1. Record Nr. UNINA9910300545103321

Autore	Širca Simon
Titolo	Computational Methods in Physics : Compendium for Students / / by Simon Širca, Martin Horvat
Pubbl/distr/stampa	Cham : , : Springer International Publishing : , : Imprint : Springer, , 2018
ISBN	3-319-78619-9
Edizione	[2nd ed. 2018.]
Descrizione fisica	1 online resource (XXIV, 880 p. 268 illus., 20 illus. in color.)
Collana	Graduate Texts in Physics, , 1868-4513
Disciplina	530.15
Soggetti	Physics Chemistry, Physical and theoretical Applied mathematics Engineering mathematics Computer science - Mathematics Numerical and Computational Physics, Simulation Theoretical and Computational Chemistry Mathematical and Computational Engineering Computational Science and Engineering
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Note generali	Includes index.
Nota di contenuto	Basics of numerical analysis -- Solution of nonlinear equations -- Matrix methods -- Transformations of functions and signals -- Statistical description and modeling of data -- Modeling and analysis of time series -- Initial-value problems for ordinary differential equations -- Boundary-value problems for ordinary differential equations -- Difference methods for one-dimensional partial differential equations -- Difference methods for partial differential equations in more than one dim -- Spectral methods for partial differential equations -- Inverse methods.
Sommario/riassunto	This book is intended to help advanced undergraduate, graduate, and postdoctoral students in their daily work by oering them a compendium of numerical methods. The choice of methods pays signicant attention to error estimates, stability and convergence issues, as well as optimization of program execution speeds. Numerous

examples are given throughout the chapters, followed by comprehensive end-of-chapter problems with a more pronounced physics background, while less stress is given to the explanation of individual algorithms. The readers are encouraged to develop a certain amount of skepticism and scrutiny instead of blindly following readily available commercial tools. The second edition has been enriched by a chapter on inverse problems dealing with the solution of integral equations, inverse Sturm-Liouville problems, as well as retrospective and recovery problems for partial dierential equations. The revised text now includes an introduction to sparse matrix methods, the solution of matrix equations, and pseudospectra of matrices; it discusses the sparse Fourier, non-uniform Fourier and discrete wavelet transformations, the basics of non-linear regression and the Kolmogorov-Smirnov test; it demonstrates the key concepts in solving sti dierential equations and the asymptotics of Sturm-Liouville eigenvalues and eigenfunctions. Among other updates, it also presents the techniques of state-space reconstruction, methods to calculate the matrix exponential, generate random permutations and compute stable derivatives.