ANNAPURNASETU-AI-DRIVEN FOOD REDISTRIBUTION AND WASTE PREVENTION PLATFORM FOR A HUNGER-FREE INDIA

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Introduction:

1. Food wastage and hunger are two major global challenges, especially in developing countries like India. A significant amount of food produced is wasted every day, while millions of people still struggle to access nutritious meals. This imbalance highlights a critical issue: the problem is not food scarcity, but the lack of efficient redistribution systems.
2. In India, surplus food is generated from multiple sources such as restaurants, hostels, hotels, events, and households. Much of this food remains unused due to the absence of proper coordination and real-time communication between donors and beneficiaries. As a result, food that could have been utilized effectively is wasted.
3. To address this issue, the project “Annapurna Setu – Food Redistribution System” is proposed. The system acts as a digital bridge connecting food donors, NGOs, and delivery volunteers through a unified platform. It enables efficient coordination, ensuring that surplus food reaches those in need in a timely manner.
4. The system incorporates modern technologies such as Artificial Intelligence and Machine Learning to improve decision-making. It includes features like food freshness detection using image analysis, intelligent matching of donors and NGOs based on location and requirements, and demand prediction using historical data.
5. By integrating a user-friendly interface with real-time tracking and optimized delivery mechanisms, the system ensures transparency and efficiency in food redistribution. Overall, Annapurna Setu aims to reduce food wastage and contribute towards solving hunger by leveraging technology for social good.

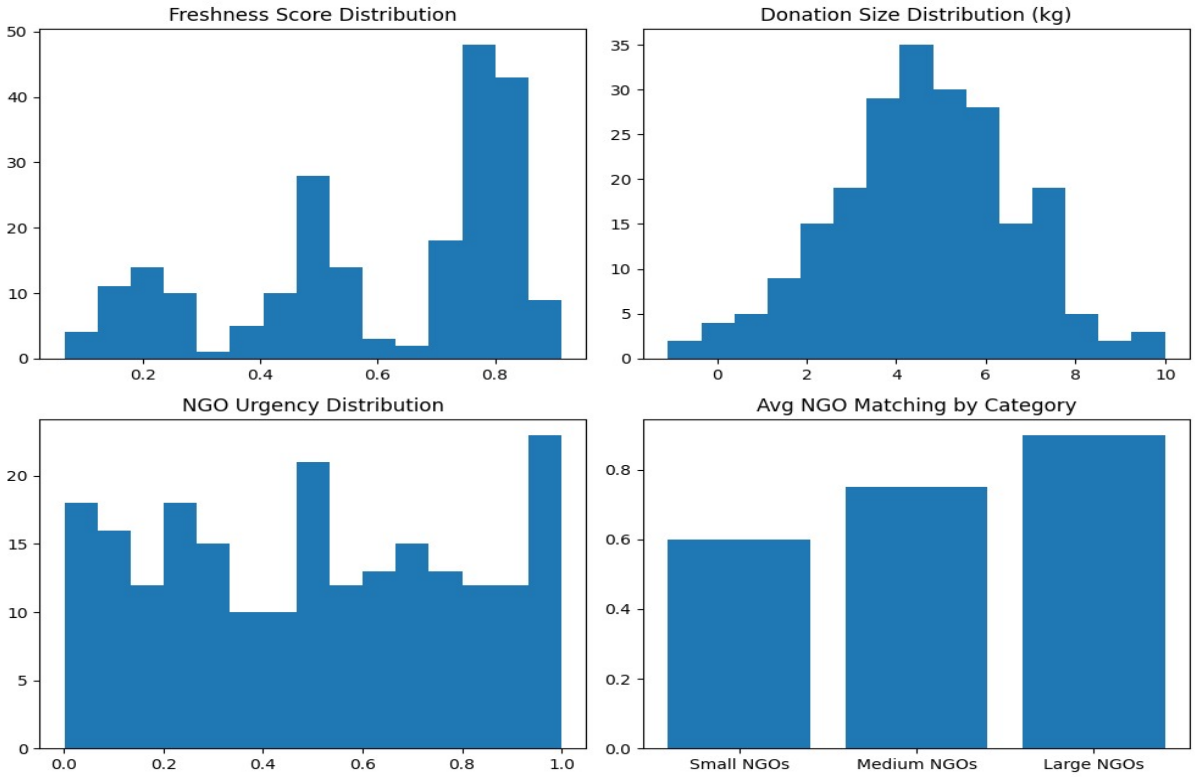

Figure 1: Distributions of main operational variables in the Annapurna Setu system.

Objectives:

1. To design and develop a centralized digital platform that connects food donors, NGOs, and delivery volunteers for efficient food redistribution.
2. To implement an AI-based food freshness detection system using image analysis to ensure the safety and quality of donated food.
3. To develop a machine learning-based recipient matching system that allocates food based on urgency, distance, NGO capacity, and food type.
4. To optimize delivery operations by incorporating route planning and real-time tracking to ensure timely and efficient food distribution.

Methodology:

1. The proposed system, Annapurna Setu, follows a structured and modular approach to enable efficient food redistribution using modern technologies.
2. Initially, data is collected from multiple sources including donors, NGOs, and delivery volunteers. Donors upload food details such as type, quantity, preparation time, location, and images through the user interface. These inputs are processed by the backend system developed using FastAPI.
3. The first stage involves food freshness verification using a deep learning-based model. The uploaded food images are preprocessed through normalization and noise reduction techniques, and then analyzed using Convolutional Neural Networks (CNN) to classify food as fresh, consumable, or spoiled. Only safe food items are considered for further processing.
4. In the second stage, the system performs intelligent recipient matching. A machine learning-based algorithm evaluates multiple parameters such as NGO urgency, distance between donor and NGO, food category compatibility, and capacity of the

NGO. Based on these factors, the system selects the most suitable NGO for allocation.

5. The third stage focuses on demand forecasting, where historical data is analyzed to predict future food requirements in different regions. This helps in proactive planning and better resource allocation.
6. The final stage involves delivery optimization. The system assigns delivery tasks to volunteers based on availability and proximity. Route optimization techniques are applied to minimize travel time and ensure timely delivery. Real-time tracking and updates are provided through the user interface.
7. The frontend of the system is developed using React, providing a user-friendly interface, while SQLite is used for data storage. The integration of AI, machine learning, and web technologies ensures that the system is scalable, efficient, and suitable for real-world deployment.

Result and Conclusion:

1. In conclusion, the Annapurna Setu system successfully demonstrates an efficient and intelligent approach to food redistribution. The system effectively connects donors, NGOs, and volunteers through a unified platform, reducing manual efforts and delays.
2. The implementation of AI-based food freshness detection ensures that only safe and consumable food is distributed. The machine learning-based matching algorithm improves allocation efficiency by considering multiple real-world factors such as urgency and distance.
3. The system also enhances delivery efficiency through route optimization and real-time coordination. Overall, the project contributes towards reducing food wastage and addressing hunger by providing a scalable, technology-driven solution for community-level deployment.

References:

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Future Scope:

The future scope of this project includes:

1. Integration of IoT-based sensors for real-time food quality monitoring and enhanced safety verification.
2. Implementation of blockchain technology to ensure transparency, traceability, and secure tracking of food donations.
3. Development of a mobile application with multilingual support to improve accessibility and expand the system for large-scale deployment across cities and regions.