

Chapter 10

Open Challenges and Research Issues of XAI in Modern Smart Cities

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ABSTRACT

In this chapter, the authors explore the open challenges and research issues related to XAI in modern smart cities. They begin by providing an overview of XAI and its importance in smart cities. They then discuss the key challenges of developing XAI systems for smart cities, including the need for transparency, interpretability, and trustworthiness. They also examine the challenges of integrating XAI systems with existing infrastructure and data sources in smart cities. Finally, they explore the potential research issues and future research directions for XAI in smart cities, including the development of new XAI techniques and the exploration of ethical and societal implications of XAI in smart cities. Overall, this chapter provides a comprehensive overview of the open challenges and research issues related to XAI in modern smart cities, which can serve as a roadmap for researchers, policymakers, and practitioners working in this field.

INTRODUCTION

A smart city is an urban area that uses advanced technologies and data analysis to improve the quality of life of its residents, enhance sustainability, and optimize urban services such as transportation, energy, and public safety. The goal of a smart city is to leverage technology and data to make the city more ef-

DOI: 10.4018/978-1-6684-6361-1.ch010

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efficient, accessible, and responsive to the needs of its citizens. A smart city is a concept that integrates technology and data to enhance the quality of life of its citizens, increase sustainability, and improve efficiency of urban services. It aims to use advanced technologies, such as the Internet of Things (IoT), Artificial Intelligence (AI), and Big Data, to address urban challenges and provide better services to its residents. The following are some of the application domains of smart cities:

1. **Transportation:** Smart transportation systems aim to improve traffic flow, reduce congestion, and enhance safety by using data-driven solutions. These systems include intelligent traffic management systems, smart parking solutions, and electric vehicle charging stations.
2. **Energy:** Smart energy systems aim to reduce energy consumption and increase the use of renewable energy sources. These systems include smart grid solutions, energy-efficient buildings, and smart home automation.
3. **Water management:** Smart water management systems aim to reduce water waste, prevent water pollution, and ensure efficient water distribution. These systems include smart water metering, leak detection systems, and water quality monitoring solutions.
4. **Waste management:** Smart waste management systems aim to reduce waste generation, improve waste collection efficiency, and increase recycling rates. These systems include smart bins, waste tracking systems, and automated waste collection systems.
5. **Public safety:** Smart public safety systems aim to enhance public safety by using data-driven solutions. These systems include intelligent video surveillance, emergency response systems, and crime prediction models.
6. **Health:** Smart health systems aim to improve health outcomes by using data-driven solutions. These systems include telemedicine solutions, health monitoring systems, and disease surveillance systems.
7. **Education:** Smart education systems aim to improve education outcomes by using technology-driven solutions. These systems include online learning platforms, personalized learning solutions, and intelligent tutoring systems.

The Need for Explainable AI in Smart Cities

As smart cities become more prevalent and complex, there is an increasing need for Explainable AI (XAI) systems to improve transparency, accountability, and trustworthiness. In many cases, decisions made by AI systems can have significant real-world consequences, such as in the areas of transportation, public safety, and healthcare. Explainable AI refers to the ability of an AI system to explain how it arrived at a decision or recommendation in a way that is understandable to humans. XAI can help users understand the rationale behind AI-generated decisions, which can improve trust and acceptance of these systems. Additionally, XAI can help identify and correct biases or errors in AI systems, which can have significant ethical implications in smart city applications. In smart city applications, XAI can be particularly important in areas such as traffic management, emergency response, and energy management. For example, an XAI system could provide an explanation for why a particular route was recommended for emergency responders or why a certain energy usage pattern was detected in a building. This can help stakeholders make informed decisions based on the insights provided by AI systems.

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