

Lecture Notes in Networks and Systems 65

H. S. Saini
R. K. Singh
Girish Kumar
G. M. Rather
K. Santhi *Editors*

Innovations in Electronics and Communication Engineering

Proceedings of the 7th ICIECE 2018

 Springer

Lecture Notes in Networks and Systems

Volume 65

Series editor

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

e-mail: kacprzyk@ibspan.waw.pl

The series “Lecture Notes in Networks and Systems” publishes the latest developments in Networks and Systems—quickly, informally and with high quality. Original research reported in proceedings and post-proceedings represents the core of LNNS.

Volumes published in LNNS embrace all aspects and subfields of, as well as new challenges in, Networks and Systems.

The series contains proceedings and edited volumes in systems and networks, spanning the areas of Cyber-Physical Systems, Autonomous Systems, Sensor Networks, Control Systems, Energy Systems, Automotive Systems, Biological Systems, Vehicular Networking and Connected Vehicles, Aerospace Systems, Automation, Manufacturing, Smart Grids, Nonlinear Systems, Power Systems, Robotics, Social Systems, Economic Systems and other. Of particular value to both the contributors and the readership are the short publication timeframe and the world-wide distribution and exposure which enable both a wide and rapid dissemination of research output.

The series covers the theory, applications, and perspectives on the state of the art and future developments relevant to systems and networks, decision making, control, complex processes and related areas, as embedded in the fields of interdisciplinary and applied sciences, engineering, computer science, physics, economics, social, and life sciences, as well as the paradigms and methodologies behind them.

Advisory Board

Fernando Gomide, Department of Computer Engineering and Automation—DCA, School of Electrical and Computer Engineering—FEEC, University of Campinas—UNICAMP, São Paulo, Brazil

e-mail: gomide@dca.fee.unicamp.br

Okyay Kaynak, Department of Electrical and Electronic Engineering, Bogazici University, Istanbul, Turkey

e-mail: okyay.kaynak@boun.edu.tr

Derong Liu, Department of Electrical and Computer Engineering, University of Illinois at Chicago, Chicago, USA and Institute of Automation, Chinese Academy of Sciences, Beijing, China

e-mail: derong@uic.edu

Witold Pedrycz, Department of Electrical and Computer Engineering, University of Alberta, Alberta, Canada and Systems Research Institute, Polish Academy of Sciences, Warsaw, Poland

e-mail: wpedrycz@ualberta.ca

Marios M. Polycarpou, KIOS Research Center for Intelligent Systems and Networks, Department of Electrical and Computer Engineering, University of Cyprus, Nicosia, Cyprus

e-mail: mpolycar@ucy.ac.cy

Imre J. Rudas, Óbuda University, Budapest, Hungary

e-mail: rudas@uni-obuda.hu

Jun Wang, Department of Computer Science, City University of Hong Kong Kowloon, Hong Kong

e-mail: jwang.cs@cityu.edu.hk

More information about this series at <http://www.springer.com/series/15179>

H. S. Saini · R. K. Singh ·
Girish Kumar · G. M. Rather ·
K. Santhi
Editors

Innovations in Electronics and Communication Engineering

Proceedings of the 7th ICIECE 2018

 Springer

Editors

H. S. Saini
Guru Nanak Institutions
Ibrahimpattnam, Telangana, India

R. K. Singh
Guru Nanak Institutions Technical Campus
Ibrahimpattnam, Telangana, India

Girish Kumar
Indian Institute of Technology Bombay
Mumbai, Maharashtra, India

G. M. Rather
Department of ECE
NIT Srinagar
Srinagar, Jammu and Kashmir, India

K. Santhi
Department of ECE
Guru Nanak Institutions Technical Campus
Ibrahimpattnam, Telangana, India

ISSN 2367-3370 ISSN 2367-3389 (electronic)
Lecture Notes in Networks and Systems
ISBN 978-981-13-3764-2 ISBN 978-981-13-3765-9 (eBook)
<https://doi.org/10.1007/978-981-13-3765-9>

Library of Congress Control Number: 2018964232

© Springer Nature Singapore Pte Ltd. 2019

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

Organizing Committee

Editorial Board Members

Patrons

Sardar Tavinder Singh Kohli, Chairman, Guru Nanak Institutions

Sardar Gagandeep Singh Kohli, Vice-Chairman, Guru Nanak Institutions

Conference Chair

Dr. H. S. Saini, Managing Director, Guru Nanak Institutions

Dr. M. Ramalinga Reddy, Director, GNITC

Conference Co-Chairs

Prof. R. K. Singh, Associate Director, GNITC

Dr. S. V. Ranganayakulu, Dean—R&D, GNITC

Steering Committee

Dr. S. Sreenatha Reddy, Principal, GNIT

Prof. Parthasaradhy, Associate Director, GNITC

Dr. Rishi Sayal, Associate Director, GNITC

Dr. K. Chanthirasekharan, Dean (Academics)

Convenors

Dr. S. J. Sugumar, HOD—ECE

Dr. K. Santhi, Professor, GNITC

Committee Members

Prof. S. Maheshwara Reddy, HOD—ECE, GNITC

Prof. B. Kedharnath, HOD—ECE, GNIT

Mr. Binod Kumar, Associate Professor, GNITC

Dr. Rashid Mohmood, Professor, ECE
 Dr. R. Prabhakar, Professor, ECE
 Prof. A. Mohan, GNITC
 Dr. Kushboo Pachori, Associate Professor, ECE
 Dr. Harpreeth Kaur, Associate Professor, ECE
 Prof. Anitha Swamidas, GNITC
 Mr. Sandeep Patil, Associate Professor
 Mr. B. Sridhar, Associate Professor, GNITC
 Mr. Md. Shoukath Ali, Associate Professor, GNITC
 Mr. D. Surendra Rao, Associate Professor, GNITC
 Mr. K. Shashidhar, Associate Professor, GNITC
 Mr. R. P. Naraiah, Associate Professor, GNITC

