2021 National Conference on Communications (NCC 2021)

Virtual Conference 27 – 30 July 2021



IEEE Catalog Number: CFP2142J-POD **ISBN:**

978-1-6654-4178-0

Copyright © 2021 by the Institute of Electrical and Electronics Engineers, Inc. All Rights Reserved

Copyright and Reprint Permissions: Abstracting is permitted with credit to the source. Libraries are permitted to photocopy beyond the limit of U.S. copyright law for private use of patrons those articles in this volume that carry a code at the bottom of the first page, provided the per-copy fee indicated in the code is paid through Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923.

For other copying, reprint or republication permission, write to IEEE Copyrights Manager, IEEE Service Center, 445 Hoes Lane, Piscataway, NJ 08854. All rights reserved.

*** This is a print representation of what appears in the IEEE Digital Library. Some format issues inherent in the e-media version may also appear in this print version.

IEEE Catalog Number:	CFP2142J-POD
ISBN (Print-On-Demand):	978-1-6654-4178-0
ISBN (Online):	978-1-6654-4177-3

Additional Copies of This Publication Are Available From:

Curran Associates, Inc 57 Morehouse Lane Red Hook, NY 12571 USA Phone: (845) 758-0400 Fax: (845) 758-2633 E-mail: curran@proceedings.com Web: www.proceedings.com



Program 2021 National Conference on Communications (NCC)

Communication Systems

An All-Digital Wideband OFDM-Based Frequency-Hopping System Using RF Sampling Data Converters	
Amit Sravan Bora (National Chiao Tung University, Taiwan), Harishore Singh Tourangbam (National Chiao Tung University,	
Taiwan), Po-Tsang Huang (National Chiao Tung University, Taiwan)	1
Digital Predistortion Resource Optimization for Frequency Hopping Transceiver System	
Jaya Mishra (Indian Institute of Technology, Roorkee, India), Girish Chandra Tripathi (Indian Institute of Technology Roorkee,	
India), Meenakshi Rawat (IIT Roorkee, India)	6
Capacity Analysis of Adaptive Combining for Hybrid FSO/RF Satellite Communication System	
Narendra Vishwakarma (Indian Institute of Technology Indore, India), Swaminathan Ramabadran (Indian Institute of	
Technology Indore, India)	11
Development of Improved SOQPSK Based Data Transmission over Aeronautical Telemetry Link	
Ravindra Mohan Nigam (Aeronautical Development Agency, India), Pyari Mohan Pradhan (IIT Roorkee, India)	17

Optical Communication

Generation of Optical Frequency Comb Using Cascaded Brillouin Scattering at Low Power Utilizing Pump Recycling Technique in a Single Mode Fiber	
Aritra Paul (Indian Institute of Technology Kanpur, India), Pradeep Kumar (Indian Institute of Technology Kanpur, India)	
Multi-Rate Kalman Filter for Carrier Phase Recovery in 200 Gbps PDM Coherent Optical Receivers	
Wrivu Sanyal (Indian Institute of Technology, Kanpur, India), Srishti Sharma (Indian Institute of Technology, Delhi, India),	20
Pradeep Kumar (Indian Institute of Technology Kanpur, India)	
Optical Sideband Interference Using Optical IQ and Mach-Zehnder Modulators	
Govind Kumar (Indian Institute of Technology Kanpur, India), Nishant Chandra (Indian Institute of Technology Kanpur, India),	
Pradeep Kumar (Indian Institute of Technology Kanpur, India)	
Mode Analysis of AlGaAs Based Hybrid Metal Insulator Plasmonic Waveguide with Nanoscale Confinement	
Santosh Kumar (NIT PATNA, India), Pintu Kumar (National Institute of Technology Patna, India), Rakesh Ranjan (National	
Institute of Technology Patna, India)	

