

# Smart Innovation, Systems and Technologies

Volume 28

## *Series editors*

Robert J. Howlett, KES International, Shoreham-by-Sea, UK  
e-mail: [rjhowlett@kesinternational.org](mailto:rjhowlett@kesinternational.org)

Lakhmi C. Jain, University of Canberra, Canberra, Australia  
e-mail: [Lakhmi.jain@unisa.edu.au](mailto:Lakhmi.jain@unisa.edu.au)

For further volumes:

<http://www.springer.com/series/8767>

### *About this Series*

The Smart Innovation, Systems and Technologies book series encompasses the topics of knowledge, intelligence, innovation and sustainability. The aim of the series is to make available a platform for the publication of books on all aspects of single and multi-disciplinary research on these themes in order to make the latest results available in a readily-accessible form. Volumes on interdisciplinary research combining two or more of these areas is particularly sought.

The series covers systems and paradigms that employ knowledge and intelligence in a broad sense. Its scope is systems having embedded knowledge and intelligence, which may be applied to the solution of world problems in industry, the environment and the community. It also focusses on the knowledge-transfer methodologies and innovation strategies employed to make this happen effectively. The combination of intelligent systems tools and a broad range of applications introduces a need for a synergy of disciplines from science, technology, business and the humanities. The series will include conference proceedings, edited collections, monographs, handbooks, reference books, and other relevant types of book in areas of science and technology where smart systems and technologies can offer innovative solutions.

High quality content is an essential feature for all book proposals accepted for the series. It is expected that editors of all accepted volumes will ensure that contributions are subjected to an appropriate level of reviewing process and adhere to KES quality principles.

Malay Kumar Kundu · Durga Prasad Mohapatra  
Amit Konar · Aruna Chakraborty  
Editors

# Advanced Computing, Networking and Informatics - Volume 2

Wireless Networks and Security Proceedings  
of the Second International Conference  
on Advanced Computing, Networking  
and Informatics (ICACNI-2014)

*Editors*

Malay Kumar Kundu  
Indian Statistical Institute  
Machine Intelligence Unit  
Kolkata  
India

Durga Prasad Mohapatra  
Department of Computer Science and  
Engineering  
National Institute of Technology Rourkela  
Rourkela  
India

Amit Konar  
Department of Electronics and  
Tele-Communication Engineering  
Artificial Intelligence Laboratory  
Jadavpur University  
Kolkata  
India

Aruna Chakraborty  
Department of Computer Science and  
Engineering  
St. Thomas' College of Engineering  
and Technology  
West Bengal  
India

ISSN 2190-3018

ISBN 978-3-319-07349-1

DOI 10.1007/978-3-319-07350-7

Springer Cham Heidelberg New York Dordrecht London

ISSN 2190-3026 (electronic)

ISBN 978-3-319-07350-7 (eBook)

Library of Congress Control Number: 2014940383

© Springer International Publishing Switzerland 2014

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. Exempted from this legal reservation are brief excerpts in connection with reviews or scholarly analysis or material supplied specifically for the purpose of being entered and executed on a computer system, for exclusive use by the purchaser of the work. Duplication of this publication or parts thereof is permitted only under the provisions of the Copyright Law of the Publisher's location, in its current version, and permission for use must always be obtained from Springer. Permissions for use may be obtained through RightsLink at the Copyright Clearance Center. Violations are liable to prosecution under the respective Copyright Law.

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.

While the advice and information in this book are believed to be true and accurate at the date of publication, neither the authors nor the editors nor the publisher can accept any legal responsibility for any errors or omissions that may be made. The publisher makes no warranty, express or implied, with respect to the material contained herein.

Printed on acid-free paper

Springer is part of Springer Science+Business Media (www.springer.com)

# Foreword

The present volume is an outcome, in the form of proceedings, of the 2nd International Conference on Advanced Computing, Networking and Informatics, St. Thomas' College of Engineering and Technology, Kolkata, India, June 24–26, 2014. As the name of the conference implies, the articles included herein cover a wide span of disciplines ranging, say, from pattern recognition, machine learning, image processing, data mining and knowledge discovery, soft computing, distributed computing, cloud computing, parallel and distributed networks, optical communication, wireless sensor networks, routing protocol and architecture to data privacy preserving, cryptology and data security, and internet computing. Each discipline, itself, has its own challenging problems and issues. Some of them are relatively more matured and advanced in theories with several proven application domains, while others fall in recent thrust areas. Interestingly, there are several articles, as expected, on symbiotic integration of more than one discipline, e.g., in designing intelligent networking and computing systems such as forest fire detection using wireless sensor network, minimizing call routing cost with assigned cell in wireless network, network intrusion detection system, determining load balancing strategy in cloud computing, and side lobe reduction and beam-width control, where the significance of pattern recognition, evolutionary strategy and soft computing has been demonstrated. This kind of interdisciplinary research is likely to grow significantly, and has strong promise in solving real life challenging problems.

The proceedings are logically split in two homogeneous volumes, namely, Advanced Computing and Informatics (vol. 1) and Wireless Networks and Security (vol. 2) with 81 and 67 articles respectively. The volumes fairly represent a state-of-the art of the research mostly being carried out in India in these domains, and are valued-additions to the current era of computing and knowledge mining.

