Abstract Submitted
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The neural circuit and synaptic dynamics underlying perceptual decision-making FENG LIU, School of Physics, Nanjing University — Decision-making with several choice options is central to cognition. To elucidate the neural mechanisms of multiple-choice motion discrimination, we built a continuous recurrent network model to represent a local circuit in the lateral intraparietal area (LIP). The network is composed of pyramidal cells and interneurons, which are directionally tuned. All neurons are reciprocally connected, and the synaptic connectivity strength is heterogeneous. Specifically, we assume two types of inhibitory connectivity to pyramidal cells: opposite-feature and similar-feature inhibition. The model accounted for both physiological and behavioral data from monkey experiments. The network is endowed with slow excitatory reverberation, which subserves the buildup and maintenance of persistent neural activity, and predominant feedback inhibition, which underlies the winner-take-all competition and attractor dynamics. The opposite-feature and opposite-feature inhibition have different effects on decision-making, and only their combination allows for a categorical choice among 12 alternatives. Together, our work highlights the importance of structured synaptic inhibition in multiple-choice decision-making processes. Reference: Cheng Xue and Feng Liu. J. Neurosci. 34, 13444-13457 (2014).

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