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## A state space method for decoding neuronal spiking signals

Cortical neurons *in vivo* have often been approximated as Poisson spike generators that convey no information other than the rate of random firing. Recently, it has been revealed by using a metric for analyzing local variation of interspike intervals that individual neurons express specific patterns in generating spikes, which may symbolically be termed regular, random or bursty [1,2]. Two hypotheses have been proposed for potential advantage of using non-Poisson spike trains in transmitting information; neurons may signal the firing irregularity by changing it in addition to the rate of firing [3], or alternatively, the receiver may estimate the firing rate accurately by making the most of non-Poisson inter-spike dependency in the received signals [4-6]. In order to determine which hypothesis is more plausible for a given spike train, we have implemented a state space method for simultaneously estimating firing irregularity and the firing rate moment by moment [7,8]. I review the recent development of the state space analysis and demonstrate new results obtained for a variety of electrophysiological data.

### References

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