Hypothesis testing for Stochastic PDEs

Igor Cialenco(Illinois Institute of Technology, Chicago, USA)
(joint work with Liaosha Xu (University of Virginia, Charlottesville, USA))

Abstract

We study the simple hypothesis testing problem for the drift coefficient for stochastic fractional heat equation driven by additive noise. We introduce the notion of asymptotically the most powerful test, and find explicit forms of such tests in two asymptotic regimes: large time asymptotics, and increasing number of Fourier modes. The proposed statistics are based on Maximum Likelihood Ratio. Additionally, we obtain a series of important technical results of independent interest: we find the cumulant generating function of the log-likelihood ratio; obtain sharp large deviation type results for $T \to \infty$, and $N \to \infty$.

Also, we will discuss how to estimate and control the Type I and Type II errors. We propose a new class of rejection regions and provide computable thresholds for T, and N, that guarantee that the statistical errors are smaller than a given upper bound. Finally, we illustrate the theoretical results by numerical simulations.