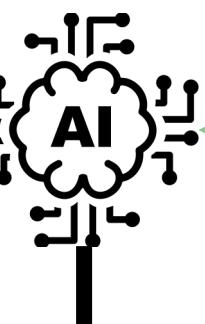
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Source
Combination
Selection

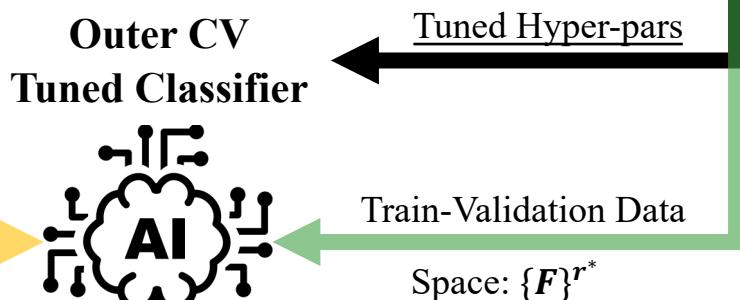
Hyper-par Tuning

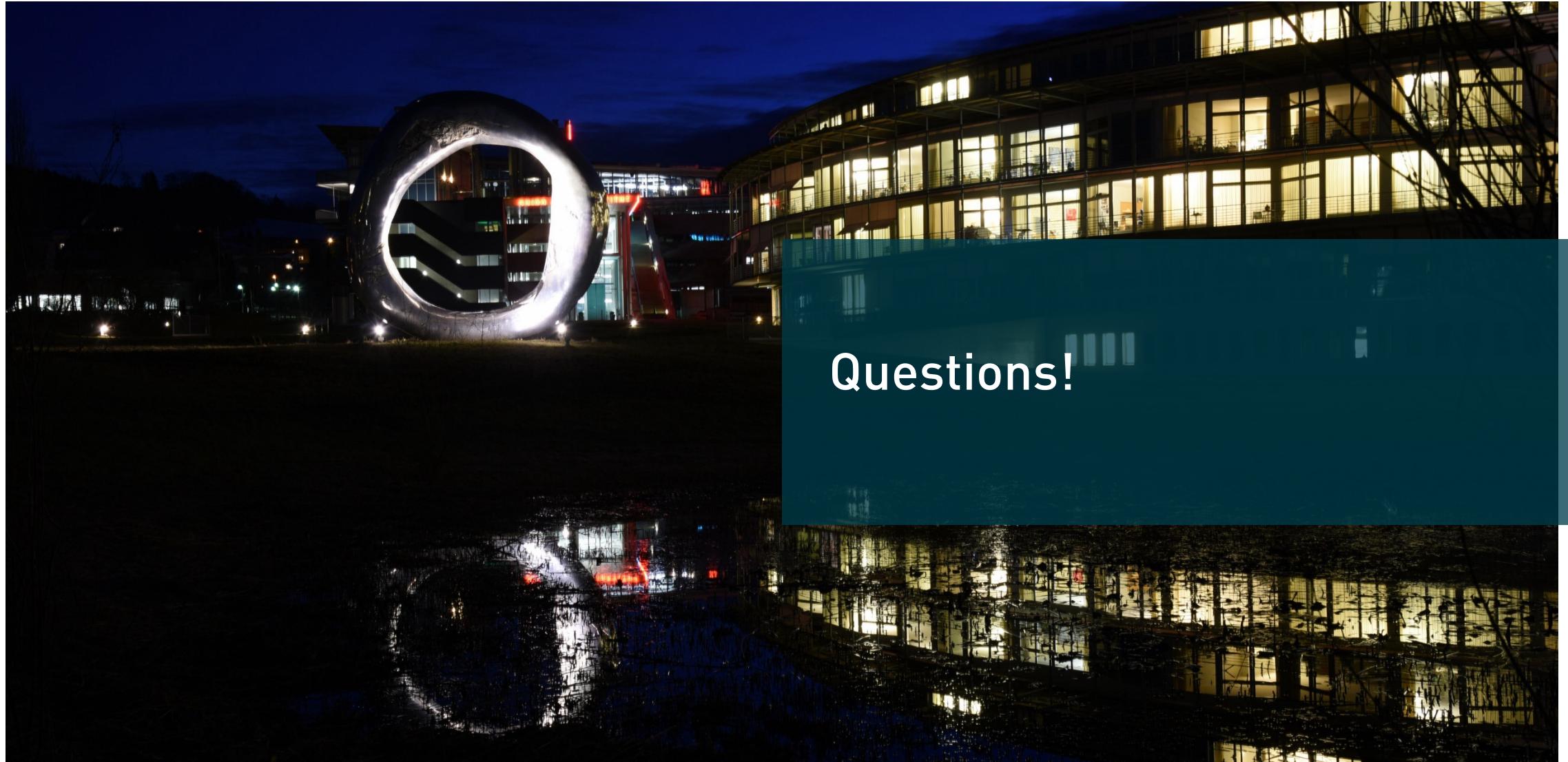


Outer CV
Tuned Classifier



Test Error
(Mean ± Std)





Questions!