



# FOOD WASTE MANAGEMENT USING MACHINE LEARNING TECHNIQUE

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**Abstract:** Food waste refers to any food that is discarded, lost, spoiled, or not consumed for various reasons throughout the food supply chain, from production to consumption. So the food waste is discarded in landfills which are decomposed to produce methane, a potent greenhouse gas that contributes significantly to climate change. Wasted food represents economic losses for businesses, from the primary producers to retail establishments, impacting the overall economy. The production, transportation, and processing of food involve significant resources such as water, energy, and land. While food is wasted, there are still millions of people facing food insecurity and hunger globally. The issue of wasted food and excess food presents both a challenge and an opportunity for positive change. The proposed project leveraging OPTICS (Ordering Points to Identify Clustering Structure) for donating leftover food to needy people using machine learning to collect surplus food from major generators and redistribute it to those in need. It is a density-based clustering algorithm that helps identify dense regions in data, making it suitable for tasks where data points form clusters of varying shapes and densities. Implement strategies to divert food waste away from landfills, reducing the production of methane and other harmful greenhouse gases.

**Keywords:** Food waste, donation, machine learning, sustainability.

## I. INTRODUCTION

Food waste refers to the discarding or loss of food that is still suitable for consumption. This wastage occurs at various stages of the food supply chain, from production and processing to distribution, retail, and consumer levels. Food waste can include any edible part of food that is discarded or left unconsumed. The production of more food than is demanded or consumed contributes to overstocking and surplus, leading to potential waste. Agricultural practices, market expectations, and inaccurate demand forecasting can contribute to overproduction.

Inefficiencies in the distribution and logistics of the food supply chain can lead to delays, spoilage, and waste at various stages. Poor transportation, inadequate storage facilities, and suboptimal inventory management can contribute to inefficiencies. Stringent cosmetic standards set by retailers and consumers often result in the rejection of produce based on appearance, even if the items are perfectly edible. Aesthetic imperfections, irregular shapes, or discoloration can lead to the rejection of food items at various stages of the supply chain.

Consumer habits, such as over-purchasing, improper storage, and misinterpretation of expiration dates, contribute significantly to food waste at the household level. Lack of meal planning, impulse buying, and a throwaway culture contribute to consumer-driven food waste.

Insufficient understanding among stakeholders, including producers, retailers, and consumers, about the environmental, economic, and social impact of food waste. Lack of education and awareness campaigns, limited access to information, and a general underestimation of the consequences of wasting food.

### 1.1 OBJECTIVE

To develop a user-friendly interface accessible to surplus food providers, orphanages, farmers, and fertilizer companies, prioritizing simplicity and easy navigation. To implement real-time communication between surplus food providers and recipients within the platform, facilitating quick and direct interaction for efficient coordination. To integrate advanced algorithms, such as OPTICS, for surplus food distribution, optimizing efficiency by recommending nearby locations with active donation requests. To emphasize the environmental impact of surplus food donations by providing real-time metrics on carbon footprint reduction and resource savings. To develop a system that dynamically reassigns surplus food posts to alternative recipients (farmers or fertilizer companies) if an initial recipient declines a donation request. To implement a robust booking module empowering food providers to confirm or reject donation requests, ensuring a streamlined and coordinated surplus food distribution process.



## 1.2 SCOPE

The project aims to develop a comprehensive web-based application for surplus food distribution, connecting food providers with recipients such as orphanages, farmers, and fertilizer companies. The platform will feature a user-friendly interface, real-time communication capabilities, and advanced algorithms for efficient surplus food distribution. Emphasizing environmental impact, the system will provide real-time metrics on carbon footprint reduction.

## II. ANALYSIS

### 3.1 SYSTEM ANALYSIS

System Analysis is a combined process dissecting the system responsibilities that are based on problem domain characteristics and user requirements

#### 3.1.1 PROBLEM DEFINITION

The causes of food waste establish several associated problems and challenges. so, farmers may incur financial losses due to the production of surplus goods that go unsold. Inefficient transportation and storage contribute to spoilage and quality degradation, rendering food unsuitable for consumption which results in higher greenhouse gas emissions and energy consumption. Higher greenhouse gas emissions, particularly methane from decomposing food waste, contribute to climate change.

