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Editorial: Intelligent and Holistic Solutions for Next Generation Wireless Networks

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Editorial:

Following the great success of 2G and 3G mobile networks and the fast growth of 4G, the next generation mobile networks or the 5th generation wireless systems has been proposed aiming to provide unprecedented networking capability to mobile users. How the next generation communication should and will be? How to effectively apply and benefit from the technologies and make them intelligently interoperate together? With developments in artificial intelligence, machine learning has boosted the sustained growth of the next generation communication networks in different perspectives. Inspired by the fundamental framework of machine learning, many researchers derive holistic approaches to achieve near or optimal solutions for next generation communication systems, which brings new opportunities for encoding and decoding, clustering, localization, mobile crowdsensing, edge computing, and security both in academia and industry.

This special issue endeavors to provide researchers with a variety of intelligent and holistic solutions by conventional optimization method, supervised/unsupervised learning, deep learning, and reinforcement learning in different aspects of next generation wireless networks.

The first article titled "Performance Analysis of an Energy-Efficient Clustering Algorithm for Coordination Networks" improves the mechanism of Coordinated Multi-Point (CoMP) for cellular telecommunication networks in terms of energy consumption caused by extra signal processing and backhaul traffic. An energy-efficient algorithm of dynamic clustering is proposed to minimize the overall network energy consumption.

The second article titled "Deep Reinforcement Learning Aided Cell Outage Compensation Framework in 5G Cloud Radio Access Networks", authored by Peng Yu, maximizes the energy efficiency of Cloud Radio Access Networks (C-RAN) by deep reinforcement learning. As a typical framework of deep learning, deep Q network (DQN) is adopted to achieve optimal mechanism of antenna downtilt and power allocation to compensate users.

As a significant application of mobile networks, the third paper titled "A Multi-sensor School Violence Detecting Method Based on Improved Relief-F and D-S Algorithms" proposed a school violence detecting method based on improved Relief-F and Dempster-Shafe (D-S) algorithms. The improved Relief-F algorithm is utilized to select features according to classification contribution and correlation. The improved D-S algorithm is designed to derive a new probability distribution function on the evidence model in order to build a new fusion rule to solve the fusion collision.

The fourth paper titled "Relaying Energy Allocation Scheme Based on Multi-User SWIPT Relaying System" investigated the relay energy allocation scheme based on the time switching (TS) operation strategy for multi-user simultaneous wireless information and power transfer (SWIPT) relaying system. The far-near problem, which means that the information rates of users who are far from the relay are significantly lower than those of users

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who are close to the relay, is solved by the common information rate maximization model, which can also achieve an optimal energy allocation strategy.

The next article titled "An Enhanced AUV- aided TDoA Localization Algorithm for Underwater Acoustic Sensor Networks" addresses the underwater localization problem. The authors proposed an AUV-aided TDoA localization algorithm to adopt Autonomous Underwater Vehicle (AUV) to dive into the predefined depth and to periodically transmits data packets around the unknown node. A time-delay mechanism is proposed to reduce unnecessary energy consumption during the underwater localization.

The sixth article titled "Pseudo-noise Code Shifting Signal for AI arranged UAV Networking" is proposed a method to improve the spectrum utilization of Code Division Multiple Access (CDMA) signals for unmanned aerial vehicle (UAV) communication applications. A pseudo-noise (PN) code shifting modulation method is investigated to effectively improve the information transmission rate of the system without affecting the processing gain and its multi-access capability.

As an important application of wireless sensor networks, the authors study the task assignment problem in mobile crowdsensing systems to reduce the average and largest makespan of all tasks. An AP-assisted average makespan sensitive online task assignment (AP-AOTA) algorithm and an AP-assisted largest makespan sensitive online task assignment (AP-LOTA) algorithm are proposed to improve the performance of task assignment with lower computational complexities in mobile crowdsensing.

The seventh paper titled "Naive Bayes Classifier Based Driving Habit Prediction Scheme for VANET Stable Clustering" utilizes a naive Bayes classifier to derive a habit prediction scheme for stable clustering in Vehicle Ad Hoe Network (VANET). According to the proposed prediction scheme, vehicles are classified into two alignments with different driving habits in terms of driving speed and other factors. Therefore, the cluster head candidates can be chosen from alignment with mild driving pattern which will benefit for stable clusters.

The article titled "Design of Power Allocation for APSK Non-Coherent Spatial Modulation System" aims to solve the problem of performance loss associated with non-coherent spatial modulation (NCSM) differential detection by proposing a novel power allocation mechanism to the communication system. The proposed novel power allocation can achieve better performance in terms of bit error rate relying on a novel amplitude phase shift keying (APSK) constellation approach.

As an innovative area of mobile networks, machine translation has become an irreplaceable application in the use of mobile phones. The article titled "Enhanced Neural Machine Translation by Joint Decoding with Word and POS-tagging Sequences" utilizes RNN-based neural machine translation (NMT) decoding models to jointly predict target word and shallow syntax sequences. Experiments on Chinese-English and German-English translation tasks show that the fully shared decoder can acquire the best performance.

The eleventh article titled "Security Aware Caching Placement Optimization Strategy in Cooperative Networks" adopts Wynar's encoding method to ensure communication security by jointly optimizing the caching placement strategy and secrecy rate. Compared with traditional encryption method, physical layer security incorporated with Wynar's encoding method has advantages on low computing complexity and low resource consumption. The simulation results show that the proposed security aware caching placement strategy can outperform the other two baseline algorithms and achieve the tradeoff between diversity and security in cooperative networks.

The last article titled "Adaptive Task Offloading in Vehicular Edge Computing Networks: A Reinforcement Learning Based Scheme" utilizes the framework of reinforcement learning to propose an adaptive task offloading approach in vehicular edge computing networks. The proposed approach outperforms existing task offloading schemes in terms of processing delay and dynamic scene adaptability due to well perceiving highly dynamic feature of vehicular networks when adopting reinforcement learning.

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