Topics in the Stochastic Modeling and Simulations

Topic (2015): Chemical Kinetic Modeling and Simulations

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Course Outline:

Lect01:   Introduction
Lect02:   ODE modeling for cellular systems: I
Lect03:   ODE modeling for cellular systems: II
Lect04:   Stochastic modeling and SSA
Lect05:   Tau-leaping method
Lect06:   Multilevel Monte Carlo for diffusion process
Lect07:   Multilevel Monte Carlo for CKS
Lect08:   Large volume limit and fluctuations
Lect09:   Multi-scale analysis framework
Lect10:   Multi-scale analysis for CKS
Lect11:   Rare events for diffusion process
Lect12:   Path integrals for CKS
Lect13:   Rare events for CKS
Lect14:   Exactly solvable models
Lect15:   Fluctuation-Dissipation theorem
Lect16:   mRNA and Protein bursting
Lect17:   Sub-diffusion of protein molecule
Lect18:   Single molecule Michaelis-Menton law
Lect19:   Non-equilibrium steady state theory: I
Lect20:   Non-equilibrium steady state theory: II
Lect21:   Statistical inference of rate constants
Lect22:   Bayesian analysis of single molecule data
Lect23:   CKS with spatial dependence
Lect24:   Turing pattern dynamics
Lect25:   Outlook

Topics to be covered:
Network reduction, Network construction, Network designing principle, ...