

# Transfer learning for neuroimaging data

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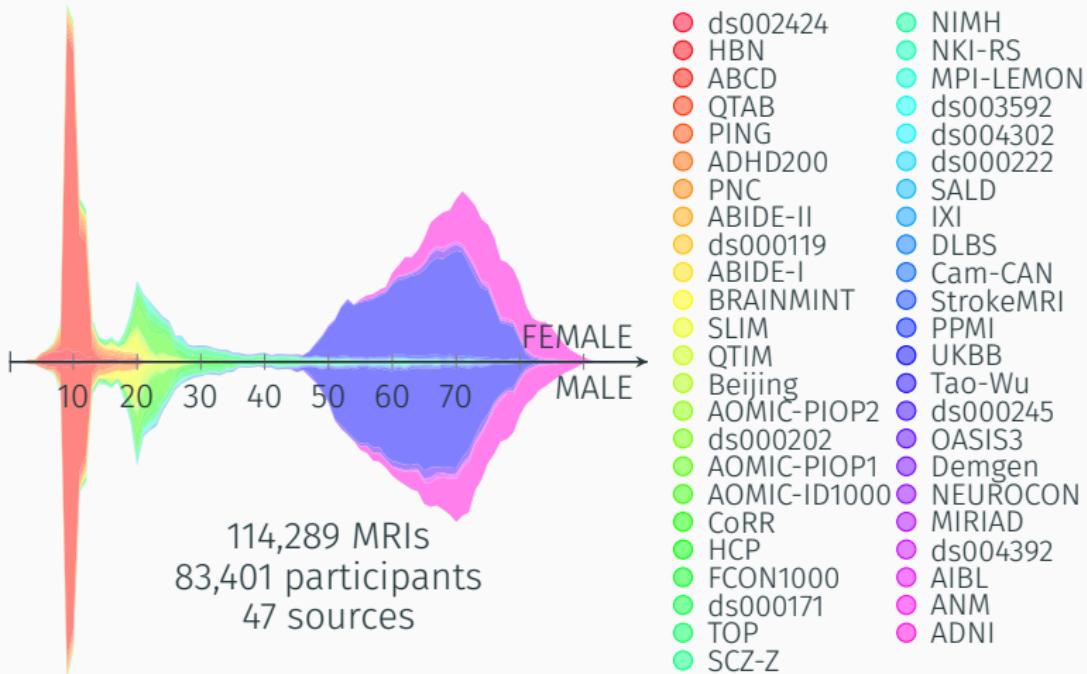
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## Background

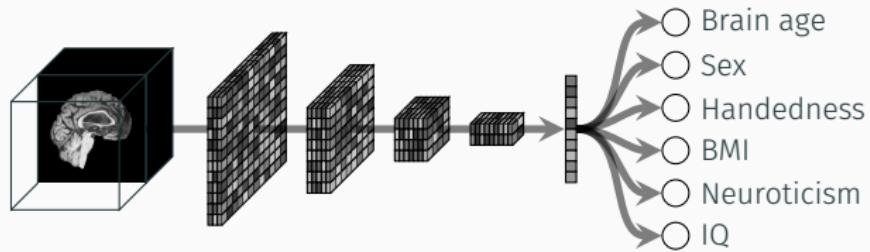
- Pretrained models for computer vision have facilitated the democratization of cutting-edge technology for processing natural images, allowing practitioners to surpass the state-of-the-art in a wide range of tasks even when resources are limited
- Why not try to achieve this for neuroimaging data as well?
- Bonus: Large, complex neural networks trained on vast amounts of heterogeneous data can learn non-linear and abstract representations that allow us to further understand brain variability.



