Using fMRI machine learning to predict individual differences in behavior


Omg this was the best week ever
All the mistakes this team made are because of me though. So be kind to them

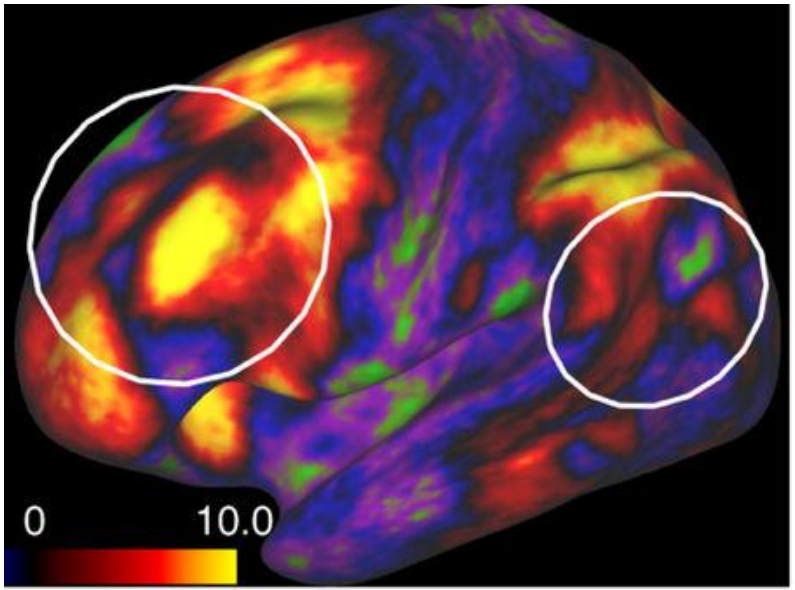
Can a whole brain “neural signature” trained on a task predict out of scanner behavior?

Data:

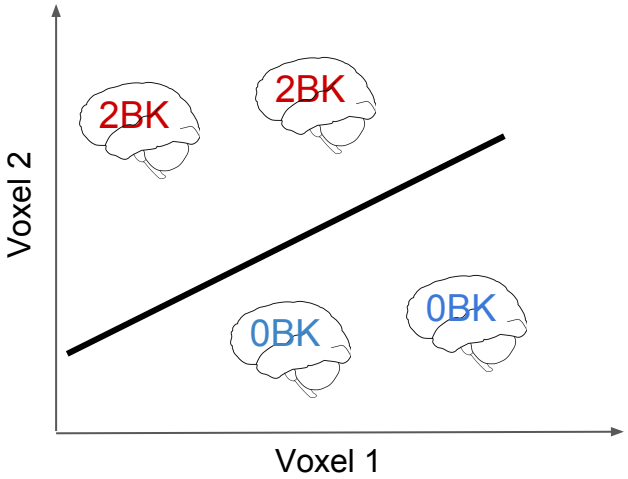
HUMAN Connectome PROJECT

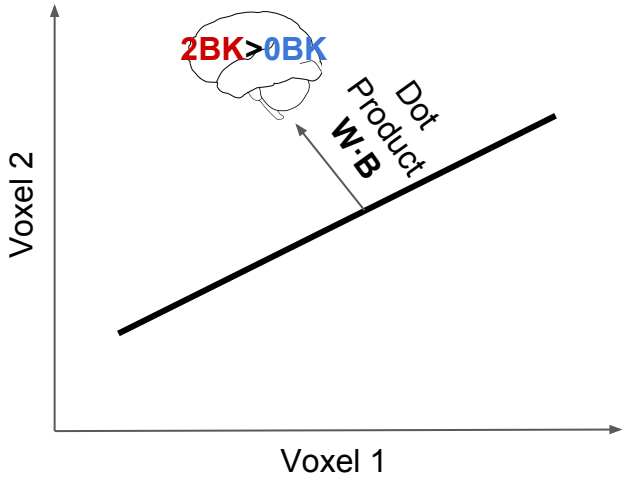
Task:

