Week of 10/09 Deliverables

Red Lemurs

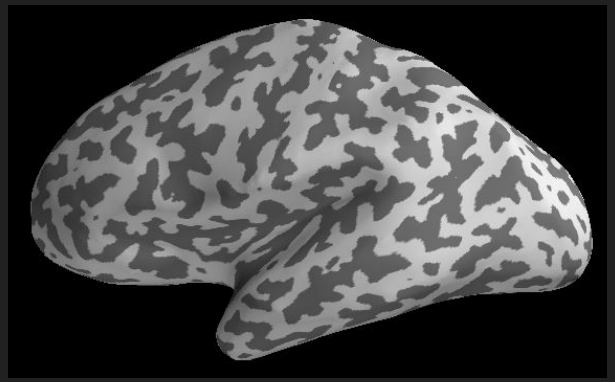
Deliverables

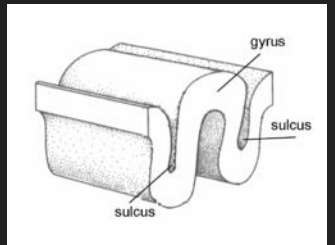
- Tech Eval of PySurfer
  - DoD: .md of Plots and Notes
- Background Readings on Biomarkers
  - DoD: Summary of Papers
- Exploratory plots
  - DoD: rmarkdown file1, file2
- API Backbone design
  - DoD: markdown
- Sparkline and Spectrogram Implementations / Backbone integrated
  - DoD: python package, notebook

Tech Eval of PySurfer

Structural MRI

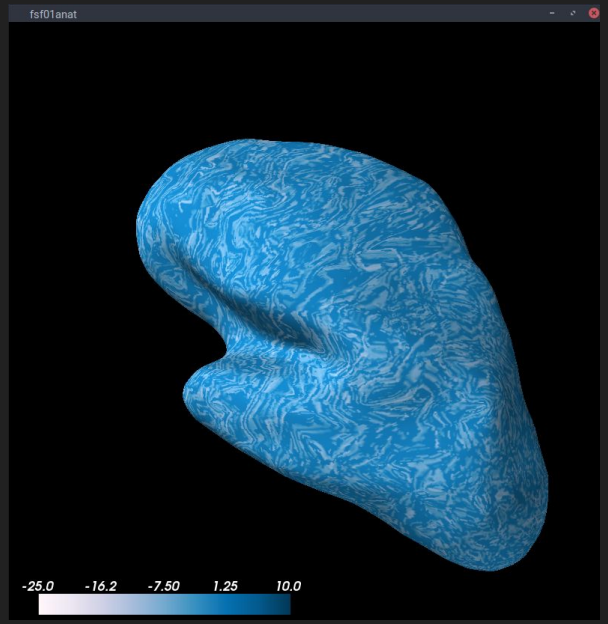
Dark = Sulci, Light = Gyri





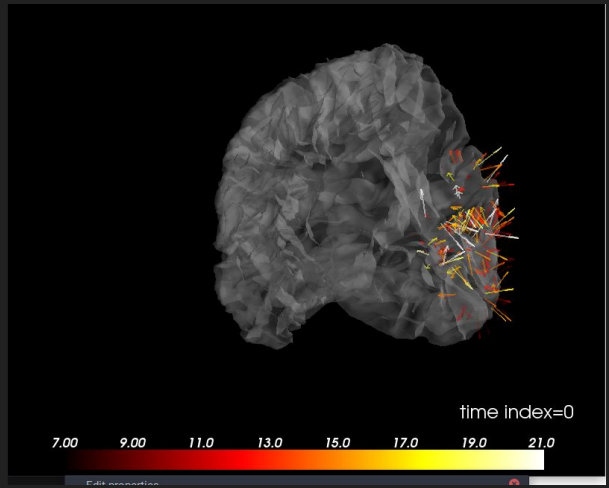
Functional MRI

One time slice, volume to surface projection



MEG Vectorized Inverse Solution

One time slice, computed using dynamic Statistical Parametric Maps (dSPM)