Speech Processing 1

Detection of Speech Overlapped with Low-Energy Music Using Pyknograms Mrinmoy Bhattacharjee (Indian Institute of Technology Guwahati, India), Mahadeva Prasanna (IIT Dharwad, India), Prithwijit	
Guha (IIT Guwahati, India)	42
A Spectral Variation Function for Variable Time-Scale Modification of Speech	
Pramod Haribhau Kachare (IIT Bombay & Ramrao Adik Institute of Technology, India), Prem C. Pandey (IIT Bombay, India)	48
Effect of High-Energy Voiced Speech Segments and Speaker Gender on Shouted Speech Detection	
Shikha Baghel (Indian Institute of Technology, Guwahati, India), Mahadeva Prasanna (IIT Dharwad, India), Prithwijit Guha (IIT	
Guwahati, India)	53
DNN Based Phrase Boundary Detection Using Knowledge-Based Features and Feature Representations from CNN	
Pavan Kumar J (Indian Institute of Science, India), Chiranjeevi Yarra (International Institute of Information Technology, India),	
Prasanta Kumar Ghosh (Indian Institute of Science, India)	59

Towards a Database for Detection of Multiple Speech Disfluencies in Indian English

Sparsh Garg (International Institute of Information Technology Hyderabad, India), Utkarsh Mehrotra (International Institute of Information Technology Hyderabad, India), Krishna Gurugubelli (IIIT-Hyderabad, India), Anil Kumar Vuppala (International

Age of Information

Age-Of-Information Bandits with Heterogeneous Data Rates	
Harsh S Deshpande (IIT Bombay, India), Sucheta Ravikanti (Indian Institute of Technology, Bombay, India), Sharayu Moharir	
(Indian Institute of Technology Bombay, India)	
On the Age of Information of a Queuing System with Heterogeneous Servers	
Anhad Bhati (IIT Bombay, India), Sibi Raj B Pillai (IIT Bombay, India), Rahul Vaze (TIFR Mumbai, India)	

Optical Systems

A Penalty-Based Routing and Spectrum Assignment in Fragmented Elastic Optical Network Spectrum	
Anjali Sharma (Indian Institute of Technology Kanpur, India), Sobir Ali (Indian Institute of Technology Kanpur, India), Varsha Lohani (IIT Kanpur, India), Yatindra Nath Singh (Indian Institute of Technology Kanpur, India)	83
Neural Networks for Predicting Optical Pulse Propagation Through Highly Nonlinear Fibers	
Naveenta Gautam (Indian Institute of Technology, India), Amol Choudhary (Indian Institute of Technology (IIT), Delhi, India), Brejesh Lall (Indian Institute of Technology Delhi, India)	89
Coupling Length Analysis by Using Three Strips for Compact Design of Photonic Waveguide in Photonic Integrated Circuit	
Veer Chandra (National Institute of Technology Patna, India), Santosh Kumar (NIT PATNA, India), Rakesh Ranjan (National Institute of Technology Patna, India)	95
Quantized Feedback-Based Space Shift Keying in Visible Light Communication	
Sivanjan Rao Chandhu (Indian Institute of Technology, Roorkee, India), Anshul Jaiswal (Indian Institute of Technology Roorkee, India)	99

Speech Processing 2

ntaneous Frequency Filter-Bank Features for Low Resource Speech Recognition Using Deep Recurre. itectures	nt
ekhar Nayak (Samsung R&D Institute Bangalore & IIT Hyderabad, India), Chintigari Shiva Kumar (IIT Hyderabad, Ir ma Murty Kodukula (Indian Institute of Technology Hyderabad, India)	
-Based End-To-End ASR for the Low Resource Sanskrit Language with Spectrogram Augmentation	
oop Chandran Savithri (Indian Institute of Science, Bangalore, India), Ramakrishnan Angarai Ganesan (Indian Instit ience & RaGaVeRa Indic Technologies Pvt Ltd, India)	
en Language Diarization Using an Attention Based Neural Network	
gabandhu Mishra (Indian Institute of Technology Dharwad, India), Ayush Agarwal (Indian Institute of Technology E dia), Mahadeva Prasanna (IIT Dharwad, India)	
ch-Training Aid with Time-Scaled Audiovisual Feedback of Articulatory Efforts	
amod Haribhau Kachare (IIT Bombay & Ramrao Adik Institute of Technology, India), Prem C. Pandey (IIT Bombay, I shal Mane (India, India), Hirak Dasgupta (IIT Bombay, India), K. S. Nataraj (Indian Institute of Technology, Bombay,	

