1. Record Nr. UNINA9911031564503321

Autore	Takahashi Akihiko
Titolo	Asymptotic Expansion and Weak Approximation : Applications of Malliavin Calculus and Deep Learning / / by Akihiko Takahashi, Toshihiro Yamada
Pubbl/distr/stampa	Singapore : , : Springer Nature Singapore : , : Imprint : Springer, , 2025
ISBN	981-9682-80-0
Edizione	[1st ed. 2025.]
Descrizione fisica	1 online resource (177 pages)
Collana	JSS Research Series in Statistics, , 2364-0065
Altri autori (Persone)	YamadaToshihiro
Disciplina	519.5
Soggetti	Statistics Mathematical statistics - Data processing Statistical Theory and Methods Statistics and Computing Applied Statistics Probabilitats Processos estocàstics Llibres electrònics
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Nota di contenuto	Chapter 1. Introduction -- Chapter 2. Itô calculus -- Chapter 3. Malliavin calculus -- Chapter 4. Asymptotic expansion -- Chapter 5. Weak approximation -- Chapter 6. Application: Deep learning-based weak approximation.
Sommario/riassunto	This book provides a self-contained lecture on a Malliavin calculus approach to asymptotic expansion and weak approximation of stochastic differential equations (SDEs), along with numerical methods for computing parabolic partial differential equations (PDEs). Constructions of weak approximation and asymptotic expansion are given in detail using Malliavin's integration by parts with theoretical convergence analysis. Weak approximation algorithms and Python codes are available with numerical examples. Moreover, the weak approximation scheme is effectively applied to high-dimensional nonlinear problems without suffering from the curse of dimensionality through combining with a deep learning method. Readers including

graduate-level students, researchers, and practitioners can understand both theoretical and applied aspects of recent developments of asymptotic expansion and weak approximation.