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Aims and Scope

Optimization has been expanding in all directions at an astonishing rate during the last few decades. New algorithmic and theoretical techniques have been developed, the diffusion into other disciplines has proceeded at a rapid pace, and our knowledge of all aspects of the field has grown even more profound. At the same time, one of the most striking trends in optimization is the constantly increasing emphasis on the interdisciplinary nature of the field. Optimization has been a basic tool in all areas of applied mathematics, engineering, medicine, economics, and other sciences.

The series *Springer Optimization and Its Applications* publishes undergraduate and graduate textbooks, monographs and state-of-the-art expository work that focus on algorithms for solving optimization problems and also study applications involving such problems. Some of the topics covered include nonlinear optimization (convex and nonconvex), network flow problems, stochastic optimization, optimal control, discrete optimization, multi-objective programming, description of software packages, approximation techniques and heuristic approaches.

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Data Mining for Biomarker Discovery

 Springer

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To our families

Preface

Life sciences that include, but are not limited to medicine, biology, and neuroscience, are popular for creating large amounts of data. Some of the most prominent examples of such data accumulation are DNA microarrays, electroencephalography (EEG), continuous data recordings from intensive care units (ICUs), etc. Such examples can motivate the application and necessity for massive data analysis methods. These methods are being developed through the creative interplay of computer science, statistics, mathematical theory of optimization, and artificial intelligence. All these methods are covered by the general term “data mining”.

When it comes to medical applications, the ultimate goal of data mining is to discover hidden underlying patterns that encapsulate useful information about the progression and status of a certain pathological condition. Such patterns can be used as biomarkers and play a very important role in identification, diagnosis and treatment planning of a patient. The extraction of patterns and associations that can serve as biomarkers becomes a more difficult task as the increasing amounts of data pose new challenges and opportunities at the same time.

A conference was held at Chania, Greece, under the general title “International Conference on Biomedical Data & Knowledge Mining: Towards Biomarker Discovery (7–9 July, 2010).” Following this event we invited selected participants of the conference to contribute a chapter related to their presented topic. In addition, we invited additional authors to share their expertise in the form of a state-of-the-art review chapter or cutting edge ongoing research description. The chapters underwent peer review by anonymous reviewers and the editors. The outcome is in this volume published by the Springer Optimization and its Applications (SOIA) book series.

Our goal was to motivate researchers from different disciplines to share their research, data, and challenging problems, triggering collaboration and fruitful discussions. We hope that the present volume will be of interest to researchers in engineering, computer science, applied mathematics, and medicine who want to learn about selected recent applications of data mining in the field of biomarker discovery.

Gainesville, Florida, USA
Orlando, Florida, USA
Chania, Greece

Panos M. Pardalos
Petros Xanthopoulos
Michalis Zervakis

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