# Chapter 13
# A Survey of Innovative Machine Learning Approaches in Smart City Applications

**M. Saranya**
*School of Computing, SRM Institute of Science and Technology, Kattankulathur, Chennai, India*

**B. Amutha**
*Computing, SRM Institute of Science and Technology, Kattankulathur, Chennai, India*

## ABSTRACT

*Smart cities are emerging as a response to the growing need for urban housing, with the goal of improving residents' quality of life through the integration of innovative machine learning technology. For these "smart cities" to work, massive amounts of data need to be collected and analyzed for insights. However, due to the various and noisy nature of the data generated, only a small portion of the enormous smart city data that is collected is actually used. The capacity to process massive amounts of noisy, inaccurate data is a hallmark of artificial intelligence and state-of-the-art machine learning. There are numerous significant everyday uses for it, including healthcare, pollution prevention, efficient transportation, improved energy management, and security. Plus, this chapter presents the ideas and evaluations of numerous innovative machine learning algorithms for their particular applications.*

## 1. INTRODUCTION

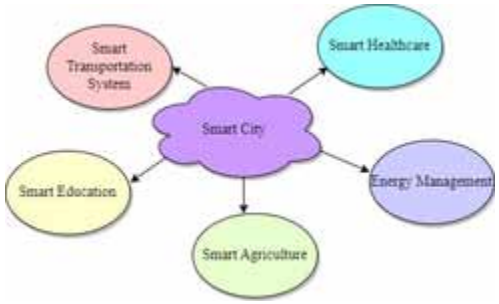
Innovation and technology are the backbone of a "Smart City," which aims to better the lives of its citizens and the globe at large. Focusing on individuals and their needs, it aims to encourage participation and welcome everyone. Our mission is to create sustainable, resilient, and habitable ecosystems so that communities can flourish. The primary focus of smart cities is on addressing complex urban problems, (Ahmed et al., 2021) particularly those pertaining to society, the economy, and the environment. In order to achieve this goal, we must adopt a more holistic approach to city administration and think creatively about how to handle challenges. The current trend in computer programming toward capabilities similar

DOI: 10.4018/979-8-3693-1642-9.ch013

to human intelligence in domains such as vision, speech recognition, and language processing is referred to as "artificial intelligence" (AI). The objective of AI is to train computers to think more intelligently and solve problems independently, without the need for programming or human oversight. One of the several potential benefits of artificial intelligence is more efficient and precise decision-making across various organizations. Moreover, AI Cugurullo, 2020, has the potential to transform city planning by facilitating the creation of "Smart Cities" that are more efficient, environmentally friendly, and visually beautiful. This is achieved by providing new tools for studying, modeling, and simulating urban processes.

One day, AI might revolutionize urban planning by helping researchers come up with new ways to analyze and model complex urban systems. Traditional urban planning is notoriously inefficient and prone to bad decision-making due to its reliance on static models and data shortages. On the other hand, a more collaborative, data-driven, and adaptable method of city planning is becoming possible with the advent of AI. Data monitoring and analysis is a crucial component of AI in urban planning. Sensors, IoT devices, social media, and government databases all produce massive amounts of data, which machine learning algorithms can efficiently sort through. Public safety, energy consumption, transportation, waste management, and citizen behavior are just a few of the many aspects of city life that this data covers. Artificial intelligence (AI) integration and analysis of this data Yücel et al., 2022can detect trends, patterns, and issues with the city's operation, revealing crucial insights. Urban planners greatly benefit from artificial intelligence's ability to optimize resource utilization and provide suggestions. Machine learning techniques and data analysis allow artificial intelligence systems to identify inefficiencies and propose solutions. Artificial intelligence paves the way for efficient urban systems, better citizen experiences, and personalized services. Systems driven by artificial intelligence (AI) can examine data on citizens' preferences and actions to propose events, activities, and restaurants based on their unique likes. The different smart city applications displayed in Figure 1In addition to boosting engagement and satisfaction among city dwellers, this contributes to the development of a vibrant urban culture. As seen in Table 1, there are several parts to the smart city system.

*Figure 1. Smart City Applications*




## 2. BACKGROUND AND MOTIVATION

The main objective of this research is to examine how machine learning technologies have contributed to the development of smart cities. Cities are confronted with enormous challenges in effectively managing their resources and enhancing the quality of life for residents as a result of the growing population.