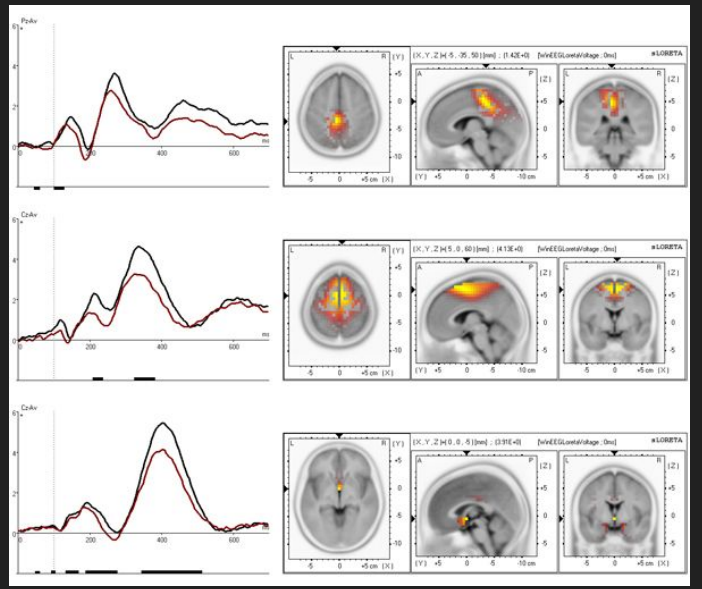
Tech Eval of PySurfer

Pros	Cons
● Great 3d visualizations, with rotations ● Actively supported (<10 hour response to Git issue from core dev) ● Supports many plots for MRI/fMRI ● Automatically creates good color scales, legends, ect.	● Uses FreeSurfer file structures, which are not very well documented ● Algorithms for visualization are not readily available, no ‘statistical setting’ or pseudocode ● Cannot currently be launched from iPython / Jupyter, must be done in a vanilla Python shell ● Unclear whether images can be produced without taking a screenshot

Background Reading on Biomarkers

- P300 (P3)
  - a positively inflected ERP peak that occur around 300 milliseconds after a task target stimulus
  - related to disorders include alcohol abuse and schizophrenia
- P50
  - reliably associated with schizophrenia
- Independent ERP components
  - ICA was used to decompose ERPs into a set of independent components
  - Executive independent components
    - Black bars indicating $p<0.05$

