



IJRASET

International Journal For Research in
Applied Science and Engineering Technology



INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 14 **Issue:** VIII **Month of publication:** August 2026

DOI: <https://doi.org/10.22214/ijraset.2026.84559>

www.ijraset.com

Call: ☎ 08813907089

E-mail ID: ijraset@gmail.com

FoodBridge: AI-Assisted Food Donation Management with Secure OTP Verification and Real-Time Tracking

Patil Sneha Sunil¹, Prof. Nirmala Shinge²

School of Computational Sciences, JSPM University, Pune, india

Abstract: Food imbalance remains a critical global issue, where excess edible food is frequently discarded while a significant portion of the population continues to face food insecurity. The main problem exists because people lack access to food which they need but there exists no effective technological solution which should link surplus food sources with people who require assistance.

This research introduces FoodBridge, a smart web-based platform which streamlines food donation and distribution through its complete digital donation system. The system connects donors, non-governmental organizations (NGOs), and delivery partners, enabling coordinated interaction across all stages of the donation lifecycle. FoodBridge provides advanced functionalities which include automatic delivery partner distribution and one-time password (OTP) verification for secure handovers and real-time food tracking through live communication technology.

The system includes its main innovation which uses a multi-layered artificial intelligence system to assess food quality before distribution, which guarantees both safety and usability. The platform executes its operation through a two-stage distribution process which begins with NGOs collecting food, followed by distribution to approved beneficiaries after the food undergoes inspection.

The system uses modern technologies which include AngularJS for user interface design and FastAPI for backend development and PostgreSQL for data storage, which allows it to achieve both performance efficiency and system growth. The experimental results showed that coordination between organizations improved while time delays decreased and transparency increased, which enabled better handling of excess food resources. FoodBridge offers a sustainable solution which reduces food waste by offering an efficient system that organizations can easily expand.

I. INTRODUCTION

Food waste and hunger are problems, especially in countries like India that are still developing. Every day a lot of food gets thrown away. At the same time many people do not have enough food to eat. The main problem is not just that there is not food but also that there is no good system to connect people who want to give food organizations that help people and companies that deliver food in a timely and organized way. Usually when people donate food it is done manually which causes delays, poor coordination. Nobody really knows what is going on.

To solve these problems FoodBridge is a website that connects people who want to give food organizations that help people and companies that deliver food all in one system. People who want to give food can post what they have. Organizations that help people can look at it and accept it if they need it. Then the system finds a good company to deliver the food. It gets there quickly and efficiently. The new version of FoodBridge has some features that make it more reliable and efficient. It uses FoodBridge to check the quality of the food before it is given out so people know it is good to eat. It also has a system for when the food is handed over from the person giving it to the company delivering it. And everyone involved can track the food in time so they know where it is and that it is getting to where it needs to go. FoodBridge also has a two-step system, for giving out food. First the food goes to organizations that help people. Then they give it to those who need it after they have checked it to make sure it is good. From a point of view FoodBridge uses AngularJS, FastAPI and PostgreSQL and it has a good security system to make sure everything is safe. By using automation, artificial intelligence and real-time tracking FoodBridge is a solution to reduce food waste and make food distribution better which helps create a more sustainable and socially responsible FoodBridge system. FoodBridge really helps people by making sure food gets to those who need it. It helps reduce the amount of food that gets thrown away which is a big problem that FoodBridge is trying to solve with FoodBridge.

II. PROBLEM STATEMENT

Food waste and hunger are two problems that exist at the same time especially in countries like India that are still developing. Every day people throw away a lot of food that's still good to eat from homes, restaurants and events while many people struggle to get basic meals. The main problem is not that there is not food but that there is no good system to get extra food to people who need it quickly.

There are some systems that try to help with food donations. They have some big problems. People who want to donate food do not know how or where to do it and charities have a time finding out what food is available and getting it picked up on time. Most of these systems rely on people doing everything by hand which causes delays, misunderstandings and waste. Since food goes bad quickly these delays often mean that the food is spoiled before it gets to the people who need it.

Also the systems we have now do not tell us what is happening with the food in time so it is hard for people involved to keep track of the donations. We also do not have a way to automatically assign people to pick up the food so everything is done by hand, which slows things down. We are also worried about whether the food's handled safely and securely because many systems do not check to make sure everything is okay when the food is handed over.

Another big problem is that we do not have a way to check if the food is safe to eat which is a big concern. Most systems also do not help get the food all the way to the people who need it they just stop at the charities.

To fix these problems we need a system that can handle food donations automatically make sure the food is safe and let us track everything in time. The FoodBridge system is trying to fix these problems by using intelligence to check how fresh the food is assigning delivery people in a smart way using secure codes to verify the handover and tracking everything in real time all, in one system. This way we can get food to people who need it efficiently reduce waste and make sure the food is handled reliably.

