

Introduction to Rare Event Simulation

This book presents a unified theory of rare event simulation and the variance reduction technique known as importance sampling. Until now, this area has had a reputation among simulation practitioners as requiring a great deal of technical and probabilistic expertise. This text keeps the mathematical preliminaries to a minimum with the only prerequisite being a single large deviation theory result that is given and proved in the text. The book contains over 50 figures and detailed simulation case studies covering a wide variety of application areas including statistics, telecommunications, and queueing systems.

This book is an attempt to present a unified theory of rare event simulation and the variance reduction technique known as importance sampling from the point of view of the probabilistic theory of large deviations. This framework allows us to view a vast assortment of simulation problems from a single unified perspective. It gives a great deal of insight into the fundamental nature of rare event simulation. Unfortunately, this area has a reputation among simulation practitioners of requiring a great deal of technical and probabilistic expertise. In this text, I have tried to keep the mathematical preliminaries to a minimum; the only prerequisite is a single large deviation theorem dealing with sequences of R_d valued random variables. (This theorem and a proof are given in the text.) Large deviation theory is a burgeoning area of probability theory and many of the results in it can be applied to simulation problems. Rather than try to be as complete as possible in the exposition of all possible aspects of the available theory, I have tried to concentrate on demonstrating the methodology and the principal ideas in a fairly simple setting.

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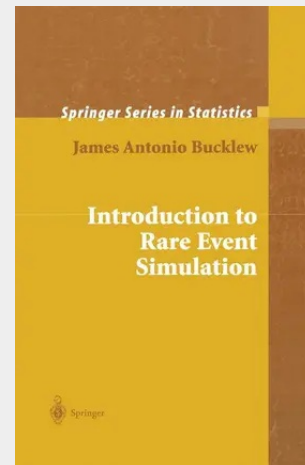
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