A Food Sharing System Linking Donors and Recipients

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Abstract: Food waste keeps piling up, even while so many people struggle to get enough to eat. One major issue? There's no simple way for people with surplus food to connect with organizations that can deliver it to those in need. That's where the Food Donation Management System steps in. This digital platform links food donor directly with non-profits and other organizations, streamlining the entire process and cutting out the usual confusion. The system runs on Node.js and Express.js for the backend, with Firebase Firestore as its database. That gives it speed, supports lots of users at once, and keeps everyone's info updated in real time. Security isn't just a buzzword here—user passwords are encrypted, so privacy stays protected.

There are two main roles: Donors and Organizations. Both can sign up, log in, and interact based on what's actually needed at the moment. Donors just fill out a few quick details about their cooked meals or groceries, and the platform sends that info right to the right organization. Organizations can browse new donations, accept them, schedule pickups, and track everything. Every step is recorded in a Donation History, so there's always a clear record. Plus, the system uses SendGrid to shoot out email alerts instantly when a donation is accepted or picked up. All of this cuts down on endless emails and phone calls, closes frustrating communication gaps, and, most importantly, helps make sure good food reaches people—not landfills. It's easy to use, widely accessible, and truly makes giving back simpler. Really, this isn't just another tech project. It's a push for social responsibility and a real move toward tackling hunger.

Keywords: food donation, surplus food management, real-time database, donor–organization coordination, Node.js, Express.js, Firebase Firestore, secure authentication, automated email notifications, SendGrid, food waste reduction.

I. INTRODUCTION

Food insecurity keeps making headlines across the globe, even though we've gotten much better at growing and transporting food. Every day, millions go hungry. Meanwhile, perfectly edible food fills up dumpsters. The real challenge isn't just growing enough—it's getting surplus food to people who need it, exactly when they need it. Recent IEEE studies keep pointing out the same roadblocks: poor coordination, slow information flow, too much manual work, and a lack of smart systems connecting donors with recipients. Over and over, research highlights the need for real-time tracking, geolocation, and digital tools to make redistribution actually work [1], [4], [9].

That's where this project comes in. We're building a Digital Food Donation & Distribution Platform that actually closes the gap. The concept is straightforward: let donors and non-profits find each other instantly, cut back on food waste, and handle donations transparently and efficiently. We drew inspiration from platforms like FoodBridge [4] and Serve Surplus [6], but pushed automation and reliability further. This way, we avoid the scaling headaches and slowdowns that dogged earlier, more manual approaches.

Donors—restaurants, individuals, community groups—can hop on, log extra food, and alert local organizations with just a few clicks. Non-profits see what's out there in real time, claim what they need, and schedule pickups without endless back-and-forth or clunky mobile tools [1], [3], [5]. Security matters, too. Session-based logins, encrypted credentials, and instant email alerts keep things safe and efficient, so everyone trusts the process.

On the tech side, we rely on Firebase Cloud Firestore for live data and use Node.js with Express.js to keep backend operations fast and scalable. Both donors and organizations get their own dashboards—track donations, see status updates, browse full histories. Earlier systems didn't offer this level of workflow structure or record-keeping [2], [7], [10]. Only verified users get in, so the platform stays accountable and legitimate. A big upgrade, inspired by

geolocation-driven research like FoodBridge [4], is our Google Maps navigation. When a non-profit accepts a donation, the platform maps out the shortest route straight to the donor. This isn't just convenient—it cuts delays, speeds up pickups, and brings a level of real-time coordination that older systems just couldn't manage [1], [5], [9]. But it's more than another app. This is about building a community that takes sustainability and responsibility seriously, making it easy for people to share what they have with those who need it most. It fits right in with the UN Sustainable Development Goals, especially Zero Hunger (SDG 2) and Responsible Consumption & Production (SDG 12).

There's still plenty of room to grow—think live pickup tracking, food quality checks, donor–NGO heatmaps, predictive analytics, even links with government food rescue programs. At its heart, this platform proves that smart technology—grounded in real research—can actually deliver a practical, scalable answer to hunger and food waste.

