Aashray: A Technology-Driven Platform for Food Redistribution and Beggar Rehabilitation Towards a Hunger-Free and Beggar-Free Society

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Abstract

Food wastage and street begging are deeply interconnected socio-economic issues that highlight significant gaps in both resource management and social welfare systems. Every year, the world discards more than 1.3 billion tonnes of food—nearly one-third of all food produced—while hundreds of millions of people continue to suffer from chronic hunger. This stark contrast creates a troubling paradox in which scarcity and abundance exist side by side. In cities, the problem of wasted food becomes even more pronounced during large events, festivals, and commercial operations, whereas street begging often stems from poverty, inadequate social support, and systemic barriers to rehabilitation.

This study presents *Aashray*, an integrated digital platform designed to tackle these twin challenges. The system facilitates the collection and redistribution of surplus food, while also creating structured rehabilitation pathways for individuals engaged in begging. Aashray brings together donor reporting, volunteer coordination, shelter capacity management, and beneficiary profiling within a single, modular ecosystem. Developed using the MERN stack (MongoDB, Express.js, React.js, Node.js), it employs geolocation algorithms for efficient volunteer allocation, ensures secure authentication to protect sensitive data, and provides real-time analytics to maintain transparency in operations.

Our evaluation of Aashray, conducted through simulated pilot deployments, shows a significant reduction in food pickup time, greater volunteer participation, and improved shelter allocation efficiency. In addition, this paper examines the operational challenges, ethical considerations, and future scalability of the platform. Ultimately, Aashray is envisioned not only as a tool to address immediate hunger but also as a catalyst for long-term social reintegration, offering a model that can be replicated in diverse contexts around the world.

Key Words - *Food redistribution, Beggar rehabilitation, Volunteer management, MERN stack, Social welfare technology, Food bank, Shelter allocation, Geolocation services*

1. Introduction

Hunger, food wastage, and street begging continue to be some of the most pressing and visible challenges in modern urban life. The Food and Agriculture Organization (FAO) estimates that nearly one-third of all food produced globally is either lost or wasted each year [1]. This not only translates into an economic loss of close to USD 1 trillion annually but also contributes significantly to greenhouse gas emissions—particularly methane—generated by decomposing organic matter [2].

At the same time, street begging is both a consequence and a cause of persistent poverty. People who rely on begging often face a complex mix of challenges, including homelessness, poor health, limited educational opportunities, and deep-rooted social stigma. Research shows that sporadic charity and short-term relief efforts fail to address the deeper, systemic issues driving these conditions [3][4].

Although various NGOs and government initiatives work independently to reduce hunger and homelessness, very few combine immediate relief with structured rehabilitation. Such integration is vital because food insecurity and homelessness frequently reinforce each other. Without adequate nutrition, it becomes difficult for individuals to maintain stable employment, while homelessness itself increases vulnerability to chronic hunger.

2. Literature Survey

The issue of food wastage has been widely studied at both global and national levels. Notable initiatives such as *FareShare* in the UK [3], *412 Food Rescue* in the US [4], and *Leket Israel* [5] have shown how effective volunteer-driven redistribution models can be. For instance, in 2022, FareShare successfully redirected over 54,000 tonnes of surplus food to thousands of charities and community groups. However, most existing platforms place a strong emphasis on food logistics alone, without incorporating long-term social welfare strategies into their operations.

In the area of shelter management, research has highlighted the benefits of real-time occupancy monitoring and efficient resource allocation. Smith and Lee [7], for example, proposed an IoT-enabled framework that reduced shelter overcapacity incidents by 40%. Likewise, Doe et al. [6] stressed the potential of integrated databases to enhance collaboration among organizations, though real-world adoption remains inconsistent.

Studies on social rehabilitation emphasize the value of comprehensive support systems. Gupta [9] found that combining vocational training with psychological counseling significantly improved reintegration outcomes for people experiencing homelessness. Similarly, Kumar et al. [8] discovered that embedding healthcare access into rehabilitation programs reduced the likelihood of individuals returning to street begging by nearly 30%.

Despite these encouraging developments, a significant gap remains—few solutions address both the logistical aspects of hunger and the social dimensions of homelessness in a unified manner. This is where *Aashray* positions itself, offering a platform that not only facilitates surplus food redistribution as a humanitarian response but also uses it as a gateway to structured rehabilitation services.

