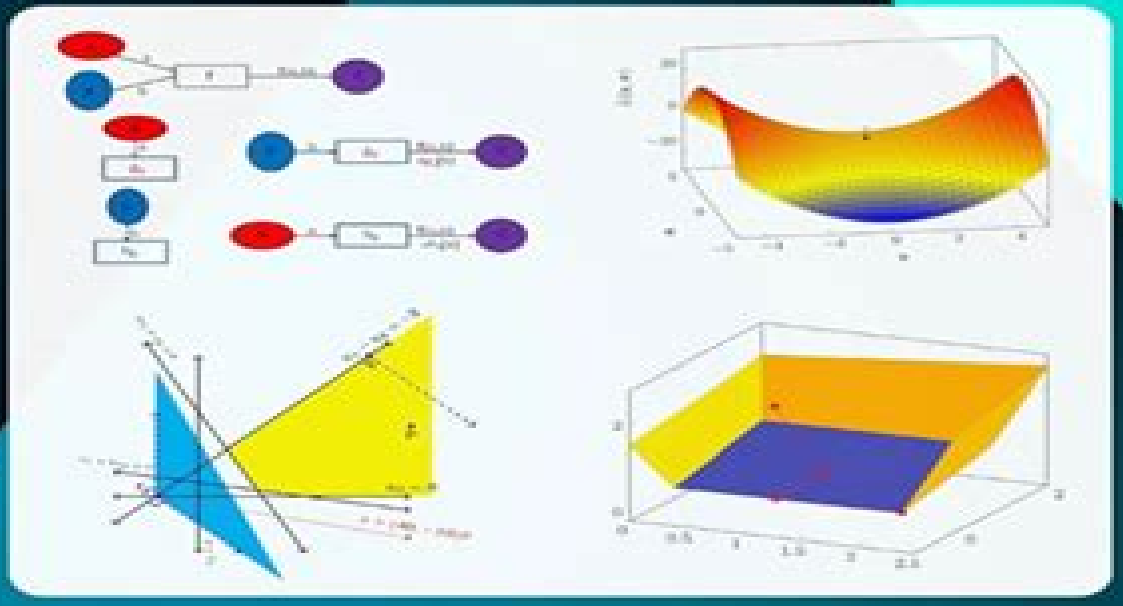
LINEAR OPTIMIZATION AND DUALITY

A Modern Exposition



Craig A. Tovey

CRC Press
Taylor & Francis Group
A CHAPMAN & HALL BOOK

Linear Programming Duals Modern Exposition

M Carnoy

Linear Programming Duals Modern Exposition:

Linear Programming with Duals Craig A. Tovey,2017-06-15 This textbook presents a theoretical treatment of linear programming network flows and applications integer programming and computational complexity The author includes a rigorous discussion of theory numerous examples and exercises and geometric intuitive explanations He also offers computational tips and interpretation of software input Unlike other books this text incorporates duality throughout its chapters rather than treating it as an add on topic It also discusses computational complexity theory which can be used to classify problems according to the appropriate solution method **Linear Optimization and Duality** Craig A. Tovey,2020-12-15 Linear Optimization and Dualiyy A Modern Exposition departs from convention in significant ways Standard linear programming textbooks present the material in the order in which it was discovered Duality is treated as a difficult add on after coverage of formulation the simplex method and polyhedral theory Students end up without knowing duality in their bones This text brings in duality in Chapter 1 and carries duality all the way through the exposition Chapter 1 gives a general definition of duality that shows the dual aspects of a matrix as a column of rows and a row of columns The proof of weak duality in Chapter 2 is shown via the Lagrangian which relies on matrix duality The first three LP formulation examples in Chapter 3 are classic primal dual pairs including the diet problem and 2 person zero sum games For many engineering students optimization is their first immersion in rigorous mathematics Conventional texts assume a level of mathematical sophistication they don t have This text embeds dozens of reading tips and hundreds of answered questions to guide such students Features Emphasis on duality throughout Practical tips for modeling and computation Coverage of computational complexity and data structures Exercises and problems based on the learning theory concept of the zone of proximal development Guidance for the mathematically unsophisticated reader About the Author Craig A Tovey is a professor in the H Milton Stewart School of Industrial and Systems Engineering at Georgia Institute of Technology Dr Tovey received an AB from Harvard College an MS in computer science and a PhD in operations research from Stanford University His principal activities are in operations research and its interdisciplinary applications He received a Presidential Young Investigator Award and the Jacob Wolfowitz Prize for research in heuristics He was named an Institute Fellow at Georgia Tech and was recognized by the ACM Special Interest Group on Electronic Commerce with the Test of Time Award Dr Tovey received the 2016 Golden Goose Award for his research on bee foraging behavior leading to the development of the Honey Bee Algorithm **Linear Optimization and Duality** Craig A. Tovey,2020-12-15 Linear Optimization and Dualiyy A Modern Exposition departs from convention in significant ways Standard linear programming textbooks present the material in the order in which it was discovered Duality is treated as a difficult add on after coverage of formulation the simplex method and polyhedral theory Students end up without knowing duality in their bones This text brings in duality in Chapter 1 and carries duality all the way through the exposition Chapter 1 gives a general definition of duality that shows the dual aspects of a

