

# ACADEMIC TASK-2

## INT-428

(Artificial Intelligence Essentials)

### COMPUTER SCIENCE AND ENGINEERING

Submitted by:

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**Annexure3b- Complete filing**

**INVENTION DISCLOSURE FORM**

Details of Invention for better understanding:

1. **TITLE:** AI and ML based dustbin to make compost
  
2. **INTERNAL INVENTOR(S)/ STUDENT(S):** All fields in this column are mandatory to be filled

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**2.DESCRPTION OF THE INVENTION:** This state-of-the-art AI dustbin system harnesses AI, IoT, adaptive sensor technology and Machine Learning to automate essential home task to full fill the manure usage in the home, including segregation of waste into recyclable and organic waste , dehydration unit for organic waste notification when to take trash out and when the process completes. By enhancing efficiency, reducing the cost of manure or compost , and optimizing resource allocation, this technology makes more easy to make compost out of the waste in the home into a more intelligent and sustainable practice.

#### **A. Purpose of the Invention:**

1. The main purpose of this invention is that in Indian house hold 9 out of 10 households always used to grow plants and we always used to buy manure and compost from outside
2. we don't the what they are using so instead of throwing the organic waste and you can dehydrate it and make it as manure so easy and convenient.

#### **Key Functionalities**

##### **1.Adaptive waste sorting with Machine Learning**

- a. Integrates with microcontroller and sensor with running embedded machine learning system to classify the waste.

- b. Detects the waste which belongs to organic and recyclable.

## **2. Compact 2 days waste**

- a. Uses 10 L capacity to hold two days waste where an average Indian household can use.
- b. Fits in a small place under a table or near to kitchen which manages waste very effectively.

## **3. Efficient Energy use and Cost-Effectiveness**

- a. Operates with a 14V power adapter maintain low energy use and affordable production costs. ○
- b. Total power used throughout the process is 200 to 240V for the components like fan, heater and sensors.

## **4. Odor-Free from Organic waste Dehydration into Manure**

- a. Converts 1KG of organic waste into 150 to 200GM of manure.
- b. Uses low energy for dehydrating system with odor control via pre-drying.

## **5. Recyclable Waste Segregation**

- a. Stores sorted recyclable dust in another bin of 10L for easy disposal or recycling.
- b. AI and ML determines which dust is organic or recyclable one.

## **6. Key Advantages**

- a. **Space-Efficient:** Compact of 20L design handles 2 days of waste, perfect for a Indian house holds
- b. **Smart Sorting :** AI and adaptive Machine Learning ensures accurate separation of waste.
- c. **Cost Effective:** Affordable at 2500 to 3500 for one dustbin and it can run at least 6 to 8 years.
- d. **Eco-Friendly:** Converts waste to manure and supports recycling and landfill impact overall.

This revolutionary system represents the future of smart management of dust, making dust into manure for plants, sustainable, and productive.

## **A. PROBLEM ADDRESSED BY THE INVENTION:**

Waste Management now a days is difficult and especially Indian house hold use organic waste as manure so the smart bin can be used to make manure from household waste. This advanced solution addresses these key concerns:

### **1 Inefficient household Waste Management**

- a. Small household generates averagely 1 to 2 Kg wate of organic and recyclable daily.
- b. Traditional waste bins are bulk for small urban households.

### **2 Resource waste and Environmental issues**

- a. Organic waste which contains more than 70% of Indian municipal waste is discarded in landfills.
- b. Mixed waste reduces recycling rates as unsorted recyclable, overload, increases environmental damage.

### **3 Odor Issues from Organic Waste**

- a. Wet waste decomposes very rapidly and leaves bad smell in both house and dustbin and making unhygienic.
- b. And conventional bins rely on passive ventilation or costly filters which is not possible for small-scale house.

### **4 High Energy and Cost Barriers in Waste Processing**

- a. Existing smart bins consumes almost 100 to 300 WH per day which is lot of electricity consumption for small household
- b. Advanced waste processing bins are very expensive which cost around 10,000 to 15,000 making them not available for small households.

