Chapter 1
Advent of Big Data in Urban Transportation for Smart Cities:
Current Progress, Trends, and Future Challenges

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ABSTRACT

The application of big data in urban transportation and development of smart cities has been attracting global interest. The overburdened transport infrastructure due to rapid urbanisation should be integrated with innovative technologies and brand-new ideas such as smart city in order to enhance its performance. Big data is now the emerging exemplar in intelligent transportation systems for effective management of all data for implementing safer, cleaner, and well-planned transport services, as well as providing personalised transport experience for road users. In this chapter, the authors lay forward the current research endeavours on big data for urban transportation infrastructure, its implementation, baseline framework, and usage on fields such as planning, routing, network configuration, and infrastructure maintenance. This chapter evaluates the contributions of big data on urban transport modelling techniques, tools, and mobility. Finally, the present trends and future challenges of big data are summarised for helping researchers to facilitate the development of smart cities.

INTRODUCTION

Recently, the generation of traffic and transportation data in terms of their speed and volume have transcended at a higher scale compared to those methods that were utilised during the last few decades. The introduction of latest digital techniques like artificial intelligence, Internet of Things (IoT), data mining, social networks, the growth of smart cities (Bello-Orgaz et al., 2016) (Castellanos et al., 2021), recent improvements in wireless technologies, and the extensive usage of cost effective sensors and mobile devices has substantially upgraded humans perception on real-time traffic and transport mobility (Meekan et al., 2017) (Kaffash et al., 2021). Since Intelligent Transportation Systems (ITS) framework and execution is based on traffic mobility data which in terms of volume, diversity (source and format), and its variable nature requires data intensive techniques like querying and analysis, integration, high performance computing, visualisation of extensive real-time systems are necessary (Khattak, 2017; Andrienko et al., 2017; Amini et al., 2017; Usman et al., 2020). Traffic congestion and road accidents are the biggest challenges faced in urban cities that requires immediate attention (Matcha et al., 2020; Ng, 2021). Hence, a more distinctive and enhanced methods of transport data collection, transmission, storage, fusion, extraction and processing are necessary (Matcha et al., 2022; Stathopoulos et al., 2017). However, it is widely admitted that the present ITS implementation is limited to data monitoring and evaluation applications (Suh et al., 2017). The above-mentioned challenges were not fulfilled by current ITS applications for efficient monitoring, decision-making and realistic