

Poster presentation

## Control and analysis of spike trains' correlations

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Emerging evidence indicates that information processing as well as learning and memory processes in both the network and single-neuron levels are highly dependent on the correlation structure of multiple spike trains. Contemporary experimental as well as theoretical studies that involve quasi-realistic neuronal stimulation thus require a method for controlling spike-train correlations. We introduce a general new strategy for generating multiple spike trains with exactly controlled mean firing rates and correlation structure (defined in terms of auto- and cross-correlation functions) [1]. Our approach non-linearly transforms random Gaussian-distributed processes with a pre-distorted correlation structure into non-negative rate processes, which are then used to generate doubly stochastic Poisson point processes with the required correlation structure. We show how this approach can be used to generate stationary or non-stationary processes, and conversely for the identification of Linear-Nonlinear-Poisson (LNP) encoding models purely from a given system's input and output correlation structures. Correlation-based identification is a "blind" alternative to reverse correlation and related techniques.

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### References

1. Krumin M, Shoham S: **Generation of spike trains with controlled auto- and cross-correlation functions.** *Neural Comput* 2009 in press.