III. OBJECTIVES

The main goal of FoodBridge is to build a platform that helps manage food donations and deliveries in a way. We want to reduce food waste and make it easier for people to get food by connecting those who donate food, NGOs and delivery partners.

Here are the specific goals of FoodBridge:

- 1) Create a platform where donors, NGOs and delivery partners can connect and coordinate food donations easily.
- 2) Use a 4-layer system that checks how fresh food is,. Only good food is given out. This system will help make sure food is safe to eat.
- 3) Design a system that automatically picks the delivery partner based on how far they are if they are available and how well they perform.
- 4) Use a verification system that sends a one-time password to ensure that food is picked up and handed over safely.
- 5) Allow people to track food donations in time using live location updates so everyone involved can see where the food is and trust the process.
- 6) Create a two-stage delivery process. Food goes from donors to NGOs and then to people who need it.
- 7) Add a system that checks food quality at the NGO level so they can. Manage food based on its condition.
- 8) Make sure authorized people can access the system and that data is secure using a special type of authentication and access control.
- 9) Provide information and insights, on how the food distribution is working and how much waste is being reduced.

IV. LITERATURE SURVEY

Food waste management and food redistribution systems have become very important in the few years. This is because there is a difference between the amount of extra food we have and the number of people who do not have enough food. Many research projects and applications have tried to solve this problem by using platforms to connect people who have extra food with charities. Many of these systems still have problems with being efficient automated and working in real-time.

Early research on food donation systems focused on creating websites or mobile apps that allow people like restaurant owners and households to share their extra food with non-governmental organizations or charities. These systems made it easier for people to access and become aware of food donation. They still relied on manual coordination, which caused delays and wasted resources.

For example a study called "Food Share Network: An AI-Based Food Donating Application" proposed a platform that connects food donors with organizations that need food. This system makes it easier for people to communicate and handle requests. It does not have automated task assignment and real-time optimization so it relies heavily on human decision-making.

Similarly "Nourish: Food Donation App Using Android and Machine Learning" introduced a mobile-based solution that uses location-based services and basic machine learning techniques. This system improves user interaction and accessibility. It mainly focuses on the user interface and does not provide complete management of the food donation process or advanced logistics handling..

Another system, "A PHP-Based Food Donation and Waste Management System" provides features like user management donation posting and basic tracking. This system also includes features like notifications and inventory handling. It still requires manual coordination for delivery and lacks intelligent automation and secure verification mechanisms.

From looking at these existing systems we can see that they have some common problems

- They do not have real-time tracking and monitoring
- They do not have automated resource or delivery assignment
- They do not integrate all stakeholders, such as food donors, non-governmental organizations and delivery agents
- They do not have mechanisms to verify the quality of the food
- They do not have transparency and scalability

Recent studies show that we need systems that are integrated, intelligent and work in time to handle the complete process of food donation efficiently. There is a growing emphasis on using technologies like artificial intelligence real-time communication and data analytics to improve coordination and reduce delays.

To overcome these problems the proposed FoodBridge system introduces an advanced and comprehensive approach. Unlike systems FoodBridge uses a 4-layer AI-based food freshness analysis to ensure food safety before distribution. It also uses an assignment algorithm to automatically select the most suitable delivery partner based on factors like distance, availability and performance.

In addition the FoodBridge system provides real-time tracking using WebSocket technology, which allows all stakeholders to monitor the donation process from start to finish. A secure OTP-based verification mechanism ensures safe and authorized food pickup addressing security concerns, in earlier systems. Furthermore FoodBridge introduces a two-stage distribution model, where non-governmental organizations not receive food but also distribute it to verified beneficiaries after quality testing.

V. SYSTEM DESIGN AND ARCHITECTURE

The FoodBridge system is made to be a platform on the web that can be used by a lot of people and is very good at managing everything about food donation and distribution. It is set up in three parts: the part that users see the part that does all the work and the part that stores all the data. The user part is made with AngularJS. It is easy to use for people who give food for NGOs and for people who deliver food. The work part is made with FastAPI. It takes care of all the important things like who can use the system and how it all works together. We use PostgreSQL to store all the data about users and food and deliveries and people who get the food. It does a great job of keeping everything safe and organized.

The FoodBridge system is divided into smaller parts that do different things like helping people log in managing food donations working with NGOs working with delivery people using artificial intelligence tracking things and helping people who get the food. We make sure that only the right people can get into the system by using codes and making sure they only have access to the things they are supposed to. The part of the system that manages food donations takes care of everything from start to finish. NGOs can use this part to accept food donations choose who will deliver the food and check if the food is good to eat. Delivery people use the system to pick up food and deliver it. They make sure it gets to where it needs to go on time.

