FEBRUARY 2022

TEXAS
The University of Texas at Austin

[HW-2]: Analysis of Electromyography (EMG) Signals

[EE-379K/385V]: NEURAL ENGINEERING

The University of Texas at Austin

[HW-1 EE379K/385V] PNS: Peripheral Nerve Signals

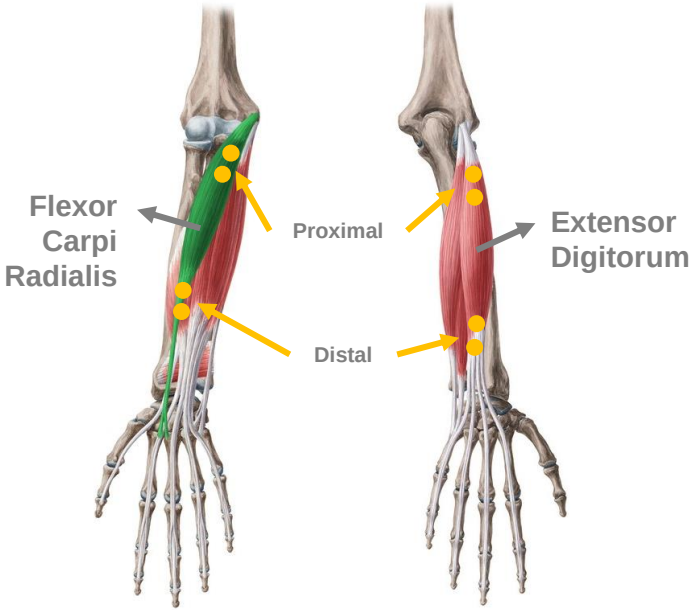
Notes:

- HW-2 is due on March 23rd
- Please start early to make use of the QA session on Wednesday
- Read literature on EMG analysis and EMG-based classification
- Discuss with others but submit your own work!
- Analyze your results concisely and comprehensively!
- We want to know your thoughts and suggestions!

[HW-1 EE379K/385V] EMG: Electromyography Signals

Aim: *- characterize EMG activity in the muscles of the forearm for different hand movements*
- classify the type of movement using EMG signals!

Experiment: *recording from the flexor carpi radialis & extensor digitorum using surface EMG*



[HW-1 EE379K/385V] EMG: Electromyography Signals

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Class-1: Grasp: *flexing of the fingers*

Class-2: Pinch: *fine pinching using the thumb and the index and middle fingers*

Class-3: Point: *Pointing forward with the index finger*

[HW-1 EE379K/385V] EMG: Electromyography Signals

Aim: ***- characterize EMG activity in the muscles of the forearm for different hand movements***
- classify the type of movement using EMG signals!

Data: ***subject.mat file contains data of six runs with 10 trials of each class***

subject.run(i).emg: (#samples x #sensors) contains emg data of i^{th} run

subject.run(i).header: contains the header info of the i^{th} run

- ***.fs:*** sampling rate
- ***.Label:*** labels of the 4 emg electrodes {ProxExt, DistExt, ProxFlx, DistFlx}
- ***.EVENT.TYP:*** event triggers during the task
- ***.EVENT.POS:*** position in samples of each trigger

