

# Advances in Intelligent Systems and Computing

Volume 1199

## Series Editor

Janusz Kacprzyk, Systems Research Institute, Polish Academy of Sciences,  
Warsaw, Poland

## Advisory Editors

Nikhil R. Pal, Indian Statistical Institute, Kolkata, India

Rafael Bello Perez, Faculty of Mathematics, Physics and Computing,  
Universidad Central de Las Villas, Santa Clara, Cuba

Emilio S. Corchado, University of Salamanca, Salamanca, Spain

Hani Hagras, School of Computer Science and Electronic Engineering,  
University of Essex, Colchester, UK

László T. Kóczy, Department of Automation, Széchenyi István University,  
Gyor, Hungary


Vladik Kreinovich, Department of Computer Science, University of Texas  
at El Paso, El Paso, TX, USA

Chin-Teng Lin, Department of Electrical Engineering, National Chiao  
Tung University, Hsinchu, Taiwan

Jie Lu, Faculty of Engineering and Information Technology,  
University of Technology Sydney, Sydney, NSW, Australia

Patricia Melin, Graduate Program of Computer Science, Tijuana Institute  
of Technology, Tijuana, Mexico

Nadia Nedjah, Department of Electronics Engineering, University of Rio de Janeiro,  
Rio de Janeiro, Brazil

Ngoc Thanh Nguyen , Faculty of Computer Science and Management,  
Wrocław University of Technology, Wrocław, Poland

Jun Wang, Department of Mechanical and Automation Engineering,  
The Chinese University of Hong Kong, Shatin, Hong Kong

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.

Indexed by SCOPUS, DBLP, EI Compendex, INSPEC, WTI Frankfurt eG, zbMATH, Japanese Science and Technology Agency (JST), SCImago.

More information about this series at <http://www.springer.com/series/11156>

Chhabi Rani Panigrahi · Bibudhendu Pati ·  
Prasant Mohapatra · Rajkumar Buyya ·  
Kuan-Ching Li  
Editors

# Progress in Advanced Computing and Intelligent Engineering

Proceedings of ICACIE 2019, Volume 2

*Editors*

Chhabi Rani Panigrahi  
Department of Computer Science  
Rama Devi Women's University  
Bhubaneswar, India

Bibudhendu Pati  
Department of Computer Science  
Rama Devi Women's University  
Bhubaneswar, India

Prasant Mohapatra  
Department of Computer Science  
University of California  
Davis, CA, USA

Rajkumar Buyya  
Cloud Computing and Distributed Systems  
(CLOUDS) Lab  
School of Computing and Information  
Systems, The University of Melbourne  
Melbourne, VIC, Australia

Kuan-Ching Li  
Department of Computer Science  
and Information Engineering  
Providence University  
Taichung, Taiwan

ISSN 2194-5357

ISSN 2194-5365 (electronic)

Advances in Intelligent Systems and Computing

ISBN 978-981-15-6352-2

ISBN 978-981-15-6353-9 (eBook)

<https://doi.org/10.1007/978-981-15-6353-9>

© Springer Nature Singapore Pte Ltd. 2021

This work is subject to copyright. All rights are reserved by the Publisher, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, reuse of illustrations, recitation, broadcasting, reproduction on microfilms or in any other physical way, and transmission or information storage and retrieval, electronic adaptation, computer software, or by similar or dissimilar methodology now known or hereafter developed.

The use of general descriptive names, registered names, trademarks, service marks, etc. in this publication does not imply, even in the absence of a specific statement, that such names are exempt from the relevant protective laws and regulations and therefore free for general use.

The publisher, the authors and the editors are safe to assume that the advice and information in this book are believed to be true and accurate at the date of publication. Neither the publisher nor the authors or the editors give a warranty, express or implied, with respect to the material contained herein or for any errors or omissions that may have been made. The publisher remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

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

This volume contains the papers presented at the 4th International Conference on Advanced Computing and Intelligent Engineering (ICACIE) 2019: The 4th International Conference on Advanced Computing and Intelligent Engineering ([www.icacie.com](http://www.icacie.com)) held during 21–23rd December 2019, at Rama Devi Women's University, Bhubaneswar, India. There were 284 submissions and each qualified submission was reviewed by a minimum of two Technical Program Committee members using the criteria of relevance, originality, technical quality, and presentation. The committee accepted 86 full papers for oral presentation at the conference and the overall acceptance rate is 29%.