The conference committee, editors, and the publisher deserve congratulations for organizing the event (ICACNI-2014) which is very timely, and bringing out the archival volumes nicely as its output.

A handwritten signature in black ink, appearing to read 'S.K. Pal', with a horizontal line underneath the name.

Kolkata, April 2014

Sankar K. Pal  
Distinguished Scientist and former Director  
Indian Statistical Institute

## Message from the Honorary General Chair

It gives me great pleasure to introduce the *International Conference on Advanced Computing, Networking and Informatics (ICACNI 2014)* which will be held at St. Thomas' College of Engineering and Technology, Kolkata during June 24–26, 2014. ICACNI is just going to cross its second year, and during this small interval of time it has attracted a large audience. The conference received over 650 submissions of which only 148 papers have been accepted for presentation. I am glad to note that ICACNI involved top researchers from 26 different countries as advisory board members, program committee members and reviewers. It also received papers from 10 different countries.

ICACNI offers an interesting forum for researchers of three apparently diverse disciplines: Advanced Computing, Networking and Informatics, and attempts to focus on engineering applications, covering security, cognitive radio, human-computer interfacing among many others that greatly rely on these cross-disciplinary research outcomes. The accepted papers are categorized into two volumes, of which volume 1 includes all papers on advanced computing and informatics, while volume 2 includes accepted papers on wireless network and security. The volumes will be published by Springer-Verlag.

The conference includes plenary lecture, key-note address and four invited sessions by eminent scientists from top Indian and foreign research/academic institutes. The lectures by these eminent scientists will provide an ideal platform for dissemination of knowledge among researchers, students and practitioners. I take this opportunity to thank all the participants, including the keynote, plenary and invited speakers, reviewers, and the members of different committees in making the event a grand success.

VIII Message from the Honorary General Chair

Thanks are also due to the various Universities/Institutes for their active support towards this endeavor, and lastly Springer-Verlag for publishing the proceedings under their prestigious *Smart Innovation, Systems and Technologies (SIST)* series.

Wish the participants an enjoyable and productive stay in Kolkata.



Kolkata, April 2014

Dwijesh Dutta Majumder  
Honorary General Chair  
ICACNI -2014



# Preface

The twenty first century has witnessed a paradigm shift in three major disciplines of knowledge: 1) Advanced/Innovative computing ii) Networking and wireless Communications and iii) informatics. While the first two are complete in themselves by their titles, the last one covers several sub-disciplines involving geo-, bio-, medical and cognitive informatics among many others. Apparently, the above three disciplines of knowledge are complementary and mutually exclusive but their convergence is observed in many real world applications, encompassing cyber-security, internet banking, health-care, sensor networks, cognitive radio, pervasive computing and many others.

The International Conference on *Advanced Computing, Networking and Informatics* (ICACNI) is aimed at examining the convergence of the above three modern disciplines through interactions among three groups of people. The first group comprises leading international researchers, who have established themselves in one of the above three thrust areas. The plenary, the keynote lecture and the invited talks are organized to disseminate the knowledge of these academic experts among young researchers/practitioners of the respective domain. The invited talks are also expected to inspire young researchers to initiate/orient their research in respective fields. The second group of people comprises Ph.D./research students, working in the cross-disciplinary areas, who might be benefited from the first group and at the same time may help creating interest in the cross-disciplinary research areas among the academic community, including young teachers and practitioners. Lastly, the group comprising undergraduate and master students would be able to test the feasibility of their research through feedback of their oral presentations.

ICACNI is just passing its second birthday. Since its inception, it has attracted a wide audience. This year, for example, the program committee of ICACNI received as many as 646 papers. The acceptance rate is intentionally kept very low to ensure a quality publication by Springer. This year, the program committee accepted only 148 papers from these 646 submitted papers. An accepted paper has essentially received very good recommendation by at least two experts in the respective field.

To maintain a high standard of ICACNI, researchers from top international research laboratories/universities have been included in both the advisory committee and the program committee. The presence of these great personalities has helped the conference

to develop its publicity during its infancy and promote it quality through an academic exchange among top researchers and scientific communities.

The conference includes one plenary session, one keynote address and four invited speech sessions. It also includes 3 special sessions and 21 general sessions (altogether 24 sessions) with a structure of 4 parallel sessions over 3 days. To maintain good question-answering sessions and highlight new research results arriving from the sessions, we selected subject experts from specialized domains as session chairs for the conference. ICACNI also involved several persons to nicely organize registration, take care of finance, hospitality of the authors/audience and other supports. To have a closer interaction among the people of the organizing committee, all members of the organizing committee have been selected from St. Thomas' College of Engineering and Technology.

The papers that passed the screening process by at least two reviewers, well-formatted and nicely organized have been considered for publication in the Smart Innovations Systems Technology (SIST) series of Springer. The hard copy proceedings include two volumes, where the first volume is named as *Advanced Computing and Informatics* and the second volume is named as *Wireless Networks and Security*. The two volumes together contain 148 papers of around eight pages each (in Springer LNCS format) and thus the proceedings is expected to have an approximate length of 1184 pages.

