CMR ENGINEERING COLLEGE
UGC AUTONOMOUS
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Department of Computer Science & Engineering

A Mini Project Presentation
on

SMART WASTE MANAGEMENT SYSTEM

(BASED ON USER PREFERENCES)

Internal Guide
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ABSTRACT

India generates over 150,000 tons of solid waste daily, yet a significant portion remains uncollected or improperly managed due to inefficient systems, poor public engagement, and lack of real-time monitoring. This leads to overflowing landfills, environmental degradation, and health risks for millions. Traditional waste management methods often fail to ensure timely collection, accurate verification, or citizen participation. The Smart Waste Management System addresses these challenges by leveraging AI for waste image verification, a reward-based user system, and real-time task coordination between citizens, waste collectors, and authorities. Users can report waste through a responsive web app built with HTML,CSS,JS, and the backend powered by Python Django processes the data, verifies the waste using Google's Gemini AI, and awards points for verified eco-friendly actions.

INTRODUCTION

- Tackles inefficiencies in urban waste management in rapidly developing cities like those in India, such as delayed collection, poor waste categorization, and limited citizen involvement.
- Built using **HTML,CSS,JS** for the frontend and **Python Django** for the backend to ensure a fast, scalable, and user-friendly web application.
- Integrates **Google Gemini AI** to verify waste reports submitted by users, filtering out spam and ensuring only genuine submissions are processed.
- Users are rewarded with **points for verified reports**, and a **leaderboard system** encourages healthy competition and sustained user engagement.
- Connects citizens, waste collectors, and municipal bodies in a **real-time, transparent ecosystem**, promoting a cleaner environment and active civic participation.

LITERATURE SURVEY

. No	Paper Titie	Author	Journal	Published Year	Conclusion
1	Ai-Powered Waste Managemente System Using Smart Bins	S. Kumar A. Menta	IEEE Internet of Things Journal	2020	Used image classification to identify waste type in smart bins, improving soirting accuracy.
2	Smart Waste Monitoring System Using IOT and Machine Learning	P. Sharma R. Verma	Journal of Cleaner Production	2021	Predicted bin fill level and optimized collecti-on routes using rea-time sensor data and ML
3	Deep Learning-Based Garbarge Detection for Smart Citles	M. Zhou L. Wei	Sustainable Citles and Society	2022	Detected garbage in streets using surveIllance images to triggei cleaning alerts
4	Real-Time Solid Waste Classificati-on Using Al and Citizen Participation	T. Singh K. Rao	International Journal of Environm-ental Sci	2023	Enabled citizens to report waste via images, verified with Al. and improved system through
5	A Web-Baked Platform for Waste Reporting: and Reward Systern n Urban Areas	A. Nair S. Joshi	Urban Computing Journal	2023	Created a citizen-centric portal for reporting waste, assigning rewards, and verifying submissions.

EXISTING SYSTEM

- **Manual & Inefficient Systems:** Waste collection in Indian cities relies on fixed schedules and manual verification, resulting in delays, mismanagement, and poor tracking. Without automation and data-driven strategies, waste disposal remains inconsistent and ineffective**.**
- **Lack of Public Engagement:** Citizens have limited involvement in reporting and monitoring waste, leading to delayed responses, unattended garbage piles, and overall inefficiency. Public participation is minimal due to the absence of incentives, leading to widespread neglect.
- **Absence of Real-Time Monitoring:** Municipal authorities struggle with outdated data, making it difficult to prioritize urgent waste-related issues and respond promptly. With no real-time insights, decision-making remains reactive rather than proactive.

PROPOSED SYSTEM

- **AI-Based Waste Verification**- Integrates **Google Gemini AI** to verify user-submitted waste images, ensuring accuracy and reducing false reports..
- **Web-Based Reporting Interface** - Built using **HTML,CSS,JS** and **Django**, the platform offers an intuitive interface where users can easily report waste with location and image.
- **Real-Time Communication** - Connects users, waste collectors, and municipal authorities through a **unified dashboard**, enabling fast action and transparent tracking.
- **Environment-Friendly Engagement** - Encourages a culture of environmental responsibility by actively involving citizens in public hygiene initiatives.

PROPOSED SYSTEM & ADVANTAGES

- Improved Accuracy
- Faster Response Time
- Enhanced Citizen Engagement
- Optimized Waste Management
- Transparent Ecosystem

TECHNIQUES AND ALGORITHMS USED

- **Image Classification using AI (Google Gemini AI)**
Used for verifying user-submitted waste images to detect the presence and type of waste. This helps filter out irrelevant or fake submissions.
- **Location Tagging (Geotagging)**
When a user submits a report, the system captures the geographic coordinates (latitude & longitude) to pinpoint the exact waste location on a map.
- **Point-Based Reward Algorithm**
A simple algorithm calculates reward points for users based on verified reports. Points may be influenced by factors like accuracy, frequency, and timeliness.
- **Leaderboard Ranking Algorithm**
Ranks users dynamically based on their accumulated reward points, promoting competition and continuous participation.
- **Django REST Framework (DRF)**
Used to build robust APIs that connect the frontend with backend logic for report submission, verification status, and data retrieval.
- **Image Upload & Processing Logic**
Handles image file uploads, stores them securely on the server, and prepares them for AI verification.

