

Predicting Stroke Recovery with Nonlinear Low-Dimensional Embeddings of Behavioral Profiles

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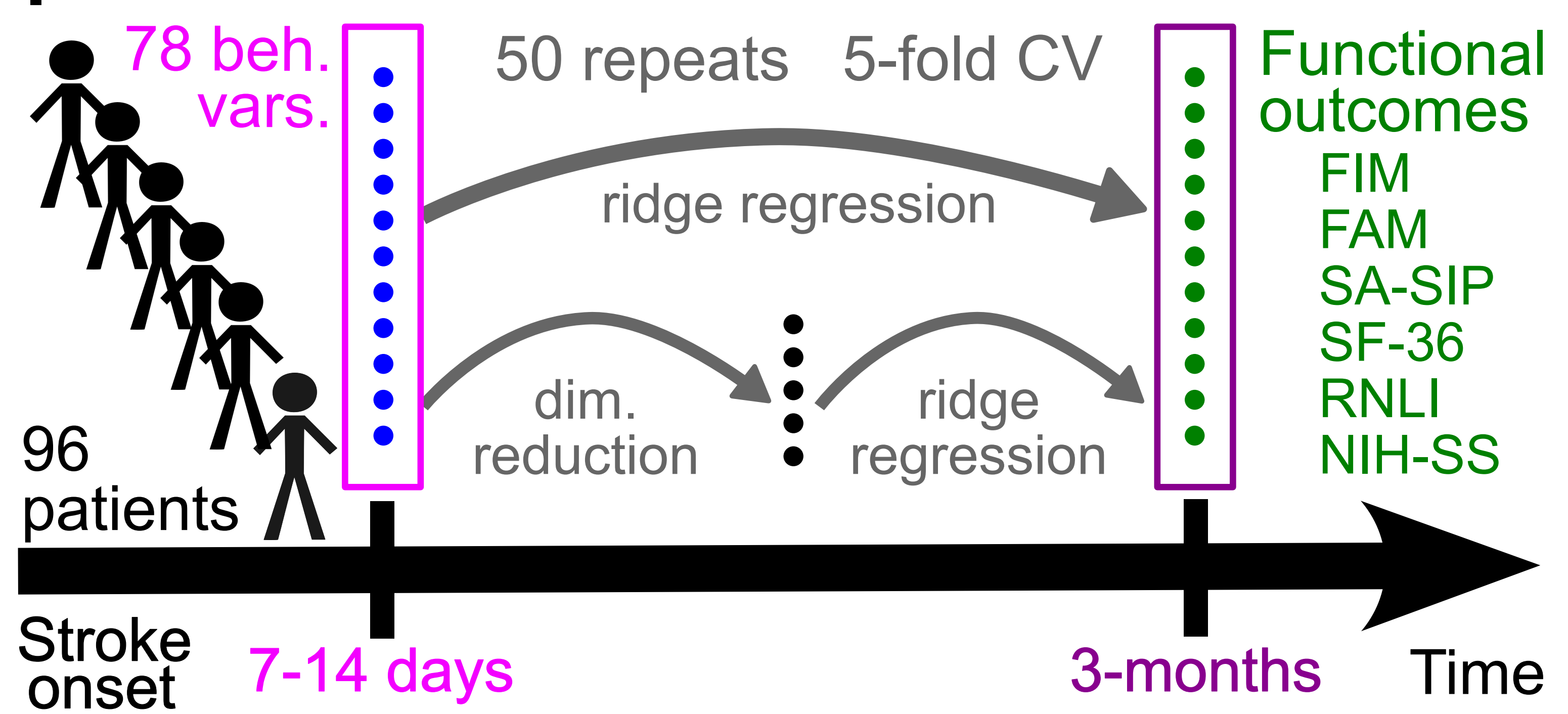
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Which measures of post-stroke behavior predict chronic outcomes?

