Predicting Seizures

Conor Murphy

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github.com/conorbmurphy/Predicting-Seizures

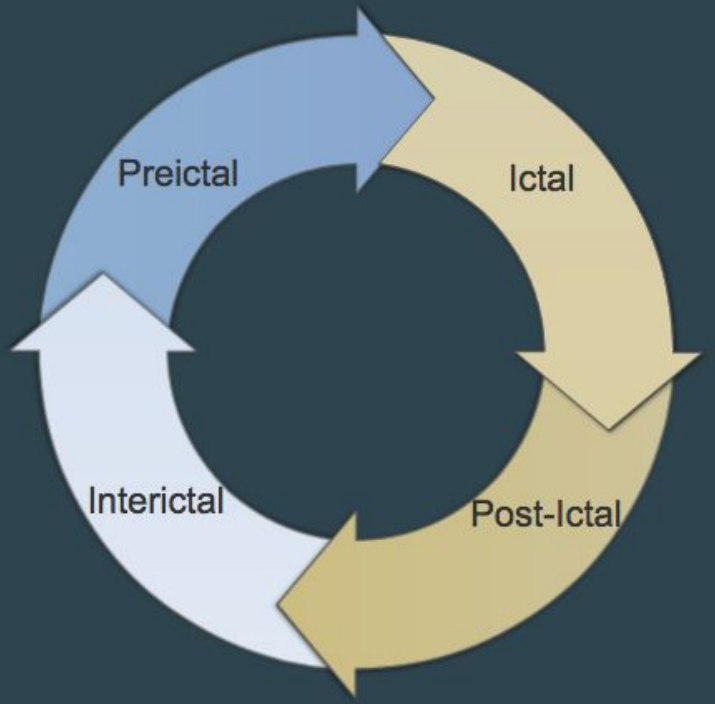
Lifecycle of Epilepsy

Interictal - Baseline/between seizures

Preictal - pre-seizure

Ictal - the seizure itself

Post-ictal - period after a seizure