### **5 Lack of User-Friendly Waste Solutions**

- a. Sorting waste and waste or managing compost requires both time and knowledge and 90% of Indian house hold are very busy from adopting sustainable practices.
- b. Home composting often yields lack of variable output like wet smell compost due to lack of automation and appeal.

### **6 AI and Machine Learning powered dust bin: A Smart Solution**

By integrating AI and Machine Learning this system automates critical farming processes, ensuring precise waste monitoring, optimized resource usage, and intelligent decision making. With real-time analytics, and AI-driven operations, this technology reduces

manual effort, enhances productivity, and promotes sustainable compost practices in homes.

## **B. OBJECTIVE OF THE INVENTION**

### **1. Sorting Efficiency**

- a. Utilize adaptive machine learning with sensors to accurately separate the waste to their respective bins with a 20L of capacity.

### **2. Increase Sustainable in Environment**

- a. Equipped with AI and machine learning, the system ensures precise application of segregation and reducing landfills.
- b. Real-time application where waste can store and turned into compost from you house to your plants.

## **C. STATE OF THE ART/ RESEARCH GAP/NOVELTY:**

Sr. No.	Patent I'd	Abstract	Research Gap	Novelty
US20160176630A1	A container includes a sensor for sensing a quantity indicative of the how much dust deposited in the bin and sends a wireless communication to a janitor to pick up the dust.	Focuses on monitoring rather processing the waste into usable outputs like manure.	Introduced wireless enabled smart bins where can identify the dust collected in the bin. and a step head of static bins.	
US20180016096A1	This invention had added the ML and Ai to identify what kind	Emphasizes sorting recyclables but does not	Pointed towards sorting with recyclability	

	of dust was disposing into it and it segregate into their respective bins. Improves recycling efficiency.	process organic waste or address or smell beyond detection.	threshold, addressing contamination issues In single stream recycling.
IN202111006039	This patent where a trash bin segregate waste into degradable and nondegradable using ultrasound and calorimetric sensors interfaced with aurdino it monitors waste level for cleaner waste management.	Limited to only segregation without converting waste into a useful matter. No self power mechanism , relies on external power .	Introduced to IoTbased segregation with real time monitoring in a compost bin , enhancing cleanliness in Indian urban contexts.
CN103717715A	This method process solid waste into engineered fuel by mechanically removing recyclables and converting into fuel. it balances heat value and reduce water use. minimize secondary pollution.	Mainly focuses on fuel pellets not manure and lack of smell free processing. No ML sorting or self powering uses conventional energy.	Main innovation from this is to produce fuel from waste with minimal uses of water and pollution optimizing calorific value for industrial use.

### C. DETAILED DESCRIPTION:

#### Overview

This smart bin integrate Artificial Intelligence (AI) and Machine Learning (ML) perform waste management including segregation, composting, dehydration, odor-free. Engineered for wate management I t enhances efficiency, minimizes landfills and making dust free, and optimizes resource use and make every waste into useful thing. m

#### System Architecture & Key Components

##### 1. AI and ML powered Navigation System

- a. Utilizes sensor which are infrared sensors which identifies organic waste.
- b. AI and ML driven route optimization conserves energy while ensuring waste segregation.

## **2. Smart Waste Management System**

- a. Equipped with two differ bins which one is belongs to organic and another for recyclable waste.
- b. AI processes real-time data to identify waste.
- c. Maintain sustainability without causing landfill.

## **3. Odor Free and Organic Processing Unit**

- a. Holds sawdust or coconut husk for a pre drying and maintain it from odor free.
- b. Holds 12V fan which used to dehydrate the organic waste.

## **4. Power Supply**

- a. Which consists of 12V or 3A cable for dehydration process.
- b. Which uses electricity efficiently without wasting.
- c. Uses a less energy not charging more than 20Rs for an Indian house hold.

## **5. Working Mechanism**

### **a. Segregation**

- a. GPS and LiDAR scan and map the field.
- b. AI calculates the most efficient operational path.

### **b. Real-Time Analysis**

- a. Sensors continuously watches waste separation and keep update to owner.

### **c. Precision Waste Management**

- a. Automates segregation and keep them in their respective bin without any fault.

### **d. Automated Composting and Eco-Friendly**

- a. Automatically dehydrate waste and converts into manure.