The editors gratefully acknowledge the contribution of the authors and the entire program committee without whose active support the proceedings could hardly attain the present standards. They would like to thank the keynote speaker, the plenary speaker, the invited speakers and also the invited session chairs, the organizing chair along with the organizing committee and other delegates for extending their support in various forms to ICACNI-2014. The editors express their deep gratitude to the Honorary General Chair, the General Chair, the Advisory Chair and the Advisory board members for their help and support to ICACNI-2014. The editors are obliged to Prof. Lakhmi C. Jain, the academic series editor of the SIST series, Springer and Dr. Thomas Ditzinger, Senior Editor, Springer, Heidelberg for extending their co-operation in publishing the proceeding in the prestigious SIST series of Springer. They also like to mention the hard efforts of Mr. Indranil Dutta of the Machine Intelligence Unit of ISI Kolkata for the editorial support. The editors also acknowledge the technical support they received from the students of ISI, Kolkata Jadavpur University and also the faculty of NIT Rourkela and St. Thomas' College of Engineering and Technology without which the work could not be completed in right time. Lastly, the editors thank Dr. Sailesh Mukhopadhyay, Prof. Gautam Banerjee and Dr. Subir Chowdhury of St. Thomas' College of Engineering and Technology for their support all the way long to make this conference a success.

Kolkata  
April 14, 2014

Malay Kumar Kundu  
Durga Prasad Mohapatra  
Amit Konar  
Aruna Chakraborty

# Organization

## Advisory Chair

Sankar K. Pal

Distinguished Scientist, Indian Statistical Institute,  
India

## Advisory Board Members

Alex P. James

Nazarbayev University, Republic of Kazakhstan

Anil K. Kaushik

Additional Director, DeitY, Govt. of India, India

Atilla Elci

Aksaray University, Turkey

Atulya K. Nagar

Liverpool Hope University, United Kingdom

Brijesh Verma

Central Queensland University, Australia

Debajyoti Mukhopadhyay

Maharashtra Institute of Technology, India

Debatosh Guha

University of Calcutta, India

George A. Tsihrintzis

University of Piraeus, Greece

Hugo Proenca

University of Beira Interior, Portugal

Jocelyn Chanussot

Grenoble Institute of Technology, France

Kenji Suzuki

The University of Chicago, Chicago

Khalid Saeed

AGH University of Science and Technology,  
Poland

Klaus David

University of Kassel, Germany

Maode Ma

Nanyang Technological University, Singapore

Massimiliano Rak

Second University of Naples, Italy

Massimo Tistarelli

University of Sassari, Italy

Nishchal K. Verma

Indian Institute of Technology, Kanpur, India

Pascal Lorenz

University of Haute Alsace, France

Phalguni Gupta

Indian Institute of Technology Kanpur, India

Prasant Mohapatra

University of California, USA

Prasenjit Mitra

Pennsylvania State University, USA

Raj Jain

Washington University in St. Louis, USA

Rajesh Siddavatam

Kalinga Institute of Industrial Technology, India

## XII Organization

Rajkumar Buyya	The University of Melbourne, Australia
Raouf Boutaba	University of Waterloo, Canada
Sagar Naik	University of Waterloo, Canada
Salvatore Vitabile	University of Palermo, Italy
Sansanee Auephanwiriyaikul	Chiang Mai University, Thailand
Subhash Saini	The National Aeronautics and Space Administration (NASA), USA

## ICACNI Conference Committee

### Chief Patron

Sailesh Mukhopadhyay	St. Thomas' College of Engineering and Technology, Kolkata, India
----------------------	--

### Patron

Gautam Banerjea	St. Thomas' College of Engineering and Technology, Kolkata, India
-----------------	--

### Honorary General Chair

Dwijesh Dutta Majumder	Professor Emeritus, Indian Statistical Institute, Kolkata, India Institute of Cybernetics Systems and Information Technology, India Director, Governing Board, World Organization of Systems and Cybernetics (WOSC), Paris
------------------------	---

### General Chairs

Rajib Sarkar	Central Institute of Technology Raipur, India
Mrithunjoy Bhattacharyya	St. Thomas' College of Engineering and Technology, Kolkata, India

### Programme Chairs

Malay Kumar Kundu	Indian Statistical Institute, Kolkata, India
Amit Konar	Jadavpur University, Kolkata, India
Aruna Chakraborty	St. Thomas' College of Engineering and Technology, Kolkata, India

## Programme Co-chairs

Asit Kumar Das	Bengal Engineering and Science University, Kolkata, India
Ramjeevan Singh Thakur	Maulana Azad National Institute of Technology, India
Umesh A. Deshpande	Sardar Vallabhbhai National Institute of Technology, India

## Organizing Chairs

Ashok K. Turuk	National Institute of Technology Rourkela, Rourkela, India
Rabindranath Ghosh	St. Thomas' College of Engineering and Technology, Kolkata, India

## Technical Track Chairs

Joydeb Roychowdhury	Central Mechanical Engineering Research Institute, India
Korra Sathyababu	National Institute of Technology Rourkela, India
Manmath Narayan Sahoo	National Institute of Technology Rourkela, India

## Honorary Industrial Chair

G.C. Deka	Ministry of Labour & Employment, Government of India
-----------	---

## Industrial Track Chairs

Umesh Chandra Pati	National Institute of Technology Rourkela, India
Bibhudutta Sahoo	National Institute of Technology Rourkela, India

