Extracting **interpretable signatures** of **whole-brain dynamics** through systematic comparison

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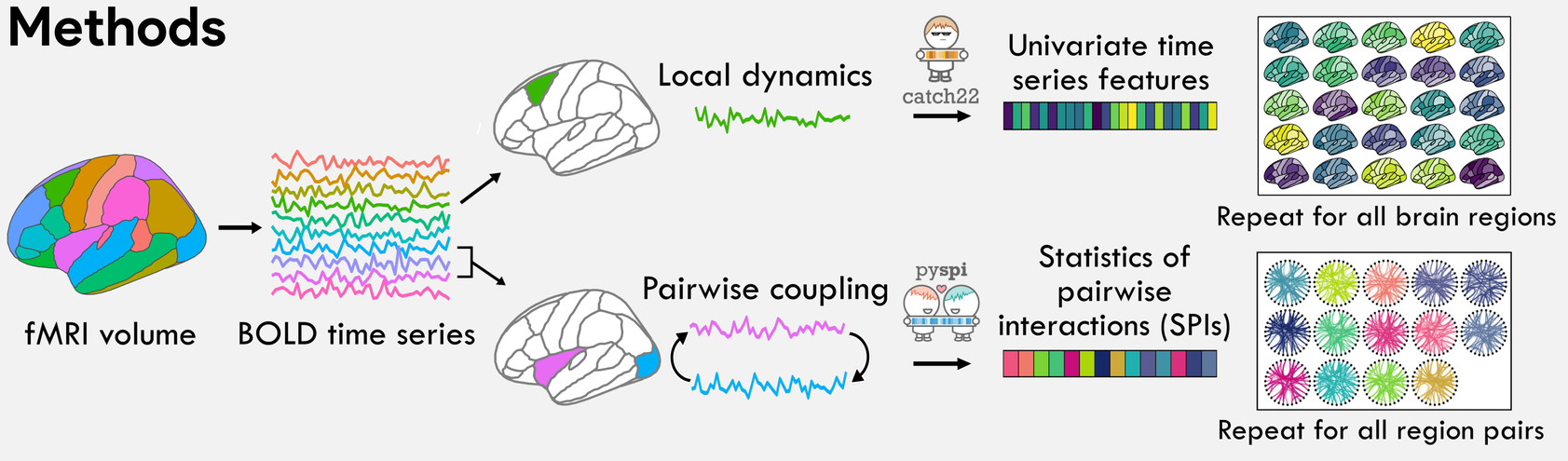
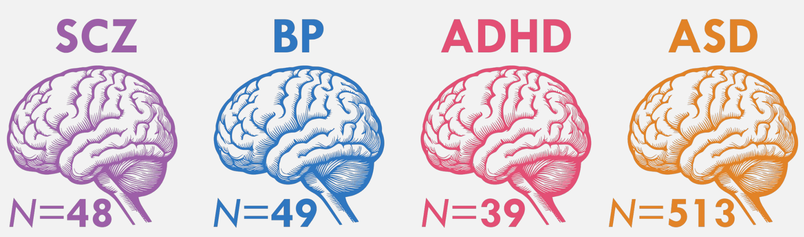
Background

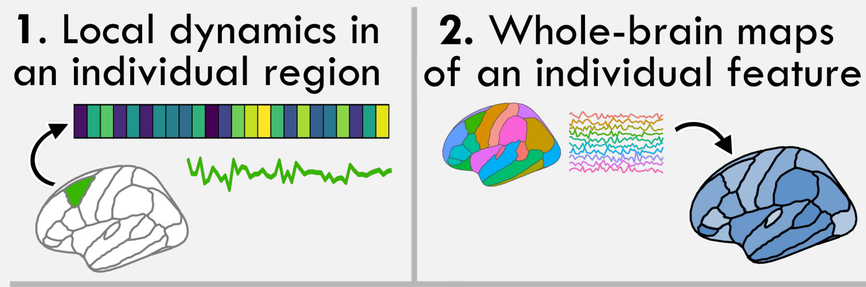
Despite myriad methods for **quantifying resting-state brain dynamics**, the choice of how to represent fMRI multivariate time series is typically made **subjectively** with a limited set of statistics. Instead, we propose the first **comprehensive framework** for the **systematic comparison** of **interpretable feature-based representations** of both **local intra-regional dynamics** and **inter-regional coupling** that is flexible across many modalities and clinical applications.

