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Comparison of strategies to elicit motor imagery-related brain patterns in multimodal BCI settings

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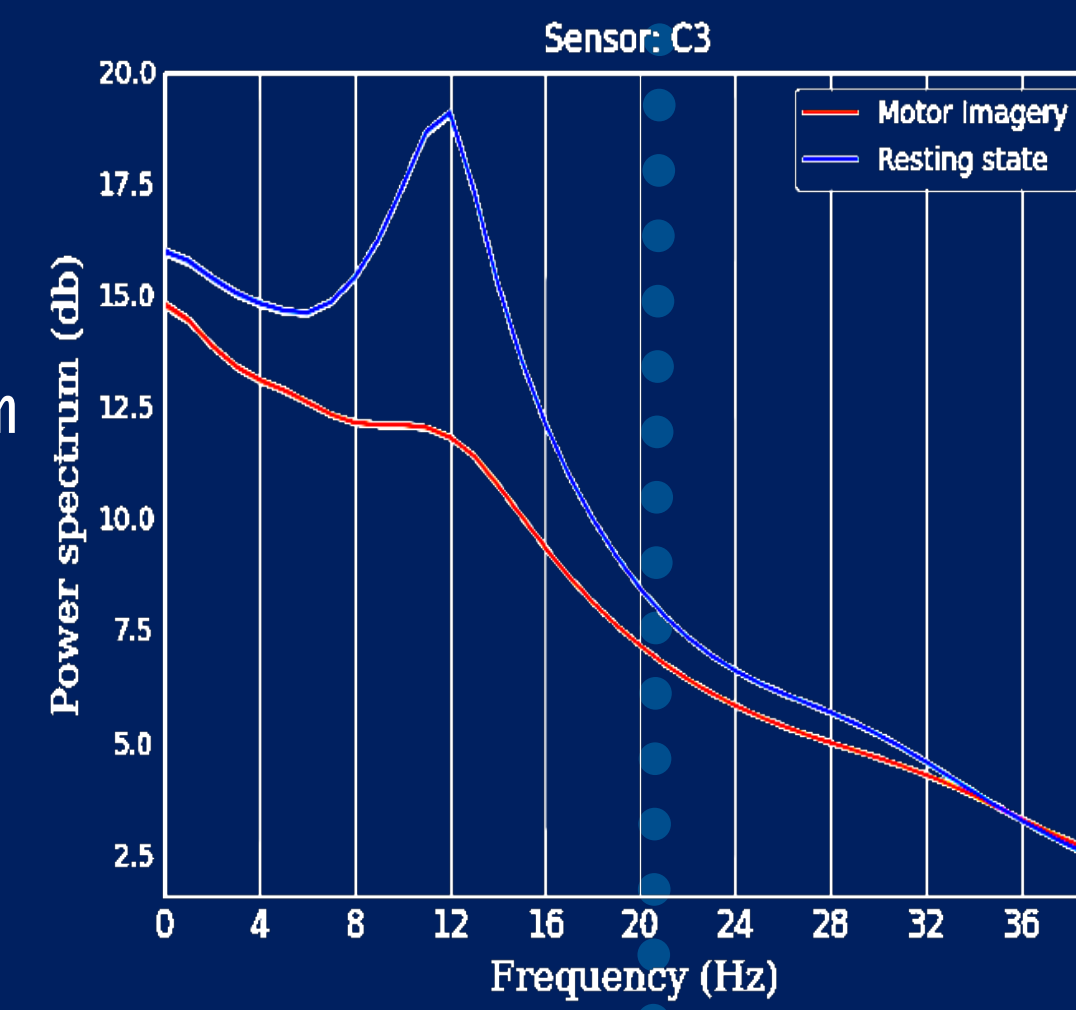
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Introduction



