Arthur E. Imperatore School of Sciences & Arts

Department of Mathematical Sciences

Seminar in Nonlinear Systems

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Sharp estimation of the almost-sure Lyapunov exponent for the Anderson model in continuous space

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Abstract: In this article we study the exponential behavior of the continuous stochastic Anderson model, i.e. the solution of the stochastic partial differential equation

$$u(t,x) = 1 + \int_0^t \kappa \Delta_x u\,(s,x)\,ds + \int_0^t W\,(ds,x)\,u\,(s,x)\,,$$

when the spatial parameter x is continuous, specifically $x \in \mathbf{R}$, and W is a Gaussian field on $\mathbf{R}_+ \times \mathbf{R}$ that is Brownian in time, but whose spatial distribution is widely unrestricted. We give a partial existence result of the Lyapunov exponent defined as $\lim_{t\to\infty} t^{-1} \log u(t,x)$. Furthermore, we find upper and lower bounds for $\limsup_{t\to\infty} t^{-1} \log u(t,x)$ and $\liminf_{t\to\infty} t^{-1} \log u(t,x)$ respectively, as functions of the diffusion constant κ which depend on the regularity of W in x. Our bounds are sharper, work for a wider range of regularity scales, and are significantly easier to prove than all previously known results. When the uniform modulus of continuity of the process W is in the logarithmic scale, our bounds are optimal.

Refreshments provided

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