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Lifecycle of Epilepsy

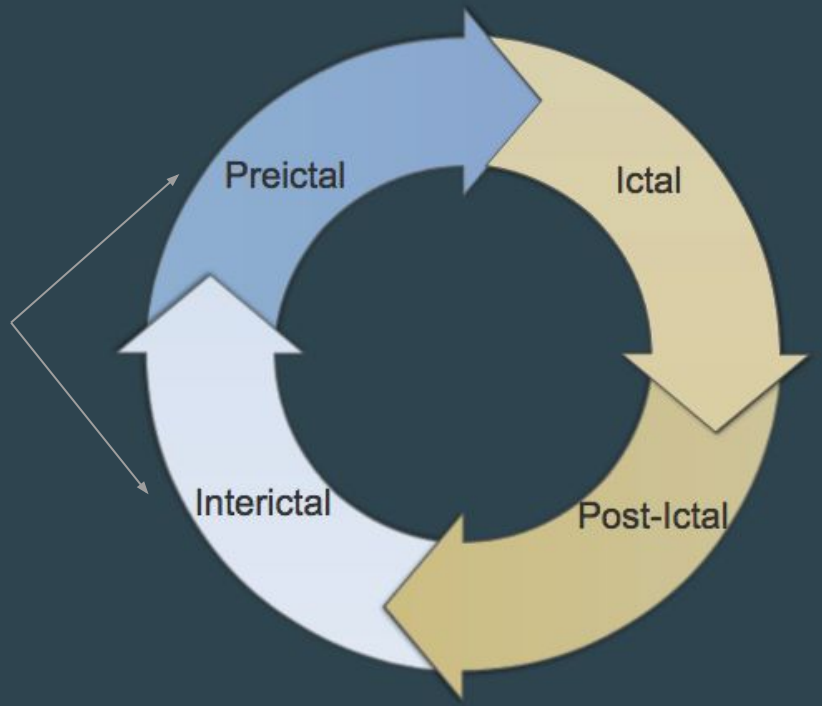
Interictal - Baseline/between seizures

Preictal - pre-seizure

Most difficult to classify

Ictal - the seizure itself

Post-ictal - period after a seizure



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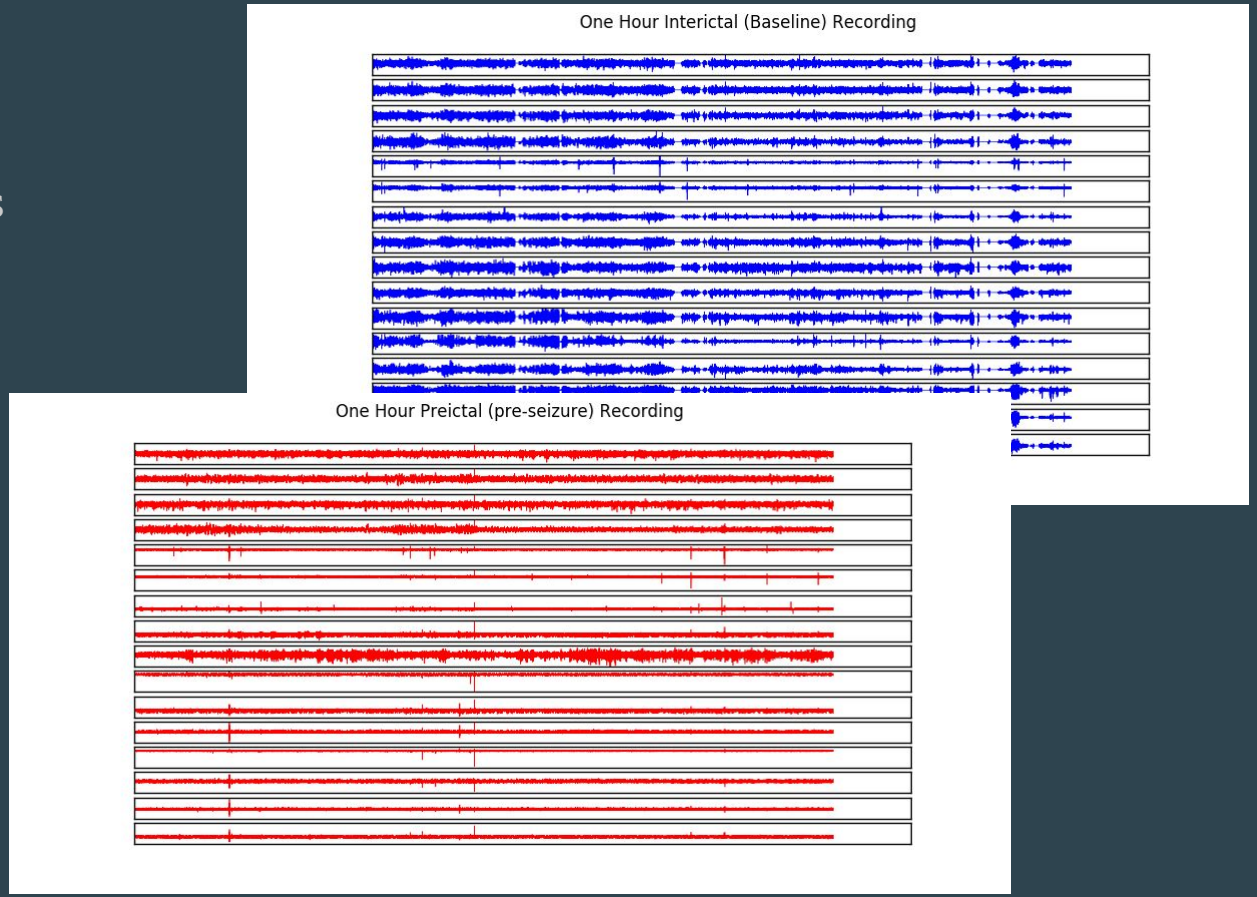
The Data

