Guest Editorial Special Issue on Smart Cities and Systems: Theories, Tools, Trends, Applications, Challenges, and Opportunities

THIS comprehensive abstract of the special issue presents an extensive array of collections of research studies that focus on the integration of state-of-the-art technologies and methodologies to advance healthcare services in smart cities through Internet of Things (IoT) applications. The studies explore innovative solutions across multiple aspects of healthcare, including privacy preservation, telemedicine, smart healthcare systems, security, abnormality detection, functional assessment, feature selection, health monitoring, diagnostics, medical vehicle routing, behavioral patterns discovery, federated learning, and personalized healthcare.

The first three studies introduce groundbreaking frameworks in smart healthcare. Article [A1] addresses the critical issue of patient data confidentiality and financial transactions within IoT healthcare systems, ensuring a secure and private environment for sensitive healthcare information as proposed by Singh et al. Article [A2] utilizes advanced AI algorithms to optimize telemedicine resources, enhancing healthcare service accessibility and efficiency in smart cities mentioned by Ahmad et al. The next work proposed by Golec et al. [A3] leverages AI and serverless computing to provide personalized and scalable healthcare services to heart patients, ensuring high-quality care.

The next three studies focus on securing IoT-based smart healthcare systems. Article [A4] introduces an enhanced privacy and security protocol for medical IoT applications, safeguarding patient data during transmission, which is proposed by Sankaran et al. Das et al. [A5] explored an innovative lightweight authentication scheme for secure communication in IoT-based healthcare systems, ensuring data integrity and user authentication. Additionally, the studies presented by Berdjouh et al. [A6] introduce advanced AI techniques for healthcare. Article [A6] employs deep-learning methods to detect human activity abnormalities in smart city environments, improving healthcare monitoring and emergency response. The next work by Zhang et al. presents [A7] which develops a deep-learning model for the functional assessment of cardiovascular disease, providing valuable insights for healthcare management. Furthermore, the studies explore intelligent feature selection and routing in healthcare applications. As mentioned by Li and Huang [A8] introduces a feature selection framework using reinforcement learning to optimize healthcare diagnosis for schizophrenia. Rezaee et al. proposed [A9] which presents an innovative approach to medical vehicle routing using UAV-borne crowd sensing and deep-learning algorithms, improving healthcare response times in emergencies. The next work by Lima et al. proposes [A10] which presents an approach for using conversational technology to monitor and discover behavioral patterns in home healthcare. Farahani et al. proposed [A11] which explores personalized and clustered federated learning in a speech recognition case study, improving the accuracy of healthcare applications. To discuss the implementation of IoT-based healthcare systems for efficient diagnostics and health monitoring, Balasundaram et al. presented [A12]. This work illustrates an IoT-based healthcare system that efficiently diagnoses health parameters in emergency care. The next work by Wen et al. discusses [A13] which focuses on health monitoring and diagnosis using geo-distributed edge ecosystems, ensuring effective healthcare services in smart cities. With the smart healthcare applications, Altaheri et al. proposed [A14] which presents a significant step forward in the field of brain–computer interfaces, offering promising potential for the development of advanced neuroprosthetic devices and aiding individuals with motor disabilities in their daily lives. The next set of papers includes the integration of cutting-edge technologies to enhance security, communication, energy management, and resource optimization in smart cities. Fu et al. [A15] addressed security and information protection in smart cities. Article [A16] introduces a UAV-assisted architecture with machine learning for agricultural information security. The next work [A16] proposes a proactive defense mechanism for smart industries using fog computing and augmented intelligence which is proposed by Javeed et al. Duan et al. [A17] investigated transmission-efficient UAV-assisted communication for intelligent connected vehicle platoons. Majumder et al. [A18] presented intelligent resource management and energy optimization. Article [A18] proposes a cognitive radio-based approach for smart transportation resource management. Anbazhagan et al. presented [A19] which focuses on IoT-based energy management in hybrid electric vehicles using driving patterns. Raja et al. proposed [A20] which introduces a framework for autonomous electric

