Abstract of Presentation

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Research interest:
Statistical analysis of neuronal signals
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Presentation Title:
Defining the firing rate for non-Poissonian spike trains

A rationale for estimating the neuronal firing rate in the neurophysiology lies in the presumption that neurons may express information in the frequency of spike occurrences. Since spike trains are not regular and the occurrences of individual spikes are generally not reproduced by the same behavioral condition, cortical neurons in vivo have often been regarded as transmitting spikes randomly in time according to given prescribed rate. From spike trains recorded in vivo, we abstracted the deviation from the ideal Poissonian firing, by measuring the local variation of inter-spike intervals, and revealed that a non-Poissonian firing characteristics, which may be distinguished by calling regular, random, and bursty, are rather prevalent among cortical neurons and are stably correlated to the physiological functions of the cortical areas. Two hypotheses have been proposed for potential advantage of using non-Poissonian spike trains in transmitting information, namely, the sender may signal the firing irregularity by changing it in addition to the rate of firing, or alternatively, the receiver may estimate the firing rate accurately by making the most of non-Poissonian inter-spike dependency in the received signals. Here I discuss the latter possibility.

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