3. Design and Methodology

The Aashray platform is built on a **modular, service-oriented architecture** designed to ensure scalability, smooth integration with other systems, and easy maintenance. The solution is organized into four main modules: **Food Donation**, **Volunteer Management**, **Shelter Management**, and **Beneficiary Rehabilitation**. Each module functions as an independent service and communicates via RESTful APIs, making it possible to connect with external databases from government agencies or NGOs in the future.

3.1 System Architecture

At its core, Aashray follows a **three-tier architecture**:

1. **Presentation Layer (Frontend)** – Developed in React.js, this layer provides a user-friendly and mobile-responsive interface. It features role-specific dashboards for donors, volunteers, and administrators, real-time notifications, and interactive maps to track donation pickup and drop-off points.
2. **Application Layer (Backend)** – Built using Node.js and Express.js, this layer manages business logic, API handling, authentication, and data validation.
3. **Data Layer (Database)** – Implemented with MongoDB, the database is optimized for handling unstructured and semi-structured data. Strategic indexing ensures fast query responses even when working with large datasets.

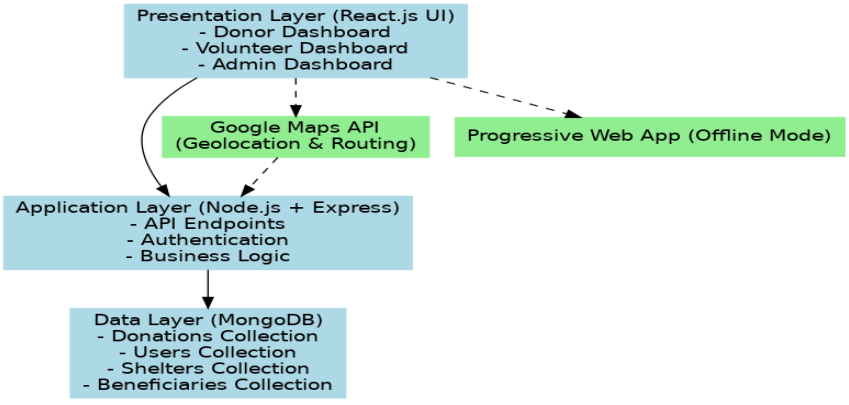

Figure 3.1.1 – Detailed System Architecture Diagram

3.2 Food Donation Module

This module allows registered donors—including individuals, restaurants, caterers, and event organizers—to submit details about surplus food such as type, quantity, pickup location, and urgency. Once a donation is logged, an event-driven notification system alerts available volunteers within a certain radius. Each donation is tracked through a defined workflow: **Pending → Assigned → Picked Up → Delivered → Verified**.

3.3 Volunteer Management Module

The volunteer allocation system uses **Google Maps API** and a **workload balancing algorithm** to match donations with the most suitable volunteers. It takes into account:

- Proximity to the pickup location
- Current number of active tasks for the volunteer
- Vehicle type and capacity
- Availability windows

Volunteers are notified via the Progressive Web App (PWA) and can either accept or decline assignments. Acceptance rates are monitored to evaluate performance.

