Exploring Brain Meta Activation Patterns Using Neuroimaging Data

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Introduction

BrainMap is a database of published neuroimaging experiments with 3D brain coordinates of where activation occurred for that experiment. These coordinates enable us to represent the brain activation with a Gaussian kernel (Laird, Lancaster, & Fox, 2005).

We describe a new ontology. We aim to bring consistency to cognitive neuroscience vocabulary and understanding of meta activation patterns. We can cluster similar activation patterns together to visualize which structures activate simultaneously in response to a particular task or stimulus, allowing us to describe a new ontology. We aim to bring consistency to cognitive neuroscience vocabulary and understanding of meta activation patterns.

Data

BrainMap is a database of published neuroimaging experiments with 3D brain coordinates of where activation occurred for that experiment. These coordinates enable us to represent the brain activation with a Gaussian kernel (Laird, Lancaster, & Fox, 2005).

BrainMap has upward of 15,000 experiments from which we selected 8,919 to work with based upon sufficient sample sizes and individual normalcy.

Methods

We utilized nonnegative matrix factorization, a nondeterministic dimension reduction technique that decomposes one matrix into two: the W matrix (vectors by # of dimensions) that represents meta activation patterns, and the H matrix (# of dimensions by activation maps) that represents the expression of each meta activation pattern in each activation map (Devarajan, 2008).

- ran for k = 2-40 fifty times each

To determine which number of clusters to choose we performed a consensus clustering algorithm on the H matrix (Brunet et al., 2004).

Cophenetic correlation: represents the consistency of the clustering solution across all runs for that solution

To yield a psychological interpretation we performed a behavioral decoding procedure that computed the probability of a certain category (working memory, passo

References


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