

Linear And Nonlinear Optimization By Igor Griva

Linear And Nonlinear Optimization By Igor Griva Linear and nonlinear optimization by Igor Griva is a fundamental subject in the field of mathematical programming, offering powerful tools for solving complex decision-making problems across various industries. Whether in engineering, economics, logistics, or data science, optimization techniques enable practitioners to identify the best possible solutions within given constraints. Igor Griva's contributions to this field, particularly through his comprehensive textbooks and research, have significantly advanced both theoretical understanding and practical applications of linear and nonlinear optimization.

Understanding Optimization: An Overview Optimization, in essence, involves finding the best solution from a set of feasible options. It is used when decisions need to maximize or minimize a particular objective function, such as profit, cost, efficiency, or risk. The process requires understanding the problem's structure, formulating it mathematically, and then applying suitable algorithms to arrive at the optimal solution.

What is Linear Optimization? Linear optimization, also known as linear programming (LP), concerns problems where both the objective function and the constraints are linear functions of the decision variables. These problems are widely used due to their simplicity and the availability of efficient solution algorithms.

Key features of linear optimization:

- Objective function:** Linear, e.g., maximize profit or minimize cost.
- Constraints:** Linear inequalities or equations representing resource limitations or requirements.
- Decision variables:** Typically continuous, representing quantities to be determined.

Example of a linear optimization problem: Maximize profit $(Z = 5x_1 + 3x_2)$ Subject to:
$$\begin{cases} 2x_1 + x_2 \leq 20 \\ x_1 + 2x_2 \leq 20 \\ x_1, x_2 \geq 0 \end{cases}$$
 This simple model can be solved efficiently using algorithms like the simplex method or interior-point methods.

What is Nonlinear Optimization? Nonlinear optimization (NLO) deals with problems where either the objective function or some of the constraints are nonlinear. These problems are inherently more complex and often require specialized algorithms for their solution.

Main characteristics of nonlinear optimization:

- Objective function:** Can be convex or non-convex, nonlinear functions.
- Constraints:** May also be nonlinear, adding complexity to the feasible region.
- Solution methods:** Use gradient-based algorithms, heuristic methods, or global optimization techniques.

Example of a nonlinear optimization problem: Minimize $(f(x, y) = x^2 + y^2)$ Subject to:
$$\begin{cases} x^2 + y \leq 10 \\ x + y^2 \geq 3 \\ x, y \geq 0 \end{cases}$$
 Such problems are common in engineering design, economics, and machine learning.

Igor Griva's Contributions to Optimization Theory and Practice Igor Griva is renowned for his pioneering work in the field of optimization, especially for his textbooks that serve as foundational resources for students and researchers. His collaborative works often focus on bridging the gap between theory and real-world applications.

Key Publications and Textbooks One of Griva's most influential books is "Linear and Nonlinear Optimization", co-authored with Anil Nerode and John W. Terrell. This book is praised for its clarity, comprehensive coverage, and practical approach. Main features of Griva's approach include:

- Clear explanations of fundamental concepts in both linear and nonlinear optimization.
- Step-by-step derivations of algorithms like the simplex method, interior-point methods, and gradient-based techniques.
- Inclusion of numerous examples and exercises to reinforce understanding.
- Discussion of real-world applications across different fields.

Other notable contributions:

- Development of algorithms for large-scale nonlinear programming.
- Enhancing the understanding of duality theory, optimality conditions, and sensitivity analysis.
- Addressing the computational complexity of various optimization problems.

Core Topics Covered in Griva's Work

- Foundations of Linear Programming**
 - Formulation of LP problems.
 - Geometric interpretation.
 - The simplex algorithm: mechanics, pivot operations, and optimality.
 - Duality theory and complementary slackness.
 - Sensitivity analysis and parametric programming.
- Advanced Topics in Nonlinear Optimization**
 - Necessary and sufficient optimality conditions.
 - Convex and non-convex problems.
 - Gradient and Hessian-based methods.
 - Interior-point methods for nonlinear problems.
 - Constraint qualifications and duality in nonlinear programming.
- Numerical Methods and Algorithms**
 - Iterative algorithms for large-scale problems.
 - Penalty and barrier methods.
 - Sequential quadratic programming (SQP).
 - Heuristics and metaheuristics for complex problems.