≃ 8k 10-minute recordings

Each recording 240k x 16

40 gb total data

EC2 m4.10xlarge



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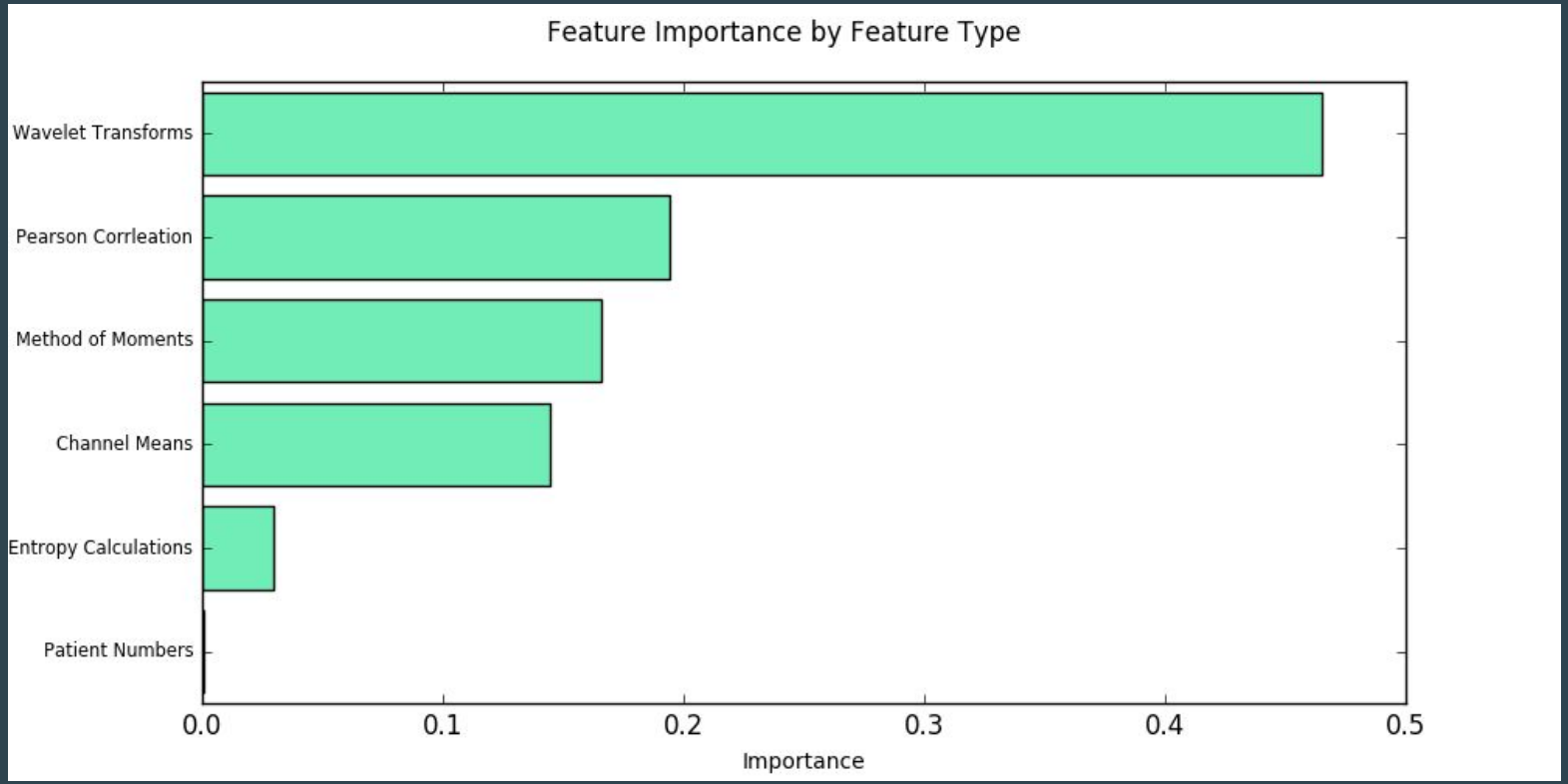
Feature Building