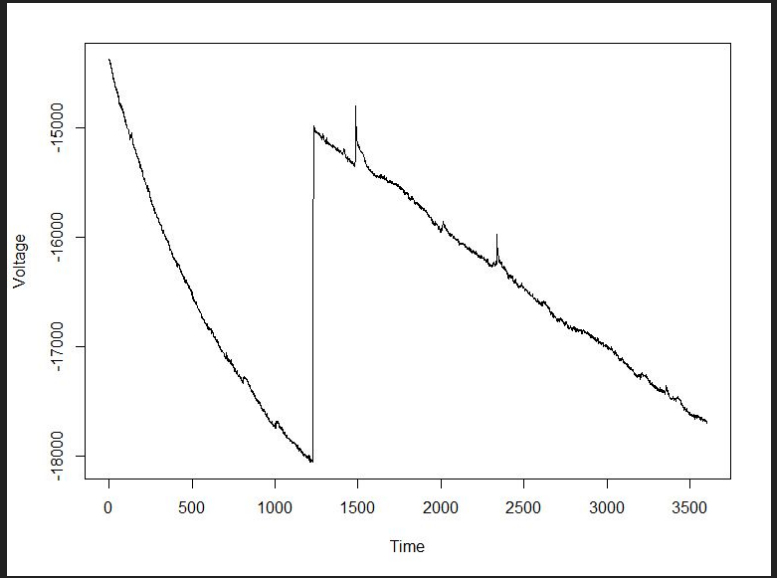
Executive independent component

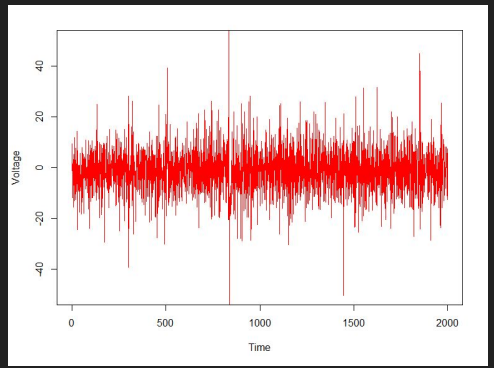


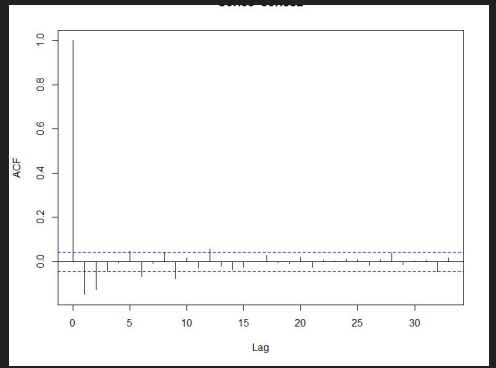
Classification of ADHD patients on the basis of independent ERP components using a machine learning system (Mueller et al. 2010)

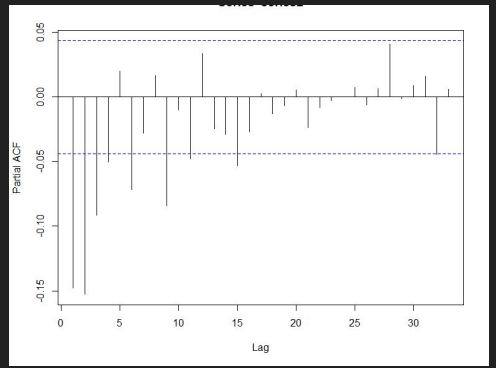
Exploratory Plots

- Time Series from Average of Electrodes (right)
  - Split data into first half (before the spike), and second half.
- Differenced Time Series, ACF, and PACF to model data (below)
- DoD



