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Data Visualization Techniques for Single and Multiple Spike Trains

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With the rapidly growing data collection technologies in simultaneous recording of large populations of neurons, it is crucial to develop statistical techniques for data analysis. Data visualization is a powerful exploratory tool to gain insight into multi-dimensional spike trains, and to detect informative spiking patterns/relationships. This talk summarizes some of the literature on visualization techniques for neural spike trains. We focus on detecting informative patterns, e.g. periodicity and burst spiking, in single neurons as well as on identifying synchronous firings in neuronal populations. We also address the computational challenges in information visualization for simultaneously recorded neural spike trains, and offer solutions in a couple of studies involving decision-making and visual stimulation. Through a simulation study, the pros and cons of different techniques are demonstrated and compared.