Practical Applications of Optimization Techniques The principles outlined in Griva's work are applied across a broad spectrum of industries:

- Supply Chain Management:** Optimizing inventory levels, routing, and logistics to reduce

costs. Finance: Portfolio optimization, risk assessment, and asset allocation. Engineering Design: Structural optimization, control systems, and machine learning models. Energy Sector: Power generation scheduling, resource allocation, and renewable energy integration. Healthcare: Resource planning, scheduling, and medical decision-making. Case Study Example: A manufacturing company aims to maximize output while minimizing costs. Using linear programming, they model resource constraints, machine capacities, and demand requirements. The optimization process identifies the optimal mix of products, resource allocation, and scheduling, leading to increased efficiency and profitability. Choosing the Right Optimization Method Selecting an appropriate optimization technique depends on the problem's nature: For Linear Problems: - The simplex method remains the standard approach. - Interior-point methods are gaining popularity for large-scale problems. - Use duality theory to analyze sensitivity and economic interpretation. For Nonlinear Problems: - Convex problems can often be solved efficiently using gradient-based methods. - Non-convex problems require global optimization techniques, heuristics, or approximation algorithms. - Sequential quadratic programming (SQP) is effective for smooth nonlinear problems with constraints. Learning Resources and Tools To delve deeper into the subject of optimization as presented by Igor Griva, consider the following resources: Textbooks: "Linear and Nonlinear Optimization" by Igor Griva, Anil Nerode, and John W. Terrell. Software Tools: MATLAB, Gurobi, CPLEX, and open-source options like COIN-OR and SciPy.optimize. Online Courses: Many universities offer courses in optimization, many of which follow the curriculum outlined in Griva's textbooks. Research Journals: Journals like the "Journal of Optimization Theory and Applications" publish cutting-edge research in the field. Conclusion Linear and nonlinear optimization by Igor Griva provides a comprehensive foundation for understanding the principles, algorithms, and applications of optimization techniques. By mastering these concepts, practitioners can solve complex problems efficiently, make informed decisions, and optimize processes across diverse industries. Griva's work continues to influence the development of new algorithms and methodologies, ensuring that optimization remains a vital tool in solving the challenges of modern science and engineering. Whether you are a student, researcher, or industry professional, leveraging the insights from Griva's contributions can significantly enhance your problem-solving toolkit. Question Answer What are the main differences between linear and nonlinear optimization discussed in Igor Griva's book? In Igor Griva's book, linear optimization involves problems where the objective function and constraints are linear functions, allowing for efficient solutions using methods like simplex. Nonlinear optimization deals with problems where the objective or constraints are nonlinear, requiring more complex algorithms such as gradient-based methods or heuristic approaches. How does Griva's book approach the topic of constraint handling in nonlinear optimization? Griva's book emphasizes the importance of constraint qualification conditions and discusses methods like penalty functions, Lagrange multipliers, and barrier methods to effectively handle nonlinear constraints during optimization. What algorithms for solving linear programming problems are covered in Igor Griva's text? The book covers classical algorithms such as the simplex method, the interior-point methods, and the revised simplex method, providing practical insights into their implementation and efficiency. Does Igor Griva's book include real-world applications of nonlinear optimization? Yes, the book features numerous examples from engineering, economics, and logistics to illustrate how nonlinear optimization techniques can be applied to solve practical, real-world problems. 5 How does the book address the convergence and optimality conditions in nonlinear optimization? Griva's book discusses necessary and sufficient conditions for optimality, including Karush-Kuhn-Tucker (KKT) conditions, and explains the convergence properties of various algorithms used in nonlinear optimization. Are there numerical methods and software tools discussed in Igor Griva's book for solving large-scale optimization problems? Yes, the book covers numerical techniques such as sequential quadratic programming and discusses software tools and libraries that facilitate solving large-scale nonlinear optimization problems. What educational level is most suitable for readers of Igor Griva's 'Linear and Nonlinear Optimization'? The book is most suitable for advanced undergraduate and graduate students in applied mathematics, operations research, engineering, and related fields, as well as practitioners seeking a comprehensive understanding of optimization methods. How does the book handle the topic of duality in linear and nonlinear optimization? Griva's book provides a thorough explanation of duality theory, including dual problems, strong and weak duality theorems, and their implications for solving optimization problems efficiently. What are the recent trends and developments in optimization covered in Igor Griva's book? While the core focuses are on fundamental methods, the book also touches upon modern topics such as convex optimization, interior-point methods, and the integration of optimization algorithms with computational software, reflecting ongoing advancements in the field. Linear and Nonlinear Optimization by Igor Griva: An In-Depth Review Optimization theory is a cornerstone of applied mathematics, engineering, economics, and computer science, providing the foundational tools for modeling, analyzing, and solving complex decision-making problems. Among the influential texts in this domain, Linear and Nonlinear Optimization by Igor Griva stands out as a comprehensive and authoritative resource that bridges theoretical