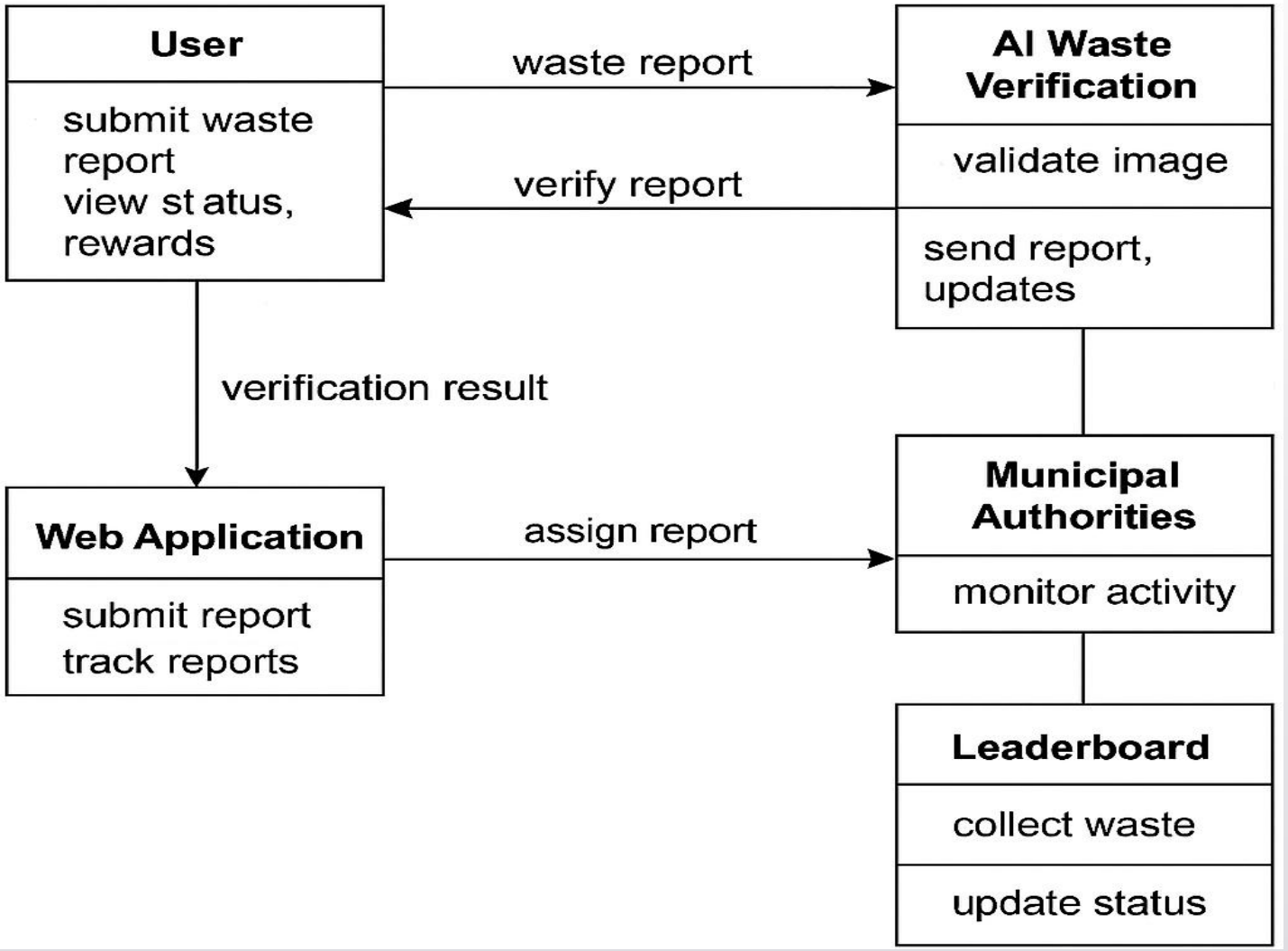
SOFTWARE REQUIREMENTS

- Programming Technology : Python(Django Framework)
- Operating System : Linux/Windows/macOS
- Frontend Development : HTML, CSS, JS
- Database : PostgreSQL(dbsqlite)
- IDE : VS Code / PyCharm
- Operating System : Windows 10/11

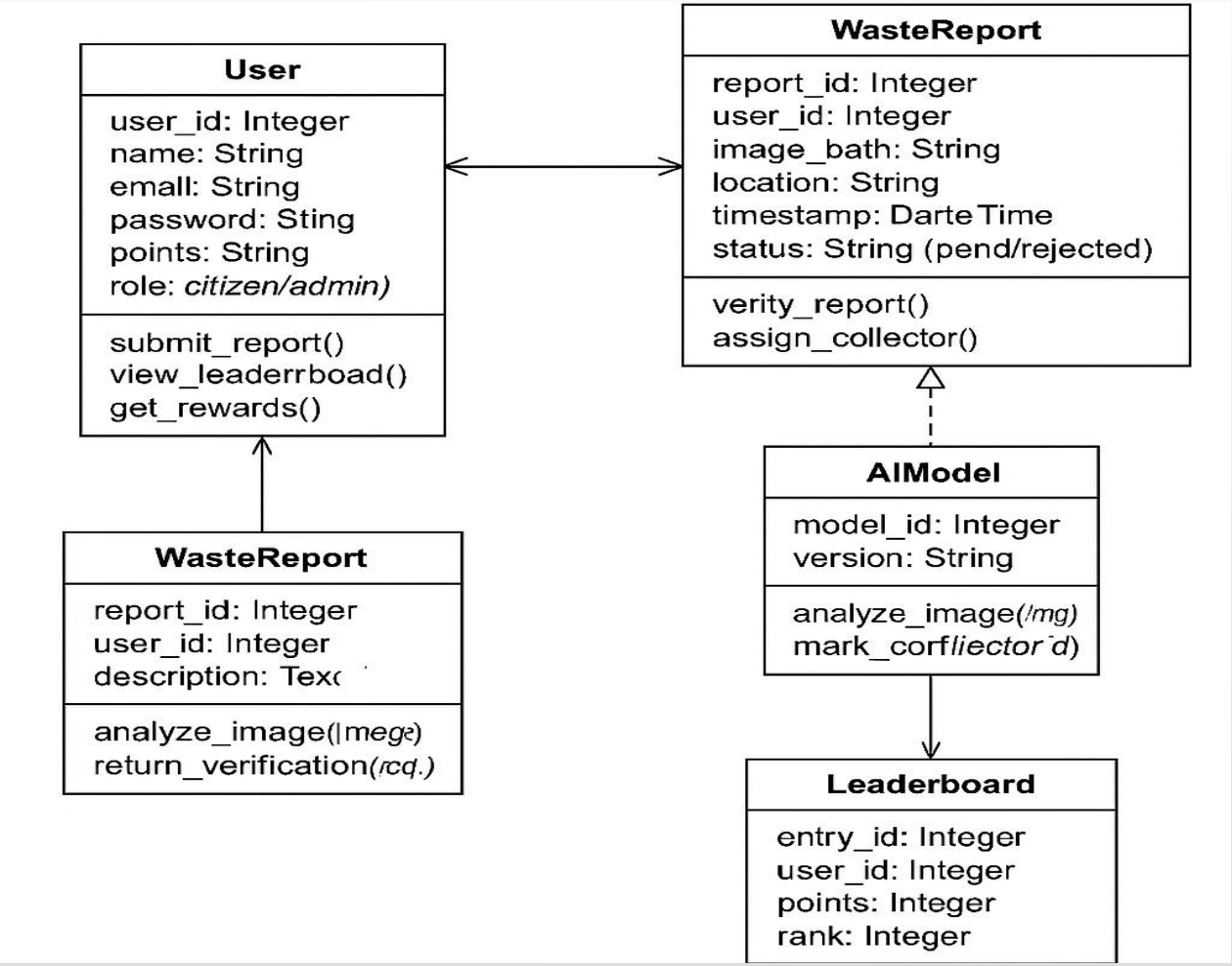
HARDWARE REQUIREMENTS

- Processor : Dual Core/I3/I5/I7
- RAM : 4GB(MIN)
- Hard Disk : 100GB or above
- Network : High-speed internet

