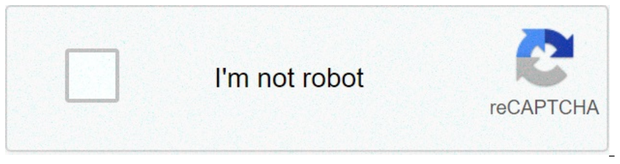

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Nonlinear programming dimitri bertsekas pdf

by Dimitri P. BertsekasISBN: 1-886529-00-0Publication: 1999, 780 pages, hardcoverPrice: $89.00 Contents, Preface, Ordering, Home This is a substantially expanded (by 130 pages) and improved edition of our best-selling nonlinear programming book. The treatment focuses on iterative algorithms for constrained and unconstrained optimization, Lagrange multipliers and duality, large scale problems, and on the interface between continuous and discrete optimization. Nearly 40% of the new material represents miscellaneous additions scattered throughout the text. The remainder deals with three new topics. These are: A new section in Chapter 3 that focuses on a simple but far-reaching treatment of Fritz John necessary conditions and constraint qualifications, and also includes semi-infinite programming. A new section in Chapter 5 on the use of duality and Lagrangian relaxation for solving discrete optimization problems. This section describes several motivating applications, and provides a connecting link between continuous and discrete optimization. A new section in Chapter 6 on approximate and incremental subgradient methods. This material is the subject of ongoing research, but it was thought sufficiently significant to be included in summary here. A new internet-based feature was added to the book, which significantly extends its scope and coverage. Many of the theoretical exercises, quite a few of them new, have been solved in detail and their solutions have been posted on the internet (see below). The book is also supported by the author's Convex Analysis and Optimization book (Athena Scientific, 2003). From the review by Olvi Mangasarian (Optima, March 1997): "This is a beautifully written book by a prolific author ... who has taken painstaking care in making the presentation extremely lucid ... The style is unhurried and intuitive yet mathematically rigorous." "The numerous figures in the book are extremely well thought out and are used in a very effective way to elucidate the text. The detailed and self-explanatory long captions accompanying each figure are extremely helpful." "The 80 pages constituting the four appendixes serve as a masterfully written introduction to the field of nonlinear programming that can be used as a self-contained monograph. Teachers using this book could easily assign these appendixes as introductory or remedial material." From the review by Mattias Heinkenschloss (Zentralblatt fur Mathematik, October 2000): "This book contains a wealth of material... Throughout this book, well-prepared graphics illustrate ideas and results. The text contains many examples and each section is followed by a set of nice exercises."Among its special features, the book: provides extensive coverage of iterative optimization methods within a unifying framework provides a detailed treatment of interior point methods for linear programming covers in depth duality theory from both a variational and a geometrical/convex analysis point of viewincludes much new material on a number of topics, such as neural network training, discrete-time optimal control, and large-scale optimizationincludes a large number of examples and exercises detailed solutions of many of which are posted on the internet (see below)developed through extensive classroom use in first-year graduate courses The author is McAfee Professor of Engineering at the Massachusetts Institute of Technology and a member of the National Academy of Engineering. He has been teaching the material included in this book in introductory graduate courses for over twenty five years. Supplementary Material: The material listed below can be freely downloaded, reproduced, and distributed . Prof. Bertsekas' Lecture Slides on Nonlinear Programming (600 K, pdf)Prof. Bertsekas' Research Papers on Nonlinear ProgrammingTheoretical problem solutions, Chapter 1 (950 K, pdf)Theoretical problem solutions, Chapter 2 (700 K, pdf)Theoretical problem solutions, Chapter 3 (800 K, pdf)Theoretical problem solutions, Chapter 4 (550 K, pdf)Theoretical problem solutions, Chapter 5 (1000 K, pdf)Theoretical problem solutions, Chapter 6 (800 K, pdf)Lecture Notes, Theoretical Problem Solutions, Codes (Link to Prof. Bertsekas' Nonlinear Programming course at MIT) Errata (400K, pdf) Questions? Please use our comments form. Cover designs by