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Editors

Research and Applications in Artificial Intelligence

Proceedings of RAAI 2020

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Dr. Indrajit Pan would like to dedicate this book to Prof. (Dr.) Siddhartha Bhattacharyya

Prof. Anirban Mukherjee would like to dedicate this book to all his research scholars

Prof. Vincenzo Piuri would like to dedicate this book to all researchers and professionals who are extraordinarily contributing to make our life better, and to students who will change our future

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Preface

Artificial intelligence is a leading theory of computer science now. Scientists across all engineering disciplines are interested upon this concept. Artificial intelligence has opened the door for all research enthusiasts and application developers to propose new age research and application concepts. Future of artificial intelligence enabled research and application are very promising. This book will discuss about the recent research trends and upcoming applications based on artificial intelligence. Many of the versatile fields of artificial intelligence will be categorically addressed through different chapters of this volume.

Over the years scientists have developed several efficient algorithms to address different real world problems realistically and propose meaningful solution for them. However, the classical problem solving algorithms often fall short of offering a robust solution to handle the multiple constraints encountered in real life situations since these core methods are often uncertain and imprecise, which remains intractable to process in practice using the conventional classical methods.

Moreover, with the progress of technology, the need for advanced computational techniques is always called for addressing the complex real life problems. The objective of such computational paradigm is to give rise to failsafe and robust solutions to the emerging problems faced by mankind. Imparting intelligence in a machine is the need of the hour. Several intelligent techniques have been in vogue over the year in this direction. Among these techniques, the soft computing techniques stand in good stead. However, it is often noted that the soft computing techniques often fall short in offering a formidable solution. On and above, if the different components of the soft computing paradigm are conjoined together, the resultant hybrid intelligent computing paradigm is found to be more efficient and robust by design and performance in these situations.

This book aims to introduce to the prospective readers the latest trends in artificial intelligence with reference to both the classical and hybrid computational paradigms.

The editors would like to take this opportunity in expressing their heartfelt regards to Management of RCC Institute of Information Tech-

nology, Kolkata and all the committee members of RAAI 2020, specially the technical committee members who have critically reviewed all the articles. Special thanks to Mr. Aninda Bose, Senior Editor, Springer, India for his constant support and guidance during this book project tenure.

Kolkata, India
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Indrajit Pan
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About the Editors

Indrajit Pan has done Bachelor of Engineering (B.E.) in Computer Science and Engineering with Honors from The University of Burdwan in 2005 and completed Master of Technology (M.Tech.) in Information Technology from Bengal Engineering and Science University, Shibpur in 2009. He was the recipient of University Medal for ranking first class first in M. Tech. He obtained Ph.D. in Engineering (Information Technology) from Indian Institute of Engineering Science and Technology, Shibpur in 2015. His research title was Design and Analysis of Droplet Routing Algorithms in Digital Microfluidic Biochip. His current research interest includes community detection, cloud computing, influence theory and digital microfluidic biochip. He joined RCC Institute of Information technology in 2006 and now the Associate Professor and Head of Information Technology Department. He takes active interest in organizing international conferences, symposiums, seminars and faculty development programs at various capacities. He organized many International conferences, seminars and faculty development programs apart from being associated in technical program committees of several other International conferences. He is an active reviewer of some IEEE Transactions and Elsevier journals based on Artificial Intelligence, Soft Computing, and Cryptography. He has authored many research publications in different International journals, edited books and conference proceedings. Five research scholars are currently working under his supervision for their doctoral dissertation. He has coauthored seven edited research volumes with prestigious publishers like John Wiley, CRC Press, De Gruyter and IGI Global. In addition to these he has coauthored four international journal proceedings with IEEE, USA and two with Springer Nature. He worked as sole guest editor in International Journal of Hybrid Intelligence, Inderscience for a special issue on Hybrid computational intelligence in big data analytics and cloud computing. He is an editorial board member of Elsevier's Applied Soft Computing Journal. Presently he is a Senior member of IEEE, USA and Senior Member of ACM, USA.

Anirban Mukherjee did his Bachelors in Civil Engineering in 1994 from Jadavpur University, Kolkata. While in service he achieved a professional Diploma in Operations Management (PGDOM) in 1998 and completed his PhD on 'Automatic Diagram Drawing based on Natural Language Text Understanding' from Indian Institute of Engineering, Science and Technology (IIEST), Shibpur in 2014. Serving RCC Institute of Information Technology (RCCIIT), Kolkata since inception (in 1999) in terms of teaching in UG engineering and MCA courses, he is currently an Professor in the Department of Information Technology. Before joining RCCIIT he served as an Engineer in the Scientific & Technical Application Group in erstwhile RCC, Calcutta for 6 years – he was involved in computer aided design and analysis of engineering structures and in teaching in CAD and DOEACC courses. His research interest includes Computer Graphics, Optimization Techniques, Computational Intelligence, and Assistive Technology. He has co-authored two UG engineering textbooks and 17 books on Computer Graphics/Multimedia for distance learning courses of BBA/MBA/BCA/MCA/B.Sc (Comp. Sc.)/M.Sc (IT) of different Universities of India.

He has several international journal and conference papers to his credit. He is the co-editor of one IGI Global Book and also co-editor of two books of CRC Press and Willey. He has reviewed several journal papers and book chapters and acted as guest editor of *Journal of Pattern Recognition Research* and *International Journal of Computers and Applications.*

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