Predicting Seizures

● ● ●

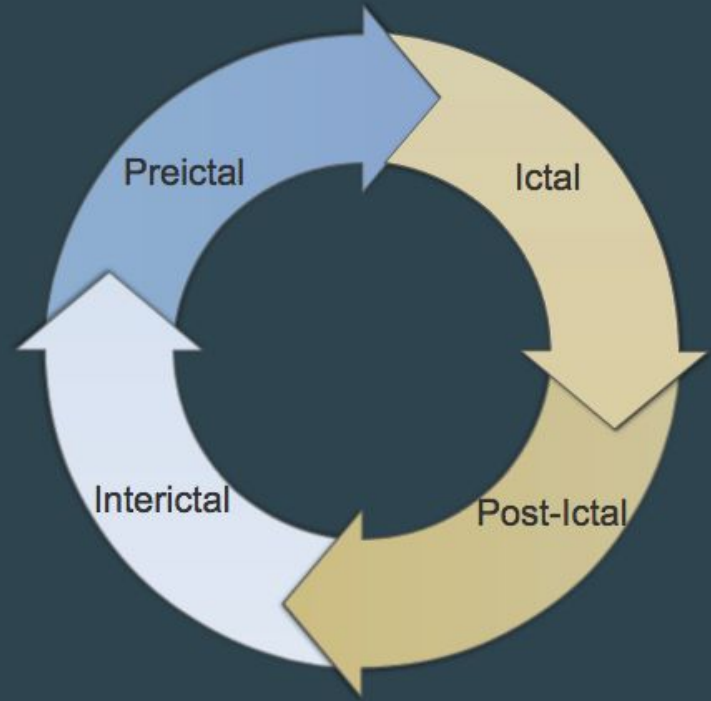Conor Murphy

conorbmurphy@gmail.com

Lifecycle of Epilepsy

Interictal - Baseline/between seizures

Preictal - pre-seizure

Ictal - the seizure itself

Post-ictal - period after a seizure
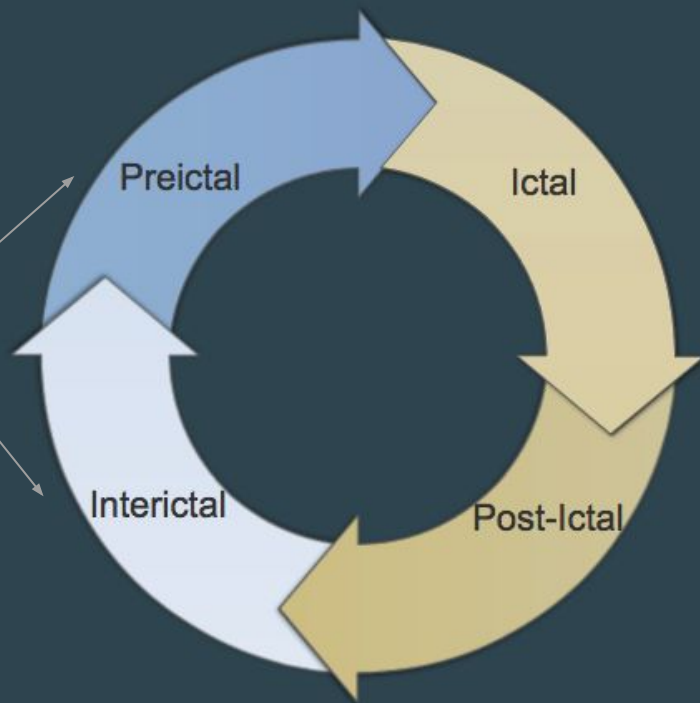
Lifecycle of Epilepsy

