Lecture Notes in Electrical Engineering 1116

Shruti Jain · Nikhil Marriwala ·
Pushpendra Singh · C. C. Tripathi ·
Dinesh Kumar *Editors*

Emergent Converging Technologies and Biomedical Systems

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Volume 1116

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Preface

Jaypee University of Information Technology Waknaghat has been known for excellence in academics, research and distinguished faculty since its inception. Jaypee Group is always supportive of the initiatives of bringing together the academicians and industry professionals producing quality and productive research. As a technical education university JUIT is committed to be a leader in adopting technological advancements to train the future engineers.

3rd Emergent Converging Technologies and Biomedical Systems (ETBS 2023) organized by the Department of Electronics and Communication Engineering and Department of Computer Sciences and Engineering and Information Technology, Jaypee University of Information Technology (JUIT) in collaboration with DST iHub-AWaDH and Indian Institute of Technology Ropar at JUIT from May 15–17, 2023. The conference is sponsored by the ***Council of Scientific and Industrial Research (CSIR) and the Biomedical Engineering Society of India (BMESI)***. The aim of the ETBS is to serve researchers, developers, and educators working in the area of signal processing, computing, control, and their applications to present and future work as well as to exchange research ideas. 2023 ETBS invites authors to submit their original and unpublished work that demonstrates current research in all areas of emergent converging technologies, signal/image processing, computing, and their applications. ETBS 2023 solicits full length original and unpublished papers, based on theoretical and experimental contributions, related, but not limited to the following tracks, are solicited for presentation and publication in the conference: Engineering in Medicine and Biology, Signal Processing and Communication, Emerging Smart Computing Technologies, Internet of Things for emerging Engineering Applications, Next Generation Computational Technologies This conference is one of the premier venues for fostering international scientific and technical exchange across research communities working in multiple domains. The 3rd ETBS 2023 technical program committee put together a program, consisting of 13 technical sessions and 8 invited talks.

We are thankful to our Chief Guest **Prof. Rajeev Ahuja**, *Director IIT Ropar* and Guest of Honors: **Mr. Bharat Kumar Sharma**, *Director and GPU advocate NVIDIA AI Tech Centre India*, and **Dr. Narayan Panigrahi**, *Scientist-'G', Group*

Head GIS Centre for Artificial Intelligence and Robotics Bangalore for gracing the inaugural session of ETBS 2023. We are also thankful to our Advisors **Prof. (Dr.) Dinesh Kumar**, *Electrical and Computer System Engineering, RMIT, University, Melbourne, Australia and* **Prof. C. C. Tripathi**, *Director, NITTTR, Bhopal*. We are also thankful to the speakers **Professor Sharath Sriram**, *Coordinator, Functional Materials and Microsystems Research Group, RMIT University, Melbourne, Australia*, **Dr. Vishal Sharma**, *School of Electronics, Electrical Engineering and Computer Science, Queen's University, Belfast, UK*, **Mr. Bharat Kumar Sharma**, *Director and GPU advocate NVIDIA AI Tech Centre India*, **Dr. Narayan Panigrahi**, *Scientist-'G', Group Head GIS Centre for Artificial Intelligence and Robotics Bangalore*, **Prof. Sanjeev Narayan Sharma**, *Dean Academics, IIITDM, Jabalpur, Madhya Pradesh, India*, **Prof. Ram Bilas Pachauri**, *Electrical Engineering Department, IIT Indore, Madhya Pradesh, India*, **Mr. Ashish P. Kuvelkar**, *Senior Director (HPC-Tech) C-DAC, Pune*, **Ms. Kamiya Khatter**, *Editor—Applied Sciences and Engineering* who spared time to share their knowledge, expertise and experience spite of their busy schedules.

ETBS 2023 have been able to garner an overwhelming response from the researchers, academicians, and industry from all over the globe. We have received the papers from Australia, United Kingdom, Jordan, Malaysia, Denmark, South Korea, Bangladesh, Saudi Arabia, Malaysia etc. making it truly International. We received papers pan-India from Tamil Nadu, Telangana, Andhra Pradesh, Bangalore, Karnataka, Punjab, Uttar Pradesh, Dehradun, Chandigarh, Haryana, New Delhi, West Bengal, Rajasthan, Uttarakhand, Madhya Pradesh, and not to mention our neighboring states. The authors are from premium institutes IITs, NITs, Central Universities, PU, and many other reputed institutes.

We have received over 310 research papers, out of which 57 papers were accepted, registered, and presented their research papers during the three day conference, acceptance ratio being 18.3%. We truly believe the participation of researchers from different universities and institutes, working on applications of thematic areas of the conference across the domains in this conference and deliberating their research issues and outcomes resulted in fruitful and productive recommendations.

