Guest Editorial Special Issue on Green Communications and Networking With Machine Intelligence for Smart Cities

MACHINE intelligence is everywhere in the modern world, fostered by connected smart devices and computers with accelerated processors and GPUs to perform advanced machine learning tasks. Green communications and networking technologies, such as LoRa, 5G/6G, and NB-IoT make it easier to collect data energy-efficiently and develop novel applications at a lower cost. Machine intelligence and green communications bring artificial intelligence (AI) to smart cities, among other domains, to enable better management of network resources, optimize operations, provide a more sustainable environment and offer user-centric services.

The advancement in machine intelligence for green networking and communications has interconnected and modernized city infrastructures, facilitating smart transportation systems, energy grid systems, and sensor-equipped smart buildings. It enables monitoring of the environment and provides better access to healthcare, emergency, and other public services. A key question in advancing wireless infrastructures is how to use artificial intelligence in green networking and communications to efficiently support smart cities.

The vision of smart cities has motivated many scientific and engineering challenges for both academia and industry to fully utilize the capabilities and benefits brought by green networking and communications with machine intelligence. This special issue aims to provide a set of innovative ideas and results in the domain of artificial intelligence and green communications for smart cities published in the IEEE TRANSACTIONS ON GREEN COMMUNICATIONS AND NETWORKING.

We appreciate the contributions to this special issue and the valuable and extensive efforts of the reviewers. The topics of this special issue range from machine intelligence to green communications and edge computing for smart cities. A brief review is summarized as follows.

[A1] proposed a non-fungible token (NFT)-based green intelligence networking scheme (NGIN) for connected and automated vehicles in smart cities. [A2] proposed a city-model-aware deep learning algorithm for dynamic channel estimation in urban vehicular environments. Liu *et al.* [A3] proposed an edge-based Joint Video Coding (eJVC) scheme, which can save up to 84.04% encoding complexity of unmanned aerial vehicle video collector in urban environment monitoring. Chen *et al.* [A4] proposed a physics-enhanced principal component analysis for compressing the vibration data of a structure in the context of structural health monitoring.

Zhu *et al.* [A5] proposed a Trust based Multi-Agent Imitation Learning (T-MAIL) scheme to improve task offloading for edge computing in smart cities. Wang *et al.* [A6] improved the energy efficiency and performance capability in deep learning on GPU servers by facilitating energy-efficient scheduling policies and online batch inference scheduling. [A7] proposed an architecture that can minimize the cost of energy consumption by deploying a number of overlays and minimizing the time needed to approve and install a block into the blockchain. [A8] developed novel computation offloading and resource allocation mechanics to maximize the utilities of mobile devices and the profits of the edge service providers in smart cities.

This special issue represents one of the first publication venues focusing on a timely topic, which brings attention from both academia and industry to the advancements in interdisciplinary research in smart cities. We hope that this special issue will impact and contribute to diverse communities in academia and industry interested in green communications and networking with machine intelligence for smart cities.

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APPENDIX: RELATED ARTICLES

[A1] Y. Ren, R. Xie, F. R. Yu, T. Huang, and Y. Liu, "Green intelligence networking for connected and autonomous vehicles in smart cities," *IEEE Trans. Green Commun. Netw.*, vol. 6, no. 3, pp. 1591–1603, Sep. 2022, doi: 10.1109/TGCN.2022.3148293.

[A2] C. Ding and I. W.-H. Ho, "Digital-twin-enabled city-model-aware deep learning for dynamic channel estimation in urban vehicular environments," *IEEE Trans. Green Commun. Netw.*, vol. 6, no. 3, pp. 1604–1612, Sep. 2022, doi: 10.1109/TGCN.2022.3173414.

[A3] Z. Liu, M. Wang, F. Chen, and Q. Lu, "Edge-assisted intelligent video compression for live aerial streaming," *IEEE Trans. Green Commun. Netw.*, vol. 6, no. 3, pp. 1613–1623, Sep. 2022, doi: 10.1109/TGCN.2022.3172900.

[A4] Q. Chen, J. Cao, and Y. Xia, "Physics-enhanced PCA for data compression in edge devices," *IEEE Trans. Green Commun. Netw.*, vol. 6, no. 3, pp. 1624–1634, Sep. 2022, doi: 10.1109/TGCN.2022.3171681.

[A5] C. Zhu, P. Zeng, A. Liu, T. Wang, and S. Zhang, "Trust based multi-agent imitation learning for green edge computing in smart cities," *IEEE Trans. Green Commun. Netw.*, vol. 6, no. 3, pp. 1635–1648, Sep. 2022, doi: 10.1109/TGCN.2022.3172367.

[A6] Y. Wang, Q. Wang, and X. Chu, "Energy-efficient online scheduling of transformer inference services on GPU servers," *IEEE Trans. Green Commun. Netw.*, vol. 6, no. 3, pp. 1649–1659, Sep. 2022, doi: 10.1109/TGCN.2022.3171680.

[A7] H. Qushtom, J. Mišić, V. B. Mišić, and X. Chang, "Efficient blockchain scheme for IoT data storage and manipulation in smart city environment," *IEEE Trans. Green Commun. Netw.*, vol. 6, no. 3, pp. 1660–1670, Sep. 2022, doi: 10.1109/TGCN.2022.3171397.

[A8] K. Peng, H. Huang, P. Liu, X. Xu, and V. C. M. Leung, "Joint optimization of energy conservation and privacy preservation for intelligent task offloading in MEC-enabled smart cities," *IEEE Trans. Green Commun. Netw.*, vol. 6, no. 3, pp. 1671–1682, Sep. 2022, doi: 10.1109/TGCN.2022.3170146.

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