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Trajectories through similarity space produced by local neocortical circuits[1] JOHN BEGGS, WEI CHEN, JON HOBBS, AONAN TANG, Indiana University, Bloomington, BEGGS LAB TEAM — The dynamics found in local cortical networks strongly impact the types of computations they can perform. Major classes of cortical network models assume that spatio-temporal activity evolves with either ultra-stable, chaotic or neutral dynamics. While experimental evidence has demonstrated that repeatable activity states can exist in cortical networks, it is still unclear what the spatio-temporal dynamics near these states are. To accurately address this question, the trajectories of similar, but not identical, inputs must be quantified. We use 60 channel microelectrode arrays to measure spatio-temporal trajectories through similarity space at 4 ms resolution in organotypic cortical cultures and acute cortical slices. Here we show that while attractive, chaotic and neutral trajectories can exist in these networks, the average trajectory has a Lyapunov exponent near zero (0.01 $\pm$ 0.2, mean $\pm$ s.d.), indicating that neutral dynamics prevail.

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