

# Preface

The use of computational methods in statistics to face complex problems and highly dimensional data, as well as the widespread availability of computer technology, is no news. The range of applications, instead, is unprecedented. As often occurs, new and complex data types require new strategies, demanding for the development of novel statistical methods and suggesting stimulating mathematical problems.

This volume presents the revised version of a selection of the papers given at S.Co. 2011, the *7th Conference on Statistical Computation and Complex Systems*, held in Padua, Italy, September 19–21, 2011. The S.Co. conference is a forum for the discussion of new developments and applications of statistical methods and computational techniques for complex and high-dimensional datasets.

Although the topics covered in this volume are diverse, the same themes recur, as research is mostly fueled by the need to analyse complicated data sets, for which traditional methods do not provide viable solutions. Among the topics presented we have estimation of traffic matrices in a communications network, in the presence of long-range dependence; nonparametric mixed-effects models for epidemiology; advanced methods for neuroimaging; efficient computations and inference in environmental studies; hierarchical and nonparametric Bayesian methods with applications in genomic studies; Markov switching models to explain regime changes in the evolution of realized volatility for financial returns; joint modelling of financial returns and multiple daily realized measures; classification of multivariate linear–circular data, with applications to marine monitoring networks; forecasting of electricity supply functions, using principal component analysis and reduced rank regression; clustering based on nonparametric density estimation; surface estimation and spatial smoothing, with applications to the estimation of the blood-flow velocity field. Whilst not exhaustive, this list should give a feel of the range of issues discussed at the conference.

This book is addressed to researchers working at the forefront of the statistical analysis of complex systems and using computationally intensive statistical methods.

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