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Self-organized resistance to noise of neuronal networks with plasticity

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One of the fundamental adaptation mechanisms of the nervous system is spike time-dependent plasticity (STDP). Depending on the spiking behavior of neural cells, plasticity regulates the coupling between individual cells and controls the network connectivity. Jointly with the Institute of Neuroscience and Medicine - Neuromodulation (Research Center Jlich) we study ensembles of synchronized spiking neurons with adaptive coupling, that are perturbed by an independent random input. For such networks, the phenomenon of self-organized resistance to noise has been reported that is characterized by an increase of the overall coupling and preservation of synchrony in the neural populations with STDP in response to the external noise growth. We studied further theoretically the influence of noise on a microscopic level by considering only two coupled neurons, where the underlying mechanism can be studied in more detail.