Advisory Board—International

Dr. Xiao-zhi Gao, Finland University
 Prof. Libor Rufer, CIMA, Micro and Nano Systems Groups, France
 Dr. Vishal M. Patel, State University of New Jersey, USA
 Dr. Savatri Bevinakopp, MIT, Australia
 Dr. C. H. Suresh Babu, K.K. University, Abha, KSA
 Shri. Rajashekar N., INPHI, UK
 Dr. Sergey Mosin, Vladimir State University, Russia
 Dr. Katina Michel, University of Wollongong, Australia
 Dr. Ahmed Faheem Zobaa, BU, UK
 Dr. Akhtar Kalam, VU, Australia
 Dr. Alfredo Vaccaro, US, Italy
 Dr. David YU, UMW, USA
 Dr. Dimitri Vinnikov, TUT, Estonia
 Dr. Gorazad Stumberger, UM, Slovenia
 Dr. Jagadish Nayak, BITS, Pilani, Dubai Campus
 Dr. Lausiong Hoe, Multimedia University, Malaysia
 Dr. Hussian Shreef, UK, Malaysia
 Dr. Murad Al-Shibli, Head—EMET, Abu Dhabi
 Dr. Nesimi Ertugrul, UA, Australia
 Richarad Blanchard, LBU, UK
 Dr. Shashi Paul, DM, UK
 Dr. Zhao Xu, HKPU, Hong Kong
 Dr. Ahmed Zobba, Brunel University, UK
 Dr. Adel Nasiri, UMW, USA
 Dr. P. N. Sugunathan, NTU, Singapore
 Dr. Hiroya Fuji Saki, University of Tokyo
 Dr. Fawnizu Azmadi Husaain, Universiti Teknologi Petronas, Malaysia
 Dimov Stojce Lice, DUT, Durban, South Africa

Advisory Board—National

Dr. Sheela Rani, Vice Chancellor, Sathyabama University, Chennai
Dr. M. Mukunda Rao, Professor Emeritus, IIT Chennai
Dr. N. V. L. Narasimha Murthy, IIT Bhubaneswar
Dr. M. Ravi Babu, IIT Ropar
Dr. Srinivasulu Thadishetti, Principal, K.U
Dr. Mahaveer Singh, Sr. Principal Scientist, National Physical Laboratory, CSIR, New Delhi
Dr. B. N. Bhandari, JNTUH, Hyderabad
Dr. L. Pratap Reddy, JNTUH, Hyderabad
Dr. D. Srinivasa Rao, JNTUH, Hyderabad
Dr. Ajish K. Abraham, HOD—Electronics, AIISH, Mysore
Dr. P. Lakshmi Narayana, Osmania University, Hyderabad
Dr. Manoj Kumar, Principal—DAVIET, Jalandhar
Dr. Pamela Chawla, Director, Institute of Engineering, MAU, HP
Dr. Novalina Jacob, Scientist, ADRIN, Hyderabad
Dr. Satish J. Sharma, RTM Nagpur University Nagpur
Dr. A. Bhujanga Rao, Department of Instrumentation, A.U. Visakhapatnam
Dr. N. K. Narayanan, Kannur University, Kerala
Dr. N. M. Renukappa, Professor and Scientist, JSS Technical Institutions, Mysore

Conference Committee Members**Budget**

Prof. R. K. Singh
Mr. Sandeep Patil

Brochure, Web site, Easy Chair/E-mail Creation

Prof. V. Bhagya Raju
Mr. B. Sridhar
Mr. Srinivas Nanda

E-mail Campaigning Team

Prof. A. Mohan
Prof. Binod Kumar
Mr. L. Siva
Mr. K. Srinivas

Physical Campaigning Team

Prof. V. Bhagya Raju
Mr. D. Surendra Rao

Applications for Funding

Mr. K. Shashidhar

Preconference Tutorials

Mr. B. Sridhar
Ms. K. Ramyasri
Mr. K. Srinivas
Mr. K. V. Abhi
Ms. K. Madhavi
Mr. Md. Mohiddin (GNIT)
Mr. Saibabu

Receiving Papers and Acknowledgment, Attending Queries of Authors

Dr. K. Santhi
Mrs. C. Sailaja
Mr. Srinivas Nanda

Conversion of Papers

Dr. S. J. Sugumar
Dr. Prabhakar
Dr. Rashid Mahmood
Dr. Khushboo
Prof. Binod Kumar
Prof. Anita Swamidas

VIP Committee

Dr. K. Santhi
Mrs. C. Sailaja
Mr. Srinivas Nanda

Invitation Preparation and Distribution

Dr. K. Santhi
Mrs. C. Sailaja

Registration (Online/Spot)

Mr. Ch. Raja Rao
Mrs. K. Yashodha
Mrs. S. Swetha

Ms. S. Aparna
Mr. A. V. Rameswar Rao

Reception

Mrs. Anitha Swamidas
Prof. Binod Kumar
Ms. Simar Preeth Kaur
Mrs. B. Mythily Devi (GNIT)

Conference Office

Dr. Binod Kumar
Mrs. P. Shravya

VC, MD, JNTUH Messages

Prof. A. Mohan

Banners

Mr. K. Krishna Kumar

Proceedings

Dr. Binod Kumar
Mr. Naraiah
Mr. L. Siva

Transport Committee

Mr. D. Surendra Rao (VIP)
Mr. N. V. S. Moorthy (Participants)
Mr. V. Shivanna
Mr. T. A. P. Noor Mohamed

Program Committee

Prof. A. Mohan
Mr. K. Sashidhar
Dr. Harpreet Kaur
Mr. K. Krishna Kumar
Mr. H. Sharath Chandra (GNIT)
Mr. A. Aravind (GNIT)
Mr. Sriram (IT services)

