

AI-Driven Smart Waste Management System for Sustainable Urban Development

Abstract

This paper proposes an AI-driven waste management framework using IoT, cloud computing, and machine learning for sustainable cities.

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Keywords

Artificial Intelligence, IoT, Smart City, Waste Management, Sustainability, Machine Learning

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1. Introduction

Urbanization has increased waste generation worldwide. Traditional collection systems are inefficient. Smart technologies improve monitoring and collection.

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2. Literature Review

Existing work focuses on IoT bins, GIS routing, and predictive analytics. This study combines these technologies into one framework.

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3. Problem Statement

Major challenges include overflowing bins, poor route planning, high fuel usage, and limited recycling.

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4. Objectives

Design a scalable intelligent waste management platform and improve efficiency.

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5. Methodology

The methodology includes data collection, preprocessing, prediction models, optimization algorithms, and dashboard visualization.

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6. System Architecture

The architecture consists of Smart Bins, IoT Gateway, Cloud Server, AI Engine, Admin Portal, and Mobile App.

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7. Experimental Results

Simulation achieved better prediction accuracy and lower operational cost.

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8. Discussion

The framework improves environmental sustainability and resource utilization.

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9. Future Scope

Future enhancements include blockchain, autonomous vehicles, and digital twins.

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10. Conclusion

The proposed solution demonstrates practical benefits for smart cities.

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