

VICTOR KONG KAREN LI ANNA LIU ERIC QIN SOPHIA XIA

PROJECT DELTA

BACKGROUND

The Paper

- ▶ From [OpenFMRI.org](https://openfmri.org/ds005) (ds005)
- ▶ "The Neural Basis of Loss Aversion in Decision Making"
- ▶ Sabrina M. Tom et al. (2007) in [Science](#)

The Data

- ▶ 16 subjects, 1 task per subject, 3 runs per task
- ▶ Examine neural systems that process decision utility with fMRI data
- ▶ Task:
 - ▶ Subjects offered 50/50 wager
 - ▶ Varying potential gains/losses
 - ▶ Prompted for decision to accept or decline

COMPLETING AND/OR IN PROGRESS

Data Fetching and Preprocessing

- ▶ Download from [OpenFMRI.org](https://openfmri.org) and decompress
- ▶ Plot to explore potentially useful information
- ▶ Drawing summary statistics from plotted data

Initial Analysis

- ▶ Convolution
- ▶ Linear regression
 - ▶ Multiple and single regression with stimulus
- ▶ Hypothesis testing
 - ▶ General t-tests
- ▶ Time series
- ▶ Principle component analysis

OUR PLAN

Goal

- ▶ To reproduce methods as well as adding our own thoughts into it
- ▶ Using other methods that may or may not come to the same conclusion

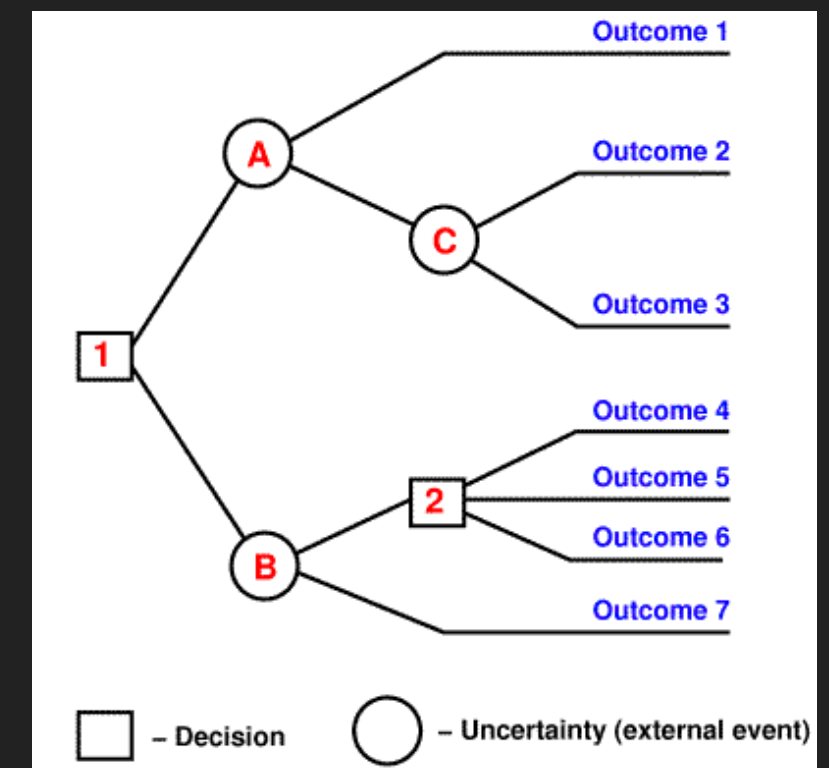
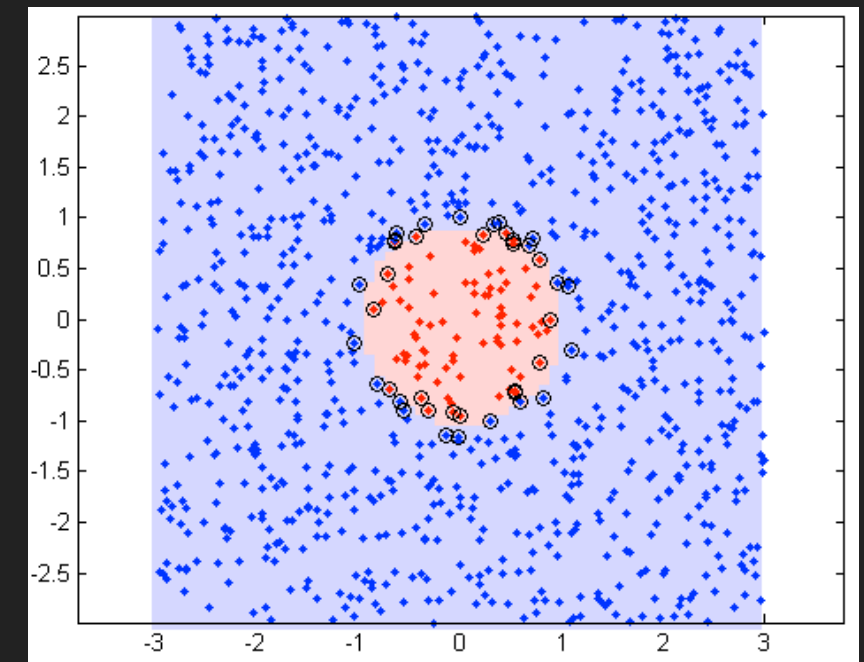
Methods and Analyses to Perform