Methods

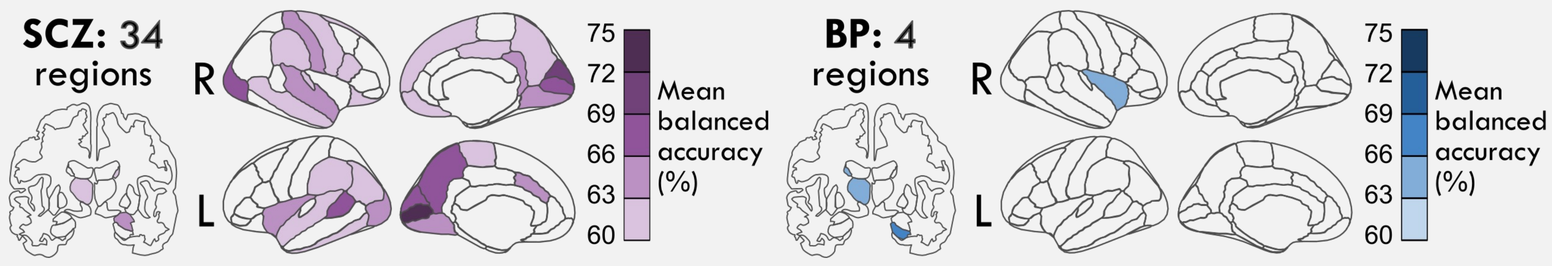


Five distinct **dynamical representations** were compared for **neuropsychiatric disorder** case-control analysis

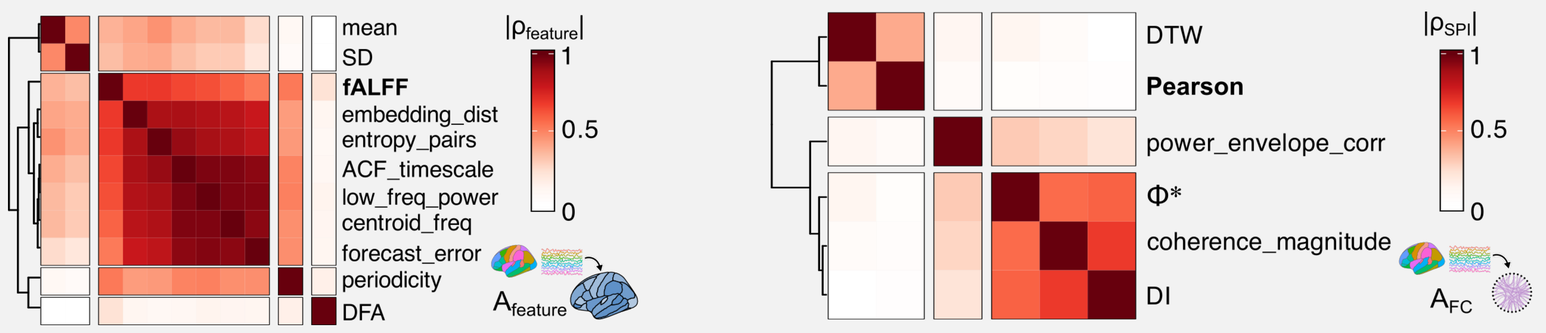




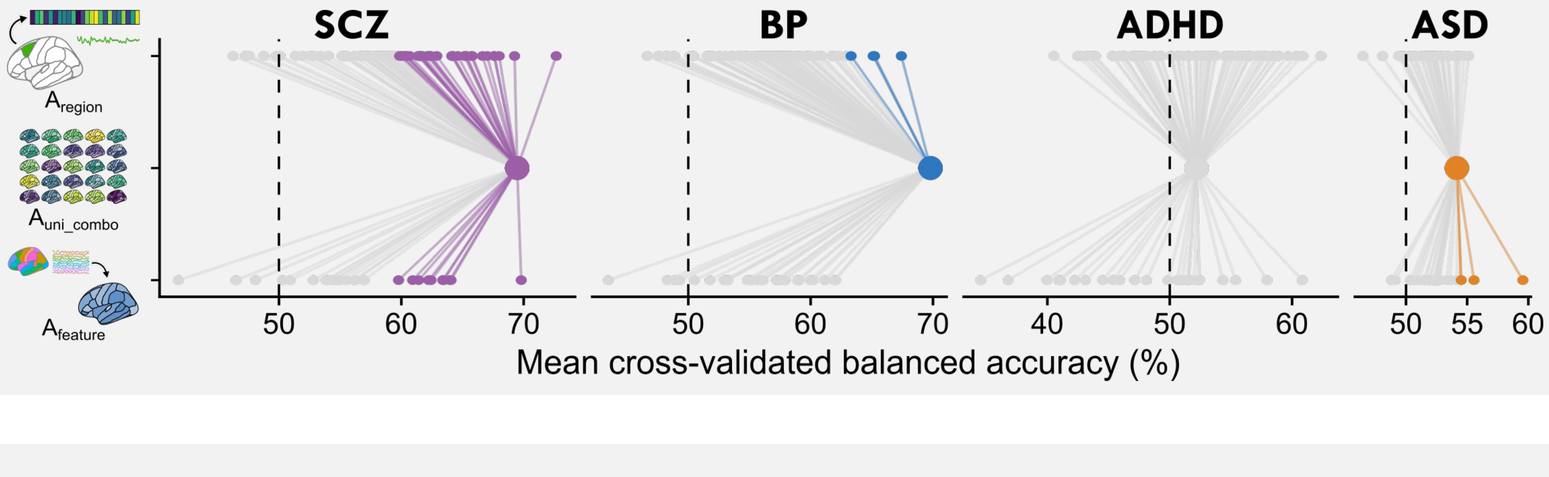
fMRI dynamics of **individual brain regions** distinguish cases vs. controls