#### 3.1.2 EXISTING SYSTEM

The manual process of coordinating and executing food donations can be time-consuming, involving phone calls, paperwork, and manual coordination efforts. Implement digital platforms or mobile applications that provide a centralized space for food donors to coordinate and manage their donations online. Replace traditional paper forms with online donation forms accessible through a digital platform. This reduces paperwork and ensures accurate and complete donor information. Utilize communication features within the digital platform for instant messaging and notifications. This facilitates direct and efficient communication between food donors and recipient organizations.

Implement automated systems for confirming donation details and tracking the status of donations. This streamlines the tracking process without the need for manual follow-ups. Integrate the digital donation platform with existing donor systems or databases. This ensures seamless coordination and consistency in donor data. Design user-friendly interfaces within the digital platform to make it easy for food donors to navigate, submit donation information, and manage their contributions.

#### Disadvantages of Existing System:

- This process involves a lot of time to contact the organization to check the requirement.
- Food waste at landfills, this food waste when dumped in open landfills causes severe health and environmental issues.
- Food waste on landfills hinders the recovery of nutrients in the soils.
- Limitations of accuracy in existing systems.
- It is more complex to compute.

#### 3.1.2 PROPOSED SYSTEM

The data collection process in your proposed system involves gathering information from both food providers (those with surplus food) and receptors (those in need of food). Information about individuals, organizations, or entities that have surplus food and are willing to donate. This may include the geographical location (latitude and longitude) of the food providers, the type and quantity of surplus food, availability timings, and any specific conditions or requirements for donation.

Information about individuals, organizations, or entities that are in need of food and can receive donations. This may encompass the geographical location (latitude and longitude) of the receptors, the type and quantity of food needed, preferred delivery times, and any specific dietary or logistical considerations. For both food providers and receptors, the system gathers geographic coordinates (latitude and longitude) to precisely locate their positions on a map. The collected geographical data aids in understanding the spatial distribution of food providers and receptors, contributing to the clustering analysis performed by the OPTICS algorithm. The data is likely structured to include fields such as name, contact information, location, type of food, quantity, and any other relevant details. The collected data may be stored in a database or a system designed to manage and organize information efficiently.

#### Advantages of Proposed System:

- Reduced methane emissions from landfills and a lower carbon footprint.
- Community benefits by providing donated, untouched, and safe food that would otherwise be thrown out.



- It provides an interface for donors and receivers to network, and it also supports stale food management and also brings community fridges into the frame.
- Establish shortest distance to deliver fresh foods to the needy people.

