BrainIAK Tutorials: User-friendly tutorials for cutting-edge MVPA methods

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Learning Advanced fMRI Analysis

Pre-Processing: There exist multiple packages (AFNI, FSL, SPM, FreeSurfer, fmriprep) to perform fMRI pre-processing and basic statistical analysis. These packages come with detailed tutorials, examples, and bootcamps.

Advanced analysis: Users often face the following challenges when trying to learn advanced fMRI analysis:

- Custom analysis scripts are often used by researchers.
- Documentation of analysis techniques is often inadequate.
- Few training materials are available for performing analysis on high performance clusters (HPC).

Our Goal: Create user-friendly learning materials for advanced fMRI analysis.

- Basics to advanced fMRI analysis on HPC.
- Detailed, step-by-step execution of analysis.
- Use open source tools for free sharing and collaboration.

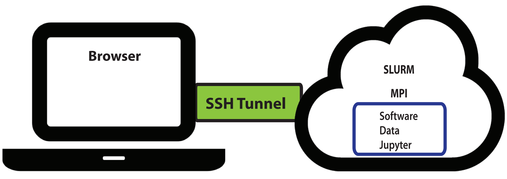
Methods

Tools: Bash Scripts, SLURM,

Packages:

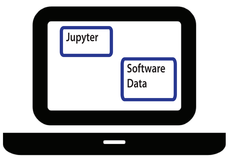
Publicly available datasets: Block Designs, Event Related Designs, Movie Datasets.

A. Tutorial architecture at Yale



High Performance Cluster

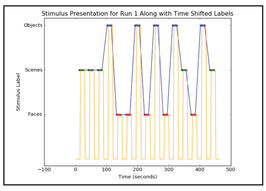
B. Tutorial on individual machine



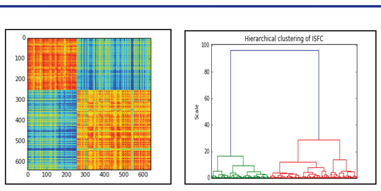
C. Tutorial topics - from the basics to the advanced.

Basics	Classification/ Correlation	Advanced Techniques
Data Loading	Cross-validation	Searchlights
Z-scoring	Dimensionality Reduction	Full Correlation Matrix Analysis[5,6] (FCMA)
Plotting Time-Series	RSA	Functional Alignment: Inter-Subject Correlation[3], Inter-Subject Functional Correlation[4] (ISFC), Shared Response Model[2]
Haemodynamic Shift	Pipelines	Real-time fMRI[7]

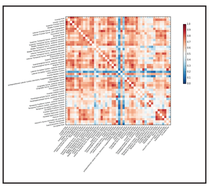
D. Samples of student generated plots



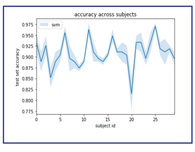
Haemodynamic Shift



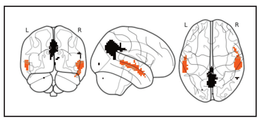
ISFC Clustering



Parcel Correlation Matrix



Classification Accuracy



FCMA: Circos Plot

Highlights

These tutorials were successfully used as part of an advanced fMRI analysis course at Yale University.

Novice users were performing advanced analysis by the end of the course.

These materials can be easily integrated with other teaching materials.

Future Work

These materials are undergoing alpha-testing.

Princeton Fall 2018 course.

Public release is planned in early 2019. Use the QR code to view sample tutorials, and to signup for updates on the tutorials.

Acknowledgements

Funding for this project was provided by Intel labs.

We would like to thank the many contributors to the BrainIAK code base, BrainIAK examples, and the tutorial alpha-testing team for their contributions.

Plot Credit: Clara Colombatto, Jacob Prince, Qihong Liu, and Sreejan Kumar.

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BrainIAK: http://brainiak.org

Other Posters: BrainIAK **2023,** Matrix-Norm **2535,** Real-Time **2045; 2858**