

A Function Approximation Approach for Parametric Optimization

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DE MARCHI, DREVES, GERDTS, GOTTSCHALK, ROGOVS, A Function Approximation Approach for Parametric Optimization (2021).

Abstract

We present a novel approach for approximating the primal and dual parameter dependent solution functions of parametric optimization problems. We start with an equation reformulation of the first order necessary optimality conditions. Then, we replace the primal and dual solutions with some approximating functions and find for some test parameters optimal coefficients as solution of a single nonlinear least-squares problem. Under mild assumptions it can be shown that stationary points are global minima and that the function approximations interpolate the solution functions at all test parameters. Further, we have a cheap function evaluation criteria to estimate the approximation error. Finally, we present some preliminary numerical results showing the viability of our approach.

Keywords: Parametric Optimization, Function Approximation, Radial Basis Functions, Nonlinear Least-Squares Problem, Global Minima.

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Parametric Optimization And Approximation

Abhijit Gosavi



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Parametric Optimization and Related Topics , 1989 **An Efficient, Strongly Polynomial, E-approximation Parametric Optimization Scheme** S.N. Kabadi, Y. P. Aneja, University of New Brunswick. Faculty of Administration, 1996

Computing and Combinatorics Ding-Zhu Du, Zhenhua Duan, Cong Tian, 2019-07-24 This book constitutes the proceedings of the 25th International Conference on Computing and Combinatorics COCOON 2019 held in Xi an China in July 2019 The 55 papers presented in this volume were carefully reviewed and selected from 124 submissions The papers cover various topics including algorithm design approximation algorithm graph theory complexity theory problem solving optimization computational biology computational learning communication network logic and game theory

Multi-parametric Optimization and Control Efstratios N. Pistikopoulos, Nikolaos A. Diangelakis, Richard Oberdieck, 2020-11-02 Recent developments in multi parametric optimization and control Multi Parametric Optimization and Control provides comprehensive coverage of recent methodological developments for optimal model based control through parametric optimization It also shares real world research applications to support deeper understanding of the material Researchers and practitioners can use the book as reference It is also suitable as a primary or a supplementary textbook Each chapter looks at the theories related to a topic along with a relevant case study Topic complexity increases gradually as readers progress through the chapters The first part of the book presents an overview of the state of the art multi parametric optimization theory and algorithms in multi parametric programming The second examines the connection between multi parametric programming and model predictive control from the linear quadratic regulator over hybrid systems to periodic systems and robust control The third part of the book addresses multi parametric optimization in process systems engineering A step by step procedure is introduced for embedding the programming within the system engineering which leads the reader into the topic of the PAROC framework and software platform PAROC is an integrated framework and platform for the optimization and advanced model based control of process systems Uses case studies to illustrate real world applications for a better understanding of the concepts presented Covers the fundamentals of optimization and model predictive control Provides information on key topics such as the basic sensitivity theorem linear programming quadratic programming mixed integer linear programming optimal control of continuous systems and multi parametric optimal control An appendix summarizes the history of multi parametric optimization algorithms It also covers the use of the parametric optimization toolbox POP which is comprehensive software for efficiently solving multi parametric programming problems

