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Criticality in Neuronal Networks NIR FRIEDMAN, Department of Physics, University of Illinois at Urbana-Champaign, SHINYA ITO, Department of Physics, Indiana University, BRADEN A. W. BRINKMAN, Department of Physics, University of Illinois at Urbana-Champaign, MASANORI SHIMONO, Department of Physics, Indiana University, R.E. LEE DEVILLE, Department of Physics, University of Illinois at Urbana-Champaign, JOHN M. BEGGS, Department of Physics, Indiana University, KARIN A. DAHMEN, Department of Physics, University of Illinois at Urbana-Champaign, TOM C. BUTLER, Department of Physics, Massachusetts Institute of Technology — In recent years, experiments detecting the electrical firing patterns in slices of in vitro brain tissue have been analyzed to suggest the presence of scale invariance and possibly criticality in the brain. Much of the work done however has been limited in two ways: 1) the data collected is from local field potentials that do not represent the firing of individual neurons; 2) the analysis has been primarily limited to histograms. In our work we examine data based on the firing of individual neurons (spike data), and greatly extend the analysis by considering shape collapse and exponents. Our results strongly suggest that the brain operates near a tuned critical point of a highly distinctive universality class.

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