

## **Emergence of collective oscillations in balanced neural networks due to intrinsic fluctuations**

**Di Volo, M.**, Segneri, M., Goldobin, D., Politi, A., Torcini, A.

We report a transition from asynchronous to oscillatory behavior in balanced inhibitory sparse neuronal networks with instantaneous synapses. Collective oscillations emerge for sufficiently connected networks. Their origin is understood in terms of a recently developed mean-field model for sparse balanced neural networks [1]. Collective oscillations are induced by irregular microscopic neural firing, due to balance. The same mechanism induces in balanced excitatory-inhibitory networks quasi-periodic collective oscillations.

[1] di Volo, M., & Torcini, A. (2018). Transition from asynchronous to oscillatory dynamics in balanced spiking networks with instantaneous synapses. *Physical review letters*, 121(12), 128301.