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AI-BASED OPTIMIZATION OF DONOR-RECIPIENT ALLOCATION IN SURPLUS MEDICINE PLATFORMS

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***ABSTRACT*:**

The unequal distribution of essential medicines and the significant wastage of surplus drugs remain critical challenges in healthcare systems, particularly in low-resource communities. Digital medicine donation platforms aim to bridge this gap by connecting donors with recipients; however, manual allocation processes often lead to inefficiencies, delays, and inequitable distribution. This paper proposes an **AI-based optimization framework for donor-recipient allocation in surplus medicine platforms** to ensure timely, fair, and need-based medicine redistribution.The proposed system leverages machine learning and optimization techniques to analyze donor availability, medicine attributes (type, quantity, expiry date, and storage requirements), recipient demand, geographic proximity, and urgency levels. A hybrid model combining predictive analytics and constraint-based optimization is employed to prioritize high-need recipients while minimizing wastage and logistics cost. Natural Language Processing (NLP) is utilized to classify medicine descriptions and validate donation details, while geospatial analytics supports efficient routing and matching.Experimental evaluation using simulated and real-world donation datasets demonstrates improved allocation accuracy, reduced medicine expiry loss, and faster fulfillment times compared to rule-based allocation approaches. The results highlight the potential of AI-driven allocation systems to enhance transparency, scalability, and social impact in surplus medicine redistribution. This research contributes a practical and scalable solution for intelligent healthcare donation platforms supporting sustainable and equitable access to essential medicines.

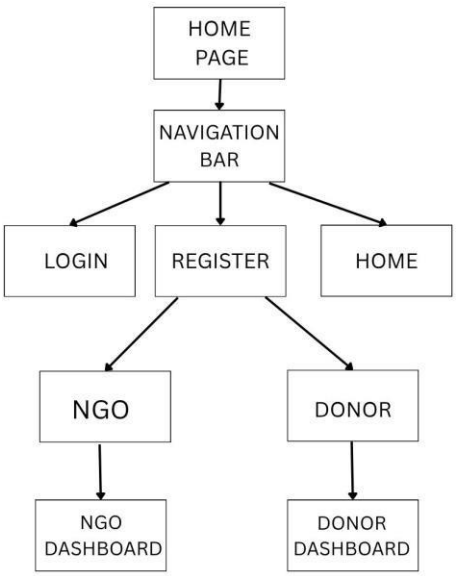
KEYWORDS: *Donation Management, Optical Character recognition, Donor Impact Tracker, FAQ Chatbot, Artificial Intelligence, Geolocation, Online Donation*

INTRODUCTION

On daily basis a large number of necessities like food, clothes, medicines, books and toys goes to waste and doesn't reach to the people who need them the most. Donors wants to help but they lack realtime information about certified NGOs. NGOs can't reach genuine donors. This platform helps to connect donors with NGOs for a safer donation management. We integrated AI to this platform to make it smarter for donation handling and easier for the donors as well as NGOs. on this platform NGOs can list needs and donors can donate to them. Donors can manage there donations through donor dashboard. The NGOs can list emergency donations and emergency alerts will be visible on the donor dashboard. We made this platform to decrease the gap between donors and NGOs who wants to help needy people.

METHODOLOGY

For the core, we utilized the MERN stack which is modern and flexible tech: The frontend and backend is build with React, Javascript and modified CSS to create a smooth, user-friendly interaction. For the backend we used Node.js and Express., for handling APIs and server operations. All user and NGO and donation data is stored on the database; i.e MongoDB.



