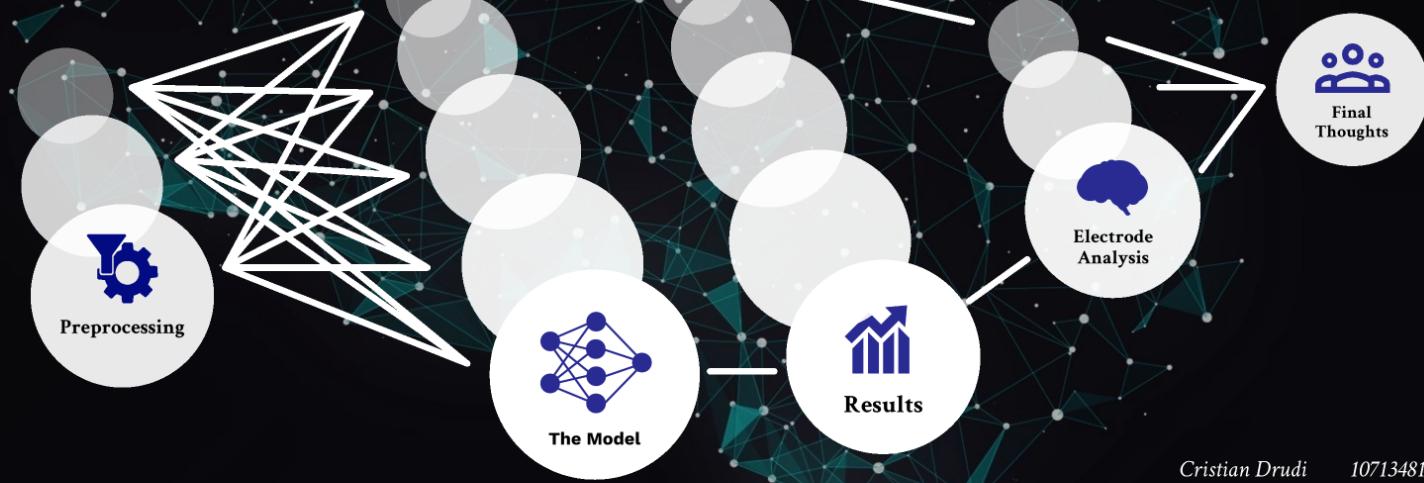


P300 Speller Project

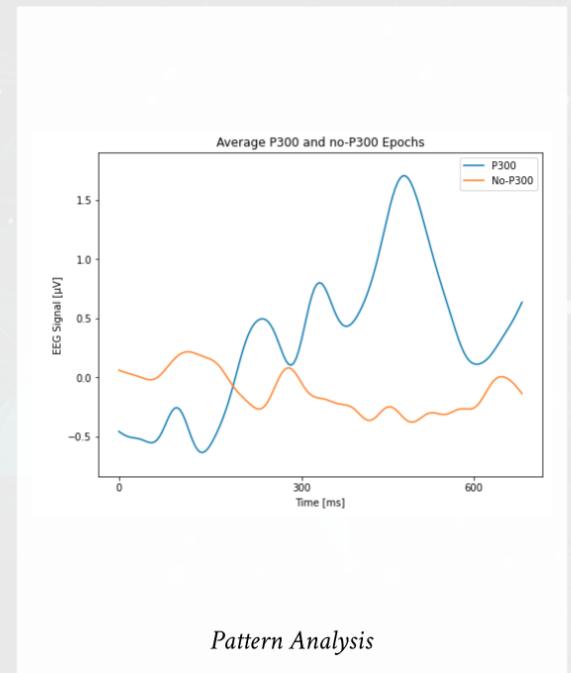
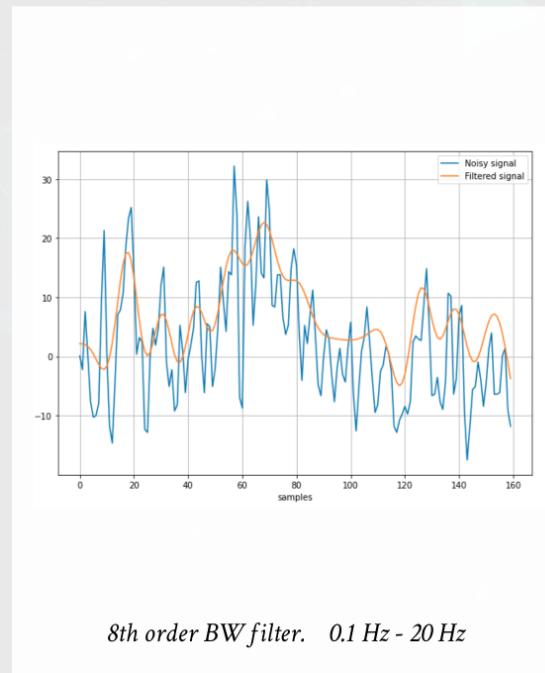
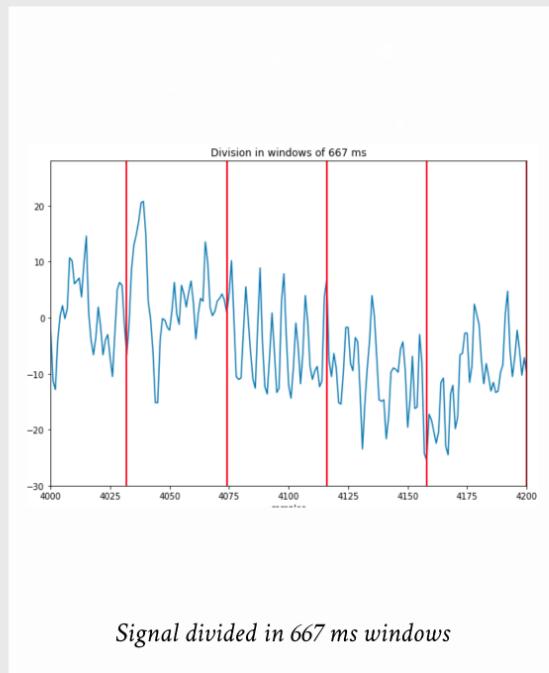
CNN with electrode subset analysis