foundations with practical applications. This review provides an in- depth exploration of Griva's work, examining its scope, pedagogical strengths, and its significance in the broader context of optimization literature. --- Introduction to Igor Griva's Optimization Text First published in the early 2000s, *Linear and Nonlinear Optimization* by Igor Griva has established itself as a pivotal reference for students, researchers, and practitioners seeking a rigorous yet accessible introduction to optimization methods. The book is structured to systematically develop the mathematical underpinnings of both linear and nonlinear programming, blending theory with real-world problem-solving techniques. The core aim of the text is to equip readers with the necessary tools to formulate, analyze, and solve optimization problems across various domains. Its comprehensive coverage makes it a preferred choice in academic curricula and professional training programs. --- Scope and Structure of the Book Dual Focus on Linear and Nonlinear Optimization The book's primary strength lies in its balanced *Linear And Nonlinear Optimization By Igor Griva* 6 treatment of two fundamental branches: - *Linear Optimization (Linear Programming)*: Focuses on problems where the objective function and constraints are linear. It emphasizes the simplex method, duality theory, sensitivity analysis, and modern interior- point methods. - *Nonlinear Optimization (Nonlinear Programming)*: Extends to problems involving nonlinear objective functions and constraints. It covers necessary optimality conditions, convexity, algorithms like gradient methods, Newton's method, and interior- point approaches. Modular Organization The material is organized into chapters that progressively build from basic concepts to advanced topics: 1. *Mathematical Foundations*: Vectors, matrices, convex sets, and functions. 2. *Linear Programming*: Formulation, geometric interpretation, simplex algorithm, duality, and sensitivity. 3. *Duality and Complementary Slackness*: Deep exploration of dual problems and economic interpretations. 4. *Interior-Point Methods*: Modern algorithms that have revolutionized linear programming. 5. *Nonlinear Optimization*: Necessary conditions (Karush-Kuhn-Tucker conditions), convexity, and unconstrained vs. constrained problems. 6. *Algorithms for Nonlinear Problems*: Gradient, quasi-Newton, conjugate gradient, and trust-region methods. 7. *Advanced Topics*: Global optimization, stochastic programming, and multi- objective optimization. --- Pedagogical Approach and Methodology Emphasis on Mathematical Rigor Griva's approach is characterized by meticulous mathematical rigor. The book carefully develops theoretical results, providing proofs where appropriate, thus ensuring that readers develop a solid understanding of underlying principles. This rigor is particularly valuable for graduate students and researchers seeking a deep comprehension. Practical Problem-Solving Techniques Despite its theoretical orientation, the text maintains a practical perspective. Each chapter includes numerous examples, exercises, and real-world applications, illustrating how to implement algorithms and interpret results. This dual focus enhances the book's utility as both a teaching resource and a practical guide. Use of Geometric and Algebraic Perspectives The book balances geometric intuition with algebraic formulations, allowing readers to visualize optimization problems while understanding their algebraic structure. This combination aids in grasping complex concepts such as duality and convexity. --- Critical Analysis of Key Topics Linear Programming: Foundations and Algorithms Formulation and Geometric Insights Griva emphasizes the importance of proper problem formulation, illustrating how real-world issues can be modeled as linear programs. The geometric interpretation—feasible regions as convex polyhedra and solutions at vertices—is thoroughly explained, aiding intuition. Simplex Method and Duality The classical simplex algorithm receives detailed treatment, including pivot rules, degeneracy, and the simplex tableau. The discussion on duality provides insight into economic interpretations and sensitivity analysis, which are critical in managerial decision-making. Interior-Point Methods A significant contribution of the book is its coverage of interior-point algorithms, which have become a standard in large-scale linear programming. The text explains the theoretical foundations, such as barrier Linear And Nonlinear Optimization By Igor Griva 7 functions and path-following methods, alongside implementation considerations. --- Nonlinear Programming: Theoretical Foundations and Algorithms Optimality Conditions Griva thoroughly discusses the Karush-Kuhn-Tucker (KKT) conditions, a cornerstone for constrained nonlinear optimization. The text explores conditions under convexity assumptions, ensuring the sufficiency of solutions and convergence properties. Convexity and Its Role The book emphasizes convex analysis, illustrating how convexity guarantees global optimality and simplifies solution procedures. It explores convex sets, functions, and the significance of convexity in ensuring the success of various algorithms. Solution Algorithms A variety of algorithms are detailed: - *Gradient Descent*: Basic iterative method for unconstrained problems. - *Quasi-Newton Methods*: Approximations to Hessian matrices for faster convergence. - *Conjugate Gradient Methods*: Suitable for large, sparse problems. - *Trust-Region Methods*: Handle nonlinearity and constraints effectively. The implementation nuances and convergence properties of each are discussed, providing practitioners with practical insights. --- Strengths and Limitations Strengths - *Comprehensive Coverage*: The book covers a broad spectrum of topics, from fundamentals to advanced methods, making it suitable for diverse audiences. - *Mathematical Rigor*: Detailed proofs and theoretical analyses reinforce understanding and credibility. - *Practical Orientation*: Inclusion of algorithms, examples, and exercises facilitates applied learning. -