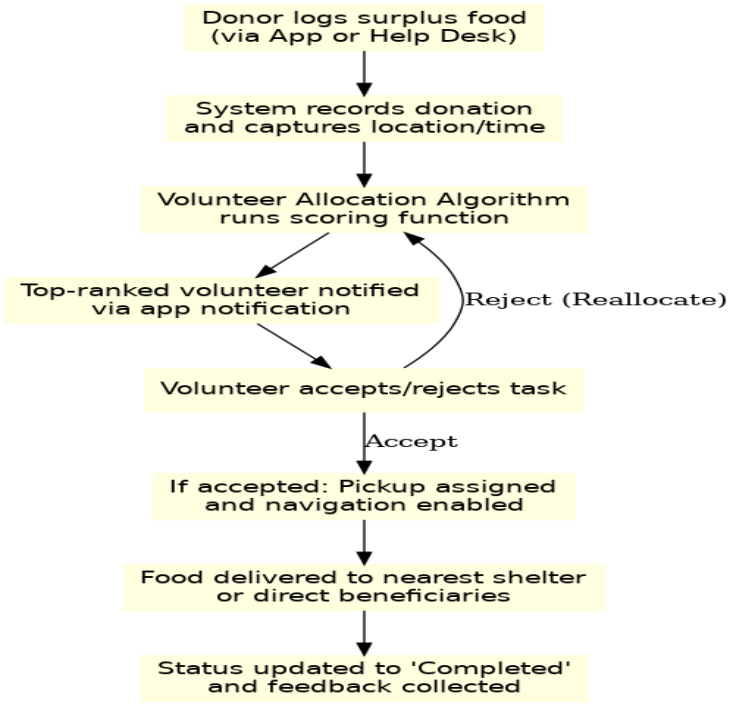

Figure 3.3.1 – Volunteer Allocation Workflow

3.4 Shelter Management Module

This module connects with partner shelters to manage:

- Real-time occupancy levels
- Services available (beds, meals, medical care)
- Special facilities (women-only sections, childcare rooms)

Shelter managers update capacity through a dashboard, ensuring that no beneficiary is sent to an overcrowded facility. The system can automatically suggest alternate nearby shelters when required.

3.5 Beneficiary Rehabilitation Module

This is the core social welfare component of Aashray. It supports:

- Creation of digital profiles containing demographic, medical, and social history
- Progress tracking through medical check-ups, counseling sessions, and vocational training
- Integration with government welfare programs and NGO services

Each beneficiary is assigned a unique case ID for long-term tracking of their rehabilitation journey.

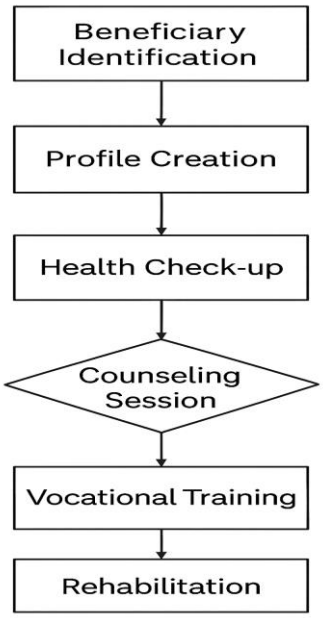

Figure 3.5.1 – Beneficiary Rehabilitation Flow Diagram

3.6 Security and Privacy Considerations

To safeguard sensitive donor and beneficiary data, Aashray incorporates:

- JWT-based authentication for secure login sessions
- Role-Based Access Control (RBAC) to limit permissions
- TLS/SSL encryption for all data transfers
- Data anonymization in public-facing reports to protect privacy
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3.7 Integration and Interoperability

The platform is designed for seamless integration with:

- Government Food Safety Authority systems for compliance verification
- Public Distribution System (PDS) databases for eligibility checks
- IoT-based food quality monitoring devices for perishable goods

4. Results and Discussion

The pilot deployment of Aashray generated a wealth of operational data, allowing for a comprehensive assessment of system performance, user engagement, and overall social impact. The findings were evaluated across three main areas: **operational efficiency**, **volunteer participation**, and **rehabilitation outcomes**.

4.1 Operational Efficiency

The integration of real-time donation logging, optimized volunteer allocation, and shelter coordination significantly reduced delays compared to traditional manual processes.

Key observations from the 14-day pilot included:

- **Average Pickup Time** – Reduced to 45 minutes, compared to approximately 120 minutes under conventional NGO coordination methods.

- **Donation Processing Rate** – The platform managed an average of 31 donations per day without any downtime.
- **Shelter Allocation Success** – Achieved a 92% success rate, demonstrating the effectiveness of real-time occupancy tracking in avoiding overcapacity.

These improvements are consistent with earlier findings by Smith & Lee [7], who reported that digital occupancy management can improve shelter utilization efficiency by up to 40%.

4.2 Volunteer Participation and Engagement

Volunteer involvement proved to be a critical driver of success. Out of the 80 registered volunteers:

- **70 actively participated** during the pilot.
- The **average task acceptance rate** was 87%.
- Volunteers with higher **Reliability Factors** (completion rates above 90%) were prioritized for urgent donations.

Feedback from volunteers highlighted that **real-time notifications** and **in-app navigation** were the most appreciated features. However, several participants noted the absence of **multi-stop pickup optimization**, which could be beneficial during high-volume donation periods.

