Analysis and Differential Geometry Seminar

Parabolic stochastic PDEs on bounded domains with rough initial conditions: moment and correlation bounds

Le Chen
Auburn University

Abstract: This talk consists of two parts of about the same length. In the first part, we make a general introduction of stochastic partial differential equations (SPDEs) from our own perspective. We will particularly emphasize their deep relationship with statistical physics. This part is intended to be accessible to the general audience. In the second part, we will focus on the nonlinear parabolic stochastic PDEs on a bounded Lipschitz domain driven by a Gaussian noise that is white in time and colored in space, with Dirichlet or Neumann boundary condition. We establish existence, uniqueness and moment bounds of the random field solution under measure-valued initial data ν. We also study the two-point correlation function of the solution and obtain explicit upper and lower bounds. For $C^{1,\alpha}$-domains with Dirichlet condition, the initial data ν is not required to be a finite measure and the moment bounds can be improved under the weaker condition that the leading eigenfunction of the differential operator is integrable with respect to $|\nu|$. As an application, we show that the solution is fully intermittent for sufficiently high level λ of noise under the Dirichlet condition, and for all $\lambda > 0$ under the Neumann condition. The second part of the talk is based on a recent joint-work with David Candil and Cheuk-Yin Lee to appear at Stochastic PDE: Analysis and Computations, 2023 (preprint available at arXiv:2301:06435).

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Atwood 240

Mathematics
Emory University