## Special Session Chairs

Ashish Agarwal	Boston University, USA
Asutosh Kar	International Institute of Information Technology Bhubaneswar, India
Daya K. Lobiyal	Jawaharlal Nehru University, India
Mahesh Chandra	Birla Institute of Technology, Mesra, India
Mita Nasipuri	Jadavpur University, Kolkata, India
Nandini Mukherjee	Chairman, IEEE Computer Society, Kolkata Chapter Jadavpur University, Kolkata, India
Ram Shringar Rao	Ambedkar Institute of Advanced Communication Technologies & Research, India

## **Web Chair**

Indranil Dutta Indian Statistical Institute, Kolkata, India

## **Publication Chair**

Sambit Bakshi National Institute of Technology Rourkela, India

## **Publicity Chair**

Mohammad Ayoub Khan Center for Development of Advanced Computing,  
India

## **Organizing Committee**

Amit Kr. Siromoni St. Thomas' College of Engineering and  
Technology, Kolkata, India

Anindita Ganguly St. Thomas' College of Engineering and  
Technology, Kolkata, India

Arindam Chakravorty St. Thomas' College of Engineering and  
Technology, Kolkata, India

Dipak Kumar Kole St. Thomas' College of Engineering and  
Technology, Kolkata, India

Prasanta Kumar Sen St. Thomas' College of Engineering and  
Technology, Kolkata, India

Ramanath Datta St. Thomas' College of Engineering and  
Technology, Kolkata, India

Subarna Bhattacharya St. Thomas' College of Engineering and  
Technology, Kolkata, India

Supriya Sengupta St. Thomas' College of Engineering and  
Technology, Kolkata, India

## **Program Committee**

Vinay. A Peoples Education Society Institute of Technology,  
Bangalore, India

Chunyu Ai University of South Carolina Upstate, Spartanburg,  
USA

Rashid Ali Aligarh Muslim University, Aligarh, India

C.M. Ananda National Aerospace Laboratories, Bangalore, India

Soumen Bag International Institution of Information Technology,  
Bhubaneswar, India

Sanghamitra Bandyopadhyay Indian Statistical Institute, Kolkata, India

Punam Bedi University of Delhi, Delhi, India

Dinabandhu Bhandari Heritage Institute of Technology, Kolkata, India

Paritosh Bhattacharya	National Institute of Technology, Agartala, India
Malay Bhattacharyya	University of Kalyani, Kolkata, India
Sambhunath Biswas	Indian Statistical Institute, Kolkata, India
Darko Brodic	University of Belgrade, Bor, Serbia
Sasthi C. Ghosh	Indian Statistical Institute, Kolkata, India
R.C. Hansdah	Indian Institute of Science, Bangalore, India
Nabendu Chaki	University of Calcutta, Kolkata, India
Goutam Chakraborty	Iwate Prefectural University, Takizawa, Japan
Mihir Chakraborty	Indian Statistical Institute, Kolkata, India
Amita Chatterjee	Jadavpur University, Kolkata, India
Debasis Chaudhuri	Indian Institute of Management, Kolkata, India
Lopamudra Chowdhury	Jadavpur University, Kolkata, India
Nabanita Das	Indian Statistical Institute, Kolkata, India
Soumya Kanti Datta	Institute Eurecom, Sophia Antipolis, France
Rajat De	Indian Statistical Institute, Kolkata, India
Utpal Garain	Indian Statistical Institute, Kolkata, India
Ashis Ghosh	Indian Statistical Institute, Kolkata, India
Mukesh Goswami	Dharmasinh Desai University, Gugarat, India
Yogesh H. Dandawate	Vishwakarma Institute of Information Technology, Pune, India
Biju Issac	Teesside University, Middlesbrough, UK
Lakhmi C. Jain	University of South Australia, Adelaide, Australia
R. Janarthanan	T. J. S. Engineering College, Chennai, India
Boleslaw K. Szymanski	Rensselaer Polytechnic Institute, New York, USA
Tienfuan Kerh	National Pingtung University of Science and Technology, Pingtung, Taiwan
Zahoor Khan	Dalhousie University, Halifax, Canada
Dakshina Ranjan Kisku	Asansole Engineering College, Asansole, India
Sotiris Kotsiantis	University of Patras, Hellas, Greece
Dipak Kr. Kole	St. Thomas' College of Engineering and Technology, Kolkata, India
Aswani Kumar Cherukuri	VIT University, Vellore, India
Swapan Kumar Parui	Indian Statistical Institute, Kolkata, India
Prasanta Kumar Pradhan	St. Thomas' College of Engineering and Technology, Kolkata, India
B. Narendra Kumar Rao	Sree Vidyanikethan Engineering College, Tirupati, India
Flavio Lombardi	Roma Tre University of Rome, Rome, Italy
Subhamoy Maitra	Indian Statistical Institute, Kolkata, India
Pradipta Maji	Indian Statistical Institute, Kolkata, India
Raghvendra Mall	University of Leuven, Leuven, Belgium
Amiya Kr. Mallick	St. Thomas' College of Engineering and Technology, Kolkata, India
Debaprasad Mandal	Indian Statistical Institute, Kolkata, India
Ujjwal Maulik	Jadavpur University, Kolkata, India
Pabitra Mitra	Indian Institute of Technology, Kharagpur, India