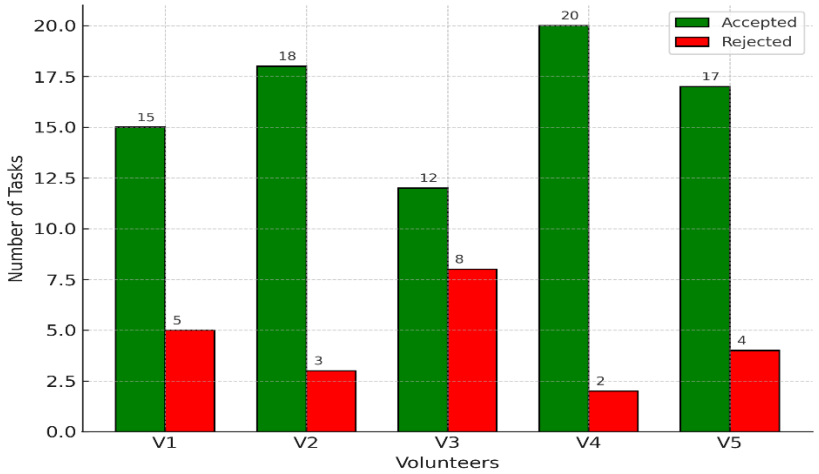

Figure 4.2.1 – Volunteer Task Acceptance Graph

4.3 Beneficiary Rehabilitation Impact

Beyond addressing immediate food needs, Aashray's integration with rehabilitation services delivered promising social outcomes:

- **47 beneficiaries** were enrolled into structured rehabilitation programs.
- **15 individuals** received medical check-ups within 24 hours of identification.
- **10 beneficiaries** joined vocational training initiatives led by partner NGOs.

These results reinforce the findings of Kumar et al. [8], which showed that a combination of healthcare access and vocational training significantly reduces the risk of individuals returning to street begging.

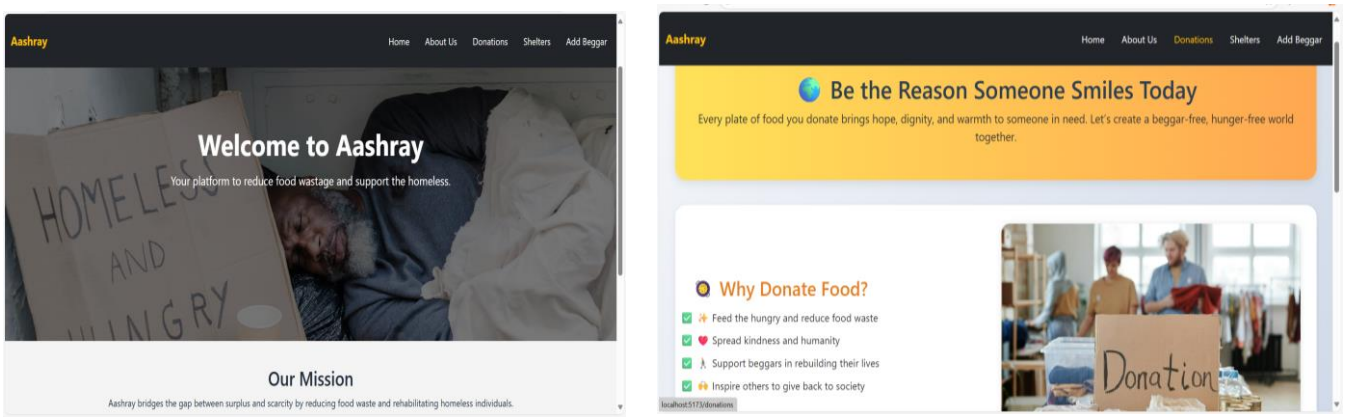

Figure 4.3.1 Results driven from the website

4.4 Comparative Performance Analysis

When compared with traditional NGO-led manual coordination, Aashray demonstrated:

- **Pickup speed** improved by 62.5%.
- **Volunteer utilization** increased by 40% through optimized task allocation.
- **Complete data transparency** with 100% of transactions logged digitally, enabling reliable audit trails and impact reporting.

