COGNITION

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5 Intelligence

1 Social Cognition

6 Executive Functions

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NATIONAL INSTITUTE OF TECHNOLOGY RAIPUR

GE ROAD, RAIPUR - 492010

CONTENTS

COGNITION

Editorial Note : COGNITION
Volume 1, Issue 4

Happy New Year to all our readers and well wishers!

We are delighted to bring you the 4th Issue (Volume 1) of Cognition - the Research Newsletter of NIT Raipur. This is a quarterly published newsletter that showcases the research accomplishments by the faculty and research scholars of NIT Raipur.

The 4th Issue of Cognition highlights the compelling ways in which the NIT fraternity has made important contributions to research and the related activities, during the quarter - October 2021 to December 2021. It also reflects the strong research-culture that the Institute has tried to build under the able guidance of Dr. A.M. Rawani, Director NIT Raipur.

This issue will introduce you to the wide variety of research articles and books/book chapters that have been published by our competent faculty and research scholars in various high impact factor journals and with reputed publishers. It will also throw light on the various research projects that have been approved or sanctioned in this quarter. Apart from this, the issue highlights other important activities related to research such as the MoUs signed, conferences, seminars organized, etc.

We are hopeful that you will enjoy knowing and learning about the immense hard work that the NIT fraternity is doing to build the Institute par excellence. Team Cognition is immensely grateful to Dr. A.M. Rawani, Director NIT Raipur, for constantly guiding and inspiring us towards achieving our academic and research goals.

We are also grateful to our respected Deans, Heads of all the departments, faculty members, research scholars, administrative and non-teaching staff for all their support.

We would appreciate if you let us know your queries, inputs or concerns. We can be contacted at: cognition@nitrr.ac.in.

Team Cognition once again wishes you a great year ahead!

Warm regards!
Editorial Team, Cognition

HEAD	MEMBER	MEMBER	MEMBER

Dr. Ayush Khare
Associate Professor
Department of Physics

Dr. Sanjeev Das
Assistant Professor
Department of MME

Dr. Y. Vijaya Babu
Assistant Professor
Department of HSS

Dr. A. K. Dash
Assistant Professor
Department of ME

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BEST RESEARCHER AWARD 2020-21

NIT Raipur felicitates the Best Researcher of the Institute with an aim to recognize and motivate faculty members among their peer groups. This award is given to an individual for his/her contributions to research and development in the institution. Dr. Awanish Kumar, Assistant Professor in Department of Biotechnology was conferred with the Best Researcher award for the year 2020-2021 for his outstanding contributions to the ongoing research in the field of biotechnology. The award comprised of citation and a memento.

In past 09 years, Dr. Kumar has brought laurels to the institute at many platforms. Recently, he was classified as top 2% scientists of the world according to ELSEVIER, USA report published in October 19, 2021. He has published more than 189 research articles in SCI journals, 10 books, 21 book chapters, and 63 articles in the proceedings of national and international conferences/seminars.

NIT Raipur family congrats Dr. Kumar on his achievement and wishes him the best for all his future endeavors.

Dr. Awanish Kumar
Assistant Professor
Department of Biotechnology

MOUs SIGNED BY NIT RAIPUR

Name of Organization : Changzhou Institute of Technology, China
Date of MOU : October 2, 2021
Purpose of MOU : For exchange of students, faculty members and research materials, and coordination in collaborative research projects.

Name of Organization : National Technical Research Organization (NTRO)
Date of MOU : November 17, 2021
Purpose of MOU : For joint R&D projects in relevant domains & technologies, availing opportunities of higher education and for participation of students in internship programs.
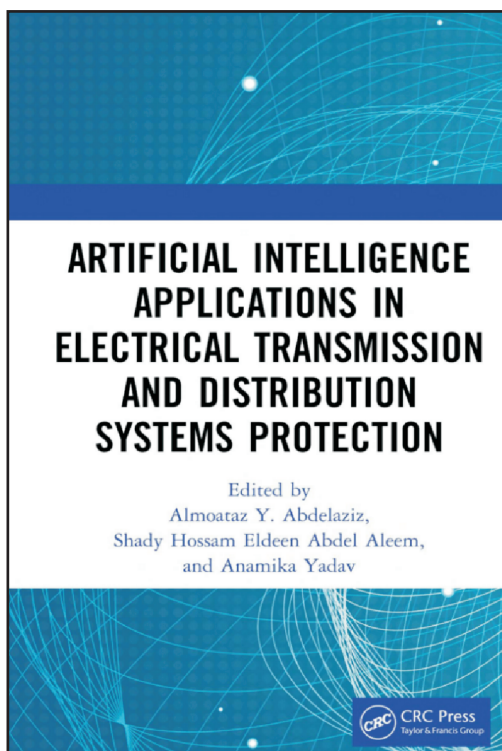
BOOKS & BOOK CHAPTERS PUBLISHED

BOOKS PUBLISHED

Titel of book : Artificial Intelligence Applications in Electrical Transmission and Distribution Systems Protection
Publisher : CRC Press
ISBN : 9780367552343
Month & year of publication : October 2021
Authors' names : Almoataz Y. Abdelaziz, Shady Hossam Eldeen, Abdel Aleem and Anamika Yadav

Dr. Anamika Yadav
Associate Professor
Department of Electrical Engg.

About the book

Artificial intelligence (AI) can successfully help in solving real-world problems in power transmission and distribution systems because AI-based schemes are fast, adaptive, and robust and are applicable without any knowledge of the system parameters. This book considers the application of AI methods for the protection of different types and topologies of transmission and distribution lines. It explains the latest pattern-recognition-based methods as applicable to detection, classification, and location of a fault in the transmission and distribution lines, and to manage smart power systems including all the pertinent aspects.

Purchase link: https://www.routledge.com/Artificial-Intelligence-Applications-in-Electrical-Transmission-and-Distribution/Abdelaziz-Aleem-Yadav/p/book/9780367552343
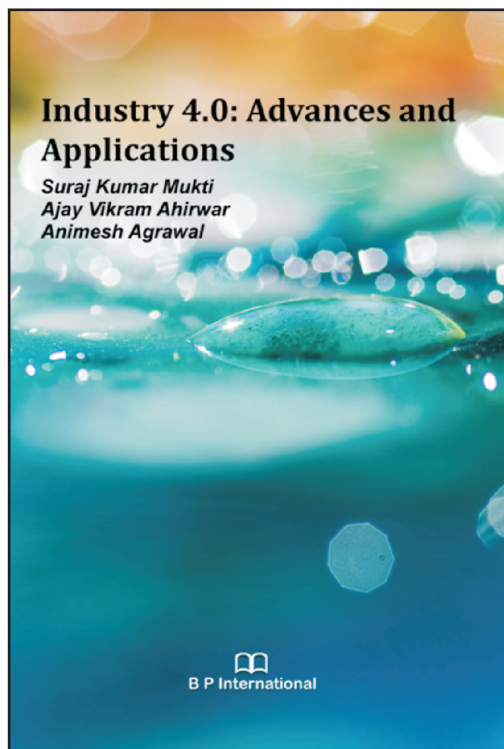
Titel of book : Industry 4.0: Advances and Applications
Publisher : B P International
ISBN : 978-93-5547-287-8
Month and year of publication : December 2021
Authors' names : Suraj Kumar Mukti, Ajay Vikram Ahirwar and Animesh Agrawal

Dr. S. K. Mukti
Assistant Professor
Department of Mechanical Engg.

Dr. Ajay Vikram Ahirwar
Assistant Professor
Department of Civil Engg.

Mr. Animesh Agrawal
Research Scholar
Department of Mechanical Engg.

About the book

There are a total of six chapters in this book. The first three chapters deal with theoretical background and the related information whereas the last three chapters are concerned with a qualitative cross-case research study regarding the decision making implementation of industry 4.0

More specifically, the first half of the book provides a detailed review of the literature and background for the chapters to come. In the second half, the data analysis and SME in India are discussed in detailed.

Purchase link: www.bookpi.org/order-book/?

BOOK CHAPTERS PUBLISHED

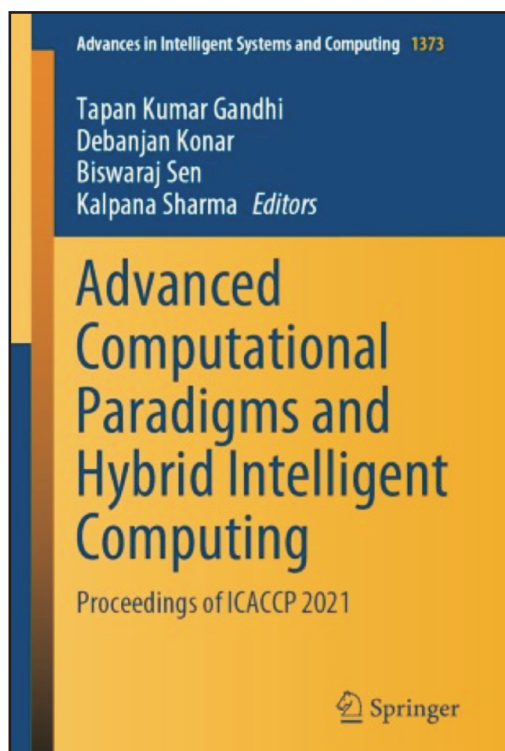**Title of Chapter :** Cloud-Based Smart Traffic Lights Monitoring and Controlling Using IoT
Title of book : Advanced Computational Paradigms and Hybrid Intelligent Computing
Publisher : Springer
ISBN : 978-981-16-4368-2(Print); 978-981-16-4369-9 (Online)
Month and year of publication : December, 2021
Authors' names : Naveen Sundar, Shristi Agrawal, Nilesh Singhania and K. Jairam Naik

About the Chapter

Emergency vehicles like ambulance and fire brigades getting stuck in the traffic often results in casualties. This chapter proposes a CSTMC architecture which stands for "cloud-based smart traffic monitoring and controlling". There are two other approaches on top of CSTMC, namely next light green (NLG) and all lights green (ALG), respectively. The CSTMC addresses the limitations faced by the existing methods using cloud computing and IoT cluster. This simplifies approach attains more reliability and reduces potential points of failure. Simulations of the proposed NLG approach achieved 15% of improvement in the travel time of emergency vehicles.

