Special Issue on Advances and Applications of Artificial Intelligence and Machine Learning for Wireless Communications

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With recent advances, Artificial Intelligence (AI) and Machine Learning (ML) approaches have emerged to show great promise in the field of wireless communications. Although some researchers are skeptical due to issues concerning complexity and reliability, benefits include the near-optimal performance or the improvement over current state-of-the-art techniques. Luckily, the big data technology delivers an excellent advantage for studying the essential characteristics of wireless networks that can be integrated with AI and ML approaches. Moreover, the recent advances in deep learning, convolutional neural networks, and reinforcement learning hold significant promise. Indeed, they offer new design approaches for solving some challenging problems that, until recently, were considered intractable.

This special issue received 18 submitted manuscripts, out of which 10 papers have been accepted for publication. The editors would like to thank the authors of all papers for their submissions and special thanks go to the reviewers for their help in allowing us to complete the reviews and decisions in a timely fashion. The papers in this special issue will report research in Advances and Applications of Artificial Intelligence and Machine Learning for Wireless Communications with the following two aspects: **Enhancing Communication Performance**; **Security, Privacy, and Anomaly Detection**.

ML for Enhancing Communication Performance: This section includes 5 papers that propose new techniques that are incorporated with ML and AI techniques.

The first paper "Deep Learning-based Channel Estimation and Tracking for Millimeter-wave Vehicular Communications" by *Intae Hwang et al.* designs deep-learning based channel estimation method for mm-wave vehicular communications and following the channel estimation, long short-term memory is utilized to track the channel. Next, the paper "QoS Provision and Energy Saving Scheme for Distributed Cognitive Radio Networks Using Deep Learning" by *Mduduzi Hlophe and B. T. Bajarah* designs an effective spectrum management scheme that utilizes traffic prediction to improve the resource consumption efficiency while considering the energy budget. The paper "Collision Prediction for a Low Power Wide Area Network using Deep Learning Methods" by *Shengmin Cui and Inwhee Joe* presents collision prediction for a low power wide area networks (LPWANs) via long short-term memory extended Kalman filter model. The next paper, "Accelerating wireless channel autoencoders for short coherence-time communications" by *M. E. Morocho-Cayamcela and Wansu Lim* propose and present accelerated autoencoders for time-varying and short coherence-time channels via dynamic learning rates. Finally, the paper "UE Throughput Guaranteed Small Cell ON/OFF Algorithm with Machine Learning" by *Tae-Yoon Park et al.* introduce small cell on/off algorithm that aims to solve the throughput reduction during small cell off process via linear regression and correlation analysis.

ML for Security, Privacy, and Anomaly Detection: This section selects 5 papers that develop new security, anomaly detection, and privacy techniques for various communication systems and applications.

The first paper provides a survey of deep learning techniques that are utilized in telecommunications. In particular, "Adversarial Attack on DL_based Massive MIMO CSI Feedback" *by Jin et al.* presents usage of deep learning techniques for the channel coding, error correction, automatic modulation selection, and MIMO receiver design. Next, the paper "Outlier Detection in Indoor Localization and Internet of Things (IoT) using Machine Learning" *by Kwon et al.* proposes to use supervised, unsupervised, and ensemble learning techniques for WiFi indoor localization applications. For unsupervised techniques, authors utilize isolation forest method, while the supervised techniques utilize SVM and KNN methods. The paper "AFRL: Adaptive Federated Reinforcement Learning for Intelligent Jamming Defense in FANET" *by Mowla et al.* presents the learning-based jamming defense that utilizes federated reinforcement learning for flying ad-hoc networks (FANET). The next paper, "Mobile Device-centric Approach for Identifying Problem Spot in Network using Deep Learning" *by Kim et al.* attacks to the problem of identifying problematic spots by the help of mobile nodes and deep learning. Determining the problem spots enables to decide and act more effectively for improving the QoS/QoE. Finally, the paper "Intelligent Network

Data Analytics Function in 5G Cellular Networks using Machine Learning" *by Sevgican et al.* presents the machine learning techniques that can be easily integrated with NWDAF and the performance evaluations of the considered methods in terms of anomaly detection.

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