

Spring 2026



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

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

The University of Texas at Austin

[HW-2 EE379K/385V] PNS: EMG

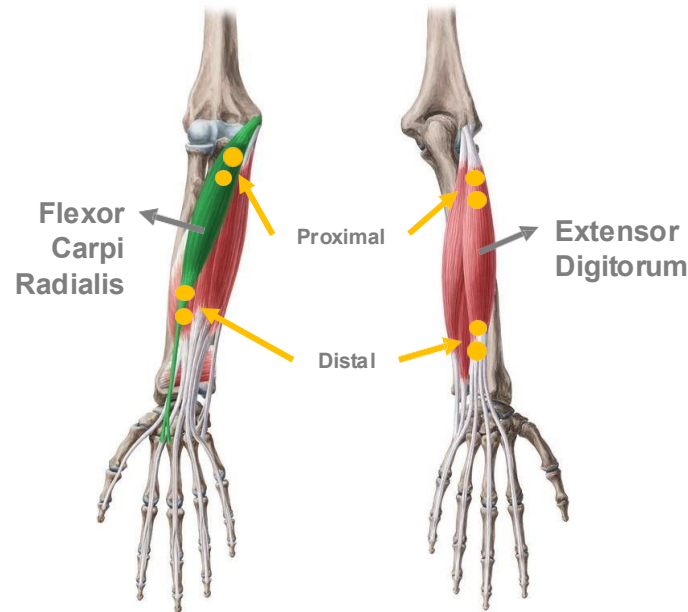
Notes:

- HW-2 is due on March 11th
- 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!

[HW-2 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



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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



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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

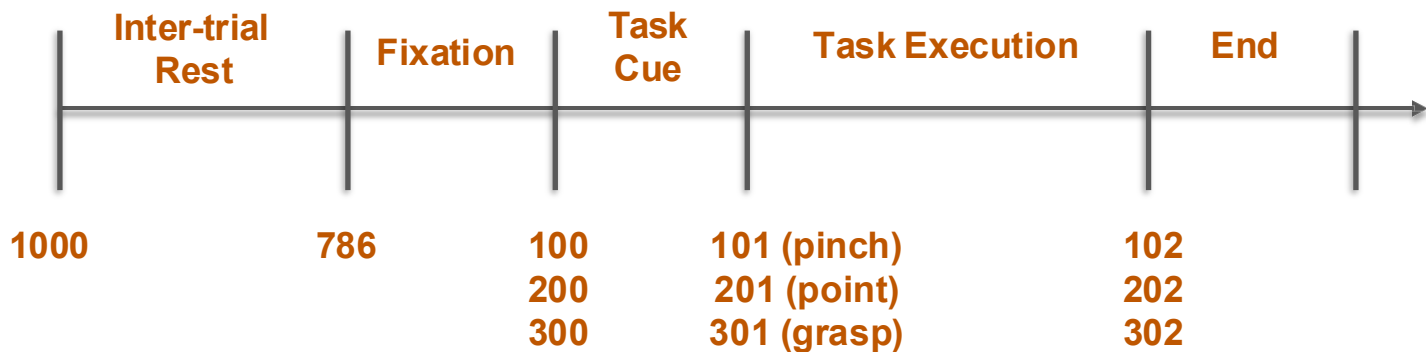
subject.run(i).header: contains the header info of the i^{th} run

