

# Predicting Seizures

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Conor Murphy

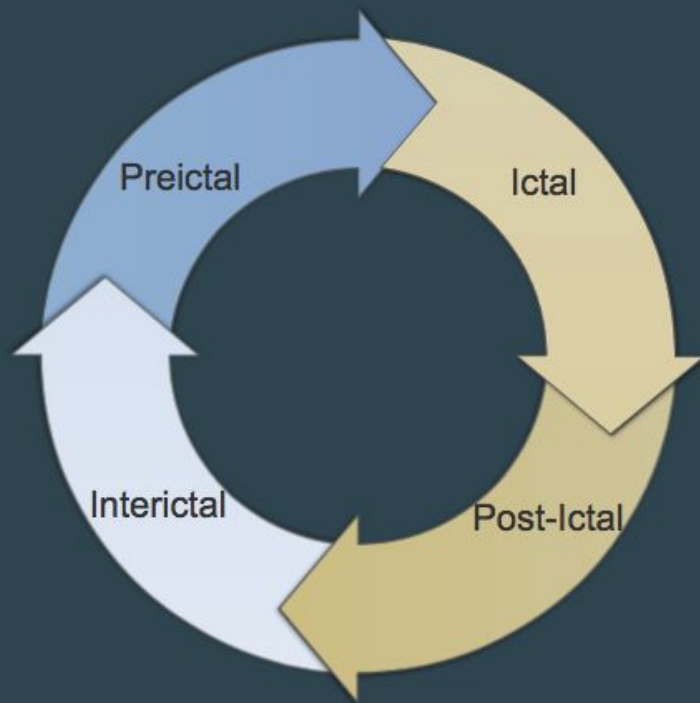
# Lifecycle of Epilepsy

Interictal - Baseline/between seizures

Preictal - pre-seizure

Ictal - the seizure itself

Post-ictal - period after a seizure



# Lifecycle of Epilepsy

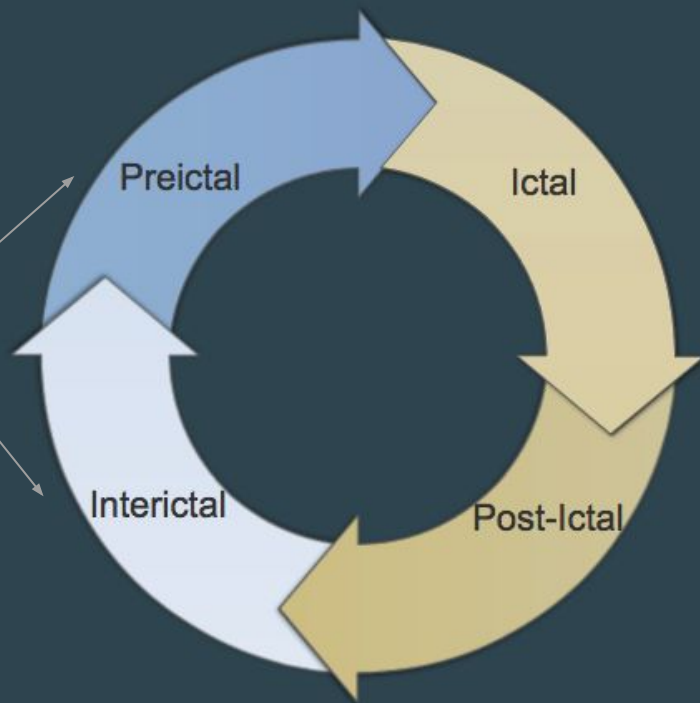
Interictal - Baseline/between seizures