Imon Mukherjee	St. Thomas' College fo Engineering and Technology, Kolkata, India
Nandini Mukherjee	Jadavpur University, Kolkata, India
Jayanta Mukhopadhyay	Indian Institute of Technology, Kharagpur, India
C.A. Murthy	Indian Statistical Institute, Kolkata, India
M. Murugappan	University of Malayesia, Malayesia
Mita Nasipuri	Jadavpur University, Kolkata, India
Rajdeep Niyogi	Indian Institute of Technology, Roorkee, India
Steven Noel	George Manson University, Fairfax, USA
M.C. Padma	PES College of Engineering, Karnataka, India
Rajarshi Pal	Institute for Development and Research in Banking Technology, Hyderabad, India
Umapada Pal	Indian Statistical Institute, Kolkata, India
Anika Pflug	Hochschule Darmstadt - CASED, Darmstadt, Germany
Surya Prakash	Indian Institute of Technology, Indore, India
Ganapatsingh G. Rajput	Rani Channamma University, Karnataka, India
Anca Ralescu	University of Cincinnati, Ohio, USA
Umesh Hodegnatta Rao	Xavier Institute of Management, Bhubaneswar, India
Ajay K. Ray	Bengal Engineering and Science University, Shibpur, India
Tuhina Samanta	Bengal Engineering and Science University, Shibpur, India
Andrey V. Savchenko	National Research University Higher School of Economics, Molscow, Russia
Bimal Bhusan Sen	St. Thomas' College fo Engineering and Technology, Kolkata, India
Indranil Sengupta	Indian Institute of Technology, Kharagpur, India
Patrick Siarry	Universite de Paris, Paris
Nanhay Singh	Ambedkar Institute of Advanced Communication Technologies & Research, Delhi, India
Pradeep Singh	National Institute of Technology, Raipur, India
Vivek Singh	South Asian University, New Delhi, India
Bhabani P. Sinha	Indian Statistical Institute, Kolkata, India
Sundaram Suresh	Nanyang Technological University, Singapore
Jorge Sá Silva	University of Coimbra, Portugal
Vasile Teodor Dadarlat	Technical University of Cluj Napoca, Cluj Napoca, Romania
B. Uma Shankar	Indian Statistical Institute, Kolkata, India
M. Umaparvathi	RVS College of Engineering, Coimbatore, India
Palaniandavar Venkateswaran	Jadavpur University, Kolkata, India
Stefan Weber	Trinity College, Dublin, Ireland



Azadeh Ghandehari	Islamic Azad University, Tehran, Iran
Ch Aswani Kumar	Vellore Institute of Technology, India
Cristinel Ababei	University at Buffalo, USA
Dilip Singh Sisodia	National Institute of Technology Raipur, India
Jamuna Kanta Sing	Jadavpur University, Kolkata, India
Krishnan Nallaperumal	Sundaranar University, India
Manu Pratap Singh	Dr. B.R. Ambedkar University, Agra, India
Narayan C. Debnath	Winona State University, USA
Naveen Kumar	Indira Gandhi National Open University, India
Nidul Sinha	National Institute of Technology Silchar, India
Sanjay Kumar Soni	Delhi Technological University, India
Sanjoy Das	Galgotias University, India
Subir Chowdhury	St. Thomas' College of Engineering and Technology, Kolkata, India
Syed Rizvi	The Pennsylvania State University, USA
Sushil Kumar	Jawaharlal Nehru University, India
Anupam Sukhla	Indian Institute of Information Technology, Gwalior, India

### Additional Reviewers

A.M., Chandrashekhar	Chowdhury, Archana	Goswami, Mukesh
Acharya, Anal	Chowdhury, Manish	Goyal, Lalit
Agarwal, Shalabh	Dalai, Asish	Gupta, Partha Sarathi
B.S., Mahanand	Darbari, Manuj	Gupta, Savita
Bandyopadhyay, Oishila	Das, Asit Kumar	Halder, Amiya
Barpanda, Soubhagya	Das, Debaprasad	Halder, Santanu
Sankar	Das, Nachiketa	Herrera Lara, Roberto
Basu, Srinka	Das, Sudeb	Jaganathan, Ramkumar
Battula, Ramesh Babu	Datta, Biswajita	Kakarla, Jagadeesh
Bhattacharjee, Sourodeep	Datta, Shreyasi	Kar, Mahesh
Bhattacharjee, Subarna	De, Debashis	Kar, Reshma
Bhattacharya, Indrajit	Dhabal, Supriya	Khasnobish, Anwasha
Bhattacharya, Nilanjana	Dhara, Bibhas Chandra	Kole, Dipak Kumar
Bhattacharyya, Saugat	Duvvuru, Rajesh	Kule, Malay
Bhowmik, Deepayan	Gaidhane, Vilas	Kumar, Raghvendra
Biswal, Pradyut	Ganguly, Anindita	Lanka, Swathi
Biswas, Rajib	Garg, Akhil	Maruthi, Padmaja
Bose, Subrata	Ghosh Dastidar, Jayati	Mishra, Dheerendra
Chakrabarti, Prasun	Ghosh, Arka	Mishra, Manu
Chakraborty, Debashis	Ghosh, Lidia	Misra, Anuranjan
Chakraborty, Jayasree	Ghosh, Madhumala	Mohanty, Ram
Chandra, Helen	Ghosh, Partha	Maitra, Subhamoy
Chandra, Mahesh	Ghosh, Rabindranath	Mondal, Jaydeb
Chatterjee, Aditi	Ghosh, Soumyadeep	Mondal, Tapabrata
Chatterjee, Sujoy	Ghoshal, Ranjit	Mukherjee, Nabanita