Integration of Modern Techniques: Coverage of interior-point methods and convex analysis reflects contemporary developments. *Limitations - Complexity:* The high level of mathematical detail may be daunting for beginners without a solid mathematical background. - *Depth Over Breadth in Some Areas:* Certain advanced topics, such as stochastic programming or global optimization, are treated briefly, which may require supplementary resources for in-depth study. - *Limited Software Guidance:* The book focuses on theory and algorithms but offers limited guidance on implementation using specific software tools. --- *Impact and Relevance in the Optimization Community* Linear and Nonlinear Optimization by Igor Griva has significantly influenced how optimization is taught and understood. Its rigorous approach has made it a staple in graduate courses worldwide, often serving as the primary textbook for courses in optimization theory and algorithms. The book's detailed treatment of interior-point methods and duality theory has contributed to the dissemination and understanding of these advanced topics. Moreover, its balanced presentation of theory and practice has helped bridge the gap between academic research and industrial applications. --- *Conclusion* Linear and Nonlinear Optimization by Igor Griva remains a seminal work in the field of optimization. Its thorough coverage, mathematical rigor, and practical insights make it an invaluable resource for anyone seeking a deep understanding of the subject. While its complexity may pose challenges for newcomers, its comprehensive approach ensures that readers develop a robust foundation capable of tackling both theoretical and applied problems. For researchers, educators, and practitioners alike, Griva's text offers a solid, authoritative guide to the principles and methods that underpin modern optimization theory and practice. As optimization continues to evolve, foundational texts like Griva's will undoubtedly remain relevant, guiding future innovations and applications. --- *Keywords:* linear optimization, nonlinear optimization, Igor Griva, convex analysis, interior-point methods, Karush-Kuhn-Tucker conditions, duality, algorithms, mathematical rigor optimization, linear programming, nonlinear programming, Igor Griva, mathematical optimization, constrained optimization, unconstrained optimization, convex optimization, optimization algorithms, numerical methods