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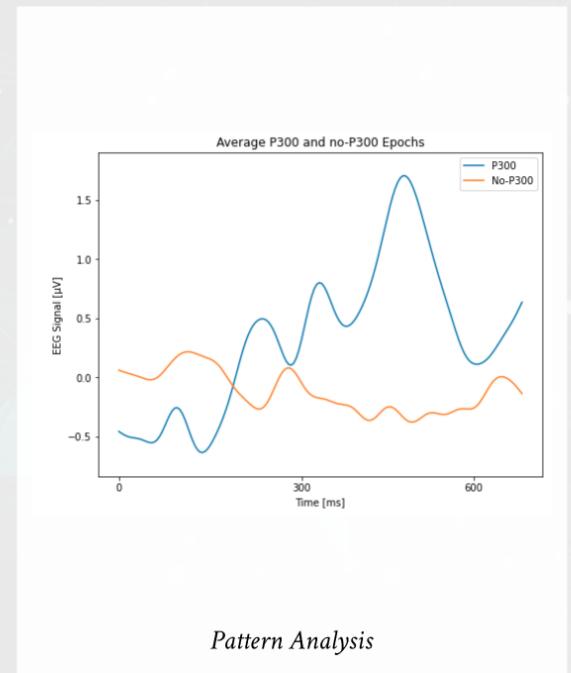
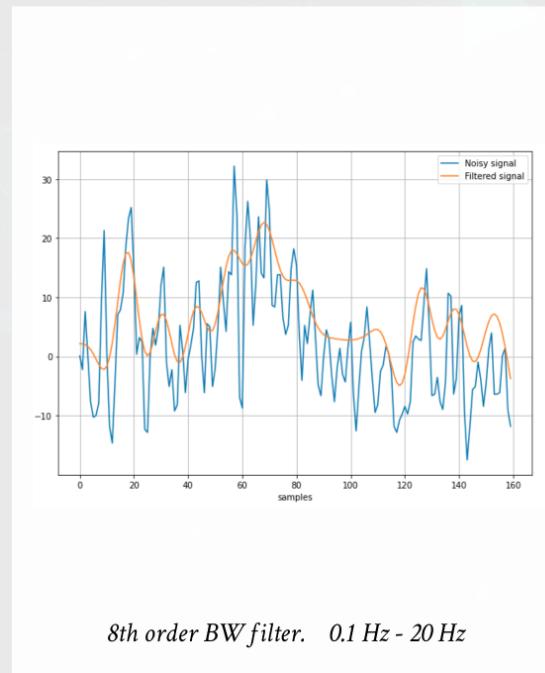
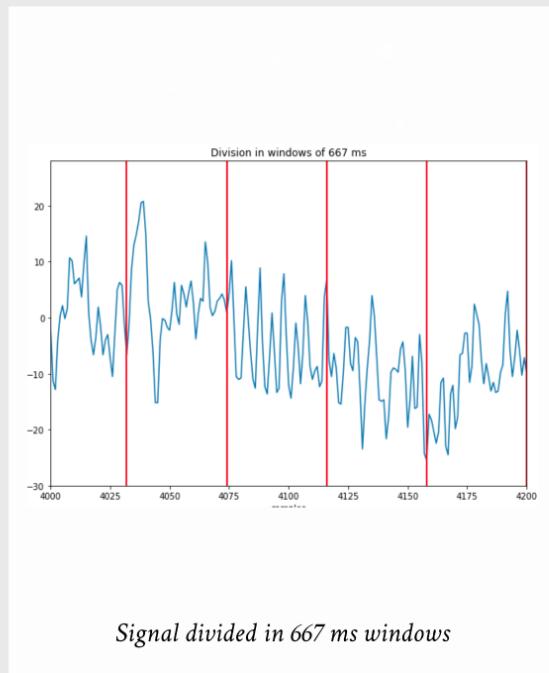
Cristian Drudi 10713481
Alessandro Gozzi 10735411
Veronika Guleva 10560430
Stefano Magni 10565789
Elena Puddu 10747895

Preprocessing Pipeline



Source: Deep Learning based on Batch Normalization for P300 Signal Detection, Liu et al. (2017)

