

Evaluating geometric similarity between neural activity and behavior using multi-level representational similarity analysis

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Introduction

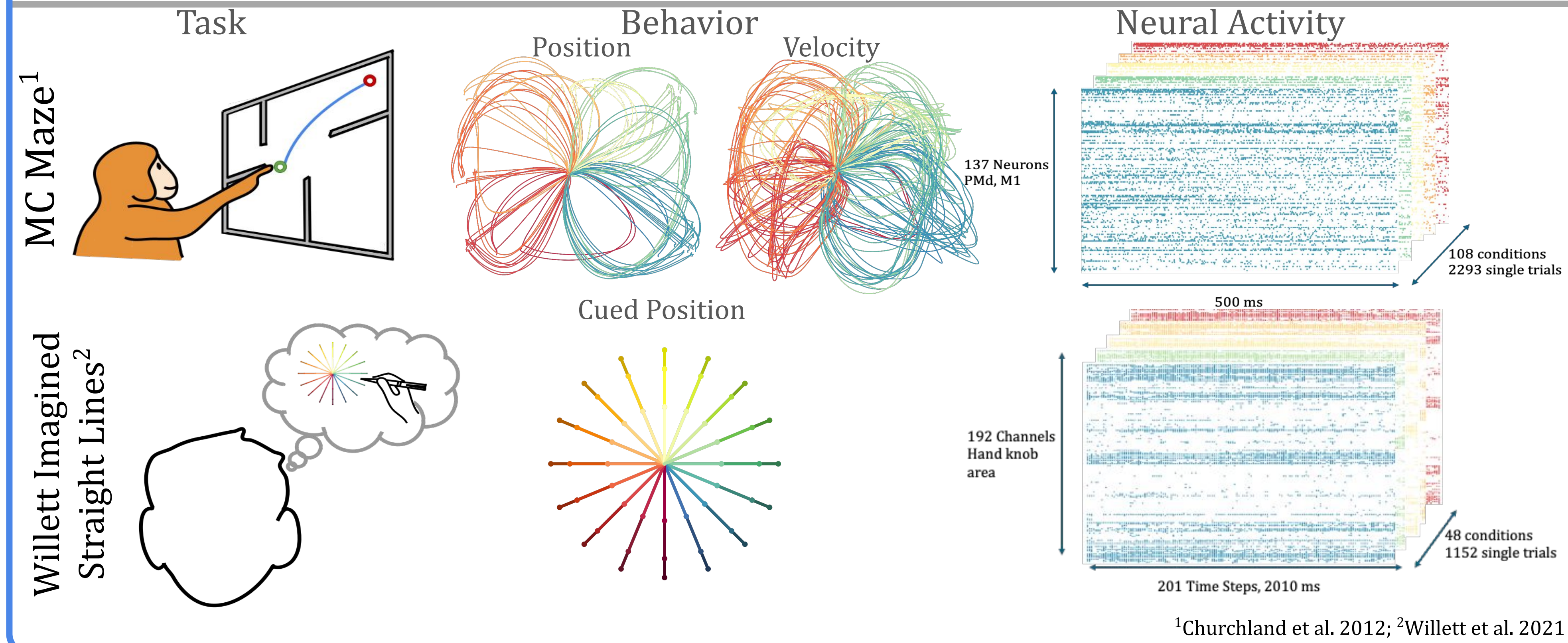
Measuring geometric similarity between neural and behavioral representations is crucial for understanding how neural activity is transformed into behavior

- Geometry is represented by pairwise distances between neural (behavioral) trajectories
- Similarity is calculated using Representational Similarity Analysis (RSA)