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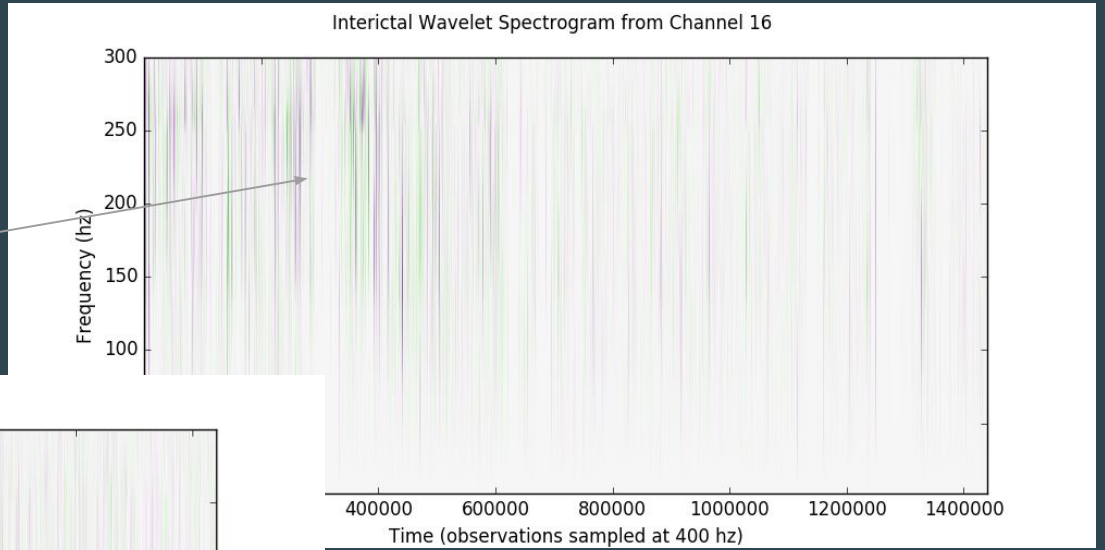
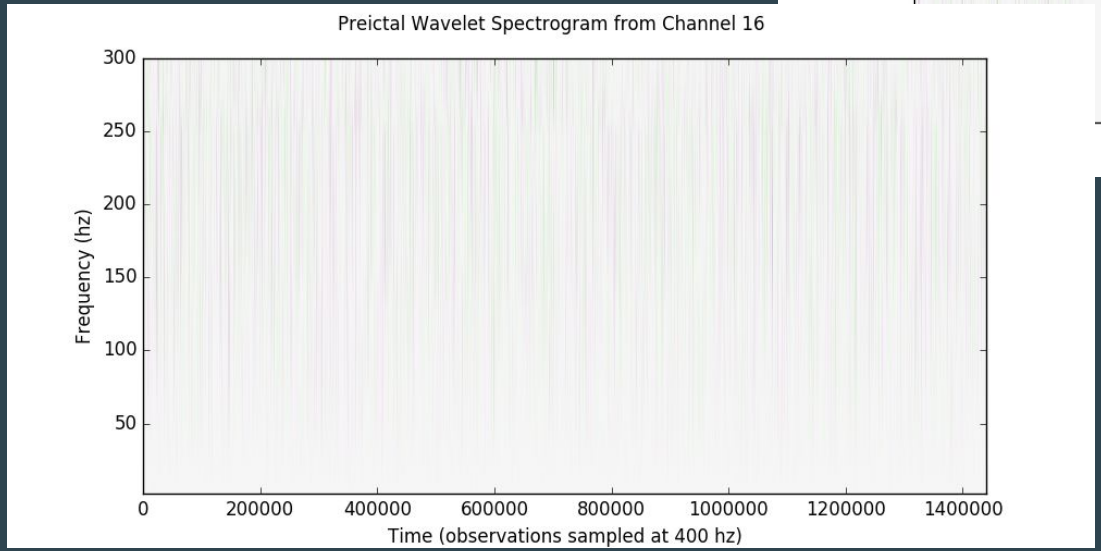
Wavelet Transforms