# Methods



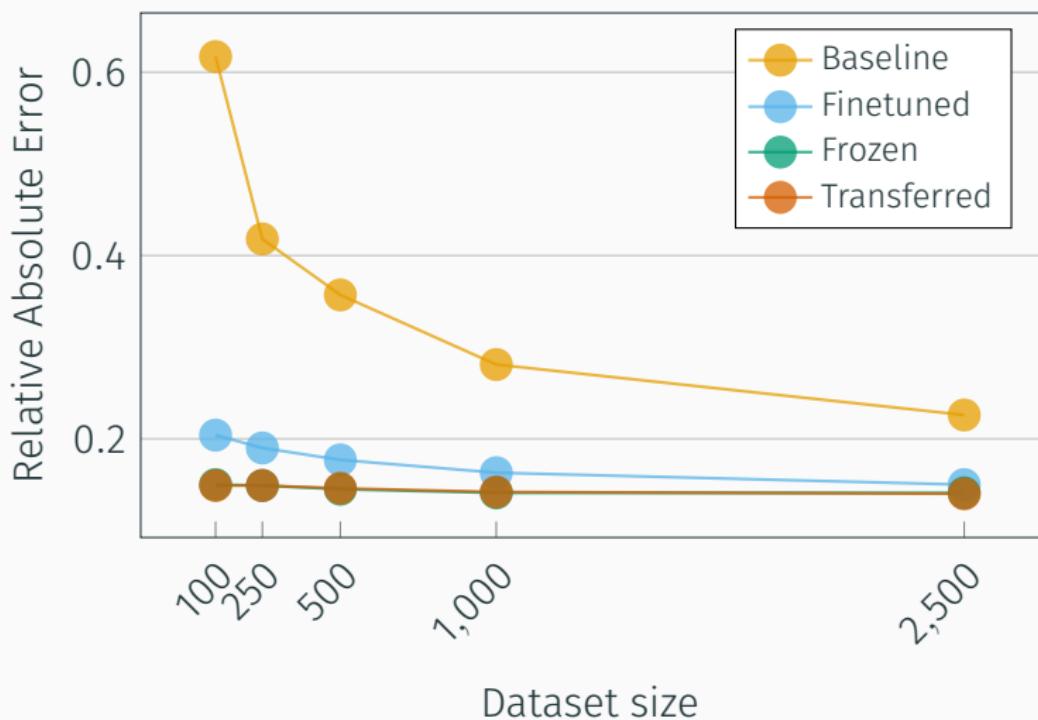
# Methods



# Results



# Results



# Results

- Each entry is the average over 100 bootstrapped training samples of size  $n$ 
  - Additional 20% for validation and 20% for testing
  - 9 models with different hyperparameters are fit, the best is selected based on validation performance
- A model trained from scratch (baseline), and three using different transfer learning strategies
  - Transferred: The pretrained model is directly applied
  - Frozen: The pretrained model is retrained while freezing everything but the final layer
  - Finetuned: The pretrained model is used for initialization, then fully retrained



