Cross-movie Prediction of Individualized Functional Topography

Jiahui Guo[1], Ma Feilong[1], Samuel A. Nastase[2], James V. Haxby[1], M. Ida Gobbini[1,3]

[1]Center for Cognitive Neuroscience, Dartmouth College, Hanover, NH, USA,
[2]Princeton Neuroscience Institute, Princeton University, Princeton, NJ, USA,
[3]Dipartimento di Medicina Specialistica, Diagnostica e Sperimentale, Università di Bologna, Bologna, Italy

Supported by NSF grants 1607845 (J.V.H), 1835200 (M.I.G), and NIH grant R01 MH127199 (J.V.H & M.I.G)

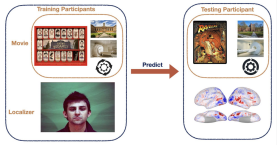
CCN Center for Cognitive Neuroscience at Dartmouth

Background

- ***Category-Selective Topographies***
  - Category-selective topographies are mostly similar across individuals but are idiosyncratic in terms of their precise conformation and location (Zhen et al. 2015, 2017).
  - Functional localizer scans are often included to map individualized topographies, using contrasts between responses to different categories (e.g., faces vs. objects).
- ***Naturalistic Stimuli***
  - ***Efficient.*** Naturalistic stimuli (e.g., movies) evoke a rich variety of brain states and engage multiple brain systems in parallel.
  - ***Ecologically Valid.*** Better simulate real-world cognition and better engage participants' attention (Vanderwal et al., 2015, 2017, 2019).
  - ***Friendly.*** More friendly and engaging for special populations, such as young children.
- ***Using Naturalistic Stimuli to Predict Individual's Topographies***
  - Individualized topographies can be estimated with high fidelity using response hyperalignment (RHA) while participants watch the same movie (Jiahui et al., 2020).
    - Movie contents need to be tailored.
    - Stimuli need to be shortened or edited to fit the schedule.
    - Different institutes, scanner models, parameters.

Aim

- *Predicting individualized topographies across diverse situations.*

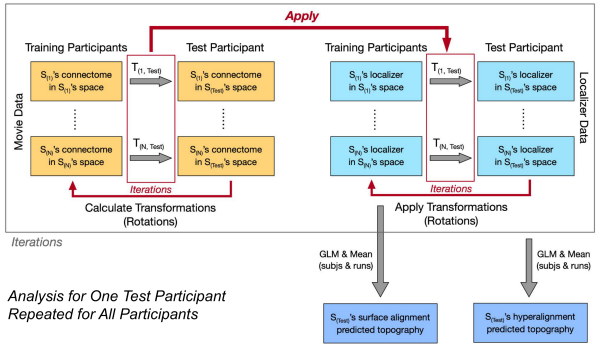


Datasets

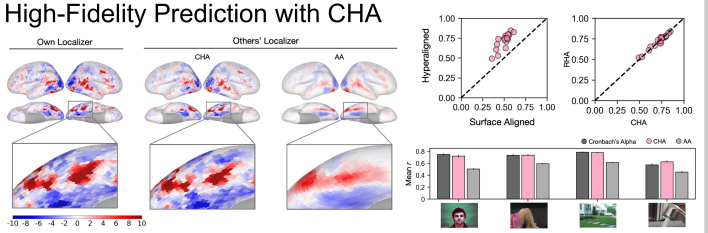
- Movies
- Locaizers — Category-Selective Localizers



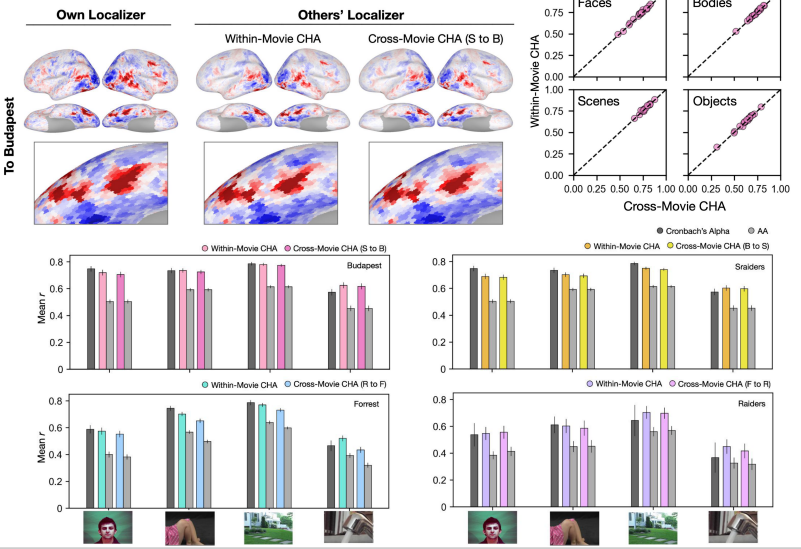
Procedures Based on Connectivity Hyperalignment (CHA)



High-Fidelity Prediction with CHA



CHA Enables Cross-Movie Predictions



Best Prediction Performance in Highly Reliable Areas