- b. **Minimize landfills and maintain eco-friendly in nature without creating mess.**

## **6. Key Benefits**

- a. **Fully Autonomous – Operates with minimal human intervention.**
- b. **AI and ML Driven Adaptability – Adjusts processes in real-time for maximum efficiency.**
- c. **Energy-Efficient – Reduces power consumption through optimized operations.**
- d. **Scalable – Suitable for all house hold.**
- e. **Sustainable – Conserves environment reduces landfills and maintains soil health.**

## **7. Conclusion**

**By combining AI, ML and sensors this advanced smart bin transforms traditional waste management into improving sustainable, reducing environmental damage.**

## **D. RESULTS AND ADVANTAGES:**

The ML and AI-powered smart bin system revolutionizes waste management by improving efficiency and productivity, offering several key advantages:

- a. **Self production**– AI and ML driven make bin to produce the waste into manure which is enough for a normal house hold.
- b. **Easy Segregation** – by its own can separate the dust without extra energy and easy to maintain.
- c. **Odor Free** – by usage of coconut pit or waste the bin will be odor free from organic waste.
- d. **Eco-Friendly** – Uses less electricity and does not exceed more than 50 to 60Watt throughout the whole process.
- e. **Sustainability**– Protect the world from landfills and waste by sewage and creating a big problem.

## **Advantages Over Existing Prior Art**

Feature	Traditional Waste Management	AI-Enabled Robotic Farming
Automation	Depends largely on manual labour for key tasks.	Fully automated without human interaction.
Waste Monitoring	Manual monitoring and no segregation.	AI and ML-powered system provides real-time waste analysis.
Resource Efficiency	Overuse of electricity and time taking process.	Smart system with dehydrating fans complete process within 2 days.
Eco-Friendly	Fills in the lands and creating a big mess without cleaning	Just produce own compost from your own waste.
Odor-Free	Normally in landfills create a large amount of ammonia and CO <sub>2</sub> causing lung diseases near to them	AI and ML ensures precise and optimized application.
Remote Monitoring	Any one need to be there to take trash out and clean the bin.	AI and ML detects the dust and send message if it was full then connect to charge and it will complete the process.

### Advantages Over Traditional Methods

- Smart Decision-Making:** Unlike manual, this system autonomously processes the waste and segregates.
- Enhanced Precision & Accuracy:** AI and ML makes that it is easy to identify which belongs to which bin.
- Eco-friendly:** Does not make environment damage and it is useful to home plants as manure.
- Scalability & Adaptability:** The system is designed to accommodate different house types and easy to fit anywhere without taking a large space.
- Conclusion**

The AI and ML -Powered smart bin surpasses traditional waste management by reducing manual effort, optimizing resource consumption, increasing productivity, and promoting sustainable

practices. By integrating AI, ML and automation, it delivers an advanced, intelligent solution that enhances waste management efficiency, profitability, and environmental sustainability.