Preictal - pre-seizure

Most difficult to classify

Ictal - the seizure itself

Post-ictal - period after a seizure



# The Data

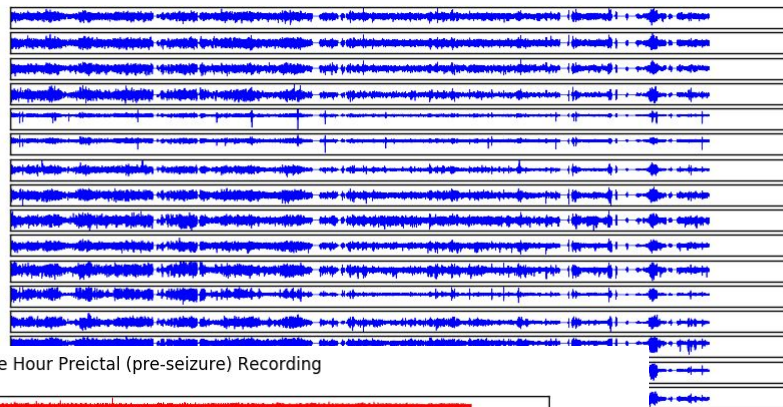
≈ 8k 10-minute recordings

Each recording 240k x 16

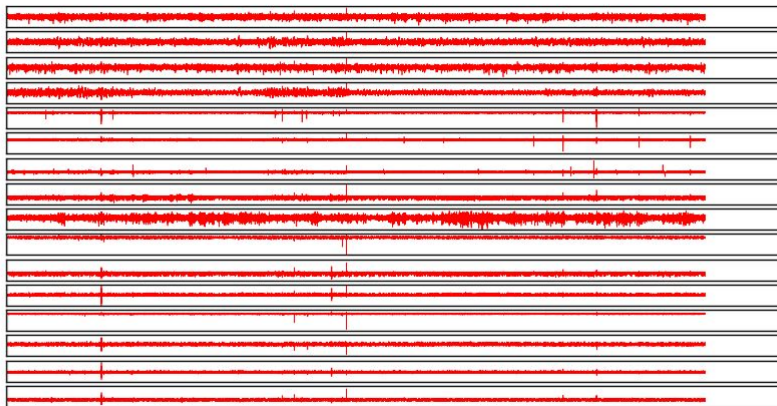
40 gb total data

EC2 m4.10xlarge

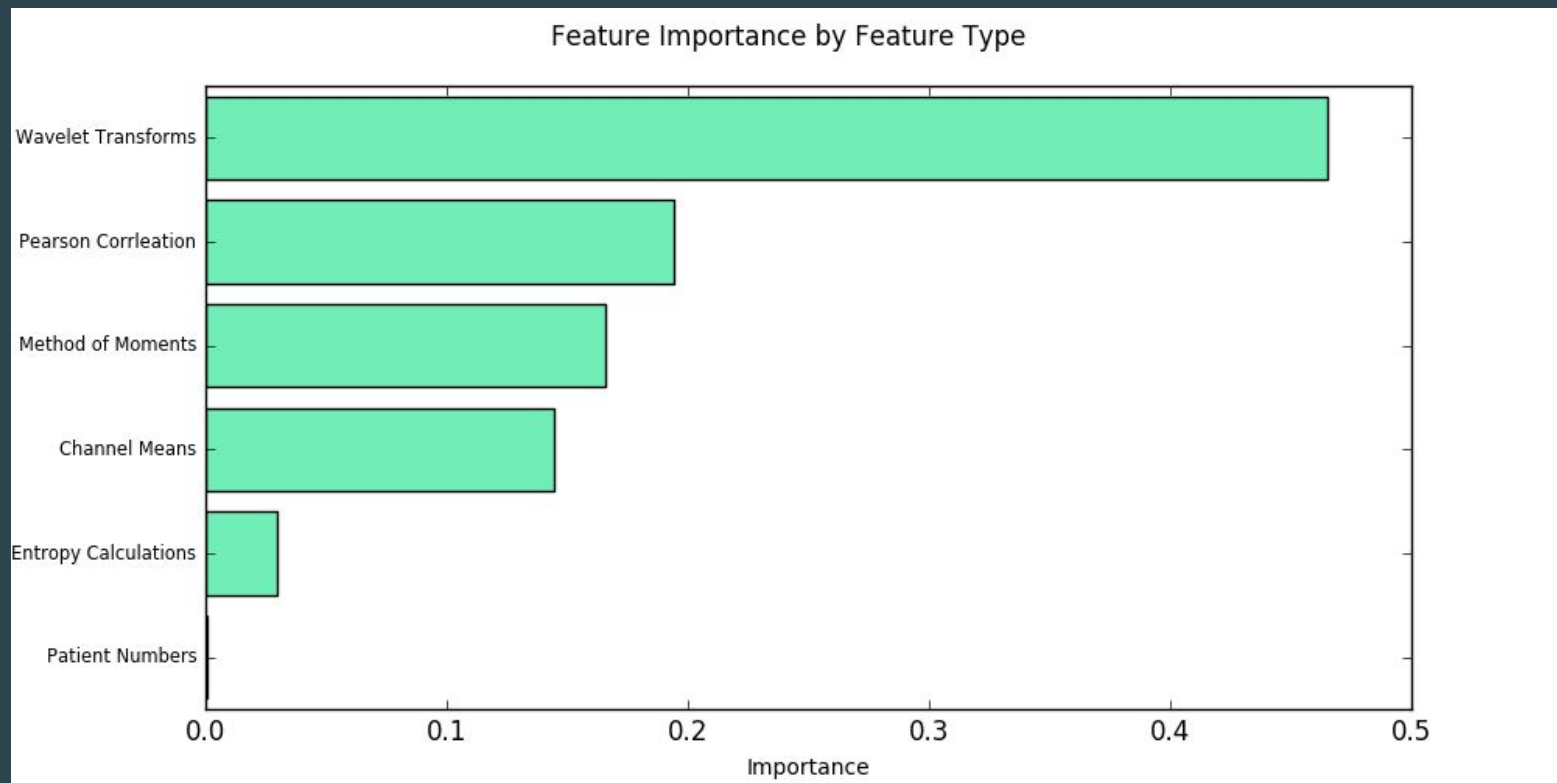
One Hour Interictal (Baseline) Recording