High frequency activity





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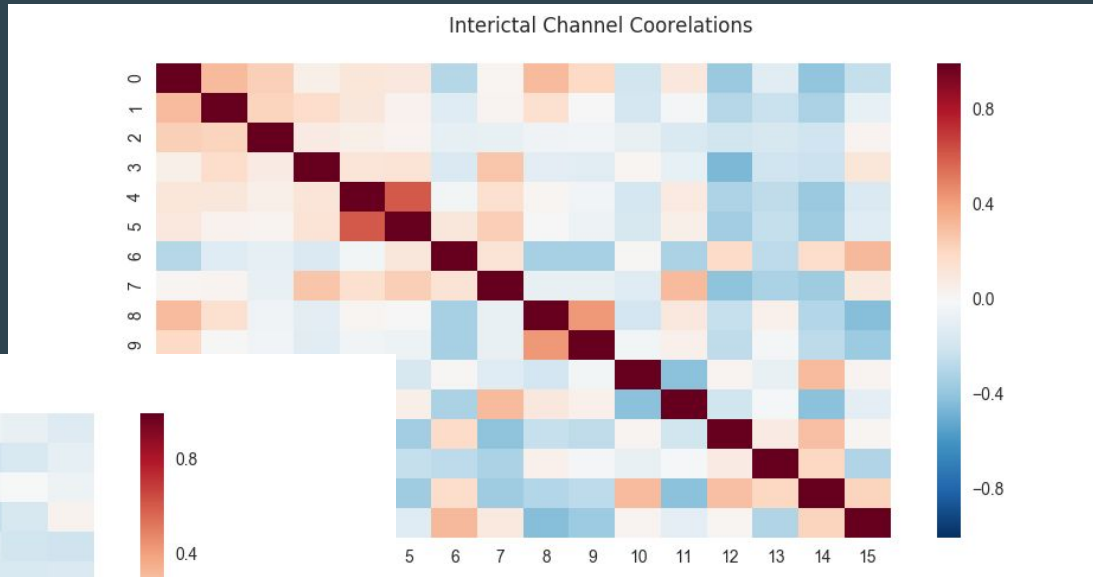
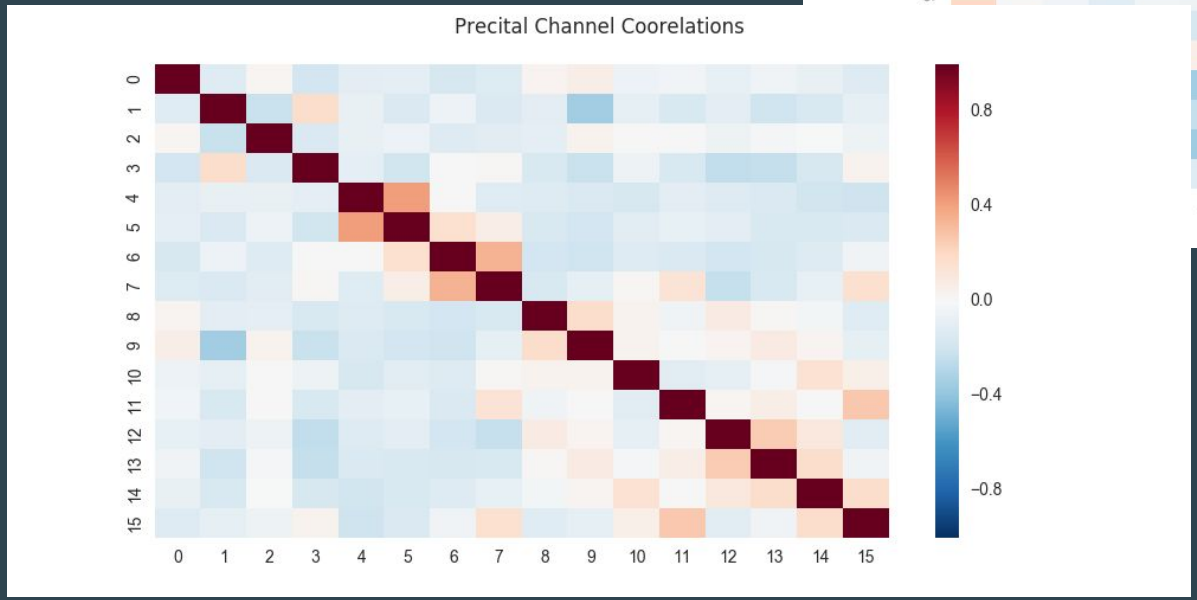
Pearson Correlations





