How aligned are different alignment metrics?

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1. Many metrics of model-brain alignment yield conflicting results

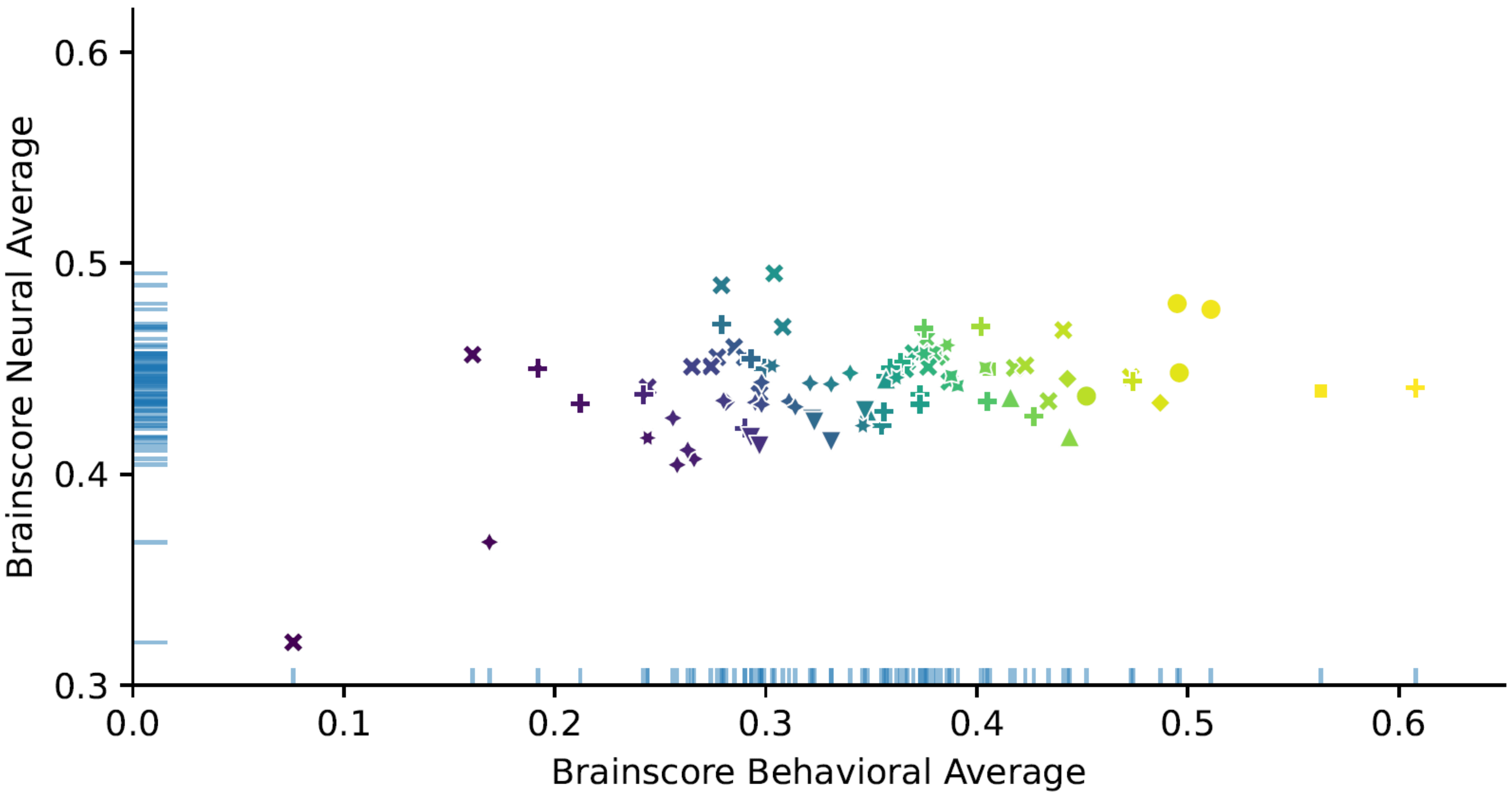
Motivation

Researchers have put forward many metrics by which the "brain-likeness" of DNNs can be measured.