ICACIE 2019, was an initiative taken by the organizers which focuses on research and applications on topics of advanced computing and intelligent engineering. The focus was also to present state-of-the-art scientific results, to disseminate modern technologies, and to promote collaborative research in the field of advanced computing and intelligent engineering. Researchers presented their work in the conference and had an excellent opportunity to interact with eminent professors, scientists, and scholars in their area of research. All participants were benefitted from discussions that facilitated the emergence of innovative ideas and approaches. Many distinguished professors, well-known scholars, industry leaders, and young researchers were participated in making ICACIE 2019, an immense success. We had also an industry panel discussion and we invited people from software industries like TCS, Infosys, Cognizant, and entrepreneurs.

We thank all the Technical Program Committee members and all reviewers/sub-reviewers for their timely and thorough participation during the review process.

We express our sincere gratitude to Prof. Padmaja Mishra, Honourable Vice Chancellor and Chief Patron of ICACIE 2019, to allow us to organize ICACIE 2019, on the campus and for her unending timely support towards organization of this conference. We would like to extend our sincere thanks to Prof. Bibudhendu Pati and Dr. Hemant Kumar Rath, General chairs of ICACIE 2019, for their valuable guidance during review of papers, as well as other aspects of the conference. We appreciate the time and efforts put in by the members of the local organizing team at Rama Devi Women's University, Bhubaneswar, India,

especially the faculty members of the Department of Computer Science, student volunteers, and administrative staff, who dedicated their time and efforts to make ICACIE 2019, successful. We would like to extend our thanks to Dr. Subhashis Das Mohapatra for designing and maintaining ICACIE 2019, Website.

We are very grateful to all our sponsors, especially Department of Science and Technology (DST), Government of India under Consolidation of University Research for Innovation and Excellence in women universities (CURIE) project for its generous support towards ICACIE 2019.

Bhubaneswar, India  
Bhubaneswar, India  
Davis, USA  
Melbourne, Australia  
Taichung, Taiwan

Chhabi Rani Panigrahi  
Bibudhendu Pati  
Prasant Mohapatra  
Rajkumar Buyya  
Kuan-Ching Li

## About This Book

The book focuses on theory, practice and applications in the broad areas of advanced computing techniques and intelligent engineering. This two volumes book includes 86 scholarly articles, which have been accepted for presentation from 287 submissions in the 5th International Conference on Advanced Computing and Intelligent Engineering held at Rama Devi Women's University, Bhubaneswar, India during 21–23rd December, 2019. The first volume of this book consists of 40 numbers of papers and volume 2 contains 46 papers with a total of 86 papers. This book brings together academic scientists, professors, research scholars and students to share and disseminate their knowledge and scientific research works related to advance computing and intelligent engineering. It helps to provide a platform to the young researchers to find the practical challenges encountered in these areas of research and the solutions adopted. The book helps to disseminate the knowledge about some innovative and active research directions in the field of advanced computing techniques and intelligent engineering, along with some current issues and applications of related topics.

# Contents

## Advanced Machine Learning Applications

<b>Prediction of Depression Using EEG: A Comparative Study . . . . .</b>	<b>3</b>
Namrata P. Mohanty, Sweta Shree Dash, Sandeep Sobhan, and Tripti Swarnkar	
<b>Prediction of Stroke Risk Factors for Better Pre-emptive Healthcare: A Public-Survey-Based Approach . . . . .</b>	<b>12</b>
Debayan Banerjee and Jagannath Singh	
<b>Language Identification—A Supportive Tool for Multilingual ASR in Indian Perspective . . . . .</b>	<b>25</b>
Basanta Kumar Swain and Sanghamitra Mohanty	
<b>Ensemble Methods to Predict the Locality Scope of Indian and Hungarian Students for the Real Time: Preliminary Results . . . . .</b>	<b>37</b>
Chaman Verma, Zoltán Illés, and Veronika Stoffová	
<b>Automatic Detection and Classification of Tomato Pests Using Support Vector Machine Based on HOG and LBP Feature Extraction Technique . . . . .</b>	<b>49</b>
Gayatri Pattnaik and K. Parvathi	
<b>Poly Scale Space Technique for Feature Extraction in Lip Reading: A New Strategy . . . . .</b>	<b>56</b>
M. S. Nandini, Nagappa U. Bhajantri, and Trisiladevi C. Nagavi	
<b>Machine Learning Methods for Vehicle Positioning in Vehicular Ad-Hoc Networks . . . . .</b>	<b>65</b>
Suryakanta Nayak, Partha Sarathi Das, and Satyasesan Panda	
<b>Effectiveness of Swarm-Based Metaheuristic Algorithm in Data Classification Using Pi-Sigma Higher Order Neural Network . . . . .</b>	<b>77</b>
Nibedan Panda and Santosh Kumar Majhi	