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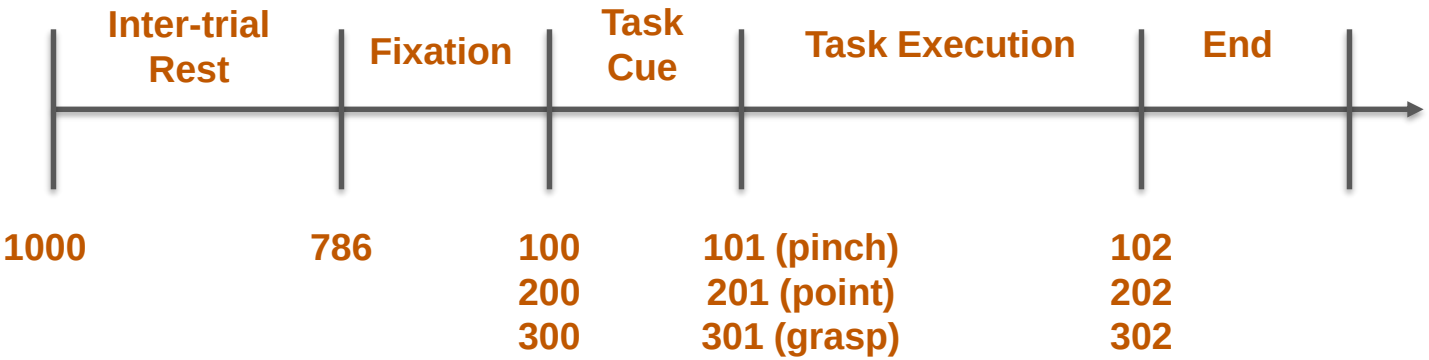
Trial Organization: *keep track of EVENT.TYP and EVENT.POS*



[HW-1 EE379K/385V] EMG: Electromyography Signals

Aim: *- characterize EMG activity in the muscles of the forearm for different hand movements*
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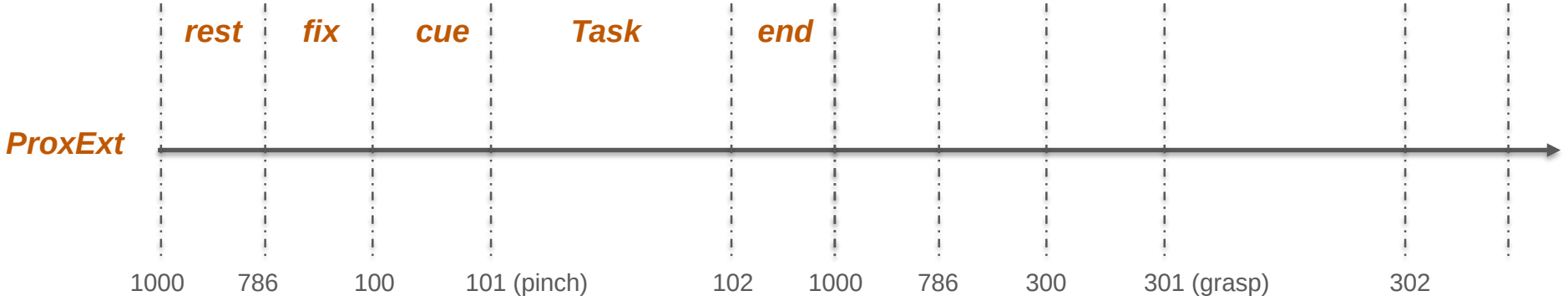
Tasks: *I) Prepare the data: filter and extract task periods*



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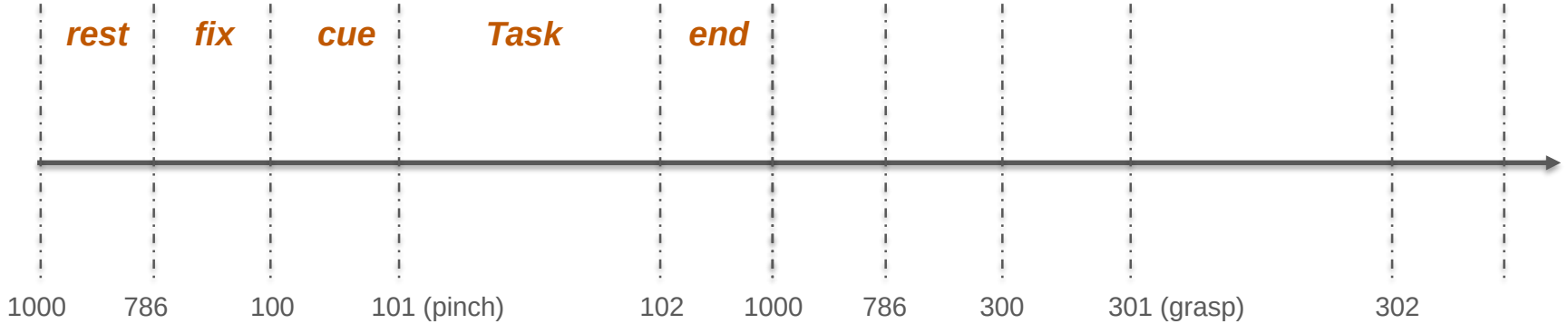
Tasks: *I) Prepare the data: filter and extract task periods*