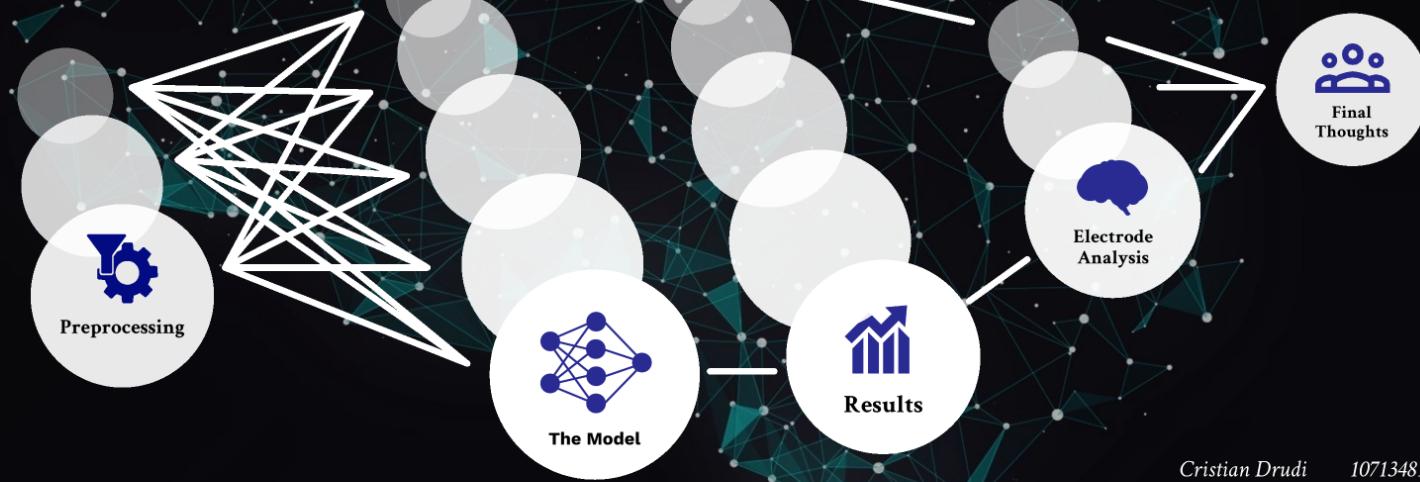
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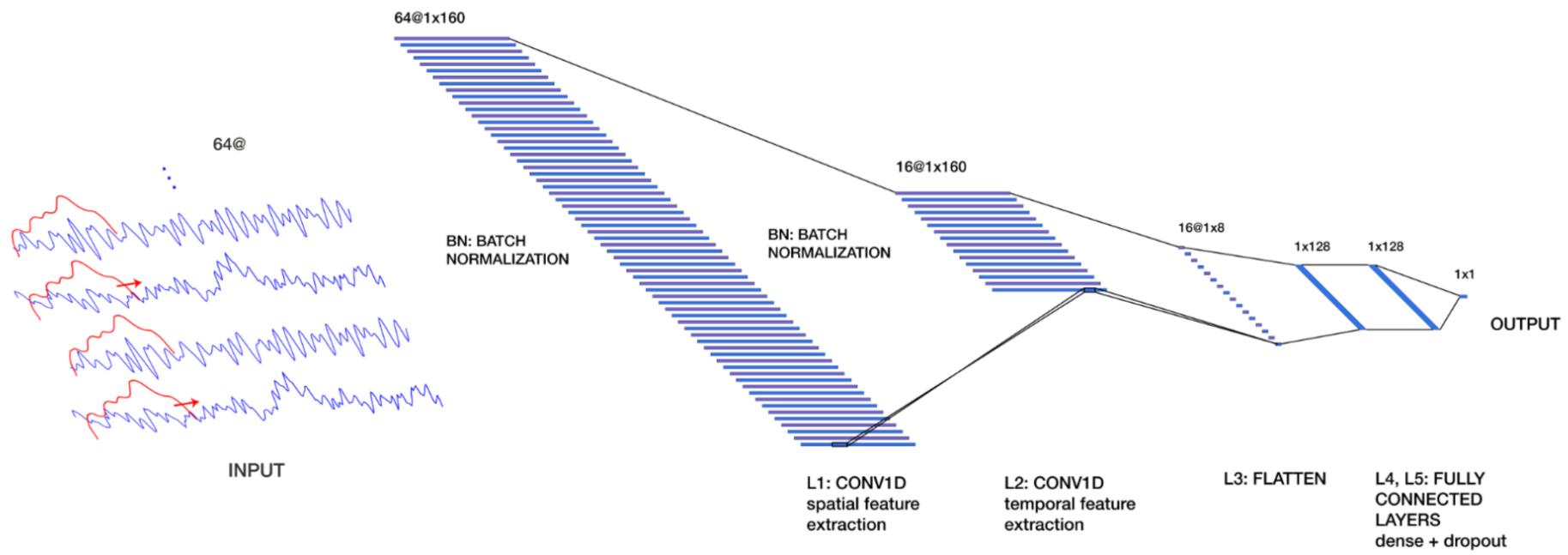
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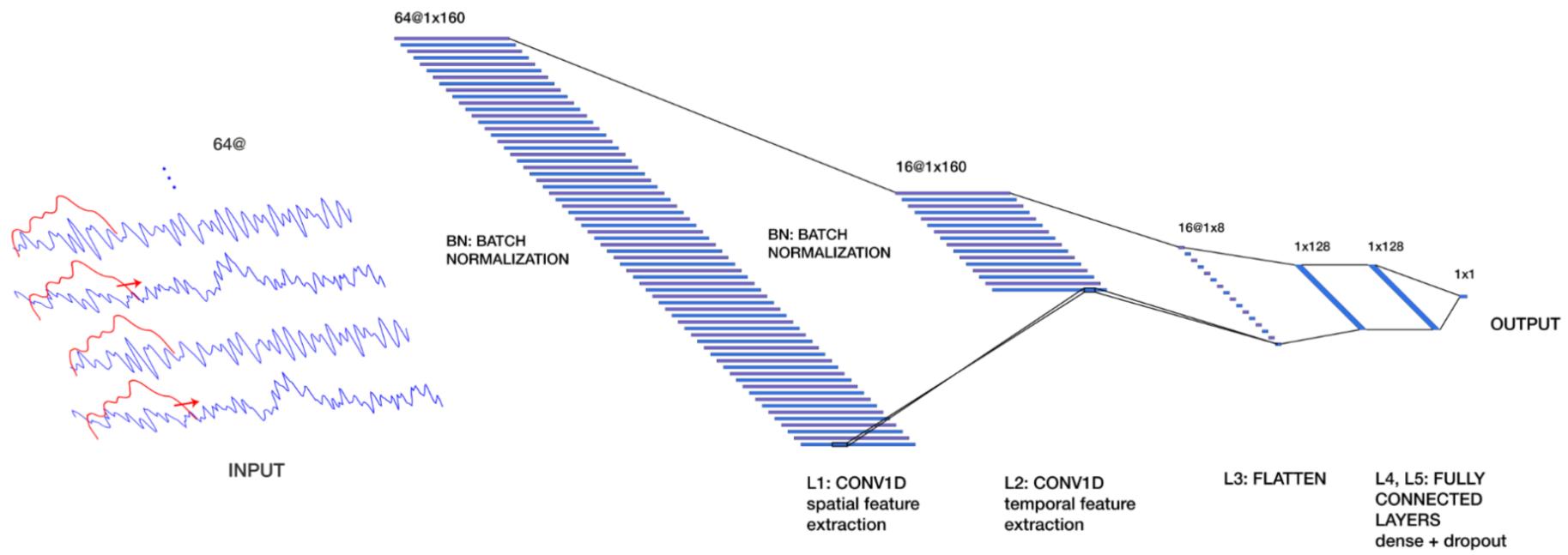
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Model Structure