<b>Deep Learning for Cover Song Apperception</b> .....	89
D. Khasim Vali and Nagappa U. Bhajantri	
<b>SVM-Based Drivers Drowsiness Detection Using Machine Learning and Image Processing Techniques</b> .....	100
P. Rasna and M. B. Smithamol	
<b>Fusion of Artificial Intelligence for Multidisciplinary Optimization: Skidding Track—Case Study</b> .....	113
Abhishek Nigam and Debi Prasad Ghosh	
<b>A Single Document Assamese Text Summarization Using a Combination of Statistical Features and Assamese WordNet</b> .....	125
Nomi Baruah, Shikhar Kr. Sarma, and Surajit Borkotokey	
<b>SVM and Ensemble-SVM in EEG-Based Person Identification</b> .....	137
Banee Bandana Das, Saswat Kumar Ram, Bibudhendu Pati, Chhabhi Rani Panigrahi, Korra Sathya Babu, and Ramesh Kumar Mohapatra	
<b>A Self-Acting Mechanism to Engender Highlights of a Tennis Game</b> . . .	147
Ramanathan Arunachalam and Abishek Kumar	
<b>Performance Evaluation of RF and SVM for Sugarcane Classification Using Sentinel-2 NDVI Time-Series</b> .....	163
Shyamal Virnodkar, V. K. Pachghare, V. C. Patil, and Sunil Kumar Jha	
<b>Classification of Nucleotides Using Memetic Algorithms and Computational Methods</b> .....	175
Rajesh Eswarawaka, S. Venkata Suryanarayana, Purnachand Kollapudi, and Mrutyunjaya S. Yalawar	
<b>A Novel Approach to Detect Emergency Using Machine Learning</b> . . . .	185
Sarmistha Nanda, Chhabhi Rani Panigrahi, Bibudhendu Pati, and Abhishek Mishra	
<b>Data Mining Applications and Sentiment Analysis</b>	
<b>A Novel Approach Based on Associative Rule Mining Technique for Multi-label Classification (ARM-MLC)</b> .....	195
C. P. Prathibhamol, K. Ananthakrishnan, Neeraj Nandan, Abhijith Venugopal, and Nandu Ravindran	
<b>Multilevel Neuron Model Construction Related to Structural Brain Changes Using Hypergraph</b> .....	204
Shalini Ramanathan and Mohan Ramasundaram	

