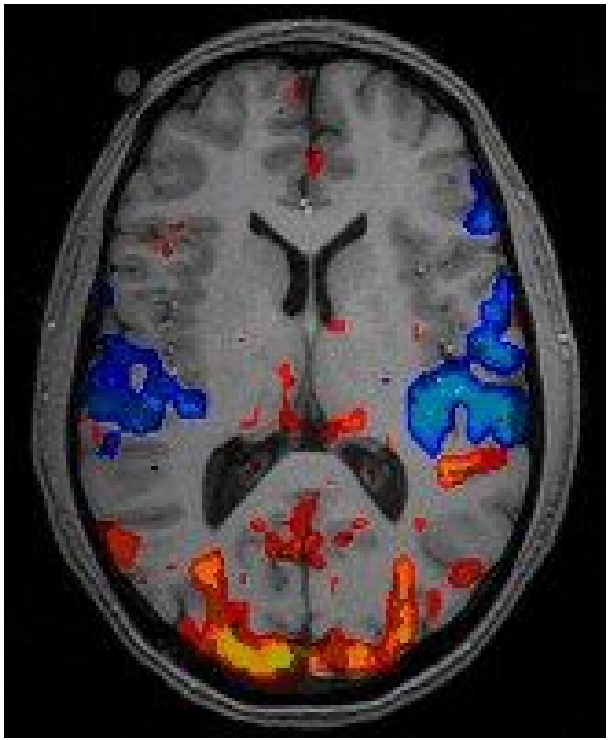
Decoding brain states from fMRI connectivity graphs

Authored by Richiardi, et. al.

Opportunity

- Ability to predict subject's brain state from fMRI studies and the BOLD response
- Machine learning advancements now allow one to notice subtle patterns
- Functional connectivity study advances (graph theory)



Challenge

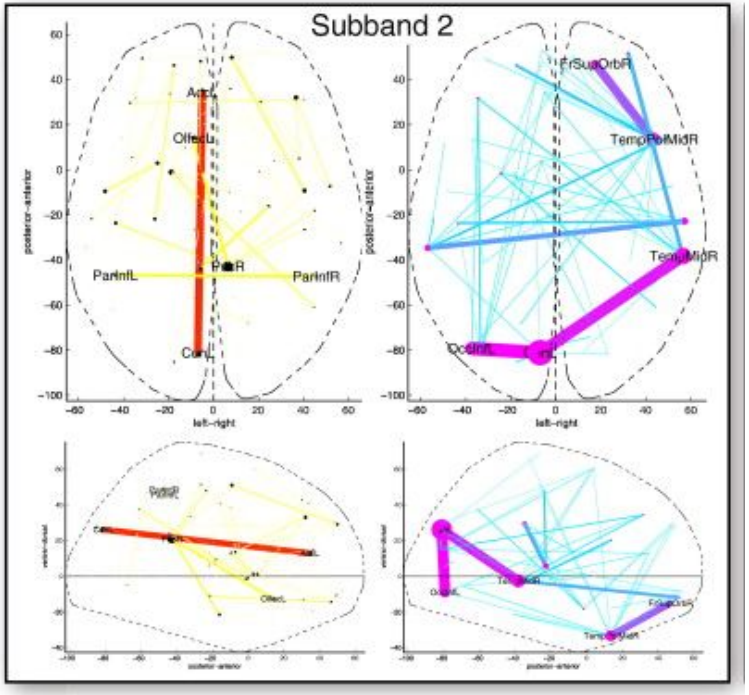
- To create a classifier to differentiate between brain states based on functional connectivity
- To use the classifier to identify the most relevant connections for a specific state

Action

- Created such a classifier and its data pipeline
- Conducted a proof of concept study

The Pipeline

- MRI -> brain atlas
- brain atlas + fMRI -> correlation matrix of brain regions
- Decision Tree training
- Extraction of most relevant data



The Study

- 15 Subjects
- Alternated between periods of rest and movie excerpts

Resolution

- Consistent subject connections suggested resting state networks
- Varying functional connectivity across BOLD frequency
- Similar/slightly worse performance than SVM
- Decision tree is much more understandable

Feedback/Future work

- Cons
  - Fairly technical
  - Not enough coverage of alternative classifiers
- Pros
  - Interesting to see a paper develop and cover the entire workflow
- Future Work
  - Higher resolution brain atlases/fMRI
  - Studies with diseased patients