Purchase Committee

Prof. S. Maheswara Reddy
Mr. D. Naresh
Mr. Rameshwara Rao
Mr. Saibabu

Certificates

Dr. Prabhakar
Mr. L. Shiva
Mrs. Nagamani
Mrs. G. Suma Latha

Food Committee

Dr. Prabhakar
Mrs. B. Anitha (VIP Refreshment and Lunch)
Mr. R. Gopinath (VIP Refreshment and Lunch)
Mr. K. Raju
Mr. Chinna Narasimhulu
Mr. Y. Jeevan

Accommodations

Dr. Prabhakar
Dr. Kushboo Pachori
Mr. Chinna Narasimhulu
Mr. K. Raju

Inauguration and Valedictory Function

Prof. R. K. Singh
Mr. Sandeep Patil
Dr. K. Santhi
Dr. S. J. Sugumar

Photographs and Video

Mr. O. Ravinder

Press Release and Media

Prof. A. Mohan
Mr. B. Sridhar

Conference Report

Dr. K. Santhi
Dr. S. J. Sugumar
Mrs. C. Sailaja

After Conference Attending Queries of Authors

Dr. K. Santhi (Springer)
Mrs. C. Sailaja (Springer)
Mr. Shoukath Ali (UGC-IJRAR)
Prof. A. Mohan (IJET)
Mr. L. Shiva (IJET)
Dr. Kushboo (JIECE)

Keynote Speech Arrangements

Mrs. G. Kiranmayee
Simar Preeth Kaur

VIP Accompany

Mr. Md. Shoukath Ali (Dr. Razali Ngah)
Mrs. G. Kiranmayee (Dr. Kim's Wife)
Dr. S. J. Sugumar (Dr. Nandy)
Mrs. Anitha Swamidas (Dr. K. B. Jayanthi)
Student (Dr. Parisa Beham)
(Dr. Danial Elizebeth Rani)
(Dr. Girish Kumar)
Ms. B. Aruna (Dr. Girish Kumar's Wife)

Reviewers

Internal Reviewers

Prof. R. K. Singh, Associate Director
Dr. S. V. Ranganayakulu, Dean/R&D, GNI
Prof. M. A. Kadar Baba, HOD/ECE, GNITC
Dr. K. Satish Reddy, Professor/ECE
Dr. K. Santhi, Professor/ECE
Dr. S. Sukumar, Professor/ECE
Dr. Syed Jalal Ahmad, Professor/ECE
Prof. Anita Swamidas, Professor/ECE
Prof. CH. Hemasundara Rao, Professor/ECE
Prof. N. V. Purnachandar Rao, Professor/ECE

Prof. A. Mohan, Professor/ECE
 Mr. V. Bhagya Raju, Professor/ECE
 Mr. K. Shashidhar, Associate Professor/ECE
 Mr. B. Sridhar, Associate Professor/ECE
 Mrs. G. Kiran Maye, Associate Professor/ECE
 Mr. Bachu Srinivas, Associate Professor/ECE
 Dr. N. Satish Kumar, Professor/ECE, GNIT
 Dr. R. Vinoth Kanna, HOD/EEE, GNIT

External Reviewers

Dr. Nazib Uddin, HOD, Professor, NIT Srinagar
 Dr. Gulal Mohemmed Rather, Professor, NIT Srinagar
 Challa S. Sastry, No. 318 (E Block), Department of Mathematics, IIIT Hyderabad
 Dr. Suryakanth V. Gangashetty, Assistant Professor, IIIT Hyderabad
 Dr. Somasundaram, Professor, IISC, Bangalore
 Dr. B. Thyaneswaran, Assistant Professor, Sona College of Technology, Salem, Tamil Nadu
 Dr. C. Rajasekaran, Professor/ECE, KSRCT, Namakkal, Tamil Nadu
 Arul Jyothi, Associate Professor, SREC, Coimbatore
 M. Nirmala, Associate Professor, KSRCT
 Dr. Shiva Subramanyam, KSRIT, Tamil Nadu
 Dr. Supha Laxmi, Professor and Head, Paavai Institutions, Tamil Nadu
 Dr. M. Maheswaran, Kongu Engineering College
 Dr. Gunavathi, Associate Professor, VIT, Vellore
 Dr. Maheshwar, Professor, Sri Krishna College of Engineering, Coimbatore
 Dr. Malmurugan, Professor, PAL Institutions
 Dr. M. V. Jithin Kumar, Research Coordinator, Heera College of Engineering & Technology, Kerala
 Gnanou Florence Sudha, Pondicherry Engineering College, Pondicherry
 Dr. J. Yogapriya, Dean (R&D), Kongunadu College of Engineering and Technology, Trichy, Tamil Nadu
 Mrs. Rohini R. Mergu, Assistant Professor, Walchand Institute of Technology, Solapur
 Dr. Jakulin Moni, Professor, Karunya University, Tamil Nadu
 Dr. V. R. Vijay Kumar, Professor, Anna University, Coimbatore
 Dr. Kanchana Bhaskar, Professor Dean Academics, VIT, Chennai
 Dr. S. P. Singh, MGIT, Hyderabad
 Dr. K. Jayashankar, Principal, Vasavi College of Engineering, Hyderabad
 Dr. B. L. Raju, Principal, ACE College of Engineering, Hyderabad
 Dr. P. G. Geetha, Professor, Sri Vidyaniketan, Tirupati
 Dr. R. P. Ramkumar, Professor/CSE/MREC
 Dr. Pasha, HOD, Professor, BVRIT
 Dr. B. Lokeswar Rao, Professor, CMRCET, Hyderabad
 Dr. Nageswara Rao, Professor, TKRCE, Hyderabad

