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The Geometry of Memory: A Physical Model WILLARD MAIER, BRUCE MILLER, Texas Christian University — In recent history physicists have become interested in viewing processes in the brain in terms of the nonlinear dynamics of interacting neurons. To achieve this they have explored different levels of fidelity in modeling the interacting neurons. An open question is whether there is a connection between specific firing patterns and the representation of memory. Izhikevich has proposed a possible connection that he has named polychoronous groups and explored it within the context of a specific dynamical model. Here a minimal model of polychronous groups in neural networks is presented. The model is computationally efficient and allows the study of polychronous groups independent of specific neuron models prevalent in the literature. Computational experiments were performed with the model in one- and two-dimensional neural architectures to determine the dependence of the number of polychronous groups on various connectivity options. Our results (arXiv:0806.1070v1 [cond-mat.dis-nn]) suggest that the concept is robust and may therefore play an important role in more realistic systems. The possibility of using polychronous groups as computational elements is also discussed.

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