Machine Learning for Communications

Learning to Decode Trellis Coded Modulation	
Jayant Sharma (IIIT Hyderabad, India), V. Lalitha (IIIT Hyderabad, India)	128
Auto-SCMA: Learning Codebook for Sparse Code Multiple Access Using Machine Learning	
Ekagra Ranjan (Indian Institute of Technology (IIT) Guwahati, India), Ameya Vikram (Indian Institute of Technology (IIT)	
Guwahati, India), Alentattil Rajesh (IIT G, India), Prabin Kumar Bora (Indian Institute of Technology Guwahati, India)	134

Communication Theory 1

Channel Estimation and Data Detection of OTFS System in the Presence of Receiver IQ Imbalance	
Sapta Girish Babu Neelam (Bharat Electronics Limited & IIT Bhubaneswar, India), Pravas Ranjan Sahu (Indian Institute of Technology Bhubaneswar, India)	. 139
Parametric Estimation of SINR Distribution Using Quantized SINR Samples for Maximizing Average Spectral Efficiency	
Karthik Mohan K (IIT Kharagpur, India), Suvra Sekhar Das (Indian Institute of Technology Kharagpur, India)	. 145
Optimal Pilot Design for Data Dependent Superimposed Training Based Channel Estimation in Single/Multi Carrier Block Transmission Systems	
Manjeer Majumder (IIT KANPUR, India), Aditya K Jagannatham (Indian Institute of Technology Kanpur, India)	151
Superimposed Pilot Based Channel Estimation for MIMO Coded FBMC Systems	
Murali Krishna Pavuluri (Indian Institute of Technology Bombay, India), Seeram Ram Prakash Sri Sai (Indian Institute of	
Technology Bombay, India), Vikram M. Gadre (IIT Bombay, India), Aditya K Jagannatham (Indian Institute of Technology Kanpur,	
India)	. 157

RF & Microwave 1

Wideband Circuit Analog Absorber Using Modified Resistive Cross-Dipoles	
Aditya Mandar Jabade (BITS-Pilani, India), Hrishikesh Sonalikar (BITS, Pilani, India)	162
Influence of Various Soil Types and Its Properties on Filamentary Planar Coil Based Magnetic Induction Communication System	
Swathi Sugumar (SSN College of Engineering, India), Sakthivel Murugan Santhanam (SSN College of Engineering, India)	167
Two-Way Array Factor Supported by Thinning Strategy for an Improved Radar Performance	
Rathod Rajender (NIT-Rourkela, India), Konidala Subhashini (National Institute Of Technology, India), B Pavan Kumar (APSD	
Communication Systems Group U R Rao Satellite Centre ISRO, India)	172

Video Processing 1

DeepSCT: Deep Learning Based Self Correcting Object Tracking Mechanism	
Khush Agrawal (Visvesvaraya National Institute of Technology, India), Rohit Lal (Visvesvaraya National Institute of Technology,	
India), Himanshu Patil (Visvesvaraya National Institute of Technology, India), Surender Kannaiyan (VNIT, Nagpur, India), Deep	
Gupta (Visvesvaraya National Institute of Technology, Nagpur, India)	176
Domain Randomization on Deep Learning Models for Image Dehazing	
Abdul Fathaah Shamsuddin (National Institute of Technology Calicut, India), Abhijith P (National Institute of Technology Calicut,	
India), Deepak Raja Sekar P M (National Institute of Technology Calicut, India), Krupasankari Ragunathan (National Institute of	
Technology Calicut, India), Praveen Sankaran (National Institute of Technology Calicut, India)	182
Deep Video Compression Using Compressed P-Frame Resampling	
Abhishek Kumar Sinha (Indian Institute of Space Science and Technology, India), Deepak Mishra (IIST, India)	188

Communication Theory 2

Angle of Arrival Distribution for Coherent Scattering from an Undulating Sea Surface	
Manishika Rawat (Indian Institute of Technology Delhi, India), Brejesh Lall (Indian Institute of Technology Delhi, India), Seshan	
Srirangarajan (Indian Institute of Technology Delhi, India)	200
Robust Linear Transceiver Design for Parameter Tracking in IoT Networks	
Mohammad Faisal Ahmed (Cisco Systems (India), India), Kunwar Pritiraj Rajput (Indian Institute of Technology Kanpur, India),	
Aditya K Jagannatham (Indian Institute of Technology Kanpur, India)	206
Performance of Two Stage Cooperative NOMA Transmission for Full-Efficient Three User Network	
Ankur Bansal (Indian Institute of Technology Jammu, India), Sudhakar Modem (Indian Institute Of Technology, Jammu, India)	212

