1154-37-2430 **Steven Collazos*** (colla054@umn.edu), Science 1535, 600 East Fourth Street, Morris, MN 56267, and **Duane Nykamp**. *Coding Properties of Firing Rate Models with Low-Rank Synaptic Weight Matrices.*

A theory in neuroscience proposes that groups of co-active neurons form a basis for neural processing. Following other researchers' work on threshold-linear networks, which are neural networks where the activation function is a rectifier, we model the collection of all possible ensembles of neurons—known as *permitted sets*, $\mathcal{P}_\Phi(W)$—as a collection of binary strings that indicate which neurons are considered active. Here Φ is a function describing how neurons respond to inputs (i.e., an activation function) and W is a matrix whose entries represent the effective influence neurons in the network have among each other (i.e., a synaptic weight matrix). Unlike the threshold-linear regime, however, Φ of the neural networks we study is C^1 with finitely many discontinuities. We construct $\mathcal{P}_\Phi(W)$ by imposing a threshold on the responsiveness of the neuron to input at the steady state. Furthermore, when W is almost rank one, we prove that $\mathcal{P}_\Phi(W)$ is a convex code, i.e., a combinatorial neural code arising from a pattern of intersections of convex sets. (Received September 17, 2019)