Working Memory



2back - 0back effect





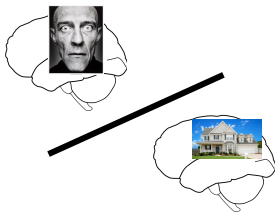
1. **Build neural signature of WM** (n=700)

2. Assess out-of-sample expression of neural signature (n=300)

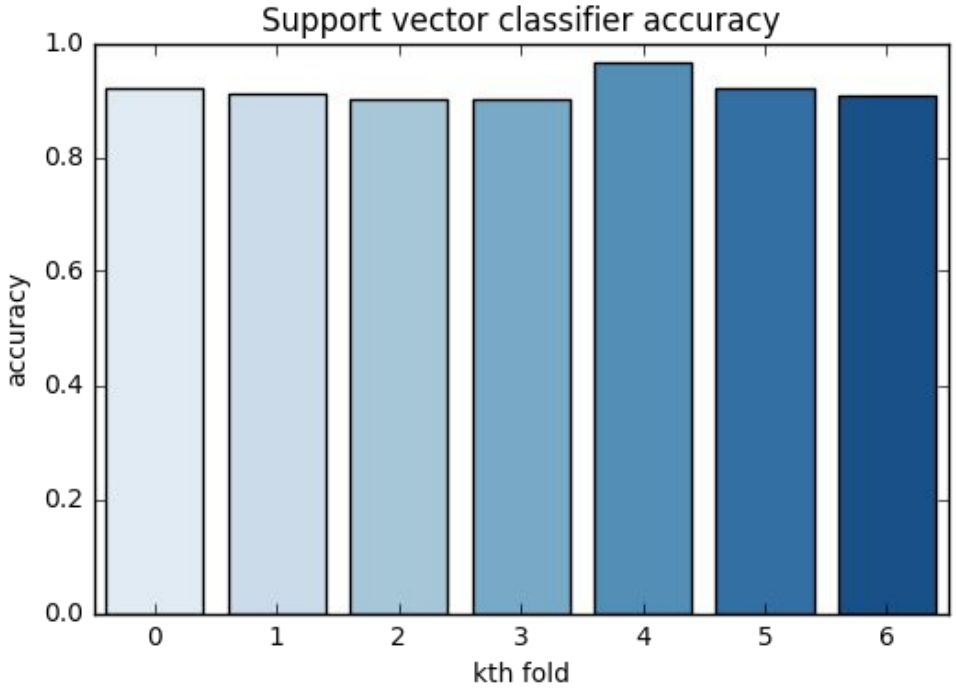
3. **Evaluate construct validity**

Near transfer: in scanner task accuracy
Far transfer: outside scanner working memory accuracy
Control analysis: personality

