Introduction to the Special Section on Big Data and Artificial Intelligence for Network Technologies

Jie Li, Jinsong Wu, Bin Hu, Chonggang Wang, Mahmoud Daneshmand, and Reza Malekian

THE generation of huge amounts of data, called big data, is creating the need for efficient tools to manage those data. Artificial intelligence (AI) has become the powerful tool in dealing with big data with recent breakthroughs at multiple fronts in machine learning, including deep learning. Meanwhile, information networks are becoming larger and more complicated, generating a huge amount of runtime statistics data such as traffic load, resource usages. The emerging big data and AI technologies may include a bunch of new requirements, applications and scenarios such as e-health, Intelligent Transportation Systems (ITS), Industrial Internet of Things (IIoT), and smart cities in the term of computing networks. The big data and AI driven network technologies also provide an unprecedented patient to discover new features, to characterize user demands and system capabilities in network resource assignment, security and privacy, system architecture, modeling and applications, which needs more explorations. The focus of this special section is to address the big data and artificial intelligence for network technologies.

We appreciate contributions to this special section and the valuable and extensive efforts of the reviewers. The topics of this special section range from big data and AI algorithms, models, architecture for networks and systems to network architecture, automation, and service based on big data and AI. A brief review follows:

In "Application Behaviors Driven Self-Organizing Network (SON) for 4G LTE Networks," Ouyang *et al.* present an application characteristics-driven self-optimization system, APP-SON, to optimize 4G/5G network performance and user Quality of Experience using big data platform. In "DCAuth: Data-Centric Authentication for Secure In-Network Big-Data Retrieval," Li *et al.* present a novel data-centric authentication scheme for secure in-network big-data retrieval. Xu *et al.* present a novel learning-based dynamic resource provisioning for network slicing in their article "Learning-Based Dynamic Resource Provisioning for Network Slicing with Ensured End-to-End Performance Bound." In "When Crowd Meets Big Video Data: Cloud-Edge Collaborative Transcoding for Personal Livecast," Zhu *et al.* propose a novel low-latency, cost-efficient mechanisms for transcoding big video data in the personal livecast applications. In "Trustworthy Website Detection Based on Social Hyperlink Network Analysi," Niu *et al.* present an enhanced OpinionWalk (EOW) algorithm to compute the trustworthiness of all websites and identify trustworthy websites with higher trust values based on social hyperlink network analysis. He *et al.* present a novel deep reinforcement learning approach to automatically make a decision for optimally allocating the network resources for social networks in "Trust-Based Social Networks With Computing, Caching and Communications: A Deep Reinforcement Learning Approach." In "Rethinking Behaviors and Activities of Base Stations in Mobile Cellular Networks Based on Big Data Analysis," Jiang *et al.* present an interesting study on behaviors and activities of base stations in mobile cellular networks using big data analysis. Sun *et al.* present a parallel recommender system using a collaborative filtering algorithm with correntropy for social networks in "A Parallel Recommender System Using a Collaborative Filtering Algorithm With Correntropy for Social Networks." Xu *et al.* present a hybrid-stream big data analytics model for performing multimedia big data analysis for data centers in "Redundancy Avoidance for Big Data in Data Centers: A Conventional Neural Network Approach." In "An Unsupervised Embedding Learning Feature Representation Scheme for Network Big Data Analysis," Guo *et al.* propose a novel unsupervised embedding learning feature representation scheme by deep Siamese neural networks, aiming to learn an efficient low-dimensional feature subspace for network analysis. Zhang *et al.* study the battery maintenance of pedelec sharing system using big data in "Battery Maintenance of Pedelec Sharing System: Big Data based Usage Prediction and Replenishment Scheduling." Finally, Tang *et al.* in "Spatial Task Assignment Based on Information Gain in Crowdsourcing" address the spatial task assignment in crowdsourcing for network design.

We believe this special section is timely and important in enhancing and advancing research in the area of big data and artificial intelligence for network technologies. The collected papers are evidence of the innovative research in the area of

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network science and a wide range of practical applications in deployed networks. We hope that this special section will impact and contribute to diverse communities in academia and industry interested in big data and artificial intelligence for network technologies.

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