

Smart Waste Segregation Using Scalable AI Models: Advancing the Vision of Sustainable Cities

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Abstract

The rapid increasing volume of city wastes creates a great environmental and operational problem especially in dry geographical areas. This study postulates smart waste segregation which is AI- and IoT-based to automate and optimize waste sorting, and to be more environmentally friendly. The proposed architecture uses sensor-based smart bins with ultrasonic sensors and cameras to get the real-time information about the type of waste and the level of fill in a bin. This information is sent to a cloud-based analytics model, where an image-based waste classifier, a Convolutional Neural Network (CNN) implemented in TensorFlow and Keras, classifies waste in eight categories (including e-waste, food waste, plastics, metals, paper, wood and organic materials). This model has a good precision and strength, as it has an overall accuracy of 98%, and the macro-average F1-score of 0.94%. In general, the suggested system offers a scalable platform of sustainable urban waste management, which encourages the generation of decisions based on the data and preservation of nature.

Keywords

Waste Segregation, AI Models, Sustainable Cities