Purchase link: https://link.springer.com/chapter/10.1007%2F978-981-16-4369-9_14

**Titel of book chapter :** An Overview of Power System Resilience: Causes, Planning and Restoration Processes

Title of book : Innovation in Electrical Power Engineering Communication, and Computing Technology

Publisher : Springer, Singapore

ISBN : 978-981-16-7075-6

Month and year of publication : December, 2021

Authors' names : Fanidhar Dewangan, Monalisa Biswal and Manohar Mishra
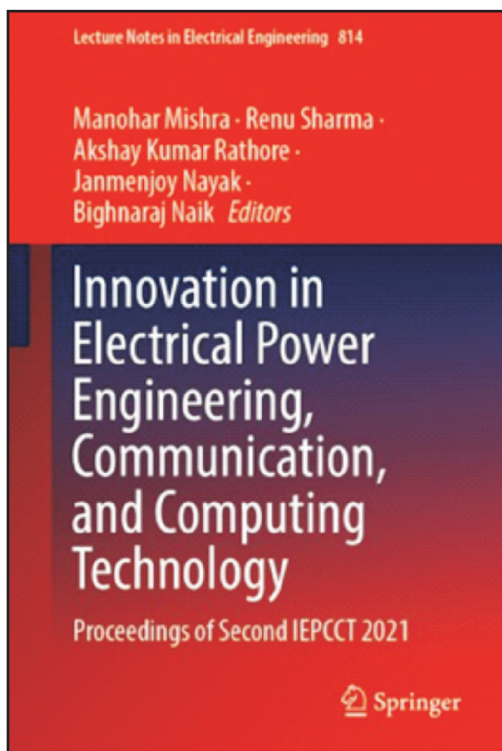
About the Chapter

In this chapter, the planning and action related steps are described which may lead to enhancement in the restoration of a power system. Focusing on the past disasters and current disasters that occurred in India, some of the findings and their preparedness are elaborated in various sections. The strengthening and controlling of electrical parameters at the time of event have been considered irrespective of power system resilience.

Purchase link: https://link.springer.com/chapter/10.1007/978-981-16-7076-3_47

Titel of book chapter: Adaptive Decision Feedback Equalizer Based on Wavelet Neural Network.
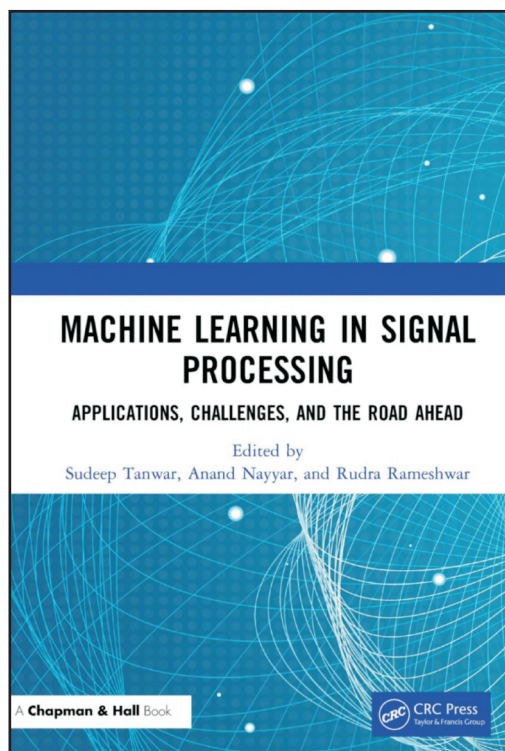
Title of book : Machine Learning In Signal Processing Applications, Challanges and Road Ahad

Publisher : Taylor and Francis Group

ISBN : 9781003107026

Month and year of publication : December, 2021

Author's name : Saikat Majumder

About the Chapter

Decision feedback equalizer (DFE) is an instance of equalization technique which consists of a feedback filter for reconstructing inter-symbol interference (ISI) from past decisions and utilizes it for the removal of ISI from the received symbols. DFE can compensate for linear and nonlinear distortions, even in channels with deep spectral null, and can track the characteristics of time-varying channel. To further improve the performance of DFE in nonlinear and time-varying channel, a novel wavelet neural network-based decision feedback equalizer (WNN DFE) is proposed in this chapter.

Purchase link:

https://www.routledge.com/Machine-Learning-in-Signal-Processing-Applications-Challenges-and-the/Tanwar-Nayyar Rameshwar/p/book/9781003107026

SPONSORED RESEARCH PROJECTS

TITLE OF RESEARCH PROJECT SANCTIONED : Design and Development of Photovoltaic Interface Compact Single Stage Multilevel Inverter Using Wide Band-gap Devices
SPONSORING AGENCY/FUNDING AGENCY : Higher Education Funding Agency (HEFA), New Delhi
DURATION : October, 2021- October, 2024
AMOUNT SANCTIONED : 25 Lakhs
PRINCIPAL INVESTIGATIOR (PI) : Dr. Varsha Singh, Department of Electrical Engineering
Co-PI : Dr. Swapnajit Pattnaik, Department of Electrical Engineering

The project aims to design a multilevel inverter that is operated from the DC link created by the front-end converter (2 stage Inverter) as well as a single stage converter. The efficiency and power density are a necessary concern that will be cared for in this project. As with the increase in power density it is challenging to design a power electronics converter with high power density. The voltage and current across the various stage of power conversion are monitored continuously using voltage and current transducer using DAQ. Thus, the data for each stage of power conversion can help to compute conversion efficiency.

TITLE OF RESEARCH PROJECT SANCTIONED : Growth, Demand and Projection Analysis of Herbal Products
SPONSORING AGENCY/FUNDING AGENCY : Wyton Pharmaceuticals and Agrotech Pvt. Ltd., Lucknow
DURATION : December, 2021-March, 2023
AMOUNT SANCTIONED : 1.2 Lakhs
PRINCIPAL INVESTIGATIOR (PI) : Dr. Deepmala Sharma, Department of Mathematic

Demand forecasting is the process of using predictive analysis of historical data to estimate and predict customers' future demand for a product or service. Demand forecasting helps the business make better-informed supply decisions that estimate the total sales and revenue for a future period. The proposed proposal will study the herbal market growth, demand, and projection analysis in statistically proven way for a range of scientific proven therapeutic herbal formulations and body care products with comparative study for different herbal products brands.

RESEARCH PAPERS PUBLISHED
(October 2021 to December 2021)

Title: Land surface temperature and spectral indices: A seasonal study of Raipur City
Authors: Subhanil Guha, Himanshu Govil, Ajay Kumar Taloor, Neetu Gill, Anindita Dey
Journal: Geodesy and Geodynamics
Web: https://doi.org/10.1016/j.geog.2021.05.002

Title : A machine learning-based classification of LANDSAT images to map land use and land cover of India
Authors: Ram Kumar Singh, Prafull Singh, Martin Drews, Pavan Kumar, Hukum Singh, Ajay Kumar Gupta, Himanshu Govil, Amarjeet Kaur, Manoj Kumar
Journal: Remote Sensing Applications: Society and Environment
Web: https://doi.org/10.1016/j.rsase.2021.100624

Title: Evaluation of silk-based bioink during pre and post 3D bioprinting: A review
Authors: Sharda Gupta, Hussam Alrabaiah, Marquette Christophe, Mohammad Rahimi-Gorji, Sohail Nadeem, Arindam Bit
Journal: Journal of Biomedical Materials Research Part B: Applied Biomaterials
Web: https://doi.org/10.1002/jbm.b.34699

Title: Accelerating skin barrier repair using novel bioactive magnesium-doped nanofibers of non-mulberry silk fibroin during wound healing
Authors: Sharda Gupta, Pallab Dutta, Veena Acharya, Pushpa Prasad, Amit Roy, Arindam Bit
Journal: Journal of Bioactive and Compatible Polymers
Web: https://doi.org/10.1177/08839115211061737

Title: Real-time automated segmentation of breast lesions using CNN-based deep learning paradigm: Investigation on mammogram and ultrasound
Authors: Kushangi Atrey, Bikesh Kumar Singh, Abhijit Roy, Narendra Kuber Bodhey
Journal: International Journal of Imaging Systems and Technology
Web: https://doi.org/10.1002/ima.22690

Title: Natural and synthetic plant compounds as anti-biofilm agents against Escherichia coli O157:H7 biofilm
Authors: Anuj Rohatgi, Pratima Gupta
Journal: Infection, Genetics and Evolution
Web: https://doi.org/10.1016/j.meegid.2021.105055

Title: Separation of bacteria Kocuria rhizophila BR-1 from its broth during synthesis of gold nanoparticles using ceramic membrane by shear-enhanced filtration process
Authors: Digvijay Dahiya, G. Pugazhenthi, Mohit Kumar, D. Vasanth
Journal: Chemosphere
Web: https://doi.org/10.1016/j.chemosphere.2021.130761

Title: Production and characterization of a novel thermostable laccase from Bacillus licheniformis VNQ and its application in synthesis of bioactive 1,4-naphthoquinones
Authors: Vikas Sharma, Gopal Pugazhenthi, Dhakshinamoorthy Vasanth
Journal: Journal of Bioscience and Bioengineering
Web: https://doi.org/10.1016/j.jbiosc.2021.09.008

Title: Emerging role and promise of nanomaterials in organoid research
Authors: Chinmaya Mahapatra, Ruda Lee, Manash K.Paul
Journal: Drug Discovery Today
Web: https://doi.org/10.1016/j.drudis.2021.11.007

Title: Biodegradation of acid red 3BN dye in sequential batch reactor: parameters and kinetics studies
Authors: Vijay Kumar, Akhilesh Khapre, Chandrakant Thakur, Prabir Ghosh, Parmesh Kumar Chaudhari
Journal: International Journal of Chemical Reactor Engineering
Web: https://doi.org/10.1515/ijcre-2021-0175

Title: Aerobic sequential batch reactor for domestic sewage treatment: parametric optimization and kinetics studies
Authors: Neela Acharya, Vijay Kumar, Vandana Gupta, Chandrakant Thakur, Parmesh Kumar Chaudhari
Journal: International Journal of Chemical Reactor Engineering
Web: https://doi.org/10.1515/ijcre-2021-0094

Title: Treatment of rice grain based distillery biodigester effluent using iron metal and salt: Chemical oxidation and electro-oxidation combined study in batch mode
Authors: Abhinesh Kumar, Prajapati Swati Mehra,Tulika Dewangan, Deepak Sharma, Shama Sen, Savita Dubey, Rajesh Kumar Kaushal, Parmesh Kumar Chaudhari, Dharm Pal
Journal: Environmental Nanotechnology, Monitoring & Management
Web: https://doi.org/10.1016/j.enmm.2021.100585

Title: Reactive Separation of Gallic Acid Using Phosphoric and Aminic Extractants in Non-Toxic Natural Diluents
Authors: Nishant Joshi, Amit Keshav, Anil K. Poonia, Jagamohan Meher
Journal: Chemical Methodologies
Web: 10.22034/chemm.2021.139021

Title: Kinetics of catalytic treatment of coking wastewater (COD, phenol and cyanide) using wet air oxidation
Authors: Vibha Verma, Prabir Ghosh, Santosh Bahadur Singh, Vandana Gupta, Parmesh Kumar Chaudhari
Journal: International Journal of Chemical Reactor Engineering
Web: https://doi.org/10.1515/ijcre-2021-0164

