Preface

Multiobjective optimization problems arise in decision-making processes in many areas of human activity including economics, engineering, transportation, water resources, and the social sciences. Although most real-life problems involve nonlinear objective functions and constraints, solution methods are principally straightforward in problems with a linear structure. Apart from Zeleny's classic 1974 work entitled "Linear Multiobjective Programming" and Steuer's 1986 book "Multiple Criteria Optimization: Theory, Computation and Application," nearly all textbooks and monographs on multiobjective optimization are devoted to nonconvex problems in a general setting, sometimes with set-valued data, which are not always accessible to practitioners. The main purpose of this book is to introduce readers to the field of multiobjective optimization using problems with fairly simple structures, namely those in which the objective and constraint functions are linear. By working with linear problems, readers will easily come to grasp the fundamental concepts of vector problems, recognize parallelisms in more complicated problems with scalar linear programming, analyze difficulties related to multi-dimensionality in the outcome space, and develop effective methods for treating multiobjective problems.

Because of the introductory nature of the book, we have sought to present the material in as elementary a fashion as possible, so as to require only a minimum of mathematical background knowledge. The first part of the book consists of two chapters providing the necessary concepts and results on convex polyhedral sets and linear programming to prepare readers for the new area of optimization with several objective functions. The second part of the book begins with an examination of the concept of Pareto optimality, distinguishing it from the classical concept of optimality used in traditional optimization. Two of the most interesting topics in this part of the book involve duality and stability in multiple objective linear programming, both of which are discussed in detail. The third part of the book is devoted to numerical algorithms for solving multiple objective linear programs. This includes the well-known multiple objective simplex method, the outcome space method, and a recent method using normal cone directions.

Although some new research results are incorporated into the book, it is well suited for use in the first part of a course on multiobjective optimization for undergraduates or first-year graduate students in applied mathematics, engineering, computer science, operations research, and economics. Neither integer problems nor fuzzy linear problems are addressed. Further, applications to other domains are not tackled, though students will certainly have no real difficulty in studying them, once the basic results of this book assimilated.

During the preparation of this manuscript I have benefited from the assistance of many people. I am grateful to my Post-Ph.D. and Ph.D. students Anulekha Dhara, Truong Thi Thanh Phuong, Tran Ngoc Thang, and Moslem Zamani for their careful reading of the manuscript. I would also like to thank Moslem Zamani for the illustrative figures he made for this book. I want to take this opportunity to give special thanks to Juan-Enrique Martinez-Legaz (Autonomous University of Barcelona), Boris Mordukhovich (Wayne State University), Nguyen Thi Bach Kim (Hanoi Polytechnical University), Panos Pardalos (University of Florida), Michel Thera (University of Limoges), Majid Soleimani-Damaneh (University of Tehran), Ralph E. Steuer (University of Georgia), Michel Volle (University of Avignon), and Mohammad Yaghoobi (University of Kerman) for their valued support in this endeavor.

Avignon Dinh The Luc
December 2014

Springer

http://www.springer.com/978-3-319-21090-2

Multiobjective Linear Programming
An Introduction
Luc, D.T.
2016, XII, 325 p. 30 illus., Hardcover
ISBN: 978-3-319-21090-2