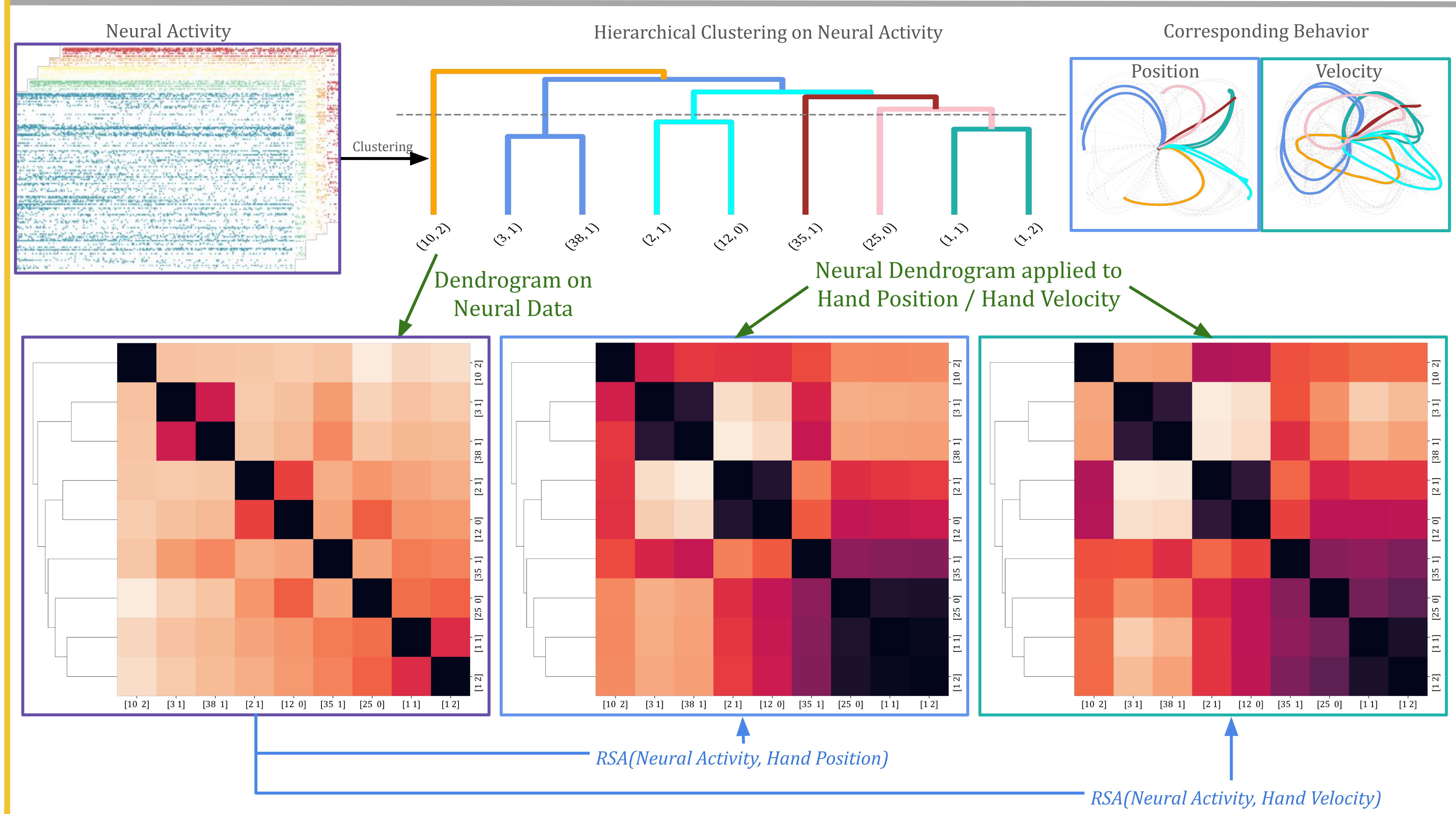
Goal:

- Qualitative and quantitative view of neural and behavioral geometric similarity
- Interpreting success of decoding models