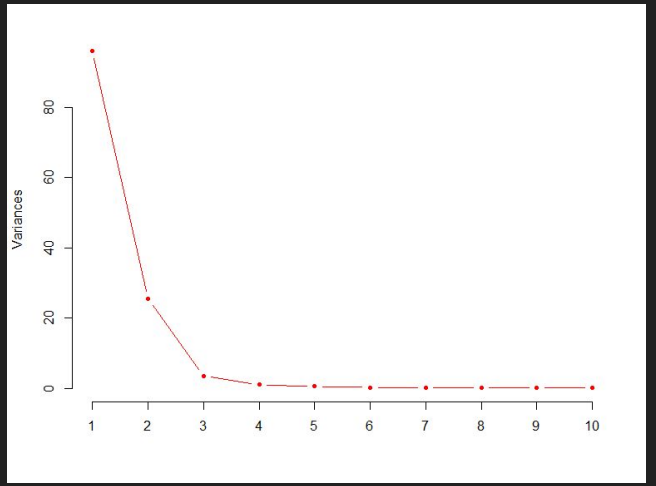


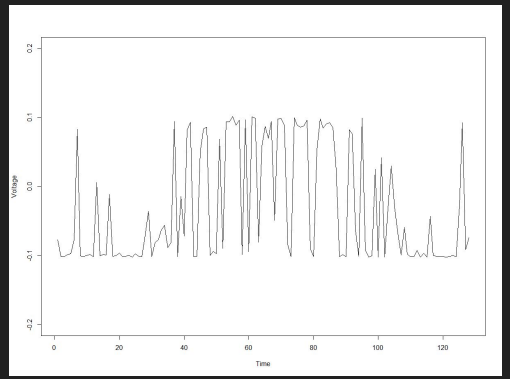


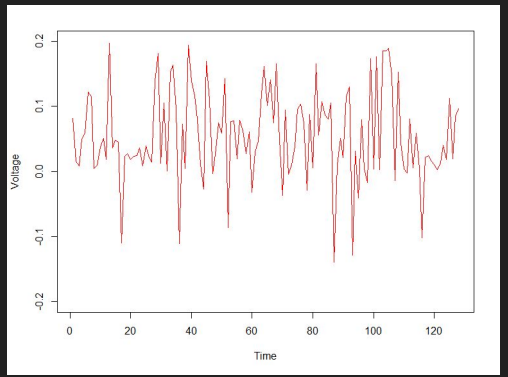


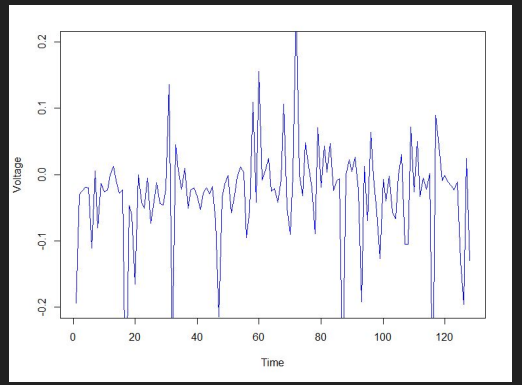
PCA

- Used 3 Principle Components to describe the data, and plot each component. See variances retained by each component (right).
- Plots of the 3 components below.
- DoD