II. LITERATURE SURVEY

Introduction

Food waste and hunger—side by side, almost mocking each other. Every year, about a third of all food produced worldwide just gets tossed, while millions go to bed hungry. It's a problem too big to ignore. That gap has pushed researchers to get inventive, turning to technology to bridge it. Cloud computing, IoT, mobile apps—they're not just buzzwords anymore. These tools are starting to reshape how we move surplus food to those who need it, automating the process and making it smarter. In the last decade, there's been a clear push to build digital platforms that make food donation easier and actually reduce waste. But there's a hitch—most of these platforms don't quite deliver. Many are little more than standalone mobile apps, not really connected to the cloud. Others stay stuck as unfinished ideas. Too many depend on manual data entry and don't let donors and NGOs interact directly. The basics—real-time notifications, user-specific access, instant alerts—are missing from most systems. Without automation, everything just drags. Food sits. Donations go untracked. The whole system limps along. This study goes after those problems directly. We're developing a cloud-based food donation platform that actually automates the tough stuff, scales up when you need it, and finally brings users together. The goal? Smarter, faster, and much more effective food sharing.

Related Works

Bharani et al. (2024) designed a surplus food management app to help donors and recipients connect using structured listings and matching [1]. It's a start, but it's just a mobile app—no real-time cloud updates, no automatic notifications. Harika et al. (2024) launched a centralized donation platform for orphanages and elderly care homes [2]. It uses collaborative filtering for suggestions, which adds a nice touch, but misses out on instant communication and cloud syncing. That means pickups can get delayed, donations fall through the cracks. Suganthi et al. (2024) presented FEAST, a platform handling food, blood, and money donations [3]. Ambitious, but it tries to do too much at once and skips out on real-time updates and alerts. FoodBridge by Haseena et al. (2025) introduced location-based coordination among donors, recipients, and delivery agents [4]. Logistics improve, but deep cloud automation is still missing. It's not really built to scale online. WasteLess (2024) focuses on cross-platform sharing, letting users post photos and pickup locations for consumables [5]. It's convenient, but skips secure authentication, automated communication, and a streamlined donation workflow. Serve Surplus (2025) stands out. It uses a Node.js backend, Flutter interface, and has built-in messaging [6]. Here, you actually see communication, notifications, and community engagement—a much stronger model. FEED (2023) lets donors log details—quantity, expiry, food type [7]. Good for tracking, but it relies too much on mobile tech and lacks lasting cloud infrastructure, making it hard to scale. Meal Match (2025) offers a web-based way to visualize food supply and connect NGOs with providers [8]. But all the coordination is manual. No automated reminders, no real-time triggers. Murthy et al. (2024) developed a web system to alert nearby NGOs about surplus food, using data analytics to monitor waste [9]. It's helpful, but centers more on visualization than managing the entire donation workflow. The F.E.A.S.T. system (2025) brings donor, and admin modules for registration, tracking, and validation [10]. Plenty of features, but it leans heavily on admin approval and skips real-time cloud syncing. That slows things down.

Discussion of Limitations

Most IEEE-reviewed systems just don't reach real-time automation, true cloud scalability, or seamless connections between donors and NGOs. FoodBridge and Serve Surplus add some location features, but their cloud sync is only partial at best. FEAST, FEED, and WasteLess stick to mobile, missing out on the flexibility and real-time updates a cloud-native web platform could offer. Meal Match depends on manual back-and-forth, which leads to delays and mistakes. Almost every solution misses automated notifications. No instant alerts when food gets picked up, accepted, or updated. Security is another weak spot—secure authentication, donation history,

COMPARISON TABLE

Paper	Proposed Methodology	Key Features	Limitations	Advantages of Our System
Optimizing Surplus Food Management (2024)	User-centric mobile app	Donor–receiver interface	Mobile-only, no cloud sync	Real-time Firebase sync, automation
Donation Platform for Orphanages (2024)	Web donation system	Personalization	No instant alerts	Full workflow + SendGrid
FEAST (2024)	Multi-purpose donation app	History tracking	No automation	Focused food-only, real-time
FoodBridge (2025)	Geolocation-based matching	Maps, listings	No cloud backend	Realtime sync + Maps routing
WasteLess (2024)	Cross-platform app	Uploads, location	No secure auth	Encrypted login + workflow
Serve Surplus (2025)	Node.js-based messaging	Notifications	No live sync	Firebase live updates
FEED (2023)	Form-based donation	Expiry metadata	No cloud scaling	Web dashboards + cloud
Digital Stage (2024)	Analytics + alerts	Visualization	No donation pipeline	Full donor/NGO dashboards
Meal Match (2025)	Web visualization	Real-time charts	Manual coordination	Auto alerts + routing

III. METHODOLOGY

1.User role identification and Authentication

Here's how the system works: First, there's a clear plan—figure out what's needed, design the database, build the backend, and set up real-time communication. The whole thing runs on Node.js with Express.js as the server. For the database, it uses Firebase Firestore, so everything stays secure, fast, and updates instantly.