[HW-1 EE379K/385V] EMG: Electromyography Signals

Aim: *- characterize EMG activity in the muscles of the forearm for different hand movements*
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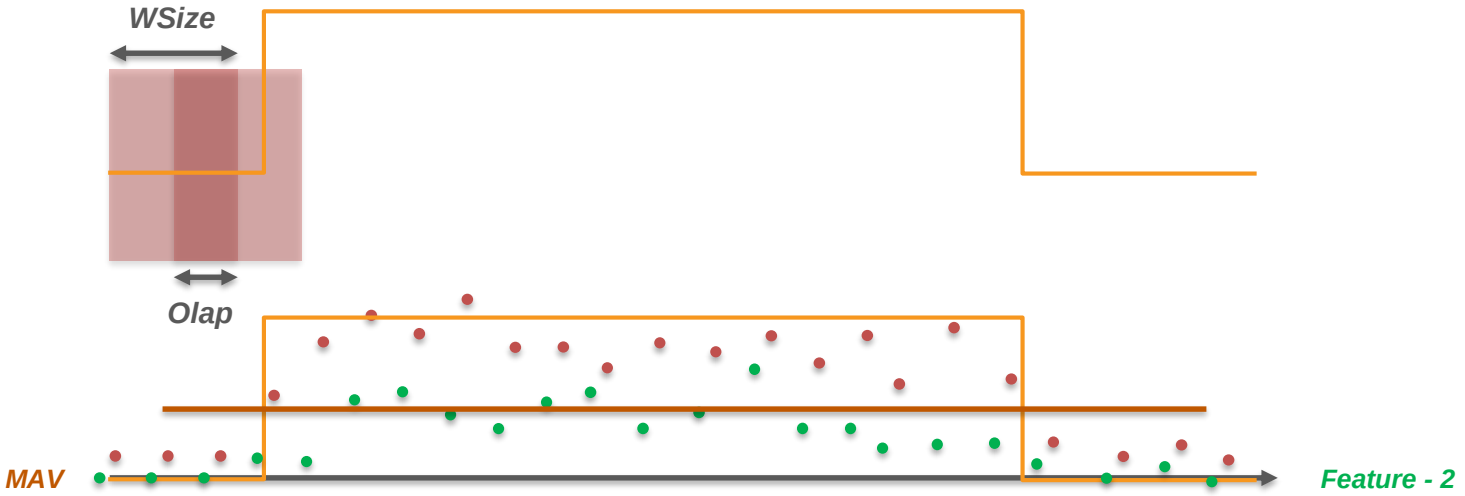
Tasks: *II) Feature Extraction*