OptimizationMathematical Optimization Theory and Operations ResearchInverse Problems, Design and Optimization - vol. 1Stochastic and Global OptimizationLinear and Nonlinear OptimizationMathematical Optimization Theory and Operations ResearchOptimization and ApplicationsMathematical Optimization Theory and Operations Research: Recent TrendsMathematical Optimization Theory and Operations Research: Recent TrendsOptimization and ApplicationsImpedance SpectroscopyLearning and Intelligent OptimizationMathematical Optimization Theory and Operations ResearchRough Sets and Intelligent Systems - Professor Zdzisław Pawlak in MemoriamOptimization and ApplicationsEmerging Paradigms in Machine LearningMathematical Optimization Theory and Operations ResearchSystem Modeling and OptimizationCombinatorial OptimizationModern Optimization Methods for Decision Making Under Risk and Uncertainty Jan Brinkhuis Yury Kochetov G. Dżemyda Igor Griva Alexander Kononov Yury Evtushenko Anton Ereemeev Yury Kochetov Nicholas Olenov Evgenij Barsoukov Roberto Battiti Michael Khachay Andrzej Skowron Milojica Jakić imović Sheela Ramanna Panos Pardalos Lorena Bociu Jon Lee Alexei A. Gaivoronski Optimization Mathematical Optimization Theory and Operations Research Inverse Problems, Design and Optimization - vol. 1 Stochastic and Global Optimization Linear and Nonlinear Optimization Mathematical Optimization Theory and Operations Research Optimization and Applications Mathematical Optimization Theory and Operations Research: Recent Trends Mathematical Optimization Theory and Operations Research: Recent Trends Optimization and Applications Impedance Spectroscopy Learning and Intelligent Optimization Mathematical Optimization Theory and Operations Research Rough Sets and Intelligent Systems - Professor Zdzisław Pawlak in Memoriam Optimization and Applications Emerging Paradigms in Machine Learning Mathematical Optimization Theory and Operations Research System Modeling and Optimization Combinatorial Optimization Modern Optimization Methods for Decision Making Under Risk and Uncertainty Jan Brinkhuis Yury Kochetov G. Dżemyda Igor Griva Alexander Kononov Yury Evtushenko Anton Ereemeev Yury Kochetov Nicholas Olenov Evgenij Barsoukov Roberto Battiti Michael Khachay Andrzej Skowron Milojica Jakić imović Sheela Ramanna Panos Pardalos Lorena Bociu Jon Lee Alexei A. Gaivoronski

this self contained textbook is an informal introduction to optimization through the use of numerous illustrations and applications the focus is on analytically solving optimization problems with a finite number of continuous variables in addition the authors provide introductions to classical and modern numerical methods of optimization and to dynamic optimization the book's overarching point is that most problems may be solved by the direct application of the theorems of fermat lagrange and weierstrass the authors show how the intuition for each of the

theoretical results can be supported by simple geometric figures they include numerous applications through the use of varied classical and practical problems even experts may find some of these applications truly surprising a basic mathematical knowledge is sufficient to understand the topics covered in this book more advanced readers even experts will be surprised to see how all main results can be grounded on the fermat lagrange theorem the book can be used for courses on continuous optimization from introductory to advanced for any field for which optimization is relevant

this book lncs 15681 constitutes the refereed proceedings of the 24th international conference on mathematical optimization theory and operations research motor 2025 held in novosibirsk russia during july 7 11 2025 the 27 full papers were carefully reviewed and selected from 72 submissions the proceeding focus on mathematical programming optimal control game theory operations research and applications machine learning and optimization

in the paper we propose a model of tax incentives optimization for investment projects with a help of the mechanism of accelerated depreciation unlike the tax holidays which influence on effective income tax rate accelerated depreciation affects on taxable income in modern economic practice the state actively use for an attraction of investment into the creation of new enterprises such mechanisms as accelerated depreciation and tax holidays the problem under our consideration is the following assume that the state region is interested in realization of a certain investment project for example the creation of a new enterprise in order to attract a potential investor the state decides to use a mechanism of accelerated tax depreciation the following question arise what is a reasonable principle for choosing depreciation rate from the state's point of view the future investor's behavior will be rational it means that while looking at economic environment the investor choose such a moment for investment which maximizes his expected net present value npv from the given project for this case both criteria and investment rule depend on proposed by the state depreciation policy for the simplicity we will suppose that the purpose of the state for a given project is a maximization of a discounted tax payments into the budget from the enterprise after its creation of course these payments depend on the moment of investor's entry and therefore on the depreciation policy established by the state

flexible graduate textbook that introduces the applications theory and algorithms of linear and nonlinear optimization in a clear succinct style supported by numerous examples and exercises it introduces important realistic applications and explains how optimization can address them

