Stochastic Numerical Methods: An Introduction for Students and Scientists

Raúl Toral, Pere Colet

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Stochastic Numerical Methods: An Introduction for Students and Scientists Raúl Toral, Pere Colet **Stochastic Numerical Methods** introduces at Master level the numerical methods that use probability or stochastic concepts to analyze random processes. The book aims at being rather general and is addressed at students of natural sciences (Physics, Chemistry, Mathematics, Biology, etc.) and Engineering, but also social sciences (Economy, Sociology, etc.) where some of the techniques have been used recently to numerically simulate different agent-based models.

Examples included in the book range from phase-transitions and critical phenomena, including details of data analysis (extraction of critical exponents, finite-size effects, etc.), to population dynamics, interfacial growth, chemical reactions, etc. Program listings are integrated in the discussion of numerical algorithms to facilitate their understanding.

From the contents:

- Review of Probability Concepts
- Monte Carlo Integration
- Generation of Uniform and Non-uniform
- Random Numbers: Non-correlated Values
- Dynamical Methods
- Applications to Statistical Mechanics
- Introduction to Stochastic Processes
- Numerical Simulation of Ordinary and
- Partial Stochastic Differential Equations
- Introduction to Master Equations
- Numerical Simulations of Master Equations
- Hybrid Monte Carlo
- Generation of n-Dimensional Correlated
- Gaussian Variables
- Collective Algorithms for Spin Systems
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