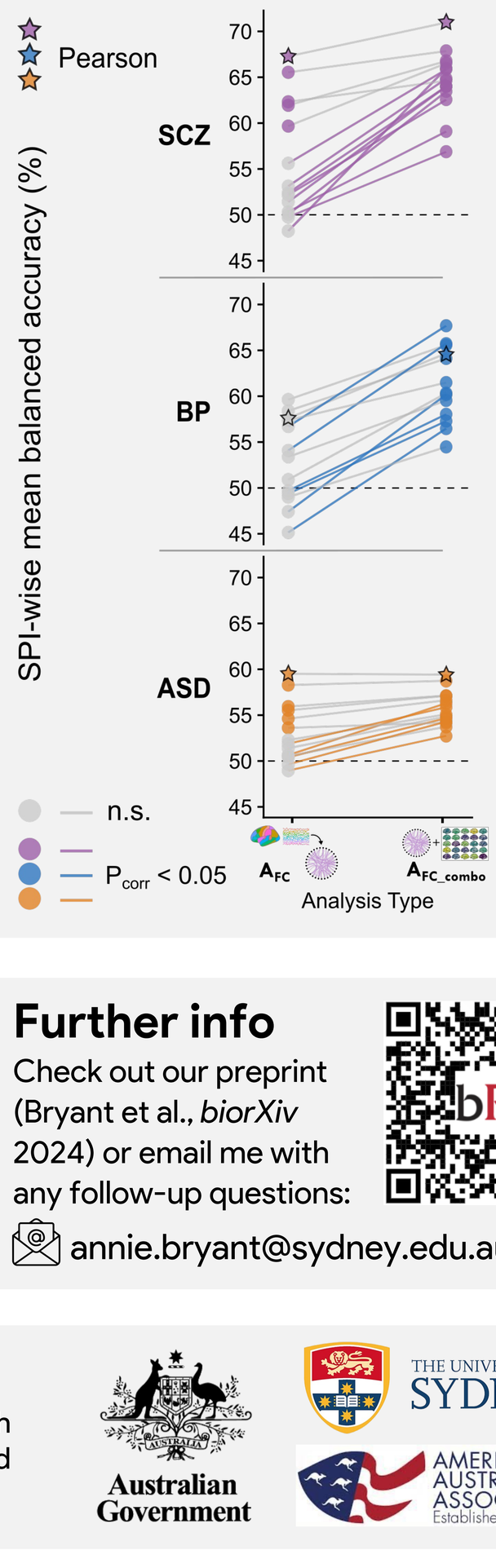
Linear properties are well suited to quantify whole-brain resting fMRI dynamics



Combining **multiple** properties of **intra-regional dynamics** can be **beneficial**



Including **brain-wide local dynamics improves FC** classification performance



Conclusions

We introduce a **general methodology** to systematically compare **intra-regional dynamics** and **inter-regional coupling** using **diverse** and **interpretable** time-series features. Our case study with neuropsychiatric disorders highlights surprisingly strong performance of **simpler statistical representations**, such as dynamics within an individual brain region, and underscores the utility of **linear time-series analysis** techniques for fMRI case-control analysis.

Further info

Check out our preprint (Bryant et al., *bioRxiv* 2024) or email me with any follow-up questions:

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Selected References

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Acknowledgements

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