#### **F. EXPANSION:**

**Smart Waste Management Solutions** – AI and ML driven smart bins manage waste very efficiently.

**Automated Compost Processes** – by dehydrating the waste at 60 to 70 degrees Celsius it convert it into dry waste.

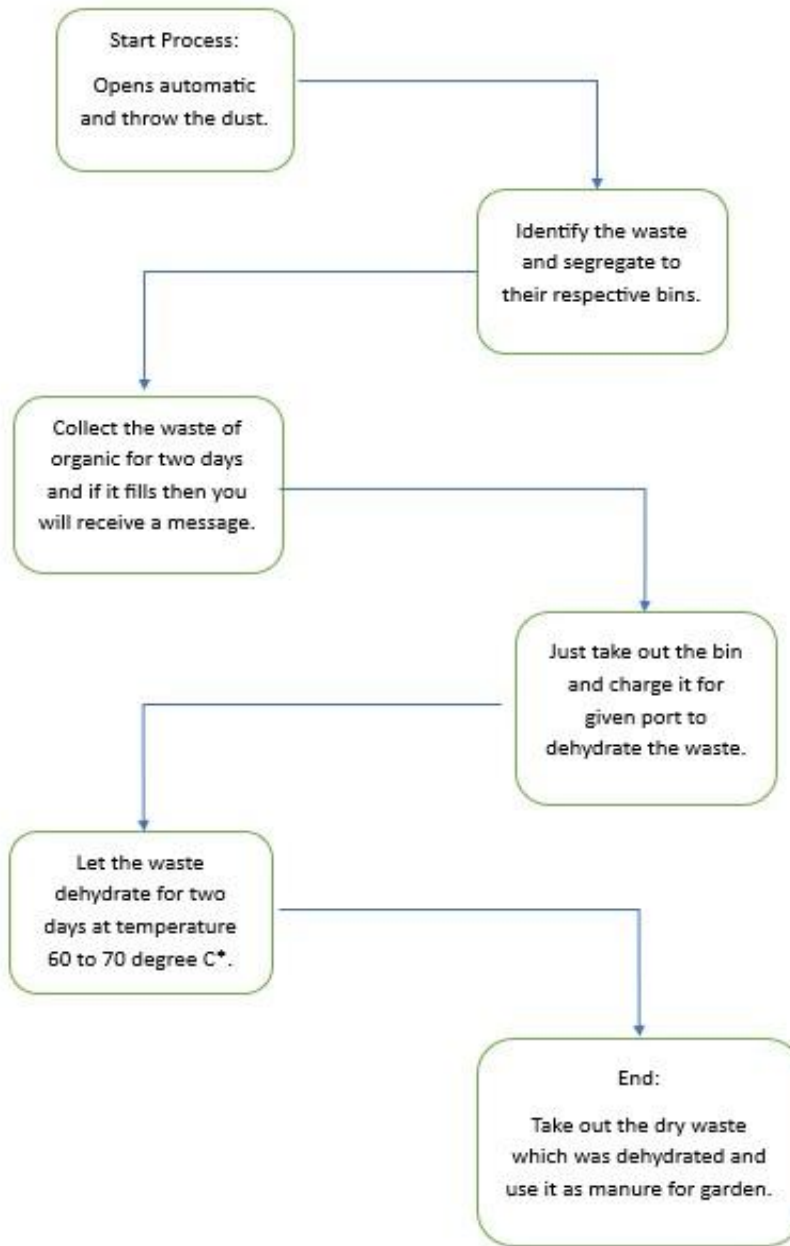
**Efficient Usage of Resources** – Uses electricity and place in a very small compact place and uses very less electricity.

**Sustainability** – One of the best way to convert waste into manure and dumping into landfills or sewage.

**Integrated IoT & Drone Connectivity** – Maintain odor- free and with sawdust or coconut pit layer it will be odor less in home.

#### **G. WORKING PROTOTYPE/ FORMULATION/ DESIGN/COMPOSITION:**

#### Flow Chart:



**G. EXISTING DATA:** Any clinical or comparative data necessary enough to support your invention. (Comparative)

Feature	AI, ML -Driven waste management	Conventional waste management
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<b>Precision Waste Management</b>	Utilizes AI, ML and sensors for continuous for segregation of waste.	Relies on manual power to segregate waste.
<b>Labor Dependency</b>	Reduces human labour by 40-60% through its automation.	Requires significant manual effort at every stage.
<b>Resource Optimization</b>	AI and ML enhances efficiency, reducing resource waste by 30-50% through precise application.	Manual estimates often lead to excessive or insufficient resource use.
<b>Improvement of Environment</b>	It reduces landfills by 50-60% in a year.	Farmers depend on experience and seasonal patterns, resulting in inconsistent yields.
Odor Free and Eco-Friendly	Don't cause smell issues and uses less electricity.	Manual detection is slower, increasing the risk of more electricity consumption.

