

Preface

This is the commemoration volume celebrating the 10th foundation anniversary of the Institute for Mathematics, Bioinformatics, Information Technology and Computer Science (IMBIC), a research institute that was founded in India in 2006 with branches in Sweden and Japan, and is dedicated to the scientific and technical activities at the forefront of various areas across interdisciplinary Mathematics, Statistics, and Computer Science.

To achieve its objectives, IMBIC organizes international interdisciplinary conferences in every December in Kolkata on “Mathematical Sciences for Advancement of Science and Technology (MSAST).” The conference MSAST 2016 was the 10th of the series of these conferences. Prominent mathematicians and statisticians were invited to contribute articles to the celebration of this milestone. The response was overwhelming. The present volume was conceived in order to exhibit the beauty of mathematics and statistics and emphasize applications in allied sciences. In order to achieve this goal, eminent scientists featuring such contributions were invited to contribute to the volume. As a culmination of this effort, the present volume contains articles covering a wide range of topics of current importance.

The articles on mathematical applications cover the topics of coloring problem, control of stochastic structures, and information dynamics, whereas the articles on statistical applications cover the areas on image denoising, life testing and reliability, survival and frailty models, analysis of drought periods, prediction of genomic profiles, competing risks, environmental applications, and chronic disease control. The articles contained in this volume present state-of-the-art material along with a detailed and lucid review of the relevant topics and issues concerned. This volume reports on the newest developments in some of the interesting and promising areas of mathematical and statistical research today, and is expected to provide an important resource for researchers and practitioners in the relevant areas mentioned above. The key features of this volume such as

- Focus on mathematical and statistical applications in a single volume,
- Accessible and lucid presentation,
- Detailed review of the cutting edge technologies,
- Articles from the worldwide experts in the field, and
- Wide range of topics on applications of modern relevance,

are expanded in 16 book chapters.

Mathematical applications span the first three chapters. Chapter 1 deals with the problem of allocating radio frequencies to the base stations of the cellular network such that interference between stations at a different distance can be avoided while keeping the range of distinct frequencies to a minimum. Chapter 2 discusses the use of vibration control techniques in order to control or suppress wild vibrations in structures caused by resonance or flutter due to external sources along with a numerical example with a recorded dataset from a California earthquake. Chapter 3 discusses the solutions of Hamilton ODE's and Hamilton–Jacobi PDE's involving single-time and multi-time higher-order Lagrangians, and is expected to be of interest to engineers and applied mathematicians.

Statistical applications span the next 13 chapters. Chapter 4 presents a comprehensive overview of the *denoising* problem and subsequent development in the context of cDNA microarray images, in the context of genomic research, where wavelet-based methods have been quite useful. Chapter 5 introduces a transformation-based distribution family appropriate for hazard modeling where the well-known Weibull model may fail, and Chap. 6 introduces yet another family based on the so-called *mode-centric Gaussian* distribution as a fraternal twin of the Gaussian distribution appropriate for life-data models.

Chapter 7 considers the use of *stochastic volatility* models for analyzing drought periods with discussions of real examples. Chapter 8 gives a new estimator of the *mean residual life function* and compares its performance with other nonparametric estimators available in the literature while illustrating the relevance of the results on a real dataset. Chapter 9 gives a detailed overview of techniques for predicting outcomes such as colon cancer survival from diverse genomic profiles whereas Chap. 10 discusses a bivariate frailty model with an application to competing risk theory. Chapter 11 considers the estimation of the stress strength parameter under the Bayesian paradigm with illustrations on a real dataset.

Chapter 12 reports on the spatiotemporal analysis of air pollution effects on clinic visits using the data from Taiwan that is based on several Bayesian techniques, and Chap. 13 gives a comprehensive review of statistical inference procedures in the context of competing risks when the cause of failure may be missing or masked for some units. Chapter 14 discusses and illustrates several environmental applications based on the Birnbaum–Saunders model, and Chap. 15 considers multistate modeling in the context of data on chronic conditions from individuals in disease registries. The final chapter, Chap. 16, presents estimation for lifetime characteristics in connection with a time-constrained life-testing experiment.

We had invited more than 50 potential contributors, and 19 articles were submitted. After a careful review, 16 articles were selected that make the 16 chapters

of the present volume. We are thankful to all the contributors to this volume and especially to the corresponding authors for their cooperation and timely submission of the articles and revisions. We have derived substantial help in reviewing these articles from the following reviewers to whom we owe our immense gratitude:

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