Model BN3 developed by Liu et al. (2018)

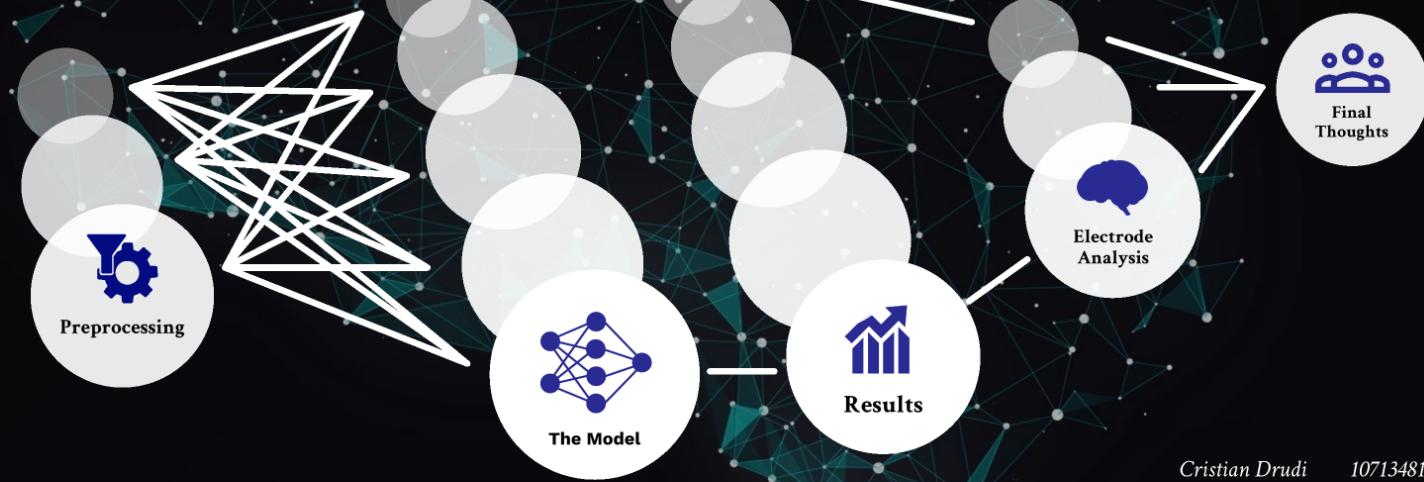
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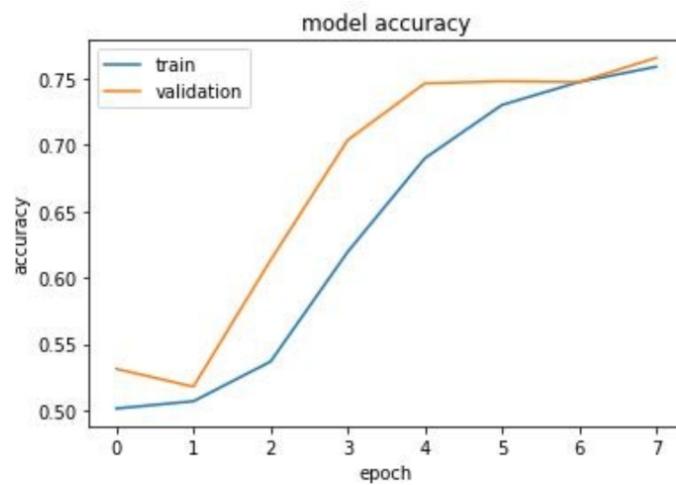
Results