Interictal - Baseline/between seizures

Preictal - pre-seizure

Ictal - the seizure itself

Post-ictal - period after a seizure

Most difficult to classify

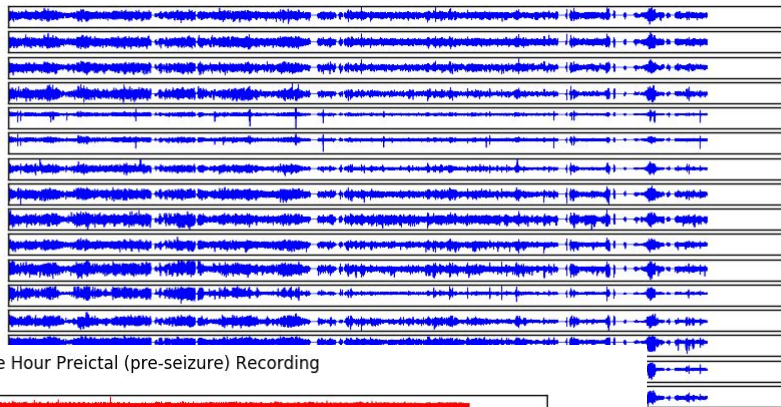Preictal

Ictal

Post-Ictal

Interictal

The Data

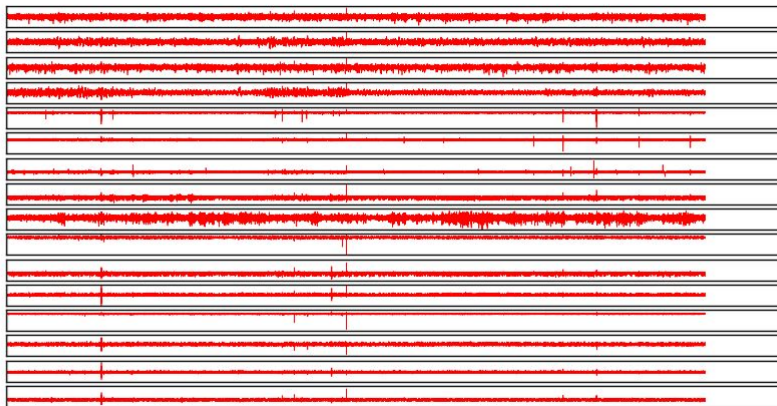≈ 8k 10-minute recordings

Each recording 240k x 16

40 gb total data

EC2 m4.10xlarge

One Hour Interictal (Baseline) Recording

One Hour Preictal (pre-seizure) Recording

Feature Building

Feature Importance by Feature Type

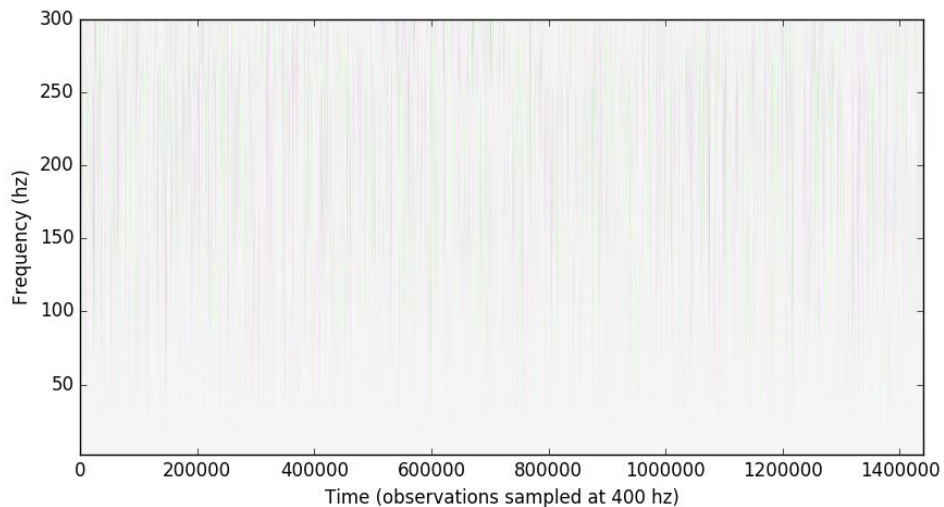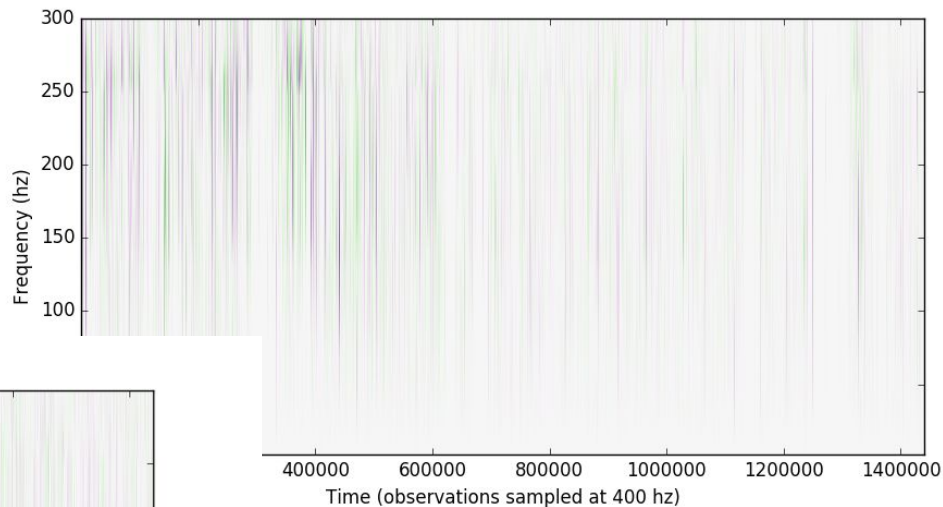| Feature Type	Importance
Wavelet Transforms	~0.46
Pearson Corrleation	~0.19
Method of Moments	~0.16
Channel Means	~0.14
Entropy Calculations	~0.03
Patient Numbers	~0.00