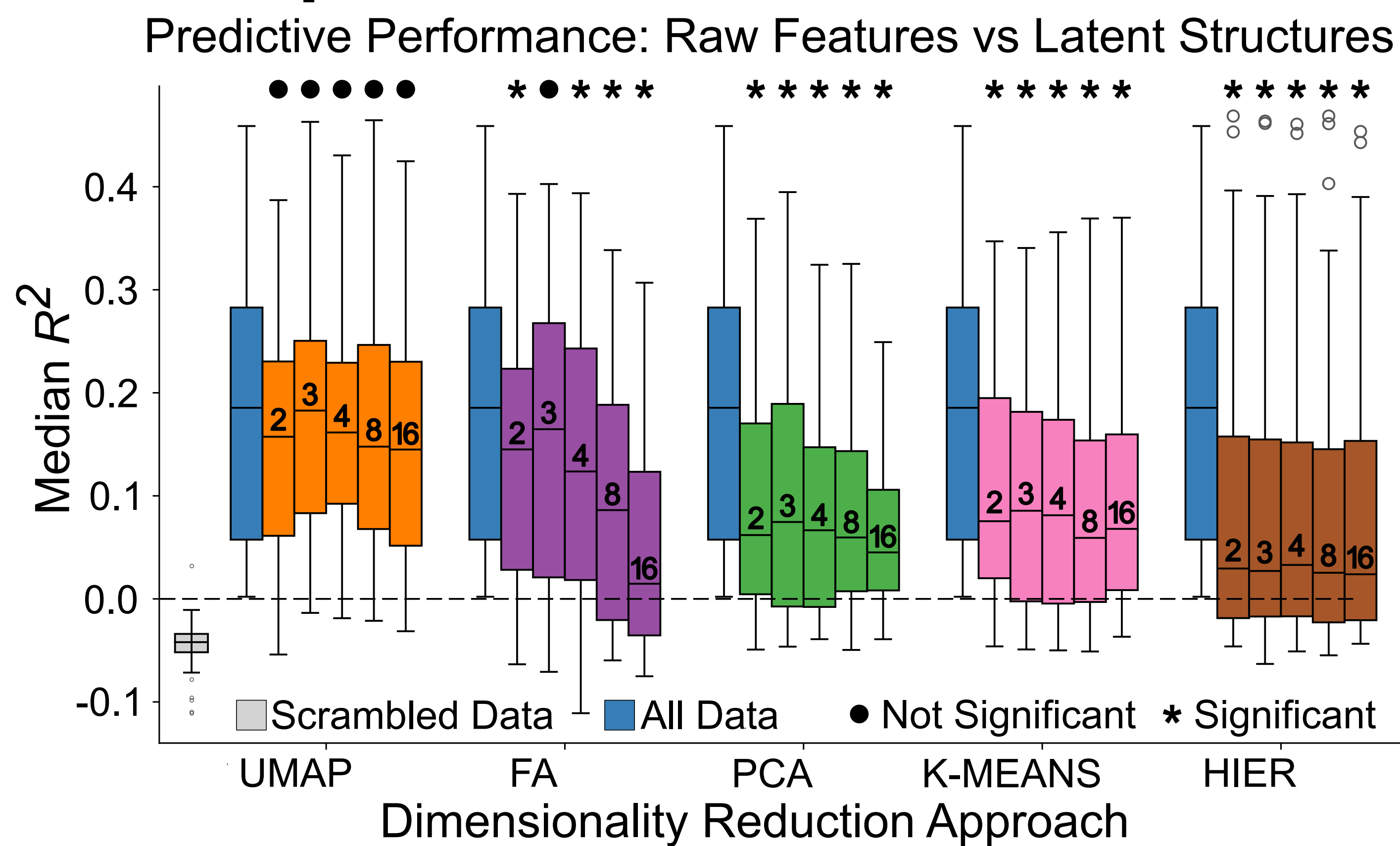
- Stroke = 3rd leading cause of death / disability¹
- Data-driven approaches may improve functional outcome prediction (e.g., activities of daily living, social reintegration).
- Latent variables have been used to characterize post-stroke deficits.^{2,3}

96 first-time unilateral ischemic stroke patients (53.8 ± 11.1 yrs. at time of stroke, 47% women, 13.6 ± 2.7 yrs. education)
 91.7% right-handed 49.0% right-sided lesion
 63.5% Black/Afr-Am 47.9% smoked tobacco in the last year
 97.7% non-Hispanic

Low-dimensional embeddings may reveal which clinical data best predict chronic outcomes.

