

Preface

This book is framed in the context of remote sensing for Earth observation and focuses on the research field of mathematical models and methodologies for the analysis of two-dimensional remote sensing images. The objective is twofold. First, the book is intended to conduct a broad analysis of the field of applied mathematics for two-dimensional remote sensing image interpretation, encompassing passive and active sensors, hyperspectral images, synthetic aperture radar (SAR), interferometric SAR, and polarimetric SAR data. Second, this book is meant to also discuss very topical and advanced subjects, which involve various types of remote sensing data (e.g., very high-resolution imagery, multiangular or multiresolution data, and satellite image time series) or of processing and learning methodologies (e.g., probabilistic graphical models, hierarchical image representations, kernel machines, data fusion, and compressive sensing) that are currently of primary importance in the Earth observation area.

The book is organized into ten chapters. The first one is introductory. It is aimed at recalling basic notions and terminology, and at providing an overview of the most prominent families of mathematical models and techniques for remote sensing image interpretation. All the other chapters are devoted either to specific typologies of remote sensing images, along with their data analysis challenges, or to individual methodological areas. Each of these nine chapters presents both a detailed review of the previous literature on the related subject and a methodological and experimental discussion of, at least, two advanced mathematical approaches to information extraction from remote sensing images. This organization is kept consistently throughout the book and allows both tutorial information and multiple on-the-edge developments to be covered on each topic.

The chapters are written and organized so that they contribute to the book as a whole and are self-consistent. Each chapter is authored by research scientists from, at least, two distinct institutions to take benefit from multiple professional experiences and perspectives on each subject. The chapter co-authors are highly prominent research scientists in the remote sensing and image processing fields. In these fields, many of them have been serving as Editors in Chief or Associate Editors in the editorial boards of prestigious international journals and are actively involved in

international scientific societies (e.g., the IEEE Geoscience and Remote Sensing Society and the IEEE Signal Processing Society). The book is intended to be used as a reference, to graduate and doctoral students and to remote sensing scientists and practitioners, as well as possibly as a textbook.

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