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

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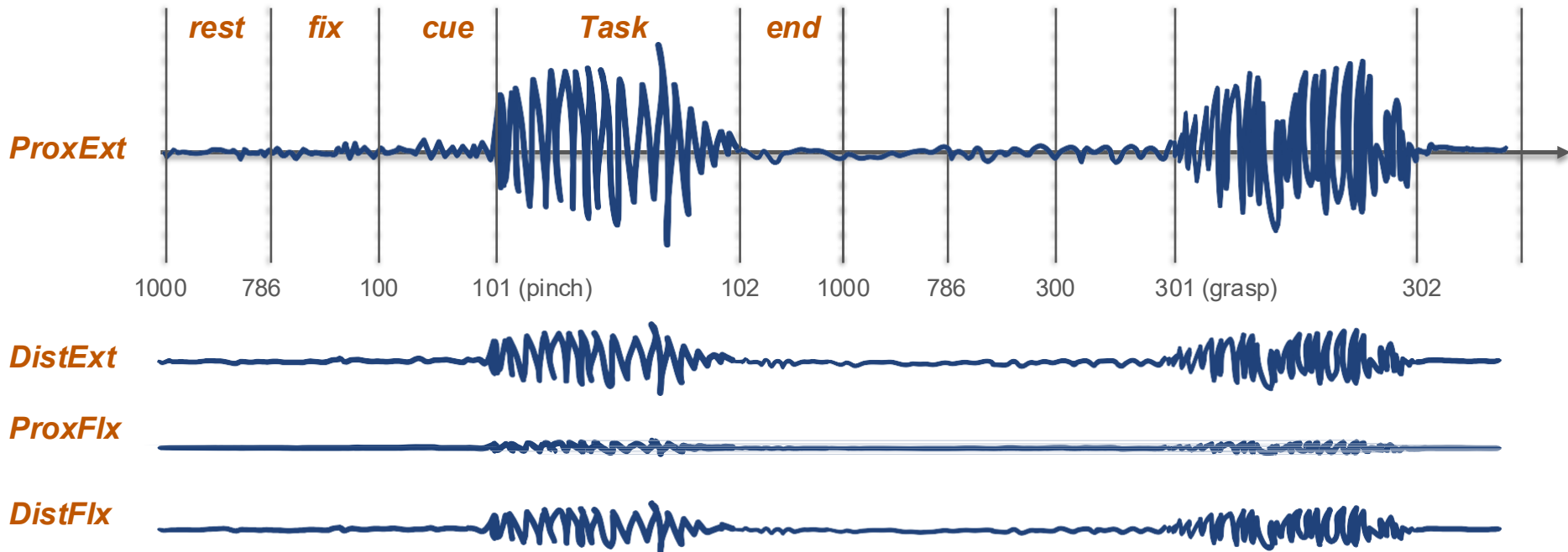
Trial Organization: keep track of *EVENT.TYP* and *EVENT.POS*



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



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

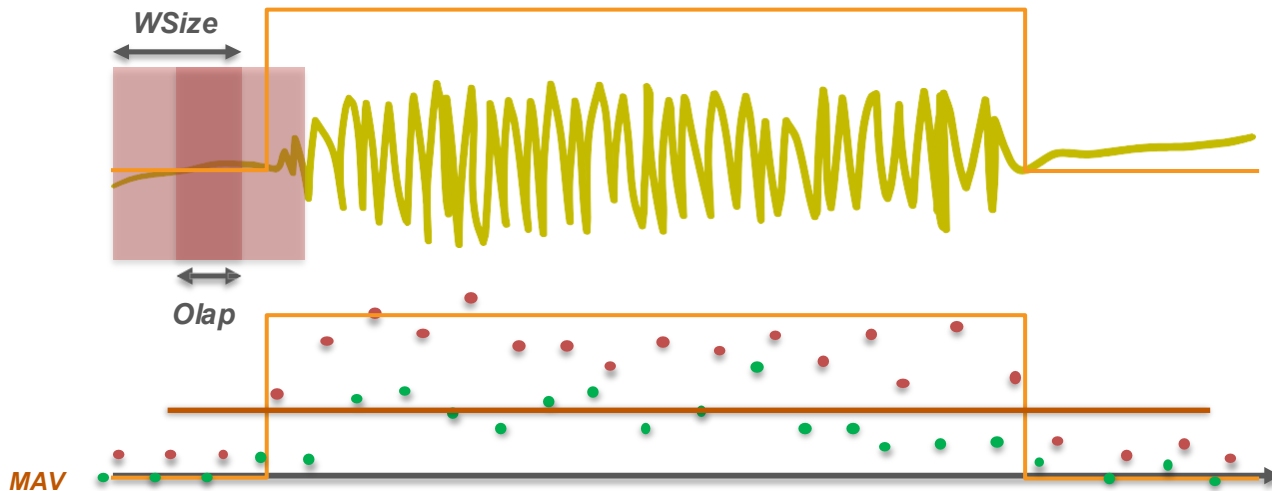
Data matrix: 30 trials x 4 sensors x samples

