## Dynamics of synaptic weights under spike-timing-dependent plasticity | Jakob Stubenrauch

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Spike-timing-dependent plasticity (STDP) has been long proposed as a phenomenological model class for synaptic learning [1]. Yet, in networks of spiking neurons, the stochastic process of synaptic weights implied by STDP rules has not been fully characterized. Here, we leverage recent advancements in the theory of shot noise [2] to analytically compute the drift and diffusion of synapses via which Poisson processes feed into a recurrent network of leaky integrate-and-fire neurons. The theory subdivides the cause of synaptic drift into contributions relating to different properties of the postsynaptic neurons. Possible applications include theory of learning. For instance, under a given training paradigm, one could compute the memory capacity and relate learning success to biophysical parameters.

[1]: G. Bi and M. Poo, Journal of Neuroscience 18, 10464 (1998).[2]: J. Stubenrauch and B. Lindner, Phys. Rev. X 14, 041047 (2024).

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