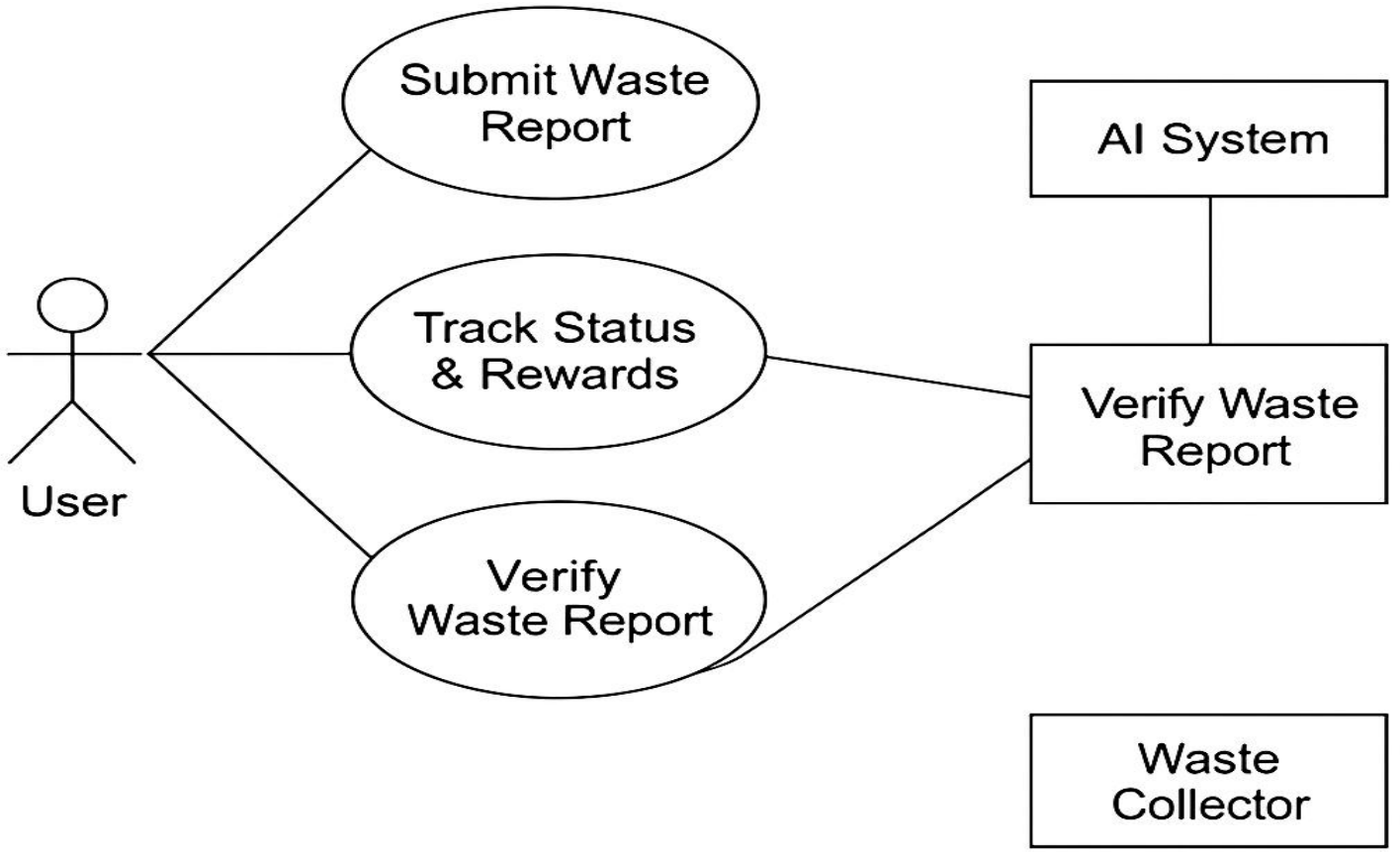
DATA FLOW DIAGRAM



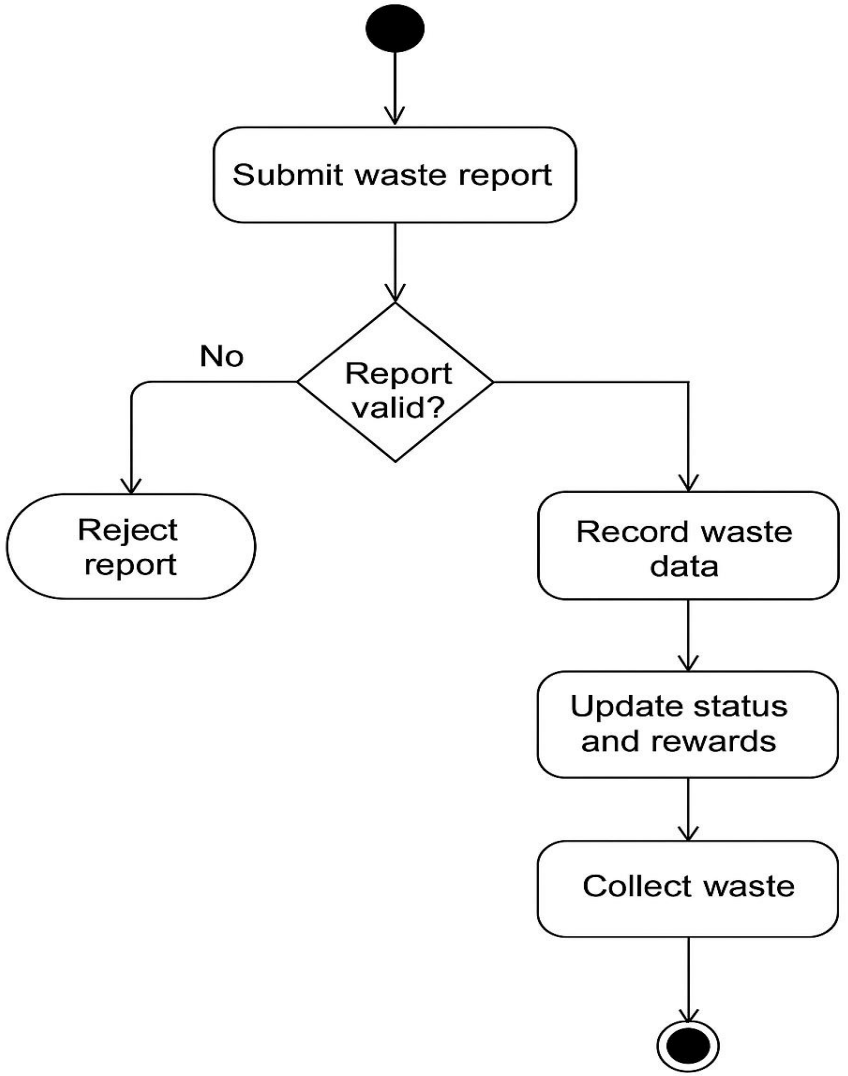
CLASS DIAGRAM



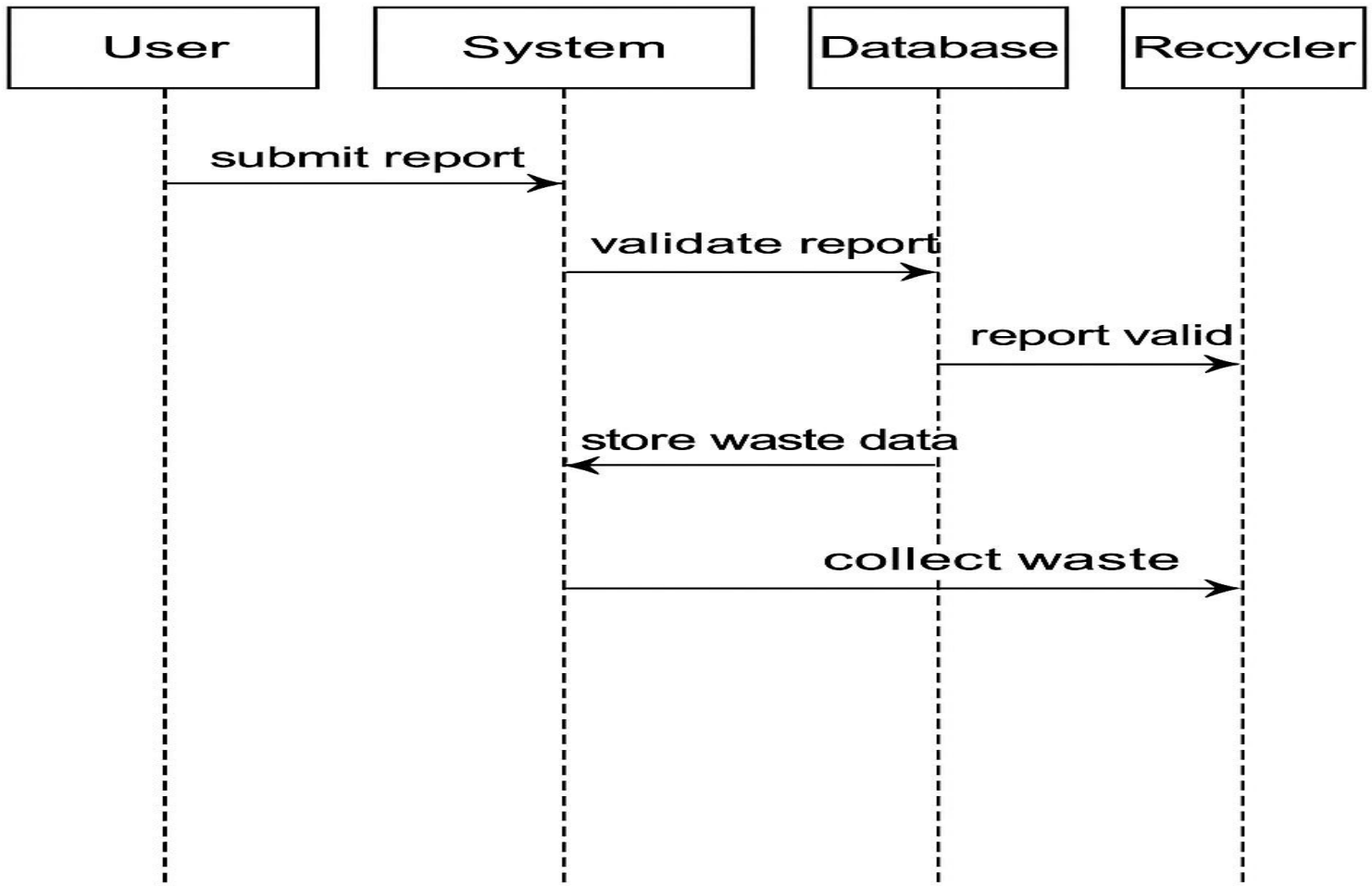
USE CASE DIAGRAM



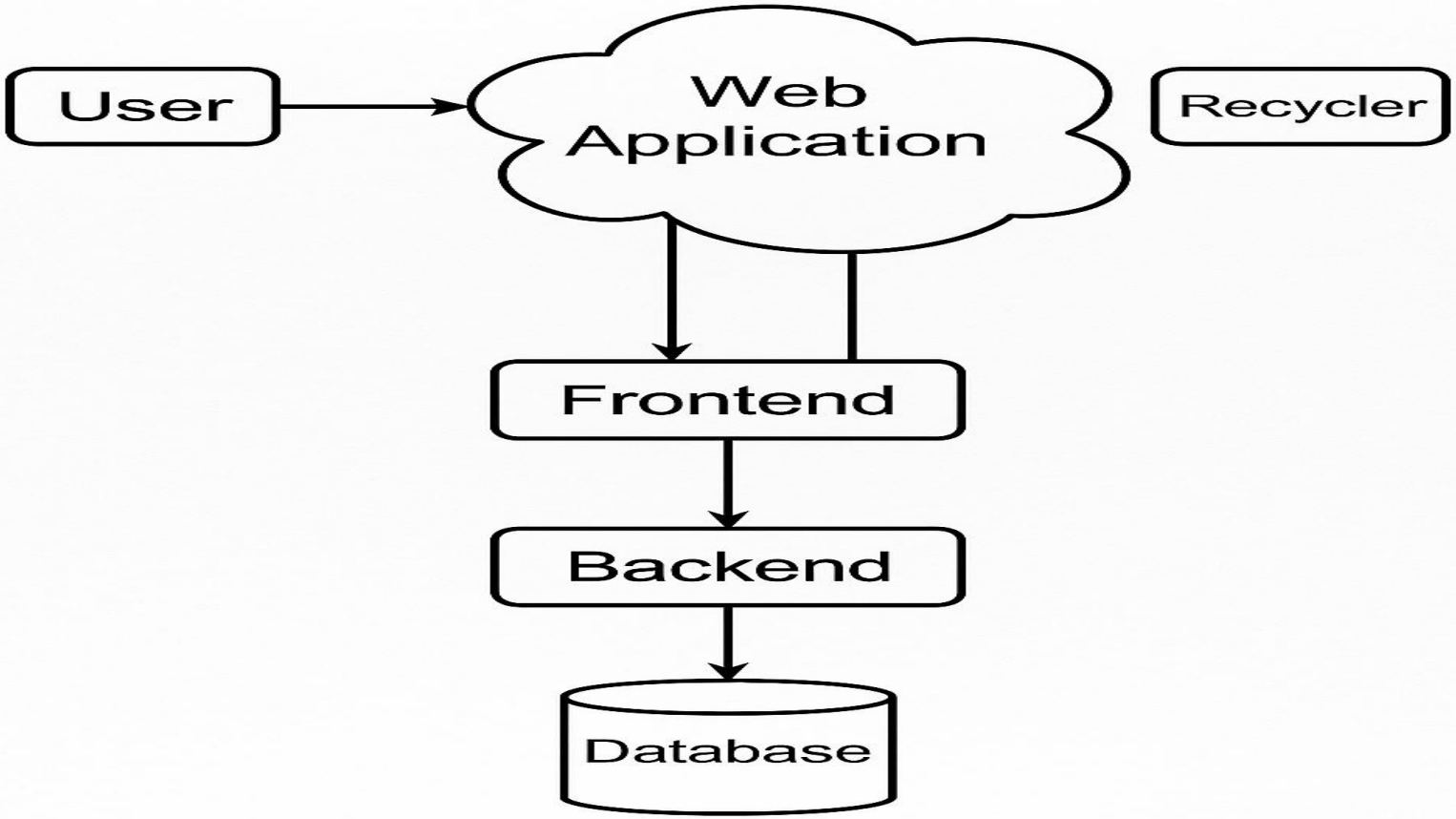
ACTIVITY DIAGRAM



SEQUENCE DIAGRAM



SYSTEM ARCHITECTURE



OUTPUT SCREENS

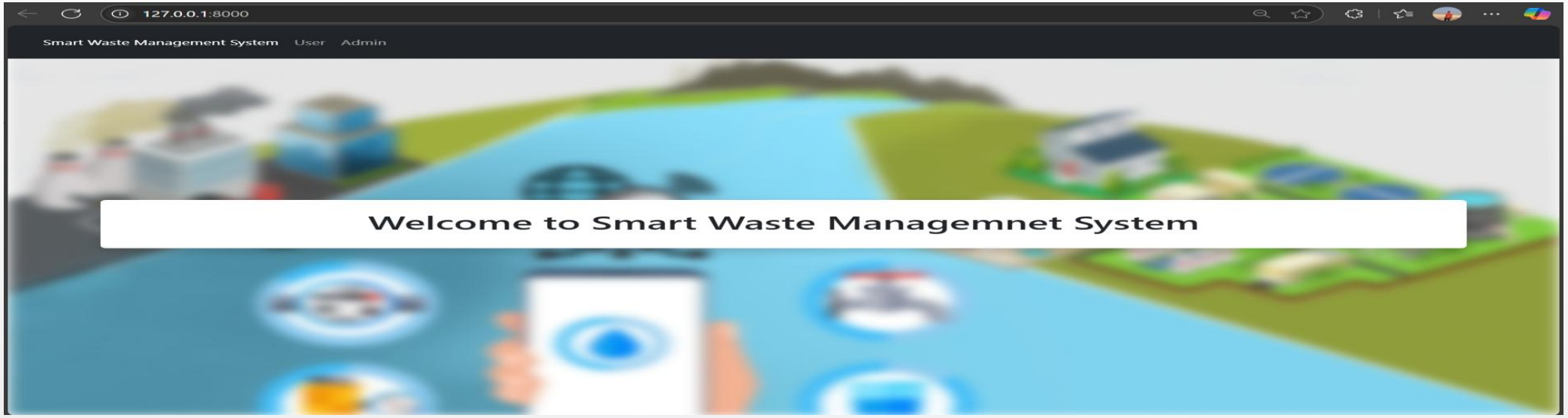


Figure i : Main Page

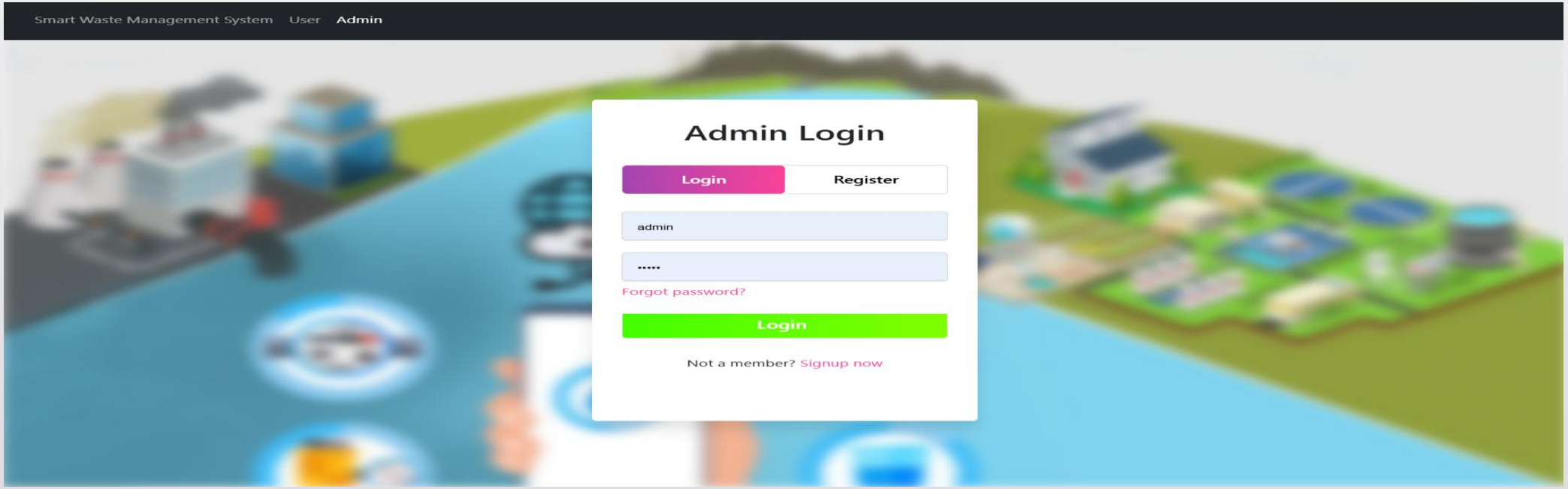


Figure ii : Admin Page

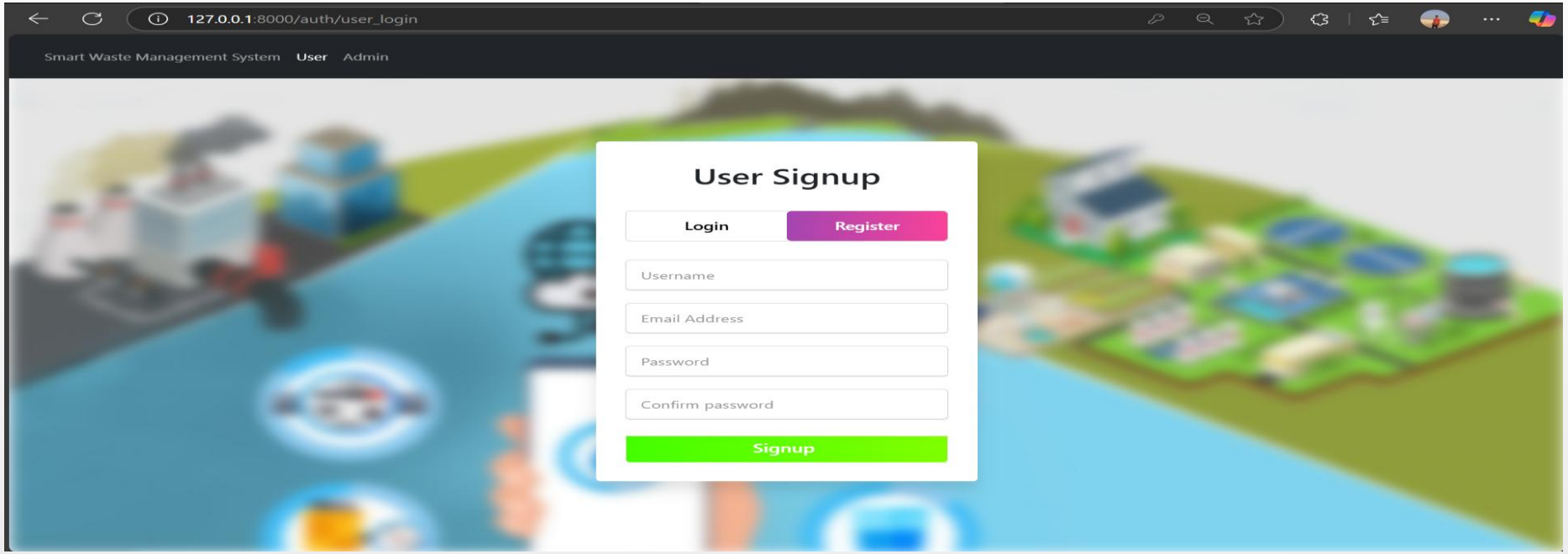


