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Information Transmission and Anderson Localization in two-dimensional networks of firing-rate neurons[1] JOSEPH NATALE, GEORGE HENTSCHEL, Emory Univ — Firing-rate networks offer a coarse model of signal propagation in the brain. Here we analyze sparse, 2D planar firing-rate networks with no synapses beyond a certain cutoff distance. Additionally, we impose Dale's Principle to ensure that each neuron makes only or inhibitory outgoing connections. Using spectral methods, we find that the number of neurons participating in excitations of the network becomes insignificant whenever the connectivity cutoff is tuned to a value near or below the average interneuron separation. Further, neural activations exceeding a certain threshold stay confined to a small region of space. This behavior is an instance of Anderson localization, a disorder-induced phase transition by which an information channel is rendered unable to transmit signals. We discuss several potential implications of localization for both local and long-range computation in the brain.

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