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G. Nagamani *Editors*

Mathematical Modelling and Computational Intelligence Techniques

ICMMCIT-2021, Gandhigram, India
February 10–12

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Preface

Mathematical modelling is an activity by which a problem involving the real world is translated into mathematics to form a model, which can then be used to provide information about the original real problem. Computational science, also known as scientific computing or scientific computation, is a rapidly growing field that uses advanced computing capabilities to understand and solve complex problems. It is an area of science that spans many disciplines, but at its core, it involves the development of models and simulations to understand natural systems.

Mathematical modelling and computational intelligence techniques are promising, hot areas of current research and development, which can provide significant advantages to users. It also plays a vital role in mathematics as far as applications are concerned. Almost all mathematicians, industrialists, scientists, engineers, and researchers in science disciplines apply mathematical modelling and computing techniques. Many new concepts, methods, and algorithms have emerged frequently with many real-life applications in the past few decades.

Owing to these facts, the Department of Mathematics of The Gandhigram Rural Institute (Deemed to be University), Gandhigram, Dindigul, Tamil Nadu, India, has organized an International Conference on Mathematical Modelling and Computational Intelligence Techniques (ICMMCIT 2021) from 10–12 February 2021. ICMMCIT 2021 is intended to provide a common forum for researchers, scientists, engineers, and practitioners throughout the world to share their ideas, latest research findings, developments, and applications, including their links to mathematical modelling, computational sciences, information sciences, and so forth. This conference is a refereed conference emphasizing different mathematical modelling, computational intelligence techniques, and their science and engineering applications. It will focus on developing mathematical modelling, analysis, and applications from theoretical and numerical perspectives involving different applied sciences and engineering.

Based on the scientific committee's reviews that composed of 104 field experts from all over the world, we accepted only 97 papers for presentation at ICMMCIT 2021 out of 143 research papers submitted. Among these 97 papers, 43 papers were selected for the peer review process. Out of 30% of selected and presented papers,

only 15% of the research contributions were finally shortlisted for publication. This volume comprises five parts consisting of 21 accepted papers after peer review. Mathematical modelling-related papers are presented in Part One. Part Two consists of papers related to image processing. Control theory papers are arranged in Part Three. Part Four consists of papers in graphs and networks. Finally, papers on inventory control are presented in Part Five.

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- Tamil Nadu State Council for Science and Technology, Tamil Nadu, India.

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We especially thank the Honorary Chairs, Co-chairs, Technical Programme Chairs, Organizing Chair, and all the committee members who worked as a team by investing their time to make ICMMCIT 2021 a great success.

We are grateful to the keynote speakers who kindly accepted our invitation. Especially, we would like to thank Dr. Ong Seng Huat, Dr. P. Raveendran (UCSI University, Malaysia), Dr. Chee Pin Tan (Monash University, Malaysia), Dr. Er. Meng Joo (Dalian Maritime University, China), Dr. Mohammad Sajid (Qassim University, Saudi Arabia), Prof. Dr. S. Sanjeewa Nishantha Perera (University of Colombo, Sri Lanka), Dr. Raju K. George (Indian Institute of Space Science and Technology (IIST), India), Dr. K. Balachandran (Bharathiar University, India), Dr. R. Roopkumar (Central University of Tamil Nadu, India), Dr. K. Somasundaram (GRI-DTBU), Dr. Rajeswari Seshadri (Pondicherry University, India), Dr. R. Sakthivel (Bharathiar University, India), and Dr. S. Marshal Anthoni (Anna University Regional Campus, India) for presenting plenary talks and making ICMMCIT 2021 a grand event.

A total of 120 experts on various topics from all around the world reviewed the paper submissions. We express our greatest gratitude for spending their valuable time to review and sort out the papers for presentation at ICMMCIT 2021. We thank Springer for providing an excellent tool called online conference systems (OCS) for managing the papers.

Finally, we would like to thank Dr. Shamim Ahmad, Senior Editor and all other Editors, Mathematical Sciences, Springer India, and members of publishing team for processing our proposal to publish the papers in the Springer series.

July 2021

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About This Book

This book is a collection of papers presented at the International Conference on Mathematical Modelling and Computational Intelligence Techniques (ICMMCIT 2021), held at the Department of Mathematics, The Gandhigram Rural Institute (Deemed to be University), Gandhigram, Tamil Nadu, India, from 10 to 12 February 2021. It was a prestigious event organized to provide an excellent international platform for the leading academicians, researchers, industrial participants, and budding students worldwide to discuss their research findings with global experts. Significant contributions from researchers worldwide in all major fields of applied analysis, mathematical modelling, and computing techniques have been received for this conference. The accepted papers are organized in topical sections as mathematical modelling, image processing, control theory, graphs and networks, and inventory control.

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