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Aim: *- characterize EMG activity in the muscles of the forearm for different hand movements*
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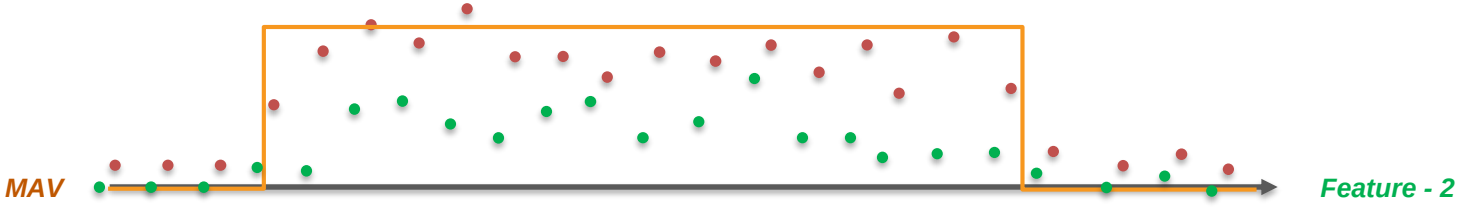
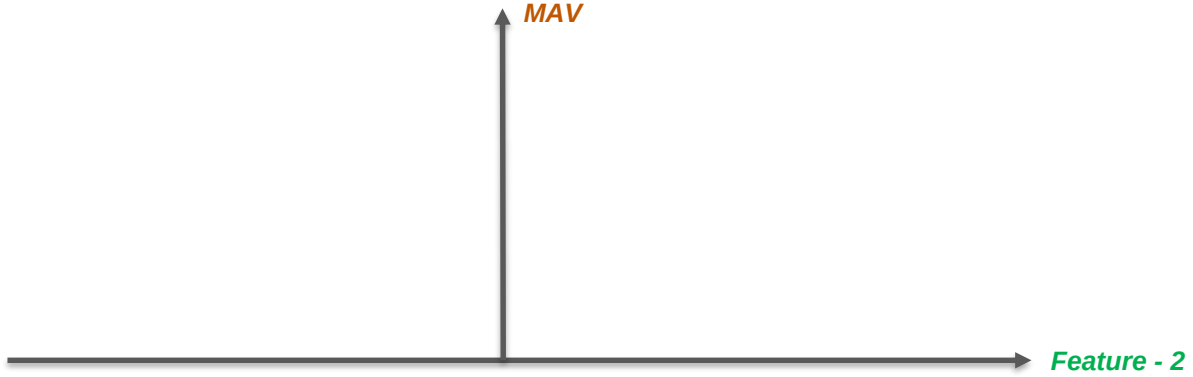
Tasks: *II) Feature Extraction: 2D feature space*





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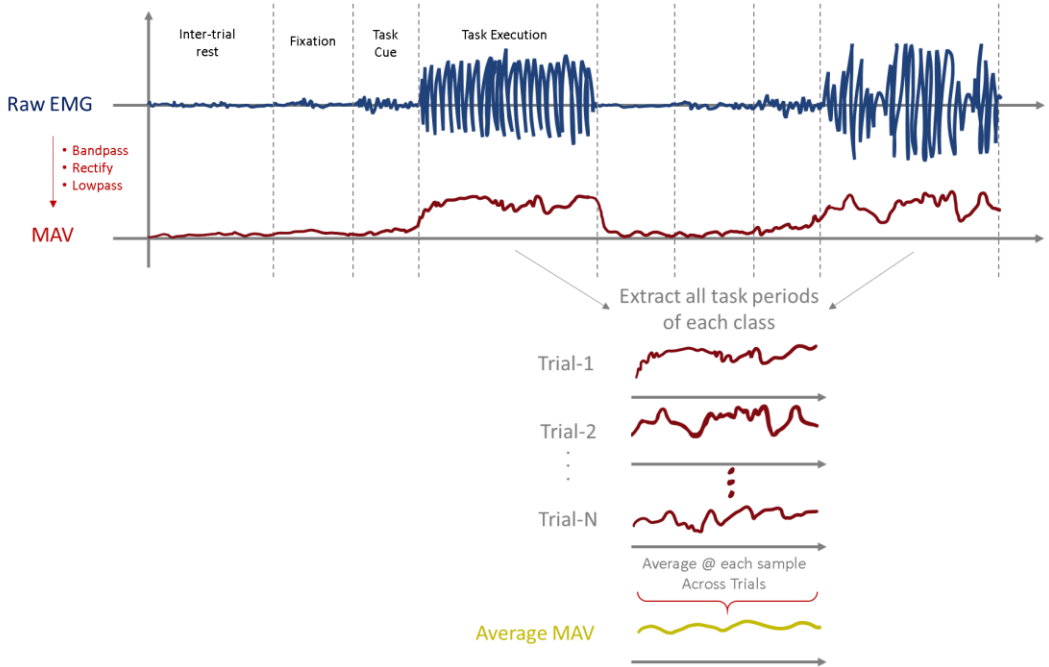
Tasks: *III) Grand Average MAV patterns*