We sincerely hope you enjoy the conference proceedings and wish you all the best!!!

Organizing Committee
ETBS 2023

About This Book

This book will provide a platform and aid to the researchers involved in designing systems that will permit the societal acceptance of ambient intelligence. The overall goal of this book is to present the latest snapshot of the ongoing research as well as to shed further light on future directions in this space. The aim of publishing the book is to serve educators, researchers, and developers working in the area of recent advances and upcoming technologies utilizing computational sciences in signal processing, imaging, computing, instrumentation, artificial intelligence, and their applications. As the book includes recent trends in research issues and applications, the contents will be beneficial to professors, researchers, and engineers. This book will provide support and aid to the researchers involved in designing the latest advancements in healthcare technologies. The conference "Emergent Convergent Technologies and Biomedical Systems" encompasses all branches of Engineering in Medicine and Biology, Signal Processing and Communication, Emerging Smart Computing Technologies, Internet of Things for Emerging Engineering Applications, Next Generation Computational Technologies. It presents the latest research being conducted on diverse topics in intelligence technologies with the goal of advancing knowledge and applications in this rapidly evolving field. Authors are invited to submit papers presenting novel technical studies as well as position and vision papers comprising hypothetical/speculative scenarios.

Keywords

(a) Engineering in Medicine and Biology
(b) Signal Processing and Communication
(c) Emerging Smart Computing Technologies
(d) Internet of Things for Emerging Engineering Applications
(e) Next Generation Computational Technologies

Contents

About the Editors

Dr. Shruti Jain is an Associate Dean (Innovation) and Professor in the Department of Electronics and Communication Engineering at the Jaypee University of Information Technology, Waknaghat, H.P., India. She has received her Doctor of Science (D.Sc.) in Electronics and Communication Engineering. She has teaching experience of around 19 years. She has filed ten patents, of which three have been granted and seven are published. She has published more than 28 book chapters and 130 research papers in reputed indexed journals (with IF ~ 70) and in international conferences. She has also published 16 books. She has completed two government-sponsored projects. She has guided 07 Ph.D. students and now has 05 registered students. She has also guided 11 M.Tech scholars and more than 110 B.Tech undergrads. She has organized 12 conferences of IEEE and Springer as Conference General Chair. Her research interests are Image and Signal Processing, Soft Computing, Internet-of-Things, Pattern Recognition, Bio-inspired Computing, and Computer-Aided Design of FPGA and VLSI circuits. She is a senior member of IEEE, Executive member of IEEE Delhi Section, life member and Executive member of Biomedical Engineering Society of India, and a member of IAENG. She is a member of the Editorial Board of many reputed journals. She is also a reviewer of many journals and a member of TPC of different conferences. She was awarded the Nation Builder Award in 2018–19 and enlisted in 2% scientist of world rankings of 2021 and 2023 published by Elsevier, data compiled by Stanford University.

Nikhil Marriwala (B.Tech., M.Tech., and Ph.D. in Engineering and Technology) is working as Assistant Professor and Head of the Department of Electronics and Communication Engineering Department, University Institute of Engineering and Technology, Kurukshetra University, Kurukshetra. He did his Ph.D. at the National Institute of Technology (NIT), Kurukshetra, in the Department of Electronics and Communication Engineering. More than 33 students have completed their M.Tech. dissertation under his guidance. He has published more than 05 book chapters in different international books, has authored more than 10 books with Pearson, Wiley, etc., and has more than 40 publications to his credit in reputed international journals (SCI, SCIE, ESCI, and Scopus) and 20 papers in international/national conferences.

He has been granted 08 patents with 02 Indian patents and 06 international patents. He has been Chairman of Special Sessions at more than 22 international/national conferences and has delivered a keynote address at more than 7 international conferences. He has also acted as organizing secretary for more than 05 international conferences and 01 national conference. He has delivered more than 70 invited talks/guest lectures in leading universities/colleges PAN India. He is having an additional charge of Training and Placement Officer at UIET, Kurukshetra University, Kurukshetra, for more than 11 years now. He is the Single Point of Contact (SPOC) and Head of the local chapter of SWAYAM NPTEL Local Chapter of UIET, KUK. He is SPOC for the Infosys campus connect program for UIET, KUK. He is the Editor of more than 06 book proceedings with Springer and Guest Editor for a Special Session in the Journal Measurement and Sensors, Elsevier. He has been awarded as the NPTEL ENTHUSIASTS for the year 2019–2020 by NPTEL IIT, Madras. He has also been awarded the "Career Guru of the Month" award by Aspiring Minds. His areas of interest are Software Defined Radios, Cognitive Radios, Soft Computing, Wireless Communications, Wireless Sensor Networks, Fuzzy system design, and Advanced Microprocessors.

