PDE Seminar
Seminar

Comparison principles for stochastic heat equations

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Abstract: The stochastic heat equation is a canonical model that is related to many models in mathematical physics, mathematical biology, particle systems, etc. It usually takes the following form:

$$\left(\frac{\partial}{\partial t} - \frac{1}{2}\Delta\right) u(t,x) = \rho(u(t,x))\, \dot{M}(t,x), \qquad u(0,\cdot) = \mu, \qquad t > 0,\ x \in R^d,$$

where μ is the initial data, $\dot{M}$ is a spatially homogeneous Gaussian noise that is white in time and ρ is a Lipschitz continuous function. In this talk, we will study a particular set of properties of this equation — the comparison principles, which include both *sample-path comparison* and *stochastic comparison principles*. These results are obtained for general initial data and under the weakest possible requirement on the correlation function — Dalang's condition, namely, $\int_{R^d}(1 + |\xi|^2)^{-1}\hat{f}(d\xi) < \infty$, where $\hat{f}$ is the spectral measure of the noise. For the sample-path comparison, one can compare solutions pathwisely with respect to different initial conditions μ, while for the stochastic comparison, one can compare certain functionals of the solutions either with respect to different diffusion coefficients ρ or different correlation functions of the noise f.
This talk is based on some joint works with Jingyu Huang and Kunwoo Kim.

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