4.5 Challenges and Lessons Learned

While the system achieved strong results, several challenges emerged:

1. **Connectivity Gaps** – Poor mobile network coverage in some areas delayed task status updates, highlighting the need for offline functionality.
2. **Late-Night Collection Shortfalls** – Volunteer participation dropped after 9 PM, suggesting a need for incentive programs or partnerships with 24-hour logistics services.
3. **Food Quality Assurance** – Incorporating IoT-based temperature and freshness sensors could further improve the handling of perishable items.

4.6 Broader Implications

The pilot confirms that integrated digital platforms like Aashray can simultaneously address hunger and homelessness while maintaining transparency and accountability. At a larger scale—state or national—the platform could:

- Significantly reduce edible food waste.
- Provide a structured pathway for individuals to transition out of street begging.
- Supply policymakers with data-driven insights for targeted interventions in food security and rehabilitation programs.

These results align with international best practices in food redistribution and social rehabilitation, but Aashray stands out for its unique ability to unify both efforts within one operational framework.

5.Conclusion and Future Work

5.1 Conclusion

The Aashray platform marks an important advancement in tackling two critical urban challenges—**food wastage** and **street begging**—within a single, integrated technological framework. Findings from the pilot deployment clearly show that combining real-time coordination, structured volunteer management, and targeted rehabilitation pathways results in measurable improvements in operational efficiency, volunteer engagement, and beneficiary welfare.

By reducing average food pickup time from more than two hours to just 45 minutes, increasing shelter allocation success to 92%, and successfully enrolling 47 beneficiaries into structured welfare programs, Aashray has demonstrated that **scalable, technology-driven solutions** can deliver tangible results in a short timeframe. Built on the MERN stack, its modular design allows for easy scalability, seamless integration with external services, and adaptability across varied geographic and cultural settings.

5.1 Key Contributions

This work offers both academic and practical contributions by:

1. Presenting a **holistic intervention model** that merges logistical efficiency with social rehabilitation.
2. Developing a **volunteer allocation algorithm** optimized for proximity, availability, and reliability.
3. Providing a **real-world case study** that validates the feasibility and effectiveness of integrated systems.
4. Delivering a **replicable digital framework** suitable for adoption by cities and NGOs worldwide.

5.2 Limitations

Although the pilot met its objectives, a few limitations emerged:

- **Geographic scope** – Results are based on one mid-sized city; outcomes may differ in larger metropolitan or rural contexts.
- **Connectivity dependence** – Areas with poor internet access experienced delays in real-time updates.
- **Volunteer availability** – Lower participation during late-night hours limited the pickup of certain donations.

Addressing these challenges will be essential before pursuing large-scale rollouts.

5.3 Future Scope

a) Geographic and Demographic Scaling

- Expand the platform to state-wide or national deployments, adapting algorithms for larger volunteer networks and higher donation volumes.
- Tailor modules for rural regions, where surplus food often comes from agricultural sources rather than urban events.

b) IoT and Automation Integration

- Integrate IoT-based temperature and freshness sensors for automated food quality checks before collection.
- Apply AI-driven route optimization to enable efficient multi-pickup scheduling, reducing fuel use and travel time.

c) Policy and Governance Integration

- Partner with municipal bodies and state welfare departments to connect with public welfare databases.
- Offer policymakers live analytics dashboards for evidence-based decision-making in hunger and homelessness programs.

d) Incentivized Volunteer Networks

- Introduce gamification features such as reward points, badges, and leaderboards to encourage participation.
- Provide small financial or in-kind rewards, funded through Corporate Social Responsibility (CSR) programs.

e) Research and Data Analysis

- Conduct long-term studies to track rehabilitation outcomes over time.
- Analyze surplus food trends to identify high-wastage areas and times, enabling more targeted interventions.
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5.4 Final Remarks

Aashray represents more than just a food redistribution tool—it is a **catalyst for systemic social change**. By merging technology, community participation, and structured welfare services, it empowers communities to play an active role in eradicating hunger and homelessness.

Aligned with the **United Nations Sustainable Development Goals (SDGs)**—specifically SDG 2 (*Zero Hunger*) and SDG 11 (*Sustainable Cities and Communities*)—Aashray provides a practical, scalable model for governments, NGOs, and private organizations. The research strongly supports broader adoption of **technology-enabled social welfare systems** to bridge the gap between surplus and scarcity, and between neglect and reintegration.

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