

Title: A Guide to Monte-Carlo Simulations in Statistical Physics (3rd Edition)

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The preface and the introduction gives a good introduction to the importance of simulation research and that it has opened many possibilities to different research areas. They emphasize not only the importance of simulations, but also the interpretation as they explain the features of Monte Carlo methods. As the title suggests, the book mostly focuses on simulations in statistical physics, however they give a brief introduction to Monte Carlo methods used in fields outside of physics in the later chapters.

The book is composed of 15 chapters where chapters 1 to 4 provide the introduction to Monte Carlo methods and some necessary background in statistical physics. They write little bit about the random number generation, from brief history to errors which may arise. The authors explain what kind of simulations are made in what situations, and their limitations. They emphasize that “aim of simulation is not to provide a better 'curve fitting' to experimental data than does analytic theory”. The importance if simulation is to understand the physics; to create an ideal experiment and to also to create a realistic experiment.

Chapters 5 to 11 are the main contents of the book, the authors guides the reader through many different case studies in Statistical Physics as they introduce algorithms and give advices on how to deal with such cases. Chapters 12 to 14 covers topics that are related to Monte Carlo methods or statistical physics that are important to discuss, but not necessarily related to Monte-Carlo simulations in statistical physics. Then author concludes with an outlook.

The examples provided in this book are written in FORTRAN and it is included in the Appendix.

This book is a great source for Monte Carlo simulations for senior undergrad with the knowledge of statistical mechanics and interest in the field. Every chapter contains some introduction to the specific phenomenon being investigated that some undergraduates without much in depth background could follow through the contents with some work. However, this book is mostly intended for graduate students and researchers who want to learn about the use of Monte Carlo methods in statistical physics.