Dr. Karunakar, Associate Professor, GITAM, Visakhapatnam
Dr. M. Suresh, Professor, CMRCET, Hyderabad
Dr. C. V. Narasimhulu, Professor, GCET, Hyderabad
Dr. A. S. N. Murthy, Professor, BVRIT, Hyderabad
Dr. P. Narahari Shastry, Professor, CBIT
Dr. Mahesh, Associate Professor
Dr. Geetha, Professor
Dr. B. K. Madhavi, Professor
Dr. Keerti Kumar, Professor
Dr. D. Venkat Reddy, Professor, MGIT
Sanket Goel, Associate Professor
Dr. D. Jayanthi, Professor, GRIET
Dr. I. V. Subba Reddy, Professor, Gitam University
Dr. Gulam Rasol Bagh, NIT Srinagar
Dr. Ramprasad, KHIT, Guntur
Dr. Usha sree, Professor, VJIET
Prof. P. V. Rao, Professor, VBIT
Dr. Prabha Selvaraj, Professor, CSE, MRIET
Dr. Brahma Reddy, Professor, VBIT
Dr. Rangaiah, Professor, RRCE
Dr. Pushamala, Professor, DSCE University
Dr. Humaira Nishat, Professor, CVR College of Engineering
Dr. Kanaka Durga, Professor and HOD, MVSR
Dr. Abbas Ahmed
Dr. Prakash Rao, Professor, St. Peters Engineering College
Dr. Keerthikumar, Professor, ECE Department
Dr. Shankar Babu, Professor, TKR Engineering College
Dr. I. A. Pasha, BVRIT
A. Raja Sekhar, Professor and HOD, Methodist College of Engineering
Dr. Sharma, Professor, Sri Indu College of Engineering
Dr. Kezia Joseph, Professor, Stanley College of Engineering
Dr. N. Sathish Kumar, Professor/ECE, Sri Ramakrishna Engineering College
Ms. S. Thenmozhi

Advisory Board

International Advisory Board for ICIECE 2017

Dr. Xiao-Zhi Gao, Finland University
Prof. Libor Rufer, CIMA, Micro and Nano Systems Groups, France
Dr. Vishal M. Patel, State University of New Jersey, USA
Dr. Savatri Bevinakopp, MIT, Australia
Dr. C. H. Suresh Babu, K.K. University, Abha, KSA

Shri. Rajashekhar N., INPHI, UK
 Dr. Surgey Mosin, Vladimir State University, Russia
 Dr. Katina Michael, University of Wollongong, Australia
 Dr. Ahmed Faheem Zobaa, BU, UK
 Dr. Akhtar Kalam, VU, Australia
 Dr. Afredo Vaccaro, US, Italy
 Dr. David Yu, UMW, USA
 Dr. Dimitri Vinnikov, TUT, Estonia
 Dr. Gorazad Stumberger, UM, Slovenia
 Dr. Jagadish Nayak, BITS Pilani, Dubai Campus
 Dr. Lausiong Hoe, Multimedia University, Malaysia
 Dr. Hussian Shareef, UK, Malaysia
 Dr. Murad Al-Shibli, Head, EMET, Abu Dhabi
 Dr. Nesimi Ertugrul, UA, Australia
 Dr. Richarad Lanchard, LBU, UK
 Dr. Shashi Paul, DM, UK
 Dr. Zhao Xu, HKPU, Hong Kong
 Dr. Ahmed Zobaa, Brunel University, UK
 Dr. Adel Nasiri, UMW, USA
 Dr. P. N. Sugunathan, NTU, Singapore
 Dr. Hiroya Fuji Saki, University of Tokyo
 Dr. Fawnizu Azmadi Hussin, Universiti Teknologi Petronas, Malaysia
 Dimov Stojce Ilcev, DUT, Durban, South Africa

National Advisory Board for ICIECE 2017

Dr. Mohammed Zafar Ali Khan, Associate Professor and HOD, EE Department, IIT Hyderabad
 Dr. Gulam Mohammed Rather, Professor—ECE, NIT Srinagar
 Dr. N. Bheem Rao, Associate Professor, NIT Warangal
 Dr. P. Radha Krishna, Principal, Research Scientist, Infosys Labs, Hyderabad
 Dr. M. Madhavi Latha, Professor—ECE, JNTU, Hyderabad
 Dr. V. Malleswara Rao, Professor and HOD—ECE, Gitam University, Visakhapatnam
 Dr. T. Srinivasulu, Professor, Professor and Dean, Faculty of Engineering, K.U., Warangal
 Dr. S. Ramanarayana Reddy, HOD—CSE, IGDTU, Delhi
 Dr. N. V. L. Narasimha Murthy, IIT Bhubaneswar
 Dr. P. V. Rao, Raja Rajeswari College of Engineering, Bangalore
 Dr. B. N. Bhandari, JNTUH, Hyderabad
 Dr. P. Lakshmi Narayana, Osmania University, Hyderabad
 Dr. Pamela Chawla, Director, Institute of Engineering, MAU, HP

Dr. Novalina Jacob, Scientist, ADRIN, Hyderabad

Dr. M. Lakshminarayana, Scientist-H (Retd) and Former Associate Director, DLRL

Ms. Madhumita Chakravarti, Scientist-G

Dr. Girish Kumar, Professor, IIT, Mumbai

Dr. Ajaz Hussain Mir, Professor, NIT, Srinagar

Preface

The Seventh International Conference on Innovations in Electronics and Communication Engineering (ICIECE 2018) organized by the Department of Electronics and Communication Engineering, Guru Nanak Institutions Technical Campus, was conducted in association with ISRO on July 27–28, 2018. The conference has grown exponentially over the years and has become a platform for scientists, researchers, academicians, and students to present their ideas and share their cutting-edge research in various fields of electronics and communication engineering. The focus for this year conference was “State of Technical Education all over the Globe and Smart Technologies,” and we had distinguished speakers from India and abroad who shared innovative solutions and technologies.

Over 300 papers were received, of which 69 papers have been selected for Springer Conference Proceedings publication. The papers selected were presented by the authors during the conference. Parallel sessions were conducted to accommodate all the authors and to give them ample time to discuss their ideas. We are happy to note that all the authors were satisfied with the arrangements and encouraged us to conduct such conferences in the future as well.

We would like to thank all the keynote speakers, participants, speakers for a preconference tutorial session, session chairs, committee members, reviewers, international and national board members, Guru Nanak Institutions management, and all the people who have directly or indirectly contributed to the success of this conference. The editors would also like to thank Springer editorial team for their support and for publishing the papers as part of the “Lecture Notes in Networks and Systems” series continuously for last 3 years.

