EEG-based epileptic seizure prediction

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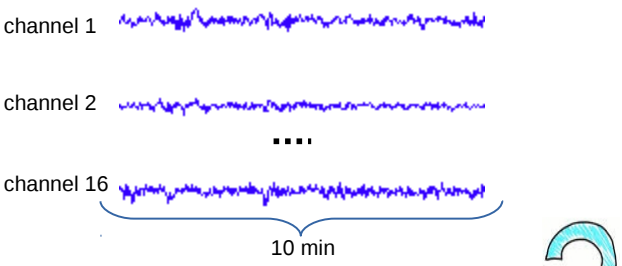
Introduction

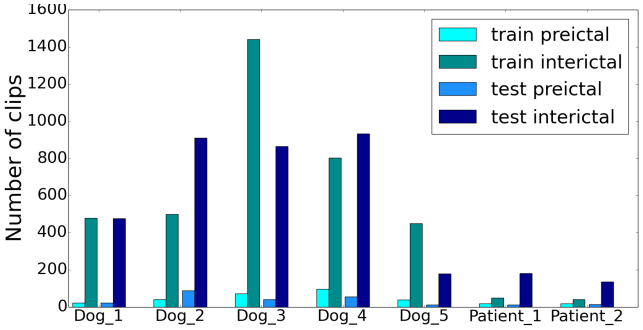
EEG-based seizure forecasting systems hold promise for improving the quality of life for patients with epilepsy (≈1% of the world's population)

In attempt to develop better classification algorithms *"American Epilepsy Society Seizure Prediction Challenge"* was organized on kaggle.com.

Problem

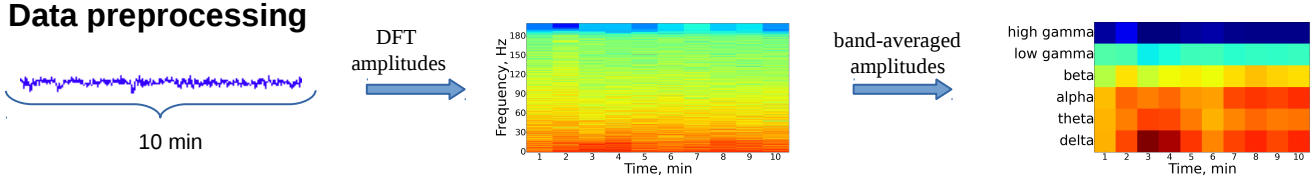


Preictal (EEG prior to a seizure) vs. Interictal (normal EEG)

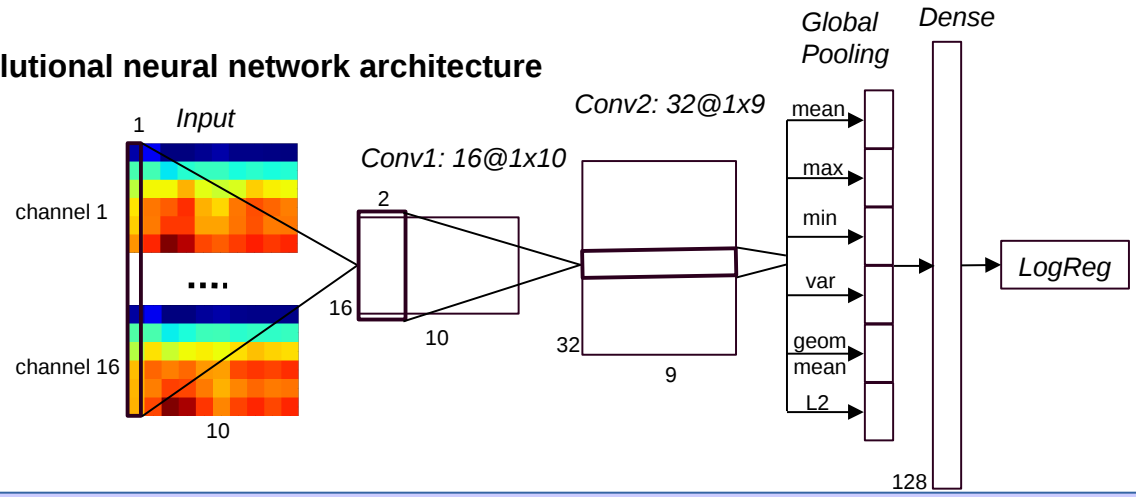


Evaluation: ROC AUC over all subjects' predictions (preictal posteriors)

Data preprocessing



Convolutional neural network architecture



Results

Place	Team	Public LB	Private LB	Held-out
1	QMSDP	0.85951	**0.81962**	0.75431
2	Birchwood	0.83869	0.80079	0.73665
3	ESAI CEU-UCH	0.82488	0.79347	0.63310
4	Michael Hills	**0.86248**	0.79251	**0.79022**
5	KPZZ	0.82051	0.79136	-
6	Carlos Fernandez	0.84225	0.79063	-
7	Isaac	0.84197	0.78863	-
8	Wei Wu	0.81803	0.78724	0.77259
9	Golondrina	0.82455	0.78513	0.76338

Conclusion

The convnet-based classifier requires simple frequency features to achieve high performance as compared to methods, which heavily exploit feature engineering.

The discrepancy between AUC scores on different test sets (private and held-out) clearly demonstrates the necessity of other testing and training strategies for EEG classification.

Therefore, we are one step closer to building a reliable seizure prediction system.