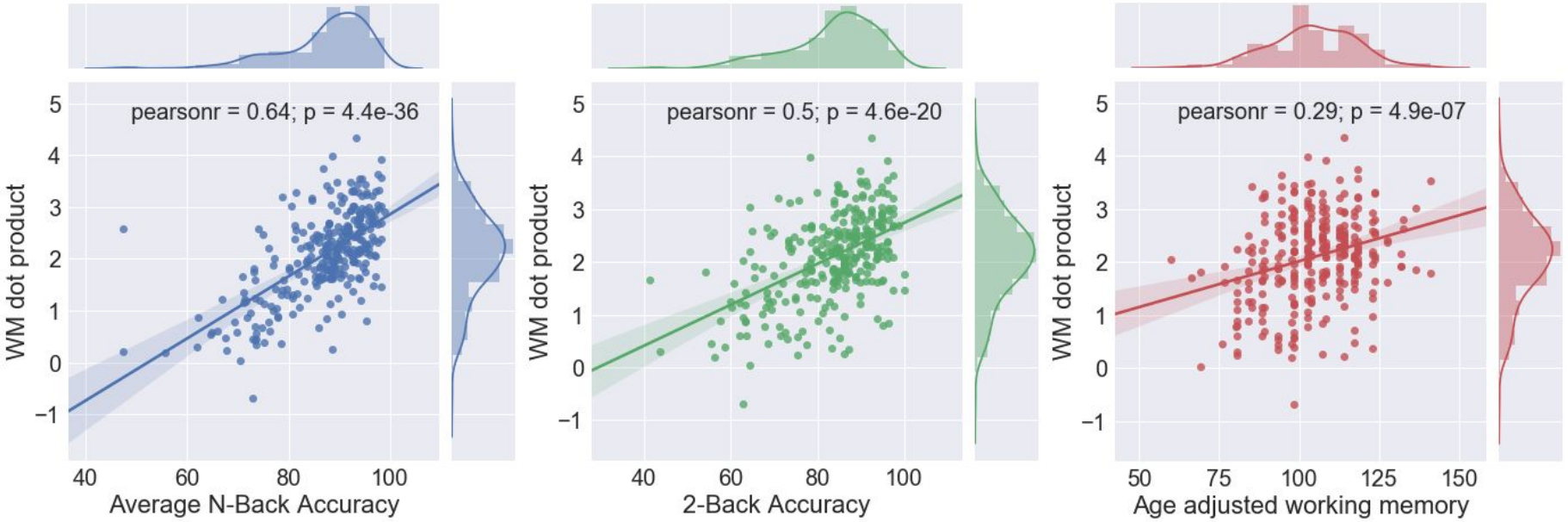
4. **Control analyses:** train on another task (faces vs places) and assess construct validity with near, far, and control measures