RF & Microwave 2

A	Miniaturized Wideband Half Mode Substrate Integrated Waveguide Bandpass Filter for C Band Applications	
	Swathy BH (IIITDM Kancheepuram, India), Pallepogu Prasanna Kumar (IIITDM Kancheepuram, India), Prerna Saxena (Indian	
	Institute of Information Technology, Design and Manufacturing, Kancheepuram, India)	218
D	Design of an Elementary Microstrip Power Splitter for Antenna Array	
	Chanchala Kumari (BIT MESRA RANCHI, India), Neela Chattoraj (Birla Institute of Technology, Mesra Ranchi, India)	223
Α	Miniaturized Interdigital Bandpass Filter for Intentional Electromagnetic Interference Applications	
	Abirami B (IIITDM Kancheepuram, India), Prerna Saxena (Indian Institute of Information Technology, Design and Manufacturing,	
	Kancheepuram, India), Premkumar K. (Indian Institute of Information Technology, Design and Manufacturing Kancheepuram,	
	India)	228

Video Processing 2

An Optical Flow Based Approach to Detect Movement Epenthesis in Continuous Fingerspelling of Sign Language	
Navneet Nayan (Indian Institute of Technology, Roorkee, India), Pyari Mohan Pradhan (IIT Roorkee, India), Debashis Ghosh	
(Indian Institute of Technology (IIT) Roorkee, India)	233
A Level Set Model Driven by New Signed Pressure Force Function for Image Segmentation	
Soumen Biswas (National Institute of Technology Silchar, India), Ranjay Hazra (Nit Silchar, India), Shitala Prasad (Research	
Scientist, Singapore), Arvind Sirvee (Rajasthan Technical University, Kota, India)	238
Phrase Recognition Using Improved Lip Reading Through Phase-Based Eulerian Video Magnification	
Salam Nandakishor (National Institute of Technology Nagaland, India), Debadatta Pati (National Institute of Technology	
Nagaland, India)	244
Visibility Restoration of Diverse Turbid Underwater Images- Two Step Approach	
Mary S Cecilia (Anna University & SSN College of Engineering, India), Sakthivel Murugan Santhanam (SSN College of	
Engineering, India)	

Millimeter Wave Systems

Joint Beamwidth and Number of Concurrent Beams Estimation in Downlink mmWave Communications

WSN

Optimal Link Scheduling for Low Latency Data Transfer over Small World WSNs	
Om Jee Pandey (University of Saskatchewan, Canada), Naga Srinivasarao Chilamkurthy (University of SRM AP, India), Rajesh M	
Hegde (Indian Institute of Technology Kanpur, India)	267
Efficient Message Dissemination in V2V Network: A Local Centrality-Based Approach	
Moyukh Laha (IIT Kharagpur, India), Raja Datta (Indian Institute of Technology Kharagpur, India)	273

Radar

Slotted Aloha for FMCW Radar Multiple Access Networks	
Haritha K (Indian Institute of Science, India), Vineeth Bala Sukumaran (Indian Institute of Space Science and Technology,	
Trivandrum, India), Chandramani Singh (Indian Institute of Science, India)	. 279
Analysis of 5G New Radio Waveform as an Illuminator of Opportunity for Passive Bistatic Radar	
Purushottama Lingadevaru (National Institute of Technology Karnataka, India), Pardhasaradhi Bethi (National Institute of	
Technology - Karnataka, India), Pathipati Srihari, Dr (National Institute of Technology Karnataka, India), G. V. k. Sharma (GITAM	
University, India)	. 285

5G New Radio

the Throughput of a Cellular Network Using Machine Learning - A Case Study of LTE	Ітрі
karam Gaikwad (IITH, India), SaiDhiraj Amuru (IIT Hyderabad, India), Kiran Kuchi (IIT Hyderabad, India)	Pr
Transport Block Processing for 5G NR PUSCH Coverage Enhancement	Enho
a Rao G (Indian Institute of Technology Hyderabad, India), Subhash Kumawat (Indian Institute of Technology	Kc
d, India), SaiDhiraj Amuru (IIT Hyderabad, India), Kiran Kuchi (IIT Hyderabad, India)	Ну
Resource Allocation for 5G-NR Massive MIMO Systems	Dow
ddy M (Indian Institute of Technology Hyderabad, India), Mounika Reddy (IIT Hyderabad, India), Abhinav Kumar	Pa
stitute of Technology Hyderabad, India), Kiran Kuchi (IIT Hyderabad, India)	(In