Benchmark collections such as Brain-Score[1] create overall rankings based on many individual scores.

Do these metrics agree in their judgements?
How many dimensions are there to model-brain alignment?
How can we properly integrate multiple metrics into integrated judgements?

2. On Brain-Score, behavioral scores have a much larger dynamic range than neural scores



Comparison of the Neural and Behavioral Average on Brain-Score: Behavioral scores explain 95% of the variance on the leaderboard. Colour indicates overall rank, with higher ranks being lighter

Discussion

Which method of aggregating scores is most appropriate?

Desirable properties:

- Independence of irrelevant alternatives
- Accounting for the non-linearity of the measurement scale
- Reflects knowledge about the ventral stream (hierarchy of scores)

Methods

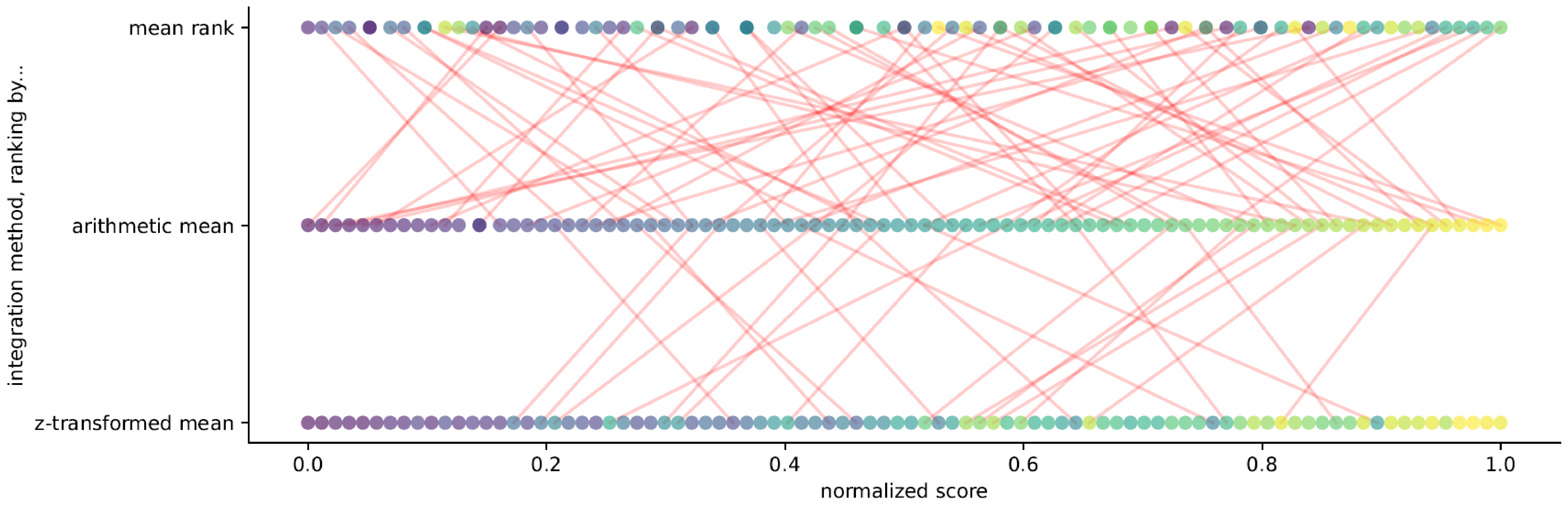
Clean scores

remove one benchmark with >50% missing scores
remove models with any missing scores

Analysis

Correlate scores with Spearman's rank correlation for all pairs
Recalculate Brain-Score aggregates for different aggregation techniques

3. Integrating metrics should make better use of relationships between benchmarks



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References:
[1] Schrimpf, M., Kubilius, J., Hong, H., Majaj, N. J., Rajalingham, R., Issa, E. B., ... & DiCarlo, J. J. (2018). Brain-score: Which artificial neural network for object recognition is most brain-like?. BioRxiv, 407007.

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