

Editorial for Special Issue “Advancements in Wireless Communications, Networks, and Signal Processing”

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1. Introduction

Due to dramatic increases in data traffic over the last decade, there has been growing interest in enhancing system performance levels in data communications and networking. Moreover, data are represented in various digital forms, such as text, voice, or video. As data capacity continues to increase, it imposes ever-higher requirements on data-processing capabilities and networking system architectures. The desired system characteristics include, but are not limited to, the following: (i) lower power consumption, (ii) minimized networking latency, (iii) higher spectral efficiency/throughput, and (iv) enhanced data security.

These technical advancements are required across the entire data infrastructure industry, in wireless networks, data-center interconnects, long-haul telecommunications, and other communication platforms. To achieve these advances, extensive research have been conducted in different layers of system architectures, including (i) physical layer schemes to enhance the bandwidth utilization of physical media; (ii) digital signal processing algorithms to optimize signal-over-noise ratio and recovered data quality; (iii) networking control and policies to minimize system latency and increase system throughput; and (iv) full-stack software design to enhance system resilience and data security.

In this Editorial, we are proud to introduce the Special Issue “Advancements in Wireless Communications, Networks, and Signal Processing”. This Special Issue highlights research efforts dedicated to addressing the technical challenges faced in the broader data communication field, focusing on original system and algorithm approaches, which can enhance state-of-the-art techniques for communications and networking.

2. Contributions

This Special Issue features original research and review articles addressing recent advancements in wireless communications, networks, and digital signal processing. The research studies in this publication cover a variety of communication applications, including (i) LTE/5G/millimeter-wave wireless network modeling and optimization; (ii) ethernet network control and optimization; and (iii) transmission studies for optical fiber communications.

This Special Issue showcases research articles that aim to predict and optimize LTE/5G/ethernet network performance using quantitative modeling approaches, including (i) dimensionality reduction [1]; (ii) user-BS selection strategy [2]; and (iii) TCP-congestion control policy optimization [3]. Furthermore, this Special Issue highlights the latest research on opportunistic networks, including improved routing approaches based on improved corpus and Markov modeling [4,5] and controller-driven approaches to opportunistic networking [6].



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In addition to wireless networks, this Special Issue also presents optical fiber transmission studies based on space-division multiplexing techniques (either via multi-mode or multi-core fibers), including microwave transmission in multi-mode fiber [7] and heterogeneously integrated multi-core fiber [8]. Finally, this Special Issue features a communication reliability case study [9] and a review article on an optical beam forming technique for millimeter-wave wireless systems [10].

3. Conclusions

This Special Issue showcases research articles sharing advancements in communication system performance, achieved by optimizing physical-layer bandwidth/spectrum utilization, digital signal-processing efficiency, or networking protocols and latency. As data capacity is increasing at an accelerating speed, the Editors believe that there are significant opportunities for researchers to move beyond state-of-the-art communication technologies in this fast-expanding field. Future research could focus on enhancing different aspects of system performance, including broadening system bandwidths, increasing spectral efficiency, reducing networking latency, enhancing system security, and optimizing system resilience.

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