III. SYSTEM DESIGN

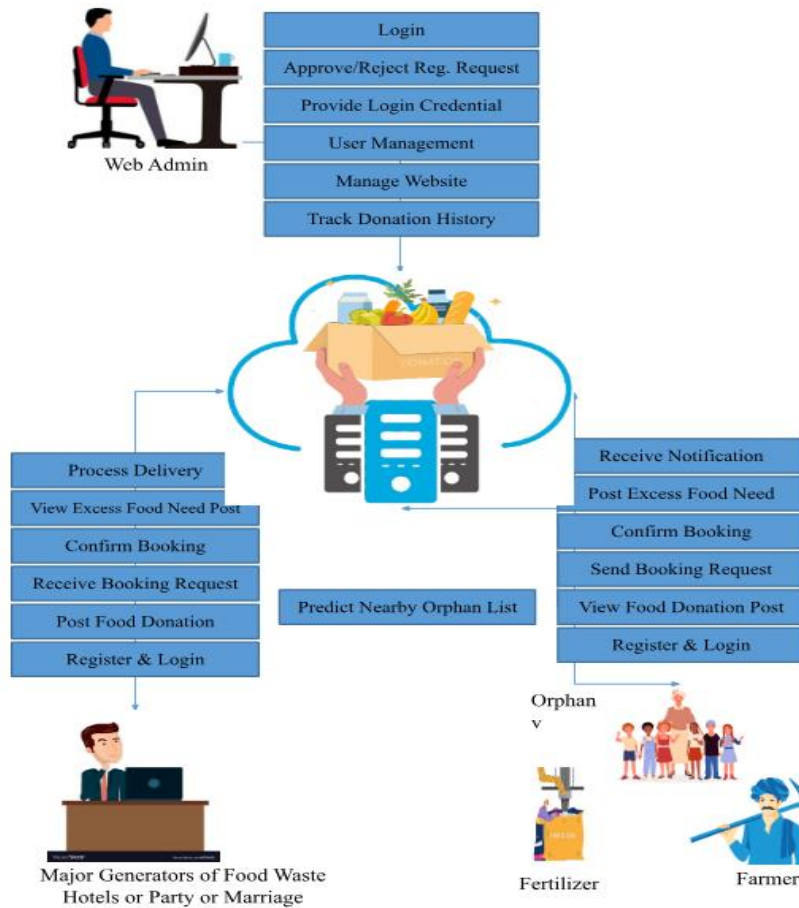


Fig. 1 Architecture diagram

IV. MODULES

1. End User Interface

1.1. Admin

- **Login:**The admin module includes a secure login system to access the admin dashboard. This login functionality ensures that only authorized personnel can manage and oversee the operations of the Food Donor Web App.
- **Approve Orphan, Farmers, and Fertilizer Company Registration Requests:**Admin has the responsibility to review and approve registration requests from Orphanages, Farmers, and Fertilizer Companies. This ensures that only legitimate entities are granted access to the platform.
- **User Management:**Admin holds the authority to manage user accounts, roles, and permissions. This includes the ability to add or remove users, assign roles, and control access to specific features within the application.
- **Manage Food Donor Web App:**This feature allows the admin to oversee and manage the overall functionality of the Food Donor Web App. Admin can make updates, add new features, and ensure the smooth operation of the entire system.

1.2. Food Provider

- **Register:**Food Providers can easily register on the platform by providing necessary details. This user-friendly process ensures that individuals and organizations willing to donate excess food can quickly join the initiative.



- **Receive Registration Approval:** Upon admin approval, Food Providers receive notifications, enabling them to activate their accounts. This step ensures that only legitimate and approved providers participate in the donation platform.
- **Login:** Food Providers have a secure login system to access their personalized dashboards. This ensures the security of their account and allows them to manage their food donation activities efficiently.
- **Profile Management:** Food Providers can maintain and update their profiles, including contact information and preferred pickup times. Keeping profiles up-to-date ensures accurate communication and efficient coordination.
- **Post Excess Food for Donate:** Food Providers can use this feature to submit details of surplus food available for donation. This includes specifying the type and quantity of food, making it visible to potential recipients.

### 1.3. Orphanage or Farmers or Fertilizer Company

- **Register:** Users from Orphanages, Farmers, and Fertilizer Companies can register on the platform by providing relevant details. This ensures that those in need and those involved in fertilizer production can actively participate.
- **Receive Registration Approval:** Upon admin approval, users receive notifications to activate their accounts, ensuring that only legitimate and approved entities participate in the food donation initiative.
- **Login:** Users have secure login systems to access their personalized dashboards, ensuring the security of their accounts and facilitating efficient engagement with the platform.
- **Post Donation Requests:** Users can submit requests for specific types and quantities of food or natural fertilizer needed. This feature allows them to communicate their requirements to potential donors.
- **Receive Excess Food Notification:** Users receive alerts when surplus food or natural fertilizer matching their requirements becomes available. This ensures timely communication between donors and recipients.

## V. RESULT AND EVALUATION

Our project proposal addresses a critical issue of food waste and its detrimental impacts on the environment, economy, and society, while also recognizing the potential for positive change. Leveraging OPTICS for surplus food donation demonstrates a forward-thinking approach, utilizing machine learning to efficiently identify and redistribute excess food to those in need.

## VI. CONCLUSION

In conclusion, the project represents a stride towards mitigating food waste and fostering a more responsible and connected community. Through meticulous design, development, and testing, the platform has demonstrated commendable success in core functionalities, including user registration, donation posting, and real-time communication.

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