

Preface

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 \mathcal{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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