this book constitutes the proceedings of the 19th international conference on mathematical optimization theory and operations research motor 2020 held in novosibirsk russia in july 2020 the 31 full papers presented in this volume were carefully reviewed and selected from 102 submissions the papers are grouped in these topical sections discrete optimization mathematical programming game theory scheduling problem heuristics and metaheuristics and operational research applications

this book constitutes the refereed proceedings of the 9th international conference on optimization and applications optima 2018 held in petrovac montenegro in october 2018 the 35 revised full papers and the one short paper presented were carefully reviewed and selected from 103 submissions the papers are organized in topical sections on mathematical programming combinatorial and discrete optimization optimal control optimization in economy finance and social sciences applications

this book constitutes the revised selected papers from the 23rd international conference on mathematical optimization theory and operations research motor 2024 held in omsk russia from june 30 to july 06 2024 the 26 full papers included in this book were carefully reviewed and selected from 79 submissions these papers have been organized in the following topical sections mathematical programming combinatorial optimization operations research and machine learning and optimization

this book constitutes refereed proceedings of the 21st international conference on mathematical optimization theory and operations research motor 2022 held in petrozavodsk russia in july 2022 the 21 full papers and 3 short papers presented in this volume were carefully reviewed and selected from a total of 88 submissions the papers in the volume are organised according to the following topical headings invited talks integer programming and combinatorial optimization mathematical programming game theory and optimal control operational research applications

this book constitutes the refereed proceedings of the 14th international conference on optimization and applications optima 2023 held in petrovac montenegro during september 18 22 2023 the 27 full papers included in this book were carefully reviewed and selected from 68 submissions they were organized in topical sections as follows mathematical programming global optimization discrete and combinatorial optimization game theory and mathematical economics optimization in economics and finance and applications

the essential reference for the field featuring protocols analysis fundamentals and the latest advances impedance spectroscopy theory experiment and applications provides a comprehensive reference for graduate students researchers and engineers working in electrochemistry physical chemistry and physics covering both fundamentals concepts and practical applications this unique reference provides a level of understanding that allows immediate use of impedance spectroscopy methods step by step experiment protocols with analysis guidance lend immediate relevance to general principles while extensive figures and equations aid in the understanding of complex concepts detailed discussion includes the best measurement methods and identifying sources of error and theoretical considerations for modeling equivalent circuits and equations in the complex domain are provided for most subjects under investigation written by a team of expert contributors this book provides a clear understanding of impedance spectroscopy in general as well as the essential skills needed to use it in specific applications extensively updated to reflect the field's latest advances this new third edition incorporates the latest research and provides coverage of new areas in which impedance spectroscopy is gaining importance discusses the application of impedance spectroscopy to viscoelastic rubbery materials and biological systems explores impedance spectroscopy applications in electrochemistry semiconductors solid electrolytes corrosion solid state devices and electrochemical power sources examines both the theoretical and practical aspects and discusses when impedance spectroscopy is and is not the appropriate solution to an analysis problem researchers and engineers will find value in the immediate practicality while students will appreciate the hands on approach to impedance spectroscopy methods retaining the reputation it has gained over years as a primary reference impedance spectroscopy theory experiment and applications once again present a comprehensive reference reflecting the current state of the field

this book constitutes the thoroughly refereed post conference proceedings of the 11th international conference on learning and intelligent optimization lion 11 held in nizhny novgorod russia in june 2017 the 20 full papers among these one genopt paper and 15 short papers presented have been carefully reviewed and selected from 73 submissions the papers explore the advanced research developments in such interconnected fields as mathematical programming global optimization machine learning and artificial intelligence special focus is given to advanced ideas technologies methods and applications in optimization and machine learning

this book constitutes the refereed proceedings of the 22nd international conference on mathematical optimization theory and operations research motor 2023 held in ekaterinburg russia during july 2 8 2023 the 28 full papers and 1 short paper included in this book were carefully reviewed and selected from 89 submissions they were organized in topical sections as follows mathematical programming and applications discrete and combinatorial optimization stochastic optimization scheduling game theory and optimal control and mathematical economics the book also contains one invited talk in full paper length