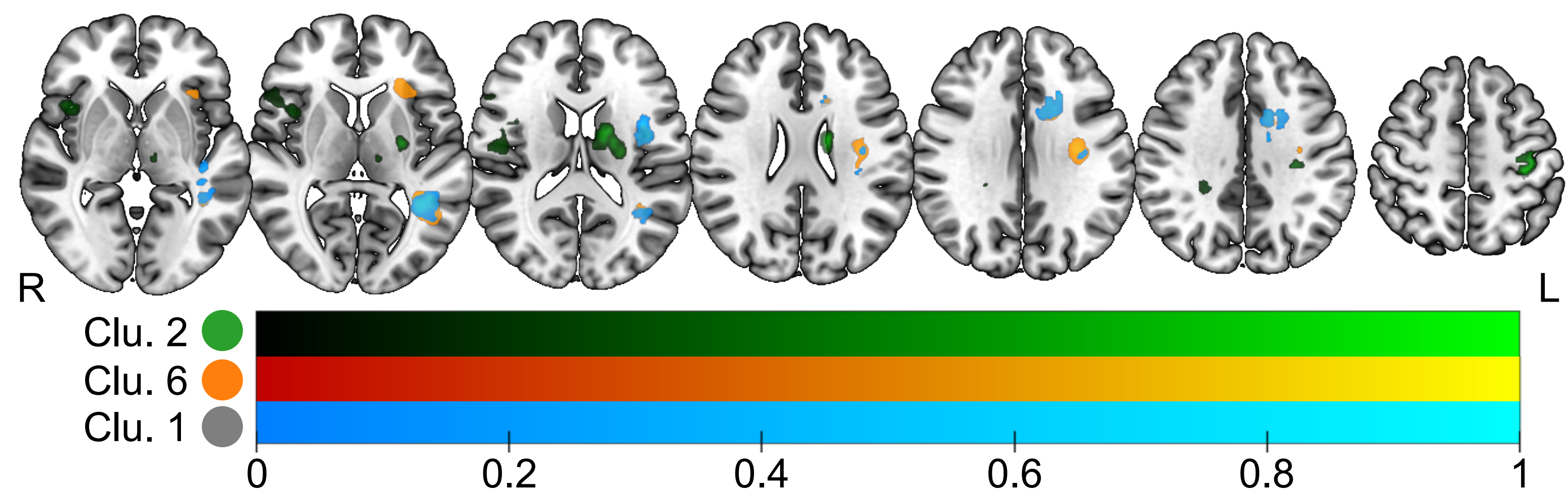


Nonlinear latent embeddings preserve predictive information



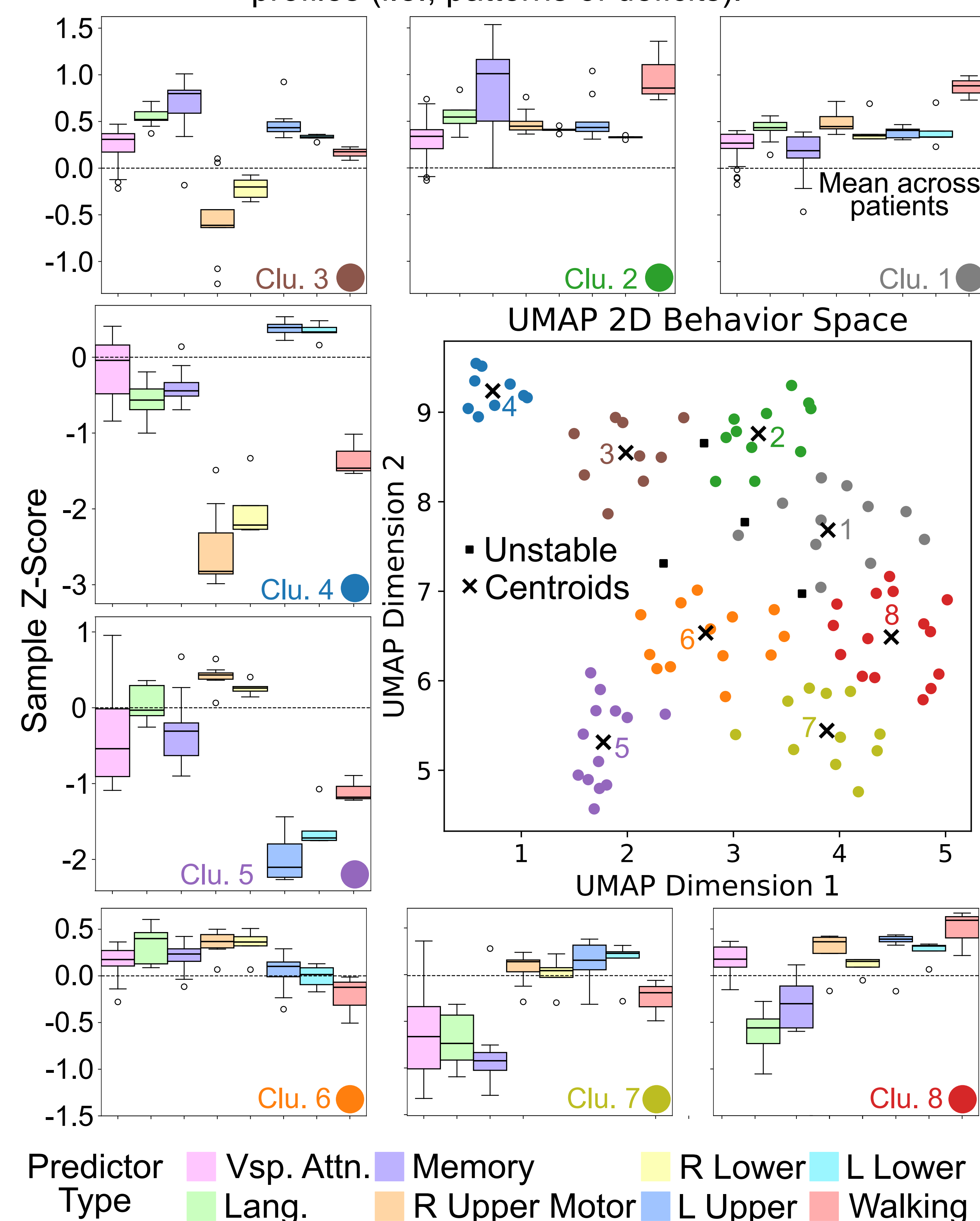
Distinct behavioral profiles correlate with distinct lesion sites

This approach reveals brain-behavior links at the profile level, not just single symptoms.