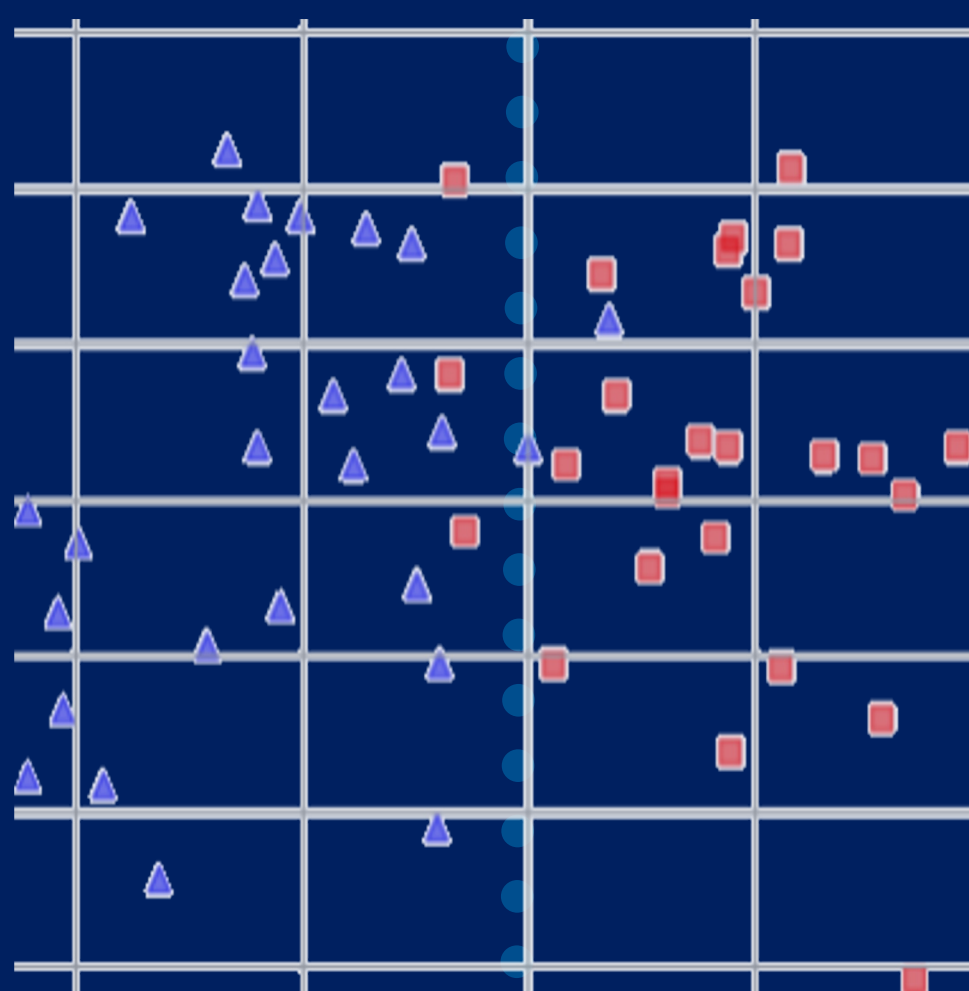
Task: Motor Imagery of the Right Hand

Acquisition: EEG to capture brain patterns corresponding to the task

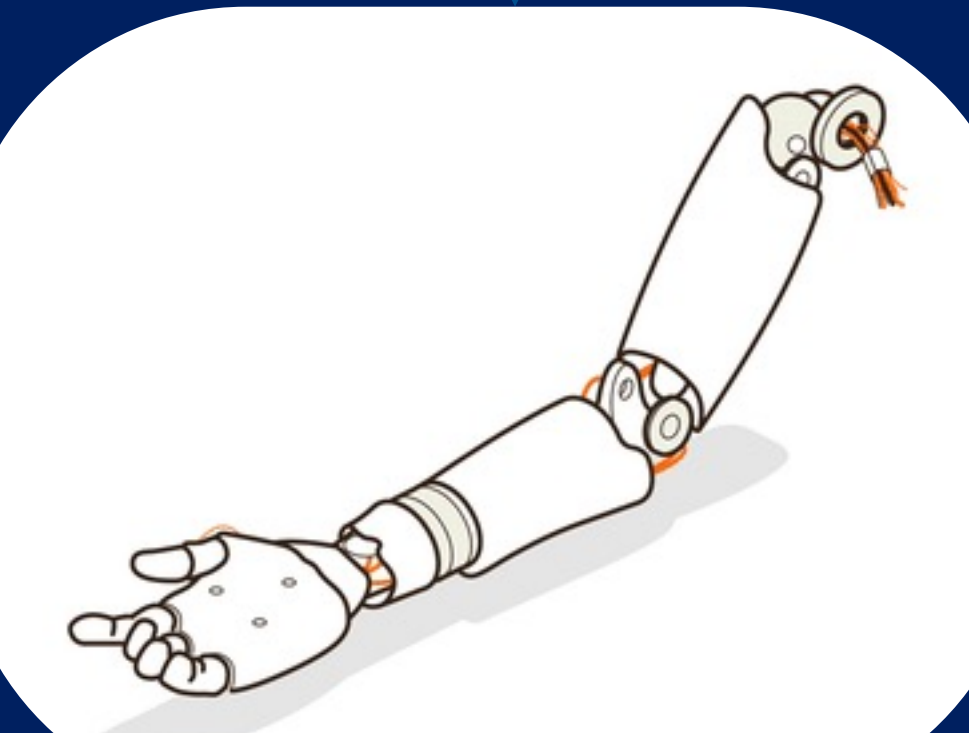


