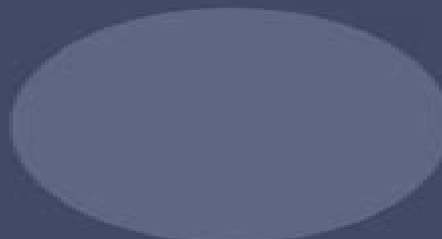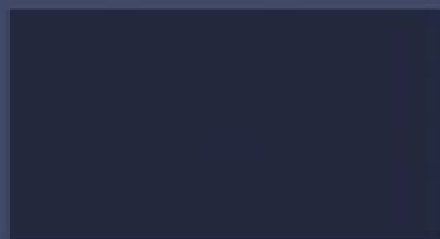# Introduction to Computational Physics for Undergraduates

Omair Zubairi
Fridolin Weber

Introduction To Computational Physics

Benjamin A. Stickler,Ewald Schachinger

Introduction To Computational Physics:

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powerful tools of the GNU Linux environment All the necessary software is open source and freely available The book starts with very simple problems in particle motion and ends with an in depth discussion of advanced techniques used in Monte Carlo simulations in statistical mechanics The level of instruction rises slowly while discussing problems like the diffusion equation electrostatics on the plane quantum mechanics and random walks **Basic Concepts in Computational Physics** Benjamin A. Stickler,Ewald Schachinger,2013-12-11 With the development of ever more powerful computers a new branch of physics and engineering evolved over the last few decades Computer Simulation or Computational Physics It serves two main purposes Solution of complex mathematical problems such as differential equations minimization optimization or high dimensional sums integrals Direct simulation of physical processes as for instance molecular dynamics or Monte Carlo simulation of physical chemical technical processes Consequently the book is divided into two main parts Deterministic methods and stochastic methods Based on concrete problems the first part discusses numerical differentiation and integration and the treatment of ordinary differential equations This is augmented by notes on the numerics of partial differential equations The second part discusses the generation of random numbers summarizes the basics of stochastics which is then followed by the introduction of various Monte Carlo MC methods Specific emphasis is on MARKOV chain MC algorithms All this is again augmented by numerous applications from physics The final two chapters on Data Analysis and Stochastic Optimization share the two main topics as a common denominator The book offers a number of appendices to provide the reader with more detailed information on various topics discussed in the main part Nevertheless the reader should be familiar with the most important concepts of statistics and probability theory albeit two appendices have been dedicated to provide a rudimentary discussion **Computational Physics: An Introduction To Monte Carlo Simulations Of Matrix Field Theory** Badis Ydri,2017-02-07 This book is divided into two parts In the first part we give an elementary introduction to computational physics consisting of 21 simulations which originated from a formal course of lectures and laboratory simulations delivered since 2010 to physics students at Annaba University The second part is much more advanced and deals with the problem of how to set up working Monte Carlo simulations of matrix field theories which involve finite dimensional matrix regularizations of noncommutative and fuzzy field theories fuzzy spaces and matrix geometry The study of matrix field theory in its own right has also become very important to the proper understanding of all noncommutative fuzzy and matrix phenomena The second part which consists of 9 simulations was delivered informally to doctoral students who were working on various problems in matrix field theory Sample codes as well as sample key solutions are also provided for convenience and completeness **An introduction to computational physics** Sauro Succi,2003-10-01 These volumes collect the lecture notes of the course An introduction to computational physics held in the academic year 2000 01 for students of the University of Pisa and Scuola Normale Superiore at the level of the last two year undergraduates in physics and chemistry The second part deals with various types of particle methods both deterministic and

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