matrix as a column of rows and a row of columns The proof of weak duality in Chapter 2 is shown via the Lagrangian which relies on matrix duality The first three LP formulation examples in Chapter 3 are classic primal dual pairs including the diet problem and 2 person zero sum games For many engineering students optimization is their first immersion in rigorous mathematics Conventional texts assume a level of mathematical sophistication they don t have This text embeds dozens of reading tips and hundreds of answered questions to guide such students Features Emphasis on duality throughout Practical tips for modeling and computation Coverage of computational complexity and data structures Exercises and problems based on the learning theory concept of the zone of proximal development Guidance for the mathematically unsophisticated reader About the Author Craig A Tovey is a professor in the H Milton Stewart School of Industrial and Systems Engineering at Georgia Institute of Technology Dr Tovey received an AB from Harvard College an MS in computer science and a PhD in operations research from Stanford University His principal activities are in operations research and its interdisciplinary applications He received a Presidential Young Investigator Award and the Jacob Wolfowitz Prize for research in heuristics He was named an Institute Fellow at Georgia Tech and was recognized by the ACM Special Interest Group on Electronic Commerce with the Test of Time Award Dr Tovey received the 2016 Golden Goose Award for his research on bee foraging behavior leading to the development of the Honey Bee Algorithm Understanding and Using Linear Programming Jiri Matousek,Bernd Gärtner,2007-07-04 This is an introductory textbook of linear programming written mainly for students of computer science and mathematics Our guiding phrase is what every theoretical computer scientist should know about linear programming The book is relatively concise in order to allow the reader to focus on the basic ideas For a number of topics commonly appearing in thicker books on the subject we were seriously tempted to add them to the main text but we decided to present them only very brie y in a separate glossary At the same time we aim at covering the main results with complete proofs and in su cient detail in a way ready for presentation in class One of the main focuses is applications of linear programming both in practice and in theory Linear programming has become an extremely ible tool in theoretical computer science and in mathematics While many of the nest modern applications are much too complicated to be included in an introductory text we hope to communicatesome of the avor and excitement of such applications on simpler examples

Encyclopedia of Business Analytics and Optimization Wang, John,2014-02-28 As the age of Big Data emerges it becomes necessary to take the five dimensions of Big Data volume variety velocity volatility and veracity and focus these dimensions towards one critical emphasis value The Encyclopedia of Business Analytics and Optimization confronts the challenges of information retrieval in the age of Big Data by exploring recent advances in the areas of knowledge management data visualization interdisciplinary communication and others Through its critical approach and practical application this book will be a must have reference for any professional leader analyst or manager interested in making the most of the knowledge resources at their disposal Optimization in Planning and Operation of Electric Power Systems Karl Frauendorfer,Hans

