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Effective connectivity in a network of spiking cortical neurons AONAN TANG, JON HOBBS, WEI CHEN, Indiana University, DUMITRU PETRUSCA, MATTHEW GRIVICH, ALEXANDER SHER, ALAN LITKE, University of California, Santa Cruz, JOHN BEGGS, Indiana University — The average cortical neuron makes and receives about 1,000 synaptic contacts. This anatomical information suggests that local cortical networks are connected in a fairly democratic manner, with all nodes having about the same degree. But the physical connections found in the brain do not necessarily reveal how information flows through the network. We used transfer entropy (Schreiber, 2000) to assess effective connectivity in cortical slice cultures placed on a 512 electrode array system (in collaboration with Alan Litke of UC Santa Cruz). These cultures (n = 6) were active for periods exceeding 1 hr, allowing us to collect long data sets for entropy statistics. Data were binned at 1 ms to match the width of a single neural spike. Analysis revealed wide differences in node degrees, but did not clearly point to a small-world or a scale-free structure.

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