<b>AEDBSCAN—Adaptive Epsilon Density-Based Spatial Clustering of Applications with Noise</b> . . . . .	213
Vidhi Mistry, Urja Pandya, Anjana Rathwa, Himani Kachroo, and Anjali Jivani	
<b>Impact of Prerequisite Subjects on Academic Performance Using Association Rule Mining</b> . . . . .	227
Chandra Das, Shilpi Bose, Arnab Chanda, Sandeep Singh, Sumanta Das, and Kuntal Ghosh	
<b>A Supervised Approach to Aspect Term Extraction Using Minimal Robust Features for Sentiment Analysis</b> . . . . .	237
Manju Venugopalan, Deepa Gupta, and Vartika Bhatia	
<b>Correlation of Visual Perceptions and Extraction of Visual Articulators for Kannada Lip Reading</b> . . . . .	252
M. S. Nandini, Nagappa U. Bhajantri, and Trisiladevi C. Nagavi	
<b>Automatic Short Answer Grading Using Corpus-Based Semantic Similarity Measurements</b> . . . . .	266
Bhuvnesh Chaturvedi and Rohini Basak	
<b>A Productive Review on Sentimental Analysis for High Classification Rates</b> . . . . .	282
Gaurika Jaitly and Manoj Kapil	
<b>A Novel Approach to Optimize Deep Neural Network Architectures</b> . . .	295
Harshita Pal and Bhawna Narwal	
<b>Effective Identification and Prediction of Breast Cancer Gene Using Volterra Based LMS/F Adaptive Filter</b> . . . . .	305
Lopamudra Das, Jitendra Kumar Das, and Sarita Nanda	
<b>Architecture of Proposed Secured Crypto-Hybrid Algorithm (SCHA) for Security and Privacy Issues in Data Mining</b> . . . . .	315
Pasupuleti Nagendra Babu and S. Ramakrishna	
<b>A Technique to Classify Sugarcane Crop from Sentinel-2 Satellite Imagery Using U-Net Architecture</b> . . . . .	322
Shyamal Virnodkar, V. K. Pachghare, and Sagar Murade	
<b>Performance Analysis of Recursive Rule Extraction Algorithms for Disease Prediction</b> . . . . .	331
Manomita Chakraborty, Saroj Kumar Biswas, and Biswajit Purkayastha	
<b>Extraction of Relation Between Attributes and Class in Breast Cancer Data Using Rule Mining Techniques</b> . . . . .	342
Krishna Mohan, Priyanka C. Nair, Deepa Gupta, Ravi C. Nayar, and Amritanshu Ram	

<b>Recent Challenges in Recommender Systems: A Survey . . . . .</b>	<b>353</b>
Madhusree Kuanr and Puspanjali Mohapatra	
<b>Framework to Detect NPK Deficiency in Maize Plants Using CNN . . . .</b>	<b>366</b>
Padmashri Jahagirdar and Suneeta V. Budihal	
<b>Stacked Denoising Autoencoder: A Learning-Based Algorithm for the Reconstruction of Handwritten Digits . . . . .</b>	<b>377</b>
Huzaifa M. Maniyar, Nahid Guard, and Suneeta V. Budihal	
<b>An Unsupervised Technique to Generate Summaries from Opinionated Review Documents . . . . .</b>	<b>388</b>
Ashwini Rao and Ketan Shah	
<b>Scaled Document Clustering and Word Cloud-Based Summarization on Hindi Corpus . . . . .</b>	<b>398</b>
Prafulla B. Bafna and Jatinderkumar R. Saini	
<b>Big Data Analytics, Cloud and IoT</b>	
<b>Rough Set Classifications and Performance Analysis in Medical Health Care . . . . .</b>	<b>411</b>
Indrani Kumari Sahu, G. K. Panda, and Susant Kumar Das	
<b>IoT-Based Modeling of Electronic Healthcare System Through Connected Environment . . . . .</b>	<b>423</b>
Subhasis Mohapatra and Smita Parija	
<b>SEHS: Solar Energy Harvesting System for IoT Edge Node Devices . . . . .</b>	<b>432</b>
Saswat Kumar Ram, Banee Bandana Das, Bibudhendu Pati, Chhabi Rani Panigrahi, and Kamala Kanta Mahapatra	
<b>An IoT-Based Smart Parking System Using Thingspeak . . . . .</b>	<b>444</b>
Anagha Bhat, Bharathi Gummanur, Likhitha Priya, and J. Nagaraja	
<b>Techniques for Preserving Privacy in Data Mining for Cloud Storage: A Survey . . . . .</b>	<b>452</b>
Ila Chandrakar and Vishwanath R. Hulipalled	
<b>A QoS Aware Binary Salp Swarm Algorithm for Effective Task Scheduling in Cloud Computing . . . . .</b>	<b>462</b>
Richa Jain and Neelam Sharma	
<b>An Efficient Emergency Management System Using NSGA-II Optimization Technique . . . . .</b>	<b>474</b>
V. Ramasamy, B. Gomathy, and Rajesh Kumar Verma	

**Load Balancing Using Firefly Approach . . . . . 483**  
Manisha T. Tapale, R. H. Goudar, and Mahantesh N. Birje

**IoT Security, Challenges, and Solutions: A Review . . . . . 493**  
Jayashree Mohanty, Sushree Mishra, Sibani Patra, Bibudhendu Pati,  
and Chhabi Rani Panigrahi

## About the Editors

**Dr. Chhabi Rani Panigrahi** is Assistant Professor in the P.G. Department of Computer Science at Rama Devi Women's University, Bhubaneswar, India. She completed her Ph.D. from Department of Computer Science and Engineering, Indian Institute of Technology Kharagpur, India. Her research interest areas include Software Testing and Mobile Cloud Computing. She holds 19 years of teaching and research experience. She has published several international journals and conference papers. She is a Life Member of Indian Society of Technical Education (ISTE) and member of IEEE and Computer Society of India (CSI).