Networking

Multi-Source TCP (MSTCP): A Transport Protocol for Distributed Content Delivery	
Lalhruaizela Chhangte (IITB-Monash Research Academy, India), Pramey Singh (IIT Bombay, India), D. Manjunath (IIT Bombay, India), Nikhil Karamchandani (Indian Institute of Technology Bombay, India)	309
On Traffic Classification in Enterprise Wireless Networks	
Sipra Behera (Tata Consultancy Services, India), Bighnaraj Panigrahi (Tata Consultancy Services, India), Hemant Kumar Rath	
(Tata Consultancy Services, India), Jyotirmoy Karjee (Samsung, Bangalore, India)	315
A Light-Weight Delay Tolerant Networking Framework for Resource-Constrained Environments	
Ajay Salas (Indian Institute of Space Science and Technology, India), Sarath Babu (Indian Institute of Space Science and	
Technology (IIST), India), Manoj Bs (Indian Institute of Space Science and Technology, India)	321

Image Processing

 Automated Macular Disease Detection Using Retinal Optical Coherence Tomography Images by Fusion of Deep

 Learning Networks

 Latha V (College of Engineering, Trivandrum, India), Ashok R (College of Engineering, Trivandrum, India), Sreeni K G (College of

 Engineering, Thiruvananthapuram, INDIA, India)
 333

 Selective Variance Based Kinship Verification in Parent's Childhood and Their Children
 333

 Madhu Oruganti (National Institute of Technology RAIPUR, India), Toshanlal Meenpal (NIT Raipur, India), Saikat Majumder
 339

5G Communications

Enhanced Precoding Aided Generalized Spatial Modulation for Massive MIMO Systems	
Kunnathully Sadanandan Sanila (IIT Goa, India), Neelakandan R (IIT Goa, India)	45
K-Preferential Slotted ALOHA for Ultra Reliable Low Latency Communications	
Satyam Agarwal (Indian Institute of Technology Ropar, India), Shubham Pandey (Indian Institute of Technology Ropar, India)	51
Uplink Channel Impulse Response Based Secondary Carrier Prediction	
Prayag Gowgi (Ericsson Research, India), Vijaya Parampalli Yajnanarayana (Ericsson Research, India)	57
Phase Calibration of Multiple Software Defined Radio Transmitters for Beamforming in 5G Communication	
Dusari Nageswara Rao (Indian Institute of Technology, Roorkee, India), Meenakshi Rawat (IIT Roorkee, India)	63

Antenna Design

Design of a Compact TM01-TE11 Mode Converter Using Periodic Iris Loading	
Ashish Chittora (BITS-Pilani, K. K. Birla Goa Campus, India)	368
Compact and Wideband Circularly Polarized Quadrature Rectangular Dielectric Resonator Antenna	
Abhijeet Gaonkar (NIT Goa, India), Pragati Patel (NIT Goa, India)	372
A Compact Reconfigurable Slot-Loaded Printed Antenna for Future Wireless Applications	
Divyanshu Bhardwaj (Indian Institute of Information Technology Guwahati, India), Anamiya Bhattacharya (Indian Space	
Research Organization, India), Bidisha DasGupta (Indian Institute of Information Technology, India)	377
An H-Plane Multi-Horn Antenna Using Substrate Integrated Waveguide Technique	
Anil Nayak, Mr (IIT Roorkee, India), Vinit Yadav (IIT Roorkee, India), Amalendu Patnaik (IIT Roorkee, India)	382

