During fMRI scanning:

Bayesian latent cause models?

Using Central question: How do we infer what situation we are in?

Situation models and “schemas”
- Serve to organize thoughts and experiences as we encode them into memory
- The posterior-medial network (PM network) of brain regions might be involved in their construction and application

Central question: How do we infer what situation we are in?

Using Bayesian latent cause models?
- Situations can be viewed as hidden causes that give rise to observable events
- We can use Bayesian inference to infer the current situation, as the posterior probability distribution $p(\text{situations} | \text{observations})$

Hypothesis: Brain regions implicated in situation modelling (the PM network) represent situations.

The safari is divided into 4 “zones”

Animals appear in different zones with different probabilities:

Subjects must continuously update their beliefs about the posterior probability of each zone.

Performance on “Which zone is more/less likely”:

1 Introduction

“Animal Safari” posteriors task

The posterior-medial network

2 “Animal Safari” posteriors task

The safari is divided into 4 “zones”

Animals appear in different zones with different probabilities:

The posterior-medial network

3 Which areas represent the posterior?

Representational similarity analysis (RSA)

Similarity structure for posterior $[T \times T]$

Neural similarity structure for ROI $[T \times T]$

What the similarity structure should look like

What the similarity structure actually looks like

Take correlation of these two matrices to obtain the representational similarity match of ROI and posterior

4 Univariate analyses

Which areas update the posterior?

Which areas represent surprise?

Which areas represent confidence?

Which areas represent difficulty?

5 Next steps

Next steps

Further alternate models for RSA
- Difficulty / attention / uncertainty / conflict
- Associative / Hebbian model
- Reinforcement learning / temporal-difference model

Connectivity analyses
- Trial-by-trial correlations
- Try to infer likelihood and posterior representations by modeling behavior

Relationship with behavior

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