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A first course in optimization.

Boca Raton, FL: CRC Press (ISBN 978-1-4822-2656-0/hbk). xxiv, 291 p. (2015).

This book, split in fifteen chapters, presents a thorough introduction to optimization for undergraduate and graduate courses in science and engineering and forms a useful toolkit of optimization techniques across several domains. The first three chapters provide a mild introduction to optimization where well-known mathematical inequalities are used to derive optimality limits, followed by geometrical programming problems and analytical limits of continuous functions. The author then moves to study convex sets and their applicability in optimization, including Gordan's theorem and the Farkas lemma. The fifth and sixth chapters move on to linear programming. After a gentle introduction in matrix theory and LU factorization, linear programming problems are introduced, including the theory of duality and the Simplex algorithm. As a natural continuation, the fundamentals of game theory and zero-sum games are studied including symmetric games, non-constant-sum games and the prisoner's dilemma. The concepts of multi-dimensional and convex differentiation of continuous functions is explored in the eighth and ninth chapters. The techniques to determine the minima and maxima of continuous functions are presented and gradient optimization methods are described. This area concludes with the tenth chapter on convex programming and the Karush-Kuhn-Tucker theorem. The author then moves to present the need for iterative optimization techniques and considers in detail the Newton-Raphson method and its approximations. The last chapters of this book consider more advanced topics, such as the solution of systems of linear equations, conjugate-gradient optimization methods and operators in optimization. Throughout this very interesting book, a number of solved and unsolved exercises provide the reader with all the necessary tools to understand the techniques and their applicability in real-life problems. The book concludes with suggestions for further reading, a bibliography and an index. *Efstratios Rappos (Aubonne)*

Classification: N65
Keywords: optimization; geometric optimization; linear programming; convex programming; iterative optimization; numerical analysis; conjugate gradient optimization; quadratic optimization