Guest Editorial Preface

AI and Edge Computing-Driven Technologies for KDN:
Challenges and Applications

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Software Defined Networking (SDN) and Network Function Virtualization (NFV) are the two main driving forces to transform the network architecture from rigid and ossified to flexible and programmable. Now, with the widespread use of Artificial Intelligence (AI) and edge computing, the new concept of Knowledge Defined Networking (KDN) emerges, which has the potential in addressing the new challenges in the current programmable networks by providing mobile edge computing and edge caching capabilities together with AI to the proximity of end users.

In the AI and edge computing integrated networks, edge resources are managed by AI systems for offering powerful computational processing and massive data acquisition locally at edge networks. AI helps to obtain efficient resource scheduling strategies in a complex environment with heterogeneous resources and a massive number of devices, while meeting the ultra-low latency and ultra-high reliability requirements of novel applications, e.g., self-driving cars, remote operation, intelligent transport systems, Industry 4.0, smart energy, e-health, and AR/VR services. By integrating AI functions and edge computing technologies into KDN, the network system become evolvable by forming a closed network loop that consists of data collection, learning, deciding and forwarding, which will finally have a full insight into the operating environment and can adapt resource allocation or orchestration in a dynamic manner.

Despite the benefits introduced by the AI and edge computing driven KDN, many challenges are still faced in this new paradigm. Until now, limited research efforts have been made for applying big data, AI and edge computing in KDN. The aim of this Special Issue is to promote the integration among the technologies of big data, AI and edge computing to speed up the development of KDN on the basis of SDN and NFV. The Special Issue will also present and highlight the advances and latest implementations and applications in the field of KDN such that the theoretical and practical frontiers can be moved forward for a deeper understanding from both the academic and industrial viewpoints. After a strict review, all told there were six papers accepted in this Special Section.

The first paper, "Research on Human Falling Recognition Based on Inertial Sensors," aimed to recognize human fall behavior based on wearable inertial sensors. The experiment in this paper

mainly adopted data fusion algorithm, which could extract various features to represent activities in time domain, frequency domain and time-frequency domain from the original data of human motion so as to effectively distinguish activities.

The second paper, "Mobile Edge Computing-Based Real-Time English Translation With 5G-Driven Network Support," studied real-time English translation based on mobile edge computing and 5G. On one hand, mobile edge computing was used to offload the complex tasks related to the computation of English sentences into the edge server for the efficient computation. On the other hand, 5G-driven network had the natural properties to support high bandwidth, low delay, and massive connection.

The third paper, "Deep Reinforcement Learning and In-Network Caching-Based Martial Arts Physical Training," leveraged deep reinforcement and in-network caching to realize the high-precision and high-efficiency data evaluation under the large-scale martial arts physical training environment while guaranteeing the online performance evaluation. To be specific, Q-learning was used to make the large-scale data evaluation. In addition, a communication protocol based on in-network caching was proposed to support the online function.

The fourth paper, "Knowledge Graph and GNN-Based News Recommendation Algorithm With Edge Computing Support," investigated news recommendation based on knowledge graph, graph neural network and edge computing. At first, the knowledge graph was used for the knowledge extraction. Then, graph neural network was used to train the extracted features. Finally, the edge computing was used to offload the high volumes of traffic to the edge server for the news recommendation computation.

The fifth paper, "Analysis and Prediction of Meteorological Data Based on Edge Computing and Neural Network," aimed at the problem of missing element values in real-time meteorological data and proposed a radial basis function neural network model based on rough set to optimize the analysis and prediction of meteorological data. In this model, the relative humidity of a single station was taken as an example, and the meteorological influencing factors were reduced by rough set theory.

The final paper, "AI-Based Safety Production Accident Prevention Mechanism in Smart Enterprises," proposed to construct a mining process for the cause of safety production accidents based on latent dirichlet allocation topic model. In order to maximize the use of accident data, this paper selected a data mining method which was suitable for the accident data structure. According to the discovery of safety production problems, the valuable information in historical accident data could be fully excavated, so as to provide effective suggestions for accident prevention.

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