Predictive UMAP embeddings arrange patients by behavioral profiles

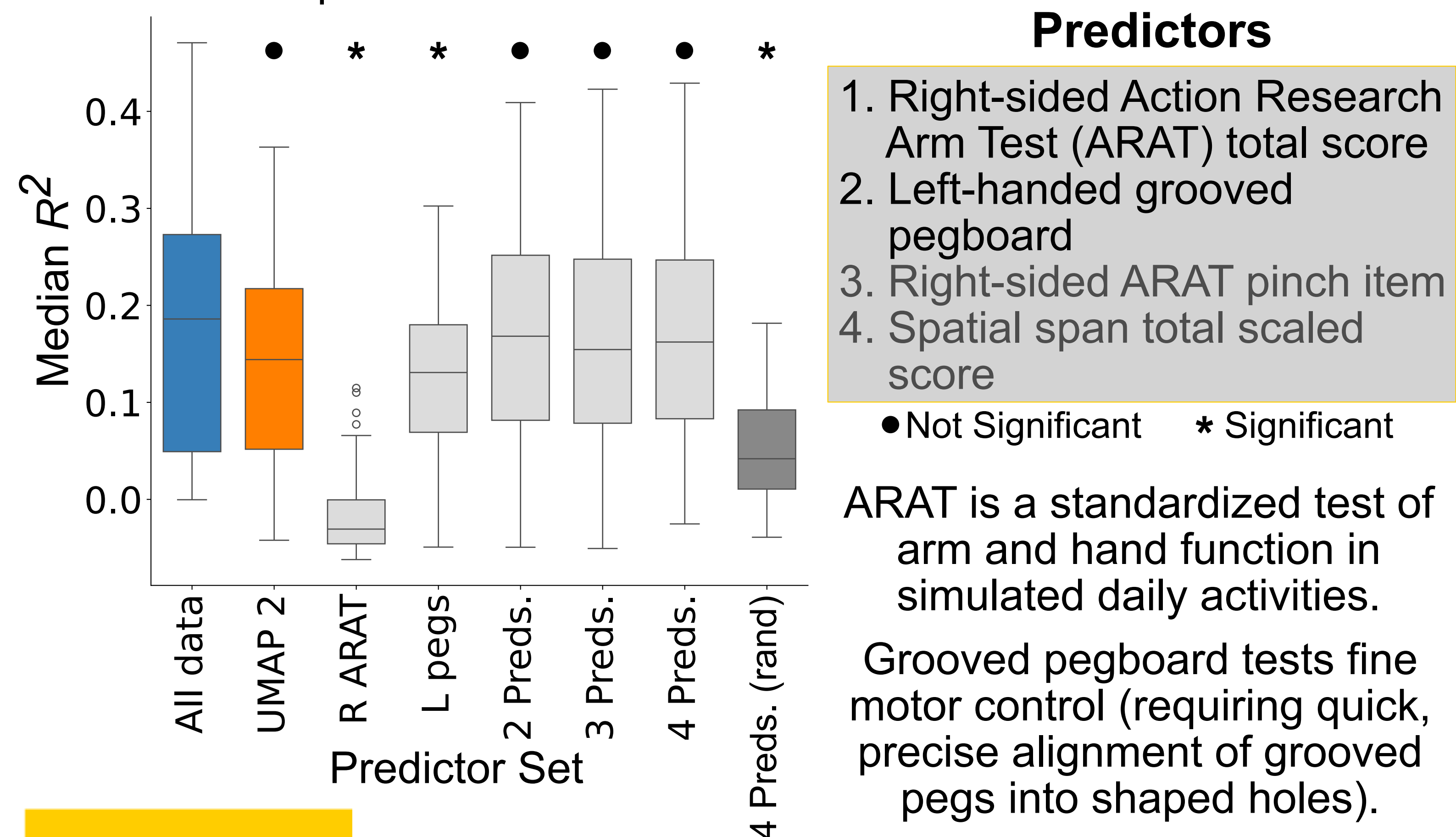
UMAP embeds patients into 2D space. Clustering within embedding reveals separable behavioral profiles (i.e., patterns of deficits).



Measures of upper limb function are most predictive

Tests were identified that were maximally informative of proximity to UMAP 2D clusters.

Two tests predicted chronic outcomes almost as well as all data.



Conclusions

- Nonlinear embeddings preserve predictive power of the full dataset.
- Latent embeddings of large-scale behavioral data can reveal which tests are most predictive of chronic outcomes.
- Neuroanatomical structure (i.e., lesion location) correlates with high-dimensional behavioral profiles, not just specific symptoms.
- Our approach aids in the development of novel outcome-predictive diagnostic tools. It also suggests basic research questions (e.g., why are these behavioral profiles common?).

References

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3. Corbetta, M., et al. (2015). Common Behavioral Clusters and Subcortical Anatomy in Stroke. *Neuron*, 85(5), 927-941.

Acknowledgements

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