One Hour Preictal (pre-seizure) Recording

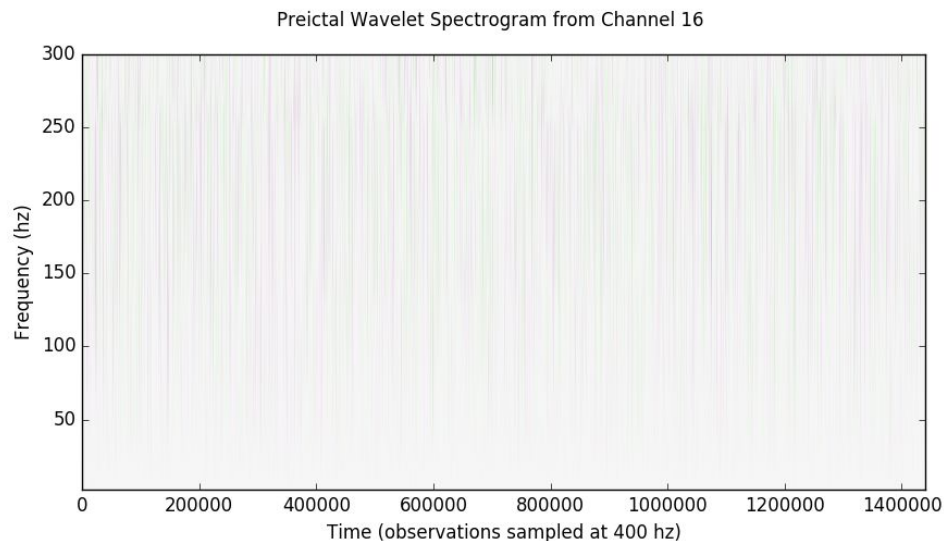
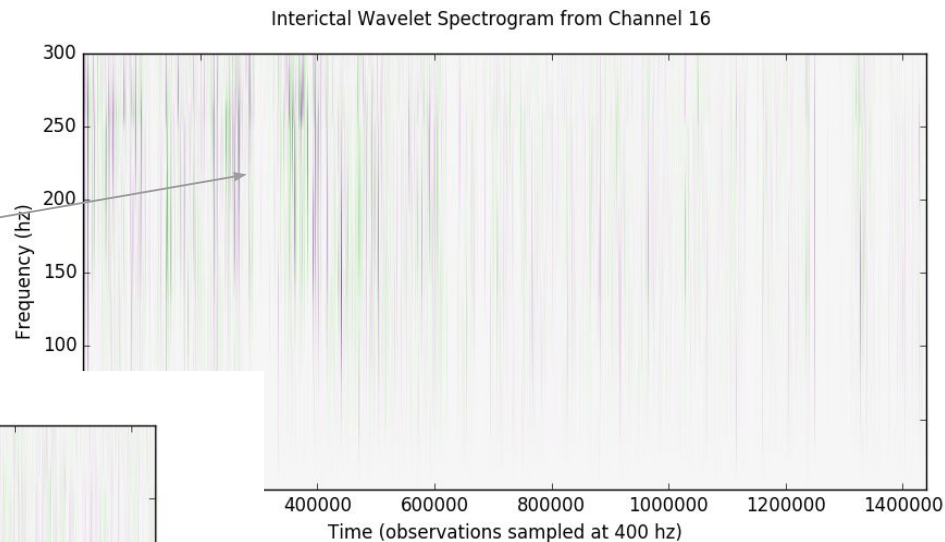


