

# **Lecture Notes in Networks and Systems**

**Volume 244**

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# IoT and Analytics for Sensor Networks

Proceedings of ICWSNUCA 2021



Springer

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# Preface and Acknowledgement

The main aim of this proceedings book is to bring together leading academic scientists, researchers, and research scholars to exchange and share their experiences and research results on all aspects of Intelligent ecosystems, data Sciences, and IoT systems. ICWSNUCA 2021 is a multidisciplinary conference organized with the objective of bringing together academic scientists, professors, research scholars, and students working in various fields of engineering and Technology. On ICWSNUCA 2021, you will have the opportunity to meet some of the world's leading researchers, to learn about some innovative research ideas and developments around the world, and to become familiar with emerging trends in Science-Technology. The conference will provide the authors, research scholars, listeners with opportunities for national and international collaboration and networking among universities and institutions for promoting research and developing the technologies globally. This conference aims to promote translation of basic research into institutional and industrial research and convert applied investigation into real-time application.

ICWSNUCA 2021 is hosted by Department of Computer Science and Engineering, Gokaraju Rangaraju Institute of Engineering and Technology, Hyderabad, India. ICWSNUCA 2021 has been held during 26–27th February, 2021, in online mode (ZOOM Platform). The conference brought together researchers from all regions around the world working on a variety of fields and provided a stimulating forum for them to exchange ideas and report on their researches. The proceeding of ICWSNUCA 2021 consists of 45 best-selected papers which were submitted to the conferences, and peer-reviewed by conference committee members and international reviewers. The Presenters have presented through virtual screen. Many distinguished scholars and eminent speakers have joined from different Countries like India, Malaysia, Bangladesh, Sri Lanka, Iraq, Libya, and Taiwan to share their knowledge and experience and to explore better ways of educating our future leaders. This conference became a platform to share the knowledge domain among different countries' research culture. The main and foremost pillar of any academic conference is the authors and the researchers. So, we are thankful to the authors for choosing this conference platform to present their works in this pandemic situation.

We are sincerely thankful to Almighty for supporting and standing at all times with us, whether it's good or tough times and given ways to concede us. Starting

from the Call for papers till the finalization of chapters, all the team members given their contributions amicably, which it's a positive sign of significant team works, the editors and conference organizers are sincerely thankful to all the members of Springer especially Mr. Aninda Bose for the providing constructive inputs and allowing an opportunity to finalize this conference proceeding. We are also thankful to Dr. Thomas Ditzinger, Prof. William Achauer, and Prof. Anil Chandy for their support. We are also grateful to Mr. Daniel Joseph Glarance, Project Coordinator, Springer for his cooperation. We are thankful to all the reviewers who hail from different places in and around the globe, who shared their support and stand firm toward quality chapter submission in this pandemic situation.

Finally, we would like to wish you have good success in your presentations and social networking. Your strong supports are critical to the success of this conference. We hope that the participants not only enjoyed the technical program in conference but also found eminent speakers and delegates in the virtual platform. Wishing you a fruitful and enjoyable ICWSNUCA 2021.

Hyderabad, India

Nadia, India

Taipei City, Taiwan

Padmalaya Nayak

Sheng-Lung Peng

Souvik Pal

# About This Book

The conference proceeding book is a depository of knowledge enriched with recent research findings. The main focus of this volume is to bring all the computing and communication-related technologies in a single platform. ICWSNUCA 2021 is aimed at providing a platform for knowledge exchange of the most recent scientific and technological advances in the fields of data analytics and computational Science, to strengthen the links in the scientific community. This event aspires to bring together leading academic scientists, researchers, industry persons, and research scholars to exchange and contribute to their knowledge, experiences and research outcome on all the phases of Computer Science, Information technology, and data analytics. This book focuses on the applications, use-cases, architectures, deployments, and recent advances of Wireless Sensor Networks as well as Ubiquitous Computing. Different Research Topics may be illustrated in this book, like Wireless Sensor Networks for the Internet of Things, IoT Applications for eHealth, smart cities, etc., architectures for WSNs and IoT, WSNs hardware and new devices, Low-power wireless technologies, Wireless ad hoc Sensor networks, Routing and data transfer in WSNs, Multicast communication in WSNs, Security management in WSNs and in IoT systems, and Power consumption optimization in WSNs. In recent years, we have been hearing about Internet of Things, Industrial IoTs (IIoTs), Industry 4.0, Smart Factories, Smart HealthCare, Smart Logistic and Supply Chains, Smart Mobility, and Smart Energy, etc. These technologies deliver huge economy and financial benefits and will continue the same in near future. But surprisingly, sensor nodes are the backbone of these technologies and these nodes can be worn, carried, embedded in the environment that can provide interesting contextual information. We find sensors in our daily life, starting from Mobile devices, Automobiles, Industrial automation, Robotic systems, Vehicular Tracking and Management Systems, etc. A significant increase in real-world event monitoring capability with Wireless Sensor Networks will lead to a further evolution of ubiquitous computing. Wireless Sensor Networks continue to attract a lot of attention from the academia and industry among researchers, industrials, equipment and chip manufacturers and service providers for promoting large-scale deployments in many applications, such as environmental monitoring, military and medical surveillance, health and wellness applications, intelligent traffic management and user's tracking and identification,

including human–computer interaction. 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 the fields of Computer Science. The primary audience for the book incorporates specialists, researchers, graduate understudies, designers, experts, and engineers who are occupied with research and computer science-related issues. The book will be organized in independent chapters to provide readers great readability, adaptability, and flexibility.

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## About the Editors

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