Biomedical Image Processing

Transfer Learning-Based Automatic Detection of Acute Lymphocytic Leukemia	
Pradeep Kumar Das (National Institute of Technology Rourkela, India), Sukadev Meher (National Institute of Technology, Rourkela, India)	
Optimized Bio-Inspired Spiking Neural Models Based Anatomical and Functional Neurological Image Fusion in NSST Domain	
Manisha Das (Visvesvaraya National Institute of Technology, Nagpur, India), Deep Gupta (Visvesvaraya National Institute of	
Technology, Nagpur, India), Petia Radeva (Universitat de Barcelona & Computer Vision Center, Spain), Ashwini Bakde (All India	
Institute of Medical Sciences, Nagpur, India)	

Biomedical Image Retrieval Using Multi-Scale Local Bit-Plane Arbitrary Shaped Patterns

Deepamoni Mahanta (Tezpur University, India), Deepika Hazarika (Tezpur University, India), Vijay Kumar Nath (Tezpur	
University, India)	398
Detection of Myocardial Infarction from 12 Lead ECG Images	
Ravi Kumar Sanjay Sane (Indian Institute of Technology Guwahati, India), Pharvesh Salman Choudhary (IIT Guwahati, India), L N	
Sharma (IIT Guwahati, India), Samarendra Dandapat (Indian Institute of Technology Guwahati, India)	404

Channel Capacity and Fixed Point Analysis

Numerically Computable Lower Bounds on the Capacity of the(1,\infty)RLL Input-Constrained Binary Erasure Channel	
V. Arvind Rameshwar (Indian Institute of Science, Bengaluru, India), Navin Kashyap (Indian Institute of Science, India)	410
Commitment over Compound Binary Symmetric Channels	
Anuj Kumar Yadav (Indian Institute of Technology Patna, India), Manideep Mamindlapally (Indian Institute of Technology	
Kharagpur, India), Amitalok J. Budkuley (Indian Institute of Technology Kharagpur, India), Manoj Mishra (National Institute of	
Science Education and Research, Bhubaneswar, Homi Bhabha National Institute, India)	416
Capacity of Photonic Erasure Channels with Detector Dead Times	
Jaswanthi Mandalapu (Indian Institute of Technology, Madras, India), Krishna P Jagannathan (Indian Institute of Technology	
Madras, India)	422
The Four Levels of Fixed-Points in Mean-Field Models	
Sarath Yasodharan (Indian Institute of Science, India), Rajesh Sundaresan (Indian Institute of Science, India)	428

Audio Processing

Binaural Reproduction of HOA Signal Using Sparse Multiple Measurement Vector Projections Gyanajyoti Routray (Indian Institute of Technology Kanpur, India), Priyadarshini Dwivedi (Indian Institute of Technology, Kanpur,	
India), Rajesh M Hegde (Indian Institute of Technology Kanpur, India)	434
Robustness and Accuracy of Time Delay Estimation in a Live Room	
Yegnanarayana B. (International Institute of Information Technology, Hyderabad, India), HVS Narayana Murthy B (Research Center Imarat, India), J v Satyanarayana (DRDO INDIA, India), Vishala Pannala (International Institute of Information Technology	
(IIIT), Hyderabad, India), Nivedita Chennupati (International Institute of Information Technology Hyderabad, India)	. 440
Learning Based Method for Robust DOA Estimation Using Co-Prime Circular Conformal Microphone Array	
Raj Prakash Gohil (Indian Institute of Technology, Kanpur, India), Gyanajyoti Routray (Indian Institute of Technology Kanpur, India), Rajesh M Hegde (Indian Institute of Technology Kanpur, India)	446
Frequency-Anchored Deep Networks for Polyphonic Melody Extraction	
Aman Kumar Sharma (IIT Kanpur & Cisco Systems, India), Kavya Ranjan Saxena (IIT, Kanpur, India), Vipul Arora (Indian Institute of Technology, Kanpur, India)	452

Energy Harvesting

Maximizing the Throughput of an Energy Harvesting Transmitter in the Presence of a Jammer with Fixed Energy	
Haseen Rahman (Indian Institute of Technology Bombay, India)	457
Relay-Aided Bidirectional Communications Between Devices in a Hybrid User Scenario for IoT	
Shivam Gujral (Indian Institute of Technology Mandi, India)	463
On Performance of Battery-Assisted SWIPT with Incremental Relaying and Nonlinear Energy Harvesting	
Kamal Agrawal (Indian Institute of Technology Delhi, India), Anand Jee (Indian Institute of Technology, Delhi, India), Shankar	
Prakriya (Indian Institute of Technology, Delhi, India)	469

