# FREQUENCY-DEPENDENT COVARIANCE AND THE CRITICAL BRAIN

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Recent analyses of high-quality data from thousands of simultaneously recorded neurons provide strong support for the hypothesis that the brain operates near the edge of instability [1]. However, these analyses often fail to capture the intricate temporal structure of brain activity, as they primarily rely on time-integrated measurements across neurons [2]. In this study, we present a novel framework designed to explore signatures of criticality across diverse frequency bands and construct a much more comprehensive description of brain activity (see Fig. 1).

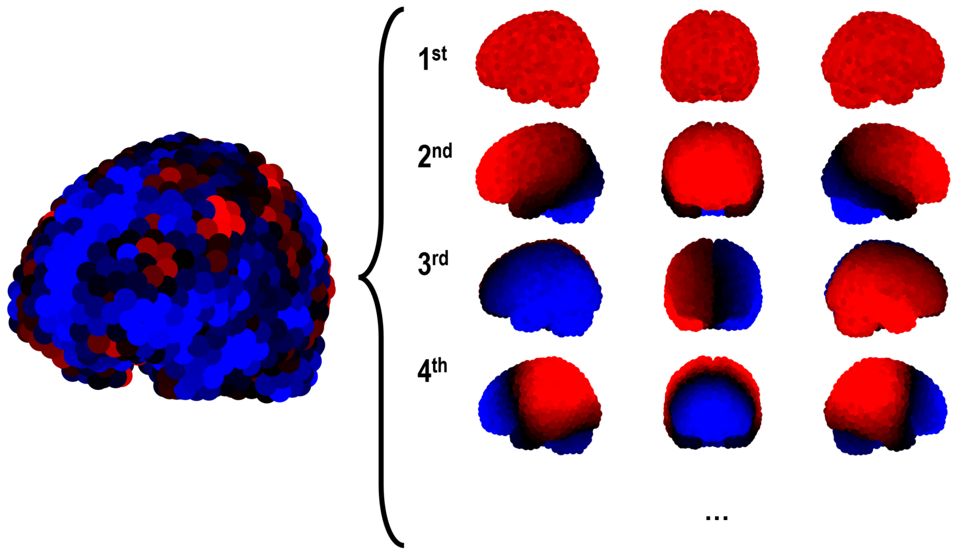


FIG. 1. Brain activity can be decomposed using our novel frameworks as a set of spatio-temporal patterns propagating at different frequencies.

[1] Y. Hu and H. Sompolinsky, *The spectrum of covariance matrices of randomly connected recurrent neuronal networks with linear dynamics*, PLOS Computational Biology **18**, e1009840 (2022).
[2] G. B. Morales, S. Di Santo, and M. A. Muñoz, *Quasiuniversal scaling in mouse-brain neuronal activity stems from edge-of-instability critical dynamics*, Proc. Natl. Acad. Sci. USA **120**, e2301123119 (2023).