Ibrahimpatnam, India
Ibrahimpatnam, India
Mumbai, India
Srinagar, India
Ibrahimpatnam, India

H. S. Saini
R. K. Singh
Girish Kumar
G. M. Rather
K. Santhi

Contents

Part I Signal and Image Processing

Detection and Classification of Exudates and Non-exudates in Retinal Images	3
R. Tamilselvi, M. Parisa Beham, A. Merline and V. Parthasarathy	
Performance Analysis of Nanoparticles in Healthcare and Biomedical Applications	15
T. Ruba, R. Tamilselvi, M. Parisa Beham and K. Muthukumaran	
Comparative Analysis of Different Clustering Techniques for Video Segmentation	23
Tunirani Nayak and Nilamani Bhoi	
Fingerprint Identification with Combined Texture Features	33
Namrata V. Jad and Satish T. Hamde	
Tuberculosis Detection Using Shape and Texture Features of Chest X-Rays	43
Niharika Singh and Satish Hamde	
Role of X-Rays in Assessment of Bone Mineral Density—A Review	51
S. M. Nazia Fathima, R. Tamilselvi and M. Parisa Beham	
Estimation of Face Pose Orientation Using Model-Based Approach	61
M. Annalakshmi, S. M. Mansoor Roomi and M. Parisa Beham	
Accurate Classification of Cancer in Mammogram Images	71
M. Parisa Beham, R. Tamilselvi, S. M. Mansoor Roomi and A. Nagaraj	
Low-Power Extended Binary Pattern Image Feature Extraction	79
S. Arul Jothi and M. Ramkumar Raja	

A Study on Smart Electronics Voting Machine Using Face Recognition and Aadhar Verification with IOT	87
Kone Srikrishnaswetha, Sandeep Kumar and Md. Rashid Mahmood	
Exhaustive Analysis of Image Enhancement Using Point-to-Point Transformation	97
Pratima Manhas, Shaveta Thakral and Parveen Arora	
Quantized Local Trio Patterns for Multimedia Image Retrieval System	107
P. Rohini and C. Shoba Bindu	
Multiple Color Channel Local Extrema Patterns for Image Retrieval	115
L. Koteswara Rao, P. Rohini and L. Pratap Reddy	
Part II Embedded Systems	
Home Automation and E-Monitoring Over ThingSpeak and Android App	127
K. Susheela, E. Sri Harshitha, M. Rohitha and S. Maheswara Reddy	
Smart Automation to Robot	139
G. Prutha and G. S. Anitha	
Posture Monitoring and Back Pain Relief Using ATmega328, Android and Unity	151
Aishwarya S. Acharya, Pavitra Gandhi, Sushmita Karkera, Nimish Ghagare and Sanjay Deshmukh	
Adaptive Neural Network-Based LMS for DSTATCOM	159
Vivekananda Ganji, D. Suresh and K. Chandrasekhar Koritala	
Modeling and Simulation of Dual Redundant Power Inverter Stage to BLDCM for MEA Application	167
B. Suresh Kumar, B. V. Ravi Kumar and K. Sindhu Priya	
Part III Communications	
Comparative Analysis of Unstacked and Stacked Bow-Tie Antenna Structures for Wireless Applications	177
Kumari Laxmi and Amanpreet Kaur	
An Efficient Method to Classify the Peer-to-Peer Network Videos and Video Servers Over Video on Demand Services	187
M. Narayanan	

A Robust Wavelet Based Decomposition and Multilayer Neural Network for Speaker Identification 197
 M. D. Pawar and Rajendra Kokate

A Novel Multiband Star-Shaped Dipole Antenna for GSM and LTE Application 211
 Gunjan Parihar and Milind Fernandes

Performance Enhancement for VANET Security Using Attack-Resistant Trust (ART) 219
 Bhakti V. Pawar and Manoj M. Dongre

Wireless Protocols: Wi-Fi SON, Bluetooth, ZigBee, Z-Wave, and Wi-Fi 229
 Gollu Appala Naidu and Jayendra Kumar

Implementation of Wavelength Diversity Technique in Free-Space Optical Link 241
 Shubham Nema, Sagar Oza, Akshay Parmar, Dhaval Shah and Suryansh Singh

Moment of Inertia-Based Approach to Recognize Arabic Handwritten Numerals 253
 Binod Kumar Prasad

Fault-Tolerant Techniques for Wireless Sensor Network—A Comprehensive Survey 261
 M. Shyama and Anju S. Pillai

Preliminary Investigation of Generation of US-Based GPS Signal 271
 S. Radharani, C. Vani and P. Naveen Kumar

Image Compression in Wireless Sensor Networks Using Autoencoder and RBM Method 279
 S. Aruna Deepthi, E. Sreenivasa Rao and M. N. Giri Prasad

A Study on Neutron Star Interior Composition Explorer 287
 C. S. N. Koushik, Shruti Bhargava Choubey and S. P. V. Subba Rao

Object Detection Using Higher Quality Optimization Techniques in Video Encoders 297
 Abhishek Choubey, Shruti Bhargava Choubey and Khushboo Pachori

Part IV VLSI

Mesochronous Operation Interface to Multicore Processor 307
 K. Sukanya and G. Laxminarayana

