On a class of nonlinear fractional Stochastic partial differential equation with fractional noise

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Abstract

In this talk, we will introduce the following fractional stochastic partial differential equation of the form

$$\frac{\partial}{\partial t}u(t,x) = \mathfrak{D}(x,D)u(t,x) + \frac{\partial f}{\partial x}(t,x,u(t,x)) + \frac{\partial^2 W^H}{\partial t \partial x}(t,x),$$

where $\mathfrak{D}(x,D)$ denotes the Markovian generator of stable-like Feller process, $f : [0,T] \times \mathbb{R} \times \mathbb{R} \to \mathbb{R}$ is a measurable function, and $\frac{\partial^2 W^H}{\partial t \partial x}(t,x)$ is a double-parameter fractional noise. We will study the existence, uniqueness and Hölder regularity of the solution. In addition, we prove the lower and upper Gaussian bounds for the probability density of the mild solution via Malliavin calculus and the new tool developed by Nourdin and Viens (Electron. J. Probab. 14 (2009)).

This talk is based on a joint work with Litan Yan (Donghua University, Shanghai, China).