

# A Function Approximation Approach for Parametric Optimization

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## 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

**Panos M. Pardalos,A.  
Migdalas,Leonidas Pitsoulis**



## **Parametric Optimization And Approximation:**

*Parametric Optimization and Approximation* F. Brosowski, 1985-04-01      **Parametric Optimization and Approximation** PARAMETRIC, BROSWOWSKI, DEUTSCH, 2013-11-21      Parametric Optimization and Approximation PARAMETRIC, BROSWOWSKI, DEUTSCH, 1985-01-01      **Approximation Methods for Multiobjective and Parametric Optimization Problems** Arne Herzel, 2022      *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 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

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Vazquez, H. Th. Jongen, 2013-11-21 **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 Optimization with Data Perturbations II Doug

E. Ward, 2001 *Inverse Heat Transfer Problems* Oleg M. Alifanov, 2012-12-06 This research monograph presents a systematic treatment of the theory of the propagation of transient electromagnetic fields such as optical pulses through dielectric media which exhibit both dispersion and absorption The work divides naturally into two parts Part I presents a summary of the fundamental theory of the radiation and propagation of rather general electromagnetic waves in causal linear media which are homogeneous and isotropic but which otherwise have rather general dispersive and absorbing properties In Part II we specialize to the propagation of a plane transient electromagnetic field in a homogeneous dielectric Although we have made some contributions to the fundamental theory given in Part I most of the results of our own research appear in Part II The purpose of the theory presented in Part II is to predict and to explain in explicit detail the dynamics of

the field after it has propagated far enough through the medium to be in the mature dispersion regime It is the subject of a classic theory based on the research conducted by A Sommerfeld and L

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