Label vector: 30 trials x 1

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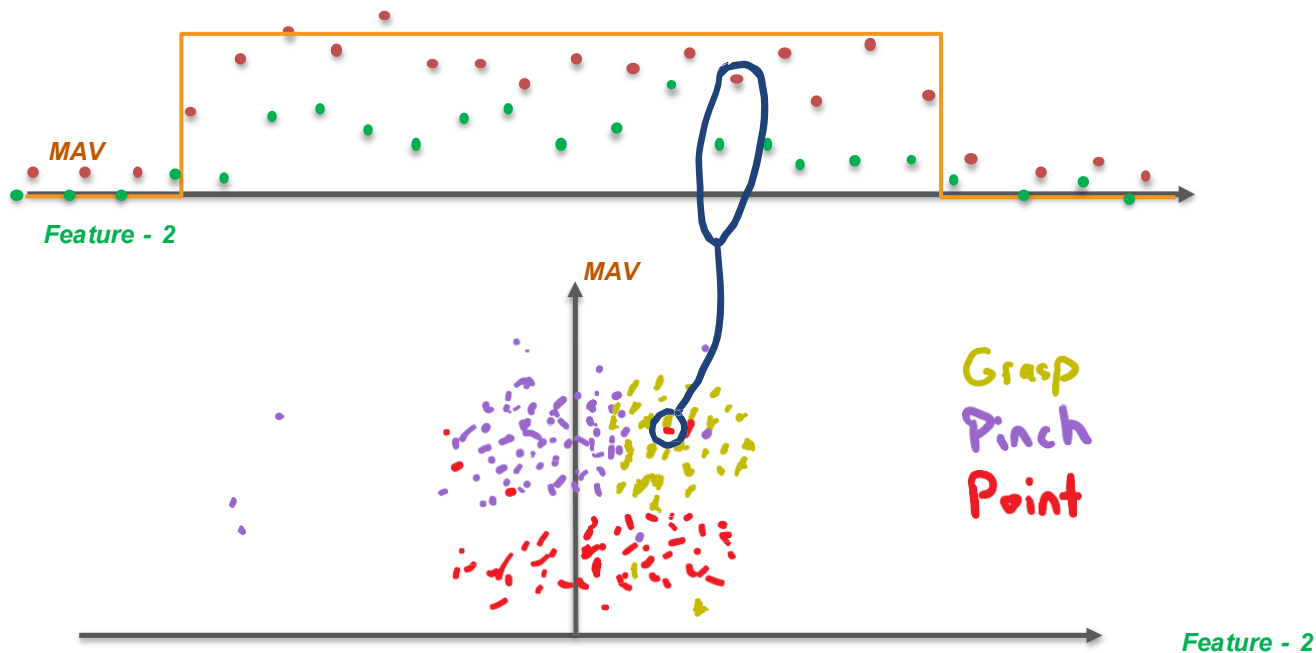
Tasks: II) Feature Extraction



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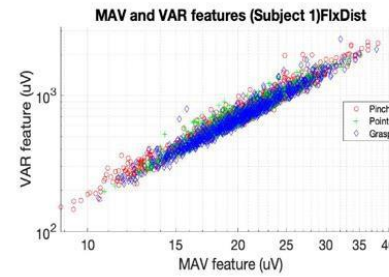
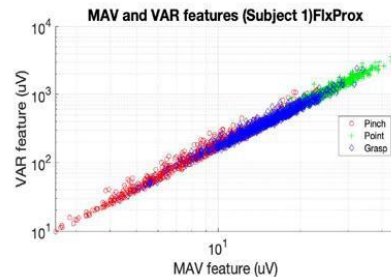
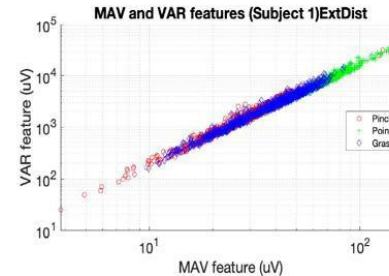
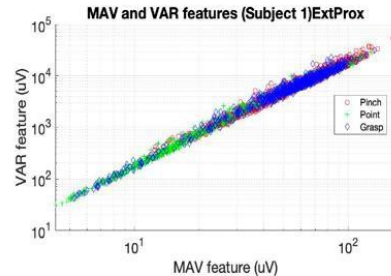
Tasks: II) Feature Extraction: 2D feature space



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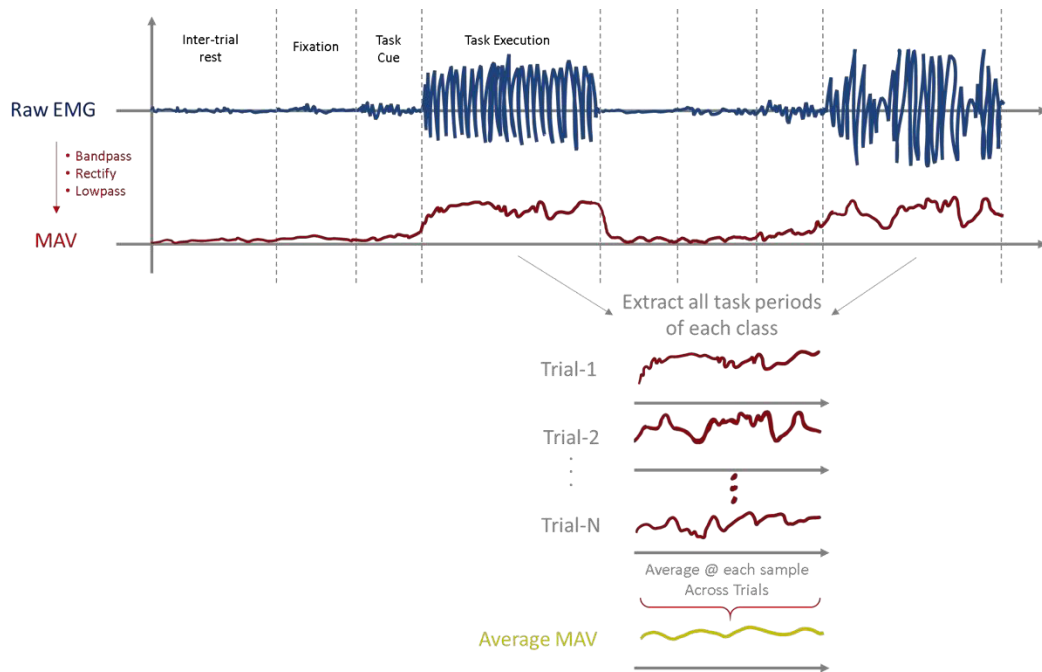
Tasks: II) Feature Extraction



