Title:

Stochastic particle methods in Bayesian statistical learning

Abstract: In the last three decades, there has been a dramatic increase in the use of particle methods as a powerful tool in real-world applications of Monte Carlo simulation in computational physics, population biology, computer sciences, and statistical machine learning. Ideally suited to parallel and distributed computation, these advanced particle algorithms include nonlinear interacting jump diffusions; quantum, diffusion, and resampled Monte Carlo methods; Feynman-Kac particle models; genetic and evolutionary algorithms; sequential Monte Carlo methods; adaptive and interacting Markov chain Monte Carlo models; bootstrapping methods; ensemble Kalman filters; and interacting particle filters. This lecture presents a comprehensive treatment of mean field particle simulation models and interdisciplinary research topics, including sequential Monte Carlo methodologies, genetic particle algorithms, genealogical tree-based algorithms, and quantum and diffusion Monte Carlo methods.