

Invited Talk 1.3

BOSOMIC DYNAMICS IN COMPLEX NETWORKS

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Abstract

Reaction-diffusion processes can be adopted to model a large number of dynamics on complex networks, such as transport processes or epidemic outbreaks. In most cases, however, they have been studied from a fermionic perspective, in which each vertex can be occupied by at most one particle. While still useful, this approach suffers from some drawbacks, the most important probably being the difficulty to implement reactions involving more than two particles simultaneously. Here we present a general framework for the study of bosonic reaction-diffusion processes on complex networks, in which there is no restriction on the number of interacting particles that a vertex can host. We describe these processes theoretically by means of continuous time heterogeneous mean-field theory and divide them into two main classes: steady state and monotonously decaying processes. We find that the time evolution and critical properties of the particle density are independent of the fermionic or bosonic nature of the process, while differences exist in the functional form of the density of occupied vertices in a given degree class. Our results can be easily generalized to tackle more complex, multi-species, reaction-diffusion processes, and open a promising path for a general study and classification of this kind of dynamical systems on complex networks.

Biography

Romualdo Pastor-Satorras is an Associate Professor at the Department de Física i Enginyeria Nuclear of the Universitat Politècnica de Catalunya, Spain. His scientific interests include: complex network theory, non-equilibrium statistical physics, quantum field theory and applications to statistical physics, and soft-condensed matter.

Romualdo Pastor-Satorras is the author or co-author of the books: *Evolution and Structure of the Internet: A Statistical Physics Approach* (Cambridge University Press, 2004; co-authored with A. Vespignani) and *Statistical Mechanics of Complex Networks* (Lecture Notes in Physics 625, Springer, 2003; co-edited with J.M. Rubí, and A. Díaz-Guilera).