

PREFACE

Special section on *Big Data and Signal Processing*

Image processing and analysis are of high relevance in various domains, including astronomy, medicine, cultural heritage, robotics, or surveillance systems. Despite the availability of many algorithms and solutions, some problems (such as image segmentation) are a challenge in the context of big data. Complex formal models and methods are key points in the development of useful and optimized algorithms for processing and analysis of graphical big data collected from simulation, monitoring, observation and experiments. Appropriate models and methods improve the accuracy, speed, and robustness of the resulting algorithms. This special section highlights recent developments in today's big data image processing and analysis in various application domains.

In the first article, *Classification of high resolution satellite images using improved U-Net*, a design of a classifier for high resolution satellite images using improved U-Net is presented. The proposed model solves the problem of the tendency of U-Net to lose object boundaries after multiple pooling operations. Two public datasets are used to assess the performance of the proposed model.

In the second article, *Implementation and evaluation of medical imaging techniques based on conformal geometric algebra*, the authors depict how conformal geometric algebra (CGA) can be used to develop efficient and effective medical imaging techniques. A novel CGA formulation is used to re-design a suite of medical imaging automatic methods, including image segmentation, 3D reconstruction and registration, allowing significantly reduced execution times while maintaining the needed result precision.

In the third article, *An intelligent multimodal framework for identifying children with autism spectrum disorder*, the authors propose a methodology that uses an optimized random forest algorithm to improve the classification accuracy and a hybrid fusion method to ensure the reliability of the classification results. The performance of the proposed framework is evaluated by means of accuracy, sensitivity, specificity, and receiver operator characteristic (ROC) curves.

In the fourth article, *Mathematical methods of signal analysis applied in medical diagnostic*, the author describes how to construct a decision-support system for brain signals analysis in deep-brain stimulation surgeries among Parkinson's disease affected patients.

The final article, *Recognition of species and genera of bacteria by means of the product of weights of the classifiers*, proposes a method that can be used to recognize bacterial cells as well as other microorganisms, for example, fungi, which exhibit similar morphological characteristics.

As the guest editors of this special issue, we would like to thank all authors who have submitted papers to the special issue. Assistance from the editorial staff of the journal is also very much appreciated. Besides, the guest editors wish to acknowledge all reviewers who have generously given their time to review the papers. Finally, our special thanks go to Professor Józef Korbicz (Editor-in-Chief) for his support throughout the preparation of this special issue.

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Sabri Pilana is an associate professor at the Department of Computer Science of Linnaeus University in Sweden. He holds a PhD degree (with distinction) in computer science from the Vienna University of Technology in Austria. His major research interests include heterogeneous computing systems and system optimization techniques. At LNU, he established the High-Performance Computing Centre. He is a senior member of the IEEE (80432603), an associate editor of the *Computing* journal (Springer), a member of HiPEAC, and an associate member of ETP4HPC.



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