Parametric Optimization Jürgen Guddat, F. Guerra Vazquez, Hubertus Th. Jongen, 1990-12-21 Explores optimization problems in which some or all of the individual data involved depends on one parameter Beginning with a preliminary survey of solution algorithms in one parametric optimization the text moves on to examine the pathfollowing curves of local minimizers pathfollowing along a connected component in the Karush Kuhn Tucker set and in the critical set pathfollowing in the set of local minimizers and in the set of critical points In addition practical applications are included Parametric Optimization and Related Topics III Jürgen Guddat, 1993 This volume contains the proceedings of the third conference on Parametric Optimization and Related Topics held in Gustrow from 30 August until 5 September 1991 Parametric optimization as a part of mathematical programming investigates the behaviour of solutions to optimization problems under data perturbations This behaviour like continuity and differentiability plays a fundamental role for a series of further questions that are of interest from a practical as well as a theoretical point of view Many relations to other disciplines of operations research like stochastic programming modelbuilding numerical methods multiobjective optimization and optimal control originate from this behaviour The presented articles all refereed are topical and original papers reflecting recent results to current directions of research in theory and applications **Parameterized and Exact Computation** Hans L. Bodlaender, Michael A. Langston, 2006-09-14 Here are the refereed proceedings of the Second International Workshop on Parameterized and Exact Computation IWPEC 2006 held in the context of the combined conference ALGO 2006 The book presents 23 revised full papers together with 2 invited lectures Coverage includes research in all aspects of parameterized and exact computation and complexity including new techniques for the design and analysis of parameterized and exact algorithms parameterized complexity theory and more **Simulation-Based Optimization** Abhijit Gosavi, 2014-11-30 *Mathematical Programming Study*, 1984 **Issues in Robotics and Automation: 2011 Edition**, 2012-01-09 Issues in Robotics and Automation 2011 Edition is a ScholarlyEditions eBook that delivers timely authoritative and comprehensive information about Robotics and Automation The editors have built Issues in Robotics and Automation 2011 Edition on the vast information databases of ScholarlyNews You can expect the information about Robotics and Automation in this eBook to be deeper than what you can access anywhere else as well as consistently reliable authoritative informed and relevant The content of Issues in Robotics and Automation 2011 Edition has been produced by the world's leading scientists engineers analysts research institutions and companies All of the content is from peer reviewed sources and all of it is written assembled and edited by the editors at ScholarlyEditions and available exclusively from us You now have a source you can cite with authority confidence and credibility More information is available at <http://www.ScholarlyEditions.com> **Pareto Optimality, Game Theory and Equilibria** Panos M. Pardalos, A. Migdalas, Leonidas Pitsoulis, 2008-07-02 This comprehensive work examines important recent developments and modern applications in the fields of optimization control game theory and equilibrium programming In particular the concepts of equilibrium and optimality are of immense practical

importance affecting decision making problems regarding policy and strategies and in understanding and predicting systems in different application domains ranging from economics and engineering to military applications The book consists of 29 survey chapters written by distinguished researchers in the above areas *Operations Research* Günter Fandel,Hermann

Gehring,2012-12-06 Tomas Gal zum 65 Geburtstag **Nonlinear Optimization in Finite Dimensions** Hubertus Th. Jongen,P. Jonker,F. Twilt,2013-12-11 At the heart of the topology of global optimization lies Morse Theory The study of the behaviour of lower level sets of functions as the level varies Roughly speaking the topology of lower level sets only may change when passing a level which corresponds to a stationary point or Karush Kuhn Tucker point We study elements of Morse Theory both in the unconstrained and constrained case Special attention is paid to the degree of differentiability of the functions under consideration The reader will become motivated to discuss the possible shapes and forms of functions that may possibly arise within a given problem framework In a separate chapter we show how certain ideas may be carried over to nonsmooth items such as problems of Chebyshev approximation type We made this choice in order to show that a good understanding of regular smooth problems may lead to a straightforward treatment of just continuous problems by means of suitable perturbation techniques taking a priori nonsmoothness into account Moreover we make a focal point analysis in order to emphasize the difference between inner product norms and for example the maximum norm Then specific tools from algebraic topology in particular homology theory are treated in some detail However this development is carried out only as far as it is needed to understand the relation between critical points of a function on a manifold with structured boundary Then we pay attention to three important subjects in nonlinear optimization Uncertainty-aware Integration of Control with Process Operations and Multi-parametric Programming Under Global Uncertainty Vassilis M.

Charitopoulos,2020-02-05 This book introduces models and methodologies that can be employed towards making the Industry 4.0 vision a reality within the process industries and at the same time investigates the impact of uncertainties in such highly integrated settings Advances in computing power along with the widespread availability of data have led process industries to consider a new paradigm for automated and more efficient operations The book presents a theoretically proven optimal solution to multi parametric linear and mixed integer linear programs and efficient solutions to problems such as process scheduling and design under global uncertainty It also proposes a systematic framework for the uncertainty aware integration of planning scheduling and control based on the judicious coupling of reactive and proactive methods Using these developments the book demonstrates how the integration of different decision making layers and their simultaneous optimisation can enhance industrial process operations and their economic resilience in the face of uncertainty

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