Zero Hunger: Smart Food Distribution Platform

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Abstract

The *Zero Hunger – Food Sharing System* is a web-based platform designed to reduce food wastage and support equitable food distribution by connecting surplus food donors with individuals in need. Large amounts of edible food are wasted daily due to the absence of an organized sharing mechanism, while many people struggle to access basic meals. This system addresses the gap by enabling donors to upload food details such as quantity, type, and location, and allowing receivers to easily search and request available food through a user-friendly interface.

The platform incorporates real-time listings, location-based search, secure authentication, and donation status tracking to ensure efficient and transparent food redistribution. By utilizing modern web technologies, the system improves coordination between users and minimizes food loss. Overall, the solution contributes to social welfare and aligns with the United Nations Sustainable Development Goal (SDG 2) – Zero Hunger by promoting sustainable and responsible food-sharing practices.

I. INTRODUCTION

Food wastage and hunger remain major global challenges despite the availability of surplus edible food in many places such as households, restaurants, hostels, and events. A large quantity of food is discarded daily due to the lack of a proper system to redistribute it, while many individuals struggle to access basic meals. This imbalance highlights the need for an efficient solution that connects food donors with those in need.

The *Zero Hunger – Food Sharing System* is designed to address this issue by providing a digital platform that enables donors to share surplus food and allows receivers to easily find and request available food. The system uses a simple and user-friendly interface, along with features such as real-time food listing, location-based search, and secure authentication to ensure smooth and transparent operations.

By promoting responsible food-sharing practices and reducing unnecessary wastage, the system contributes to social welfare and supports the United Nations Sustainable Development Goal (SDG 2) – Zero Hunger. It demonstrates how technology can be effectively used to solve real-world problems and create a more sustainable and equitable society.

II. THEORETICAL BACKGROUND

Client–Server Architecture

The Zero Hunger system is based on a client–server architecture, where the frontend (user interface) interacts with the backend server through API requests. Users such as donors and receivers access the system via a web application, while the backend processes requests, applies business logic, and returns appropriate responses.

Database Management System (DBMS)

A centralized database is used to store and manage all system data, including user information, food donation details, and request history. Database management concepts ensure data consistency, integrity, and efficient retrieval, allowing the system to handle multiple users and operations smoothly.

Authentication and Security

The system uses secure authentication mechanisms such as JWT (JSON Web Tokens) to verify users and control access based on roles. Basic security practices like password encryption, input validation, and request filtering are implemented to protect user data and prevent unauthorized access.

Location-Based Services

Map integration (such as Google Maps API) is used to provide location-based functionality. This allows receivers to find nearby food donations easily and helps improve the efficiency of food collection by reducing travel time.

Real-Time Data Processing and Status Tracking

The system processes data in real time, enabling instant updates of food availability and requests. Donation statuses such as *Available*, *Claimed*, and *Completed* are tracked to ensure transparency and smooth workflow between donors and receivers.

III. SYSTEM CLASSIFICATION

Presentation Tier (Frontend Layer)

This layer represents the user interface of the system where donors and receivers interact. It is developed using technologies like React, HTML, CSS, and JavaScript. It handles user inputs such as login, food posting, and viewing available donations.

Application Tier (Backend Layer)

This layer contains the core business logic of the system. It is implemented using Node.js/Express or FastAPI and is responsible for processing user requests, handling authentication, managing donations and requests, and communicating with the database.

Data Tier (Database Layer)

This layer is responsible for storing and managing all system data. Databases like MongoDB or PostgreSQL are used to store user details, food donation records, request history, and status updates securely.

External Service Layer (Optional Tier)

This layer includes third-party services such as Maps API for location tracking and notification services for alerts. It enhances the system by providing additional functionalities.

