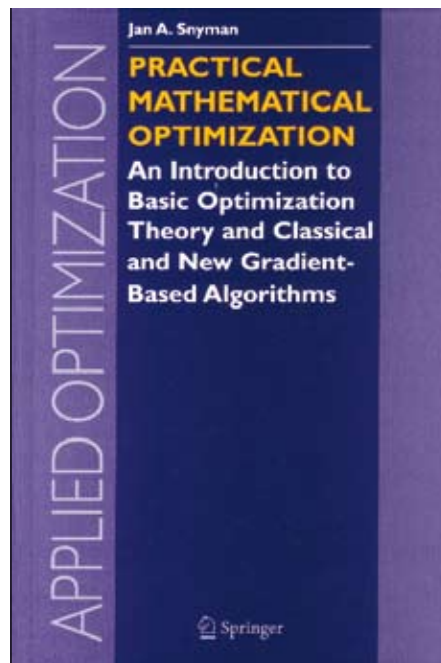


PRACTICAL MATHEMATICAL OPTIMISATION: AN INTRODUCTION TO BASIC OPTIMISATION THEORY AND CLASSICAL AND NEW GRADIENT-BASED ALGORITHMS BY PROF. JAN SNYMAN

This is a timely addition to the literature on optimisation basics and algorithms.

The book is divided logically into six chapters and an appendix: Chapter 1 contains basic concepts of optimisation, some mathematical background material and optimality conditions for unconstrained problems. Chapter 2 presents algorithms for unconstrained optimisation problems. Zero-, first- and second-order methods are presented. Chapter 3 contains numerical methods for constrained optimisation problems. Penalty, multiplier and classical methods, such as the gradient projection and sequential quadratic programming methods, are presented. Chapter 4 contains new gradient-based methods that have been developed by the author and his co-workers. These methods are particularly suitable for complex engineering and multidisciplinary applications. The methods use only the first order information and require no explicit step-size calculation. In addition, the methods are very robust and can treat noisy functions and discontinuous problems. These are highly desirable features for the engineering and other practical applications. Global optimisation methods are also presented. Chapter 5 contains numerous solved example problems that demonstrate various optimisation concepts and methods. Chapter 6 contains proofs of all the theorems. A linear programming problem and the corresponding solution method are described in an appendix.

It is amazing that Prof. Snyman has been able to include so much material in a book of 257 pages. The material is well written and accessible. It covers all the important topics required to teach basic concepts and methods of optimisation in a concise, yet rigorous manner. Many well-considered figures are used to illustrate the material. All the theorems are included in a separate chapter. In this way, the more practical-orientated readers need not burden themselves with their proofs. More mathematically orientated readers can refer to them at any point in the text. The book will be useful as a textbook at undergraduate senior level and first-year postgraduate



level courses in engineering and other applied sciences fields.

Prof. Snyman is a world leader in the field of mathematical optimisation of mechanical systems. Earlier last year he received an honorary professoriate from the University of Mikolc. He belongs to various engineering societies in America, and is a senior member of the American Institute of Aeronautics and Astronautics. Prof. Snyman's scientific contributions were acknowledged by the University of Pretoria with the presentation of an Exceptional Academic Achiever Award for 2001 to 2003, and again for the period 2004 to 2006.

Reviewed by Prof. Jasbir S Arora

Prof. Jasbir Arora is an F Wendell Miller Distinguished Professor of Engineering at the University of Iowa. He is also a professor in the Department of Civil and Environmental Engineering and professor in the Department of Mechanical and Industrial Engineering. Arora is a research engineer in the Center for Computer-Aided Design at the University of Iowa, where he is associated with the Virtual Soldier Research Programme and Director of the Optimal Design Laboratory. Prof. Arora has worked in the areas of optimisation algorithms and their applications for design of structural and mechanical systems.

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