



# BrainIAK Education: User-Friendly Tutorials for Advanced, Computationally-Intensive fMRI Analysis

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Yale

UNIVERSITY

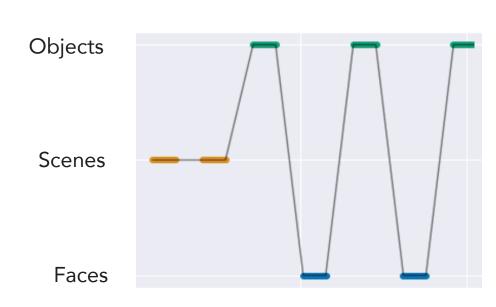
#### Available now at:

# https://brainiak.org/tutorials

# Getting started

#### Data Handling

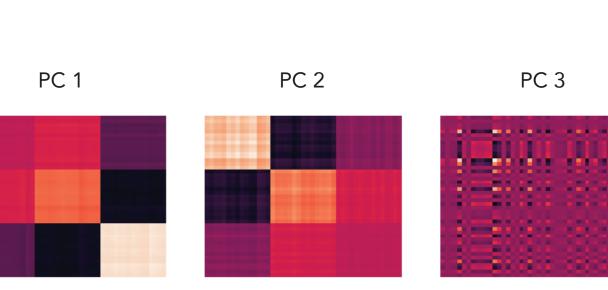
Load, reshape and normalize fMRI data in Python



Condition membership of each TR from a run

#### Dimensionality Reduction

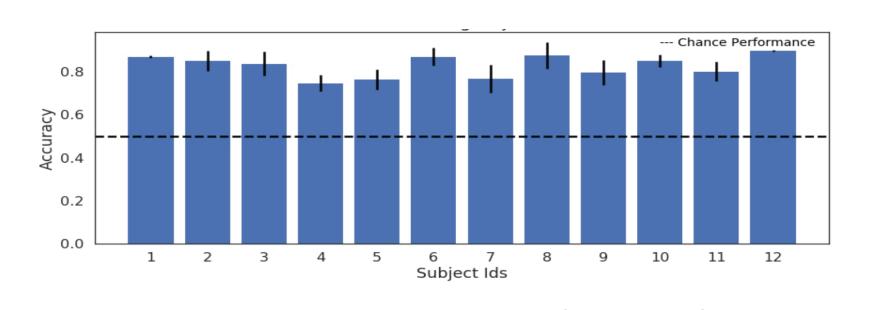
Apply PCA and other feature selection techniques



Activity of each PC for all runs and stimuli

#### Classification

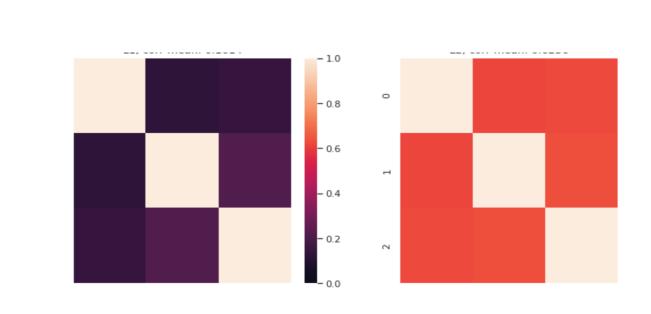
Run a classifier using leave-one-run-out cross-validation



Face vs scene classification for each participant

#### Classifier optimization

Use cross-validation to optimize classifier hyperparameters

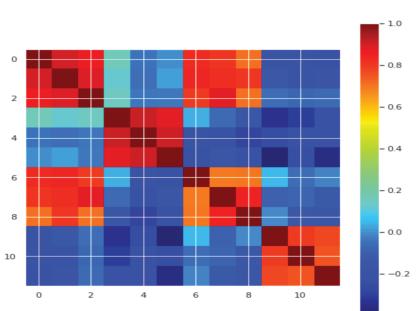


Inter-run consistency of L1 (left) and L2 (right) weights

# Advanced Techniques

RSA

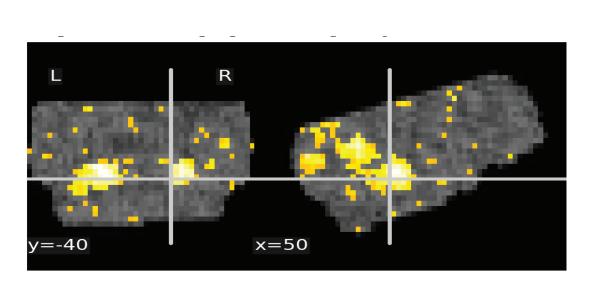
Compare pattern similarity for human and non-human data



Item-level correlation, clustering into item category

### Searchlights

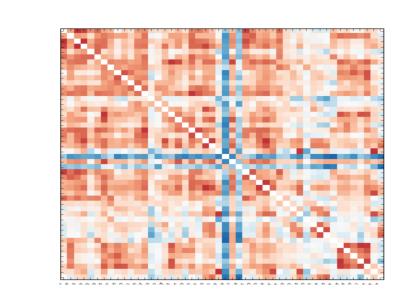
Setup and run a parallelized



Thresholded searchlight of face vs scene

### Seed-based Connectivity

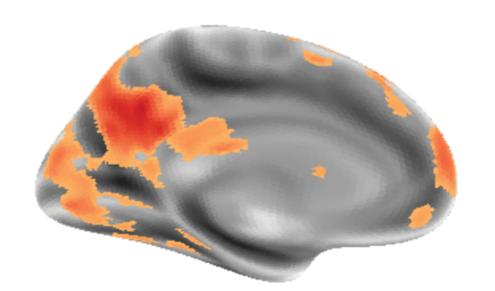
Define seeds and compute functional connectivity



