**1. IoT-Enabled Solid Waste Management in Smart Cities**

This paper explores the use of IoT technologies, such as LoRaWAN and Wi-Fi, to monitor public and residential trash bins via smart sensors. The system integrates Public Bin Level Monitoring Units (PBLMU) and Home Bin Level Monitoring Units (HBLMU) for real-time tracking and efficient waste collection. The study validates the proposed architecture through experiments, emphasizing the system's low power consumption and the potential for scalability in smart city applications​

**2. Classification and Recycling of Recyclable Garbage Based on Deep Learning**

This study utilizes a lightweight YOLOv5s model, enhanced with ShuffleNet v2 and depth-separable convolution, for efficient garbage classification. The model achieves high accuracy (94% mAP) and reduced parameters, making it suitable for deployment on low-power devices like Jetson Nano. The research highlights improvements in detection speed and classification performance compared to traditional YOLO models​.

**3. Smart IoT-Based Solid Waste Management System Using Computer Vision**

This paper presents a computer vision-enabled solution using a ResNet V2-based CNN model for classifying municipal solid waste into biodegradable and non-biodegradable categories. It integrates IoT sensors and machine learning techniques, achieving 19% higher accuracy and lower error rates compared to existing methods. The proposed model emphasizes efficient waste segregation for sustainable urban waste management.

**4. Applications of Convolutional Neural Networks for Intelligent Waste Identification and Recycling** (2023)​: This review highlights the use of convolutional neural networks (CNNs) in waste management, specifically for recycling, waste classification, and trash detection. It covers datasets, advanced CNN models, and key applications while discussing the challenges in implementing CNNs for efficient waste management under Industry 4.0 and "Zero Waste" initiatives.

**5.Smart Bins for Enhanced Resource Recovery in Smart Cities** (2024)​: This paper reviews the role of smart bins in urban waste management, focusing on automation and material separation. It identifies challenges such as the lack of standardization and limited integration of advanced technologies in current systems, advocating for improvements to support circular economy models in smart cities.

**6.Waste Management in the Smart City: Current Practices and Future Directions** (2023)​: The article examines smart waste management in urban environments using a bibliometric review. It discusses technological innovations, societal challenges, and the integration of IoT in waste systems. Future directions include energy recovery, transportation efficiency, and enhanced citizen engagement to achieve sustainability goals

**7. Exploring How Open Source Software Can Be Utilized in Healthcare** (2020)​: This thesis explores the implementation of free and open-source software (FLOSS) in the healthcare sector. It analyzes usability and user acceptance issues, reporting challenges such as user perceptions of outdated interfaces and logistical difficulties. Two virtual machines tailored for clerical and clinical tasks demonstrate the feasibility of FLOSS in healthcare.

8. **(Smart Waste Management: Waste Segregation using Machine Learning)**​: This paper introduces an automated waste segregation system using drones equipped with image processing, GPS, and GSM technologies. The system employs convolutional neural networks (CNNs) for classifying waste into categories with 95% accuracy and supports multi-object detection via YOLO and Darknet frameworks. It aims to streamline waste management, reduce labor costs, and promote recycling for an eco-friendly environment.

9. **(Smart Trash Bin Model Design for Smart Cities)**​: The study proposes IoT-based smart trash bins incorporating sensors, image classification, and spectroscopy for efficient waste segregation. These bins identify materials and optimize collection processes, aiming to reduce management costs and enhance urban sanitation. The system achieves high accuracy in material identification and is adaptable for future smart city applications, including integration with cloud-based management systems.

**Machine Learning in Wireless Sensor Networks for Smart Cities: A Survey** : This survey explores the application of machine learning (ML) in wireless sensor networks (WSN) for smart city applications such as waste management, healthcare, and traffic monitoring. It highlights the predominance of supervised learning techniques (61%), followed by reinforcement learning (27%), and unsupervised learning (12%) for optimizing network coverage, energy efficiency, and data aggregation in resource-limited IoT scenarios.

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    School of Computer Science and Engineering, Vellore Institute of Technology, Chennai, Tamilnadu, and Department of Electronics and Communication Engineering, Koneru Lakshmaiah Education Foundation, Vijayawada, Andhra Pradesh, India.  
    Email: gayathri.r@vit.ac.in, sholausha.rani@vit.ac.in, christie.vincent2021@vitstudent.ac.in.*