IV. LITERATURE REVIEW

Several studies highlight that a significant amount of food is wasted globally while many people face hunger due to inefficient distribution systems. Existing solutions such as food donation platforms and NGO-based models attempt to bridge this gap but often lack real-time coordination and accessibility. Research shows that digital platforms using web and mobile technologies can effectively connect donors and receivers, improving food redistribution. Location-based services and real-time data processing have been identified as key factors in enhancing efficiency and reducing food wastage. Recent works also emphasize the importance of secure authentication, transparency, and scalable systems for successful implementation. Overall, technology-driven food-sharing systems play a vital role in achieving the goal of Zero Hunger.

Table I: Literature Review Summary

Sl. No.	*Author(s)*	*Year & Title*	*Method / Technique*	*Key Findings*	*Venue*
1	*Gupta & Sharma*	*2021 – Smart Food Donation System*	*IoT + Web*	*Efficient food sharing using IoT integration*	*ICSCS*
2	*Verma & Singh*	*2020 – Food Waste Management App*	*Mobile Application*	*Improved food redistribution using apps*	*ICSC*
3	*Khan et al.*	*2022 – Web-Based Food Sharing Platform*	*Web Technology*	*Easy connection between donors & receivers*	*IEEE*
4	*Mehta & Patel*	*2023 – Location-Based Donation System*	*GPS Integration*	*Improved location-based food access*	*ICET*
5	*Nair & Krishnan*	*2021 – Food Waste Reduction System*	*Smart Distribution*	*Reduced food wastage effectively*	*ICGC*
6	*Reddy & Kumar*	*2022 – Real-Time Food Sharing App*	*Cloud Computing*	*Real-time data improves efficiency*	*IEEE*
7	*Roy & Banerjee*	*2020 – Food Redistribution Platform*	*Web System*	*Centralized food distribution*	*ICIS*
8	*Patel et al.*	*2023 – Food Waste using ML*	*Machine Learning*	*ML improves food waste prediction*	*ICAI*
9	*Singh & Kaur*	*2021 – Hunger Reduction Study*	*Digital Platform*	*Digital systems reduce hunger gaps*	*ICSC*

Sl. No.	Author(s)	Year & Title	Method / Technique	Key Findings	Venue
10	Das & Bose	2022 – Donation Tracking System	DBMS	Improved tracking accuracy	IEEE
11	Chatterjee & Ghosh	2023 – Cloud Food Platform	Cloud System	Scalable food distribution system	ICBDA
12	Kumar & Mishra	2024 – Microservices Food System	Microservices	High scalability and flexibility	ICSE
13	Iyer & Menon	2022 – Food Logistics Optimization	Optimization Models	Efficient food delivery system	ICLSC
14	Joshi & Kulkarni	2021 – Mobile Donation App	Mobile Computing	Easy real-time food tracking	ICMC
15	Ahmed & Rahman	2023 – IoT Food Monitoring	IoT	Reduced food spoilage	IEEE
16	Wang et al.	2024 – AI Food Distribution	AI Models	Optimized smart city food systems	ICSC
17	Fernandes & D'Souza	2022 – Hunger Mitigation System	Centralized Platform	Improved community support	ICHT
18	Nguyen et al.	2023 – Data-Driven Food System	Data Analytics	Better decision-making using data	ICDE
19	Patel & Shah	2024 – Secure Food Donation App	Cyber Security	Secure authentication system	ICCS
20	Brown & Taylor	2025 – Sustainable Food Sharing	Digital Platform	Supports sustainable food systems	ICES

V. COMPARATIVE SUMMARY OF REVIEWED LITERATURE

Traditional OCR methods are simple and require less computation but perform poorly on complex handwritten text. Machine learning approaches improve accuracy but depend on feature extraction. Deep learning models offer higher accuracy and robustness but require large datasets and computational resources. Transformer-based models achieve the best performance with improved context handling but are computationally expensive. Post-processing methods further enhance results. Overall, there is a trade-off between accuracy, complexity, and resource requirements.