Title: Pretreatment of lignocellulosic agricultural waste for delignification, rapid hydrolysis, and enhanced biogas production: A review
Authors: Gopal P.Naik, Anil K. Poonia, Parmesh K. Chaudhari
Journal: Journal of the Indian Chemical Society
Web: https://doi.org/10.1016/j.jics.2021.100147

Title: Microcontroller Based Automated Reactor for Esterification of Lactic Acid: MATLAB Simulation
Authors: Amol A Bhusari, Bidyut Mazumdar, Rathod Ajit, P. Ruta, D Khonde
Journal: Iran. J. Chem. Chem. Eng
Web: 1021-9986/2021/5/1607-1615

Title: Application of CeO_2-MWCNTs nanocomposite for heavy metal ion detection in aqueous solutions by electrochemical technique
Authors: Arti Mourya, Bidyut Mazumdar, Sudip K.Sinha
Journal: Cleaner Materials
Web: https://doi.org/10.1016/j.clema.2021.100021

Title: Some non-uniformity patterns spread over the lower Mahanadi River Basin, India
Authors: Ramgopal T Sahu, Mani Kant Verma, Ishtiyaq Ahmad
Journal: Geocarto International
Web: https://doi.org/10.1080/10106049.2021.2005699

Title: Long short-term memory based functional characterization model for unknown protein sequences using ensemble of shallow and deep features
Authors: Saurabh Agrawal, Dilip Singh Sisodia, Naresh Kumar Nagwani
Journal: Neural Computing and Applications
Web: https://doi.org/10.1007/s00521-021-06674-4

Title: Augmented sequence features and subcellular localization for functional characterization of unknown protein sequences
Authors: Saurabh Agrawal, Dilip Singh Sisodia, Naresh Kumar Nagwani
Journal: Medical & Biological Engineering & Computing
Web: https://doi.org/10.1007/s11517-021-02436-5

Title: PICAndro: Packet InspeCtion-Based Android Malware Detection
Authors: Vikas Sihag, Gaurav Choudhary, Manu Vardhan, Pradeep Singh, Jung Taek Seo
Journal: Security and Communication Networks
Web: https://doi.org/10.1155/2021/9099476

Title: A hybrid ensemble-filter wrapper feature selection approach for medical data classification
Authors: Namrata Singh, Pradeep Singh
Journal: Chemometrics and Intelligent Laboratory Systems
Web: https://doi.org/10.1016/j.chemolab.2021.104396

Title: Spam message detection using Danger theory and Krill herd optimization
Authors: Aakanksha Sharaff, Chandramani Kamal, Siddhartha Porwal, Surbhi Bhatia, Kuljeet Kaur, Mohammad Mehendi Hassan
Journal: Computer Networks
Web: https://doi.org/10.1016/j.comnet.2021.108453

Title: Sentiment analysis from email pattern using feature selection algorithm
Authors: Ulligaddala Srinivasarao, Aakanksha Sharaff
Journal: Expert Systems
Web: https://doi.org/10.1111/exsy.12867

Title: Rice Crop Disease Prediction Using Machine Learning Technique
Authors: Bharati Patel, Aakanksha Sharaff
Journal: International Journal of Agricultural and Environmental Information Systems (IJAEIS)
Web: 10.4018/IJAEIS.20211001.oa5

Title: A QoS aware optimal node deployment in wireless sensor network using Grey wolf optimization approach for IoT applications
Authors: Kavita Jaiswal, Veena Anand
Journal: Telecommunication Systems
Web: https://doi.org/10.1007/s11235-021-00831-9

Title: Deep transfer learning framework for the identification of malicious activities to combat cyberattack
Authors: Deepak Singh, Anurag Shukla, Mohit Sajwan
Journal: Future Generation Computer Systems
Web: https://doi.org/10.1016/j.future.2021.07.015

Title: A cloud-fog computing system for classification and scheduling the information-centric IoT applications
Author: K. Jairam Naik
Journal: International Journal of Communication Networks and Distributed Systems
Web: https://www.inderscience.com/info/inarticletoc.php?jcode=ijcnds&year=2021&vol=27&issue=4

Title: Dynamic workflow scheduling in the cloud using a neural network-based multi-objective evolutionary algorithm
Authors: Siddharth Chandra, Paras Agarwal & K. Jairam Naik
Journal: International Journal of Communication Networks and Distributed Systems
Web: https://www.inderscience.com/info/inarticletoc.php?jcode=ijcnds&year=2021&vol=27&issue=4

Title: Workflow scheduling optimisation for distributedenvironment using artificial neural networks and reinforcement learning
Authors: Mounish Pedagandam, Amrita Mishra, K. Jairam Naik
Journal: International Journal of Computational Science and Engineering
Web: https://www.inderscience.com/jhome.php?jcode=ijcse

Title: Microencapsulation of Cassia fistula Flower Extract with Chitosan and its Antibacterial Studies.
Authors: Vandana Singh Suryavanshi, Tungabidya Maharana, Pratik Kumar Jagtap
Journal: Current Drug Delivery
Web: 10.2174/1567201818666211006102721

Title: Assessment of anesthesia practice patterns for endovascular therapy for acute ischemic stroke: a Society for Neuroscience in Anesthesiology and Critical Care (SNACC) Member Survey
Authors: Deborah A Rusy, Adam Hofer, Mads Rasmussen, Chanannait Paisansathan, Deepak Sharma
Journal: Journal of neurosurgical anesthesiology
Web: 10.1097/ANA.0000000000000661

Title: Convergence of two-stage iterative scheme for K-weak regular splittings of type II
Authors: Vaibhav Shekhar, Snigdhashree Nayak, Nachiketa Mishra, Debasisha Mishra
Journal: Applied Mathematics and Computation
Web: https://doi.org/10.1016/j.amc.2021.126471

Title: Magnetohydrodynamic effect on axisymmetric Stokes low past a weakly permeable spheroid with a solid core
Authors: M. K. Prasad, T. Bucha
Journal: Archives of Mechanics
Web: 10.24423/aom.3857

Title: Couple stress fluid past a sphere embedded in a porous medium
Authors: Krishna Prasad Madasu, Priya Sarkar
Journal: Archive of Mechanical Engineering
Web: 10.24425/ame.2021.139314

Title: Improvement in the prediction of peak particle velocity of blast-induced ground vibrations using K-means clustering
Authors: Rajesh Sonkar, Prakash Y Dhekne, Narendra D Londhe
Journal: Arabian Journal of Geosciences
Web: https://doi.org/10.1007/s12517-021-08620-z

Title: Classification of faults in an IEEE 30 bus transmission system using fully convolutional network
Authors: Anurag Tikariha, Narendra D Londhe, Baidyanath Bag, Ritesh Raj
Journal: International Transactions on Electrical Energy Systems
Web: https://doi.org/10.1002/2050-7038.13134

Title: Computer aided pain detection and intensity estimation using compact CNN based fusion network
Authors: Ashish Semwal, Narendra D Londhe
Journal: Applied Soft Computing
Web: https://doi.org/10.1016/j.asoc.2021.107780

Title: Psoriasis Lesion Detection Using Hybrid Seeker Optimization-based Image Clustering
Authors: Manoranjan Dash, Narendra D Londhe, Subhojit Ghosh, Ritesh Raj, Rajendra Sonawane
Journal: Current Medical Imaging
Web: https://doi.org/10.2174/1573405617666210224112123

Title: Prevention and detection of FDIA on power-network protection scheme using multiple support set
Authors: Tanmoy Kanti Das, Subhojit Ghosh, Ebha Koley
Journal: Journal of Information Security and Applications
Web: https://doi.org/10.1016/j.jisa.2021.103054

Title: Design of a coordinated cyber-physical attack in IoT based smart grid under limited intruder accessibility
Authors: Prasanta Kumar Jena, Subhojit Ghosh, Ebha Koley
Journal: International Journal of Critical Infrastructure Protection
Web: https://doi.org/10.1016/j.ijcip.2021.100484

Title: An Ensemble Classifier Based Scheme for Detection of False Data Attacks Aiming at Disruption of Electricity Market Operation
Authors: Prasanta Kumar Jena, Subhojit Ghosh, Ebha Koley, Murli Manohar
Journal: Journal of Network and Systems Management
Web: https://doi.org/10.1007/s10922-021-09610-y

Title: Design and implementation of a new inverter topology with reduced THD and part count
Authors: Mudadla Dhananjaya, Swapnajit Pattnaik, Devendra Potnuru
Journal: International Journal of System Assurance Engineering and Management
Web: https://doi.org/10.1007/s13198-021-01486-0

Title: A Time-Frequency based backup protection scheme for enhancing grid security against power system blackout
Authors: Kasimala Venkatanagaraju, Monalisa Biswal
Journal: International Journal of Electrical Power & Energy Systems
Web: https://doi.org/10.1016/j.ijepes.2021.107780

Title: A passive communication-based islanding detection technique for AC microgrid
Authors: Ruchita Nale, Monalisa Biswal, Nand Kishor
Journal: International Journal of Electrical Power & Energy Systems
Web: https://doi.org/10.1016/j.ijepes.2021.107657

Title: Swarm Evaluated Threshold Elimination Approach for Symmetrical Fault Detection During Power Swing
Authors: Chinta Durga Prasad, Monalisa Biswal
Journal: IETE Journal of Research
Web: https://doi.org/10.1080/03772063.2021.1986150

Title: Enhancing fault detection function in wind farm-integrated power network using Teaching Learning-Based Optimization technique
Authors: Ch Durga Prasad, Monalisa Biswal, Papia Ray
Journal: International Transactions on Electrical Energy Systems
Web: https://doi.org/10.1002/2050-7038.12735

Title: A flicker-free decoupled ripple cancellation technique for LED driver circuits
Authors: Manish Kumar Barwar, Lalit Kumar Sahu, Pallavee Bhatnagar, Krishna Kumar Gupta, Allamsetty Hema Chander
Journal: Optik
Web: https://doi.org/10.1016/j.ijleo.2021.168029

Title: Comparative Analysis of Surface Mounted and Interior Permanent Magnet Synchronous Motor for Low rating Power Application
Authors: Supriya Naik, Baidyanath Bag, K Chandrasekaran
Journal: Journal of Physics: Conference Series
Web: https://iopscience.iop.org/article/10.1088/1742-6596/2070/1/012119/meta

Title: Model Order Reduction of Discrete Time Interval System based on Time Moment Matching
Authors: A. P. Padhy, V. Singh, V. P. Singh
Journal: Automatic Control and Computer Science
Web: https://link.springer.com/article/10.3103/S0146411621090066?utm_source=xmol&utm_medium=affiliate&utm_content=meta&utm_campaign=DDCN_1_GL01_metadata

Title: A Multi-Objective Metaheuristic Approach Based Adaptive Clustering and Path selection in IoT Enabled Wireless Sensor Networks
Authors: Pallavi Joshi, Ajay Singh Raghuvanshi
Journal: International Journal of Computer Networks and Applications
Web: 10.22247/ijcna/2021/209988

