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Can simple interactions capture complex features of neural activity underlying behavior in a virtual reality environment? LEENOY MESHULAM, JEFFREY GAUTHIER, CARLOS BRODY, DAVID TANK, WILLIAM BIALEK, Princeton Univeristy — The complex neural interactions which are abundant in most recordings of neural activity are relatively poorly understood. A prime example of such interactions can be found in the in vivo neural activity which underlies complex behaviors of mice, imaged in brain regions such as hippocampus and parietal cortex. Experimental techniques now allow us to accurately follow these neural interactions in the simultaneous activity of large neuronal populations of awake behaving animals. Here, we demonstrate that pairwise maximum entropy models can predict a surprising number of properties of the neural activity. The models, that are constrained with activity rates and interactions between pairs of neurons, are well fit to the activity 'states' in the hippocampus and cortex of mice performing cognitive tasks while navigating in a virtual reality environment.

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