	Avg. accuracy	Avg. loss
BN3	Subject A: 0.7 Subject B: 0.77	0.5933
CNN	0.5943	0.6922
LSTM-CNN	0.5493	0.6886

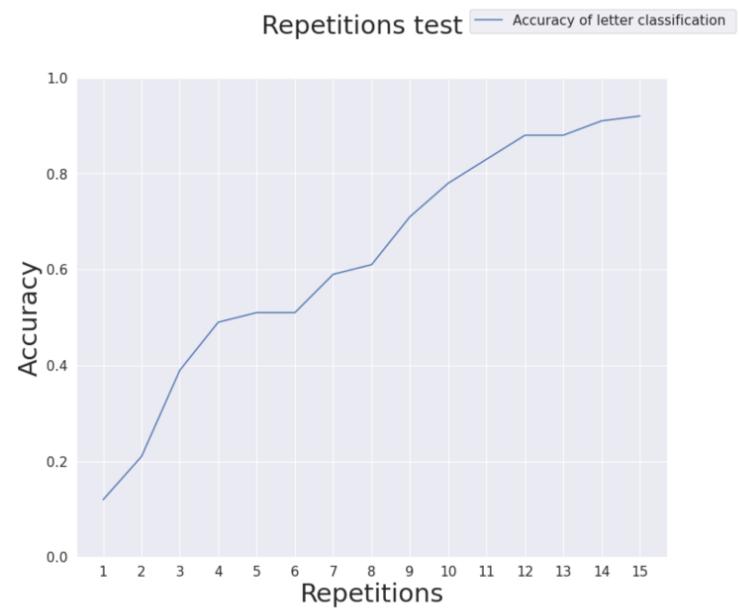
Model accuracy

Among the three models that we implemented, the model built following Liu's paper showed to achieve the best overall performance

Model accuracy



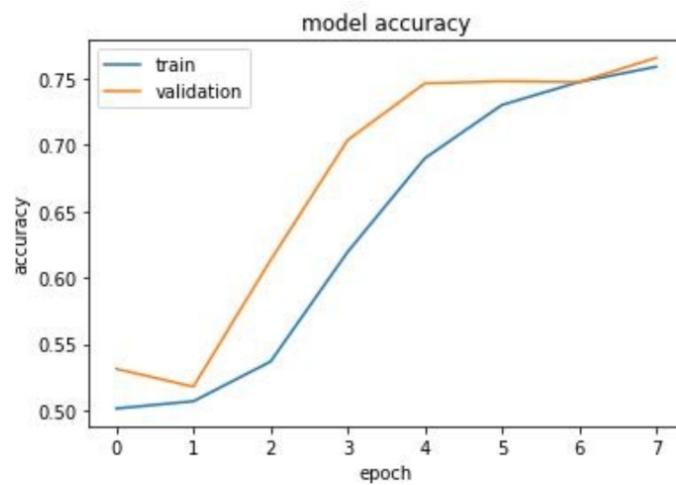
Our neural network showed to have an accuracy on the test set equal to 0.77 for subject B and 0.7 for subject A in P300 identification.



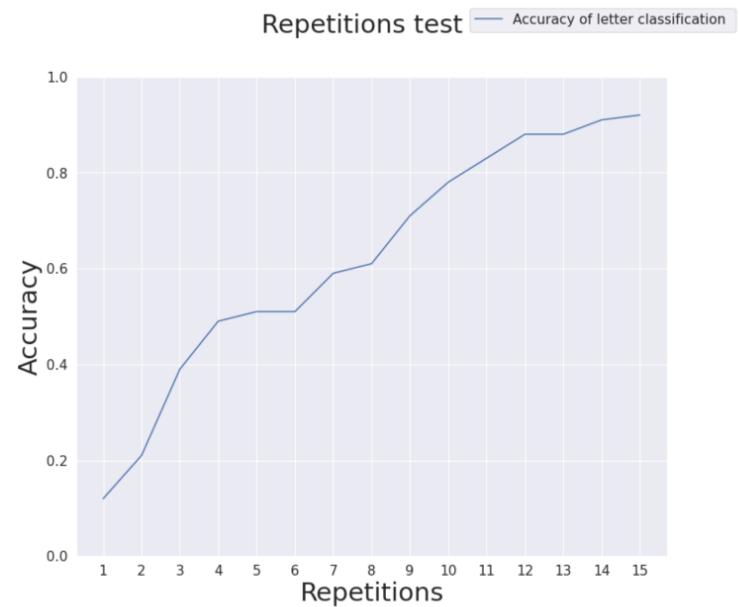
The model achieves an average accuracy of 92% in character recognition.

