EXCURSION THEORY: AN APPLICATION TO STOCHASTIC LEAKY INTEGRATE AND FIRE NEURONAL MODELS

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ABSTRACT. In classical LIF models, the firing time coincides with the first-passage time of a fixed threshold. However, the observation of experimental intracellular recordings shows that this hypothesis is often disobeyed. This requires that the spiking mechanism typical of LIF models has to be changed. We propose a new definition of the firing time of a neuron and study it in the framework of excursion theory.
Ito's excursion theory represents one of the most powerful tool in probability, as it allows us to describe, in a simple way, the complexity of a stochastic path.
In particular, we review the question of the first excursion exceeding a fixed length u of a diffusion process. Main results related to this problem has been developed in [1, 2]. We specialize our study for Wiener, Ornstein-Uhlenbeck and Feller process.

REFERENCES

[1] J. Pitmann, M. Yor. Hitting, occupation and inverse local times of one-dimensional diffusions: martingale and excursion approaches, *Bernoulli* 1 pp. 1-24, 2003.
[2] R.K. Getoor. Excursions of a Markov process, *The Annals of Probability* 7 (2) pp. 244-266, 1979.

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