Ann Gallager. [Return to Athena Scientific Homepage]info@athenasc.com References: Additional References: Practical Optimization, P.E. Gill, W. Murray, M.H. Wright. Numerical Methods for Unconstrained Optimization and Nonlinear Equations, J.E. Dennis and R.B. Schnabel Nonlinear Programming: theory and algorithms, M.S. Bazaraa, C.M. Shetty, Sherali Linear and Nonlinear Programming, D.G. Luenberger, Second Edition Nonlinear Programming, Peressini, Sullivan, Uhl Practical Methods of Optimization, R. Fletcher Mathematical Programming Methods, G, Zoutendijk Nonlinear Programming, G.P. McCormick Mathematical programming : theory and algorithms, M. Minoux (QA402.5.M5613) Optimization by Vector Space Methods, D.G. Luenberger Convex Analysis, R.T. Rockafellar Theory of Extremal Problems, A.D. Ioffe and V.M. Tihomirov Home Page, C&O 466/666, ftp://orion.uwaterloo.ca/pub/henry/teaching/w97/666.w97/readme.html Term Work: will consist of homework problems . (See attached schedule of assignments.) Final Exam: A 3-hour exam, scheduled by the registrar. (Please see the detailed course outline for topics covered during the semester.) Marking Scheme: Homework..... 50% Final Exam..... 50% Major Topics Sub-topics Resources for the different topics are included. Unconstrained Optimization (Chapter 1) Optimality Conditions first and second order; proofs; convex case Gradient Methods - Convergence Steepest Descent; stepsize rules; rates of convergence; Armijo rule with proof; concepts of sufficient decrease and gradient related; behaviour on quadratic functions Newton's Method and Variations (outline of Conjugate Gradient, Quasi-Newton, and Trust Region Methods); details of proof of convergence, with rates, for Newton's method; steepest descent convergence on quadratics Least Squares Problems Optimization Over a Convex Set (Chapter 2) Optimality Conditions Feasible Directions Methods Lagrange Multiplier Theory (Chapter 3) Necessary Conditions for Equality Constraints Sufficient Conditions and Sensitivity Analysis Inequality Constraints Lagrange Multiplier Algorithms (Chapter 4) Barrier and Interior Point Methods Penalty and Augmented Lagrangian Methods The Quadratic Penalty Function Method Exact Penalty Methods - Sequential Quadratic Programming Lagrangian Methods Duality and Convex Programming (Chapter 5) The Dual Problem Lagrange Multipliers, The Weak Duality Theorem Strong Duality Duality Methods (Chapter 6) Nondifferentiable Optimization Methods Lagrangian Relaxation Nonlinear Programming Software local (personal) software information local (UofW) software information Homework #1 (Unconstrained Optimization) Due: Tuesday January 21 Reading Problems Bertsekas, pp 15, #1.1.6 (Weber Point) and solution latex file. Bertsekas, pp 51, #1.2.14 (Steepest Descent) and solution latex file1 and file2. Bertsekas, pp 115 #1.5.3 (Gauss-Newton); Use the optimization technology center to solve a similar problem but with k randomly generated data points, k=50; if possible, discuss the solver that you used and the algorithm. Bertsekas, pp 141 #1.7.2 (Limited Memory BFGS) Homework #2 (Optimization Over a Convex Set) Due: Thursday February 6 Reading Problems Bertsekas, pp 187 #2.1.10 (Second Order Nec. Opt. Cond.) Bertsekas, pp 188 #2.1.11 (Second Order Suff. Opt. Cond.) Bertsekas, pp 190 #2.1.16 (Fractional Programming) Bertsekas, pp 223 #2.3.8 (The Proximal Minimization Algorithm) Homework #3 (Lagrange Multiplier Theory) Due: Thursday February 20 Reading Bertsekas, topics in Chapter 3 Problems Bertsekas, pp 271 #3.1.6 (The AGM Inequality) Bertsekas, pp 291 #3.3.6 (Minimax) Bertsekas, pp 309 #3.4.4 (Transportation Problem) Homework #4 (Lagrange Multiplier Algorithms) Due: Tuesday March 11 Reading Bertsekas, topics in Chapter 4 Problems Bertsekas, pp 327 #4.1.1 (Central Path - for the program, you can use OTC-NEOS) Bertsekas, pp 360 #4.2.8 (Ill-Conditioning of Penalty Methods) Bertsekas, pp 271 #4.3.4 (Exact Penalty Functions) Bertsekas, pp 271 #4.3.9 (Maratos' Effect) Homework #5 Due: Thursday April 3 Reading Bertsekas, topics in Chapters 5 and 6 Problems Bertsekas, pp 436 #5.1.7 (Duality Gap for the Knapsack Problem) Bertsekas, pp 450 #5.3.1 (Boundedness of Lagrange Multipliers) Bertsekas, pp 530 #6.4.1 (Linear Problems with Coupling Variables) [1]D.P. Bertsekas, G.S. Lauer, N.R. Sandell, Jr. and T.A. Posbergh, “Optimal short term scheduling of large-scale power systems,”IEEE Transactions on Automatic Control AC-28 (1982) 1–11. Google Scholar [2]D.P. Bertsekas and J.N. Tsitsiklis,Parallel and Distributed Computation: Numerical Methods (Prentice-Hall, Englewood Cliffs, NJ, 1989). Google Scholar [3]D.P. Bertsekas, “Necessary and sufficient conditions for a penalty method to be exact,”Mathematical Programming 9 (1975) 87–99. Google Scholar [4]D.P. Bertsekas, “Newton's method for linear optimal control problems,” in:Proceedings of the Symposium on Large Scale Systems (Udine, 1976) pp. 353–359.