Dataset



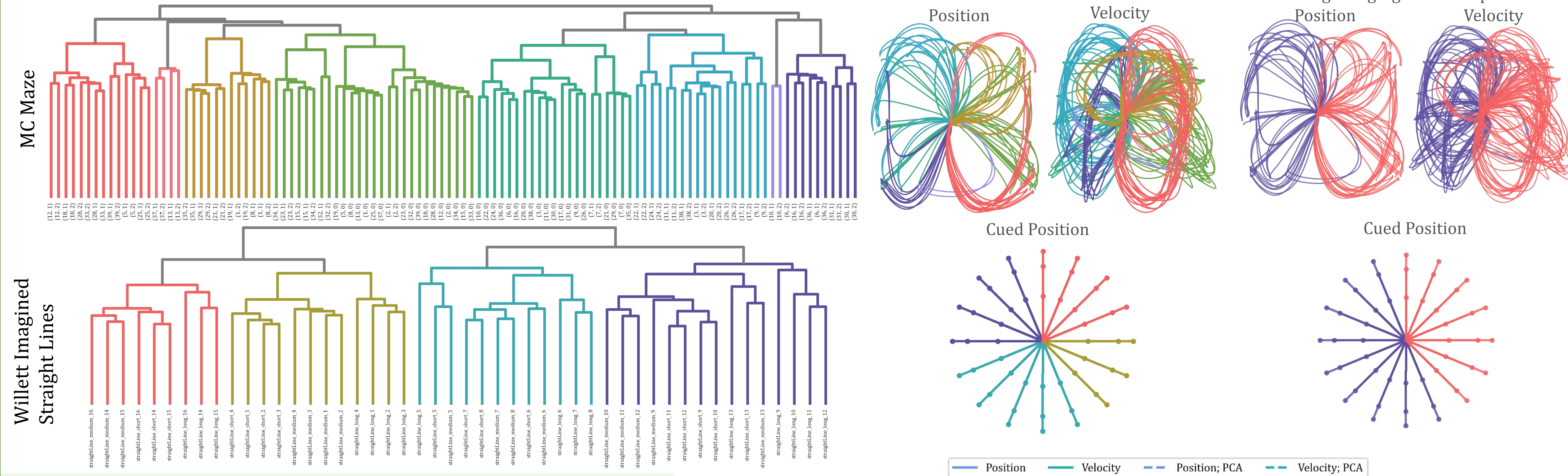
Methods



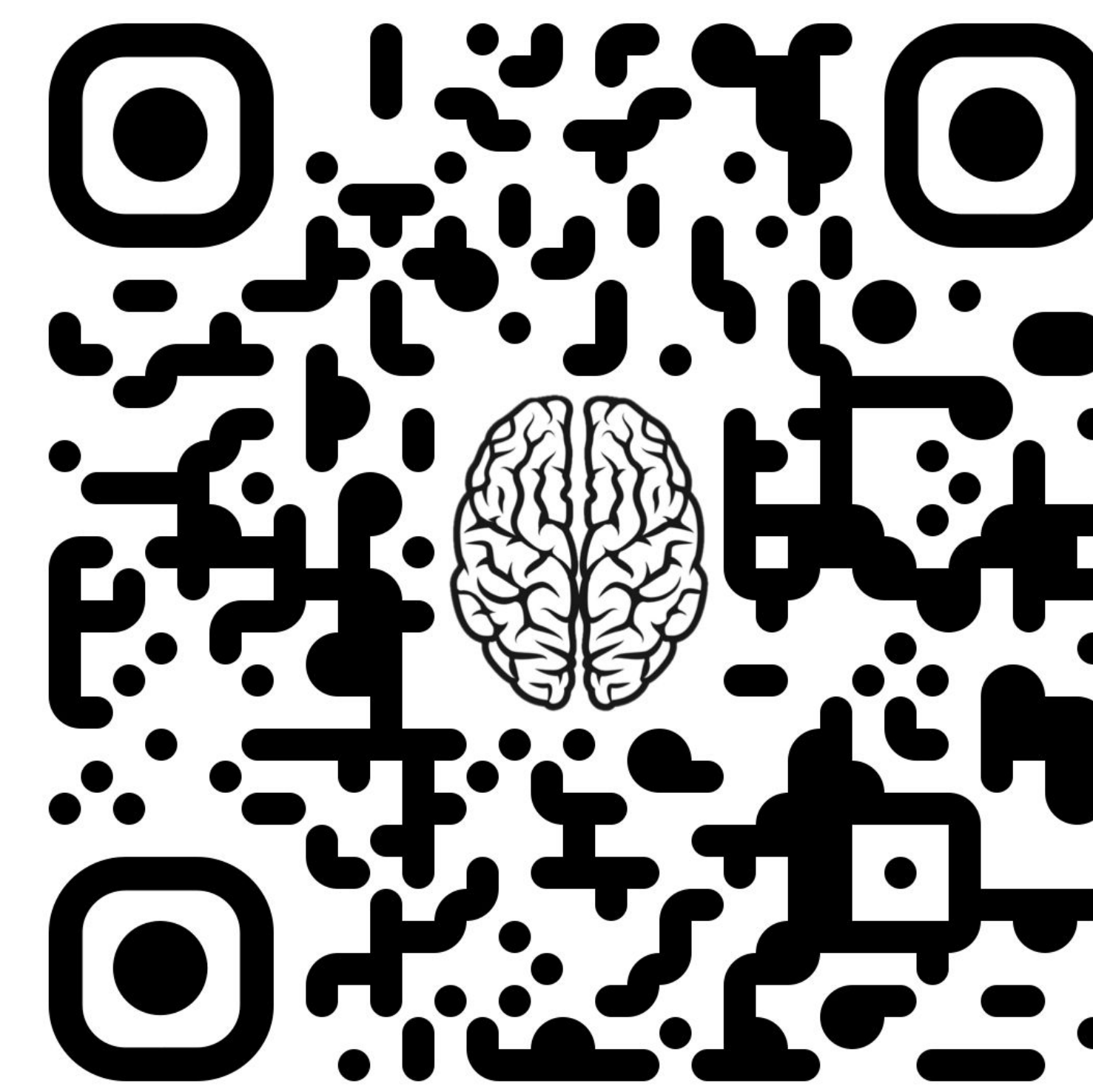
Representation Similarity Analysis (RSA) between X, Y = Spearman Rank Correlation (X, Y)