Whole-brain parcellation correlation matrix

# Inter-Subject Correlation

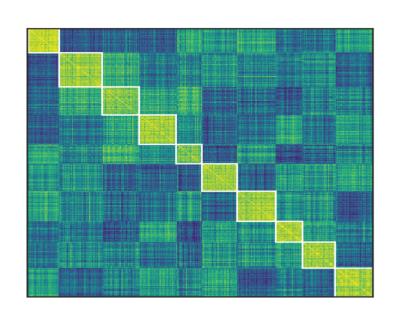
Calculate correlations between subjects to estimate task-specific signal



Inter-subject correlation during movie watching

#### Event Segmentation

Find latent event states in continuous, naturalistic stimuli

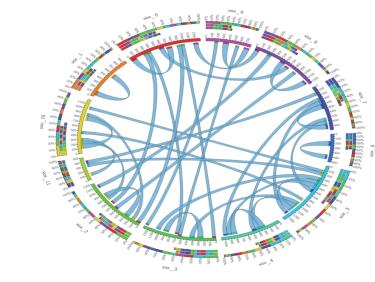


TR to TR correlation with event boundaries overlaid

searchlight analysis

## Full Correlation Matrix analysis

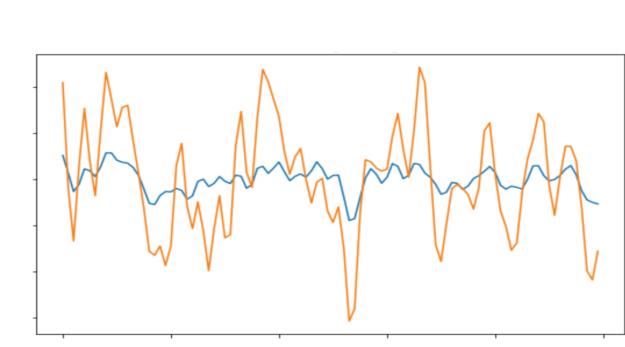
Perform an unbiased, seedless, full brain correlation analysis



Circos plot of every voxel in the brain's correlation with all others

### Shared Response Modeling

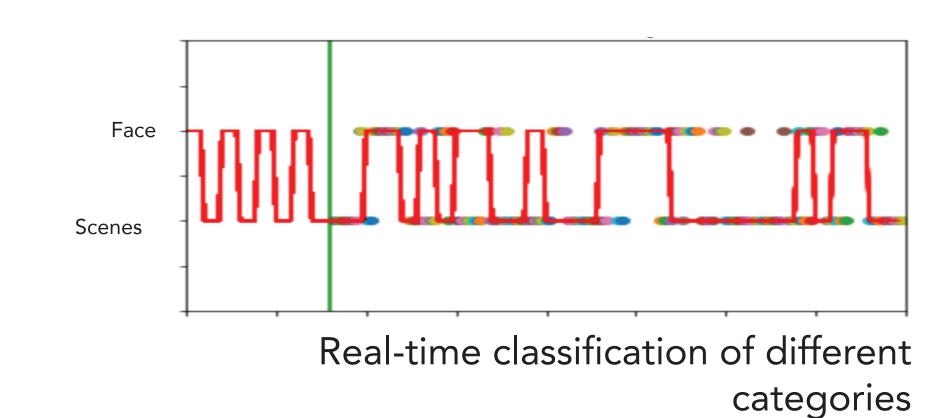
Use a common stimulus to project subjects into a shared functional space



Raw and SRM-based reconstructed voxel activity

#### Real-time

Handle and classify fMRI data generated in real-time



#### Tools

Integrates numerous free resources













### Installation

Several installation options: Cloud for running on mobiles/laptops Docker and Conda for local installation on Mac, Windows and Linux Server and cluster installation for job



submission





### Data

Uses publicly available datasets, including block, event-related and movie designs

Preprocessing has been completed to minimize startup

Can be adapted to your datasets easily

# Contribute



We welcome contributions to the BrainIAK methods and tutorials.

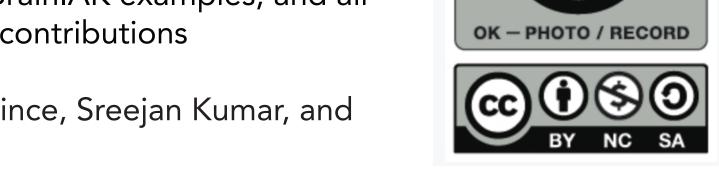
Completely free and open-source. The tutorials, data, and preprint are avialable here: https://brainiak.org/tutorials

Chat with us on Gitter

#### Acknowledgements

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We would like to thank the many contributors to the BrainIAK code base, BrainIAK examples, and all the tutorial testers and students for their contributions



Plot Credit: Clara Colombatto, Jacob Prince, Sreejan Kumar, and Paula J. Brooks