[5]D.P. Bertsekas,Constrained Optimization and Lagrange Multiplier Methods (Academic Press, New York, 1982). Google Scholar [6]L.M. Bregman, “The relaxation method of finding the common point convex sets and its application to the solution of problems in convex programming,”USSR Computational Mathematics and Mathematical Physics 7 (1967) 200–217. Google Scholar [7]Y. Censor and S.A. Zenios, “The proximal minimization algorithm with D-functions,” (1989), to appear in:Journal of Optimization Theory and Applications. [8]G. Chen and M. Teboulle, “Convergence analysis of a proximal-like minimization algorithm using Bregman functions,” (1990), to appear in:SIAM Journal on Optimization. [9]G.B. Dantzig,Linear Programming and Extensions (Princeton University Press, Princeton, NJ, 1963). Google Scholar [10]J. Eckstein, “Nonlinear proximal point algorithms using Bregman functions, with applications to convex programming,” (1990), to appear in:Mathematics of Operations Research. [11]A.V. Fiacco and G.P. McCormick,Nonlinear Programming: Sequential Unconstrained Minimization Techniques (Wiley, New York, 1968). Google Scholar [12]E.G. Golshtein and N.V. Tretjiakov, “Modified Lagrangians in convex programming and their generalizations,”Mathematical Programming Studies 10 (1979) 86–97. Google Scholar [13]C.D. Ha, “A generalization of the proximal point algorithm,”SIAM Journal on Control and Optimization 28 (1990) 503–512. Google Scholar [14]A.J. Hoffman, “On approximate solutions of systems of linear inequalities,”Journal of Research of the National Bureau of Standards 49 (1952) 263–265. Google Scholar [15]B.W. Kort and D.P. Bertsekas, “A new penalty function method for constrained minimization,” in:Proceedings of the 1972IEEE conference on decision and control (New Orleans, 1972) pp. 162–166.[16]G.S. Lauer, D.P. Bertsekas, N.R. Sandell, Jr. and T.A. Posbergh, “Optimal solution of large-scale unit commitment problems,”IEEE Transactions on Power Systems and Apparatus 101 (1981) 79–86. Google Scholar [17]D.G. Luenberger,Linear and Nonlinear Programming (Addison-Wesley, Reading, MA, 1984). Google Scholar [18]F.J. Luque, “Nonlinear proximal point algorithms,” Ph.D. Thesis, Department of Civil Engineering and Operations Research Center, Massachusetts Institute of Technology (Cambridge, MA, 1984). Google Scholar [19]F.J. Luque, “The nonlinear proximal point algorithm,” Report LIDS-P-1598, Laboratory for Information and Decision Systems, Massachusetts Institute of Technology (Cambridge, MA, 1986). Google Scholar [20]O.L. Mangasarian and T.-H. Shiau, “Lipschitz continuity of solutions of linear inequalities, programs and complementarity problems,”SIAM Journal of Control and Optimization 25 (1987) 583–595. Google Scholar [21]B. Martinet, “Regularisation d'inéquations variationelles par approximations successives,”Revue Française d'Automatique et Informatique Recherche Opérationalle 4 (1970) 154–159. Google Scholar [22]V.H. Nguyen and J.J. Strodiot, “On the convergence rate of a penalty function method of exponential type,”Journal of Optimization Theory and Applications 27 (1979) 495–508. Google Scholar [23]B.T. Poljak and N.V. Tretjakov, “An iterative method for linear programming and its economic interpretation,”Matecon 10 (1974) 34–46. Google Scholar [24]S.M. Robinson, “Bounds for errors in the solution set of a perturbed linear program,”Linear Algebra and its Applications 6 (1973) 69–81. Google Scholar [25]R.T. Rockafellar,Convex Analysis (Princeton University Press, Princeton, NJ, 1970). Google Scholar [26]R.T. Rockafellar, “New applications of duality in convex programming,” in:Proceedings of the Conference on Probability (Brasov, 1971) pp. 73–81.[27]R.T. Rockafellar, “A dual approach to solving nonlinear programming problems by unconstrained minimization,”Mathematical Programming 5 (1973) 354–373. Google Scholar [28]R.T. Rockafellar, “Monotone operators and the proximal point algorithm,”SIAM Journal on Control and Optimization 14 (1976) 877–898. Google Scholar