13 Big Data, Artificial Intelligence and IoT Enabled Smart Cities
Applications and Challenges

Aboobucker Ilmudeen

CONTENT

13.1 Introduction 219
13.2 Smart Cities 221
13.3 The Big Data Applications in Smart Cities 222
13.4 Artificial Intelligence Applications in Smart Cities 223
13.5 IoT Applications in Smart Cities 223
13.6 Prior Studies in Big Data, Artificial Intelligence and IoT Applications in Smart Cities 224
13.7 Modern Technologies, Methods and Infrastructures in Designing Smart Cities 225
13.8 Design and Deployment of Big Data, AI and IoT Applications in Smart Cities 231
13.9 Big Data, Artificial Intelligence and IoT Challenges in Smart Cities 232
13.10 Proposed Conceptual Design Architecture for Big Data, AI, and IoT for Smart City 233
13.10.1 Smart City Data Collection and Generation 234
13.10.2 Smart City Data Processing and Analysis 234
13.10.3 Smart City Knowledge Portal of Smart City Development 234
13.10.4 Smart City Design Concepts and Domains 234
13.11 Conclusion 235

13.1 INTRODUCTION

In the era of "big data, artificial intelligence (AI), and Internet of things (IoT)", the recent developments in digital technologies have facilitated the rapid innovation and re-engineering of smart cities. Cities across the globe are always modernizing their digital infrastructure facilities to offer a comfortable lifestyle for their citizens. The digital infrastructure and technology are producing a digital revolution

of lifestyle for citizens. Smart cities are constantly upgrading their state-of-the art digital infrastructure facilities to support the lifestyle of their citizens. Accordingly, the smart city can offer timely and quick responses to various stakeholders such as daily routine needs, peoples' living, safety, and security measures, citizen travelling and passage, health services, and commercial and industrial activities (Pramanik, Lau, Demirkan, & Azad, 2017).

The utmost objective of constructing a smart city is to experience and gain access to facilities with modern technologies and the latest structural arrangements of facilities to offer superior value to society and to encourage government service efficiency, public autonomy, and societal relationships (Sun & Zhang, 2020). However, cities have problems such as food and water safety, disaster recovery and prevention, environmental stewardship, facilities for shopping, tourism, and recreation, travelling facilities, energy efficiency, care of elderly people, and crime and accident prevention (Wu, Wu, & Wu, 2019). Smart cities are more and more moving to specific technologies to tackle problems that are linked to the environment, society, infrastructure, morphology, and many others. This rapid development and application of technology is possible when smart cities greatly implement the potentials of big data, IoT, sensor devices, and artificial intelligence.

Big data analytics via AI can significantly bring many economic prospects, superior management capabilities, and urban designing. The construction and planning of a smart city and urbanization must cope with the requirements of cities, technology, citizens, spaces, resources, and social responsibility (Sun & Zhang, 2020). Similarly, the applications of modern technologies in designing and maintaining the smart cities are continually advancing. Figure 13.1 shows the popularity of big data, AI, and IoT in Google Trends under the urban and regional planning category among academia, researchers, citizens, policy makers, engineers, designers, industrialists, etc.

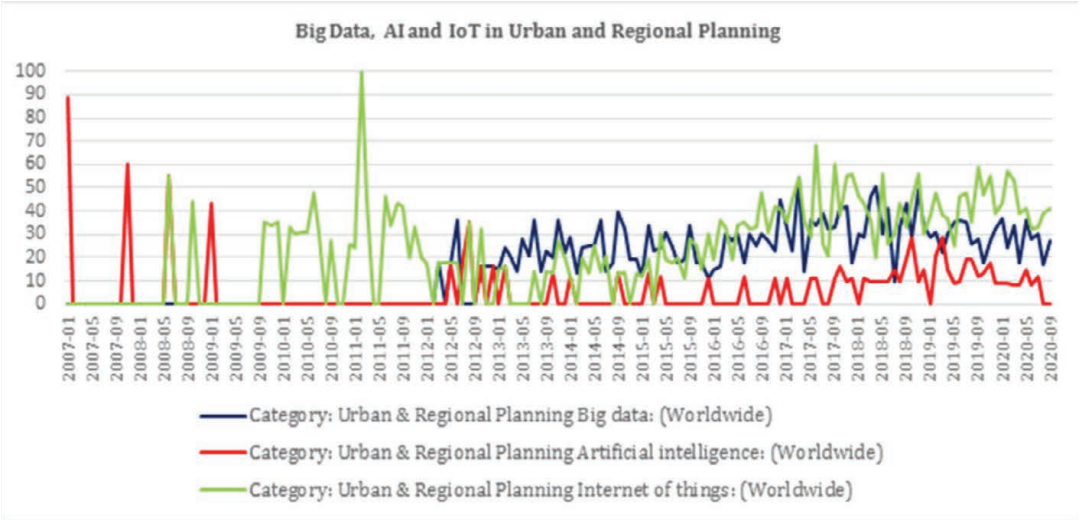

FIGURE 13.1 Status of big data, AI and IoT 2007 to 2020.

Source: Google Trends, 15, September 2020