Stationary distributions of semistochastic processes with disturbances at random times and with random severity

Maria C.A. Leite

Department of Mathematics and Statistics, University of Toledo

Maria.Leite@utoledo.edu

Nikola Petrov

Department of Mathematics, University of Oklahoma

Ensheng Weng

Department of Ecology and Evolutionary Biology, Princeton University

Keywords: Ecology, Ecosystems

Mathematical modeling can play an important role in understanding and predicting phenomena in natural sciences. In this talk we will discuss the role of mathematical models in describing and understanding disturbance and recovery regimes of systems. We will consider a mathematical model for a semi-stochastic continuous-time continuous-state space random process that undergoes downward disturbances with random severity occurring at random times. Between two consecutive disturbances the evolution is deterministic, given by an autonomous ordinary differential equation. This model allows the derivation of explicit expressions for several quantities of interest, providing important information on the behavior of the system. In particular, we derive explicit expressions for distributions connecting two consecutive post-disturbance levels, stationary distribution of the post disturbance levels as well as the stationary distribution of the random process.