

Preface

The subject of optimization is a fascinating blend of heuristics and rigour, of theory and experiment. It can be studied as a branch of pure mathematics, yet has applications in almost every branch of science and technology. This book aims to present those aspects of optimization methods which are currently of foremost importance in solving real life problems. I strongly believe that it is not possible to do this without a background of practical experience into how methods behave, and I have tried to keep practicality as my central theme. Thus basic methods are described in conjunction with those heuristics which can be valuable in making the methods perform more reliably and efficiently. In fact I have gone so far as to present comparative numerical studies, to give the feel for what is possible, and to show the importance (and difficulty) of assessing such evidence. Yet one cannot exclude the role of theoretical studies in optimization, and the scientist will always be in a better position to use numerical techniques effectively if he understands some of the basic theoretical background. I have tried to present such theory as shows how methods are derived, or gives insight into how they perform, whilst avoiding theory for theory's sake.

Some people will approach this book looking for a suitable text for undergraduate and postgraduate classes. I have used this material (or a selection from it) at both levels, in introductory engineering courses, in Honours mathematics lectures, and in lecturing to M.Sc. and Ph.D. students. In an attempt to cater for this diversity, I have used a Jekyll and Hyde style in the book, in which the more straightforward material is presented in simple terms, whilst some of the more difficult theoretical material is nonetheless presented rigorously, but can be avoided if need be. I have also tried to present worked examples for most of the basic methods. One observation of my own which I pass on for what it is worth is that the students gain far more from a course if they can be provided with computer subroutines for a few of the standard methods, with which they can perform simple experiments for themselves, to see for example how badly the steepest descent method handles Rosenbrock's problem, and so on.

In addition to the worked examples, each chapter is terminated by a set of questions which aim to not only illustrate but also extend the material in the