Title: A Gaussian mixture model method for eigenvalue-based spectrum sensing with uncalibrated multiple antennas
Authors: Saikat Majumder
Journal: Signal Processing
Web: https://www.sciencedirect.com/science/article/abs/pii/S0165168421004412

Title: A data fusion-based data aggregation and sensing technique for fault detection in wireless sensor networks
Authors: Shashank Gavel, RaghavrajuCharitha, Pialy Biswas & Ajay Singh Raghuvanshi
Journal:Computing
Web: https://doi.org/10.1007/s00607-021-01011-y

Title: Feature reduction scheme for anomaly-based intrusion detection in wireless networks: Building of hybrid model
Authors: Shashank Gavel, Jyotsana Singh, Namrata Shukla, Ajay Singh Raghuvanshi, Sudarshan Tiwari
Journal: Transactions on Emerging Telecommunications Technologies
Web: https://doi.org/10.1002/ett.4367

Title: High-Performance Exploration of Buried Channel In0.53Ga0.47/InP Stepped Poly Gate MOSFET Using Asymmetric Underlap Gate Spacer
Authors: S. S. Mohanty, S. Mishra, M. Mohapatra, G. P. Mishra
Journal: IETE Technical Review
Web: https://doi.org/10.1080/02564602.2021.1996287

Title: High electric field sensing in ultrathin SiO2 and tunnel region to enhance GaInP/Si dual junction solar cell performance
Authors: Manish Verma, Guru Prasad Mishra
Journal: IEEE Sensors Journal
Web: DOI: 10.1109/JSEN.2021.3131770

Title: Performance Improvement of Heterojunction Double Gate TFET with Gaussian Doping
Authors: Sasmita Sahoo, Sidhartha Dash, Soumya Ranjan Routray, Guru Prasad Mishra
Journal: Silicon
Web: https://doi.org/10.1007/s12633-020-00736-3

Title: Image denoising for magnetic resonance imaging medical images using improved generalized cross-validation based on the diffusivity function
Authors: Sreedhar Kollem, Katta Ramalinga Reddy, Duggirala Srinivasa Rao, Chintha Rajendra Prasad, V. Malathy, J. Ajayan, Deboraj Muchahary
Journal: International Journal of Imaging Systems and Technology
Web: https://doi.org/10.1002/ima.22681

Title: Performance enhancement through optimization of metal oxide electron transport layer in hybrid solar cell
Authors: Deboraj Muchahary, Kodam Priyanka, Lakum Sai Ram, Aarthi Prahitha, Sreedhar Kollem
Journal: Optik
Web: https://doi.org/10.1016/j.ijleo.2021.168102

Title: Robust discriminative feature subspace analysis for kinship verification
Authors: Aarti Goyal, Toshanlal Meenpal
Journal: Information Sciences
Web: https://doi.org/10.1016/j.ins.2021.07.046

Title: Multi-objective feature selection based on quasi-oppositional based Jaya algorithm for microarray data
Authors: Abhilasha Chaudhuri, Tirath Prasad Sahu
Journal: Knowledge-Based Systems
Web: https://doi.org/10.1016/j.knosys.2021.107804

Title: An energy efficient scheme by exploiting multi-hop D2D communications for 5G networks
Authors: Rishav Dubey, Pavan Kumar Mishra, Sudhakar Pandey
Journal: Physical Communication
Web: https://doi.org/10.1016/j.phycom.2021.101576

Title: Stock market forecasting using intrinsic time-scale decomposition in fusion with cluster based modified CSA optimized ELM
Authors: Sudeepa Das, Tirath Prasad Sahu, Rekh Ram Janghel
Journal: Journal of King Saud University-Computer and Information Sciences
Web: https://doi.org/10.1016/j.jksuci.2021.10.004

Title: DLTIF: Deep Learning-Driven Cyber Threat Intelligence Modeling and Identification Framework in IoT-Enabled Maritime Transportation Systems
Authors: Prabhat Kumar, Govind P Gupta, Rakesh Tripathi, Sahil Garg, Mohammad Mehedi Hassan
Journal: IEEE Transactions on Intelligent Transportation Systems
Web: 10.1109/TITS.2021.3122368

Title: Comparative Study of the Different Variants of the DV-Hop Based Node Localization Algorithms for Wireless Sensor Networks
Authors: Amanpreet Kaur, Govind P Gupta, Sangeeta Mittal
Journal: Wireless Personal Communications
Web: https://doi.org/10.1007/s11277-021-09206-4

Title: BDTwin: An Integrated Framework for Enhancing Security and Privacy in Cybertwin-driven Automotive Industrial Internet of Things
Authors: Randhir Kumar, Prabhat Kumar, Rakesh Tripathi, Govind P Gupta, Sahil Garg, Mohammad Mehedi Hassan
Journal: IEEE Internet of Things Journal
Web: 10.1109/JIOT.2021.3122021

Title: Memetic Algorithm based Energy Efficient Wake-up Scheduling Scheme for Maximizing the Network Lifetime, Coverage and Connectivity in Three-Dimensional Wireless Sensor Networks
Authors: Vrajesh Kumar Chawra, Govind P Gupta
Journal: Wireless Personal Communications
Web: https://doi.org/10.1007/s11277-021-09197-2

Title: A distributed ensemble design based intrusion detection system using fog computing to protect the internet of things networks
Authors: Prabhat Kumar, Govind P Gupta, Rakesh Tripathi
Journal: Journal of Ambient Intelligence and Humanized Computing
Web: https://doi.org/10.1007/s12652-020-02696-3

Title: ESOTP: ECC-based secure object tracking protocol for IoT communication
Authors: Suman Majumder, Sangram Ray, Dipanwita Sadhukhan, Muhammad Khurram Khan, Mou Dasgupta
Journal: International Journal of Communication Systems
Web: https://doi.org/10.1002/dac.5026

Title: Prevention and detection of FDIA on power-network protection scheme using multiple support set
Authors: Tanmoy Kanti Das, Subhojit Ghosh, Ebha Koley
Journal: Journal of Information Security and Applications
Web: https://doi.org/10.1016/j.jisa.2021.103054

Title: Identification and prioritization of strategies to tackle COVID-19 outbreak: A group-BWM based MCDM approach
Authors: Naeem Ahmad, Md Gulzarul Hasan, Rejaul Karim Barbhuiya
Journal: Applied soft computing
Web: https://doi.org/10.1016/j.asoc.2021.107642

Title: Numerical Evaluation for Spacer Vane Effects on Flow and Heat Transfer of Water at Supercritical Pressure in Annular Channel
Authors: Satish Kumar Dhurandhar, SL Sinha, Shashi Kant Verma
Journal: Nuclear Science and Engineering
Web: https://doi.org/10.1080/00295639.2021.2003650

Title: Investigation of indoor environment quality and factors affecting human comfort: A critical review
Authors: Ghogare Abhijeet Ganesh, Shobha Lata Sinha, Tikendra Nath Verma, Satish Kumar Dewangan
Journal: Building and Environment
Web: https://doi.org/10.1016/j.buildenv.2021.108146

Title: Role of Information and Communication Technology (ICT) to Enhance the Success of Knowledge Management (KM): a Study in a Steel Plant
Authors: Animesh Agrawal, Chitranjan Kumar, Suraj Kumar Mukti
Journal: Journal of the Knowledge Economy
Web: https://doi.org/10.1007/s13132-020-00694-6

Title: Blockchain drivers to achieve sustainable food security in the Indian context
Authors: Vinay Surendra Yadav, A.R. Singh, Rakesh D Raut, Naoufel Cheikhrouhou
Journal: Annals of Operations Research
Web: https://doi.org/10.1007/s10479-021-04308-5

Title: Design of multi-objective sustainable food distribution network in the Indian context with multiple delivery channels
Authors: Vinay Surendra Yadav, AR Singh, Rakesh D Raut, Naoufel Cheikhrouhou
Journal: Computers & Industrial Engineering
Web: https://doi.org/10.1016/j.cie.2021.107549

Title: Role of heat inputs on microstructure and mechanical properties in coarse-grained heat-affected zone of bainitic steel
Authors: Sanjeev Kumar, Pradeep Kasyap, Chandan Pandey, B. Basu, S.K. Nath
Journal: CIRP Journal of Manufacturing Science and Technology
Web: https://doi.org/10.1016/j.cirpj.2021.09.002

Title: Simulation Based Optimization of Geometrical Factors and Process Parameters for a Continuous Caster to Fabricate Aluminum Based MMC
Authors: Prasenjit Biswas, Santosh Mishra, Mrinal Sahu, Archana Mallik, Sanjeev Das
Journal: International Journal of Metalcasting
Web: https://doi.org/10.1007/s40962-021-00705-5

Title: Cyclic voltammetry to study kinetics of blast furnace slag and cerium dioxide modified electrode
Authors: Arti Mourya, Sudip K Sinha, Bidyut Mazumdar
Journal: International Journal of Chemical Reactor Engineering
Web: https://doi.org/10.1515/ijcre-2021-0101

Title: Sintering effect on the structure and multiferroic behavior of nanostructured BiMnO3 ceramic synthesized by mechanochemical route
Authors: Khushbu K Rahangdale, Subhas Ganguly
Journal: Ferroelectrics
Web: https://doi.org/10.1080/00150193.2021.1991224

Title: Influence of Ga Doping on Multiferroic Behaviour of Modified BiMnO3-BaTiO3 Ceramics
Authors: Khushbu K Rahangdale, Subhas Ganguly
Journal: Journal of The Institution of Engineers (India): Series D
Web: https://doi.org/10.1007/s40033-021-00285-y

Title: Effect of oxygen vacancies on the dielectricity of Ga doped equimolar BiMnO3–BaTiO3 characterized by XPS analysis
Authors: Khushbu K Rahangdale, Subhas Ganguly
Journal: Physica B: Condensed Matter
Web: https://doi.org/10.1016/j.physb.2021.413570

Title: Study of Material Flow and Mechanical Properties of Friction Stir Welded AA2024 with AA7075 Dissimilar Alloys using Top-Half-Threaded Pin Tool.
Authors: Pragya Nandan Banjare, Satya Kumar Dewangan, Manoranjan Kumar Manoj
Journal: Walailak Journal of Science & Technology
Web: https://tis.wu.ac.th/index.php/tis/article/view/4

Title: Effect of TiB2 Particles on the Morphological, Mechanical and Corrosion Behaviour of Al7075 Metal Matrix Composite Produced Using Stir Casting Process
Authors: M Manoj, GR Jinu, J Suresh Kumar, V Mugendiran
Journal: International Journal of Metalcasting
Web: https://doi.org/10.1007/s40962-021-00696-3

Title: Influence of B4C on Dry Sliding Wear Behavior of B4C/Al–Mg–Si Composites Synthesized via Powder Metallurgy Route
Authors: Neeraj Kumar, M.K. Manoj
Journal: Metals and Materials International
Web: https://doi.org/10.1007/s12540-020-00814-6

CONFERENCES / STTPs ORGANIZED

**Title :** National Conference on Advanced Materials and Applications (NCAMA-2021)
Organizing Department : Physics
Duration : November 25-26, 2021
Chairperson : Dr. Sadhana Agrawal
Organizing Secretaries : Dr. Ayush Khare and Dr. K.S. Ojha

3rd National Conference on Advanced Materials and Applications (NCAMA-2021) was organized by Department of Physics during November 25-26, 2021 through virtual mode. It was the third edition of NCAMA where more than 50 participants from different parts of country presented their works. The two-day event was inauguarated by Dr. Prabhat Diwan, Dean (R&C), NIT Raipur. The participants of the conference were addressed by Dr. Jyoti Ranjan Mohanty, IIT Hyderabad and Dr. Jai Singh, Guru Ghasidas Central University, Bilaspur as invited speakers. Some selected papers from the conference will be published in European Physical Journal Special Topics (a Springer Publication).

