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**AI-DRIVEN SMART WASTE MANAGEMENT: OPTIMIZING
RECYCLING AND WASTE REDUCTION THROUGH IOT AND
MACHINE LEARNING**

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Abstract

Waste management is a critical challenge for environmental sustainability, with inefficient recycling and waste disposal contributing to pollution and resource depletion. This research explores an AI-driven smart waste management system that leverages IoT sensors, machine learning, and blockchain to optimize waste collection, recycling, and reduction. The primary objectives include real-time waste monitoring, automated waste classification, and efficient recycling process optimization. IoT sensors embedded in waste bins will track fill levels and send data to an AI-based system, which will predict collection schedules and reduce operational costs. Machine learning algorithms will enhance waste sorting efficiency, distinguishing between recyclables and non-recyclables. Additionally, blockchain technology will ensure transparency in waste tracking and recycling compliance. The proposed system aims to minimize landfill waste, lower carbon footprints, and promote a circular economy by improving waste management efficiency and encouraging sustainable practices.

Keywords-Smart Waste Management, Artificial Intelligence (AI), Internet of Things (IoT), Machine Learning, Blockchain for Waste Tracking, Recycling Optimization, Sustainable Waste Reduction.