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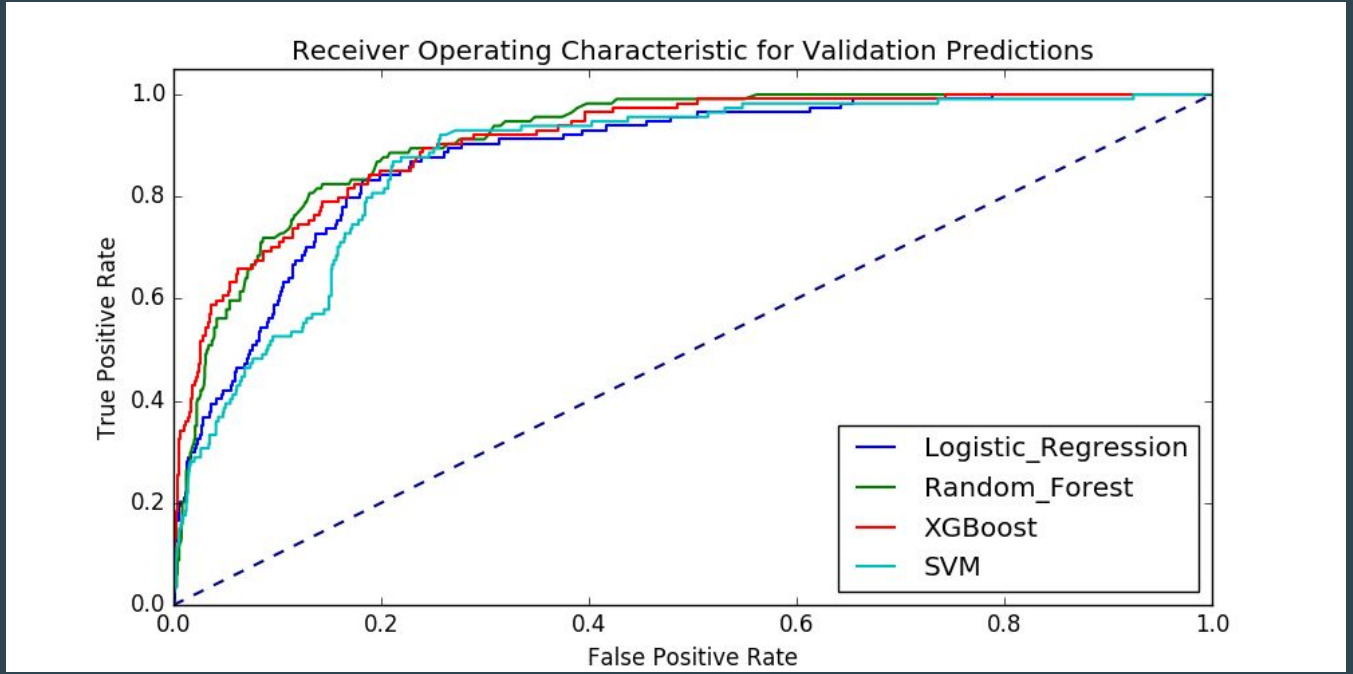
Method of Moments, etc.

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

Final Scores



Patient	Logistic Regression	Random Forest	XGBoost	SVM
Combined	0.81 / 0.88	0.88 / 0.91	0.91	0.84 / 0.87

Next Steps

- Understanding feature interaction
- Bayesian live model
- Side data
  - Metric of severity of patient's epilepsy
  - Calibration of the system to attain better baseline
  - Activity data to address what's influencing a given brain state
- Additional wavelets: Morlet and 'spike-and-wave'
- Convolutional Neural Nets

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Thank you!

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