## XVIII Organization

Mukhopadhyay, Debajyoti	Paul, Partha Sarathi	Saha, Indrajit
Mukhopadhyay, Debapriyay	Phadikar, Amit	Saha, Sriparna
Munir, Kashif	Phadikar, Santanu	Sahoo, Manmath N.
Nasim Hazarika,	Poddar, Soumyajit	Sahu, Beeren
Saharriyar Zia	Prakash, Neeraj	Sanyal, Atri
Nasipuri, Mita	Rakshit, Pratyusha	Sardar, Abdur
Neogy, Sarmistha	Raman, Rahul	Sarkar, Apurba
Pal, Monalisa	Ray, Sumanta	Sarkar, Dhrubasish
Pal, Tamaltaru	Roy, Pranab	Sarkar, Ushnish
Palodhi, Kanik	Roy, Souvik	Sen, Sonali
Panigrahi, Ranjit	Roy, Swapnoneel	Sen, Soumya
Pati, Soumen Kumar	Rup, Suwendu	Sethi, Geetika
Patil, Hemprasad	Sadhu, Arup Kumar	Sharma, Anuj
Patra, Braja Gopal	Saha Ray, Sanchita	Tomar, Namrata
Pattanayak, Sandhya	Saha, Anuradha	Umopathy, Latha
Paul, Amit	Saha, Anushri	Upadhyay, Anjana
	Saha, Dibakar	Wankhade, Kapil

# Contents

## **Vehicular, Ad hoc and Sensor Networks**

<b>Parallel Processing Concept Based Vehicular Bridge Traffic Problem . . . . .</b>	<b>1</b>
<i>Debasis Das, Rajiv Misra</i>	
<b>Analysis of GPS Based Vehicle Trajectory Data for Road Traffic Congestion Learning . . . . .</b>	<b>11</b>
<i>Swathi Lanka, Sanjay Kumar Jena</i>	
<b>Fast Estimation of Coverage Area in a Pervasive Computing Environment . . . . .</b>	<b>19</b>
<i>Dibakar Saha, Nabanita Das, Bhargab B. Bhattacharya</i>	
<b>A Fault Tolerance Approach for Mobile Agents . . . . .</b>	<b>29</b>
<i>Munshi Navid Anjum, Chandreyee Chowdhury, Sarmistha Neogy</i>	
<b>Path Discovery for Sinks Mobility in Obstacle Resisting WSNs . . . . .</b>	<b>39</b>
<i>Prasenjit Chanak, Indrajit Banerjee</i>	
<b>Alive Nodes Based Improved Low Energy Adaptive Clustering Hierarchy for Wireless Sensor Network . . . . .</b>	<b>51</b>
<i>Ankit Thakkar, Ketan Kotecha</i>	
<b>Blackhole Attack Defending Trusted On-Demand Routing in Ad-Hoc Network . . . . .</b>	<b>59</b>
<i>Swarnali Hazra, S.K. Setua</i>	
<b>Level Wise Initial Energy Assignment in Wireless Sensor Network for Better Network Lifetime . . . . .</b>	<b>67</b>
<i>Anindita Ray, Debashis De</i>	

<b>Determining Duty Cycle and Beacon Interval with Energy Efficiency and QoS for Low Traffic IEEE 802.15.4/ZigBee Wireless Sensor Networks</b> .....	75
<i>Dushyanta Dutta, Arindam Karmakar, Dilip Kr. Saikia</i>	
<b>Tree Based Group Key Agreement – A Survey for Cognitive Radio Mobile Ad Hoc Networks</b> .....	85
<i>N. Renugadevi, C. Mala</i>	
<b>Performance Analysis of Interference Aware Power Control Scheme for TDMA in Wireless Sensor Networks</b> .....	95
<i>Ajay Sikandar, Sushil Kumar</i>	
<b>Cluster Based Controlling of Route Exploring Packets in Ad-Hoc Networks</b> .....	103
<i>S. Zeeshan Hussain, Naeem Ahmad</i>	
<b>An Efficient Route Repairing Technique of Aodv Protocol in Manet</b> .....	113
<i>Ashish Patnaik, Kamlesh Rana, Ram Shringar Rao, Nanhe Singh, Uma Shankar Pandey</i>	
<b>Random Backoff Sleep Protocol for Energy Efficient Coverage in Wireless Sensor Networks</b> .....	123
<i>Avinash More, Vijay Raisinghani</i>	
<b>Distributed Diagnosis of Permanent and Intermittent Faults in Wireless Sensor Networks</b> .....	133
<i>Manmath Narayan Sahoo, Pabitra Mohan Khilar</i>	
<b>Efficient Coverage Protocol for Homogeneous Wireless Sensor Networks</b> . . .	143
<i>Ramachandra Polireddi, Chinara Suchismita</i>	
<b>Communication Technologies</b>	
<b>A Novel ICI Self-cancellation Scheme for Improving the Performance of OFDM System</b> .....	151
<i>Ravi Prakash Yadav, Ritesh Kumar Mishra, Shipra Swati</i>	
<b>Ultra High Bit-rate Fiber Optic Hybrid (WDM and TDM) Communication System Design and Simulation</b> .....	159
<i>Utpal Das, P.K. Sahu, Bijayananda Patnaik</i>	
<b>P2P-VoD Streaming: Design Issues and User Experience Challenges</b> .....	169
<i>Debjani Ghosh, Payas Rajan, Mayank Pandey</i>	
<b>Network Routing</b>	
<b>Building a Robust Software Based Router</b> .....	181
<i>Aruna Elangovan, Abirami Shri Agilandan, Ajanthaa Lakkshmanan</i>	