Results

Clustering in the Neural Domain Resulted in the Identification of Similar Behaviors

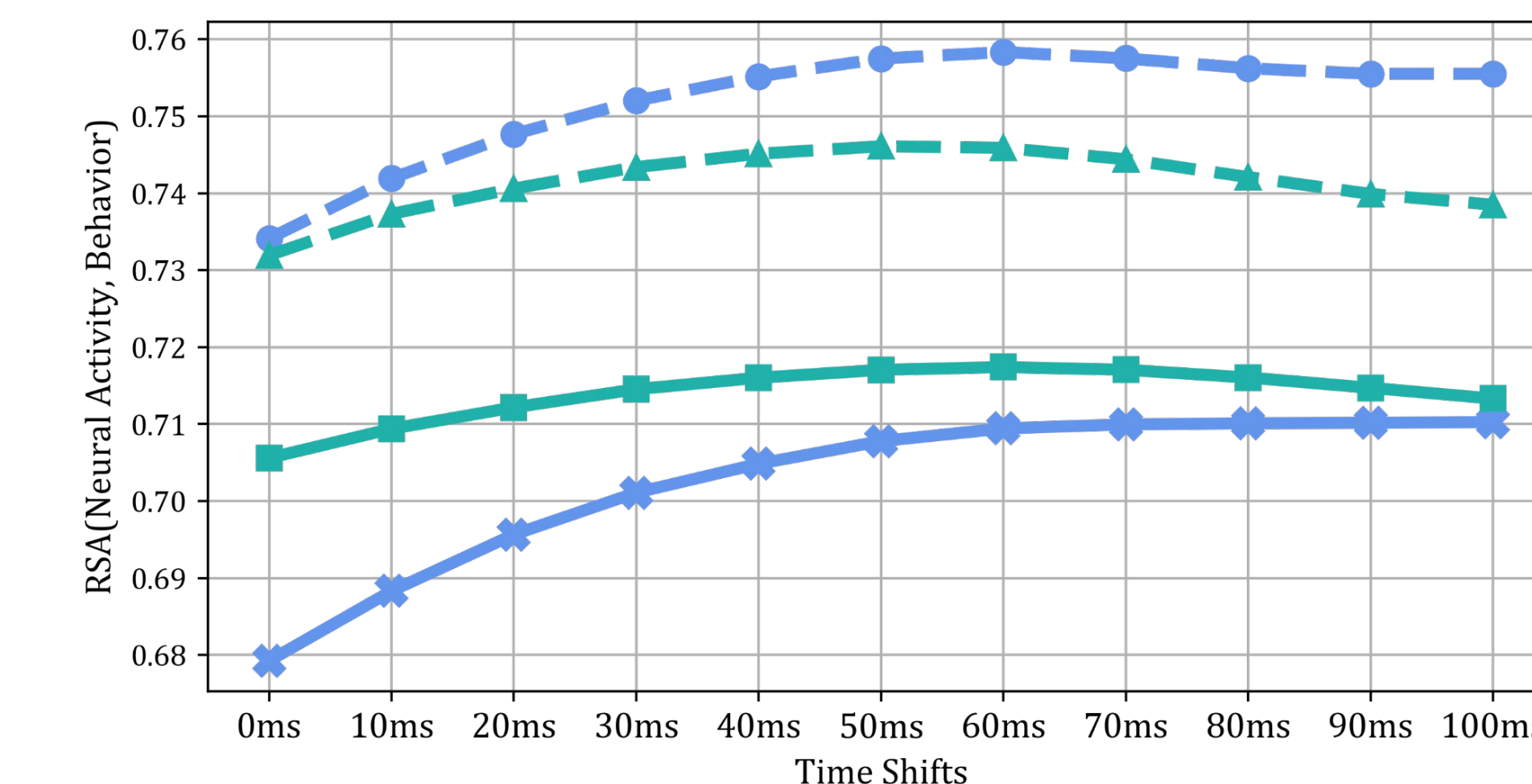


Interactive Visualization

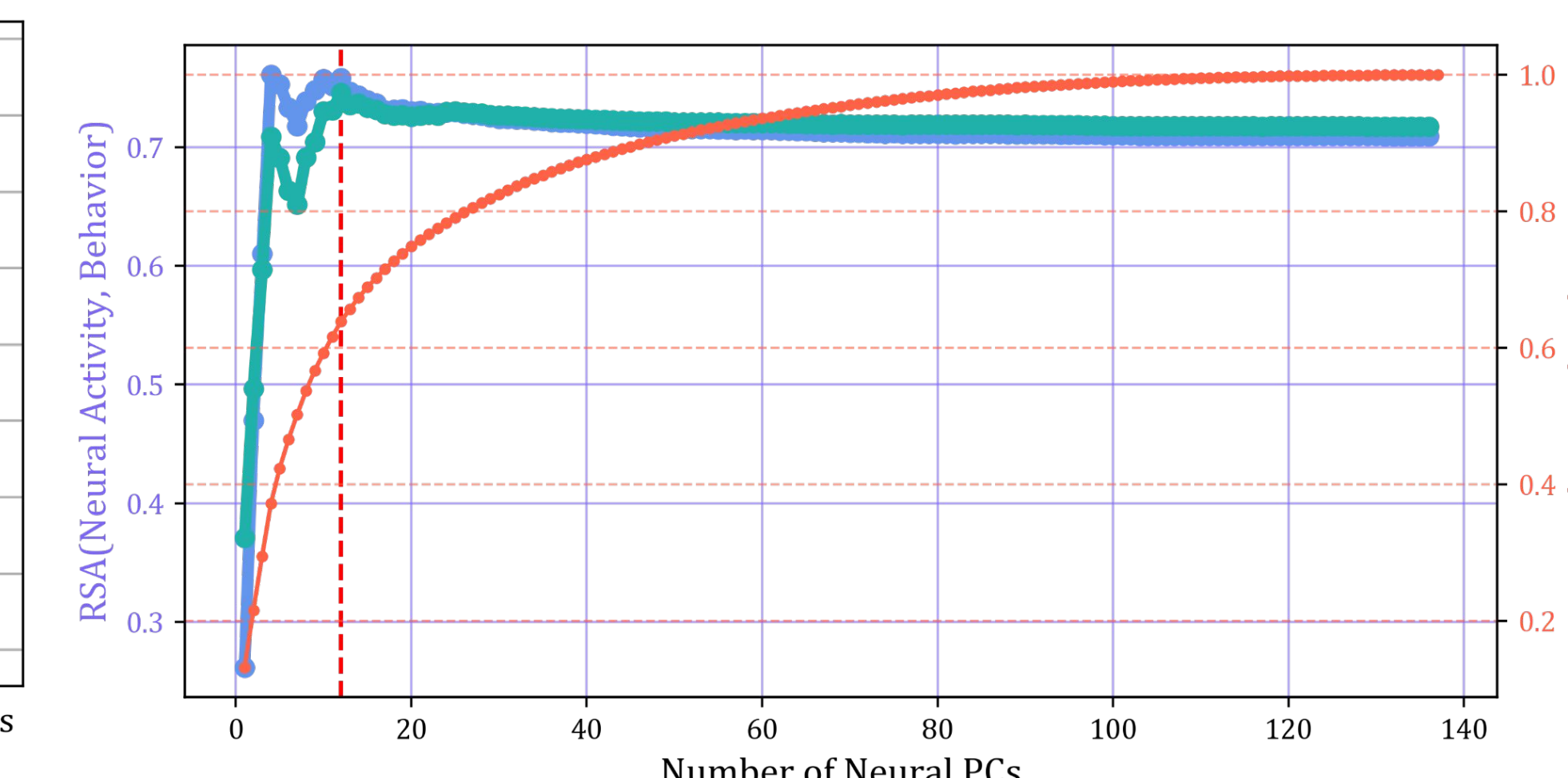