A Novel Architecture of High-Speed and Area-Efficient Wallace Tree Multiplier Using Square Root Carry Select Adder with Mirror Adder	319
Yamini Devi Ykuntam and M. Rajan Babu	
Design of a Highly Reliable and Reconfigurable Pulsed Latch Circuits	327
B. Keerthi and K. Ragini	
Design of a Novel High-Speed- and Energy-Efficient 32-Bit Carry-Skip Adder	335
B. Sanjana and K. Ragini	
Reduction of Coupling Transition by Using Multiple Encoding Technique in Data Bus and Its Power Analysis	345
V. Shavali, G. M. Sreerama Reddy and P. Ramana Reddy	
Low-Power and High-Speed Configurable Arithmetic and Logic Unit	355
Naveen Kumar Kabra and Zuber M. Patel	
FPGA Implementation of Speculative Prefix Accumulation-Driven RNS for High-Performance FIR Filter	365
G. Reddy Hemantha, S. Varadarajan and M. N. Giri Prasad	
Energy-Efficient SRAM Cell Design with Body Biasing	377
P. Kalyani, M. Madhavi Latha and P. Chandra Sekhar	
Increasing the Verification Analysis Using Tool Assessment as Per DO-254	387
Manju Nanda and P. Rajshekhar Rao	
Reducing Power in Register Files for CAM- and SRAM-Based Processor Units	395
K. Muralidharan and K. Sridevi	
Comparative Analysis of 8-Bit ALU in 90 and 45 nm Technologies Using GDI Technique	403
T. Swapna Rani and Kumud Kumar Bhardwaj	
Buffer Overflow Attack and Prevention for an FPGA-Based Soft-Processor System	409
Chamandeep Singh, Sripadam Satish, Jubin Mitra and Sandeep Shukla	
High-Voltage Gain CMOS Charge Pump at Subthreshold Operation Regime for Low Power Applications	417
C. Arul Murugan, B. Banuselvasaraswathy and K. Gayathree	

Part V Miscellaneous

Robot Path Planning Using Memory 429
 Gadhamsetty Ravi Theja and Srinath R. Naidu

**A Comparative Analysis of Breadth First Search Approach
 in Mining Frequent Itemsets** 441
 M. Sinthuja, N. Puviarasan and P. Aruna

Email Authorship Attribution 451
 Suman Patil, Sandeep Varma Nadimpalli and Pavithra K. Yadav

**A Security-Aware Trust-Based SLA Framework Using SDN
 in Cloud Environment** 459
 H. M. Anitha and P. Jayarekha

Big Data Computing with Distributed Computing Frameworks 467
 Gurjit Singh Bhathal and Amardeep Singh

**A Novel Approach for Weather Prediction Using Forecasting
 Analysis and Data Mining Techniques** 479
 Md Rashid Mahmood, Raj Kumar Patra, Rohit Raja and G. R. Sinha

**A Cloud-Based Inventory Management System Using
 a Smart Trolley for Automated Billing and Theft Detection** 491
 B. Karunakara Rai, J. P. Harshitha, Radhika S. Kalagudi, B. S. Priyanka
 Chowdary, Palak Hora and B. Sahana

**Long Short-Term Memory-Convolution Neural Network Based
 Hybrid Deep Learning Approach for Power Quality Events
 Classification** 501
 Rahul, Kapoor Rajiv and M. M. Tripathi

Author Index 511

Editors and Contributors

About the Editors



Dr. H. S. Saini is Managing Director for the Guru Nanak Institutions with Ph.D. in the field of computer science. He has over 22 years of experience at university/college level in teaching UG/PG students and has guided several B.Tech., M.Tech., and Ph.D. projects. He has published/presented more than 30 high-quality research papers in international and national journals and proceedings of international conferences. He is Editor of *Journal of Innovation in Electronics and Communication Engineering (JIECE)* published by Guru Nanak Publishers. He has two books to his credit. He is a lover of innovation and is an advisor for NBA/NAAC accreditation process to many institutions in India and abroad.



Prof. R. K. Singh is Associate Director, Guru Nanak Institutions Technical Campus, who is an alumnus of REC (now MNIT Jaipur) and did his M.Tech. from IIT Bombay, in the field of communication engineering. He has served Indian Army in the core of electronics and mechanical engineering for 20 years before hanging his uniform as Lt Col. He has rich industrial experience as Army Officer managing workshops and has been Teaching Faculty for more than 6 years while in service. He started his career as Teaching Assistant at MNIT Jaipur for 1 year before joining Indian Army. As Professor, he has served for more than 12 years after premature retirement from the army services. He has

served as HOD, Vice Principal, and Principal of various engineering colleges before being approved as Associate Director of this institute.

He had hands-on experience with high-tech electronic equipment and has done many courses on radars and simulators. He has published many papers on microstrip antennas, VLSI, and radar signal processing in national and international conferences.



Dr. Girish Kumar received Ph.D. in electrical engineering from IIT Kanpur in 1983. From 1983 to 1985, he was Research Associate in the Electrical Engineering Department, University of Manitoba, Winnipeg, Canada. From 1985 to 1991, he was Assistant Professor in the Electrical Engineering Department, University of North Dakota, Grand Forks, USA. Since 1991, he is Professor in the Electrical Engineering Department, IIT Bombay. His research interests are cell tower radiation hazards and solutions, microstrip antennas and arrays, broadband antennas, and microwave integrated circuits and systems. He has written more than 200 papers in the international and national journals and conference proceedings. He has written a book entitled “Broadband Microstrip Antennas” published by Artech House, USA.



G. M. Rather joined National Institute of Technology, Srinagar (erstwhile Regional Engineering College, Srinagar) in March 1983 just after the completion of B.E. in the year 1982 from the same institute. He is working as Professor in Electronics and Communication Engineering Department since 2004. He has a teaching experience of 34 years behind him. During his service, he has taught courses at PG and UG levels. He completed his M.E. course in electrical communication engineering and Ph.D. both from Indian Institute of Science, Bangalore, in 1988 and 1994, respectively.

He has published around 20 technical papers in national and international journals and conferences. He has expertise in the fields of microelectronics, analog

and digital communication, data communication, and millimeter wave communication and is presently supervising around eight students in these fields.

He is Member of IEEE and IEEE Microwave Society, Fellow of IETE, and Life Member of ISTE (India).