Wavelet Transforms

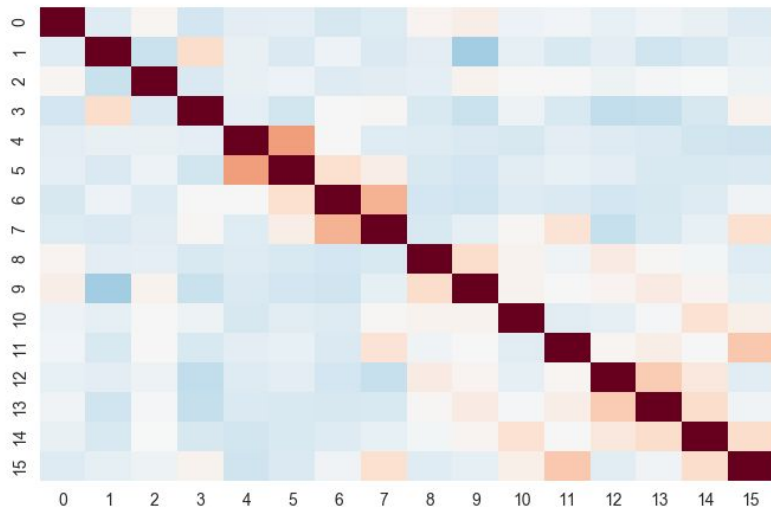

Interictal Wavelet Spectrogram from Channel 16

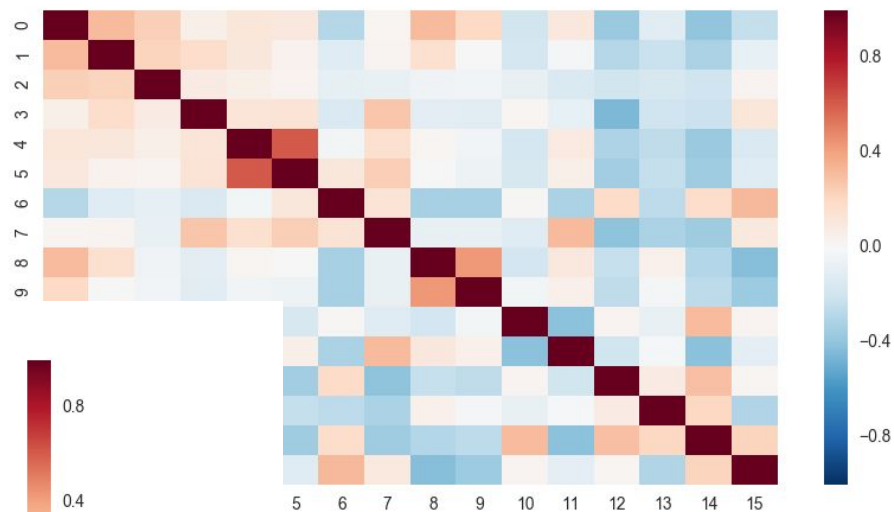Preictal Wavelet Spectrogram from Channel 16

Pearson Correlations

Interictal Channel Coorelations

Precital Channel Coorelations

Method of Moments, etc.

- Mean
- Variance
- Skew
- Kurtosis
- Entropy
- Min/Max
- Median

Final Scores - AUC ROC

Patient	Log. Regression	Random Forest	XGBoost	SVM
Combined	0.81 / 0.88	0.88 / 0.91	0.91	0.84 / 0.87
A	0.84 / 0.85	0.85 / 0.90	0.90	0.84 / 0.87
B	0.90 / 0.88	0.85 / 0.86	0.88	0.87 / 0.90
C	0.86 / 0.85	0.91 / 0.93	0.93	0.87 / 0.87

5-fold cross validation / score on validation set

conorbmurphy@gmail.com

github.com/conorbmurphy/Predicting-Seizures

Next Steps

- Understanding feature interaction
- Side data
  - Metric of severity of patient's epilepsy
  - Calibration of the system
  - Activity data
- Convolutional Neural Nets
- Additional wavelets: Morlet and 'spike-and-wave'

Thank you!

conorbmurphy@gmail.com

github.com/conorbmurphy/Predicting-Seizures

@conorbmurphy