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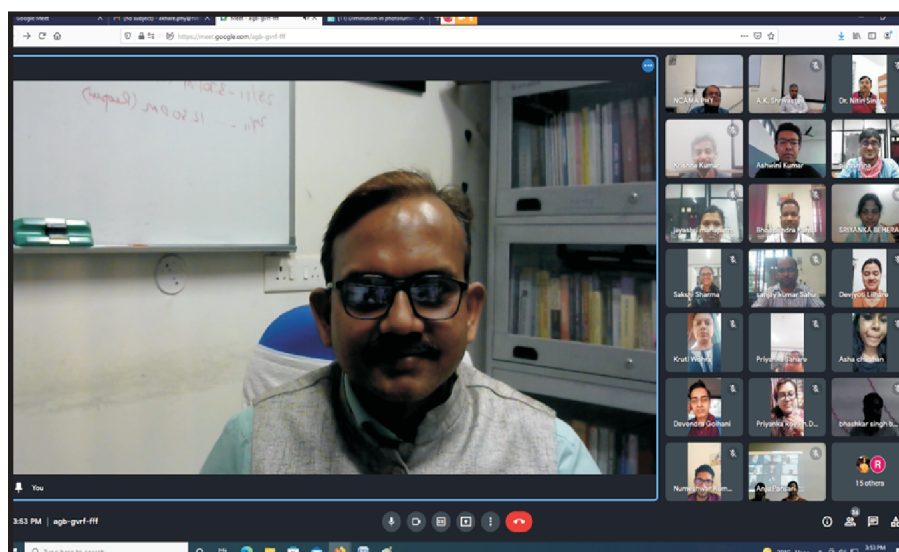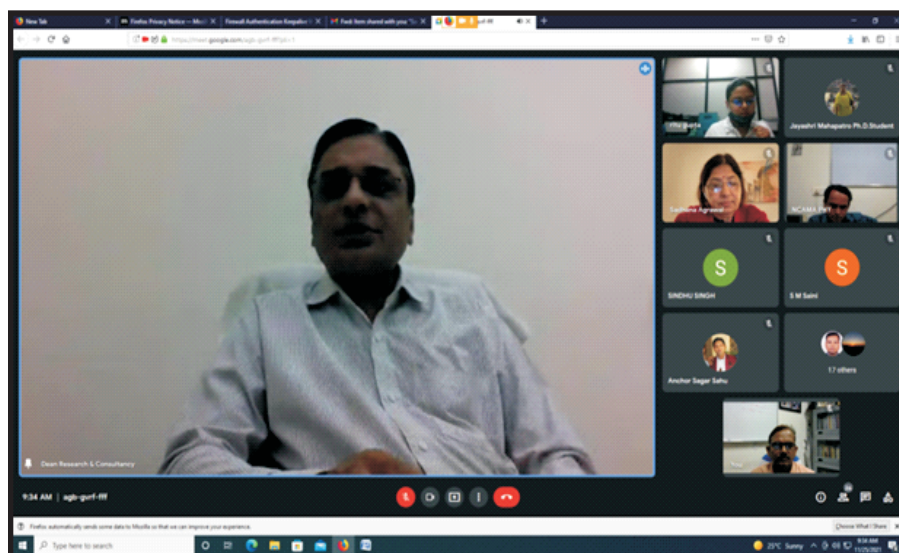
**Title :** National Workshop on Computational Intelligence and Blockchain Technology (CIBT-21)

Organizing Department : Computer Science and Engineering

Duration : December 4-8, 2021

Chairperson : Dr. Dileep Singh Sisodia

Organizing Secretaries : Dr. Preeti Chandrakar and Dr. K. Jairam Naik

The workshop was intended to provide core understanding knowledge and expertise to the research scholars, academicians, and industry professionals in the domain of block chain and computational intelligence. This workshop provided the platform to trade off the ideas among researchers, developers, and practitioners. The lectures were delivered by the eminent experts from IITs and NITs in the field of CI and BT, and implementation, with focus on latest advances in this field. This five day course was conducted with 14 lectures, discussions and hands on laboratory practices with latest tools for the 61 participants.
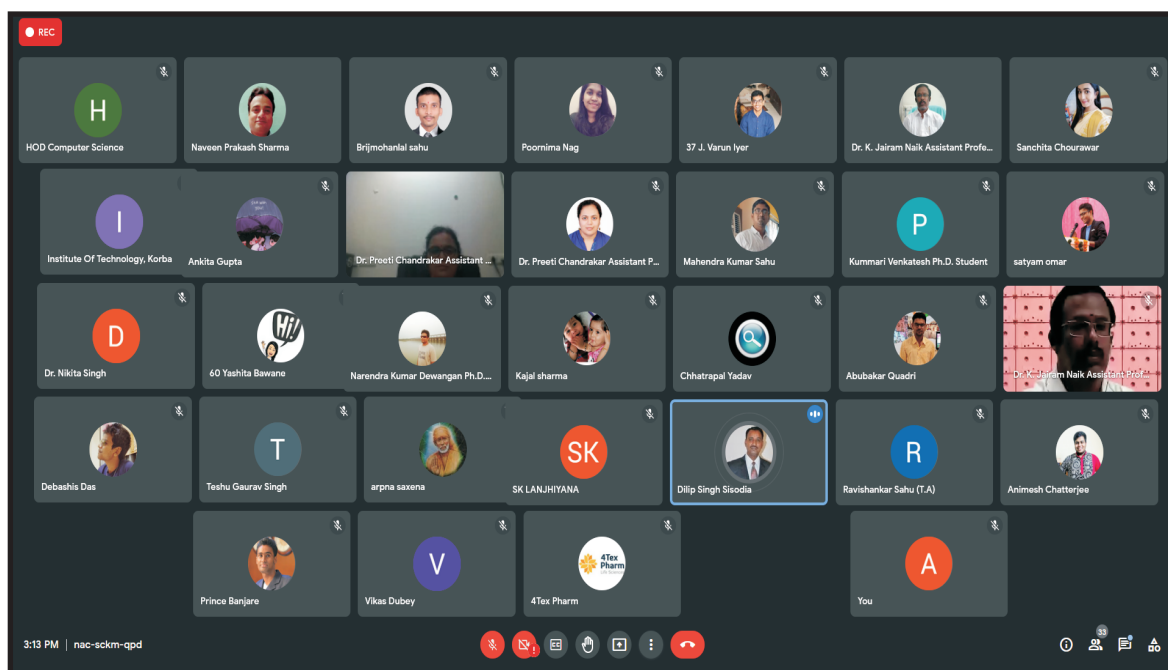
Title : 3rd International Conference on Machine Learning, Image Processing, Network Security and Data Science (MIND-2021)
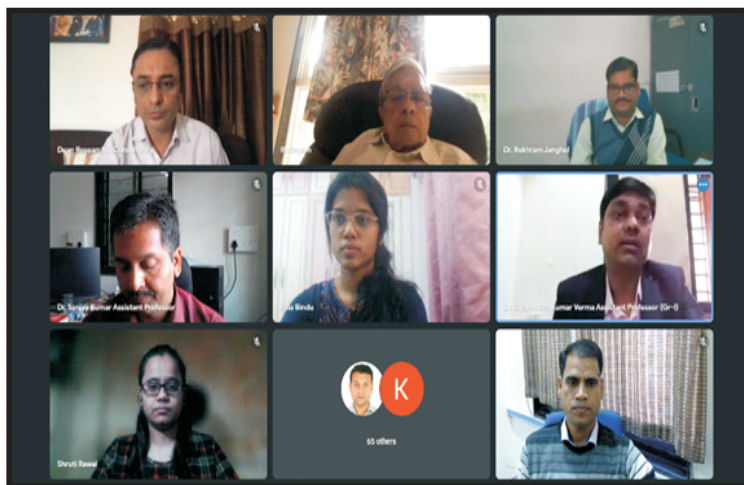
Organizing Department : Information Technology

Duration : December 11-12, 2021

Chairperson : Dr. Rajesh Doriya

Organizing Secretaryies : Dr. Sanjay Kumar and Dr. Rekh Ram Janghel, NIT Raipur, and Dr. Gyanendra Kumar Verma, NIT Kurukshetra, India

The idea behind the MIND-2021 conference series was to bring all the recent advancement in the field of Machine Learning, Image Processing, Networking and Data Science under one umbrella. Its first two editions have been successfully organized by NIT Kurukshetra and NIT Silchar in the year 2019 and 2020, respectively. NIT Raipur had organized 3rd edition of MIND-2021. In MIND-2021, we had received 276 articles from various parts of the world and India. From outside India we had received the articles from Japan, Srilanka, Oman, Bangladesh, Malaysia. In India, we had received articles from ISRO, IIT Kharagpur, CSIR Chandigarh, Army Institute of Technology Pune, MNNIT Allahabad, NIT Surathkal, NIT Trichy, NIT Warangal, NIT Rourkela, VNIT Nagpur, NIT Raipur, MANIT Bhopal, NIT Jalandhar, NIT Andhra Pradesh, NIT Silchar, NIT Agartala, NSIT New Delhi, ABV IIITM Gwalior, IIIT Allahabad, IIIT Naya Raipur, IIIT Lucknow, College of Engineering Pune are to name few. We had also received the submissions from the R&D industries as well.

After a peer review process and strict plagiarism compliance, out of 276 articles only 71 articles have been accepted. This time, all the accepted and presented papers will be published in Scopus indexed proceedings with Springer in their prestigious "Lecture Notes in Electrical Engineering" series.