Let's talk about users. There are two main types: Donors and Organizations (like NGOs). When someone logs in, the system checks their info against the right Firestore collection, either Donors or Organizations. If the details match, it creates a secure session token using express-session. Anyone who's not logged in gets blocked from protected parts of the site. The system checks for a valid session every time someone tries to access these routes

2. Data Storage & Structure

We use a NoSQL Firestore schema, which lets us store data in a flexible, document-based way. Here's how we organize things:
- Donors: All registered donor info goes here.
- Organizations: This holds details for every registered NGO.
- Donations: We keep all food donation posts in this collection.
- Donors/Notifications: Donors get their notifications here.
- Organizations/Notifications: Same idea, but for organizations.
- Donors/don_history: Tracks each donor's donation history.
- Organizations/org_his: Tracks donation history for every organization

3. Food Donation & Request Handling

Donors fill out a form to post their extra food. The system saves each post in the Donations collection. Organizations get to see these donations. If something works for them, they can send a request to the donor. Donors check out these requests and decide whether to accept. When an NGO shows interest, the donor gets a heads-up.

4. Real-Time Notification Mechanism

Here's how notifications work:
A donor posts food—registered NGOs see it right away.
An NGO sends a request—that request lands in the donor's notifications.
If the donor approves, the NGO gets a notification in their own collection.

5. Session-Based Access & Route Protection
Every dashboard or role-specific page checks session variables—like req.session.userEmail for donors or req.session.orgEmail for NGOs. If the session's missing, the user gets sent straight to the login page. That way, only the right people get in.

6. Rendering & User Interface
The UI runs on EJS templates, so it grabs live data from the database. You'll see things like your notifications, donation history, open donation requests, and personal info (name, email) right there when you log in.

The UI includes a "View Location" button that opens the donor's exact spot in Google Maps. Volunteers can just tap it and get directions right away, no guessing or getting lost. It makes it way easier to find new places, saves time on the road, and honestly, just makes the whole food collection process smoother and more reliable.

7. Donation Closure & History Logging
After a donation has been accepted and finalized:
The donation status is changed to completed
Information written in donar_history and organization_history sub-collections
Deleted from active donation feed
It is a way to record the movements of food in a transparent and responsible manner.
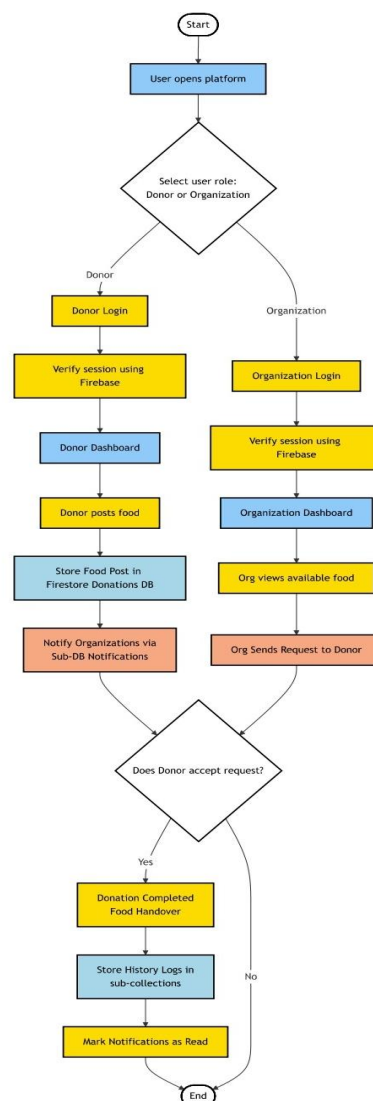

Figure 3.1: Operational Flow of the Food Donation Management System

IV.   SYSTEM ARCHITECTURE

This system runs on a three-tier setup: there's the User Interface Layer, the Application Layer, and the Database Layer. Splitting things up this way keeps everything organized and easy to scale. It also makes the data flow smoothly. Donors and organizations interact through a cloud-based backend, so everything stays connected and up-to-date.