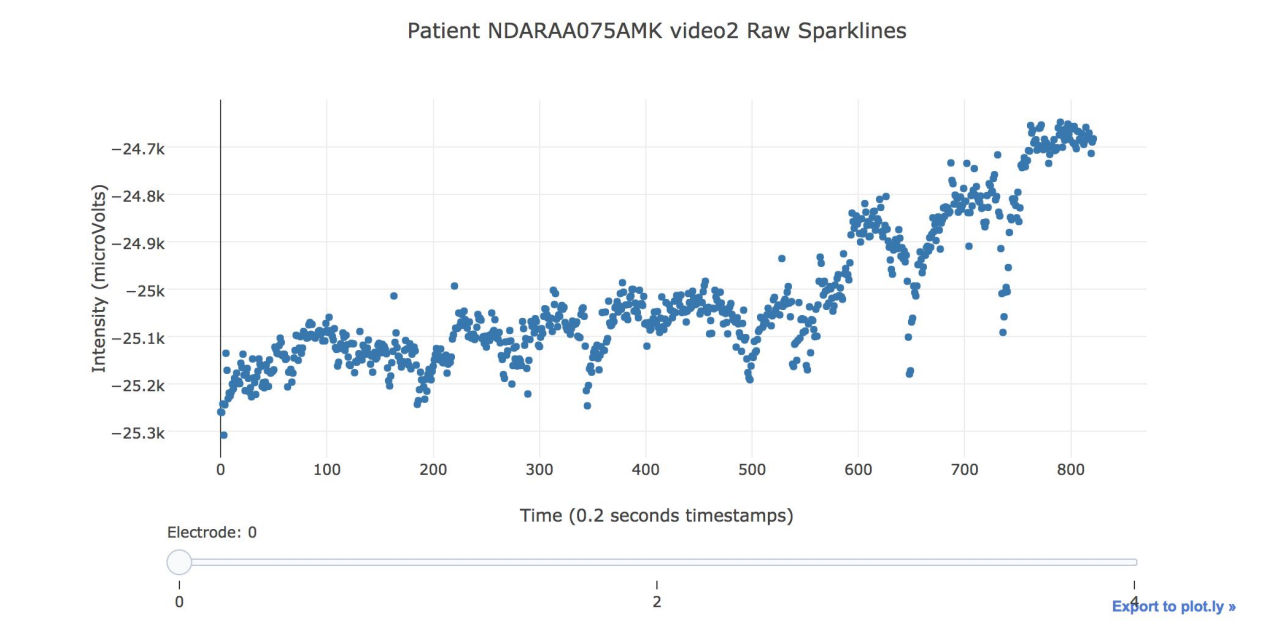




API Sparklines + Spectrograms

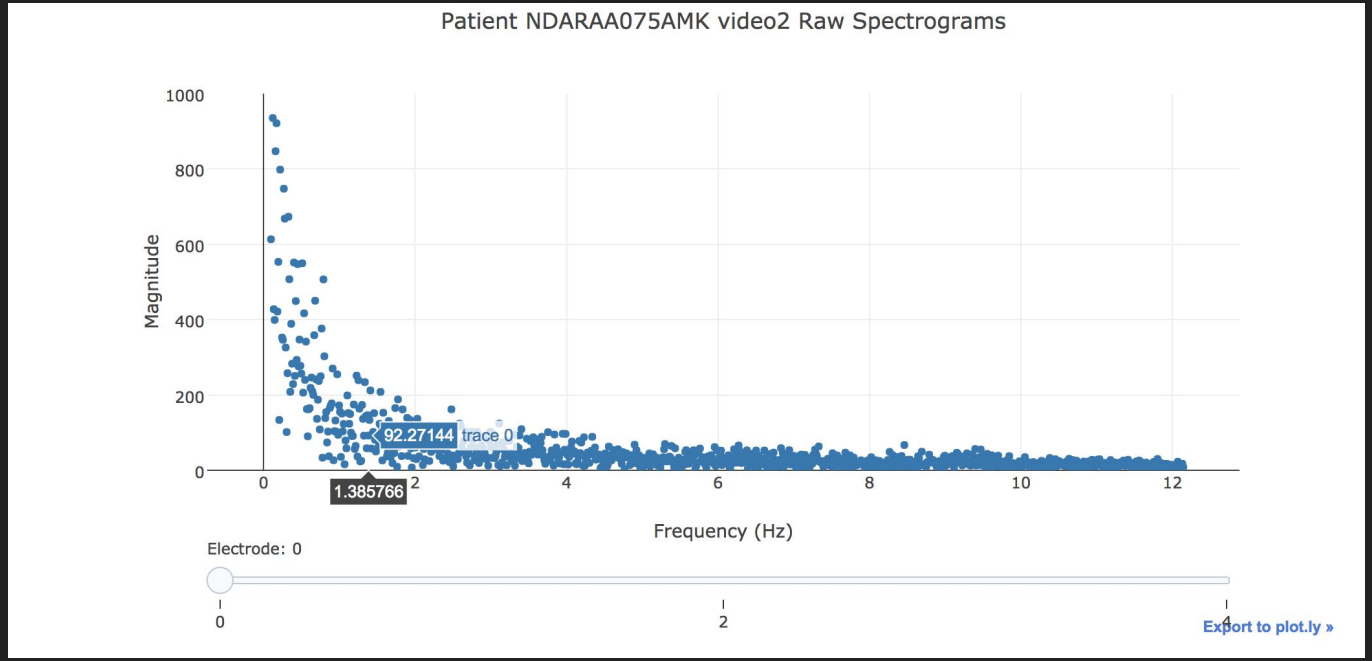
- DoD: python package, notebook
- Followed API pattern from last year. Made dictionaries to define parameters.

Sparklines:



API Sparklines + Spectrograms cont.

Spectrograms:



Next Week

- Tech Eval of MNE
  - Also these might be useful: https://portal.mrn.org/d3vis_demo/
- Sparklines with averaging filters, (something to view “evoked potentials”)
- Get S3 set up so we can store our own derivatives / preprocessed data
- Pairwise distance visualizations (similarity function between scans)