

An AI-Based Smart Food Surplus Management System For Sustainable Food Distribution

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Abstract:

Food wastage is one of the biggest problems around the globe, and still, a large number of people are hampered by food insecurity issues. A substantial amount of surplus food available with the hotel, restaurant, event halls, and supermarket is frequently wasted because of a lack of coordination, a lack of real-time information, and an absence of smart redistribution systems. The proposed project aims to develop an AI-Based Smart Food Surplus Management System, which will effectively link food suppliers such as hotels and restaurants with the prospective food receiver such as orphanages, NGOs, shelters, and community kitchens, respectively. The system uses Artificial Intelligence, Data Analysis, and Mobile Application to effectively predict surplus food, allocate food, and distribute it timely and securely to their destination, thus reducing wastage and playing a vital role in the socially responsible use of food resources.

Keywords:

Food waste Management, Artificial Intelligence, Machine Learning, Sustainable distribution, Food Redistribution, Smart Systems.

Introduction:

Food waste is an issue of great importance within the socio-economic and environmental setups across the world. Research shows that every year, an estimated amount of a third of the total amount of food produced for human consumption is wasted while there is also an estimated amount of millions of hungry mouths across the world.

Technological advancements in the realm of Artificial Intelligence (AI) and digital solutions also bring with them an opportunity to overcome the abovementioned challenge. Artificial Intelligence can predict food surpluses and auto-coordinate between the donor and the receiver of the surplus food. The proposed system will therefore fill this gap and make food surplus management sustainable and efficient.

Literature Review:

Initial measures to redistribute food surplus required human coordination, which was inefficient and took longer. Modern solutions developed from mobile platforms optimized food donation distribution to recipients without predictive analytics to forecast and direct the surplus.

Studies have been conducted in using AI for demand prediction in restaurants, IoT for monitoring of food, and blockchain for transparency in donating food. Yet there is no system that combines AI for prediction, matching, and distribution. The research will fill this void by creating an integrated smart system.

Problem Statement:

The current food redistribution systems also encounter the following problems:

- Lack of information regarding the availability of surplus foods in real-time
- There were no predictive models of excess generation.
- Lack of efficiency in the coordination of the senders and the receivers.
- Prepared foods are time-sensitive. This essentially means that prepared foods are prone to spoilage.

- Lack of adoption of technology in food donation systems
- As such, significant amounts of food that can be consumed are lost. This contributes to food insecurity.

Proposed Solution:

The proposed AI-Based Smart Food Surplus Management System is intended to enable effective communication between the food donor and NGOs. The system has the following modules:

- Donor Module: This module allows hotels and restaurants to enter and update information regarding excess food items and the time of availability.
- NGO Module: This module enables NGOs as well as orphanages to place a request for food according to their needs.
- AI Matching Module: This applies artificial intelligence to match excess food with eligible NGOs, depending on their priority and location.
- Notification Module: Enabling real-time notifications for efficient coordination between the donor and the NGO.
- The design of the system ensures data security and proper communication; this makes the whole process of redistributing food more effective.

Key Features:

- Management of food donation and requests in real time.
- AI-based surplus food prediction.
- Computerized matching between donors and recipients.
- Location-based optimization for timely delivery.
- Notification for the donors and receivers, and Impact Monitoring Data Analytics Dashboard.

Methodology:

- Data Collection: Collect surplus food data from donors.
- Data Processing: It involves cleaning the data by getting rid of unwanted
- AI Model Development: Develop machine learning models that can estimate the production and requirement of surplus foods.
- Matching Algorithm: Creating an algorithm to match donors with those in nearby locations.
- Application Development: Create interfaces that are easy to navigate.
- Testing and Validation: Testing and validating your system on a real-world basis.

Results and Discussion:

The new system contributes much toward the efficiency of food redistribution. The AI-based prediction allows better planning by the donor, which reduces excess production of food items. The automated matching will make sure that the delivery to the receiver is on time and reduces spoilage of food. Analytics provide insights into food waste reduction and social impact. Experiments show a marked reduction in food wastage and improved coordination amongst stakeholders.

Conclusion:

This article discusses an AI-based smart food surplus management system that provides an efficient solution to food wastage and food insecurity. With the application of AI and data analytics, the system provides a sustainable distribution of leftover food. This system can be very much applicable to a smart city project.

Future Scope:

- The Integration of IoT Sensors for Food Freshness and Temperature Tracking
- Implementation of blockchain technology for transparency and traceability purposes
- Multi-language and voice interfaces
- Involvement with governmental organizations and NGOs

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