On the front end, donors get a web portal where they can sign up, log in, and share their donation details. Organizations use the same platform to see, accept, or manage those donation offers. All these actions go through the Application Layer, built with Node.js and Express.js. This layer handles the main business logic, authentication, session checks, data validation, and routing behind the scenes.

Every bit of data gets stored in Firebase Firestore, which serves as our Database Layer. It's secure, lives in the cloud, and keeps everything in sync in real time. User profiles, donation info, transaction history, notifications—everything's tucked away in organized collections and documents. Thanks to Firestore's real-time updates, any changes—say, a donor submits a new offer or an organization accepts one—show up instantly for everyone. Nobody has to hit refresh or wait around.

To keep everyone in the loop, the system uses SendGrid to fire off emails automatically whenever donations get registered, accepted, or collected. This means less chasing people for updates, and both donors and organizations know exactly what's happening at every stage.
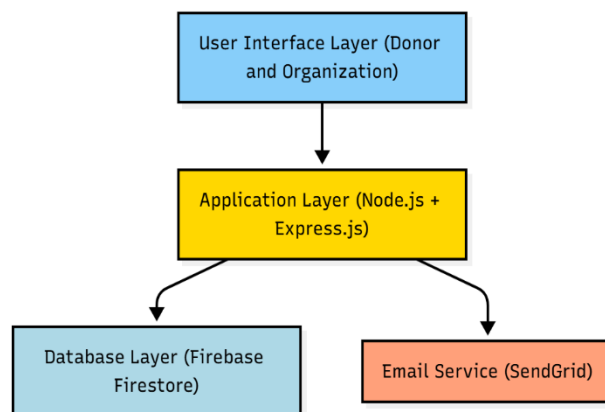

Figure 4.1: System architecture of Food Donation Platform

V.   ALGORITHM

Donor Donation Submission
Step 1: First, the donor opens the app and logs in with their email and password. If the info checks out, they get access to the donation section.
step 2: The donor picks the type of donation—say, Food or Grocery—then fills in the details: item name, how much they're giving, where it's coming from, and which organization should get it.
step 3: Once they hit submit, the system generates a unique Donation Order ID. It saves all the details to the donor's Donation_History in Firebase Firestore. At the same time, it saves the same info in the organization's Donation_History

step 4: The app then creates a new notification for the chosen organization and shoots them an email alert through SendGrid. The donor sees a confirmation message, and that's it—the process is done.

Organization Acceptance
step 1: The organization signs in with its email and organization ID. The system pulls up every pending donation request from Firestore.
step 2: The organization looks through the list and picks a donation to accept.
step 3: Once they've made their choice, the system marks the donation as "Accepted" in both the organization's and the donor's Donation_History.
step 4: It creates a notification for the donor and shoots out an acceptance email using SendGrid.
step 5: Finally, the organization sees the updated donation status right on their dashboard. That's it.
Advantages
1.Cuts Down on Food Waste

This system grabs surplus food and gets it straight to people who need it. Less food ends up in the trash, and more of it feeds communities.

2.Tracks Everything in Real Time
Every donation gets logged the moment it happens. Donors and organizations can see what's going on, right when it happens, which keeps things honest and organized.

3.Runs Smoothly in the Cloud
The whole thing runs on Firebase Firestore, so it scales up automatically and stays reliable—no fussing with servers or worrying about downtime

4.Keeps Everyone in the Loop
With SendGrid sending out email updates, nobody has to chase people down. Donors and organizations know exactly when food gets submitted, accepted, or picked up.

5.Easy to Use for Everyone
The web platform is straightforward, so donors and organizations can jump right in. No confusing steps—just a simple way for more people to get involved.

VI. CONCLUSION

The Food Donation Management System tackles food waste and hunger head-on with a tech-driven approach. Using tools like Node.js, Express.js, Firebase Firestore, and SendGrid for emails, it keeps things running smoothly between donors and organizations. People can connect, share updates in real time, and trust that their data stays safe. The whole process—from submitting a donation to getting it picked up—feels straightforward and open. With its cloud setup, the system isn't just reliable—it can grow as the community does. In the end, this project makes it easier to get surplus food where it's needed, brings more people into the cause, and pushes us all a little closer to a world with less waste and less hunger.

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