Figure iii : Registration for new user

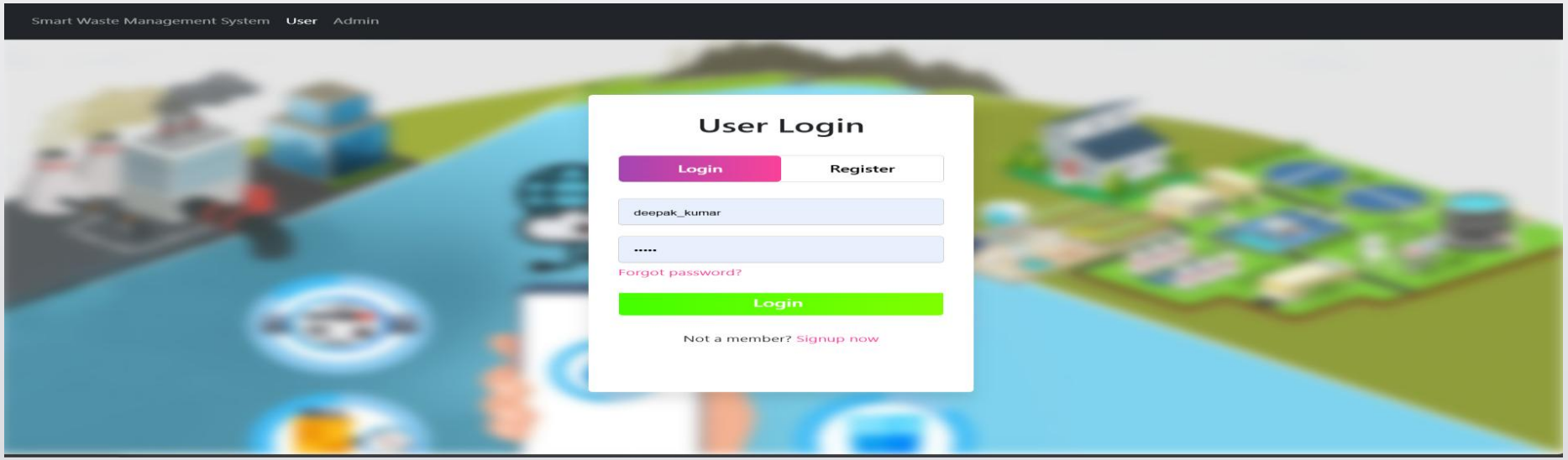


Figure iv : Login Page

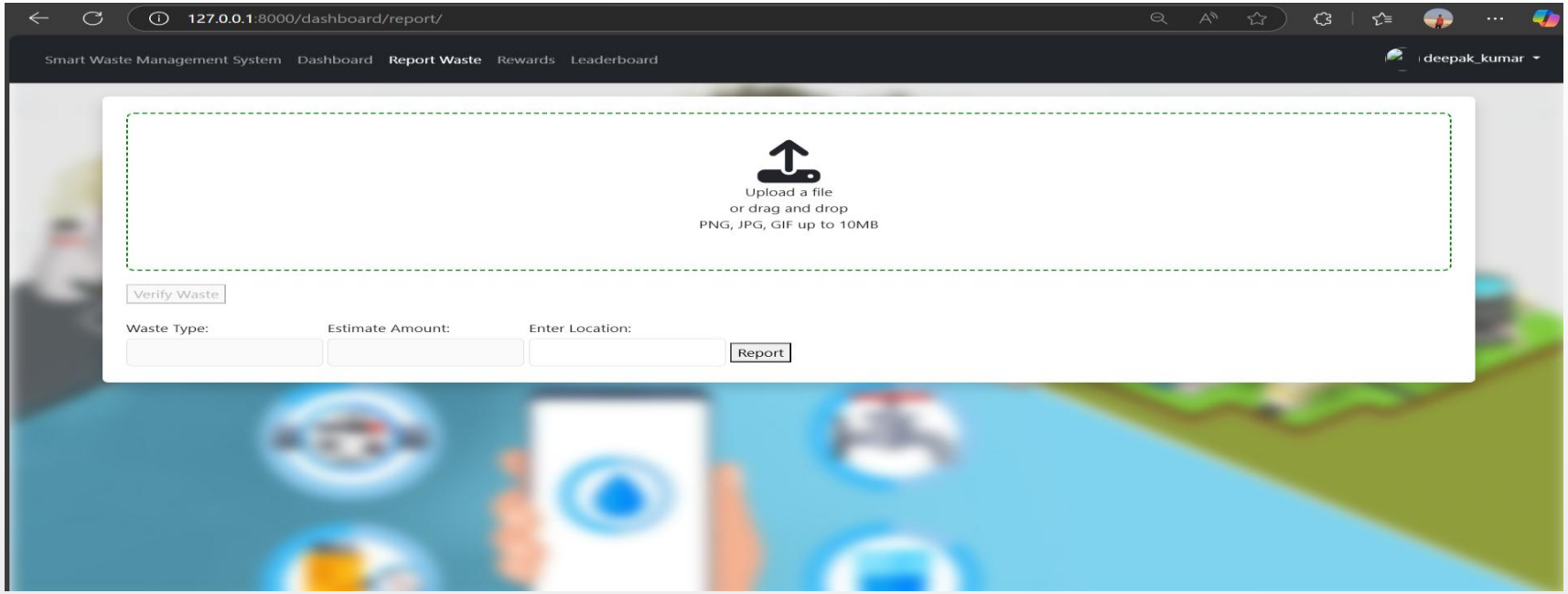


Figure vii : Report waste

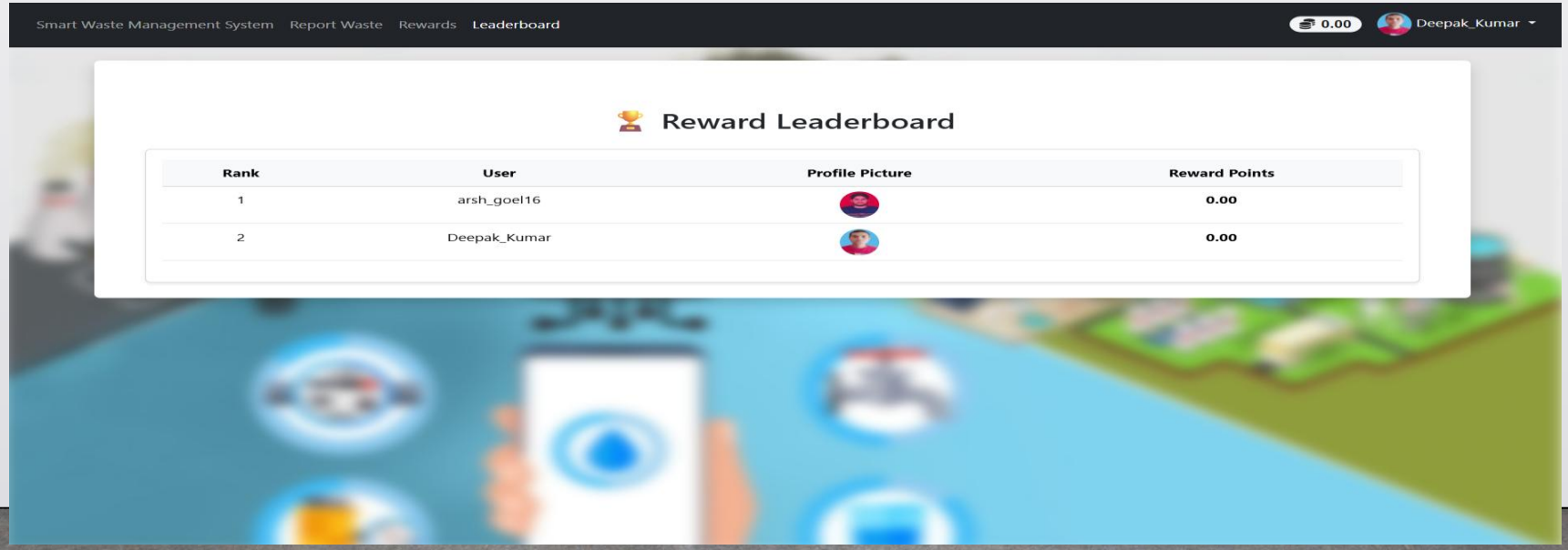


Figure viii : Reward leaderboard

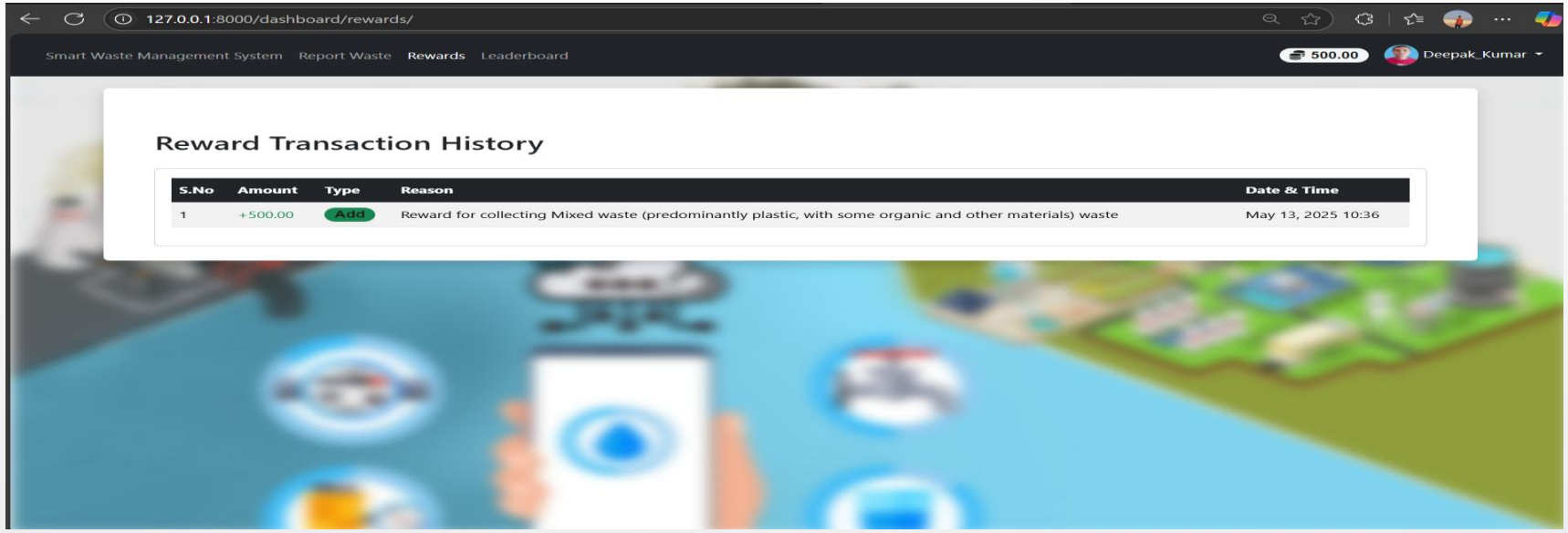


Figure IX : Reward Transaction History user

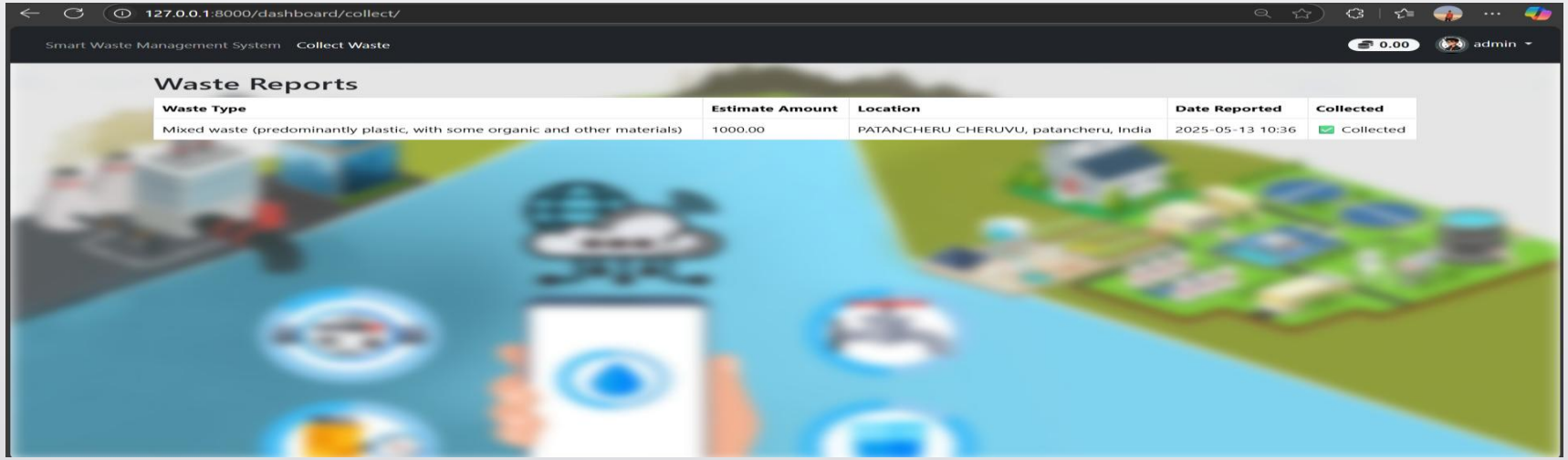


Figure X : Admin page

CONCLUSION