Machine Learning

Attention-Based Phonetic Convolutional Recurrent Neural Networks for Language Identification	
Ramesh Gundluru (Indian Institute of Technology, Hyderabad, India), Vayyavuru Venkatesh (Indian Institute of Technology	
Hyderabad, India), Kodukula Sri Rama Murty (Indian Institute of Technology, Hyderabad, India)	475
Spatio-Temporal Prediction of Roadside PM2.5 Based on Sparse Mobile Sensing and Traffic Information	
Anand Kakarla (Indian Institute Of Technology Hyderabad, India), Venkata Satish Kumar Reddy Munagala (Indian Institute of	
Technology Hyderabad, India), Tetsuhiro Ishizaka (Nihon University, Japan), Atsushi Fukuda (Nihon University, Japan), Soumya	
Jana (Indian Institute of Technology, Hyderabad, India)	481
Early Prediction of Human Action by Deep Reinforcement Learning	
Hareesh Devarakonda (IIIT Sricity, India), Snehasis Mukherjee (Shiv Nadar University, India)	486
A Deep Reinforcement Learning Approach for Shared Caching	
Pruthvi Trinadh (Indian Institute of Technology Bhubaneswar, India), Anoop Thomas (Indian Institute of Technology	
Bhubaneswar, India)	492

Relays

Greedy Successive Relaying for the Multicarrier Diamond Relay Channel	
Antony Mampilly (IIT Madras, India), Srikrishna Bhashyam (Indian Institute of Technology Madras, India)	498
Outage Analysis of SWIPT-Enabled Multi-Relay Aided Full Duplex NOMA System Under Partial Relay Selection	
Shubham Shinkar (National Institute of Technology Calicut, India), Babu A v (National Institute of Technology Calicut, India)	504
Analysis of Multi-Hop Device-To-Device Networks with Half-Duplex Relays	
Gourab Ghatak (IIIT Delhi, India)	510
On Outage Probability Analysis of Uplink Cooperative VFD-NOMA over Nakagami-m Faded Channels	
Justin Jose (Indian Institute of Technology Indore, India), Parvez Shaik (Indian Institute of Technology Indore, India), Shubham Bisen (Indian Institute of Technology Indore, India), Vimal Bhatia (Indian Institute of Technology Indore, India)	516

Clustering

A Novel Clustering Tendency Assessment Algorithm for WSN Generated Spatio-Temporal Data	
Kartik Vishal Deshpande (Indian Institute Of Technology, India), Dheeraj Kumar (IIT Roorkee, India)	522
Dimension Reduction and Clustering of Single Cell Calcium Spiking: Comparison of t-SNE and UMAP	
Suman Gare (IIT Hyderabad, India), Soumita Chel (IIT Hyderabad, India), Manohar Kuruba (IIT Hyderabad, India), Soumya Jana	
(Indian Institute of Technology, Hyderabad, India), Lopamudra Giri (IIT Hyderabad, India)	528

Detection & Estimation

Safe Sequential Optimization in Switching Environments	
Durgesh Kalwar (Indian Institute of Space Science and Technology, India), Vineeth Bala Sukumaran (Indian Institute of Space	
Science and Technology, Trivandrum, India)	534
Empirical Study of Weight Initializations for COVID-19 Predictions in India	
Meenal Narkhede (College of Engineering, Pune, India), Shubham Mane (College of Engineering, Pune, India), Prashant	
Bartakke (College of Engineering, Pune, India), M Sutaone (College of Engineering, Pune, India)	540