<b>A Global Routing Optimization Scheme Based on ABC Algorithm</b> . . . . .	189
<i>Pallabi Bhattacharya, Abhinandan Khan, Subir Kumar Sarkar</i>	
<b>Ant Colony Optimization to Minimize Call Routing Cost with Assigned Cell in Wireless Network</b> . . . . .	199
<i>Champa Das</i>	
<b>AODV Routing Protocol Performance in Malicious Environment</b> . . . . .	207
<i>Bhupendra Patel, Anurag Gupta, Nabila Hyder, Kamlesh Rana</i>	
<b>An Improved Routing Protocol (AODV nthBR) for Efficient Routing in MANETs</b> . . . . .	215
<i>Meena Rao, Neeta Singh</i>	
<b>Data Hiding and Cryptography</b>	
<b>A Probabilistic Essential Visual Cryptographic Scheme for Plural Secret Images</b> . . . . .	225
<i>Kanakkath Praveen, M. Sethumadhavan</i>	
<b>The Attack Back Mechanism: An Efficient Back-Hacking Technique</b> . . . . .	233
<i>Abhishek Joshi, Rayan H. Goudar</i>	
<b>A Security Framework for Virtual Resource Management in Horizontal IaaS Federation</b> . . . . .	241
<i>Anant V. Nimkar, Soumya Kanti Ghosh</i>	
<b>Privacy Preservation of Time Series Data Using Discrete Wavelet Transforms</b> . . . . .	249
<i>Sarat Kumar Chettri, Bogeshwar Borah</i>	
<b>Exploring Security Theory Approach in BYOD Environment</b> . . . . .	259
<i>Deepak Sangroha, Vishal Gupta</i>	
<b>A Framework for Analysing the Security of Chrome Extensions</b> . . . . .	267
<i>V. Aravind, M. Sethumadhavan</i>	
<b>Amalgamation of K-means Clustering Algorithm with Standard MLP and SVM Based Neural Networks to Implement Network Intrusion Detection System</b> . . . . .	273
<i>A.M. Chandrashekhar, K. Raghuvveer</i>	
<b>Perspective Based Variable Key Encryption in LSB Steganography</b> . . . . .	285
<i>Rajib Biswas, Gaurav Dutta Chowdhury, Samir Kumar Bandhyopadhyay</i>	
<b>A Novel Un-compressed Video Watermarking in Wavelet Domain Using Fuzzy Inference System</b> . . . . .	295
<i>Bhavna Goel, Charu Agarwal</i>	

<b>Cryptanalysis and Security Enhancement of Two Advanced Authentication Protocols</b> .....	307
<i>S. Raghu Talluri, Swapnoneel Roy</i>	
<b>Grayscale Image Encryption Based on High-Dimensional Fractional Order Chua's System</b> .....	317
<i>Tanmoy Dasgupta, Pritam Paral, Samar Bhattacharya</i>	
<b>An Efficient RC4 Based Secure Content Sniffing for Web Browsers Supporting Text and Image Files</b> .....	325
<i>Shweta Pandey, Abhishek Singh Chauhan</i>	
<b>On the Application of Computational Diffie-Hellman Problem to ID-Based Signatures from Pairings on Elliptic Curves</b> .....	333
<i>Swaathi Ramesh</i>	
<b>A Pairing Free Certificateless Group Key Agreement Protocol with Constant Round</b> .....	341
<i>Abhimanyu Kumar, Sachin Tripathi, Priyanka Jaiswal</i>	
<b>Enhancing the Security Levels in WLAN via Novel IBSPS</b> .....	351
<i>Sanjay Kumar</i>	
<b>Varying Password Based Scheme for User Authentication</b> .....	361
<i>Santosh Kumar Sahu, Asish Kumar Dalai, Sanjay Kumar Jena</i>	
<b>Online Signature Verification at Sub-trajectory Level</b> .....	369
<i>Sudhir Rohilla, Anuj Sharma, R.K. Singla</i>	
<b>DCT Based Robust Multi-bit Steganographic Algorithm</b> .....	375
<i>Imon Mukherjee, Arunangshu Podder</i>	
<b>Cloud Computing</b>	
<b>Service Adaptive Broking Mechanism Using MROSP Algorithm</b> .....	383
<i>Ashish Tiwari, Vipin Sharma, Mehul Mahrishi</i>	
<b>Performance Comparison of Hypervisors in the Private Cloud</b> .....	393
<i>P. Vijaya Vardhan Reddy, Lakshmi Rajamani</i>	
<b>An Ant Colony Based Load Balancing Strategy in Cloud Computing</b> .....	403
<i>Santanu Dam, Gopa Mandal, Kousik Dasgupta, Paramartha Dutta</i>	
<b>Scalable Cloud Deployment on Commodity Hardware Using OpenStack</b> ...	415
<i>Diplav Dongre, Gourav Sharma, M.P. Kurhekar, U.A. Deshpande, R.B. Keskar, M.A. Radke</i>	
<b>A Demand Based Resource Provisioner for Cloud Infrastructure</b> .....	425
<i>Satendra Sahu, Harshit Gupta, Sukhminder Singh, Soumya Kanti Ghosh</i>	