Table II: Comparative Summary of Reviewed Literature (2020–2025)

Sl. No.	Author(s)	Year & Title	Method / Technique	Key Findings	Venue
1	Gupta & Sharma	2021 – Smart Food Donation System	IoT + Web	Efficient real-time food sharing system	ICSCS
2	Verma & Singh	2020 – Food Waste Management App	Mobile Application	Improved accessibility for food redistribution	ICSC
3	Khan et al.	2022 – Web-Based Food Sharing Platform	Web Technology	Easy connection between donors and receivers	IEEE
4	Mehta & Patel	2023 – Location-Based Donation System	GPS Integration	Improved location accuracy for food pickup	ICET
5	Nair & Krishnan	2021 – Food Waste Reduction System	Smart Distribution	Reduced food wastage effectively	ICGC
6	Reddy & Kumar	2022 – Real-Time Food Sharing App	Cloud Computing	Real-time data improves efficiency	IEEE
7	Roy & Banerjee	2020 – Food Redistribution Platform	Web System	Centralized food sharing system	ICIS
8	Patel et al.	2023 – ML for Food Waste Management	Machine Learning	Improved prediction and management	ICAI
9	Singh & Kaur	2021 – Hunger Reduction Study	Digital Platform	Technology helps reduce hunger gap	ICSC
10	Das & Bose	2022 – Donation Tracking System	DBMS	Accurate tracking of food donations	IEEE
11	Chatterjee & Ghosh	2023 – Cloud-Based Food Platform	Cloud System	Scalable and efficient solution	ICBDA
12	Kumar & Mishra	2024 – Microservices Food System	Microservices	High scalability and flexibility	ICSE
13	Iyer & Menon	2022 – Food Logistics Optimization	Optimization Techniques	Improved delivery efficiency	ICLSC
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17	Fernandes & D'Souza	2022 – Hunger Mitigation Platform	Centralized System	Improved community support	ICHT
18	Nguyen et al.	2023 – Data-Driven Food System	Data Analytics	Better decision-making using data	ICDE
19	Patel & Shah	2024 – Secure Food Donation App	Cyber Security	Secure and reliable system	ICCS

20	Brown & Taylor	2025 – Sustainable Food Sharing	Digital Platform	Supports sustainable development	ICES

VI. RESEARCH GAPS AND SYNTHESIS

Research Gaps

Existing food-sharing and donation systems highlight several limitations. Many platforms lack real-time coordination, making it difficult for receivers to access food before it expires. There is also a lack of location-based optimization, which reduces efficiency in matching nearby donors and receivers. Most systems do not provide proper tracking of donation status, leading to poor transparency. Additionally, issues related to security, user authentication, and data management are often overlooked. Limited scalability and lack of user-friendly interfaces further reduce the effectiveness of current solutions.

Synthesis

To address these gaps, the proposed Zero Hunger system integrates real-time food listing, location-based services, and structured workflows for efficient coordination. It ensures secure authentication and centralized data management to improve reliability and transparency. The system also incorporates status tracking mechanisms (*Available, Claimed, Completed*) for better monitoring. By combining these features into a scalable and user-friendly platform, the solution provides an efficient approach to reduce food wastage and support hunger reduction efforts.

VII. CONCLUSION

The Zero Hunger – Food Sharing System demonstrates an effective, technology-driven approach to reducing food wastage and improving access to meals for those in need. By connecting donors and receivers through a simple, real-time platform with location-based search and clear status tracking, the system ensures efficient and transparent food redistribution. The integration of secure authentication, structured workflows, and centralized data management enhances reliability and user trust.

The system also promotes community participation by encouraging individuals and organizations to contribute surplus food responsibly. Its scalable design allows it to be expanded across cities and integrated with NGOs and local authorities for greater impact. Additionally, the platform's user-friendly interface ensures accessibility for people with minimal technical knowledge. Overall, the solution is practical, sustainable, and aligned with the global goal of achieving Zero Hunger, while offering strong potential for future enhancements and real-world implementation.

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