The classifier works



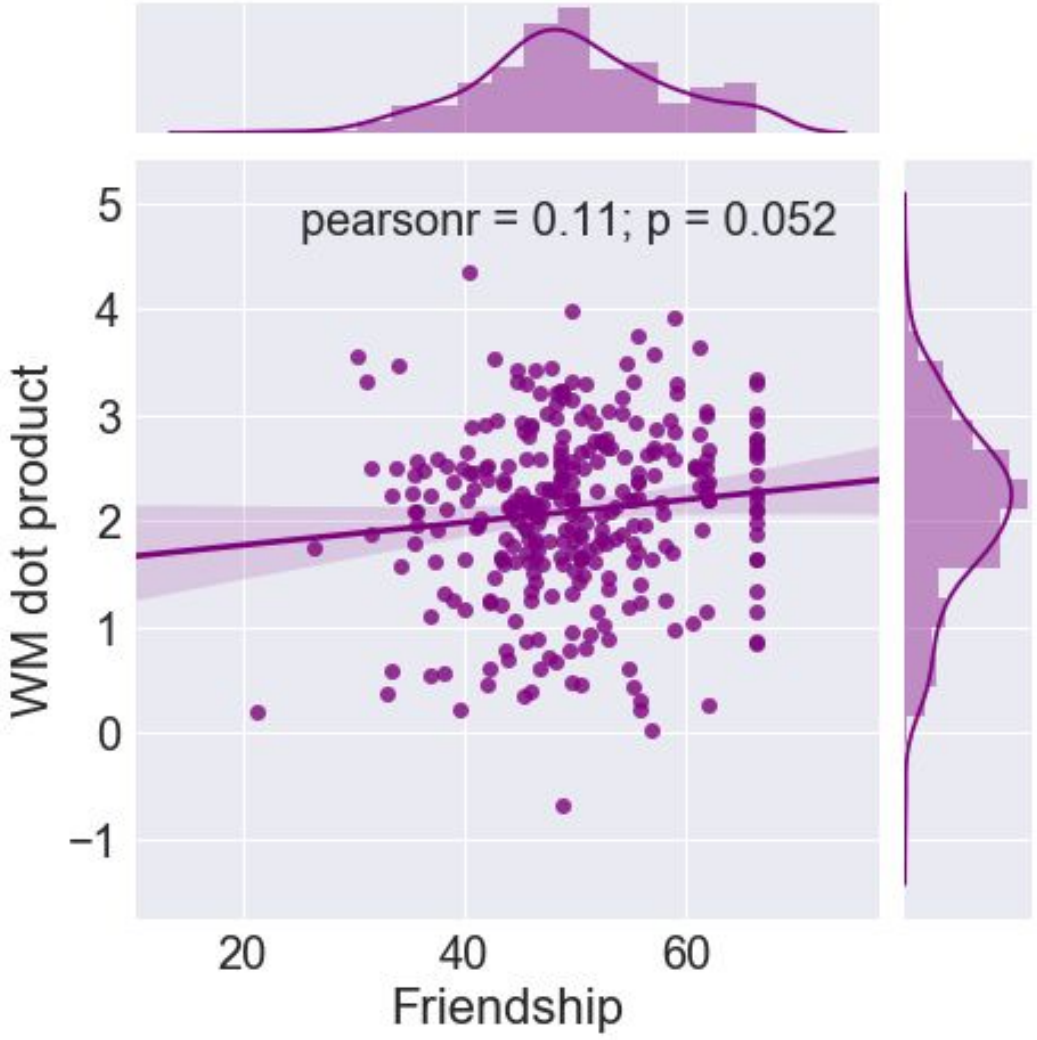
Construct Validity



