# 

# **Vivekanand Education Society's Institute of Technology**

# 

# 

**Department of Computer Engineering**

**Group No.: 47**

**Date :- 02/08/2024**

**Project Synopsis Template (2024-25) - Sem VII**

EnviroScan: Community and NGO Waste Solution

Ms. Rupali Soni

CMPN

Bhagyashree Vaswani Chanadni Gangwani Shamal Dhekale

V.E.S.I.T V.E.S.I.T V.E.S.I.T

[2021.bhagyashree.vaswani@ves.ac.in](mailto:2021.bhagyashree.vaswani@ves.ac.in) [2021.chandni.gangwani@ves.ac.in](mailto:2021.chandni.gangwani@ves.ac.in) [2021.shamal.dhekale@ves.ac.in](mailto:2021.shamal.dhekale@ves.ac.in)

# **Abstract**

Our platform leverages advanced object detection technology to enhance community-driven waste management. Users can report dumpsters in their area by uploading videos or photos, which are then analyzed to detect and count plastic waste. This precise data aids NGOs in efficiently allocating resources for waste collection and segregation. Additionally, the platform serves as a hub for environmental engagement, allowing NGOs to announce drives and events, encouraging community participation. It also offers news and articles on sustainability practices, promoting environmental awareness and education among users. By bridging the gap between technology and community action, our platform simplifies the process for users and empowers NGOs with actionable insights. The integration of object detection technology streamlines resource allocation and reduces operational inefficiencies, while the community engagement features encourage active participation in environmental initiatives. Through its informative content and event promotion capabilities, the platform not only supports effective waste management but also drives broader awareness and involvement in sustainability efforts.

# 

# **Introduction**

In the era of rapid technological advancements and increasing environmental concerns, our project emerges as a beacon of innovation and community empowerment in waste management. Our platform leverages cutting-edge object detection technology to enable users to report issues related to dumpsters in their vicinity by simply uploading videos or photos. This technology meticulously analyzes the media to detect and count the number of plastic items, providing an accurate assessment of waste quantities.

This feature is transformative for NGOs engaged in waste management drives. Armed with precise data, these organizations can better allocate their resources—trucks, collectors, manpower, and plastic bags—streamlining their operations and significantly reducing the time and effort required for waste segregation. This allows NGOs to focus more on the impactful work of cleaning and less on logistical challenges.

Our platform is designed to foster a collaborative community spirit. NGOs can post about upcoming drives and events, inviting the community to participate and contribute to the cause. This not only helps in mobilizing resources but also strengthens the bond between the organization and the community it serves.

Furthermore, our project is dedicated to spreading awareness and education about environmental sustainability. The platform offers a wealth of news and articles on innovative ways to reduce, reuse, and recycle, keeping users informed and engaged. By promoting best practices and new technologies in waste management, we aim to inspire individuals and communities to take proactive steps towards a cleaner, greener future.

In essence, our project is more than just a technological solution; it is a comprehensive platform that empowers NGOs, engages communities, and promotes environmental stewardship. Together, we can make a significant impact in managing waste more efficiently and creating a sustainable environment for future generations.

# 

# **Problem Statement**

In an era marked by rapid urbanization and increasing environmental concerns, effective waste management has become a critical imperative. Despite existing efforts, many communities still face challenges in managing waste efficiently, leading to issues such as improper recycling, delayed waste collection, and a lack of public awareness about sustainable practices.

This project aims to address these challenges by integrating cutting-edge technology with community engagement and education. By leveraging advanced waste detection systems, optimizing waste collection schedules, and facilitating real-time updates for cleaning drives, our initiative seeks to enhance recycling efficiency and overall cleanliness within communities.

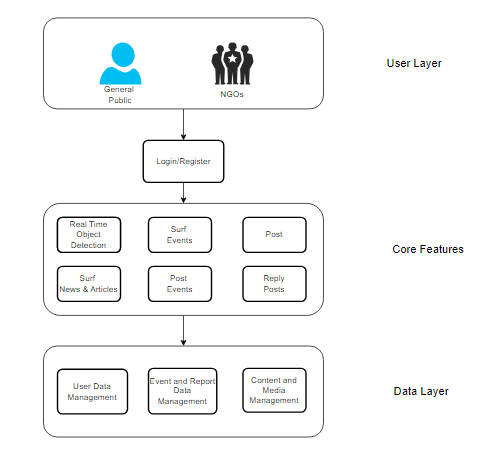
Additionally, through public awareness campaigns and a robust complaint management system, we empower individuals to actively participate in maintaining sustainable waste management practices. Ultimately, this initiative fosters cleaner and more sustainable environments for all.

