Chapter 8
Open Challenges and Research Issues of XAI in Modern Smart Cities

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ABSTRACT

The increasing use of AI in modern smart cities calls for explainable artificial intelligence (XAI) systems that can improve the efficiency and effectiveness of city operations while being transparent, interpretable, and trustworthy. Developing a unified framework for XAI that can handle the heterogeneity of data and systems in smart cities is the first challenge, considering the need to incorporate human factors and preferences in AI systems. The second challenge is developing new XAI methods that can handle the complexity and scale of smart city data. Addressing ethical and legal aspects is also critical, including ensuring that AI systems are fair and unbiased, protecting citizens' privacy and security, and establishing legal frameworks. Evaluating the effectiveness and usability of XAI systems is also crucial in improving city operations and stakeholder trust apart from XAI research for smart cities: improved visualization, human feedback, integration.

DOI: 10.4018/978-1-6684-6361-1.ch008

I. INTRODUCTION

- **Brief overview of XAI and smart cities**

As depicted in Fig 1.0 there are essentially five perspectives on why XAI matters in the context of smart cities as well. In recent years, the emergence of advanced technologies, such as the Internet of Things (IoT) (Prabakar et al., 2023) and artificial intelligence (AI) (Priyadarshini et al., 2022), has transformed urban environments into modern smart cities. These cities are characterized by the integration of digital technologies into various systems, such as transportation, energy, and security, to improve the quality of life for citizens. However, the complexity of these systems and the vast amount of data they generate pose significant challenges for decision-making and management. This is where XAI comes in. XAI, or explainable artificial intelligence, is a subset of AI that seeks to make machine learning models more transparent and understandable to humans. XAI can help decision-makers and managers better understand the inner workings of AI models (Jayakumar, Brohi, & Jhanjhi, 2021), enabling them to make informed decisions and identify potential biases or errors.

Figure 1. Why XAI matters: The five essential views
Source: Saeed & Omlin (2023)