# Results

Relative Absolute Error

1  
0.8  
0.6  
0.4

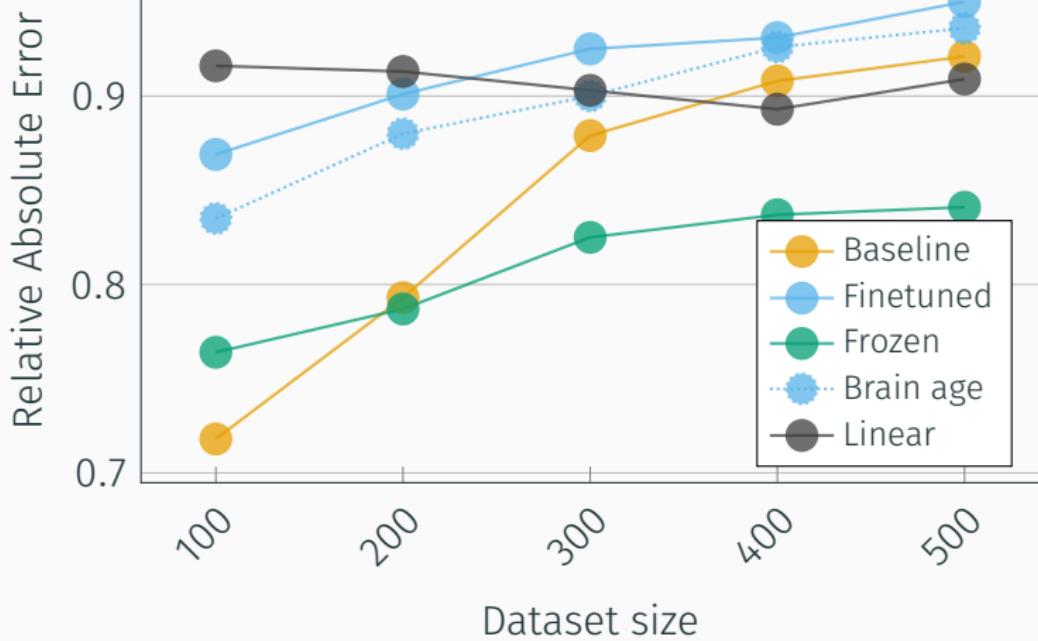
100 200 300 400 500

Dataset size

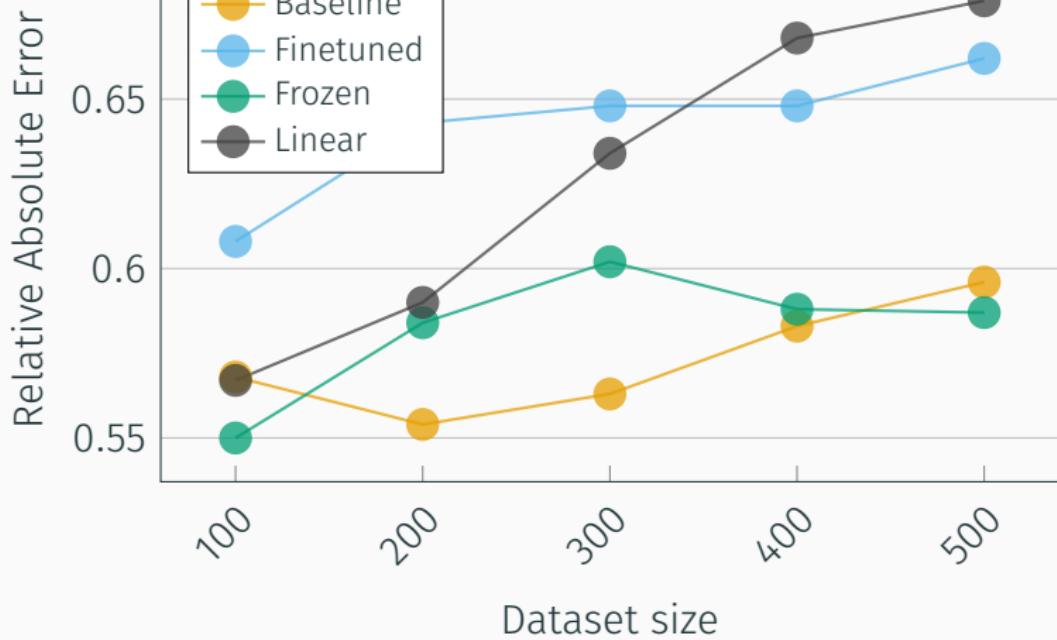
- Baseline
- Finetuned
- Frozen
- Transferred



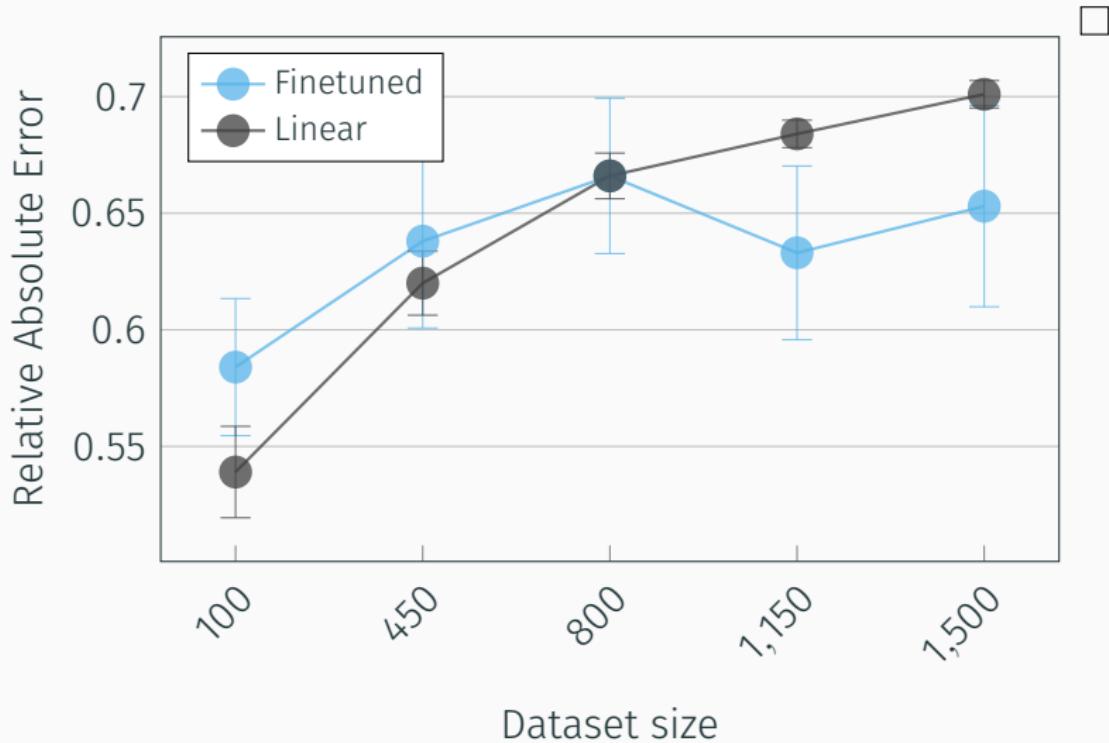
# Results



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Why does the deep learning model not behave asymptotically?

- It shouldn't (bad luck?)
- Double descent? (👉)
- Some property of the data? (heterogeneity?)
- Some property of the model? (too simple?)
- **Some property of the procedure?**