this book is dedicated to the memory of professor zdzisław pawlak who passed away almost six years ago he is the founder of the polish school of artificial intelligence and one of the pioneers in computer engineering and computer science with worldwide influence he was a truly great scientist researcher teacher and a human being this book prepared in two volumes contains more

than 50 chapters this demonstrates that the scientific approaches discovered by of professor zdzisław pawlak especially the rough set approach as a tool for dealing with imperfect knowledge are vivid and intensively explored by many researchers in many places throughout the world the submitted papers prove that interest in rough set research is growing and is possible to see many new excellent results both on theoretical foundations and applications of rough sets alone or in combination with other approaches we are proud to offer the readers this book

this book constitutes the refereed proceedings of the 10th international conference on optimization and applications optima 2019 held in petrovac montenegro in september october 2019 the 35 revised full papers presented were carefully reviewed and selected from 117 submissions the papers cover such topics as optimization operations research optimal control game theory and their numerous applications in practical problems of operations research data analysis and software development

this book presents fundamental topics and algorithms that form the core of machine learning ml research as well as emerging paradigms in intelligent system design the multidisciplinary nature of machine learning makes it a very fascinating and popular area for research the book is aiming at students practitioners and researchers and captures the diversity and richness of the field of machine learning and intelligent systems several chapters are devoted to computational learning models such as granular computing rough sets and fuzzy sets an account of applications of well known learning methods in biometrics computational stylistics multi agent systems spam classification including an extremely well written survey on bayesian networks shed light on the strengths and weaknesses of the methods practical studies yielding insight into challenging problems such as learning from incomplete and imbalanced data pattern recognition of stochastic episodic events and on line mining of non stationary data streams are a key part of this book

this book constitutes the proceedings of the 20th international conference on mathematical optimization theory and operations research motor 2021 held in irkutsk russia in july 2021 the 29 full papers and 1 short paper presented in this volume were carefully reviewed and selected from 102 submissions additionally 2 full invited papers are presented in the volume the papers are grouped in the following topical sections combinatorial optimization mathematical programming bilevel optimization scheduling problems game theory and optimal control operational research and mathematical economics data analysis

this book is a collection of thoroughly refereed papers presented at the 27th ifip tc 7 conference on system modeling and optimization held in sophia antipolis france in june july 2015 the 48 revised papers were carefully reviewed and selected from numerous submissions they cover the latest progress in their respective areas and encompass broad aspects of system modeling and optimization such as modeling and analysis of systems governed by partial differential equations pdes or ordinary differential equations odes control of pdes odes nonlinear optimization stochastic optimization multi objective optimization combinatorial optimization industrial applications and numericsof pdes

this book constitutes the thoroughly refereed post conference proceedings of the 5th international symposium on combinatorial optimization isco 2018 held in marrakesh marocco in april 2018 the 35 revised full papers presented in this book were carefully reviewed and selected from 75 submissions the symposium aims to bring together researchers from all the communities related to combinatorial optimization including algorithms and complexity mathematical programming and operations research

the book comprises original articles on topical issues of risk theory rational decision making statistical decisions and control of stochastic systems the articles are the outcome of a series international projects involving the leading scholars in the field of modern stochastic optimization and decision making the structure of stochastic optimization solvers is described the solvers in general implement stochastic quasi gradient methods for optimization and identification of complex nonlinear models these models constitute an important methodology for finding optimal decisions under risk and uncertainty while a large part of current approaches towards optimization under uncertainty stems from linear programming lp and often results in large lps of

special structure stochastic quasi gradient methods confront nonlinearities directly without need of linearization this makes them an appropriate tool for solving complex nonlinear problems concurrent optimization and simulation models and equilibrium situations of different types for instance nash or stackelberg equilibrium situations the solver finds the equilibrium solution when the optimization model describes the system with several actors the solver is parallelizable performing several simulation threads in parallel it is capable of solving stochastic optimization problems finding stochastic nash equilibria and of composite stochastic bilevel problems where each level may require the solution of stochastic optimization problem or finding nash equilibrium several complex examples with applications to water resources management energy markets pricing of services on social networks are provided in the case of power system regulator makes decision on the final expansion plan considering the strategic behavior of regulated companies and coordinating the interests of different economic entities such a plan can be an equilibrium a planned decision where a company cannot increase its expected gain unilaterally

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