Oscillation and Non-oscillation in Solutions of Nonlinear Stochastic Delay Differential Equations

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Abstract
This paper studies the oscillation and nonoscillation of solutions of a nonlinear stochastic delay differential equation, where the noise perturbation depends on the current state, and the drift depends on a delayed argument. When the restoring force towards equilibrium is relatively strong, all solutions oscillate, almost surely. However, if the restoring force is superlinear, positive solutions exist with positive probability, and for suitably chosen initial conditions, the probability of positive solutions can be made arbitrarily close to unity.

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