- ▶ Logistic regression
- ▶ Time series
- ▶ Hypothesis tests
- ▶ Correlation analysis
- ▶ Robust regression analysis
- ▶ Principle component analysis

OUR PLAN

Methods and Analyses to Perform (cont'd)

- ▶ Support vector machines
 - ▶ Process: draw boundaries between clusters
 - ▶ Classify brain parts:
 - ▶ Parts (de)activate most when making decisions?
 - ▶ Parts are active given a good/bad/obvious/etc. wager?
 - ▶ Are these parts the same or different?
- ▶ Decision trees
 - ▶ Process: analyze inputs consecutively
 - ▶ Models human decision-making well
 - ▶ MANY questions:
 - ▶ What results from combinations of parts activating?
 - ▶ What results from combinations of gains/losses?
 - ▶ What parts activate given combinations of gains/losses?



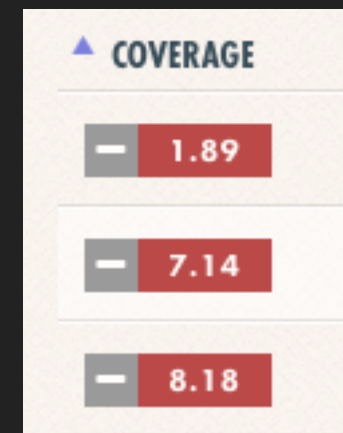
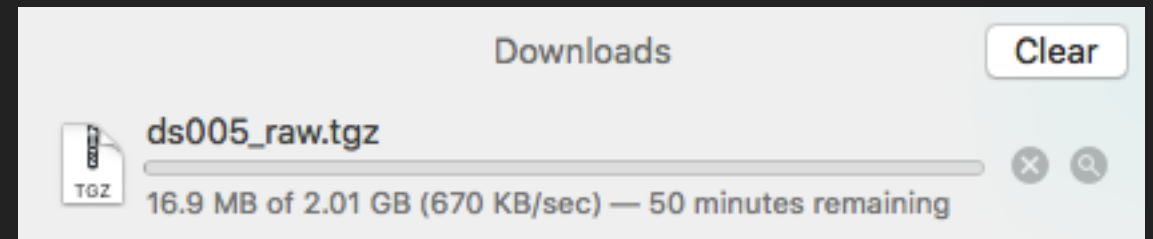
OUR PLAN

- ▶ Simplification steps
- ▶ Issues we have discussed
- ▶ Methods of validating models
 - ▶ t-tests
 - ▶ RSS
 - ▶ Cross-validation

OUR PROCESS

Most Difficult Parts of the Project

- ▶ Size of data
 - ▶ Spent much time deciphering format
 - ▶ What we need and don't need
- ▶ Writing tests for functions
 - ▶ Lack small piece of data that we know all about
 - ▶ Can improvise for simple functions only



Issues Working as a Team

- ▶ Difficult for all to meet together
- ▶ Different styles of coding and documenting
- ▶ Difficult to communicate what we want to do
 - ▶ Don't tell each other what we plan to do
- ▶ Organizing GitHub repository

OUR PROCESS

Most Useful Parts of the Class

- ▶ Linear modelling
- ▶ Correlation per voxel

Least Helpful Parts of the Class

- ▶ Comparison to R
- ▶ Mathematical writing

What We Need to Accomplish in the Project

Potential Topics to Cover in Future

- ▶ More linear regression, ANOVA, Principle component analysis
- ▶ Machine learning (classification, regression, cross-validation)
- ▶ Permutation tests (bootstrap)
- ▶ Software tools (Git, Python)