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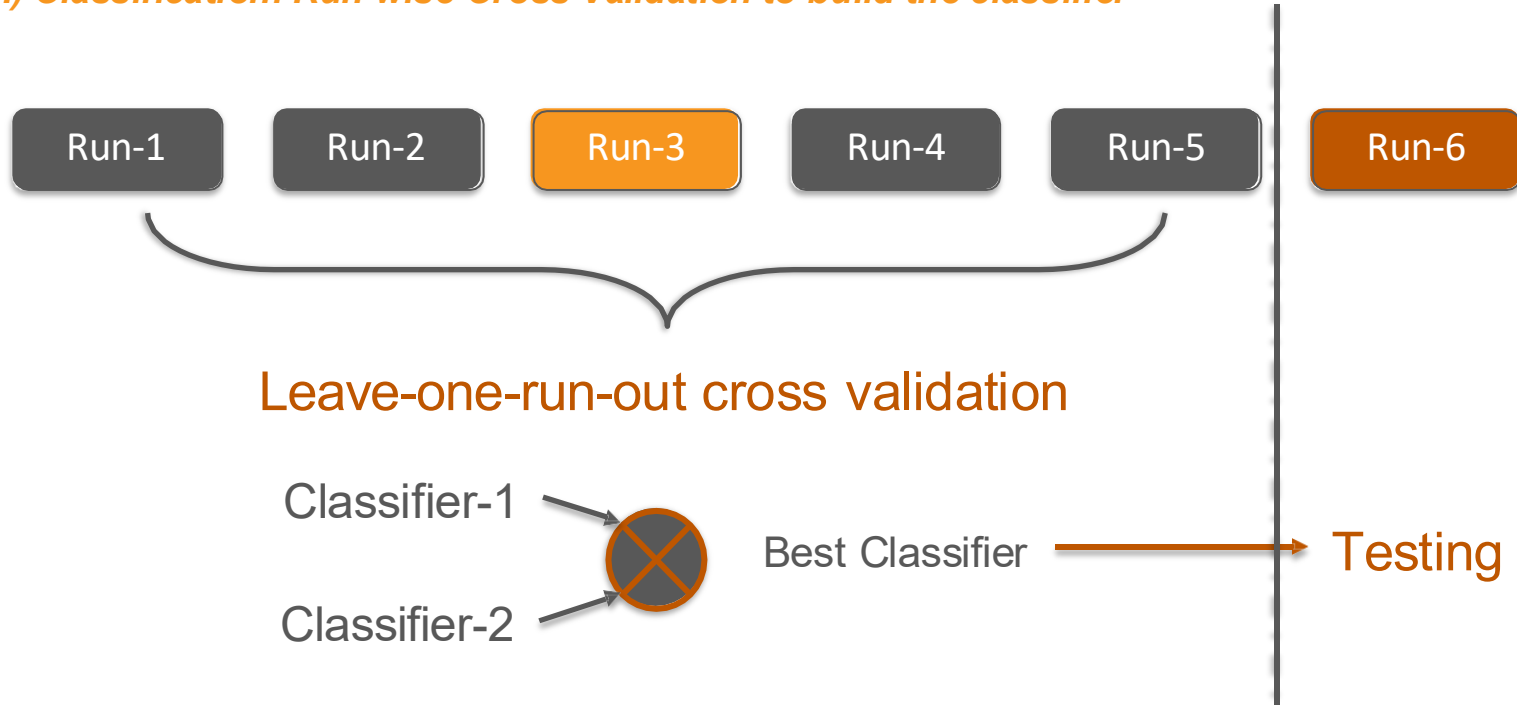
Tasks: III) Grand Average MAV patterns



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Tasks: III) Classification: Run-wise Cross Validation to build the classifier



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Tasks: III) Classification: Transfer Decoders

