

Multi-class oscillating systems of interacting Hawkes processes

LÖCHERBACH, EVA (SPEAKER/PRESENTER)

University of Cergy-Pontoise, France, eva.loecherbach@u-cergy.fr

DITLEVSEN, SUSANNE *University of Copenhagen, Denmark*

Multivariate nonlinear Hawkes processes; Mean-field approximations; Oscillations; Diffusion approximation.

We consider multi-class systems of interacting nonlinear Hawkes processes modeling several large families of neurons and study their mean field limits. As the total number of neurons goes to infinity we prove that the evolution within each class can be described by a nonlinear limit differential equation driven by a Poisson random measure, and state associated central limit theorems. We study situations in which the limit system exhibits oscillatory behavior, and relate the results to certain piecewise deterministic Markov processes and their diffusion approximations.

References

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