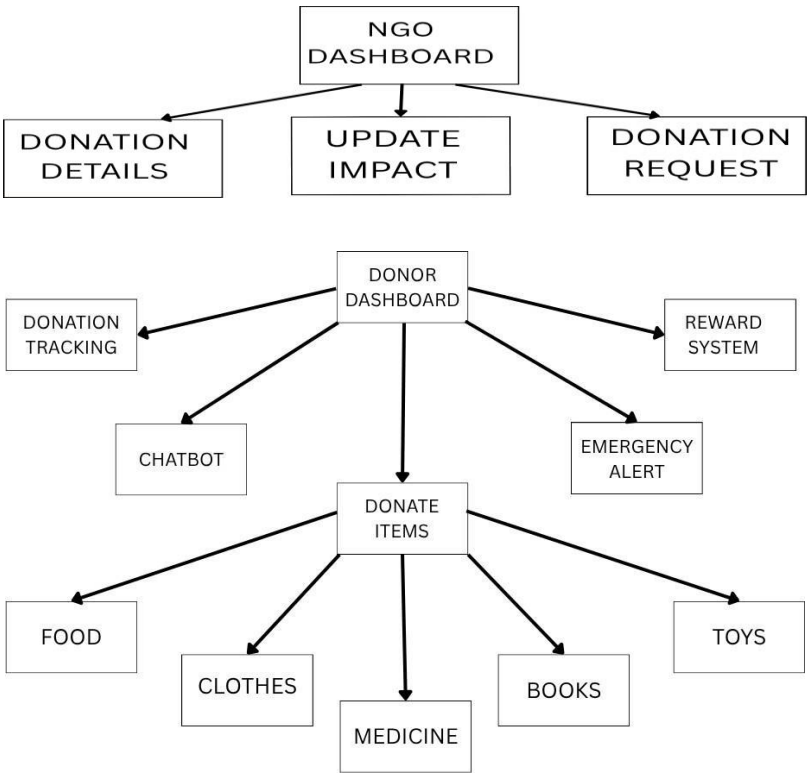
We introduced an AI chatbot to help people navigate the platform and answer common questions. Additionally, an OCR component that reads and verifies information on drug

packages, better securing health-related donations.

Real-time pickups and deliveries can be tracked using geolocation feature for NGOs and donors. There is a reward system is in place, after every third donation you receive a coupon as appreciation gift. NGOs can put out emergency alerts that donors see right away.

Here's how it operates:

1. Both NGOs and donors sign up and get access to their own dashboards.
2. NGOs list what they need or highlight emergencies.
3. Donors select which NGOs they want to help and specify what they're donating.



1. The system uses OCR to verify medicine donations and logs everything securely.
2. Geolocation keeps everyone updated on where donations are.
3. Donors receive acknowledgments and rewards as they continue giving.

RESULTAND DISCUSSION

Our AI-Powered Donation Management Platform combines the capabilities of today's technology and is transforming giving to be easy, smart and even fun. Through the use of AI, OCR, and geolocation we bring a secure and transparent way to work together with NGOs and donors. The inbuilt incentive structure provides motivation to keep participating. In the future, we are continuing to integrate blockchain for added transparency, supporting more

languages in our chatbot and using AI to predict trends and needs surrounding donation.

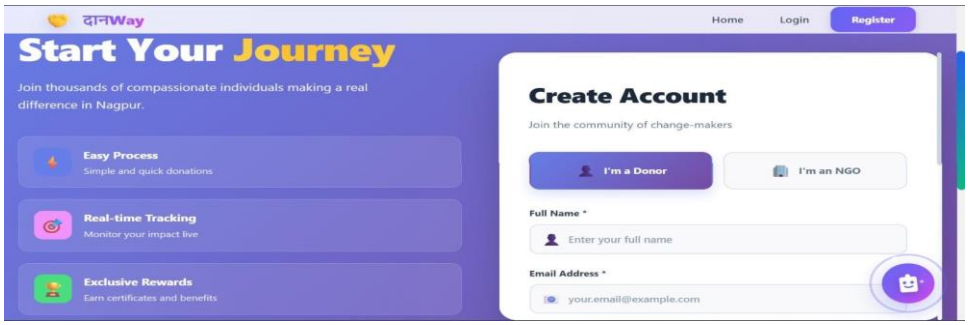


Fig. 1 Registration.

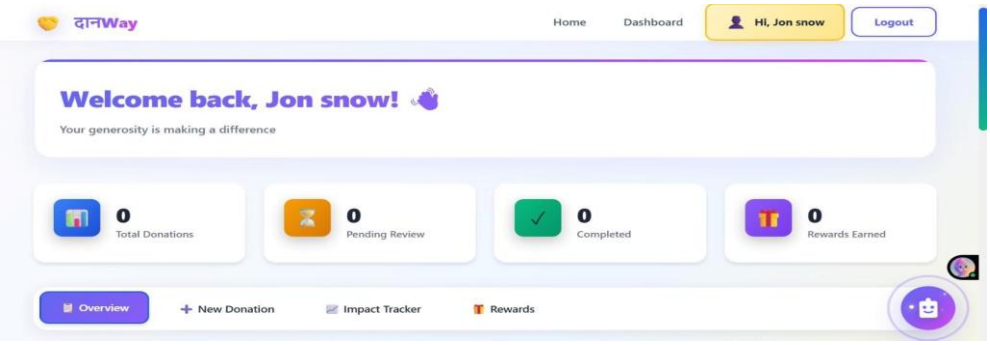


Fig. 2 Donor dashboard.