The FoodBridge system also has some cool features that make it work very well and be very reliable. We use an artificial intelligence system that checks if the food is fresh by looking at pictures of it. We also have a system that automatically chooses the delivery person based on how far away they are and if they are available. The system also has a verification system that makes sure only the right people can pick up food so we do not have to worry about someone taking food who is not supposed to. We can also track where the food is in time so everyone can see where their food is and if it is going to be late.

The FoodBridge system also has a way of getting food to people who need it. First the food goes from the people who give it to the NGOs. Then the NGOs check if the food is good to eat and give it to people who really need it. The whole process has steps like waiting to see if someone will take the food accepting the food giving it to someone to deliver picking it up delivering it and finally being done. This way we can keep track of everything. Make sure it all works correctly. Overall the FoodBridge system uses technology, automated systems and safe ways of working to make a great system, for donating and delivering food.

VI. IMPLEMENTATION

The FoodBridge system is built using web technology to ensure it works efficiently can handle a lot of users and performs well in real-time. The part of the system that users interact with is built using AngularJS. This makes it easy and friendly for donors, NGOs and delivery partners to use.

- Users can do things like register log in post food donations track what is happening and manage tasks from their dashboards.
- The backend of the system, which handles all the behind-the-scenes work is built using FastAPI. This allows the system to handle API requests quickly do tasks asynchronously and communicate smoothly between parts of the system.
- PostgreSQL is used as the database. It stores structured data about users, donations, deliveries, beneficiaries and system logs.

The FoodBridge system is built in a way. Each part of the system like authentication, managing donations, NGO operations, managing delivery partners, AI processing and real-time tracking is handled by its module.

- The system uses JWT-based login and Role-Based Access Control (RBAC) for authentication. This means each user can only access the features they are supposed to.
- When a donor submits food details like type, quantity, location, expiry time and an image the system starts a 4-layer AI-based food freshness analysis. This analysis checks the food using image verification, metadata checks and image processing techniques.

After the AI validation NGOs can. Accept donations that fit their needs.

- The system then assigns a delivery partner. This can be done manually. Through a smart AI algorithm that chooses the best partner based on distance, availability and past performance.
- A secure OTP-based verification is used for food pickup. A 6-digit OTP is. Verified when the donor hands over the food to the delivery partner.

Once the pickup is confirmed the system allows real-time tracking of the delivery partner using WebSocket technology.

- This lets donors and NGOs see where the delivery partner is and the status of the delivery live.
- When the food is delivered to the NGO it goes through a quality test. It is classified as fresh, moderate or spoiled.

Based on this classification the food is. Given out immediately marked for urgent use or rejected.

The system uses a two-stage distribution model. Accepted food is assigned to verified beneficiaries like shelters, individuals or community centers.

All activities are. Recorded in the system through lifecycle tracking and audit logs. This ensures transparency and accountability.

The FoodBridge system also includes features like notifications, messaging and analytics. These enhance user interaction. Help monitor the systems performance

Overall the FoodBridge system combines automation, secure verification and real-time communication. This makes it an efficient and reliable platform, for food donation and distribution.

VII. RESULTS AND DISCUSSION

The FoodBridge system is really good at making food donation and distribution. It is more efficient and transparent than systems. We tested FoodBridge with different groups, like donors, NGOs and delivery partners. The results were great with coordination and faster response times.

One of the things about FoodBridge is the way it checks the freshness of food. This is done using intelligence, which helps make sure that only good food is accepted. The system checks the food times to make sure it is not spoiled. FoodBridge also picks the delivery partner based on how far away they are, if they are available and how well they have done in the past. This means that food gets delivered faster and resources are used better.

The system is also very safe. It uses a code to make sure that food is handed over to the right people. This reduces the risk of food being taken by the people. FoodBridge also lets everyone track the food in time so they can see where it is and what is happening to it. This makes the system more transparent. Builds trust.

Another good thing about FoodBridge is the way it distributes food. It first delivers food to NGOs. Then they give it to people who really need it after checking the quality. This helps make sure that only good food gets to the people who need it. The system also provides a lot of information through dashboards and notifications so users can stay informed.

Compared to systems FoodBridge is more automated and easier to use. It uses technology like AngularJS, FastAPI and PostgreSQL which makes it work well even with many users.

Overall FoodBridge does a job of addressing the problems, with existing food donation systems. It uses intelligence, automation and real-time communication to make the system better. FoodBridge not makes the process more efficient but it also helps reduce food waste and supports people in need. The FoodBridge system is a way to make food donation and distribution better and it really helps the FoodBridge system work well.