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Aim: *- characterize EMG activity in the muscles of the forearm for different hand movements*
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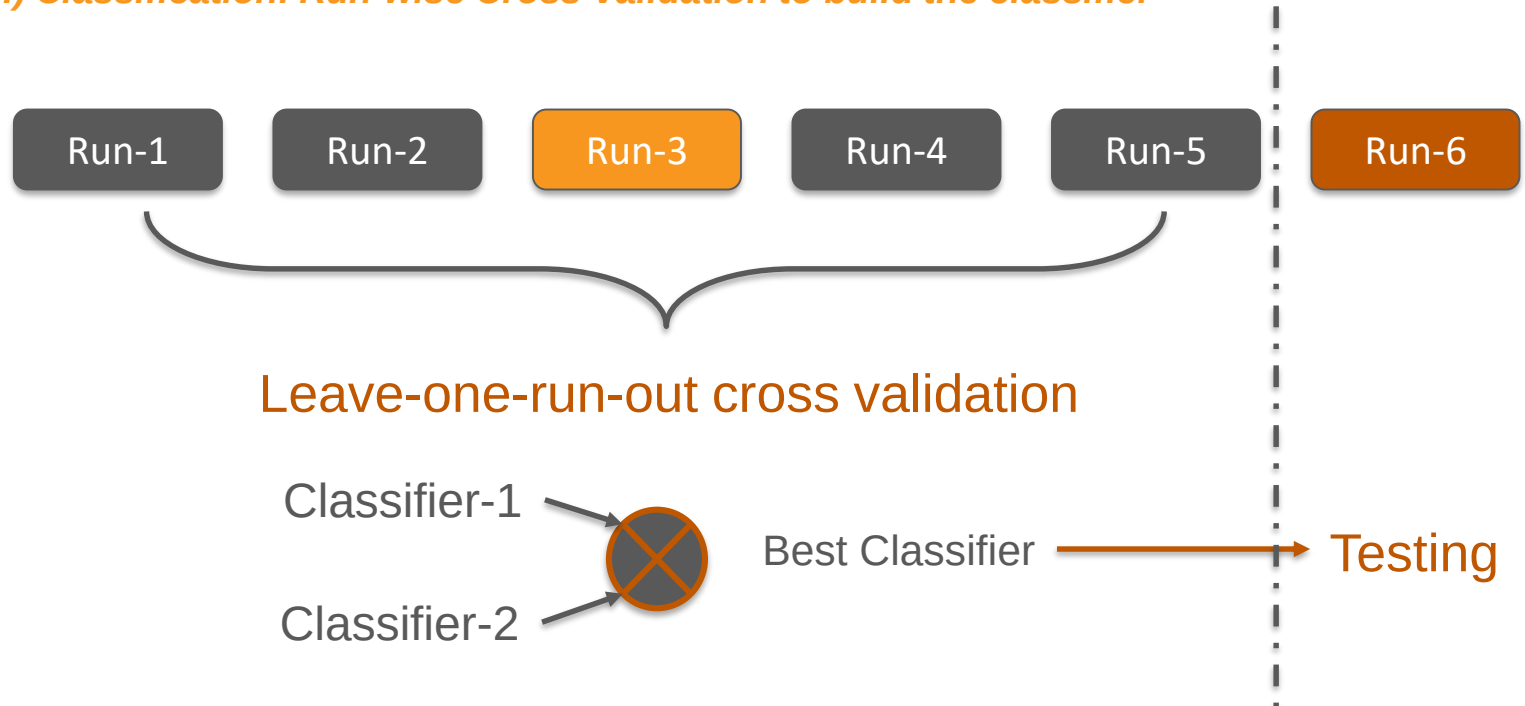
Tasks: *III) Classification: Run-wise Cross Validation to build the classifier*



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Tasks: *III) Classification: Transfer Decoders*