Scan this to view an interactive version of the proposed method

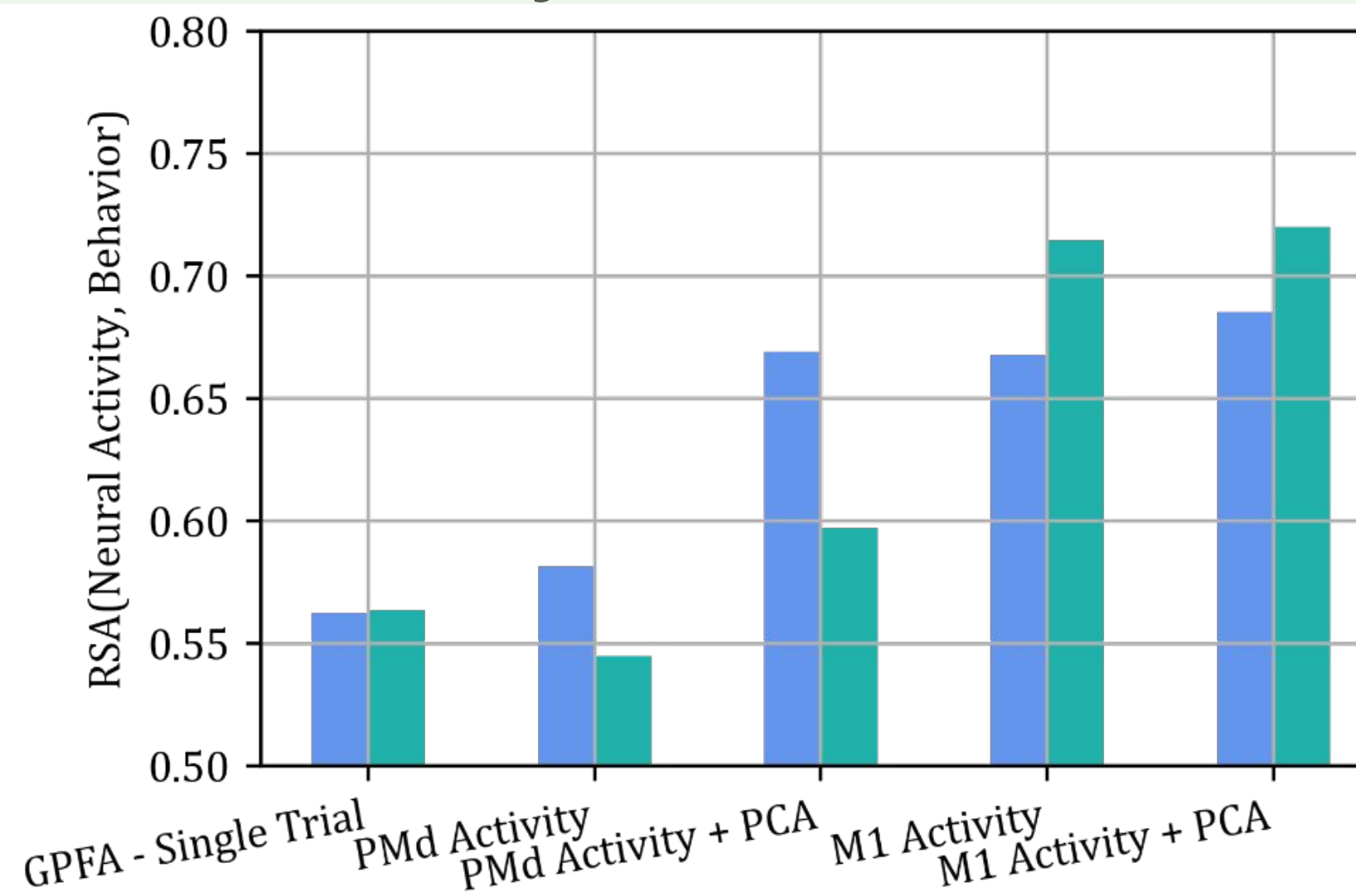
Time Shifts



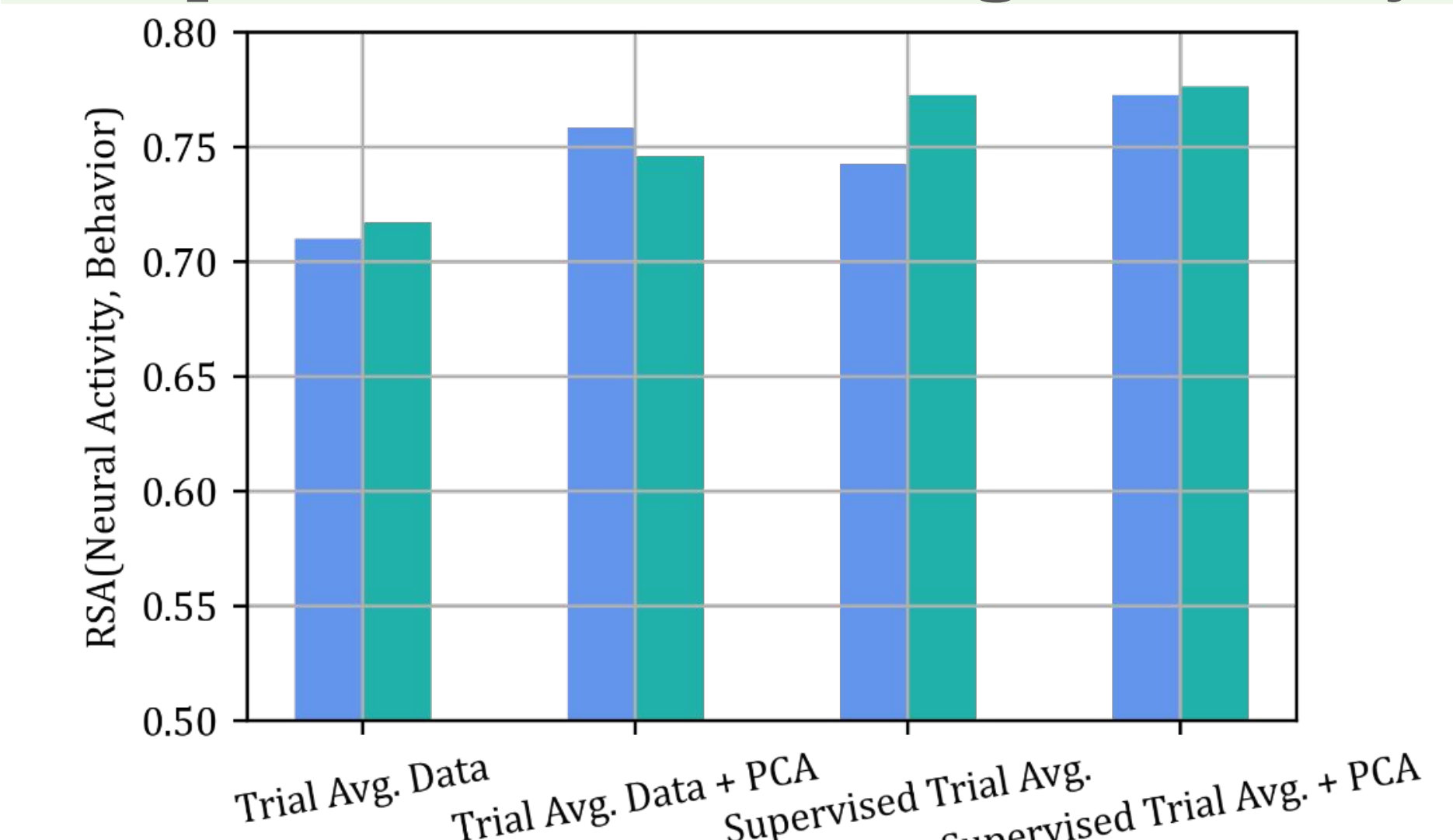
Geometry vs Dimensionality



Geometry of M1 and PMd



Population vs Decoding Geometry



Conclusion

- Provides an approach to analyze population-level geometric similarity between neural and behavioral trajectories
- Evaluate the geometric similarity between behavior and neural representations across latent models and brain regions
- Our approach is not specific to any species or task. We plan on extending this to complex behavioral tasks and contexts in other species.