Studies in Computational Intelligence

Volume 651

Series editor

Janusz Kacprzyk, Polish Academy of Sciences, Warsaw, Poland
e-mail: kacprzyk@ibspan.waw.pl
About this Series

The series “Studies in Computational Intelligence” (SCI) publishes new developments and advances in the various areas of computational intelligence—quickly and with a high quality. The intent is to cover the theory, applications, and design methods of computational intelligence, as embedded in the fields of engineering, computer science, physics and life sciences, as well as the methodologies behind them. The series contains monographs, lecture notes and edited volumes in computational intelligence spanning the areas of neural networks, connectionist systems, genetic algorithms, evolutionary computation, artificial intelligence, cellular automata, self-organizing systems, soft computing, fuzzy systems, and hybrid intelligent systems. Of particular value to both the contributors and the readership are the short publication timeframe and the worldwide distribution, which enable both wide and rapid dissemination of research output.

More information about this series at http://www.springer.com/series/7092
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.

Nilanjan Dey
Vikrant Bhateja
Aboul Ella Hassanien
Contents

Part I Clinical Applications of Medical Imaging

Abdominal Imaging in Clinical Applications: Computer Aided Diagnosis Approaches ..................................... 3
Amira S. Ashour, Nilanjan Dey and Waleed S. Mohamed

An Overview of Pectoral Muscle Extraction Algorithms Applied to Digital Mammograms ...................... 19
Suhas Sapate and Sanjay Talbar

Magnetic Resonance Brain Imaging Segmentation Based on Cascaded Fractional-Order Darwinian Particle Swarm Optimization and Mean Shift Clustering ............................................. 55
Hala Ali, Mohammed Elmogy, Eman El-Daydamony, Ahmed Atwan and Hassan Soliman

3D Brain Tumor Segmentation Based on Hybrid Clustering Techniques Using Multi-views of MRI ........ 81
Eman A. Abdel Maksoud and Mohammed Elmogy

Part II Classification and Clustering

Comparison of CAD Systems for Three Class Breast Tissue Density Classification Using Mammographic Images .................................................. 107
Kriti and Jitendra Virmani

Ensemble Classifiers Construction Using Diversity Measures and Random Subspace Algorithm Combination: Application to Glaucoma Diagnosis ................................................. 131
Soraya Cheriguene, Nabiha Azizi and Nilanjan Dey

Motor Imagery Classification Based on Variable Precision Multigranulation Rough Set and Game Theoretic Rough Set .............. 153
K. Renuga Devi and H. Hannah Inbarani
Computer Aided Diagnosis System for Mammogram
Abnormality ............................................ 175
Ahmed M. Anter and Aboul Ella Hassenian

Automated Segmentation and Classification of Hepatocellular
Carcinoma Using Fuzzy C-Means and SVM ......................... 193
Mai R. Ibraheem and Mohammed Elmogy

Part III Computer Aided Diagnosis (CAD) Tools and Case Studies

Ultrasound Based Three Dimensional Computer Aided Diagnosis
(CAD) Tool for the Diagnosis of Anterior Talofibular Ligament ...... 213
Vedpal Singh, Iraivan Elamvazuthi, Varun Jeoti, John George,
Norashikin Yahya and Dileep Kumar

Electroanatomical Mapping Systems. An Epochal Change in
Cardiac Electrophysiology .................................................. 237
Carlo Pappone, Carmine Garzillo, Simonetta Crisà and Vincenzo Santinelli

Image Quality Assessment: A Case Study on Ultrasound Images
of Supraspinatus Tendon .................................................... 257
Rishu Gupta, I. Elamvazuthi and J. George

Development of EOG and EMG-Based Multimodal
Assistive Systems ............................................................. 285
Biswajeet Champaty, D.N. Tibarewala, Biswajit Mohapatra and Kunal Pal

Theory of Parallel MRI and Cartesian SENSE Reconstruction:
Highlight ................................................................. 311
Joseph Suresh Paul, Raji Susan Mathew and M.S. Renjith

Applications of Bio-molecular Databases in Bioinformatics .......... 329
Archana Kumari, Swarna Kanchan, Rajeshwar P. Sinha and Minu Kesheri

Statistical Methods for Managing Missing Data: Application to
Medical Diagnosis ............................................................ 353
Souad Guessoum, Hadjer Zaayout, Nabiha Azizi, Nadjet Dendani
and Hayet Djellali

Advances in Soft Computing Approaches for Gene Prediction:
A Bioinformatics Approach ............................................. 383
Minu Kesheri, Rajeshwar P. Sinha and Swarna Kanchan

Part IV Bio-inspiring Based Computer Aided Diagnosis Techniques

Artificial Bee Colony Based Segmentation for CT Liver Images ...... 409
Abdalla Mostafa, Ahmed Fouad, Mohamed Abd Elfattah,
Aboul Ella Hassanien and Hesham Hefny
<table>
<thead>
<tr>
<th>Title</th>
<th>Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nature Inspired Optimization Algorithms for CT Liver Segmentation</td>
<td>431</td>
</tr>
<tr>
<td>Ahmed Fouad Ali, Abdalla Mostafa, Gehad Ismail Sayed,</td>
<td></td>
</tr>
<tr>
<td>Mohamed Abd Elfattah and Aboul Ella Hassanien</td>
<td></td>
</tr>
<tr>
<td>Optimized Multi Threshold Brain Tumor Image Segmentation Using Two</td>
<td>461</td>
</tr>
<tr>
<td>Dimensional Minimum Cross Entropy Based on Co-occurrence Matrix</td>
<td></td>
</tr>
<tr>
<td>Taranjit Kaur, Barjinder Singh Saini and Savita Gupta</td>
<td></td>
</tr>
<tr>
<td>Bio-inspired Swarm Techniques for Thermogram Breast Cancer Detection</td>
<td>487</td>
</tr>
<tr>
<td>Gehad Ismail Sayed, Mona Soliman and Aboul Ella Hassanien</td>
<td></td>
</tr>
</tbody>
</table>