In the BCI competition the second one obtained an average accuracy of 90%.

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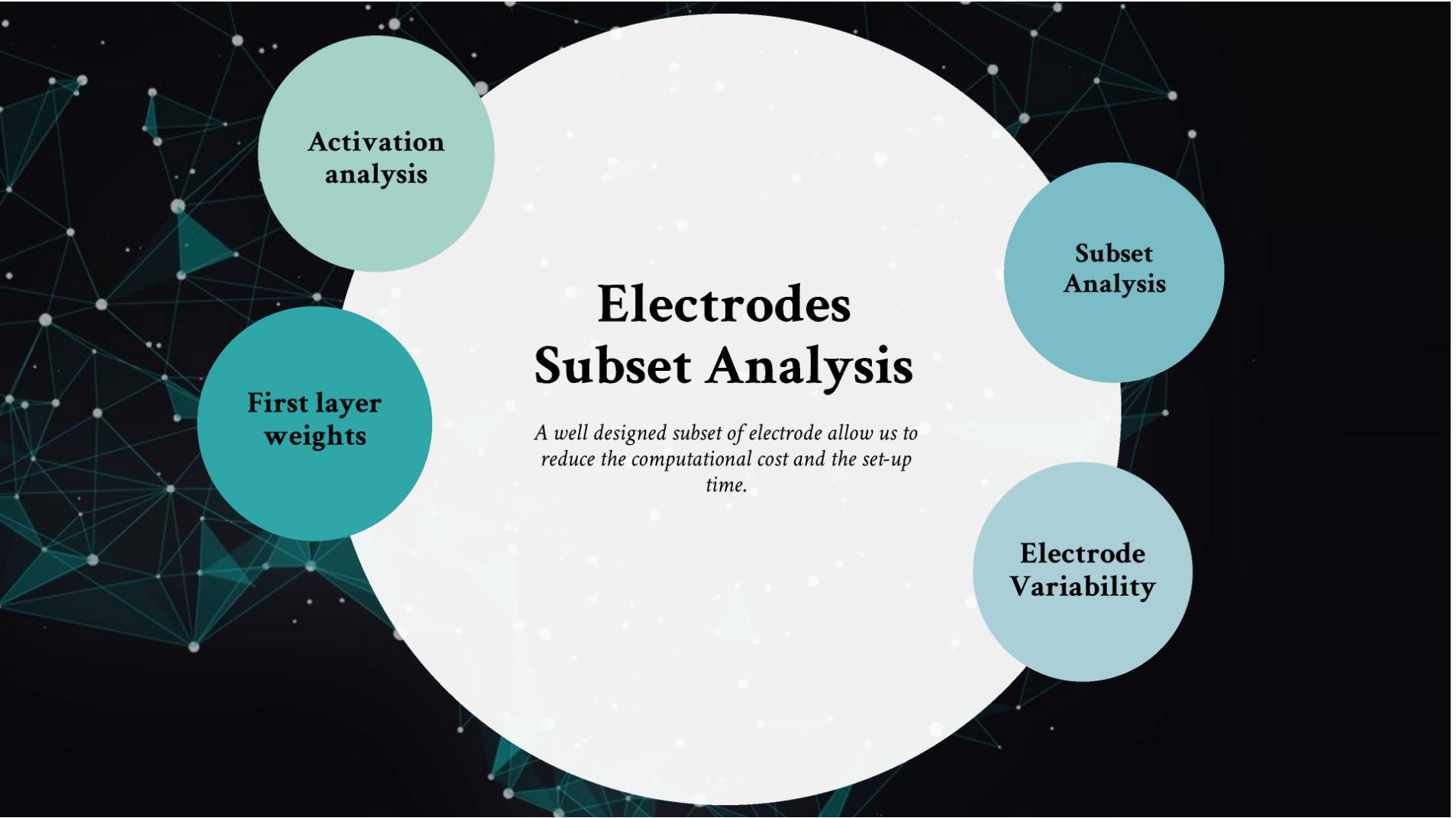
P300 Speller Project

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Electrodes Subset Analysis

A well designed subset of electrode allow us to reduce the computational cost and the set-up time.