# Feature Building



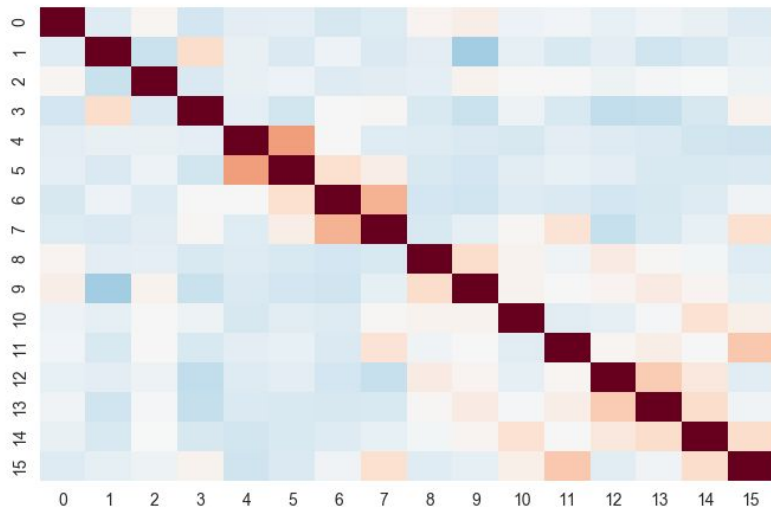
# Wavelet Transforms

High frequency activity

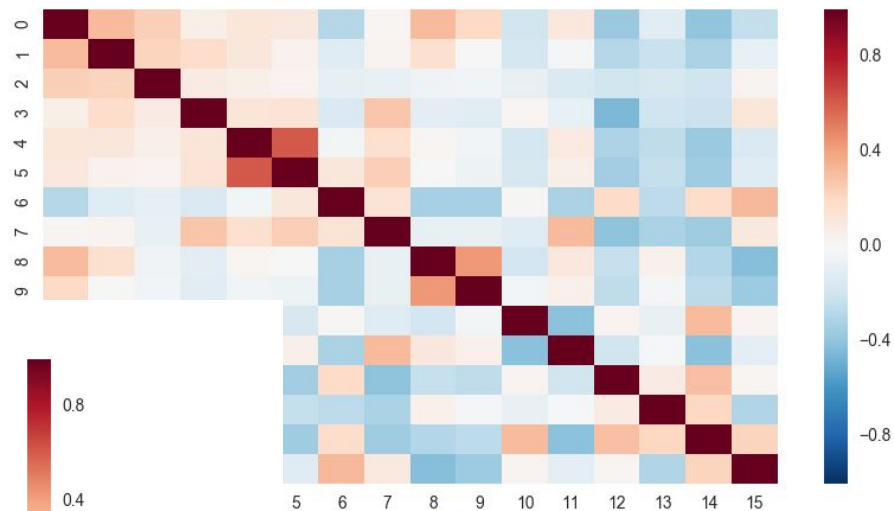


# Pearson Correlations

Precital Channel Correlations



Interictal Channel Correlations

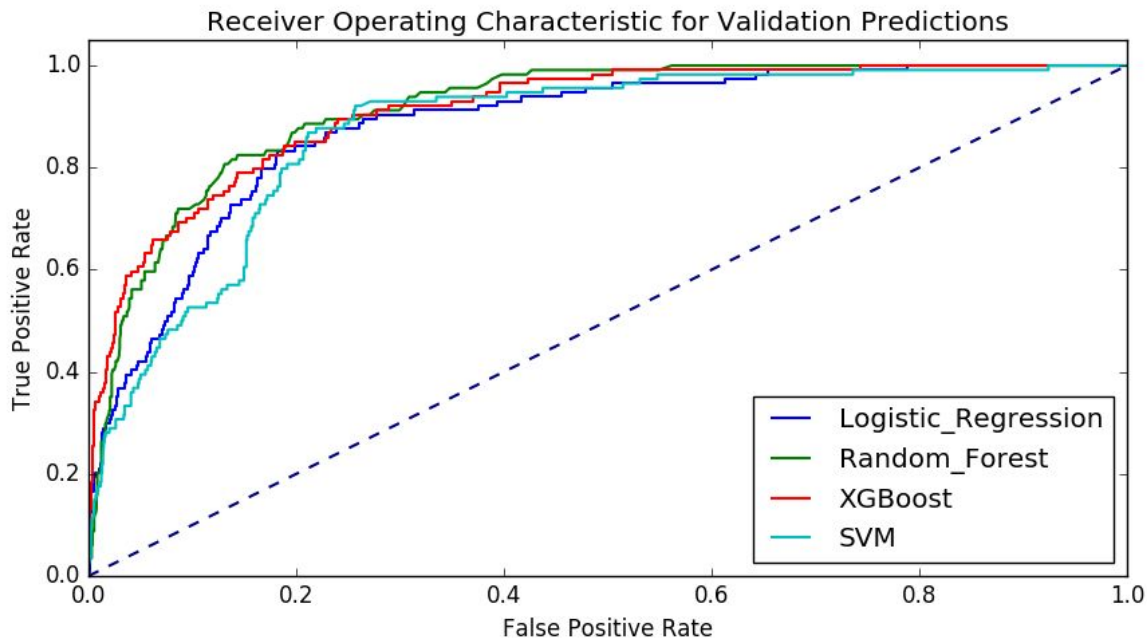


# Method of Moments, etc.

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



# Final Scores



Patient	Log. Reg	R. 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

# Thank you!

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[github.com/conorbmurphy/Predicting-Seizures](https://github.com/conorbmurphy/Predicting-Seizures)

[@conorbmurphy](https://twitter.com/conorbmurphy)