

## Guest Editorial Preface

# Special Issue of Applications of Artificial Intelligence and Machine Learning in New Generation of Computer Communications: Solutions, Trends, and Methods

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The role of this special issue is mainly focused on Artificial Intelligence (AI) and Machine Learning (ML) approaches, well known from IT disciplines, are beginning to emerge in the networking domain. Increasingly integrated with and supporting various aspects of computing and networking, Artificial Intelligence (AI) is anticipated to become increasingly more important in terms of support for digital assets as well as physical infrastructure. These approaches can be clustered into AI/ML techniques for network management; network design for AI/ML applications and system aspects. AI/ML techniques for network management, operations & automation address the design and application of AI/ML techniques to improve the way we address networking today. Recently, networking has become the focus of a huge transformation enabled by new models resulting from virtualization and cloud computing. This has led to a number of novel architectures supported by emerging technologies such as Software-Defined Networking (SDN), Network Function Virtualization (NFV) and more recently, edge cloud and fog. This development towards enhanced design opportunities along with increased complexity in networking as well as in networked applications has fueled the need for improved network automation in agile infrastructures. Artificial Intelligence techniques are used to execute efficient, rapid, trustworthy management operations. Network design and optimization for AI/ML applications addresses a complementing topic namely the support of AI/ML-based systems through novel networking techniques including new architectures as well as performance models.

On the other hand, Artificial Intelligence (AI), well known from computer science (CS) disciplines, are beginning to emerge in the wireless communications and have recently received much attention as a key enabler for future 5G and beyond wireless networks. These AI approaches including Machine Learning (ML), Deep Learning (DL) and Deep Reinforcement Learning (DRL) approaches have been gradually applied to wireless communication systems for various purposes, which extensively improve the performance of wireless communication systems and users. Therefore, AI technologies have a great potential to meet the various requirements of seamless wide-area coverage, low-power massive-connections, low latency high-reliability, and many other scenarios.

Due to the new features of future communications, such as complex scenarios with unknown channel models, high speed and accurate processing requirements, traditional methods are no longer suitable which brings much more potential application of AI. Just as DL technology has become a new hotspot in the research of physical-layer wireless communications and challenges conventional communication theories. Currently DL-based methods show promising performance improvements but lack of solid analytical tools and universal network architectures. In addition to the traditional neural network-based data-driven model, the model-driven deep network model and the DRL model which combined DL with reinforcement learning are more suitable for dealing with future communication systems, which can be modelled with interpretability. Moreover, most of current studies focus on solving old problems such as estimation accuracy and resource allocation optimization in wireless communication systems. However, it is important to distinguish new capabilities created by AI technologies and rethink wireless communication systems based on AI-driven schemes. Therefore, the old theory will be supplemented and updated to a large extent when solving the old problems with the new method of AI. At the same time, the problems brought by the introduction of AI technology into communication, such as how to reduce the complexity of AI algorithm to make it suitable for lightweight devices and so on are also important directions in the future.

The following research articles are selected in the special issue on “Artificial intelligence and Machine learning in new generation of Computer Communications: Solutions, Trends and Methods”.

- A Performance-Based Comparative Encryption and Decryption Technique for Image and Video for Mobile Computing
- Obtaining Super-Resolution Satellites Images Based on Enhancement Deep Convolutional Neural Network
- An Evaluation Study of E-Learning Course at the Duhok Polytechnic University: A Case Study
- A Metaheuristic Approach for Tetralet-Based Medical Image Compression
- Study of Using Applications of Artificial Intelligence in Performance of Financial Markets
- Effect of Fair Value Based on IFRS 13 on the Qualitative Characteristics of Accounting Information

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