# **Proposed Solution**

To address the challenges of effective waste management, our solution integrates advanced technology with community engagement and education. The increasing urbanization and environmental concerns have highlighted the need for innovative approaches to waste management. Traditional methods often fall short in terms of efficiency and sustainability, leading to improper recycling, delayed waste collection, and general public unawareness about proper waste disposal practices. Our comprehensive solution aims to bridge these gaps by combining state-of-the-art technological advancements with robust community involvement and continuous education efforts. By leveraging machine learning, mobile technology, and public outreach programs, we seek to transform waste management into a more efficient, transparent, and community-driven process. The core components of our solution include the following:

1. Object Detection System for Waste Segregation: We will implement an advanced object detection system using machine learning algorithms to automatically segregate waste. Initially, a diverse dataset of waste images is collected and annotated, with data augmentation techniques applied to enhance robustness. This system will count different types of waste, such as plastic, organic waste, and recyclables, ensuring accurate monitoring and segregation. Pre-trained models such as YOLO, Faster R-CNN, or SSD are then utilized, with transfer learning employed to fine-tune these models on the waste dataset. The training process involves selecting suitable hyperparameters and evaluating the model's performance using metrics like precision, recall, and IoU for evaluating the accuracy of the model. This data will help in monitoring waste composition and ensuring proper recycling processes are followed.
2. Real-Time Updates, Notifications, and Complaint Management: A mobile application will be developed to provide residents with real-time updates on waste collection schedules and cleaning drives. The app will also offer features for reporting issues, such as overflowing bins or missed collections, directly to the waste management authorities. An efficient complaint management system within the app will ensure that reported issues are addressed promptly, improving overall service quality and community satisfaction.
3. Public Awareness Campaigns: To foster community involvement and education, we will launch comprehensive public awareness campaigns. These campaigns will include:
   1. Workshops and Seminars: Conducted in local communities and schools to educate people on the importance of waste segregation, recycling, and reducing waste.
   2. Community Events: Organizing clean-up drives, recycling competitions, and sustainability fairs to engage the community and promote hands-on learning.

# **Methodology / Block Diagram**

****

**User Layer**

General Public: Represents everyday users who can access various features such as event information, news/articles, and reporting waste.

NGOs: Represents non-governmental organizations and cleanup drive organizers who can post events and respond to user reports.

**Core Features**

Login/Register: The entry point for all users, enabling them to log in or register to access the app's features.

Real-Time Object Detection: Allows users to scan and detect waste in real-time and display count

Surf Events: Enables users to browse upcoming events organized by NGOs.

Post Events: Allows NGOs to create and post details about upcoming cleanup events.

Surf News & Articles: Provides users with access to educational content and news articles about waste management.

Post: Allows users to post reports about garbage dumps, including geotagged and timestamped images.

Reply Posts: Enables NGOs to respond to user-submitted reports after taking appropriate actions.

**Data Layer**

User Data Management: Manages all data related to user authentication, profiles, and roles.

Event and Report Data Management: Handles data related to events organized by NGOs and reports submitted by users.

Content and Media Management: Manages educational materials, news articles, and user-uploaded media.

# 

# 

# 

# 

# 

# 

# 

# **Hardware , Software and tools Requirements**

**Hardware Requirements**

1. Server Infrastructure

* Processor : Multi-core processor (e.g., Intel Xeon or AMD Ryzen) for handling server-side operations and object detection algorithms.
* Memory : Minimum 16 GB of RAM, scalable based on user load and data processing needs.
* Storage : SSD storage with sufficient capacity for handling large volumes of images/videos and databases.
* Network : High-speed internet connection for seamless data transfer and user interaction.

2. User Devices

* Smartphones/Tablets : Devices running iOS 12 or later or Android 9.0 (Pie) or later for app access and functionality.
* Computers : Modern desktop or laptop computers with internet access for users managing or interacting with the platform through web browsers.

**Software Requirements**

1. Backend

* Operating System : Windows Server.
* Programming Languages : Python (for object detection and backend services), Node.js (if needed for backend operations).
* Frameworks : Flask or Django (for Python-based backend services).
* Database : MongoDB (for storing user data, reports, and other information).

2. Object Detection

* Libraries : OpenCV, TensorFlow, or PyTorch (for implementing object detection algorithms).
* Pre-trained Models : YOLO (You Only Look Once), SSD (Single Shot MultiBox Detector), or Faster R-CNN (Region-based Convolutional Neural Networks).