Feature selection: Power Spectrum at specific frequency for specific electrodes

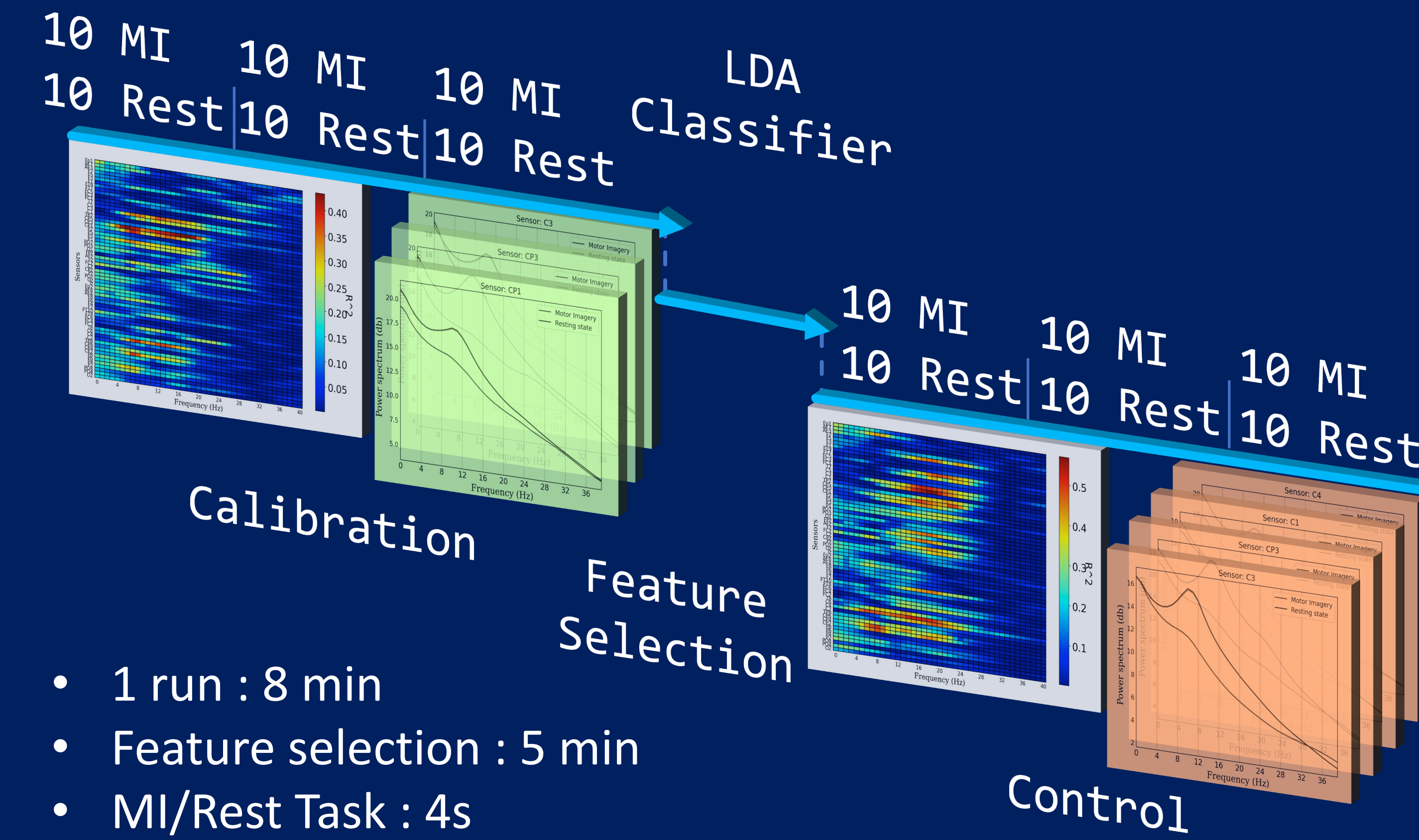
Classification: Discrimination between classes, feedback based on probability to belong to a class



Active feedback: Control of devices, the nature of the feedback influences the performances

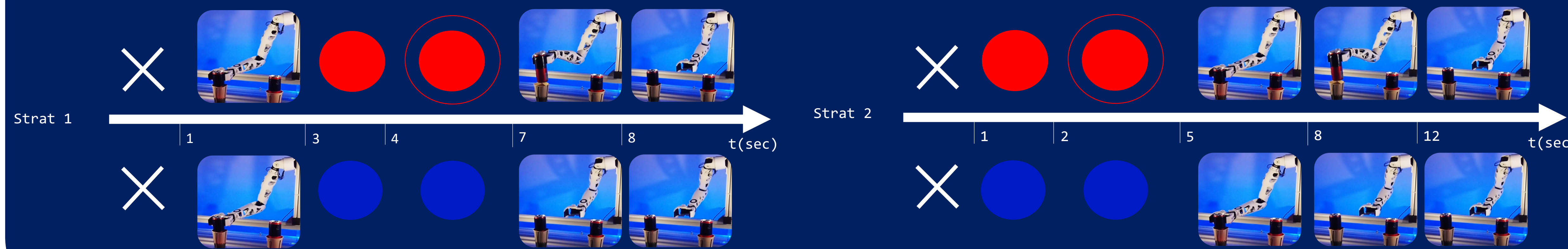


Methods

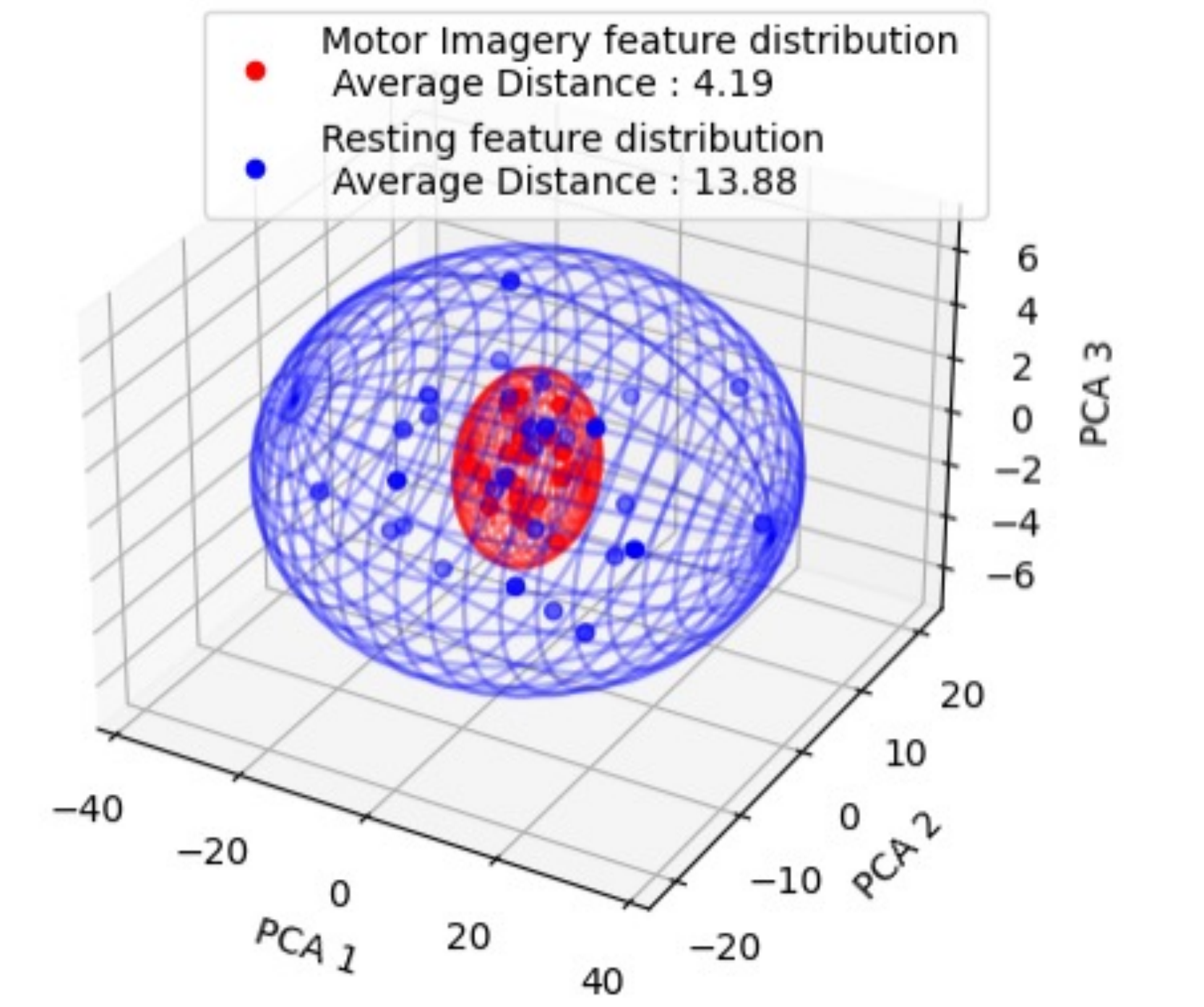


- Seven healthy subjects (27.2 +/- 2.1 years old, 1 Male)
- 2 sessions
- 1-2 weeks between sessions
- 64 BrainAmp Active electrodes - TP9/TP10 REF/GND

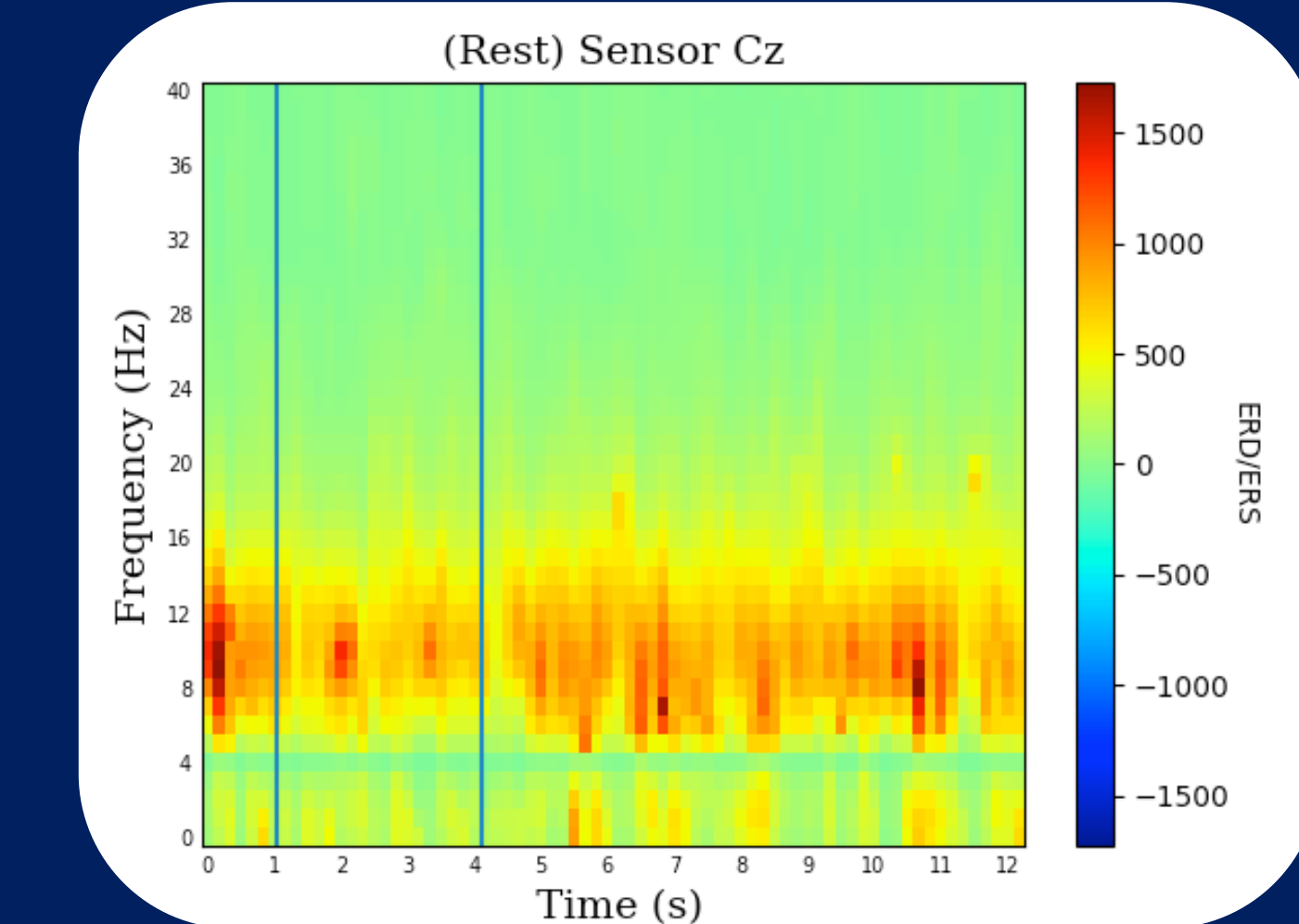
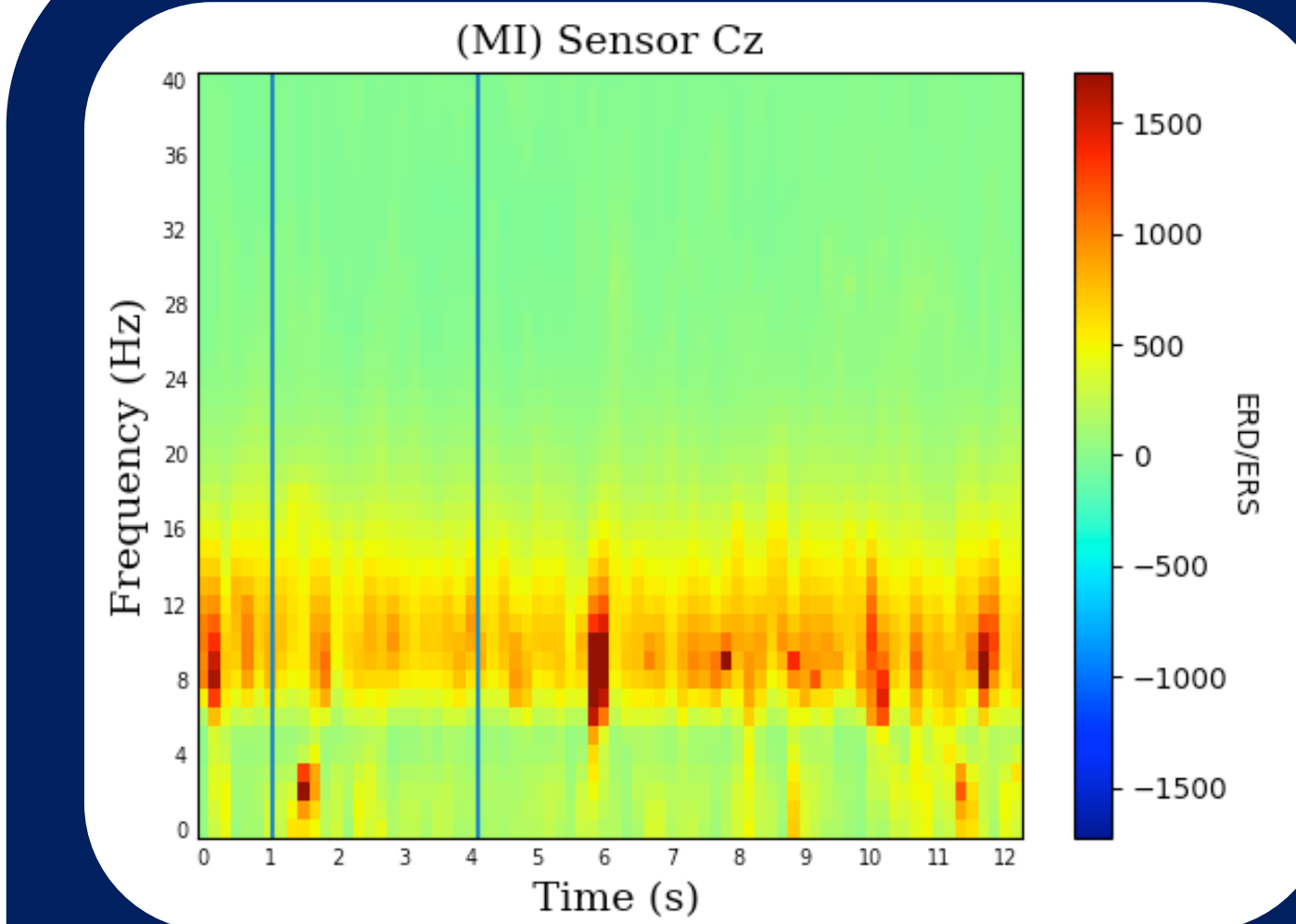
- 1 run : 8 min
- Feature selection : 5 min
- MI/Rest Task : 4s
- Red dot : Motor Imagery Task
- Blue dot Resting state
- White cross : selection of the target with gaze



PCA Distribution of Power Spectrum Features between classes

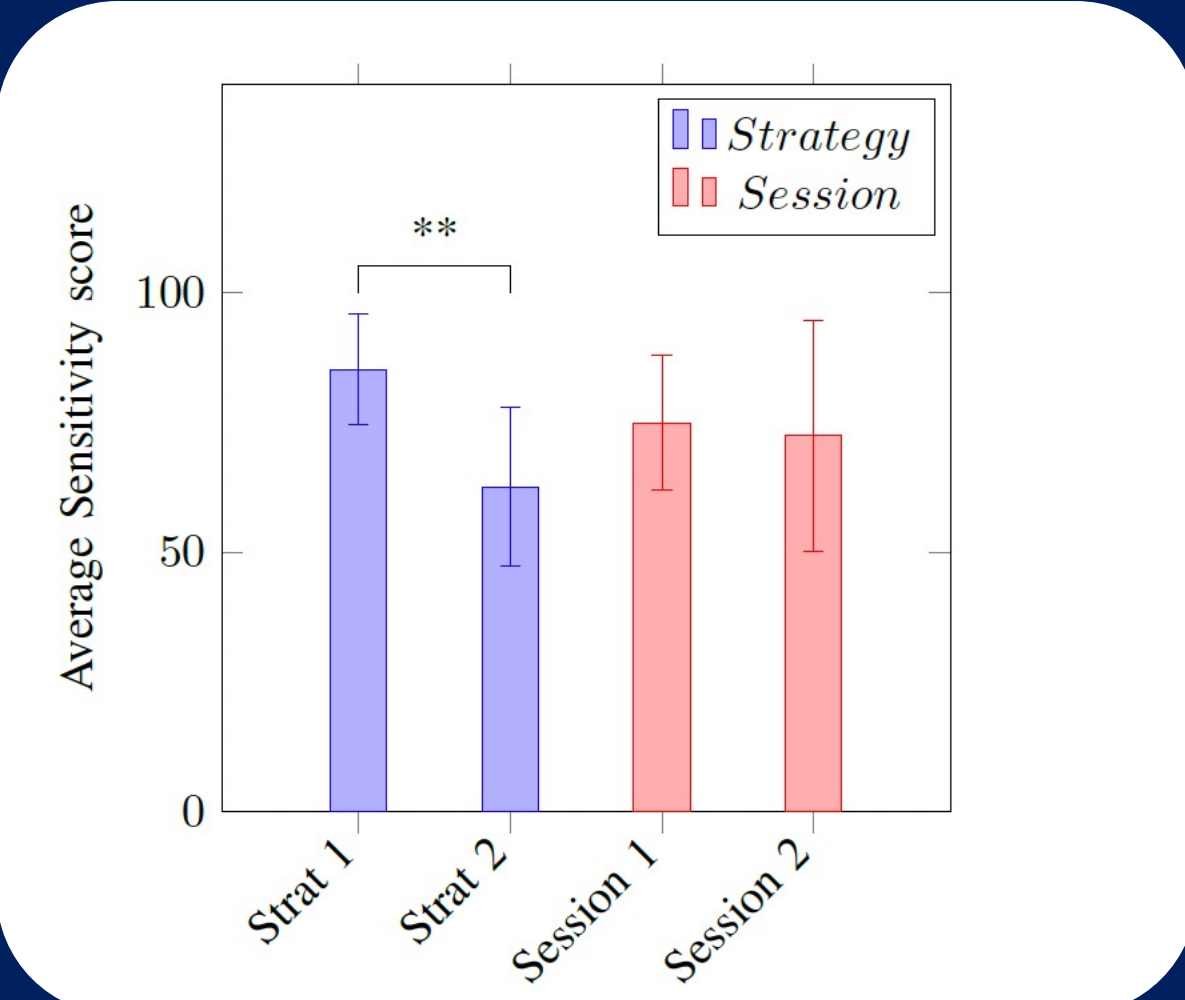


- High variability within the resting state between trials
- Motor imagery task more redundant between trials
- The Resting state instruction remains to tackle for more consistency

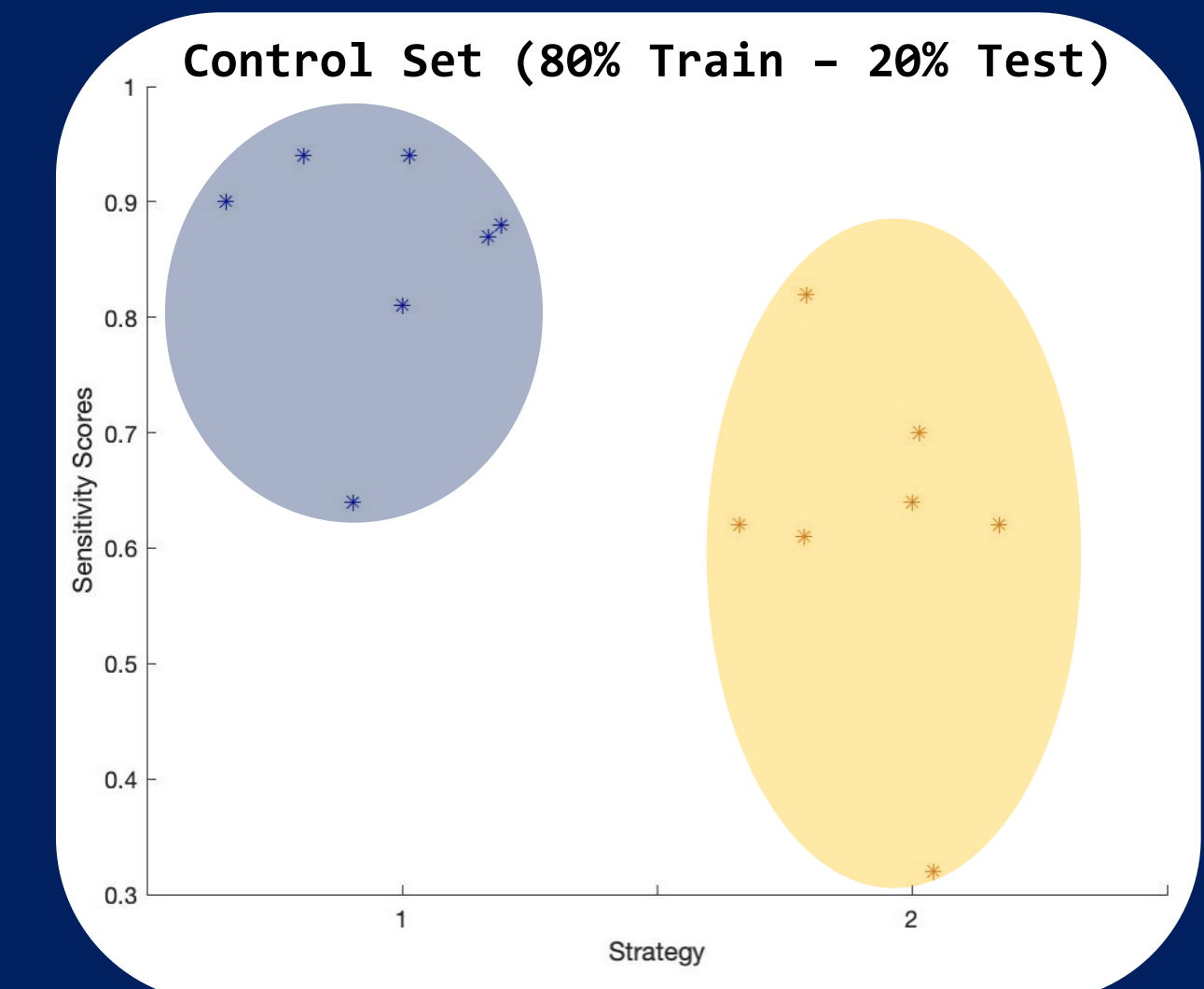


- Synchronization related to robotic arm movement, ➢ A possible pattern of preparation/pre-trigger

Classification Results



- No Statistical differences between sessions
- No Effect of learning
- Statistical differences for SVM
- Trend on LDA
- 2 ways permuted ANOVA, $p < 0.01$



Conclusion

- Differences between strategies: a way to improve the performances
- Being in control of the robot changes the statistical differences in frequency more than in intensity