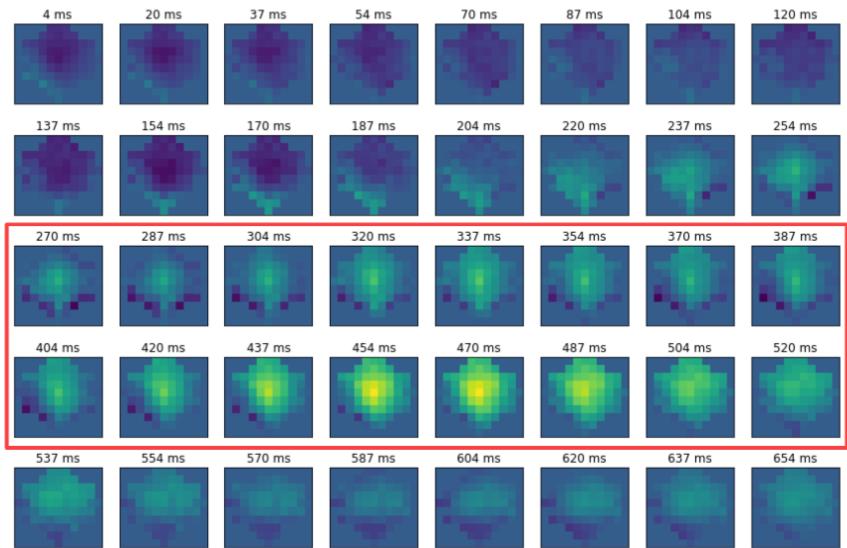
First layer
weights

Activation
analysis

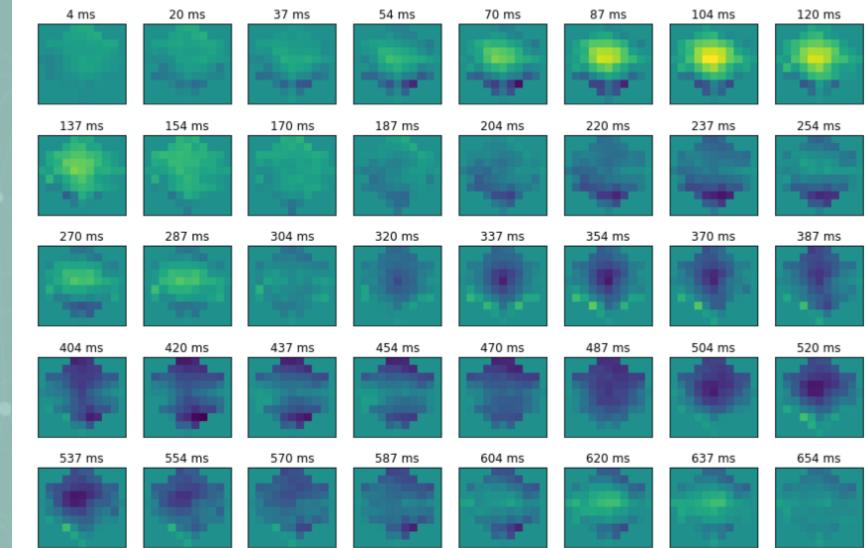
Subset
Analysis

Electrode
Variability

Spatial Activation visualization

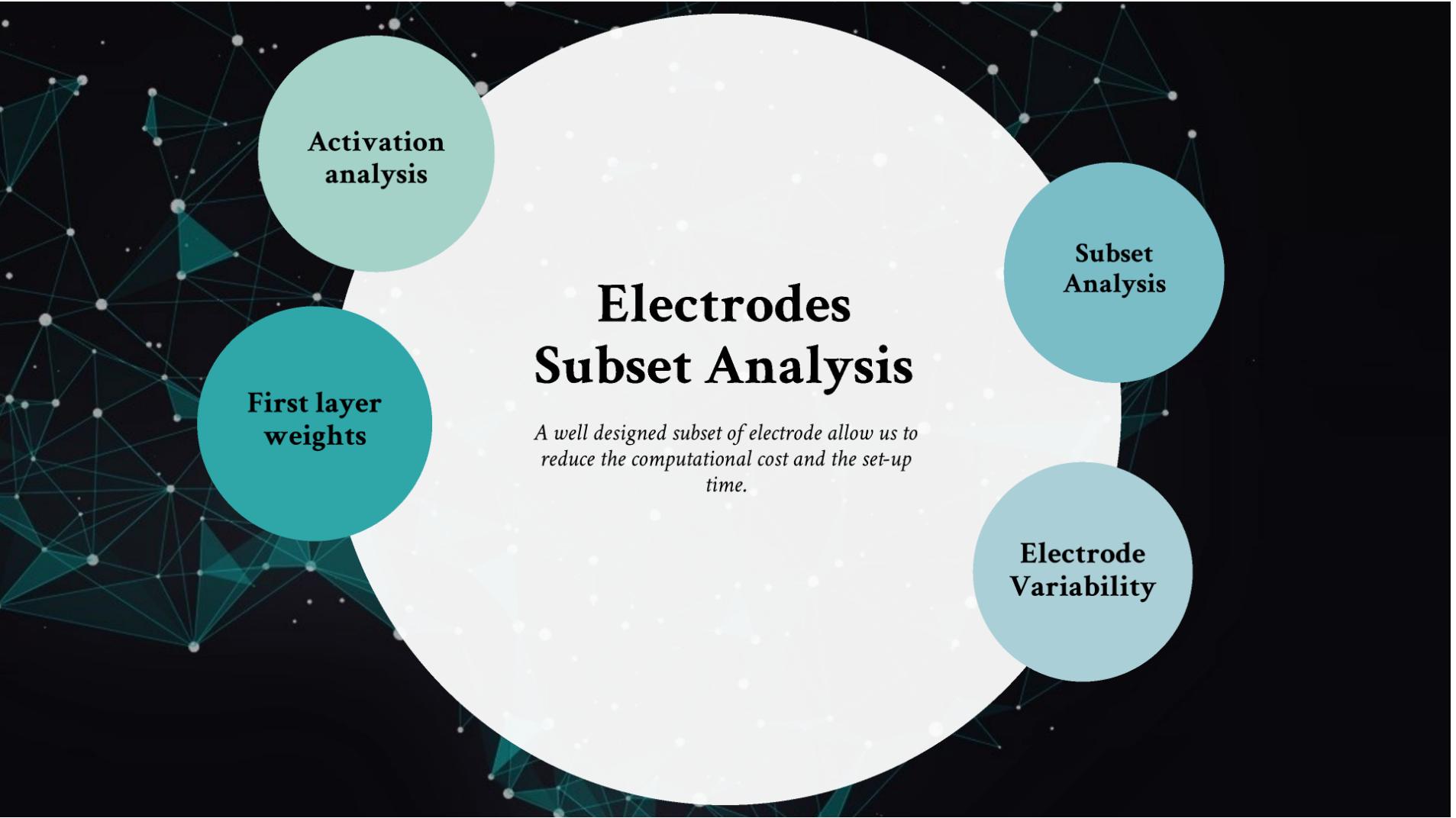


P300 Activation



noP300 Activation

