

APPLIED INTERVAL ANALYSIS



Luc Jaulin
Michel Kieffer
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Springer



Applied Interval Analysis

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Applied Interval Analysis Luc Jaulin, 2001-08-30 CD ROM contains trial version of Sun Microsystems Forte Developer 6 for use with Solaris SPARC Platform Edition 2 6 2 7 and 2 8 *Applied Interval Analysis* Luc Jaulin, Michel Kieffer, Olivier Didrit, 2001-09-06 This book is about guaranteed numerical methods based on interval analysis for approximating sets and about the application of these methods to vast classes of engineering problems Guaranteed means here that inner and outer approximations of the sets of interest are obtained which can be made as precise as desired at the cost of increasing the computational effort It thus becomes possible to achieve tasks still thought by many to be out of the reach of numerical methods such as finding all solutions of sets of non linear equations and inequality or all global optimizers of possibly multi modal criteria The basic methodology is explained as simply as possible in a concrete and readily applicable way with a large number of figures and illustrative examples Some of the techniques reported appear in book format for the first time The ability of the approach advocated here to solve non trivial engineering problems is demonstrated through examples drawn from the fields of parameter and state estimation robust control and robotics Enough detail is provided to allow readers with other applications in mind to grasp their significance An in depth treatment of implementation issues facilitates the understanding and use of freely available software that makes interval computation about as easy as computation with floating point numbers The reader is even given the basic information needed to build his or her own C interval library

Applied Interval Analysis Luc Jaulin, Michel Kieffer, Olivier Didrit, Eric Walter, 2012-12-06 At the core of many engineering problems is the solution of sets of equations and inequalities and the optimization of cost functions Unfortunately except in special cases such as when a set of equations is linear in its unknowns or when a convex cost function has to be minimized under convex constraints the results obtained by conventional numerical methods are only local and cannot be guaranteed This means for example that the actual global minimum of a cost function may not be reached or that some global minimizers of this cost function may escape detection By contrast interval analysis makes it possible to obtain guaranteed approximations of the set of all the actual solutions of the problem being considered This together with the lack of books presenting interval techniques in such a way that they could become part of any engineering numerical tool kit motivated the writing of this book The adventure started in 1991 with the preparation by Luc Jaulin of his PhD thesis under Eric Walter s supervision It continued with their joint supervision of Olivier Didrit s and Michel Kieffer s PhD theses More than two years ago when we presented our book project to Springer we naively thought that redaction would be a simple matter given what had already been achieved **Introduction to Interval Analysis** Ramon E. Moore, R. Baker Kearfott, Michael J. Cloud, 2009-04-16 An introduction to interval analysis for scientists and engineers interested in scientific computation especially using INTLAB MATLAB **Methods and Applications of Interval Analysis** Ramon E. Moore, 1979-01-01 Mathematics of Computing Numerical Analysis **Interval Analysis: A New Tool for Applied**

Mathematics L. B. Rall, WISCONSIN UNIV-MADISON MATHEMATICS RESEARCH CENTER., 1981 Interval arithmetic has been found to be useful in numerical analysis as an automatic means to bound data truncation and roundoff errors in computations Now that the speed of microprogrammed interval arithmetic approaches that of standard floating point operations a wider range of application to engineering and other problems has become feasible Since in many practical situations data are only known to lie within intervals and only ranges of values are sought as satisfactory answers straightforward interval computation can yield the desired results Examples of this type of application are worst case analysis of the stability of structures and the performance of electrical circuits The recently developed theory of integration of interval functions also bears directly on the problems of solution of integral equations and the minimization of functionals defined in terms of integrals Since certain chaotic phenomena such as catastrophes and turbulence are difficult to describe by single valued functions the introduction of interval functions and the corresponding analysis may lead to simpler models which will yield results of accuracy satisfactory for practical purposes Applied and Computational Matrix Analysis Natália Bebiano, 2017-03-01 This volume presents recent advances in the field of matrix analysis based on contributions at the MAT TRIAD 2015 conference Topics covered include interval linear algebra and computational complexity Birkhoff polynomial basis tensors graphs linear pencils K theory and statistic inference showing the ubiquity of matrices in different mathematical areas With a particular focus on matrix and operator theory statistical models and computation the International Conference on Matrix Analysis and its Applications 2015 held in Coimbra Portugal was the sixth in a series of conferences Applied and Computational Matrix Analysis will appeal to graduate students and researchers in theoretical and applied mathematics physics and engineering who are seeking an overview of recent problems and methods in matrix analysis **Parallel Processing and Applied Mathematics** Roman Wyrzykowski, Jack Dongarra, Ewa Deelman, Konrad Karczewski, 2023-04-26 This two volume set LNCS 13826 and LNCS 13827 constitutes the proceedings of the 14th International Conference on Parallel Processing and Applied Mathematics PPAM 2022 held in Gdansk Poland in September 2022 The 77 regular papers presented in these volumes were selected from 132 submissions For regular tracks of the conference 33 papers were selected from 62 submissions The papers were organized in topical sections named as follows Part I numerical algorithms and parallel scientific computing parallel non numerical algorithms GPU computing performance analysis and prediction in HPC systems scheduling for parallel computing environments and frameworks for parallel cloud computing applications of parallel and distributed computing soft computing with applications and special session on parallel EVD SVD and its application in matrix computations Part II 9th Workshop on Language Based Parallel Programming WLPP 2022 6th Workshop on Models Algorithms and Methodologies for Hybrid Parallelism in New HPC Systems MAMHYP 2022 first workshop on quantum computing and communication First Workshop on Applications of Machine Learning and Artificial Intelligence in High Performance Computing WAML 2022 4th workshop on applied high performance numerical algorithms

for PDEs 5th minisymposium on HPC applications in physical sciences 8th minisymposium on high performance computing interval methods 7th workshop on complex collective systems Interval Methods for Solving Nonlinear Constraint Satisfaction, Optimization and Similar Problems Bartłomiej Jacek Kubica, 2019-03-08 This book highlights recent research on interval methods for solving nonlinear constraint satisfaction optimization and similar problems Further it presents a comprehensive survey of applications in various branches of robotics artificial intelligence systems economics control theory dynamical systems theory and others Three appendices on the notation representation of numbers used as intervals endpoints and sample implementations of the interval data type in several programming languages round out the coverage

Introduction to Interval Analysis Ramon E. Moore, R. Baker Kearfott, Michael J. Cloud, 2009-01-01 An update on the author's previous books this introduction to interval analysis provides an introduction to INTLAB a high quality comprehensive MATLAB toolbox for interval computations making this the first interval analysis book that does with INTLAB what general numerical analysis texts do with MATLAB

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