Pushpendra Singh is an experimental physicist with a passion for cyber-physical system instrumentation and quantum sensing devices. His research focuses on nuclear reactions and instrumentation for rare-decay studies, quantum sensing devices/imagers, and the deployment of cyber-physical systems. He is the principal investigator and project director of the iHub-AWaDH (Agriculture and Water Technology Development Hub), a Technology Innovation Hub (TIH) established by the Department of Science and Technology (DST), Government of India, at IIT Ropar in the framework of National Mission on Interdisciplinary Cyber-Physical Systems (NM-ICPS). In the profession of scientific research, He received Prof. C. V. K. Baba Award for my Ph.D. thesis in the year 2008 from the Indian Physics Association (IPA). He was awarded an INFN international fellowship at the Laboratori Nazionali di Legnaro, Italy, in 2009. After a term at Legnaro in 2011, He joined the GSI—Helmholtz Centre for Heavy-Ion Research GmbH, Darmstadt, Germany, as a visiting scientist, where He has been associated with the Lund-York-Cologne-Calorimeter (LYCCA) and the Advanced GAmma Tracking Array (AGATA) as a technical coordinator for multi-branch signal processing through digital electronics. He joined the Department of Physics at IIT Ropar in 2013. Presently, He is a member of NuSTAR collaboration for the Facility for Anti-proton and Ion Research (FAIR) at Darmstadt in Germany and collaborates with the scientists from JINR Dubna (Russia), TU Darmstadt (Germany), ANL (USA), LASTI (University of Hyogo, Japan), and Aksaray University (Turkey).

C. C. Tripathi completed his Ph.D. in electronics from Kurukshetra University, Kurukshetra. Since 2016, he has been working as Director of the University Institute of Engineering Technology (an autonomous institute), Kurukshetra University, Kurukshetra. His research areas are microelectronics, RF MEMS for communication, and industrial consultancy. He has filed 1 patent and published over 80 papers

in journals and conference proceedings. Prof. Tripathi is an Experienced Professor with a demonstrated history of working in the higher education industry. He has been working extensively on graphene-based flexible electronic devices, sensors, etc. Presently, he is working as Director, NITTTR, Bhopal.

Prof. Dinesh Kumar completed B.Tech. from IIT Madras and Ph.D. from IIT Delhi and is Professor at RMIT University, Melbourne, Australia. He is fellow of Australasian Institute of Digital Health. He has published over 400 papers, authored 08 books, and is on a range of Australian and international committees for Biomedical Engineering. His passion is for affordable diagnostics and making a difference for his students. His work has been cited over 8400 times, and he has also had multiple successes with technology translation. He is Member of Therapeutics Goods Administration (TGA), Ministry of Health (Australia) for medical devices. He is also on the editorial boards for IEEE Transactions of Neural Systems and Rehabilitation Engineering and Biomedical Signals and Controls. He has been Chair of large number of conferences and given over 50 keynotes speeches.

Storage and Organisation of Geospatial Data in Distributed Blockchain Using IPFS

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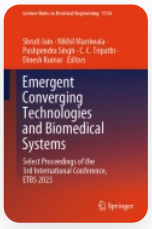

Emergent Converging Technologies and Biomedical Systems

(ETBS 2023)

Shivanshu Singh, Ayush Tah & Sanjib Saha

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Abstract

The rapid development of global navigation, information and communication technology, and sensor technology, alongside the launch of a vast number of geo-satellites, have led to an unprecedented amount of geospatial data being generated. The need to share and use this data reliably has persisted, and data privacy, integrity, and security have become crucial issues. Guaranteeing these aspects of geospatial data is challenging, given the extensive use of the data in a range of technologies and the fact that it is stored in various formats and calibrated by different standards. Before any comparison, combination, or mapping can occur, data scrubbing and reformatting are necessary. Maintaining data integrity, while sharing or storage, is challenging under these conditions. To preserve the privacy and integrity of geospatial data, the data must be validated and protected from unauthorized modifications. Blockchain has recently emerged as a potential solution to the challenges of geospatial data, as it possesses tamper-proof, traceable, trust-free, transparent, and decentralized characteristics. Blockchain integrates consensus mechanisms, asymmetric cryptographic algorithms, and distributed data storage to achieve these features, making it a promising technology to address the issue. We have proposed a method for storing and accessing geospatial data in the distributed blockchain using InterPlanetary File System (IPFS). We have tested our proposed method using VEDAS SIH dataset, Bhuvan dataset and Kaggle SpaceNet dataset. The test result of the proposed method is efficient, secure, and immutable. The proposed method is compared with the state-of-the-art centralized storage solutions.

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