P300 activation occurs 300 - 400 ms after the flashing row or column a peak is measured.



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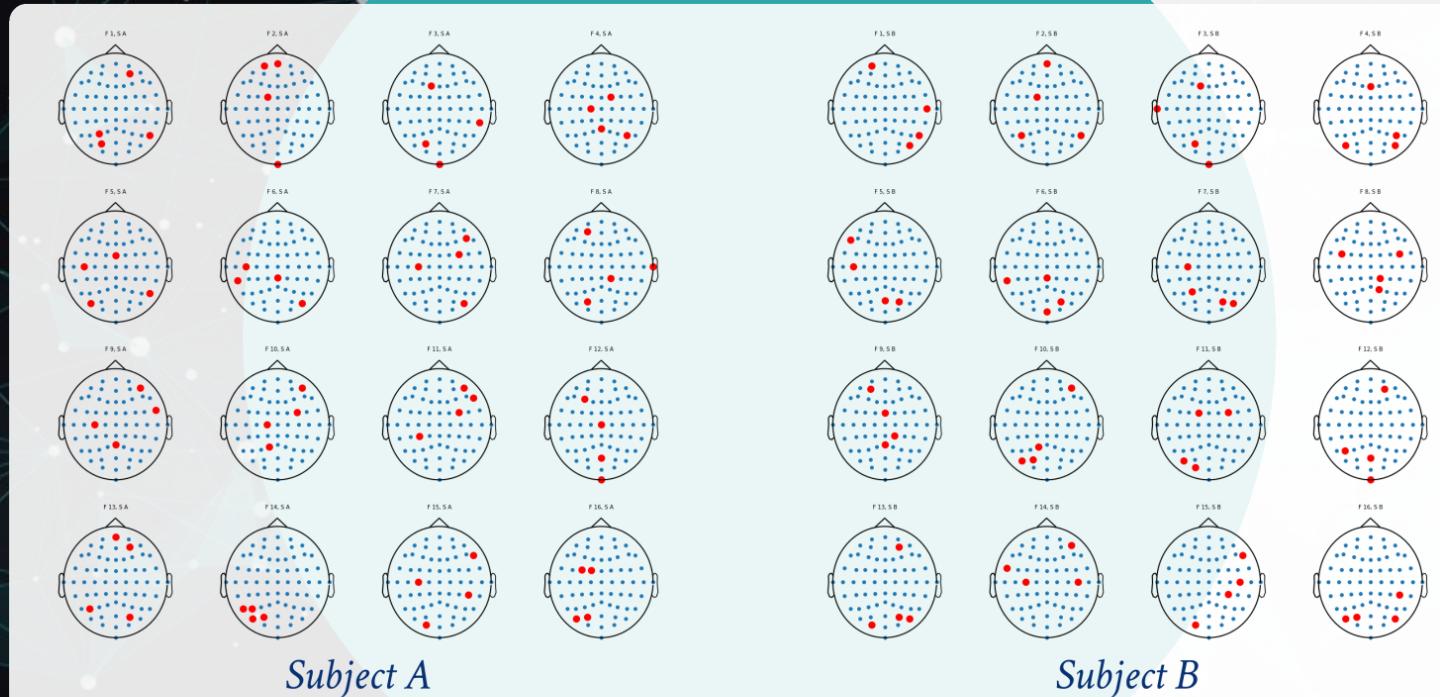
First layer
weights

Activation
analysis

Subset
Analysis

Electrode
Variability

Weights visualization



*Electrodes associated with the
most significant weights*