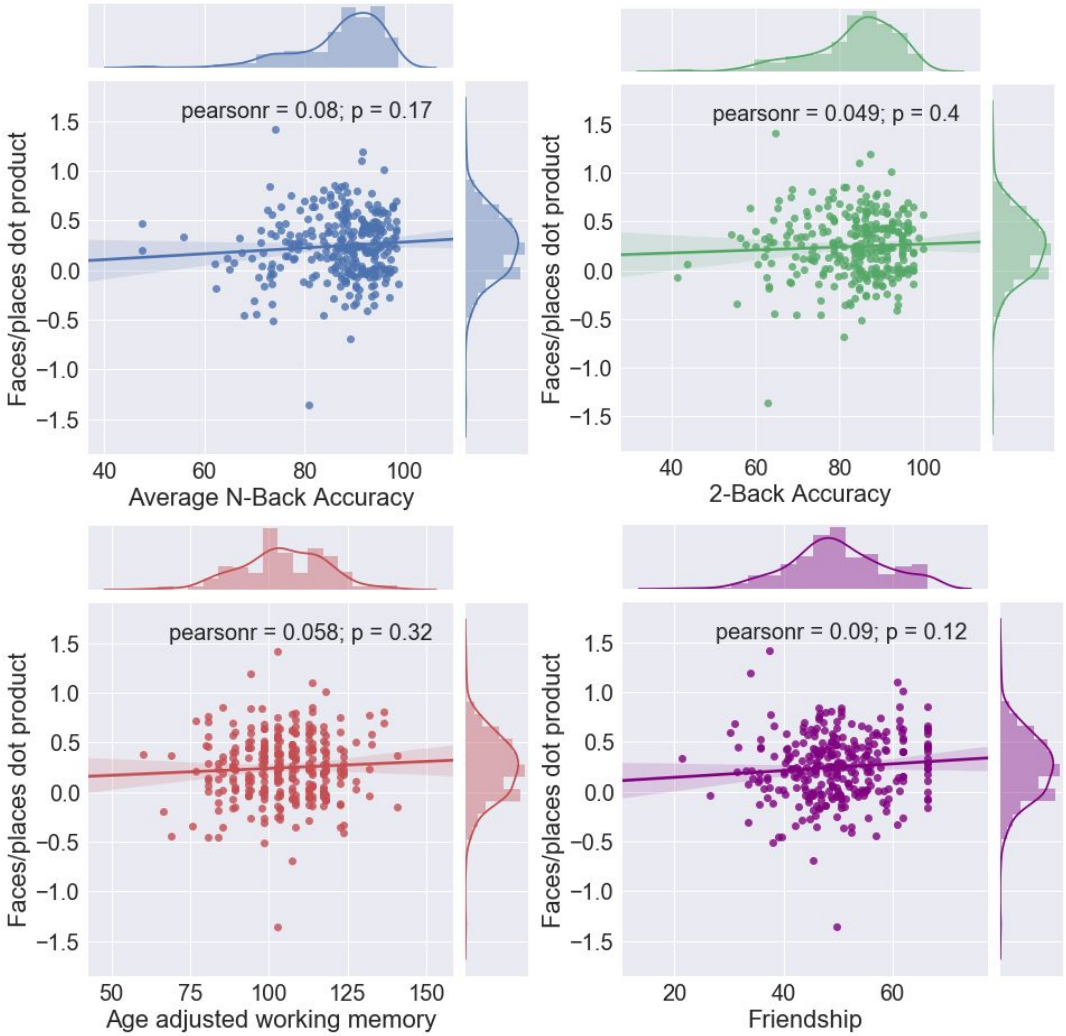
Near transfer

Far transfer

Near, far, wherever you are… (transfer)