**H.USE AND DISCLOSURE (IMPORTANT):** Please answer the following questions:

A. Have you described or shown your invention/ design to anyone or in any conference?	YES ( )	NO (✓)
B. Have you made any attempts to commercialize your invention (for example, have you approached any companies about purchasing or manufacturing your invention)?	YES ( )	NO (✓)
C. Has your invention been described in any printed publication, or any other form of media, such as the Internet?	YES ( )	NO (✓)

D. Do you have any collaboration with any other institute or organization on the same? Provide name and other details.	YES ( )	NO (✓)
E. Name of Regulatory body or any other approvals if required.	YES ( )	NO (✓)

## 7. Potential Chances of Commercialization.

### 1. Market Demand

- **Urban Waste Management:** Cities are reeling under biodegradable waste. A smart dustbin which separates and activates composting would significantly enhance efficiency.
- **Smart Home Integration:** With the growth in smart appliances, a smart composting dustbin is a seamless fit into the lifestyle of conscious consumers.
- **Sustainability Trends:** Consumers and governments alike are trending towards eco-friendly solutions. Source composting helps reduce landfill burden and promotes circular economy practices.

### 2. AI/ML Value Proposition

- **Smart Sorting:** ML algorithms can recognize and sort biodegradable waste correctly, minimizing human error.
- **Composting Optimization:** AI can track temperature, humidity, and microbial activity to speed up and optimize the composting process.
- **User Education:** AI might provide real-time feedback or alerts (e.g., "Too much plastic detected," or "Compost ready!")

### 3. Commercial Viability

- **Target Markets:**

Households: Particularly in developed areas with high sustainability consciousness.

Restaurants and Cafés: Where food waste is high.

Municipal Corporations: Mass deployment in public spaces.

- **Business Models:**

Direct Sales: Intelligent bins sold to consumers.

Subscription Models: For maintenance, analytics, or compost collection services.

Data-as-a-Service: Sell waste analytics to municipalities or sustainability organizations.

#### **4. Technical Feasibility**

- IoT + Sensors: For real-time monitoring of waste conditions.
- Mobile App Integration: Improves user experience and control.
- ML Training: Utilizing image recognition or sensor data to sort waste items.

#### **5. Challenges to Consider**

- Cost: AI + sensor systems can be costly upfront.
- Maintenance: Composting systems have ongoing maintenance, which might act as a hurdle.
- Adoption Hurdles: Customers are likely to be skeptical or ignorant about composting.

#### **6. Growth & Investment Trends**

- Venture capital is more and more flowing towards GreenTech and intelligent waste solutions.
- Governments provide grants or incentives towards sustainable urban growth.

#### **8. List of companies which can be contacted for commercialization along with the website link**

<b>Name</b>	<b>Location</b>	<b>Focus Area</b>	<b>Website</b>
Ishitva Robotic Systems	Ahmedabad, India	AI-powered waste segregation using computer vision & robotics	<a href="https://ishitvatech.com/">https://ishitvatech.com/</a>

TrashCon	Bangalore, India	Automated waste segregation and composting machines	<a href="https://trashcon.in/">https://trashcon.in/</a>
ECOWRAP	Jaipur, India	IoT and AI-enabled smart bins for composting & collection	<a href="https://www.ecowrap.in/">https://www.ecowrap.in/</a>
Saahas Zero Waste	Bangalore, India	Integrated zero-waste management and composting solutions	<a href="https://saahaszerowaste.com/">https://saahaszerowaste.com/</a>
Gold Technologies	Bangalore, India	Rapid composting machines for wet waste	<a href="https://goldcomposter.com/">https://goldcomposter.com/</a>
Bin-e	Poland	Smart AI waste bin with auto-sorting and compression	<a href="https://bine.world/">https://bine.world/</a>
ZenRobotics	Finland	Robotic AI waste sorting systems for industrial use	<a href="https://zenrobotics.com/">https://zenrobotics.com/</a>
Lomi by Pela	Canada	Smart kitchen composters for household waste	<a href="https://pela.earth/lomi">https://pela.earth/lomi</a>



(Letter Head of the external organization)

**NO OBJECTION CERTIFICATE**

This is to certify that Lovely Professional University or its associates shall have no objection if Lovely Professional University files an IPR (Patent/Copyright/Design/any other.....) entitled AI and ML based dustbin to make compost including the name(s) of, P. Hemanth Charan, V. Mahesh, M. Manaswi as inventors who are students studying in our University.

Further Lovely Professional University shall not provide any financial assistance in respect of said IPR nor shall raise any objection later with respect to filing or commercialization of the said IPR or otherwise claim any right to the patent/invention at any stage.

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