In MIND-2021, four distinguished experts delivered keynote speeches in MIND-2021 conference.
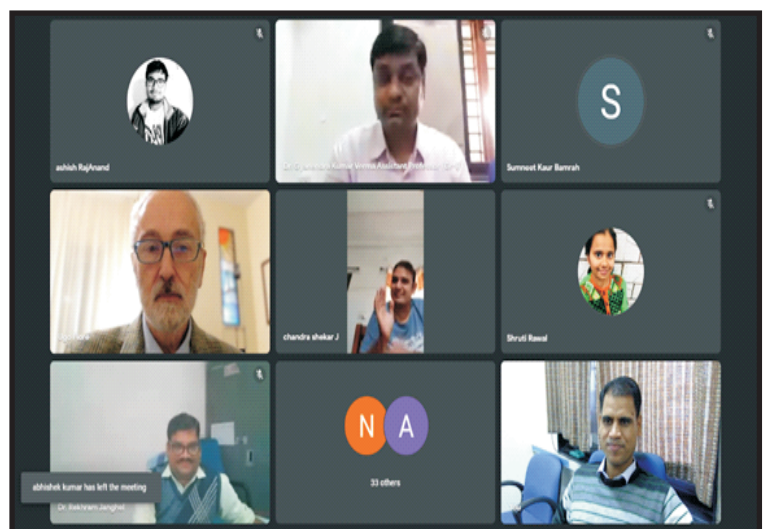
Dr. Prabhat Diwan, Dean (R&C) inaugurated the MIND-2021 along with the Guest of Honor, Prof. R.K. Shyamsundar, and HoD (IT) whereas the event was concluded by chief guest Dr. P.Y. Dhekne, Dean (SW) along with HoD (IT) with concluding remarks.

Title : 4th International Conference on Information Systems and Management Science (ISMS - 2021)

Organizing Department : Computer Science and Engineering Department, National Institute of Technology Raipur, India and The Faculty of ICT, University of Malta, Malta
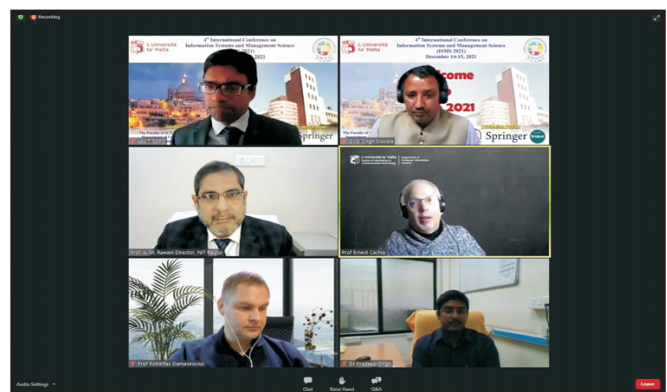
Duration : December 14-15, 2021

Chairpersons : Dr. Lalit Garg and Dr. Dilip Singh Sisodia

Organizing Secretaries : Dr. Pradeep Singh, Dr. Deepak Singh and Dr. Jitendra Kumar Rout

4th International Conference on Information Systems and Management Science (ISMS-2021) was jointly organized by the Department of Computer Science and Engineering, National Institute of Technology Raipur, India and The Faculty of ICT, University of Malta, Malta during December 14-15, 2021(Virtual Mode). ISMS-2021 was inaugurated on 14th December with an inaugural address by Prof. A. M. Rawani, Director, NIT Raipur and Prof. Ernest Cachia, Head, Faculty of ICT University of Malta. Inaugural speakers highlighted the theme ISMS-2021 and importance of organizing joint international conferences and other collaborative activities between faculty, research scholars and students of both the universities. Both the speakers also shared their immense knowledge and experience regarding teaching and research ideas along with glimpses of both the Institute's history, heritage, and current status. ISMS-2021 organizing chairs Dr. Lalit Garg from University of Malta and Dr. Dilip Singh Sisodia from NIT Raipur welcomed all guests, speakers, and participants. Conference secretaries Dr. Pradeep Singh, Dr. Deepak Singh and Dr. Jitendra Kumar Rout from NIT Raipur presented vote of thanks to the guests and speakers.

The four keynote speakers for the conference were Dr. Robertas Damaševicius, Kaunas University of Technology, Kaunas, Lithuania, Prof. Pradeep Kumar, Indian Institute of Management Lucknow, India, Prof Nizar Zorba, Qatar University, Doha, Qatar, Prof. Ram Bilas Pachori, Indian Institute of Technology Indore, India. The keynote speakers shared their experience and ideas in their respective domain expertise. Dr. Robertas Damaševicius, delivered talk on Data Augmentation Methods for small datasets, Prof. Pradeep Kumar on AI in business, Prof. Zorba on Crowd Sensing Challenges and Prof. Pachori on Multi-channel EEG signal processing for brain disease diagnosis.

ISMS-2021 received a total 111 full papers for peer review. After conducting double blind peer reviews 48 papers were selected for presentation. The conference proceedings will be published by Scopus indexed Springer LNNS book series. The valedictory session was addressed by Prof. Carl James Debono, Dean, Faculty of ICT, University of Malta, Malta and Dr.Shrish Verma,Dean (Academic Affairs) and Dr. Prabhat Diwan, Dean (Research & Consultancy) of NIT Raipur, India. ISMS-2021 organizing chairs Dr. Lalit Garg from University of Malta and Dr.Dilip Singh Sisodia from NIT Raipur expressed their gratitude for the kind of support from all stakeholders.

**Title :** Advances in Chemical and Environmental Engineering (ACEE-2021)
Organizing Department : Chemical Engineering
Duration : December 16-17, 2021
Chairperson : Dr. P. K. Chaudhari
Organizing Secretaries : Dr. A. K. Poonia, Dr. Prabir Ghosh and Dr. Chandrakant Thakur

Two days International Conference on Advances in Chemical and Environmental Engineering (ACEE-2021) was organized by Department of Chemical Engineering, NIT Raipur during 16-17 December 2021. Conference was inaugurated by Dr. P. Diwan, Dean, (R&C) NIT Raipur and Dr. Akshat Tanksale, keynote speaker of the conference. Dr. Dipendu Saha had given his keynote talk on second day of the conference. More than 65 participants presented their research ideas during this two days event. Paper presentation session were chaired by various experts of different NITs. Based on their evaluation, best paper and best presenter awards were given to the participants. The conference covered various topics and new research ideas in the field of chemical and environmental engineering. The coneference valedictory ceremony was organized on 17th December 2021 evening in the presence of Dr. Shrish Verma, Dean (Academics), NIT Raipur. During this ceremony conference proceeding was launched.
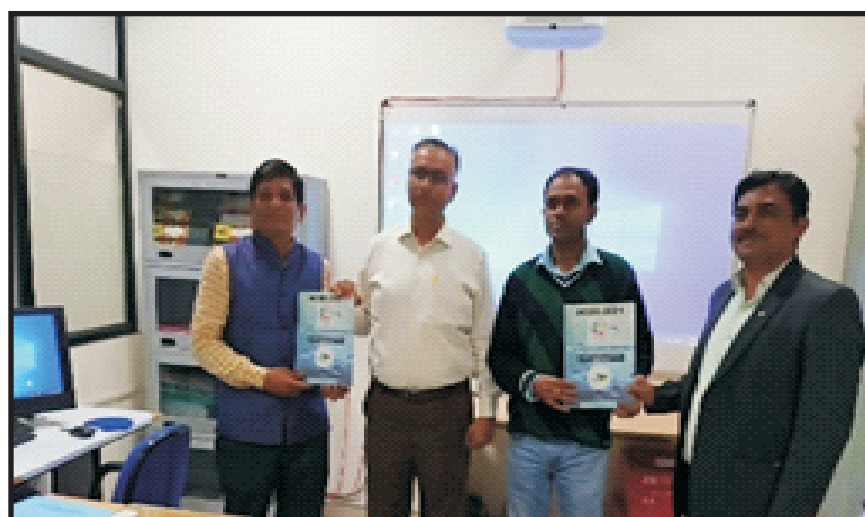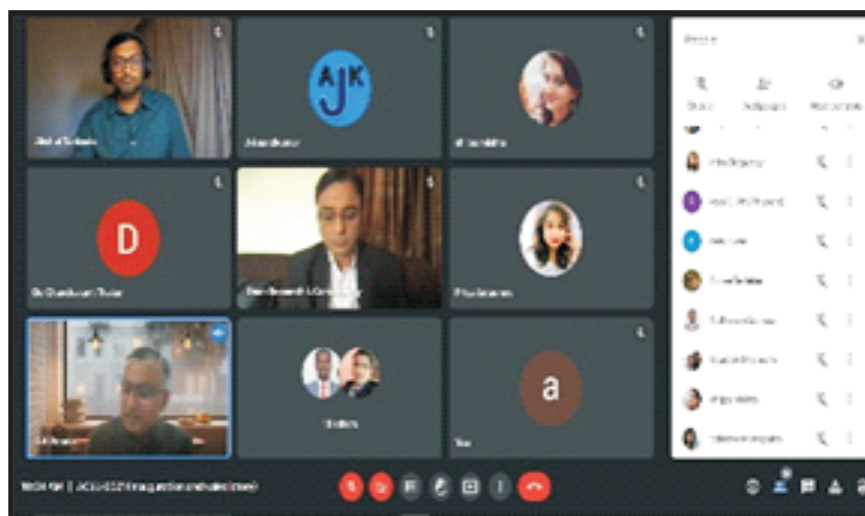
Title : 1st International Virtual Conference on Recent Advances in Material Science and Organic Synthesis (RAMSOS-2021)
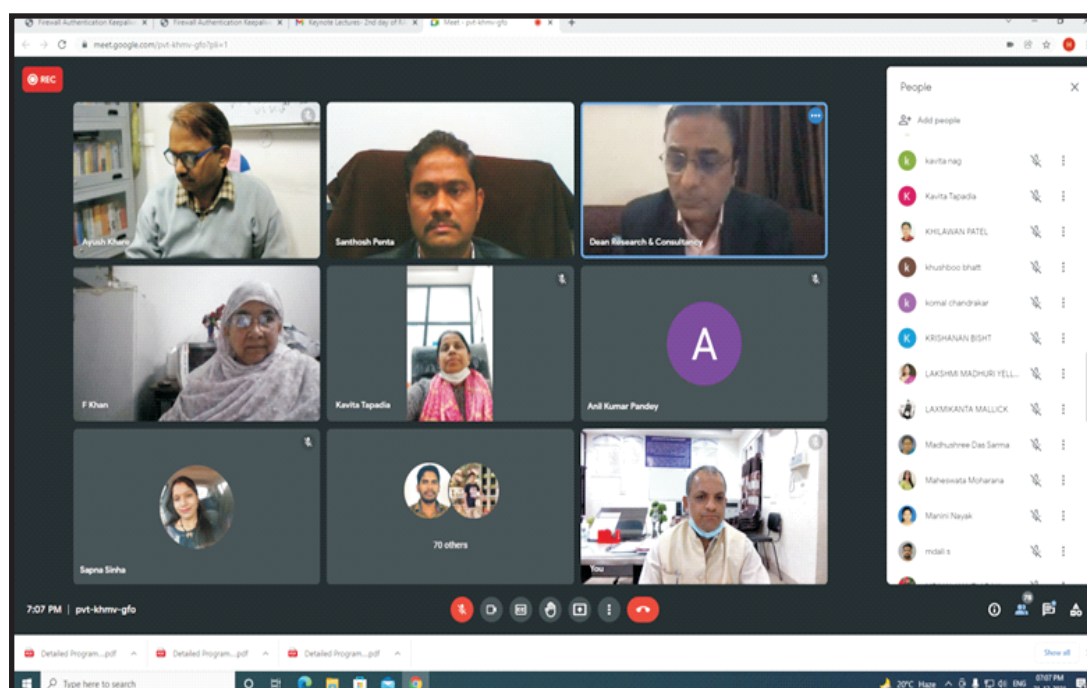**Organizing Department :** Chemistry
Duration : December 20-21, 2021
Organizing Secretaries : Dr. Santhosh Penta, Dr. (Mrs.) K. Tapadia and Dr. S.P. Mahapatra
Chairperson : Dr. (Mrs.) F. Khan