- The system efficiently tailors waste collection and management processes by analyzing user behavior, location data, and waste types, ensuring timely and targeted responses to waste-related issues.
- By integrating image classification, deep learning, and geolocation analysis, the model enhances accuracy in detecting and classifying waste, improving the reliability of system recommendations and automation.
- Testing revealed increased user participation and satisfaction as the system simplifies reporting, provides real-time updates, and rewards users—thereby encouraging consistent involvement in sustainable waste practices.
- Designed to scale across cities, the platform supports live data integration and flexible modules, making it suitable for various urban settings with evolving environmental challenges and demographics.
- Incorporating IoT-enabled smart bins, predictive analytics, and integration with municipal dashboards can further automate collection logistics and optimize waste management at a city-wide level.

FUTURE ENHANCEMENTS

- **IoT-Enabled Smart Bins:** Integrate sensor-based smart bins that monitor waste levels in real time and automatically notify the system for pickup, reducing overflow and improving efficiency.
- **Predictive Route Optimization:** Use machine learning to analyze collection patterns and traffic data, enabling dynamic route planning that minimizes fuel usage and speeds up waste collection.
- **Mobile App with Push Notifications:** Develop a user-friendly mobile app that allows easy reporting, real-time status updates, and instant reward tracking—boosting citizen participation and engagement.

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[3]Deep Learning-Based Garbage Detection for Smart Cities – M. Zhou, L. Wei, *Sustainable Cities and Society*,2022. https://www.sciencedirect.com/science/article/pii/S2210670721004567

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THANK YOU