

Preface

Recently, developments in the domain of biomedical sensing and imaging along with its associated clinical applications attract the focus of researchers. The main goal is to develop algorithmic and computer-based approaches to design efficient CAD systems using medical images obtained through various imaging modalities. The application of computer-based approaches to medical applications has opened numerous challenging problems for both the medical computing field and the mathematical community. CAD systems are often utilized to achieve accurate diagnosis, which provide early detection of life-threatening diseases.

This volume comprises of 21 chapters, including two overview chapters, abdominal imaging in clinical applications supported computer-aided diagnosis approaches as well as different techniques for solving the pectoral muscle extraction problem in the preprocessing part of the CAD systems for detecting breast cancer in its early stage using digital mammograms. Afterward, some chapters related to swarms-based segmentation in several medical applications are involved. These chapters included segmentation framework that is based on fractional-order Darwinian particle swarm optimization (FODPSO) and mean shift (MS) techniques, 3D brain tumor segmentation based on hybrid clustering techniques using multi-views of MRI, and an automatic segmentation method that performs multilevel image thresholding by using the spatial information encoded in the gray-level co-occurrence matrix (GLCM). Moreover, some chapters proposed several classification techniques including comparison of CAD systems for three class breast tissue density classification using mammographic images, developing novel automated glaucoma diagnosis system which analyze and classify retinal images using based on feature selection and static classifier selection schemes, proposing automated classification of ultrasound liver tumors using support vector machine (SVM) with the aid of fuzzy c-means (FCM) and level set method, and classification of motor imagery BCI based on variable precision multigranulation rough set and game theoretic. Furthermore, other chapters that included an ultrasound-based three-dimensional computer-aided diagnosis (CAD) tool for the diagnosis of anterior Talofibular ligament, introducing an advancements of

electroanatomic mapping systems, providing details about the approaches for development of methods for image quality assessment followed by brief introduction on existing image quality assessment methods, discussing a human–computer interface (HCI)-based novel approach for designing a computer-aided control and communication system using electrooculogram (EOG) and electromyogram (EMG) signals for people with severe hindrance to motor activities and communication and highlighted the theory of parallel MRI and Cartesian SENSE reconstruction. Finally, some chapters are concerned with an elaborate and illustrative discussion about various bioinformatics tools used for gene prediction; sequence/phylogenetic analysis as well as function prediction, realizing a decision support system based on the technique of case-based reasoning and dedicated to the diagnosis of a very dangerous pulmonary pathology, and describing various gene structure prediction programs which based on individual/hybrid soft computing approaches as a bioinformatics approach.

We would like to express gratitude to the authors for their contributions. It would not have been possible to reach this publication quality without the contributions of the many anonymous referees involved in the revision and acceptance process of the submitted manuscripts. Our gratitude is extended to them as well. It is expected very good promote for almost all readers for this book—from undergraduate students to postgraduate levels and also for researchers, professionals, and engineering. As the editors, we wish this book will stimulate further research in medical imaging applications based algorithmic- and computer-based approaches and utilize them in real-world clinical applications. We would like to thank also the reviewers for their diligence in reviewing the chapters. Special thanks go to our publisher, Springer.

We hope that this book will present promising ideas and outstanding research results supporting further development of computer-based approaches in medical imaging for clinical applications.

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Algorithmic and Computer-Based Approaches

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