Department of Chemistry, NIT Raipur organized two-days 1st International Virtual Conference on "Recent Advances in Material Science and Organic Synthesis" (RAMSOS-2021) during December 20-21, 2021. The event was successfully organized by Dr. Santhosh Penta, Dr. K. Tapadia and Dr. S.P. Mahapatra (HoD Chemistry) as organizing secretaries and Prof. F. Khan as Chairperson. The RAMSOS-2021 International Conference was inaugurated by Dean (Academic Affairs), Prof. Shrish Verma. Two plenary lectures were delivered by Prof. Kwang Pyo Kim, Kyung Hee University, South Korea and Prof. Uwe Beifuss,University of Hohenheim, Germany. In addition to this, 5 keynote lectures were delivered by eminent professors from IITs and NITs. The event was witnessed with 102 research paper presentations by faculty members and research scholars related to material science and organic synthesis from different institutes, universities and research organizations in 6 oral presentation sessions. As per the consent from different publishers, full research papers presented in this conference are going to be published in International SCI and Scopus Indexed Journals such as "International Journal of Materials Research", "Journal of Structural Chemistry" and "Materials Today: Proceedings" after peer review process. Dr. Prabhat Diwan, Dean (R&C), NIT Raipur was the chief guest of the valedictory function. He declared the "Best Oral Presentation Awards" and concluded the event by motivating all the participants and organizers.

Title : Online Faculty Development Programme(FDP) on Data Science and Its Applications
Organizing Departments : E & ICT Academy, NIT Warangal, Telangana in association with Department of Computer Science and Engineering, NIT Raipur
Duration : January 10 -19, 2022
Organizing Secretaries : Dr. Aakanksha Sharaff, NIT Raipur and Dr. S. K. Panda, NIT Warangal

This Online FDP was devoted to address the need to enhance the knowledge about the latest development pertaining to Data Science and its Applications.The whole course was handled by academicians from IITs/NITs/IIITs/IISERs/NISERs/Abroad and industry experts in the concerned field.The program was open to the faculty of engineering colleges, MCA colleges and other allied disciplines in India. Many industry personnel working in the concerned/allied discipline also attended this program.

UPCOMING EVENTS (CONFERENCE / SEMINAR / STTP, etc.)

Title : International Conference on Applied Mechanics, Machine Learning and Advanced Computation (AMMLAC- 2022)
Organizing Departments : Department of Mechanical Engineering and Department of Computer Science & Engineering
Duration : March 11 -12, 2022
Organizing Secretaries : Dr. Rajana Suresh Kumar and Dr. Nisha Netam, Department of Mechanical Engineering; Dr. Aakanksha Sharaff, Department of Computer Science and Engineering;
Chairman : Dr. S. Sanyal, Department of Mechanical Engineering
Participants : UG/PG/PhD Students, faculties, researchers, industry professionals, foreign students/professionals
Registration fees : UG/PG/PhD Students - Rs. 4500.00, Faculties/researchers/industry professionals - Rs. 5500/- and Foreign participants - USD 200.00

The International Conference on Applied Mechanics, Machine Learning and Advanced Computation (AMMLAC-2022) will provide a platform for sharing knowledge on applications of Applied Mechanics, Machine Learning and in an interdisciplinary area of machine learning applications in Applied Mechanics and Advanced Computation. The conference also provides an opportunity to the students, researchers and professionals from both academia and industry to meet and share the cutting-edge developments thru technical discussions. It also allows the delegates to address scientific and technological issues of the world with up-to-date advancements in the field and provide information on new methods, techniques, and applications. This conference also has interactive panel discussions and keynote talks, oral, and poster presentations in Virtual mode. Comprehensive sessions are planned to address recent advances in computational techniques to cater to the needs of global market with an objective to transfer knowledge from research to industry and vice-versa.

Title : 1ˢᵗ International Conference on Smart Materials and Applications (SMA-2022)
Organizing Department : Physics
Duration : March 4-5, 2022
Chairperson : Dr. Sadhana Agrawal
Organizing Secretaries : Dr. B.K. Sahoo, Dr. S.M. Saini and Dr. Ayush Khare
Participants : PhD Students, faculty members and persons from industries
Registration fees : PhD Students - Rs. 1180.00 (only abstract presentation), Rs. 4720.00 (abstract presentation and publication), faculties - Rs. 1770.00 (only abstract submission), Rs. 5900.00 (abstract presentation and publication) and Persons from industry - Rs. 7080.00

The Department of Physics is going to organize its first ever International Conference on Smart Materials and Applications (SMA-2022) during March 4-5, 2021. The conference will provide a platform to the young researchers and scientists not only from India but abroad as well. A number of foriegn experts are being approached to share their knowledge with the young minds and guide them for future works. After presentation, the selected papers will be considered for publication in SCOPUS/SCI journal.

Title : International Conference on Computational Intelligence and Network Security (ICCINS-2022)
Organizing Department : Computer Science and Engineering
Duration : March 3-4, 2022
Chairman : Dr. Dileep Singh Sisodia
Organizing Secretaries : Dr. K. Jairam Naik and Dr. Preeti Chandrakar
Participants : Research scholars and students, academicians, faculties, scientists and industry professionals
Registration fees : Research scholars- Rs. 5900.00, Academicians/faculties/scientists- Rs. 7080.00 and Industry professionals- Rs. 8260.00

The Department of Computer Science & Engineering, NIT Raipur is organizing its 1ˢᵗ International Conference "Computational Intelligence and Network Security (ICCINS-2022)" during March 3-4, 2022 for deliberating with distinguished experts in this field. This invitation is open for all academicians, research scholars, post-docs, PG and UG students functioning in the relevant areas. It also provides a premier interdisciplinary platform for researchers, practitioners and educators to present and discuss the most recent innovations, trends, and concerns as well as practical challenges encountered and solutions adopted in relevant areas. Authors submitting full paper will be considered for Online Oral Presentation & Publication in AIP Book Series (Scopus &WoS Indexed) subjected to peer review policy. The invited speakers of the event are Dr. Khalid Mohiuddin, Professor, King Khalid University, Saudi Arabia and Dr. Arup Kumar Pal, Associate Professor, IIT Dhanbad, India.

ARTICLES OF PRIME RELEVANCE

Lattice Boltzmann Method: An Alternative Numerical Computational Technique

Abhishek Sahu and Shubhankar Bhowmick

Department of Mechanical Engineering

National Institute of Technology Raipur, India

In the context of engineering problems related to real world applications, determining an exact solution is always a challenging task. During the last century, various computational methods came into existence for solving governing equation of concerned domain. These conventional techniques (FVM, FDM and FEM) are based on macroscopic scale, wherein the fluid and matter are treated as continuum and the governing equation is derived. Further, discretization and iterative technique are implemented on governing differential equations until the convergence is achieved. In addition, the advent of computers in latter decades have accelerated the use of these method and established themselves as powerful computational tools for exploring the fluid dynamics and heat transfer phenomenon. In spite of having easy understanding and simple methodology, determining numerical solution involving complex phenomenon, irregular geometry and intricate boundary condition with sufficient accuracy and stability is always an uphill task by using conventional techniques. In the present write-up, a relatively new and advanced computational technique based on Boltzmann Equation is reported as an alternative computational tool for advanced and complex fluid simulations.

The measure of flow is widely known to be carried out in either of the two levels of description: continuum or atomistic. On one hand, the continuum level describes the fluids with the help of spatial and temporal derivatives of flow parameters such as density, velocity, pressure, etc., while on the other, as it is a well-accepted and proven fact that fluids are ultimately a compilation of atoms and molecules, their discrete behaviour becoming apparent from nano-meter scale and below, the measurement of flow at such scale delves into the atomistic level of description. Lesser known, there exists a third but intermediate level of describing the fluid flow. This alternative but relatively modern level of description considers fluids from a statistical mechanics viewpoint and treats fluid as a set of particles with probability distributions wherein the fluid motion is represented by a probability of finding a given fluid particle at a given position in space (r) and time (t), with a given velocity, (v). This third level of description is the mesoscopic level and is based on kinetic theory of gases and is subsequently derived from Boltzmann's equation [1]:

$$\frac{\partial f}{\partial t} + \vec{v}.\nabla f = C(f,f) \tag{1}$$

In Eq. 1, the left-hand side, with the probability distribution function (f(r,v;t)) as the dependent variable in PDE, represents the non-local,free streaming of the particles and the right-hand sides describes the changes in the probability distribution function induced by inter-particle collisions.This collision term is local and highly non-linear.