Dr. K. Santhi completed her B.E. in electrical and electronics engineering from Madras University in the year 2000; M.E. in applied electronics from Anna University, Chennai, in the year 2007; and her Ph.D. from Anna University, Chennai, in the year 2015. She is working as Professor in the Department of Electronics and Communication Engineering at Guru Nanak Institutions Technical Campus, Hyderabad. She has published more than 25 publications in international and national journals and conferences which include IEEE, Springer, Elsevier, etc. She has organized many seminars, workshops, and international conferences. She is Member of IEEE and Life Member of ISTE and IETE. Her research interests are digital image processing, electronics, control system, and image analysis for metallography. She has 20 years of teaching and 10 years of research experience.

Contributors

Aishwarya S. Acharya Dwarkadas J. Sanghvi College of Engineering, Mumbai, India

G. S. Anitha Department of EEE, RV College of Engineering, Bengaluru, India

H. M. Anitha Department of Information Science and Engineering, BMS College of Engineering, Bangalore, India

M. Annalakshmi Department of ECE, Sethu Institute of Technology, Virudhunagar, Tamil Nadu, India

Parveen Arora NEC Technologies India Pvt Ltd, Bengaluru, India

S. Arul Jothi ECE Department, Sri Ramakrishna Engineering College, Coimbatore, Tamil Nadu, India

C. Arul Murugan Department of ETE, Karpagam College of Engineering, Coimbatore, India

P. Aruna Department of Computer Science and Engineering, Annamalai University, Chidambaram, Tamil Nadu, India

S. Aruna Deepthi Jawaharlal Nehru Technological University Ananthapur, Ananthapuramu, India

B. Banuselvasaraswathy Department of ECE, Sri Krishna College of Technology, Coimbatore, India

M. Parisa Beham Department of ECE, Sethu Institute of Technology, Virudhunagar, Tamil Nadu, India

Kumud Kumar Bhardwaj ECE, CMR College of Engineering & Technology, Medchal, India

Gurjit Singh Bhathal Department of Computer Science and Engineering, Punjabi University, Patiala, Punjab, India

Nilamani Bhoi Department of Electronics and Telecommunication Engineering, VSSUT, Burla, Sambalpur, Odisha, India

P. Chandra Sekhar Electronics and Communication Engineering, Osmania University, Hyderabad, India

K. Chandrasekhar Koritala Department of Electrical and Electronics Engineering, RVR&JC, Guntur, India

Abhishek Choubey Electronics and Communication Engineering, Sreenidhi Institute of Science and Technology (SNIST), Hyderabad, India;
Electronics and Communication Engineering, Gurunanak Institute of Technology, Hyderabad, Telengana, India

Shruti Bhargava Choubey Electronics and Communication Engineering, Sreenidhi Institute of Science and Technology (SNIST), Hyderabad, India;
Electronics and Communication Engineering, Gurunanak Institute of Technology, Hyderabad, Telengana, India

Sanjay Deshmukh Dwarkadas J. Sanghvi College of Engineering, Mumbai, India

Manoj M. Dongre Department of Electronics and Telecom, Ramrao Adik Institute of Technology, Navi Mumbai, India

Milind Fernandes Goa College of Engineering, Ponda, Goa, India

Pavitra Gandhi Dwarkadas J. Sanghvi College of Engineering, Mumbai, India

Vivekananda Ganji Department of Electrical and Electronics Engineering, Acharya Nagarjuna University, Guntur, India

K. Gayathree Department of ECE, Sri Krishna College of Technology, Coimbatore, India

Nimish Ghagare Dwarkadas J. Sanghvi College of Engineering, Mumbai, India

M. N. Giri Prasad Department of ECE, JNTU College of Engineering, Jawaharlal Nehru Technological University Ananthapur, Ananthapuramu, India

Satish T. Hamde Department of Instrumentation Engineering, SGGSI&T, Nanded, Maharashtra, India

J. P. Harshitha Department of ECE, RVCE, Bengaluru, India

Palak Hora Department of ECE, RVCE, Bengaluru, India

Namrata V. Jad Department of Instrumentation Engineering, SGGSI&T, Nanded, Maharashtra, India

P. Jayarekha Department of Information Science and Engineering, BMS College of Engineering, Bangalore, India

Naveen Kumar Kabra Sardar Vallabhbhai National Institute of Technology Surat, Surat, India

Radhika S. Kalagudi Department of ECE, RVCE, Bengaluru, India

P. Kalyani Electronics and Communication Engineering, JNTUH, Hyderabad, India

Sushmita Karkera Dwarkadas J. Sanghvi College of Engineering, Mumbai, India

B. Karunakara Rai Department of ECE, NMIT, Bengaluru, India

Amanpreet Kaur Department of Electronics and Communication Engineering, Thapar Institute of Engineering and Technology, Patiala, India

B. Keerthi Department of ECE, G. Narayanamma Institute of Technology and Science, Hyderabad, India

Rajendra Kokate Department of Instrumentation Engineering, Government College of Engineering, Jalgaon, India

L. Koteswara Rao Department of Electronics and Communication Engineering, Koneru Lakshmaiah Education Foundation (A Deemed to-be University), Off-campus Centre, Hyderabad, India

C. S. N. Koushik Sreenidhi Institute of Science and Technology (SNIST), Hyderabad, India

Jayendra Kumar Department of Electronics and Communication Engineering, National Institute of Technology Jamshedpur, Jamshedpur, Jharkhand, India

Sandeep Kumar Department of Electronics and Communications, Sreyas Institution of Engineering and Technology, Hyderabad, India

Kumari Laxmi Department of Electronics and Communication Engineering, Thapar Institute of Engineering and Technology, Patiala, India

G. Laxminarayana Department of ECE, Anurag College of Engineering, Ranga Reddy, Telangana, India

M. Madhavi Latha Electronics and Communication Engineering, JNTUH, Hyderabad, India

S. Maheswara Reddy ECE, GNITC, Hyderabad, Telangana, India

Md Rashid Mahmood Department of Electronics and Communications, Guru Nanak Institutions Technical Campus, Hyderabad, India

Pratima Manhas ECE Department, FET, Manav Rachna International Institute of Research & Studies, Faridabad, India