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vehicle navigation and energy management in complex environments. The next work by Krishankumar et al. presents [A21] which investigates zero-carbon measures for sustainable transportation using fuzzy preferences. Article [A22] by Jannu et al. presents an energy management and harvesting system for industrial IoT applications. The next work is proposed by Yang et al. [A23], which explores adaptive modulation techniques for smart systems. Basu et al. proposed [A50] which presents a dynamic resource introspection and virtual network function embedding approach for 5G networks. The studies by Sarma et al. introduce [A24] which investigates power optimization in mm-Wave cellular networks for smart city applications. Khan et al. presented [A25] which focuses on efficient person reidentification in IoT-assisted cyber–physical systems. The next set of papers presents a diverse collection of research studies focusing on cutting-edge technologies and methodologies in the context of smart cities and the IoT. The next work by Tyagi et al. [A26] proposes a swarm-optimized approach to detect attacks in smart grids and addresses security and attack detection in smart city systems. Irfan et al. proposed [A27] which introduces a noncontact ECG system for health monitoring in smart cities. Next, the studies explore behavior analysis and prediction for smart city services. Zhang et al. presented [A28] which investigates long-term survival patterns in social groups. Yin et al. proposed [A29] which presents a contrastive learning method for time-aware service delivery in smart cities. Wang et al. presented [A30] which proposes a hybrid ML framework for wind power forecasting. The next work [A31] proposed by Jee and Prakriya presents an energy-efficient IoT network with relay assistance. Additionally, the editorial paper covers various machine learning and AI applications. Jin et al. presented [A32] which focuses on deep learning for cyber–physical systems. Li et al. [A33] proposed and explored multitask learning for tourism applications. The next studies also tackle edge computing and resource optimization. Ou et al. proposed [A34] which predicts container power consumption in edge servers. Li et al. presented [A35] which introduces a hierarchical federated recommendation system. The next set of studies discusses trajectory tracking, communication, and routing in smart cities. Huang et al. [A36] presented a trajectory tracking system for micro-UAVs. Wei et al. proposed [A37] which presents a low-delay routing scheme for UAV communications. The next work by Yang and Luo [A38] proposes hardware optimization and statistical approaches. Article [A38] introduces a CNN accelerator for embedded devices. Velliangiri et al. proposed [A39] which focuses on statistical approaches for DoS attack detection. The next work by Khan et al. unveils [A40] which harnesses machine-learning algorithms to optimize energy distribution and demand response, paving the way for a greener, more sustainable urban environment. The next work by Guo et al. introduces [A41], showcasing how advanced mathematical techniques and machine learning can accurately estimate occupancy patterns, transforming smart building management and energy utilization. Han et al. proposed [A42] which offers a proactive defense mechanism against cyber threats, ensuring secure and uninterrupted communication in smart cities. Vohnout et al. presented [A43] which emphasizes the fusion of fog computing and smart grids to create energy-positive districts, fostering sustainable urban growth. In the next work, Konecny et al. explained [A44] which provides energy-efficient data processing and prolongs the operational lifespan of IoT sensors for a more resource-conscious urban landscape. Prauzek et al. delved into [A45], by shedding light on how energy management policies can enhance overall system reliability and longevity. The next work by Zhai et al. introduces [A46], a cutting-edge computer vision technique enhancing safety and resource allocation in densely populated urban areas. Finally, Hayawi et al. presented [A47], by offering real-time data processing capabilities and supporting diverse smart city applications, paving the way for connected, intelligent, and eco-friendly urban future. The next work by Chavhan et al. [A48] explores communication and trajectory perception in smart cities. Article [A48] presents an edge-based communication system for vehicle and pedestrian trajectory perception. Das et al. presented [A49] which explores how blockchain technology can revolutionize transportation systems, addressing both its potential benefits and the obstacles it must overcome. Basu et al. studied [A50] which introduces DRIVE, a cutting-edge approach leveraging machine learning to enhance 5G networks by dynamically managing resources and embedding virtual network functions, paving the way for smarter, more efficient connectivity. These titles collectively represent the remarkable progress made in creating more efficient, secure, and sustainable urban ecosystems, igniting the path toward smarter and greener cities of tomorrow.

In this editorial, we present a comprehensive and insightful exploration of the dynamic landscape of smart cities. Through the lens of theories, tools, trends, applications, challenges, and opportunities, this article sheds light on the remarkable advancements and transformative potential of smart city technologies. The diverse range of topics covered, from AI-assisted energy management to advanced predictive models and innovative computing paradigms, demonstrates the collective efforts of researchers and practitioners in building more efficient, secure, and sustainable urban environments. While the journey toward smart cities is filled with challenges, the opportunities they offer for enhancing urban living are boundless. With continued collaboration, innovation, and investment in smart city technologies, we are poised to witness the rise of interconnected, intelligent, and resilient cities, enriching the lives of citizens and shaping a more sustainable and prosperous future for all.

APPENDIX: RELATED ARTICLES

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