The advantage of using Boltzmann Equation for flow simulation lies in (1) being immensely economical than the atomistic description due to its mesoscopic nature and (2) in holding larger volume of information than the continuum description, since the probability distribution function lives in a six-dimensional space spanned by particle position and velocity each (three dimensions each).The minimal form of Boltzmann equation (Eq. 1)is Lattice Boltzmann Equation which simulates the dynamic behaviour of fluid flows without directly solving the equations of continuum fluid mechanics [2]:

$$f_i(\vec{r} + \vec{c}_i \Delta t, t + \Delta t) = f_i(\vec{r};t) + \Omega_{ij}\left(f_j^{eq}(\vec{r};t) - f_j(\vec{r};t)\right) \tag{2}$$

In Eq. 2, the first term on the right-hand side represents the probability of finding a particle at position r and time t with velocity v =ci. where i is the set of discrete speeds connecting nodes of a regular lattice (for example, in case of 2D and 3D lattices as shown in Fig. 1 (a-b), i=1, 2,3 …9 and i= 1, 2, 3…15 respectively).
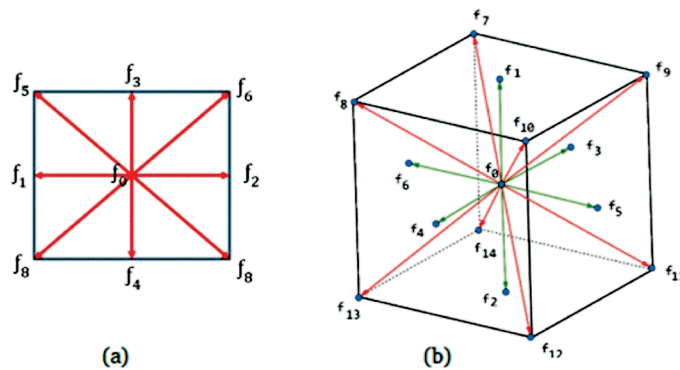

Fig. 1 (a-b) Schematic of 2D (D2Q9) and 3D (D3Q15) lattices

Technically, with i being the set of discrete speeds connecting the nodes of regular lattice which means that at each site the particles can only move along a finite number of directions in straight lines, the advantage of LBE, then, is reduced degrees of freedom associated with the velocity space. By givingthe set of ciwith sufficient symmetries to satisfy the laws of conservation of mass, momentum and energy, LBE quantitatively reproduces the equations of fluid motion of continuum description level [3].As a computational fluid dynamics solver, the distinctive features of LBE are its space-time locality. One of the main computational distinctions of Lattice Boltzmannis that in contrast to Navier-Stokes equation, streaming is exact, since it proceeds along constant streamlines and non-locality (streaming, LHS) is linear and non-linearity (collision, RHS) is local. In Navier-Stokes equations, the transport term is non-local and non-linear at a time. Other than this, complex boundary

conditions are readily formulated with the help of elementary bounce-back, reflections etc. of the lattice 'molecules' with solid walls. In LB formulation, pressure and strain tensor are locally available as linear combinations of the equilibrium and non-equilibrium components of the discrete distribution function, f, and subsequently the pressure can now be easily and directly post-processed from the flow field. Last, but not the least, LBE is highly amenable to parallel computing. These salient features help LBE acquire success as Navier-Stokes simulator 'in kinetic disguise' and render it to be a highly conceptual, effective and computationally efficient alternative numerical technique for complex fluid dynamic problems.

Since the last three decade there is enormous growth in the usage of LBE/LBM for fluid dynamics and heat transfer problems. In addition to describing non-ideal gas effects driven by potential energy interactions, LBM can solve all transport phenomena controlled by advection-diffusion-reaction mechanisms, as well. Applications of LBM are reported in solving flow over a bluff body, diverse quantum mechanics, nanofluids, microfluid devices, image processing etc. In the recent past, LBE/LBM have shown its capability to becoupled with various conventional methodssuch as FEM, FDM and FVM with ease.As a result, derivatives of LBM such as FD-LBM, FE-LBM, FV-LBM and also LBM-LBM have also been reported in recent literatures. Understanding and implementation of Lattice Boltzmann Method requires the in-depth knowledge of mathematics, and complete background of statistical mechanics and kinetic theory. Proponent of LBM believe that, these methods have a potential to be successfully applied in the various scientific fields of physics, chemistry, biomedicine, biochemistry, materialscience, hemodynamics, micro and nano-fluidics etc. At the set levels of engineering accuracy, realizing its full potential poses many challenges ahead to be overcome and the constraints are certainly not on the side of the tool but are due to the end user's limited imagination and understanding only.

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Cyber-Physical Security in Smart Grid

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Introduction

The continuous rise inelectricity demand accommodated by theintegration of distributed energy resources (DERs) have raised the concern towards maintainingsafety, dependability and reliability in the power delivery. Thus, to enhance the efficiency and reliability in the power quality, the legacy power grid infrastructure has to be modernised with the advancement in monitoring, control and communication technologies. In this regard, the use of advanced metering infrastructure (AMI) incorporating phasor measurement units (PMUs), intelligent electronic devices (IEDs), smart meters (SMs) enabled with the internet technologies for the communication and control mechanism has revolutionised the power system into smart grid. The amalgamation of hybrid energy resources,active load units through internet of things (IoT) enabled monitoring, control and communication technologies has led smart grid to be the most complex cyber-physical system.However, the heterogeneity in the integration of cyber and physical infrastructure has increased its vulnerability to attacks at physical and cyber layer.The architecture of smart grid is shown in Fig. 1.
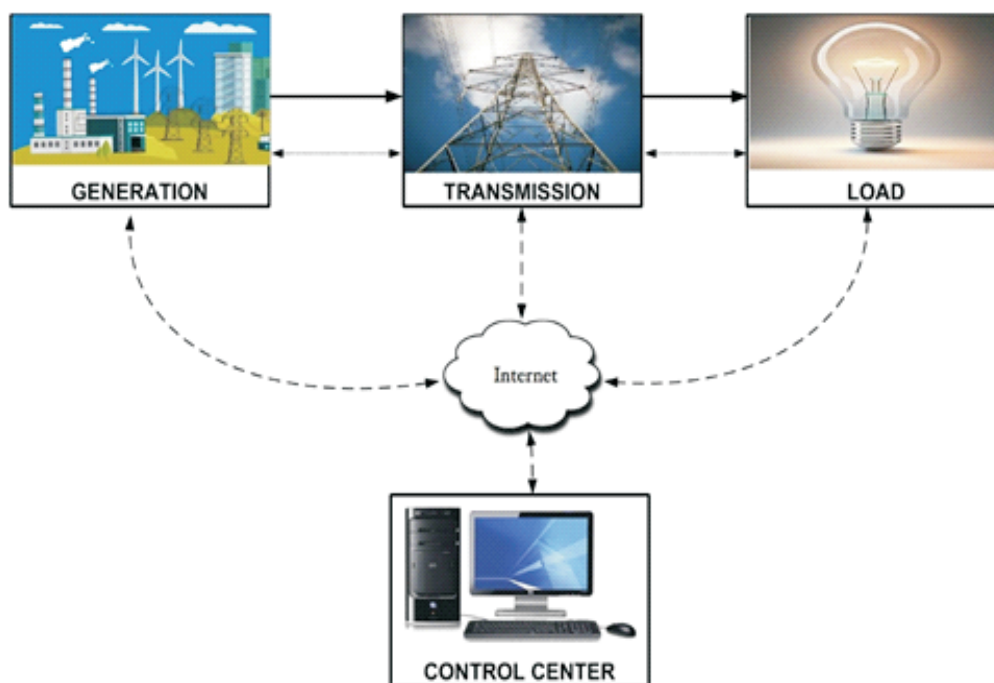

Fig. 1 Architecture of smart grid

Traditionally, power grid infrastructure was prone to attacks at the physical layer aiming at the power system units. The attack on California power station to alter network topology by targeting generators, transformers, and optical fibre cables resulted in blackout due to

cascading failures. With the increasing penetration of cyber technologies at the control and operation layer, the power sector has experienced threat at the cyber layer. The attack on the Israel electricity authority through injection of malware raised the concern towards securing the industrial infrastructure against cyber threats. Recently, the attack on Ukraine power grid through the intrusion of malware into the control system followed by remotely switching of the circuit breakers and disrupting the telecommunication network led to blackout for several hours. The proper coordination in the execution of attack at cyber and physical layer has demonstrated the severity of the cyber-physical attack.

Types of Cyber Attacks

The supervisory control and data acquisition system (SCADA) acquires network information by collecting the system measurements through the measurement devices deployed across the wide area network. The cyber-attack aims at manipulating the sensor information by injecting malicious information while transmitted through the communication network. Depending upon the execution and objective of injecting the malicious information, cyberattacks have been classified into following types.

1. **Random cyber attack:** In this case, the intruder injects malicious sensor information into the sensor measurements to disrupt the state estimation and thus, the control actions. The sensor information may be modified at the output of sensors or during transmission through the communication channel.

2. **Cyber-topology attack:** Cyber-topology attack targets at altering the network topology without physical disconnection of line/ bus interconnection. In this case, the intruder injects a falsified status regarding line connectivity or on/off status of a circuit breakers connecting two buses. The reconfiguration in network topologycompels the control center operator to redistribute the optimal power flow.

3. **Denial of Service (DoS) attack:** The DoS attack aims at restricting the control center operator regarding the real-time situational awareness by accessing a specific network resource. The intruder executes a DoS attack either by sending malformed data packets into the communication channel, or by exhausting the server (CPU, memory, data bandwidth) or user (bandwidth, router processing capacity) network resources to restrict control center operator regarding the real-time situational awareness.

4. **Replay Attack:** The replay attack aims at mimicking a previously recorded event, the network has already encountered. Under this case, the intruder injects a set of data packets manipulating the sensor information and network configuration from the recorded events during normal scenario to evade the standard attack detection mechanisms.

Attack detection and mitigation

Considering the rising threats to the power systems and its consequences, it is essential to develop necessary countermeasures to ensure a safe and reliable operation in the energy

delivery. The various methods adopted towards detecting and eliminating the impact of cyber-attack are as follows

1. **Data driven detection approach:** The data driven approaches rely on the dataset used for training and testing the normal or attacked scenario. The algorithm is trained based on the signatures of past recorded normal, contingency and attack scenarios. The lack of sufficient dataset for the attack cases necessitates the training of the classifier by incorporating pseudo attack vectors. Thus, the continuous evolution in attack scenarios of which the detection algorithm has not been trained causes to affect the accuracy of attack detection.

2. **Forecasting techniques:** The attack detection can be accomplished by using the forecasted values of sensor measurements based on the network parameter, configuration and load demand. Under such scenario, the detection accuracy heavily depends on the accuracy of forecasted data. However, the dynamics in the power system parameters affect the detection accuracy by violating the detection thresholds.

3. **Securing critical sensors:** The detection of data driven and forecasting techniques can be enhanced by incorporating the secured sensor readings at the identified critical locations. The secured sensor information restricts the intruder to inject any random data into the sensor measurements, as the same would allow the attack detection by violating the physics associated with the network parameters.

The attack detection can be carried out to eliminate the corrupted measurements from the dataset accumulated at the SCADA. In case the corrupted measurements are not possible to be removed, the awareness regarding the attacks allows the intruder to minimise the impact by minimizing the involvement of malicious measurement in executing the smart grid operations.

The evolution of cyber threats in form of Stuxnet, Havex, Blackenergy, and Triton over the years has increased the threat towards securing the smart grid against possible cyber threats. In this regard, the detection and mitigation mechanisms relying on the trained dataset doesn't ensure a secure operation against possible threats. Further, securing all the sensors and communication channel across the wide geographical area limits its implementation due to economic feasibility. In this regard, securing the smart grid against threats at the physical and cyber layer is major challenge to be solved.
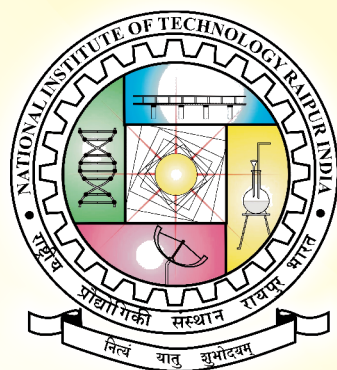
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