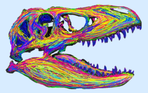
Stimulus Representation in the Interactions Between Multiple Brain Regions



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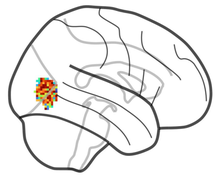
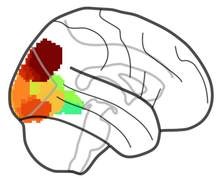
Introduction

- Stimulus representation research has generally focused on cell assemblies (e.g., how neurons in a voxel encode perceptual features)
- However, the organization of cell assemblies remains unclear. Perhaps, they are distributed across regions
- Our research investigates this topic, and whether different areas within a brain system (e.g., the occipital lobe) interact to represent stimuli

ROI



System

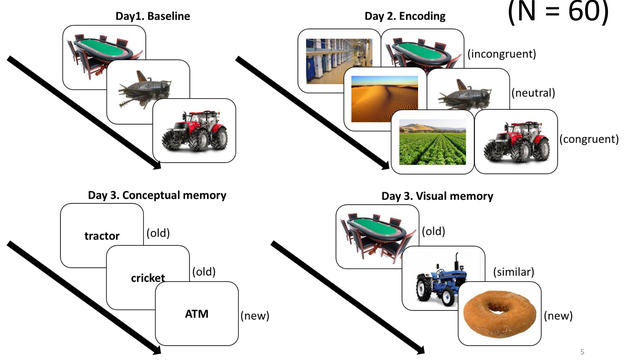


Specific questions

- Should representation be entirely understood as localized assemblies? Alternatively, do representations manifest at a system level?
- Can representations be studied using tools for dynamic functional connectivity?

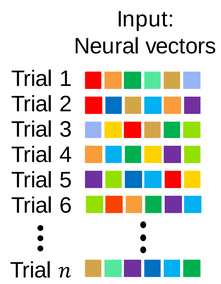
Task design

(N = 60)

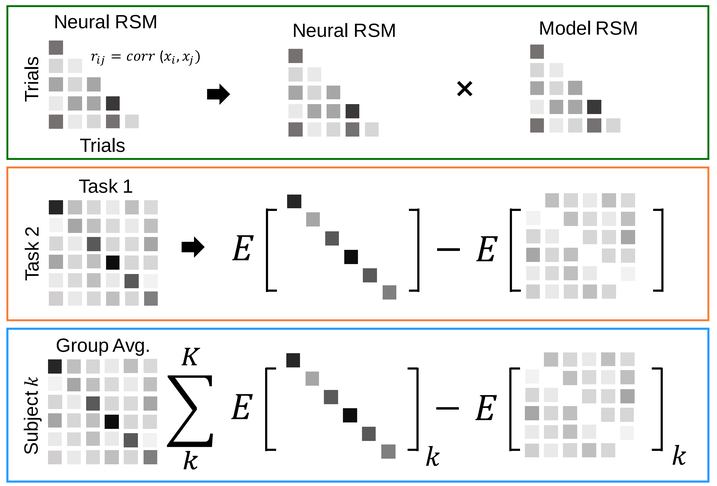


Types of analysis

Input: Neural vectors



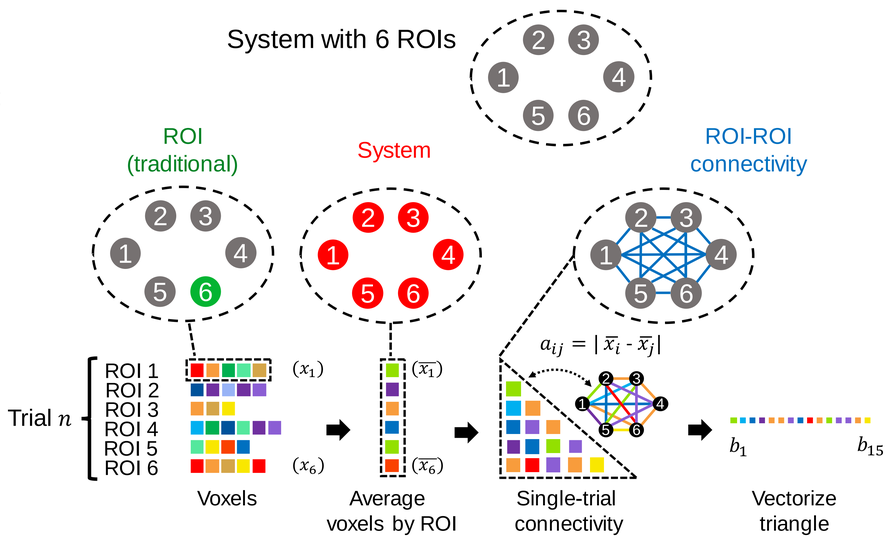
- The neural vector input traditionally has been defined as every voxel in a region of interest (ROI)



Different levels

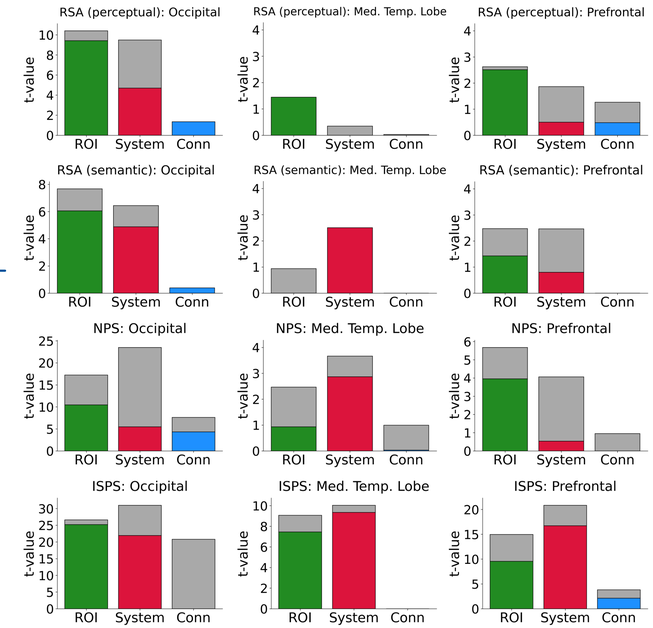
However, the above analyses can actually be done with different types of input vectors:

- *ROI activity* (traditional, unit = voxel)
- *System activity* (unit = ROI average)
- *System connectivity* (unit = ROI-ROI edge)



Results

- Perform every analysis across every level for each subject
  - e.g., generate RSA system scores
- For each level, regress out the effects of other levels
  - e.g., regress out RSA ROI scores and RSA connectivity scores from RSA system scores
- Colored bars reflect effects specific to a given level (post-regression), grey areas reflect effects partially mediated by another level (pre-regression)



Discussion

- Consistent with the idea that representation is partially distributed
- Methodologically, this approach may prove uniquely useful for research on semantics or some specific areas, such as the MTL

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R01-AG066901-01A1

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