Guest Editorial Preface Special Issue on 5G and a Vision of 6G: Fundamentals, Applications and Emerging Trends

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Our society is becoming more and more dependent on everything digital, whether when it comes to the connectivity of any type of object, the management of industrial structures, the exchange of large volumes of data, etc.

The need for very high speed mobile communication is therefore vital to better prepare for the arrival of new services and emerging applications such as Artificial Intelligence, autonomous vehicles, and the Internet of Things. All of this generates exchanges of increasingly colossal volumes of data, making it necessary to consider new communication systems in various fields from communication to commerce, industry, transportation, cybersecurity, and healthcare.

Starting from 2020, the Fifth Generation (5G) wireless communication networks are increasingly establishing themselves as the norm of communication despite the challenges they still face such as mass connectivity, ultra-reliability, and guaranteed low latency.

5G presents itself as another kind of mobile system model that supports high frequencies, extreme node densities, large-scale antennas, high bandwidth huge, etc. Yet, to ensure continuity and competitiveness in wireless communication systems, efforts from industry and academia have started to

conceptualize the next generation of wireless communication systems, also known as Sixth Generation (6G).

The sixth generation aims to provide revolutionary communication services and applications to meet the future demands of the 2030s by providing a global coverage, an enhanced spectral/energy/cost efficiency, a better intelligence level and security, etc.

The aim of this special issue is to highlight the most promising lines of research, using new enabling technologies and methods to solve issues and challenges related to 5G and 6G communication systems.

This special issue is a collection of six papers which are written by eminent professors and researchers from different countries. The papers were initially peer reviewed by the Editorial board members and then, by reviewers who, themselves, span over different countries.

The paper, *Interoperability Issues and Challenges in 6G Networks*, proposes a taxonomy to provide deep insights into interoperability issues, challenges, and possible solutions for 6G interoperability with WIoT, IoTk, IoE, and other networks. The paper summarizes significant challenges regarding interoperability issues in various areas related to 6G and highlights the broad scope to further research.

In the paper, *Impact of LoRA and 5G on Smart Manufacturing from Automation Perspective*, the authors evaluate the current landscape of factory automation and the influence of 5G and LoRA communication on smart manufacturing automation, where front-end technologies are split into four categories: smart goods, smart working, smart manufacturing, and smart supply chain.

In the paper, *Demystifying Blockchain in 5G and beyond Technologies*, the role of Blockchain technology in 5G and beyond networks is discussed. This paper also highlights the various challenges that act as a hindrance while implementing the Blockchain in 5G and beyond networks. Moreover, the paper also discusses the future aspects of Blockchain in 5G networks. In the paper, *A Novel Design of FANET Routing Protocol Aided 5G Communication using IoT*, a comprehensive study is formally introduced covering routing protocols used in flying ad hoc networks, mobility models, heuristic computations, architecture and optimization techniques for improving parameters in flying ad hoc networks. This paper reflects and explains future challenges and helps scientists, researchers to discover more research gaps that have been discussed in the literature and need more investigation.

In the paper, *Lightweight and Secure Authentication Model for Vehicle to Everything (V2X) Communication based on 5G Networks*, the authors

propose a secure authentication scheme for 5G-based V2X communication. To achieve security requirements, their approach aims to provide a high degree of security in different vehicular communication (V2V, V2I, V2N) by using lightweight cryptographic algorithms in order to safely receive all keys and messages from RSU, vehicles, and the network.

In the paper, *Improved Next-Generation Radio Access Networks Using a Centralized Opto-Electronic Oscillator*, the authors propose placing an Opto-Electronic Oscillator (OEO) in the central-office, that distributes its signal from there to multiple Radio Units (RU) base-stations through the mobile front-haul network using a Radio-over-Fiber (RoF) transmission approach.