

Chapter 13

Leveraging AI and IoT for Efficient Hospital Waste Management Analysis

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ABSTRACT

Hospital waste management is a critical aspect of healthcare operations, influencing public health, environmental sustainability, and operational efficiency. Traditional methods often rely on manual processes prone to errors and inefficiencies. This paper explores the transformative potential of Artificial Intelligence (AI) and the Internet of Things (IoT) in optimizing hospital waste management. AI facilitates predictive analytics for waste generation trends and enhances waste segregation, while IoT enables real-time monitoring and data-driven decision-making. Case studies and comparative analyses demonstrate significant improvements in efficiency, sustainabil-

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ity, and regulatory compliance with AI and IoT integration. The findings underscore the role of technology in creating safer, more sustainable healthcare environments.

I. INTRODUCTION

As a result of the confluence of artificial intelligence (AI) and the internet of things (IoT), the techniques that hospitals use to control trash are undergoing significant transformations. When these two components are brought together, new approaches to enhancing processes that are beneficial in terms of both their impact on the environment and their operational efficiency are established. When it comes to the healthcare business, conventional waste management systems often confront challenges that are associated with high prices, inefficiencies, and worries about the environment. Using artificial intelligence and the internet of things to enhance waste segregation, collection, and disposal systems may help hospitals save money on operating expenses and ensuring that they comply with environmental requirements. This can be accomplished by improving waste management systems (Akdaş, Ö, Doğan, Bas, & Uslu, 2021).

The use of artificial intelligence (AI) technology such as machine learning and predictive analytics has made it possible to accurately identify and classify medical waste. Using these technologies makes it possible to do this. There is a possibility of this happening now that these technologies are being used. When everything is said and done, this reduces the likelihood of discovering contamination and makes it possible to isolate the surrounding region to an adequate degree. Sensors and smart bins are two examples of gadgets that are part of the Internet of Things and have the capability to gather and monitor data in real time. Consequently, this makes it possible to prioritise the distribution of resources and to take timely action (Boopathi, 2023). This combination of technology makes the hospital environment safer and more ecologically friendly than it would have been otherwise. In addition to this, it significantly improves the effectiveness of the activities that are involved in waste management.

One of the most important stages towards the creation of a circular economy is the use of artificial intelligence and the internet of things to the management of trash in hospitals. A circular economy is distinguished by the reduction of waste, the preservation of resources, and the decrease of environmental impact. This is one of the most important steps of the process. Because of the use of these cutting-edge technology, there is a greater possibility that waste management and environmental stewardship may become more effective in the future at healthcare facilities. The figure1 presents a detailed breakdown of the types and amounts of biomedical waste generated by AIIMS Delhi in 2018. It highlights the significant quantities

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