**Dr. Bibudhendu Pati** is Associate Professor and Head of the P.G. Department of Computer Science at Rama Devi Women's University, Bhubaneswar, India. He completed his Ph.D. from IIT Kharagpur. Dr. Pati has 21 years of experience in teaching, research. His interest areas include Wireless Sensor Networks, Cloud Computing, Big Data, Internet of Things, and Network Virtualization. He has got several papers published in journals, conference proceedings and books of international repute. He is a Life Member of Indian Society of Technical Education (ISTE), Life Member of Computer Society of India, and Senior Member of IEEE.

**Prof. Prasant Mohapatra** is serving as the Vice Chancellor for Research at University of California, Davis. He is also a Professor in the Department of Computer Science and served as the Dean and Vice-Provost of Graduate Studies during 2016-18. He was the Department Chair of Computer Science during 2007-13. In the past, Dr. Mohapatra has also held Visiting Scientist positions at Intel Corporation, Panasonic Technologies, Institute of Infocomm Research (I2R), Singapore, and National ICT Australia (NICTA). Dr. Mohapatra received his doctoral degree from Penn State University in 1993, and received an Outstanding Engineering Alumni Award in 2008. He is also the recipient of Distinguished Alumnus Award from the National Institute of Technology, Rourkela, India. Dr. Mohapatra received an Outstanding Research Faculty Award from the College of Engineering at the University of California, Davis. He received the HP Labs Innovation awards in 2011, 2012, and 2013. He is a Fellow of the IEEE and a

Fellow of AAAS. Dr. Mohapatra's research interests are in the areas of wireless networks, mobile communications, cyber security, and Internet protocols. He has published more than 350 papers in reputed conferences and journals on these topics. Dr. Mohapatra's research has been funded through grants from the National Science Foundation, US Department of Defense, US Army Research Labs, Intel Corporation, Siemens, Panasonic Technologies, Hewlett Packard, Raytheon, and EMC Corporation.

**Prof. Rajkumar Buyya** is a Redmond Barry Distinguished Professor and Director of the Cloud Computing and Distributed Systems (CLOUDS) Laboratory at the University of Melbourne, Australia. He is also serving as the founding CEO of Manjrasoft, a spin-off company of the University, commercializing its innovations in Cloud Computing. He has authored over 650 publications and seven text books including "Mastering Cloud Computing" published by McGraw Hill, China Machine Press, and Morgan Kaufmann for Indian, Chinese and international markets respectively. Dr. Buyya is one of the highly cited authors in computer science and software engineering worldwide (h-index=120, g-index=255, 76,800+ citations). He is named in the recent Clarivate Analytics' (formerly Thomson Reuters) Highly Cited Researchers and "World's Most Influential Scientific Minds" for three consecutive years since 2016. Dr. Buyya is recognized as Scopus Researcher of the Year 2017 with Excellence in Innovative Research Award by Elsevier for his outstanding contributions to Cloud computing. He served as founding Editor-in-Chief of the IEEE Transactions on Cloud Computing. He is currently serving as Editor-in-Chief of Software: Practice and Experience, a long standing journal in the field established ~50 years ago.

**Prof. Kuan-Ching Li** is currently a Professor in the Department of Computer Science and Information Engineering at the Providence University, Taiwan. He was the Vice-Dean for Office of International and Cross-Strait Affairs (OIA) in this same university since 2014. Prof. Li is recipient of awards from Nvidia, Ministry of Education (MOE)/Taiwan and Ministry of Science and Technology (MOST)/Taiwan, as also guest professorship from different universities in China. He got his PhD from University of Sao Paulo, Sao Paulo, Brazil in 2001. His areas of research are networked and GPU computing, parallel software design, and performance evaluation and benchmarking. He has edited 2 books: Cloud Computing and Digital Media and Big Data published by CRC Press. He is a Fellow of the IET, senior member of the IEEE and a member of TACC.