S. M. Mansoor Roomi Department of ECE, Thiagarajar College of Engineering, Madurai, Tamil Nadu, India

A. Merline Department of ECE, Sethu Institute of Technology, Tamil Nadu, India

Jubin Mitra IIT Kanpur, Kanpur, Uttar Pradesh, India

K. Muralidharan Department of ECE, Coimbatore Institute of Technology, Coimbatore, India

K. Muthukumaran Department of ECE, Sethu Institute of Technology, Virudhunagar, Tamil Nadu, India

Sandeep Varma Nadimpalli Department of Information Science and Engineering, BMS College of Engineering, Bengaluru, Karnataka, India

A. Nagaraj Department of ECE, Sethu Institute of Technology, Virudhunagar, Tamil Nadu, India

Gollu Appala Naidu Department of Electronics and Communication Engineering, National Institute of Technology Jamshedpur, Jamshedpur, Jharkhand, India

Srinath R. Naidu Department of Computer Science and Engineering, Amrita School of Engineering, Bengaluru, India;
Amrita Vishwa Vidyapeetham, Coimbatore, India

Manju Nanda Aerospace Electronics and System Division, CSIR-NAL, Bangalore, India

M. Narayanan Department of Computer Science and Engineering, Malla Reddy College of Engineering, Secunderabad, Hyderabad, Telangana, India

P. Naveen Kumar Department of ECE, University College of Engineering, Osmania University, Hyderabad, India

Tunirani Nayak Department of Electronics and Telecommunication Engineering, VSSUT, Burla, Sambalpur, Odisha, India

S. M. Nazia Fathima Department of ECE, Sethu Institute of Technology, Virudhunagar, Tamil Nadu, India

Shubham Nema Department of Electronics and Communication Engineering, Institute of Technology, Nirma University, Ahmedabad, Gujarat, India

Sagar Oza Department of Electronics and Communication Engineering, Institute of Technology, Nirma University, Ahmedabad, Gujarat, India

Khushboo Pachori Electronics and Communication Engineering, Sreenidhi Institute of Science and Technology (SNIST), Hyderabad, India;
Electronics and Communication Engineering, Gurunanak Institute of Technology, Hyderabad, Telangana, India

Gunjan Parihar Goa College of Engineering, Ponda, Goa, India

Akshay Parmar Department of Electronics and Communication Engineering, Institute of Technology, Nirma University, Ahmedabad, Gujarat, India

V. Parthasarathy Department of ECE, Sethu Institute of Technology, Tamil Nadu, India

Zuber M. Patel Sardar Vallabhbhai National Institute of Technology Surat, Surat 395007, India

Suman Patil Department of Information Science and Engineering, BMS College of Engineering, Bengaluru, Karnataka, India

Raj Kumar Patra CMR Technical Campus, Hyderabad, India

M. D. Pawar Department of Electronics and Telecommunication Engineering, Maharashtra Institute of Technology, Aurangabad, India

Bhakti V. Pawar Department of Electronics and Telecom, Ramrao Adik Institute of Technology, Navi Mumbai, India

Anju S. Pillai Department of Electrical and Electronics Engineering, Amrita School of Engineering, Amrita Vishwa Vidyapeetham, Coimbatore, India

Binod Kumar Prasad ECE Department, Guru Nanak Institutions Technical Campus, Ibrahimpatnam, Telangana, India

L. Pratap Reddy Department of Electronics and Communication Engineering, Jawaharlal Nehru Technological University Hyderabad College of Engineering, Hyderabad, India

B. S. Priyanka Chowdary Department of ECE, RVCE, Bengaluru, India

G. Prutha Department of EEE, RV College of Engineering, Bengaluru, India

N. Puviarasan Department of Computer and Information Science, Annamalai University, Chidambaram, Tamil Nadu, India

S. Radharani Department of CSE, University College of Engineering, Osmania University, Hyderabad, India

K. Ragini Department of ECE, G. Narayanamma Institute of Technology and Science, Hyderabad, India

Rahul EC Department, Delhi Technological University, Delhi, India

Rohit Raja Sreyas Institute of Engineering and Technology, Hyderabad, India

M. Rajan Babu Department of ECE, Lendi Institute of Engineering and Technology, Vizianagaram, India

Kapoor Rajiv EC Department, Delhi Technological University, Delhi, India

P. Rajshekhar Rao Department of Avionics, IST, JNTUK, Kakinada, Andhra Pradesh, India

P. Ramana Reddy Department of ECE, JNTUACEA, Anantapuram, Andhra Pradesh, India

M. Ramkumar Raja ECE Department, Coimbatore Institute of Engineering and Technology, Coimbatore, India

Md. Rashid Mahmood Department of Electronics and Communications, Guru Nanak Institutions Technical Campus, Hyderabad, India

B. V. Ravi Kumar CBIT, Hyderabad, India;
Research Centre Imarat (RCI), Hyderabad, India

G. Reddy Hemantha Department of ECE, Jawaharlal Nehru Technological University Ananthapur, Ananthapuramu, India

P. Rohini Department of Computer Science and Engineering, Faculty of Science & Technology, ICFAI Foundation for Higher Education (A Deemed-to be University), Hyderabad, India;
Department of CSE, JNTUA, Anantapuramu, India

M. Rohitha ECE, SPMVV, Tirupathi, Andhra Pradesh, India

T. Ruba Department of ECE, Sethu Institute of Technology, Virudhunagar, Tamil Nadu, India

B. Sahana Department of ECE, RVCE, Bengaluru, India

B. Sanjana Department of ECE, G. Narayanamma Institute of Technology and Science, Hyderabad, India

Sripadam Satish NIT, Tiruchirappalli, Tamil Nadu, India

Dhaval Shah Department of Electronics and Communication Engineering, Institute of Technology, Nirma University, Ahmedabad, Gujarat, India

V. Shavali Department of ECE, JNTUA, Anantapuramu, Andhra Pradesh, India

C. Shoba Bindu Department of CSE, JNTUACEA, Anantapuramu, India

Sandeep Shukla IIT Kanpur, Kanpur, Uttar Pradesh, India