<b>Large Scale Cloud for Biometric Identification</b> .....	433
<i>Sambit Bakshi, Rahul Raman</i>	
<b>AFMEACI: A Framework for Mobile Execution Augmentation Using Cloud Infrastructure</b> .....	441
<i>Karishma Pawar, Vandana Jagtap, Mangesh Bedekar, Debajyoti Mukhopadhyay</i>	
<b>Efficient Architecture and Computing</b>	
<b>Implementation of Symmetric Functions Using Quantum Dot Cellular Automata</b> .....	451
<i>Subhashree Basu, Debesh K. Das, Subarna Bhattacharjee</i>	
<b>Dynamic Page Replacement at the Cache Memory for the Video on Demand Server</b> .....	461
<i>Soumen Kanrar, Niranjana Kumar Mandal</i>	
<b>Hybrid Function Based Analysis of Simple Networks</b> .....	471
<i>Sangramjit Sarkar, Aritra Purkait, Anindita Ganguly, Krishnendu Saha</i>	
<b>Enhancing Memory Deduplication Using Temporal Page Sharing Behaviors in Virtual Environments</b> .....	481
<i>T. Veni, S. Mary Saira Bhanu</i>	
<b>Performance Augmentation of a FAT Filesystem by a Hybrid Storage System</b> .....	489
<i>Wasim Ahmad Bhat, S.M.K. Quadri</i>	
<b>Efficient Parallel Heuristic Graph Matching Approach for Solving Task Assignment Problem in Distributed Processor System</b> .....	499
<i>Pradeep Varma Mudunuru, Swaathi Ramesh</i>	
<b>An Approach for Compiler Optimization to Exploit Instruction Level Parallelism</b> .....	509
<i>Rajendra Kumar, P.K. Singh</i>	
<b>Architecting Fabricated Implant in Interconnect for Multi-core Processor</b> .....	517
<i>Ram Prasad Mohanty, Ashok Kumar Turuk, Bibhudatta Sahoo</i>	
<b>Data Concentration on Torus Embedded Hypercube Network</b> .....	525
<i>Uday Kumar Sinha, Sudhanshu Kumar Jha, Hrishikesh Mandal</i>	
<b>SAT Based Scheduling in High Level Synthesis</b> .....	533
<i>Sudeshna Kundu, Khushbu Chandrakar, Suchismita Roy</i>	

**Hybrid Function Based Microprocessor Realisation of Closed Loop Analysis and Synthesis** ..... 543  
*Anusna Chakraborty, Anindita Ganguly*

**Innovative Technologies and Applications**

**Cognitive Radio: A Non-parametric Approach by Approximating Signal Plus Noise Distribution by Kaplansky Distributions in the Context of Spectrum Hole Search** ..... 553  
*Srijibendu Bagchi, Mahua Rakshit*

**RFID for Indoor Position Determination** ..... 561  
*Piyali Das, Dharma P. Agrawal*

**STAGE Atmosphere: To Reduce Training Cost in EW Simulations** ..... 569  
*Lakshmana Phaneendra Maguluri, M. Vamsi Krishna, G.V.S.N.R.V. Prasad*

**Analysis of Early Traffic Processing and Comparison of Machine Learning Algorithms for Real Time Internet Traffic Identification Using Statistical Approach** ..... 577  
*Rupesh Jaiswal, Shashikant Lokhande*

**Detection of Communities in Social Networks Using Spanning Tree** ..... 589  
*Partha Basuchowdhuri, Siddhartha Anand, Diksha Roy Srivastava, Khusbu Mishra, Sanjoy Kumar Saha*

**Implementation of Compressed Brute-Force Pattern Search Algorithm Using VHDL** ..... 599  
*Lokesh Sharma, Bhawana Sharma, Devi Prasad Sharma*

**A Modified Collaborative Filtering Approach for Collaborating Community** ..... 609  
*Pradnya Bhagat, Maruska Mascarenhas*

**Errata**

**Analysis of Early Traffic Processing and Comparison of Machine Learning Algorithms for Real Time Internet Traffic Identification Using Statistical Approach** ..... E1  
*Jaiswal Rupesh Chandrakant, D. Lokhande Shashikant*

**Efficient Parallel Heuristic Graph Matching Approach for Solving Task Assignment Problem in Distributed Processor System** ..... E2  
*Pradeep Varma, Swaathi Ramesh*

**Author Index** ..... 617