Glavitsch,Rainer Bacher,2013-10-14 Permanently increasing requirements in power supply necessitate efficient control of electric power systems An emerging subject of importance is optimization Papers on modelling aspects of unit commitment and optimal power flow provide the introduction to power systems control and to its associated problem statement Due to the nature of the underlying optimization problems recent developments in advanced and well established mathematical programming methodologies are presented illustrating in which way dynamic separable continuous and stochastic features might be exploited In completing the various methodologies a number of presentations have stated experiences with optimization packages currently used for unit commitment and optimal power flow calculations This work represents a state of the art of mathematical programming methodologies unit commitment optimal power flow and their applications in power system control **Modern Trends in Cybernetics and Systems: Proceedings of official and other meetings, exhibitions, symposia and Section 1 Economic cybernetic systems and management** ,1977 *Criteria and Methods of Structural Optimization* Andrzej M Brandt,1987-06-30 This book is intended to serve all those who are interested in structural opti mization whether they work in this field or study it for other purposes Rapid growth of interest in the cognitive aspects of optimization and the increas ing demands that the present day engineer has to meet in modern design have created the need of a monographic treatment of the subject The vast number and wide range of structural optimization problems formulated and investigated in the last twenty years call for an attempt to sum up the pres ent state of knowledge in this domain and to outline the directions of its further development The present authors undertook this task hoping that the result would stimulate further work towards finding new methods and solutions and increasing the range of applications of the optimization methods to structural design The immediate aim of the book is to present the basic criteria and methods of optimization and to provide a reference guide to the most important publications in the field The book consists of fourteen chapters Chapter 1 introduces the basic concepts definitions and assumptions relating to structural optimization Chapter 2 gives the foundations of optimization for minimum elastic strain potential or maximum rigidity and sets a basis for optimization of bar plate and lattice structures Chapter 3 presents criteria of strength design and their applications to plane structures Linear Programming Romesh Saigal,1995-11-30 Presents a unified approach to the study of boundary simplex and interior point methods for linear programming Derives both classes of methods from the complementary slackness theorem with the duality theorem derived from Farkas lemma which is proved as a convex separation theorem Offers a new and inductive proof of Kantorovich s theorem related to the convergence of Newton s method and discusses the primal the dual and the primal dual affine scaling methods the polynomial barrier method and the projective transformation method Includes a chapter on background material for the study of boundary methods and a chapter detailing new methods using LQ factorization and iterative techniques Can be used as a text in a one or two semester advanced graduate course on linear programming Annotation copyright by Book News Inc Portland OR **Global Optimization** Leo Liberti,Nelson

Maculan,2006-06-22 Most books about global optimization describe the theory of the algorithms whereas a given implementation s quality never depends exclusively on the theoretical soundness of the algorithms that are implemented The literature rarely discusses the tuning of algorithmic parameters implementation tricks software architectures and the embedding of local solvers within global solvers And yet there are many good software implementations out there from which the entire community could learn something The scope of this book is moving a few steps toward the systematization of the path that goes from the invention to the implementation and testing of a global optimization algorithm Some of the contributors to the book are famous and some are less well known but all are experts in the discipline of actually getting global optimization to work Thus the papers in this book address the following topics Descriptions of new implementations of general purpose or problem specific global optimization algorithms New algorithms in global optimization some with numerical results and a discussion of the implementation Surveys discussing existing software packages International Encyclopedia of Business and Management Malcolm Warner,John Paul Kotter,2002 **Nonlinear Optimization** H. A. Eiselt,Carl-Louis Sandblom,2019-11-09 This book provides a comprehensive introduction to nonlinear programming featuring a broad range of applications and solution methods in the field of continuous optimization It begins with a summary of classical results on unconstrained optimization followed by a wealth of applications from a diverse mix of fields e g location analysis traffic planning and water quality management to name but a few In turn the book presents a formal description of optimality conditions followed by an in depth discussion of the main solution techniques Each method is formally described and then fully solved using a numerical example *Computers and Mathematical Programming* William Wallace White,1978

Economic Theory and its History Giuseppe Freni,Heinz D. Kurz,Andrea Mario Lavezzi,Rodolfo Signorino,2016-01-29 This collection brings together leading economists from around the world to explore key issues in economic analysis and the history of economic thought This book deals with important themes in economics in terms of an approach that has its roots in the works of the classical economists from Adam Smith to David Ricardo The chapters have been inspired by the work of Neri Salvadori who has made key contributions in various areas including the theory of production the theory of value and distribution the theory of economic growth as well as the theory of renewable and deplorable natural resources The main themes in this book include production value and distribution endogenous economic growth renewable and exhaustible natural resources capital and profits oligopolistic competition effective demand and capacity utilization financial regulation and themes in the history of economic analysis Several of the contributions are closely related to the works of Neri Salvadori This is demonstrated with respect to important contemporary topics including the sources of economic growth the role of exhaustible resources in economic development the reduction and disposal of waste the redistribution of income and wealth and the regulation of an inherently unstable financial sector All contributions are brand new original and concise written by leading exponents in their field of expertise Together this volume represents an invaluable contribution to economic analysis

and the history of economic thought This book is suitable for those who study economic theory and its history political economy as well as philosophy Technical Abstract Bulletin ,1979 **Mathematical Economics and Operations Research** Joseph Zaremba,1978 *NBS Special Publication* ,1968 **The American Economic Review** ,1965 **Journal of the Association for Computing Machinery** Association for Computing Machinery,1959 **The Theory of International Trade** John Somerset Chipman,2008-01-01 John Chipman is one of the most esteemed economists working in international trade theory Presented in two volumes this work presents Chipman s survey articles on the theory of international trade The papers explore the evolution of thought from classical to new classical and on to modern theory

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