VIII. FUTURE SCOPE

The FoodBridge system can be made better by adding new technologies and making it do more things to make it work more efficiently make it bigger and have a bigger impact on the real world. Here are some things that can be done to make the FoodBridge system better in the future:

- 1) **Advanced AI Enhancement:** The FoodBridge system already uses intelligence to check how fresh food is but this can be improved by using better machine learning models so it is more accurate and can predict what people will need and when they will need it. The FoodBridge system can use these models to figure out when food will be donated and when people will need it.
- 2) **Route Optimization for Delivery Partners:** The FoodBridge system can help delivery partners find the way to get to where they are going by using special algorithms that show them the fastest way, which will get food to people faster and stop it from going bad. The FoodBridge system will help delivery partners do their job better.
- 3) **Enhanced Real-Time Tracking:** The FoodBridge system can be made better by adding detailed maps and traffic information so people can see exactly where their food is and when it will get to them. The FoodBridge system will make sure people know where their food is all the time..
- 4) **Improved Beneficiary Management:** The FoodBridge system can work with organizations or government agencies to find out who needs food the most and get it to them first which will make sure food is given to the people who need it most. The FoodBridge system will help get food to the people.
- 5) **Mobile Application Development:** A special app can be made for the FoodBridge system that will make it easier for people to use so they can do everything they need to do with the FoodBridge system on their phone. The FoodBridge system will be easier to use.
- 6) **Security Improvements:** The FoodBridge system can be made secure by adding extra steps to make sure only the right people can get in and by using special technology to keep track of everything that happens so nobody can change anything they are not supposed to. The FoodBridge system will be safer.
- 7) **Advanced Analytics and Reporting:** The FoodBridge system can show detailed information, about how well it is working, like how much food is being wasted, what people are doing with the FoodBridge system and how well the FoodBridge system is performing, which will help make the FoodBridge system better. The FoodBridge system will have information to help it get better.

IX. CONCLUSION

The FoodBridge system is made to solve the problems of food waste and hunger. It does this by giving an technology-driven way for people to donate and distribute food. The system brings together people who want to donate food, non-governmental organizations and delivery partners on one platform. This makes it easier for them to work together and reduces delays in getting food to people who need it.

The new and improved version of FoodBridge has advanced features that make the system work better and more reliably. It uses an analysis to check how fresh the food is so only good food is given out. The system also picks the delivery partner, which saves time and makes sure resources are used well. Additionally a special verification system makes sure that authorized people can pick up food and people can track their food in real time.

FoodBridge also has a two-part system for giving out food. First food goes from donors to -governmental organizations and then it goes to people who need it after it has been checked for quality. The system uses technology like AngularJS, FastAPI and PostgreSQL and it has good security measures to keep data safe.

Overall FoodBridge shows how artificial intelligence, automation and real-time communication can make food distribution systems work better. The platform reduces food waste. Helps people in need by getting surplus food to them quickly and reliably. If more people use FoodBridge and it gets even better it could make a difference, in how we manage food and support our communities. The FoodBridge system is a way to make sure that food gets to people who need it and it is an important part of solving the problems of food waste and hunger.

X. ACKNOWLEDGMENT

I want to thank the Department of Computer Application JSPM University, Pune, for helping me with the tools and creating a good environment for this research.

I am really thankful to my guide Prof. Nirmala Shinge for his help constant motivation and smart ideas throughout this study. Her support was very important for the development of the FoodBridge system.

The Department of Computer Application JSPM University, Pune helped me a lot.

I also want to thank JSPM University, Pune for their help and for encouraging new ideas and research. The knowledge and resources from the university greatly helped me finish this project.

In addition JSPM University, Pune supported me with their resources.

Lastly I want to thank my family and friends for their support and motivation during the year 2025–2026. Their encouragement helped me finish this research work.

My family and friends were very supportive, throughout this research.

REFERENCES

- [1] M. Grinberg, *Flask Web Development: Developing Web Applications with Python*, O'Reilly Media, 2018.
- [2] W. Stallings, *Cryptography and Network Security: Principles and Practice*, 7th ed., Pearson Education, 2017.
- [3] J. F. Kurose and K. W. Ross, *Computer Networking: A Top-Down Approach*, 7th ed., Pearson, 2016.
- [4] R. Elmasri and S. B. Navathe, *Fundamentals of Database Systems*, 7th ed., Pearson, 2016.
- [5] I. Sommerville, *Software Engineering*, 10th ed., Pearson Education, 2015.
- [6] R. S. Pressman, *Software Engineering: A Practitioner's Approach*, 8th ed., McGraw-Hill Education, 2014.
- [7] A. S. Tanenbaum and M. Van Steen, *Distributed Systems: Principles and Paradigms*, 2nd ed., Pearson, 2017.
- [8] S. Tilkov and S. Vinoski, "Node.js: Using JavaScript to Build High-Performance Network Programs," *IEEE Internet Computing*, vol. 14, no. 6, pp. 80–83, 2010.



10.22214/IJRASET



45.98



IMPACT FACTOR:
7.129



IMPACT FACTOR:
7.429



INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Call : 08813907089  (24*7 Support on Whatsapp)