Advances in Intelligent Systems and Computing

Volume 817

Series editor

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

The series "Advances in Intelligent Systems and Computing" contains publications on theory, applications, and design methods of Intelligent Systems and Intelligent Computing. Virtually all disciplines such as engineering, natural sciences, computer and information science, ICT, economics, business, e-commerce, environment, healthcare, life science are covered. The list of topics spans all the areas of modern intelligent systems and computing such as: computational intelligence, soft computing including neural networks, fuzzy systems, evolutionary computing and the fusion of these paradigms, social intelligence, ambient intelligence, computational neuroscience, artificial life, virtual worlds and society, cognitive science and systems, Perception and Vision, DNA and immune based systems, self-organizing and adaptive systems, e-Learning and teaching, human-centered and human-centric computing, recommender systems, intelligent control, robotics and mechatronics including human-machine teaming, knowledge-based paradigms, learning paradigms, machine ethics, intelligent data analysis, knowledge management, intelligent agents, intelligent decision making and support, intelligent network security, trust management, interactive entertainment, Web intelligence and multimedia.

The publications within "Advances in Intelligent Systems and Computing" are primarily proceedings of important conferences, symposia and congresses. They cover significant recent developments in the field, both of a foundational and applicable character. An important characteristic feature of the series is the short publication time and world-wide distribution. This permits a rapid and broad dissemination of research results.

Jagdish Chand Bansal · Kedar Nath Das
Atulya Nagar · Kusum Deep
Akshay Kumar Ojha
Editors

Soft Computing for Problem Solving

SocProS 2017, Volume 2

Springer

Editors
Jagdish Chand Bansal
Department of Mathematics
South Asian University
New Delhi, India

Kusum Deep
Department of Mathematics
Indian Institute of Technology Roorkee
Roorkee, Uttarakhand, India

Kedar Nath Das
Department of Mathematics
National Institute of Technology Silchar
Silchar, Assam, India

Akshay Kumar Ojha
School of Basic Sciences
Indian Institute of Technology Bhubaneswar
Bhubaneswar, Odisha, India

Atulya Nagar
Department of Mathematics and Computer Science, Faculty of Science
Liverpool Hope University
Liverpool, UK

ISSN 2194-5357 ISSN 2194-5365 (electronic)
Advances in Intelligent Systems and Computing
ISBN 978-981-13-1594-7 ISBN 978-981-13-1595-4 (eBook)
https://doi.org/10.1007/978-981-13-1595-4

Library of Congress Control Number: 2018947855

This Springer imprint is published by the registered company Springer Nature Singapore Pte Ltd.
The registered company address is: 152 Beach Road, #21-01/04 Gateway East, Singapore 189721, Singapore

Preface

SocProS, which stands for 'Soft Computing for Problem Solving,' is entering its seventh edition as an established and flagship international conference. This particular annual event is a joint collaboration between a group of faculty members from the institutes of repute like South Asian University, New Delhi; NIT Silchar; Liverpool Hope University, UK; IIT Roorkee; and IIT Bhubaneswar.

The first in the series of SocProS started in 2011 and was held from 20th to 22nd December on the IIT Roorkee Campus with Prof. Deep (IITR) and Prof. Nagar (Liverpool Hope University) as the general chairs. JKLU Jaipur hosted the second SocProS from December 28 to 30, 2012. Coinciding with the Golden Jubilee of the IIT Roorkee's Saharanpur Campus, the third edition of this international conference, which has by now become a brand name, took place at the Greater Noida Extension Centre of IIT Roorkee during December 26–28, 2013. Afterward, in 2014, it has been organized at NIT Silchar, Assam, during December 27–29, 2014. The next conference series was held at Saharanpur Campus of IIT Roorkee during December 18–20, 2015. In the last year, Thapar University, Patiala, has hosted the conference during December 23–24, 2016.

Like earlier SocProS conferences, the focus of SocProS 2017 is on soft computing and its applications to real-life problems arising in diverse areas of medical and health care, supply chain management, signal processing and multimedia, industrial optimization, image processing, cryptanalysis, etc. SocProS 2017 attracted a wide spectrum of thought-provoking articles. A total of 164 high-quality research papers have been selected for publication in the form of this two-volume proceeding.

We hope that the papers contained in this proceeding will prove helpful toward improving the understanding of soft computing at teaching as well as research level and will inspire more and more researchers to work in the field of soft computing.

The editors would like to express their sincere gratitude to SocProS 2017 patron, plenary speakers, invited speakers, reviewers, program committee members, international advisory committee, and local organizing committee; without whose support, the quality and standards of the conference could not be maintained. We

express special thanks to Springer and its team for this valuable support in the publication of this proceeding.

Over and above, we would like to express our deepest sense of gratitude to the 'Indian Institute of Technology (IIT) Bhubaneswar' to facilitate the hosting of this conference. Our sincere thanks to all the sponsors of SocProS 2017.

SAU New Delhi, India — Jagdish Chand Bansal
NIT Silchar, India — Kedar Nath Das
LHU, Liverpool, UK — Atulya Nagar
IIT Roorkee, India — Kusum Deep
IIT Bhubaneswar, India — Akshay Kumar Ojha

About the Book

The proceedings of SocProS 2017 will serve as an academic bonanza for scientists and researchers working in the field of soft computing. This book contains theoretical as well as practical aspects using fuzzy logic, neural networks, evolutionary algorithms, swarm intelligence algorithms, etc., with many applications under the umbrella of 'soft computing.' The book will be beneficial for young as well as experienced researchers dealing across complex and intricate real-world problems for which finding a solution by traditional methods is a difficult task.

The different application areas covered in the proceedings are image processing, cryptanalysis, industrial optimization, supply chain management, newly proposed nature-inspired algorithms, signal processing, problems related to medical and health care, networking optimization problems, etc.

Contents

About the Editors

Dr. Jagdish Chand Bansal is Assistant Professor at the South Asian University, New Delhi, India, and Visiting Research Fellow at Liverpool Hope University, Liverpool, UK. He has an excellent academic record and is a leading researcher in the field of swarm intelligence, and he has published numerous research papers in respected international and national journals.

Dr. Kedar Nath Das is Assistant Professor in the Department of Mathematics, National Institute of Technology Silchar, Assam, India. Over the past 10 years, he has made substantial contributions to research on 'soft computing.' He has published several research papers in prominent national and international journals. His chief area of interest is evolutionary and bio-inspired algorithms for optimization.

Prof. Atulya Nagar holds the Foundation Chair as Professor of Mathematical Sciences and is Dean of the Faculty of Science, Liverpool Hope University, UK. He is an internationally respected scholar working at the cutting edge of theoretical computer science, applied mathematical analysis, operations research, and systems engineering.

Prof. Kusum Deep is Professor in the Department of Mathematics, Indian Institute of Technology Roorkee, India. Over the past 25 years, her research has made her a central international figure in the area of nature-inspired optimization techniques, genetic algorithms, and particle swarm optimization.

Dr. Akshay Kumar Ojha is Associate Professor at the School of Basic Sciences, Indian Institute of Technology Bhubaneswar, Odisha, India. He completed his B.Sc., M.Sc., and Ph.D. at Utkal University in 1978, 1980, and 1997, respectively. His research interest areas are geometric programming, artificial neural networks, genetic algorithms, particle swarm optimization, fractional programming, nonlinear optimization, data analysis and optimization, and portfolio optimization. He has 34 years of experience and has published over 30 journal articles and 6 books.