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A futuristic digital interface with a glowing Earth globe in the center. The background is dark blue with various data visualizations including bar charts, line graphs, and network diagrams. Text elements like 'BUSINESS', 'NETWORK SEARCH', and 'WORLD' are visible. A person's hand is seen at the bottom, interacting with the interface.

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# Automated Biomedical Waste Segregator

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**ABSTRACT:** As medical waste generation increases in India, proper disposal is crucial for public health and safety. The WHO guidelines for managing biomedical waste include a colour coding system to identify and segregate different types of waste, but this can be challenging for those without adequate training. The current colour-coded bin system has limitations, including misclassification of waste and potential contamination. To address these issues, we propose an automated biomedical waste segregator system that uses deep learning algorithms and image processing to accurately classify and segregate waste. This system is expected to improve waste management and reduce the need for manual labour while enhancing public health and safety.

**KEYWORDS:** Colour coding system, Waste detection, Image processing, Waste separation, Deep learning algorithm.

## I. INTRODUCTION

Medical wastes are considered as one of the most dangerous wastes in the world. These wastes contain infectious or potentially infectious materials, hazardous, chemicals or radioactive substances and cause a risk of infection or injury to healthcare workers, patients and general public if not handled and disposed of properly. According to the report by World Health Organization (WHO), healthcare activities worldwide generates an estimated 5.2 million tonnes of waste annually. This figure is expected to increase to 9.2 million tonnes by 2030.

So the proper disposal of biomedical waste is critical for maintaining public health and safety. World Health Organization (WHO) provided guidelines for the safe management of biomedical waste which includes a colour coding system. The current color-coded bin system has several limitations, such as misclassification of waste, manual labour requirements, and the potential for contamination. Improper disposal of medical waste in hospitals can have several negative effects on the environment and public health.

## II. RELATED WORK

Aleena V.J. et.al [1]: This study proposes an "automatic waste segregator and monitoring system" that separates waste into metal, plastic, and organic categories. The system monitors the waste collection process and regulates waste flow using sensors, blowers, and an Arduino Uno. K Abhinav Nishanth [2]: This project aims to create a compact and affordable automatic waste segregator that separates waste step-by-step using blowers and magnets. Ultrasonic sensors detect bin levels, and the waste is disposed of in separate bins for recycling. Jasmine. A [3]: This paper suggests using a smart bin with an image of a municipal waste bigot to segregate waste automatically, including useful paper. The bin can transmit data on the waste, triggering actions. The system employs sensors and motors connected to an Arduino board. Vijayakumar. H [4]: The waste is segregated automatically via Ducts and separate pathways. Weight sensors are added for monitoring waste collection process. The sensors would be placed in all the garbage bins. When the garbage reaches the level of the sensor, then the indication will be given to the microcontroller.

The microcontroller will give indication to the driver of garbage collection truck by sending Short Message Services (SMS) using Global System for Mobile communication (GSM) technology.

### III. METHODOLOGY

The automated biomedical waste segregator system will use cameras to capture images of biomedical waste. The images will be processed using deep learning algorithms to classify the waste into appropriate categories such as infectious waste, non-infectious waste and hazardous waste. The deep learning algorithms will be trained using a large dataset of images to enable the system to identify different types of biomedical waste accurately. The system will use a convolutional neural network (CNN) to process the images and classify the waste.

### IV. EXPERIMENTAL RESULTS

The proposed automated biomedical waste segregator system using deep learning algorithms and image processing can greatly enhance waste management practices in India by improving waste segregation accuracy and reducing reliance on manual labor. However, successful implementation will require high-quality image processing and comprehensive dataset for algorithm training. The system's potential impact on public health and safety is significant, but costs and sustainability must be considered. Overall, the system offers great potential for improving waste management practices in India.

Figure shows the results of waste detection from an image by using deep learning algorithm.



Fig. 1 Input Image

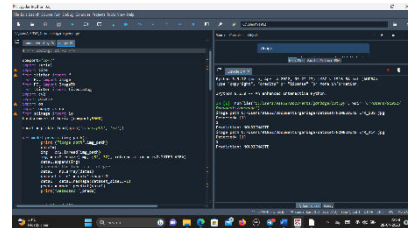


Fig. 2 Output Image

### V. CONCLUSION

The proposed automated biomedical waste segregator system using deep learning algorithms and image processing can improve waste management and reduce the risk of contamination. The system's success depends on algorithm accuracy, image quality, and cost-effectiveness. It has the potential to improve public health and safety, but cost and maintenance must be considered for long-term sustainability.

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