3. Frontend

* Framework : React (for building the web application interface).
* Libraries : Redux (for state management), Axios (for API requests).
* Design : CSS frameworks like Bootstrap or Material-UI for responsive design.

4. Miscellaneous Tools

* IDE/Editor : VSCode or IntelliJ IDEA (for development).
* API Testing : Postman(for testing and documenting APIs).

# **Proposed Evaluation Measures**

The primary objective of our waste management application is to empower communities by providing a comprehensive tool for efficient waste categorization, community engagement, and education on sustainable practices. As we strive to build a more sustainable future, this app aims to bridge the gap between citizens and environmental organizations, fostering a collaborative approach to waste management. While technology continues to evolve, creating new opportunities for community-driven initiatives, our app remains dedicated to making waste management more accessible, informative, and actionable for all users.

To ensure the highest standards of user experience and system performance, we have outlined a series of evaluation measures.

* **Image Classification Accuracy:** The percentage of images correctly identified as recyclable or non-recyclable. This can be measured against a labeled dataset to ensure the system's reliability.
* **False Positive/Negative Rates:** The rate at which the system incorrectly classifies recyclable items as non-recyclable and vice versa.
* **App Performance Metrics**: Evaluate the app's speed, responsiveness, and stability, particularly in processing image uploads and displaying results.
* **Downtime and Uptime**: Track the app's availability and any instances of downtime.
* **Geotagging Accuracy**: The precision of geotagged data for complaints and events, ensuring that location information is accurately captured and displayed.
* **Mapping Service Performance**: The effectiveness of the mapping service in displaying events, user locations, and other geospatial data.
* **Awareness Improvement**: Measure the increase in user knowledge about waste management practices through quizzes, surveys, or follow-up assessments.
* **Content Engagement**: Track the consumption of educational content, including articles, tips, and news updates.

# 

# **Conclusion**

In conclusion, the proposed platform represents a significant advancement in waste management by integrating cutting-edge object detection technology with a community-driven approach. By enabling users to report and analyze plastic waste through an intuitive app interface built with React, the platform addresses key challenges in waste segregation and resource allocation for NGOs. The deployment of advanced technologies and thoughtful integration of user engagement features not only streamlines operational processes but also fosters a more collaborative and informed approach to environmental stewardship.

With robust hardware, scalable software solutions, and a suite of development tools, the platform is designed to handle the complexities of waste management efficiently. It empowers NGOs with precise data, enhances community participation through event promotion and educational content, and ultimately drives broader environmental impact.

The platform's comprehensive approach, combining technology with active community involvement, sets a new standard in waste management solutions. It reflects a commitment to sustainability and innovation, paving the way for more effective and engaged environmental practices.

# 

# 

# 

# 

# 

# **References**

1. W. Lin, "YOLO-Green: A Real-Time Classification and Object Detection Model Optimized for Waste Management," 2021 IEEE International Conference on Big Data (Big Data), Orlando, FL, USA, 2021, pp. 51-57, doi: 10.1109/BigData52589.2021.9671821.
2. R. Tiwari and A. K. Dubey, "WasteDet: An Anchor Free Novel Detection Algorithm for improving Waste Management," 2022 International Conference on Computational Intelligence and Sustainable Engineering Solutions (CISES), Greater Noida, India, 2022, pp. 26-30, doi: 10.1109/CISES54857.2022.9844399.
3. T. Ahmed Chowdhury, N. Jahan Sinthiya, S. M. Sajid Hasan Shanta, M. Tasbiul Hasan, M. Habib and R. M. Rahman, "Object Detection Based Management System of Solid Waste Using Artificial Intelligence Techniques," 2022 IEEE 13th Annual Ubiquitous Computing, Electronics & Mobile Communication Conference (UEMCON), New York, NY, NY, USA, 2022, pp. 0019-0023, doi: 10.1109/UEMCON54665.2022.9965643.
4. K. Alfatmi, F. S. Shinde, M. Shahade, S. S. Sharma, S. S. Aruja and T. Y. Chaudhari, "E-Safe: An E-waste Management and Awareness Application using YOLO Object Detection," 2023 7th International Conference on Intelligent Computing and Control Systems (ICICCS), Madurai, India, 2023, pp. 1061-1066, doi: 10.1109/ICICCS56967.2023.10142705.
5. A. Alqattaf, "Plastic Waste Management: Global Facts, Challenges and Solutions," 2020 Second International Sustainability and Resilience Conference: Technology and Innovation in Building Designs(51154), Sakheer, Bahrain, 2020, pp. 1-7, doi: 10.1109/IEEECONF51154.2020.9319989.

Mentor Signature:

Group Member Signature: