Monte-Carlo Methods and Stochastic Processes: From Linear to Non-Linear

By Emmanuel Gobet

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Developed from the author's course at the Ecole Polytechnique, **Monte-Carlo Methods and Stochastic Processes: From Linear to Non-Linear** focuses on the simulation of stochastic processes in continuous time and their link with partial differential equations (PDEs). It covers linear and nonlinear problems in biology, finance, geophysics, mechanics, chemistry, and other application areas. The text also thoroughly develops the problem of numerical integration and computation of expectation by the Monte-Carlo method.

The book begins with a history of Monte-Carlo methods and an overview of three typical Monte-Carlo problems: numerical integration and computation of expectation, simulation of complex distributions, and stochastic optimization. The remainder of the text is organized in three parts of progressive difficulty. The first part presents basic tools for stochastic simulation and analysis of algorithm convergence. The second part describes Monte-Carlo methods for the simulation of stochastic differential equations. The final part discusses the simulation of non-linear dynamics.

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Monte-Carlo Methods and Stochastic Processes: From Linear to Non-Linear By Emmanuel Gobet Bibliography

- Rank: #2638289 in Books
- Published on: 2016-08-01
- Original language: English
- Number of items: 1
- Dimensions: 9.20" h x .90" w x 6.30" l, .0 pounds
- Binding: Hardcover
- 336 pages

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Review

"Emmanuel Gobet has successfully put together the modern tools for Monte Carlo simulations of continuous-time stochastic processes. He takes us from classical methods to new challenging nonlinear situations from various fields of applications, and rightly explains that naive approaches can be misleading. The book is self-contained, rigorous and definitely a must-have for anyone performing simulations and worrying about quantifying statistical errors."
-**Jean-Pierre Fouque**, Director of the Center for Financial Mathematics and Actuarial Research, *University of California, Santa Barbara*

About the Author

Emmanuel Gobet is a professor of applied mathematics at Ecole Polytechnique. His research interests include algorithms of probabilistic type and stochastic approximations, financial mathematics, Malliavin calculus and stochastic analysis, Monte Carlo simulations, statistics for stochastic processes, and statistical learning.

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