samsi
NSF·Duke·NCSU·UNC

QMC Opening Workshop
August 28-September 1, 2017

Lecture: *Probabilistic Numerical Methods for High-Dimensional Partial Integral Differential Equations*

Speaker: Guannan Zhang

Abstract:

In this talk, we discuss some recent advances in probabilistic schemes for high-dimensional PIDEs. It is known that traditional PDE solvers, e.g., finite element, finite difference methods, do not scale well with the increase of dimension. The idea of probabilistic schemes is to link a wide class of nonlinear parabolic PIDEs to stochastic Levy processes based on nonlinear version of the Feynman-Kac theory. As such, the solution of the PIDE can be represented by a conditional expectation (i.e., a high-dimensional integral) with respect to a stochastic dynamical system driven by Levy processes. In other words, we can solve the PIDEs by performing high-dimensional numerical integration. A variety of quadrature methods could be applied, including MC, QMC, sparse grids, etc. The probabilistic schemes have been used in many application problems, e.g., particle transport in plasmas (e.g., Vlasov-Fokker-Planck equations), nonlinear filtering (e.g., Zakai equations), and option pricing, etc.