UAV Communications

Joint Bandwidth and Position Optimization in UAV Networks Deployed for Disaster Scenarios Neetu R R (IIIT Delhi, India), Akshita Gupta (Indraprastha Institute of Information Technology, India), Gourab Ghatak (IIIT Del	lhi
India), Anand Srivastava (Indraprastha Institute of Information Technology Delhi, India), Vivek A Bohara (Indraprastha Institute of Information Technology, Delhi (IIIT-Delhi), India)	ite
Trajectory Prediction of UAVs for Relay-Assisted D2D Communication Using Machine Learning	
Pradip Kumar Barik (Indian Institute of Technology, Kharagpur, India), Ashu Dayal Chaurasiya (Indian Institute of Technology Kharagpur, India), Raja Datta (Indian Institute of Technology Kharagpur, India), Chetna Singhal (Indian Institute of Technology Kharagpur, India)	gy FED
Optimal Deployment Strategy for Relay Based UAV Assisted Cooperative Communication for Emergency Applications	
Nelapati Lava Prasad (Indian Institute of Technology Bhubaneswar, India), Chanakya Ajit Ekbote (Indian Institute of Technolo Bhubaneswar, India), Barathram. Ramkumar (Indian Institute of Technology Bhubaneswar, India)	57
Optimal Data Transfer in UAV-Assisted Edge-Networks Using 3D Beamforming	
Shraddha Tripathi (Indian Institute of Technology Kanpur, India & NCTU Taiwan, Taiwan), Om Jee Pandey (University of Saskatchewan, Canada), Rajesh M Hegde (Indian Institute of Technology Kanpur, India)	

Biomedical Signal Processing & Networks

Brain Source Localization with Covariance Fitting Approaches	
Anchal Yadav (Indian Institute of Technology Delhi India, India), Prabhu Babu (CARE, Indian Institute of Technology, Delhi,	
India), Monika Aggarwal (IIT Delhi, India), Shiv Dutt Joshi (Indian Institute of Technology, Delhi, India)	570
Performance Analysis of Convolutional Neural Network Based EEG Epileptic Seizure Classification in Presence of Ocular Artifacts	
Payal Patel (IIT Bhubaneswar, India), Udit Satija (Indian Institute of Technology (IIT), India)	576
Implementation of a Spiking Neuron in CMOS	
Iman Burman (Indian Institute of Technology Kharagpur, India), Archita Hore (IIT Kharagpur, India), Ayan Chakraborty (Indian	
Institute of Technology Khragpur, India), Sharba Bandyopadhyay (IIT Kharagpur, India), Saswat Chakrabarti (G. S. Sanyal School	
of Telecommunications & Indian Institute of Technology, Kharagpur, India)	581
Heart Rate Estimation from RGB Facial Videos Using Robust Face Demarcation and VMD	
Arya Deo Mehta (National Institute of Technology, Rourkela, India), Hemant Sharma (National Institute of Technology,	
Rourkela, India)	587

RIS

Performance Analysis of RIS Assisted Smart Grid HEMS Using RQAM Modulation	
Ashish Kumar Padhan (Indian Institute of Technology Bhubaneswar, India), Pravas Ranjan Sahu (Indian Institute of Technology	
Bhubaneswar, India), Subhransu Samantaray (Indian Institute of Technology, Bhubaneswar, India)	593
BER Analysis of RIS Assisted Bidirectional Relay System with Physical Layer Network Coding	
Jeba Triphena (Thiagarajar College of Engineering, Madurai, India), Vetrivel Chelian Thirumavalavan (Thiagarajar College of	
Engineering, Madurai, India), Thiruvengadam S Jayaraman (Thiagarajar College of Engineering, Madurai, India)	599

Security

Order Statistics Based Collision Analysis for PUFs

Girish Vaidya (Indian Institute of Science, India), Chandramani Singh (Indian Institute of Science, India), Prabhakar Venkata T. On Physical Layer Security of Correlated Multiantenna Cognitive Radio Receivers

Brijesh Soni (School of Engineering and Applied Science, Ahmedabad University, India), Dhaval Karshanbhai Patel (School of Engineering and Applied Science-Ahmedabad University, India), Sagar Kavaiya (School of Engineering and Applied Science, Ahmedaad University, India), Mazen Omar Hasna (Qatar University, Qatar), Miguel López-Benítez (University of Liverpool,

DSP Algorithms

Fast DFT Computation for Signals with Spectral Support

(Charantej Reddy Pochimireddy (IIT Hyderabad, India), Prabhu Tej V s s (Indian Institute of Technology Hyderabad, India), Aditya	
:	Siripuram (Indian Institute of Technology Hyderabad, India)	617
Im	proved Hankel Norm Criterion for Interfered Nonlinear Digital Filters Subjected to Hardware Constraints	
:	Srinivasulu Jogi (IIITDM Kancheepuram, India), Priyanka Kokil (Indian Institute of Information Technology Design and	
	Manufacturing, Kancheepuram, India)	623