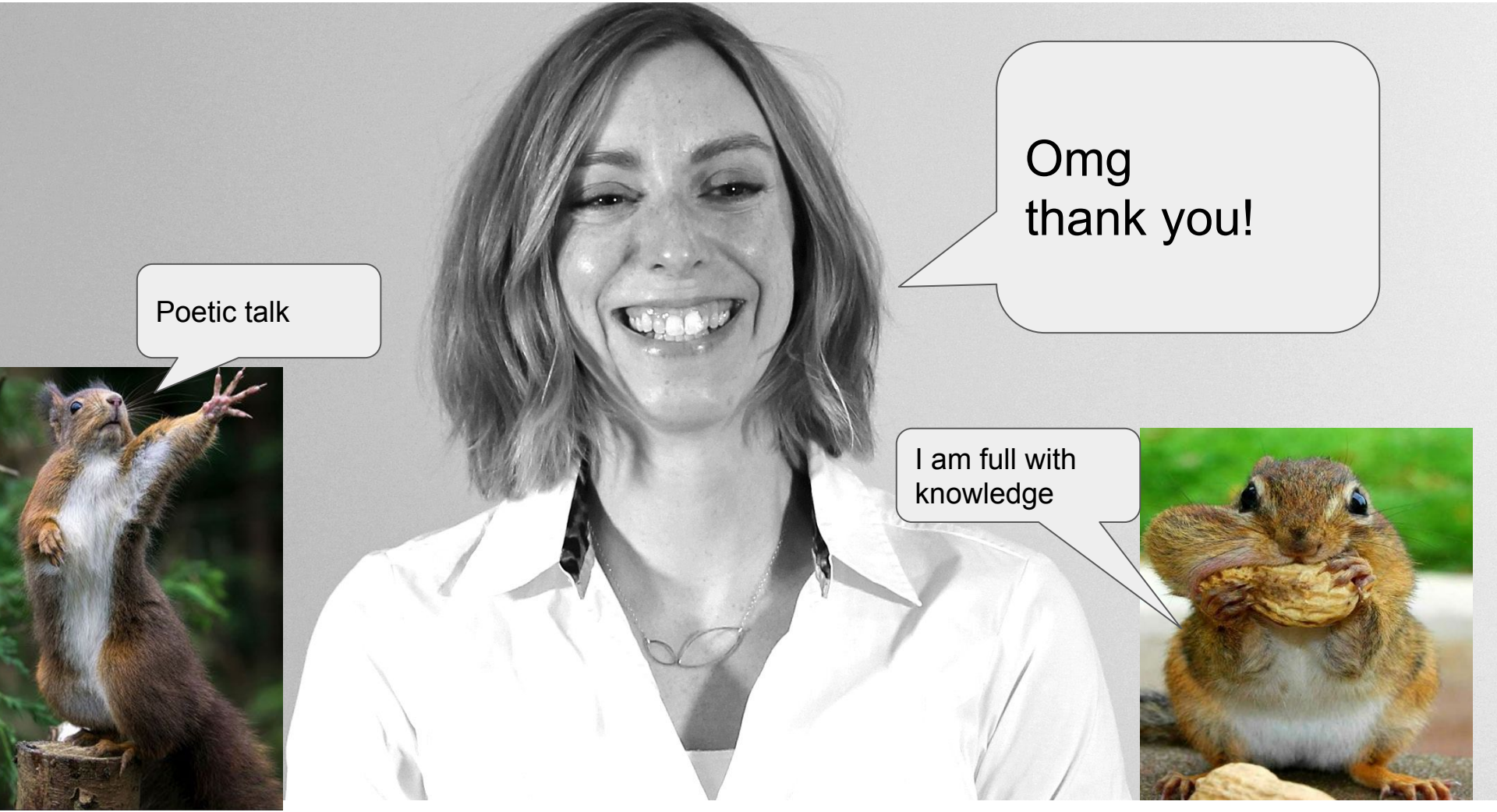


Control analysis (faces v. places)

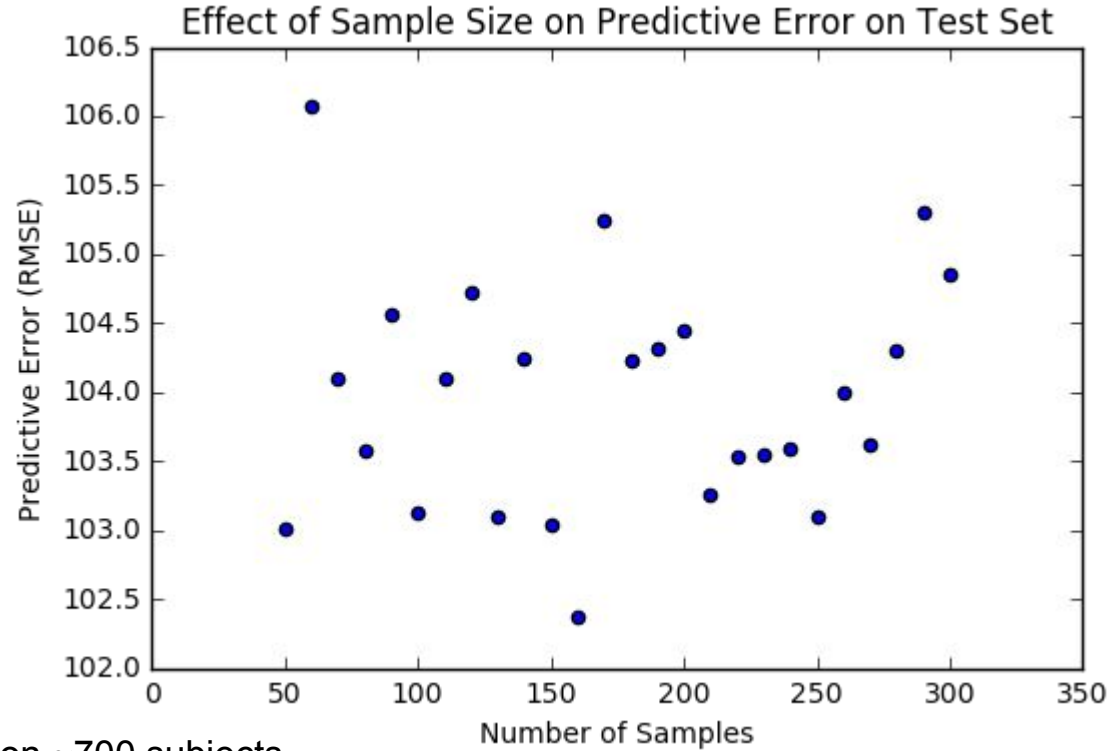


Next Steps, Open Questions

- What regions reliably predict behavior?
  - “Lesion” individual brain areas and test performance
- What are the best ML classifiers?
  - parametric vs nonparametric, linear vs nonlinear
- Do these results extend to other psychological processes?
  - emotion, social cognition
  - resting-state


Omg
thank you!
Poetic talk
I am full with
knowledge

More test data = lower predictive error?



SVC trained on ~700 subjects