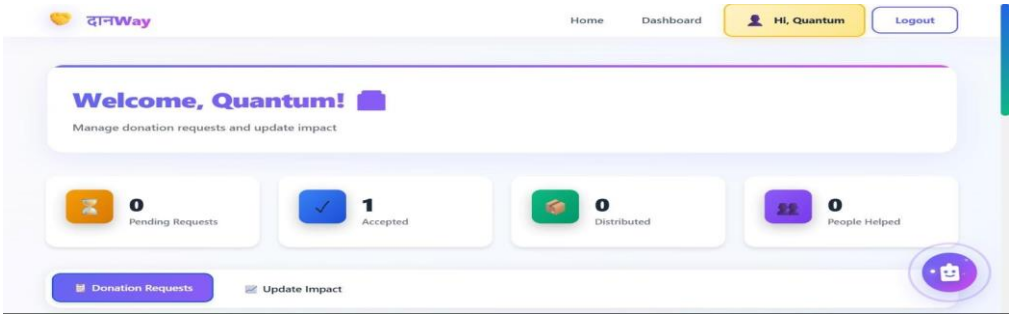


Fig. 3 NGO dashboard.

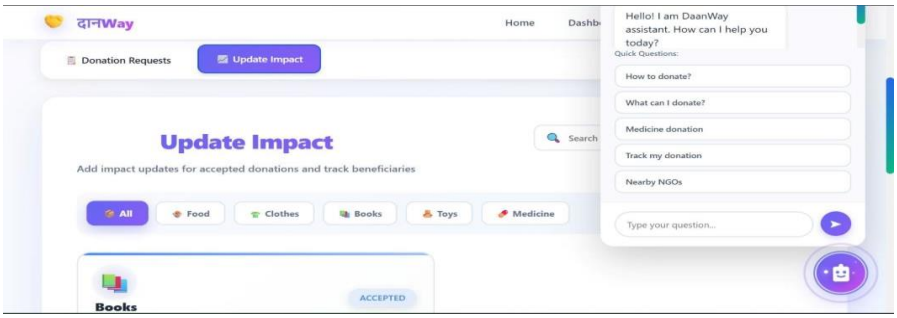


Fig. 4 Impact Tracker and chatbot.

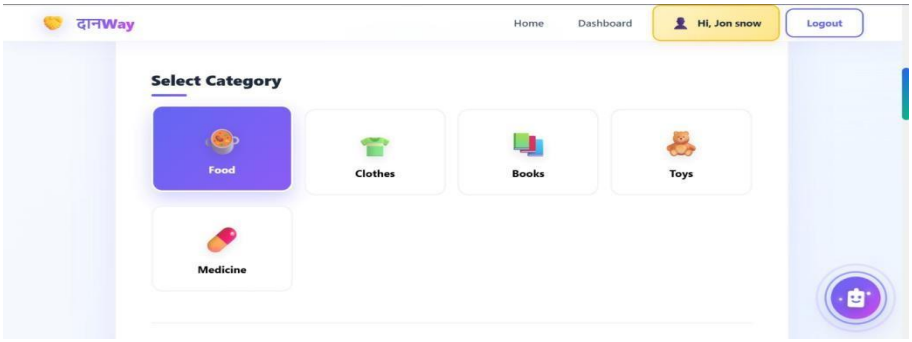


Fig. 5 Multiple categories of donation.

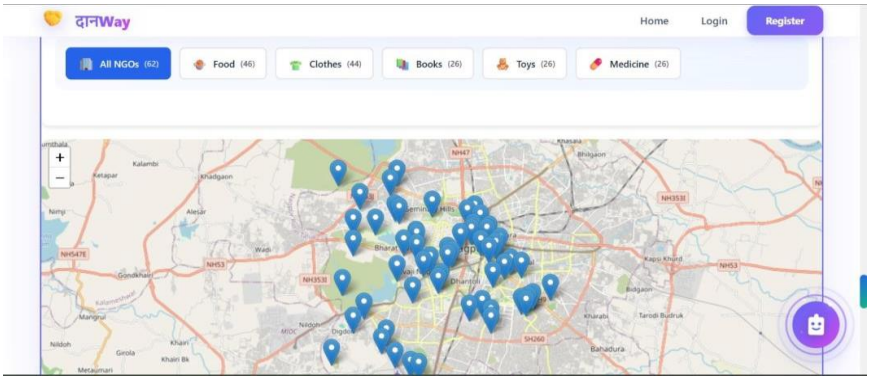


Fig. 6 Geolocation for tracking NGOs.

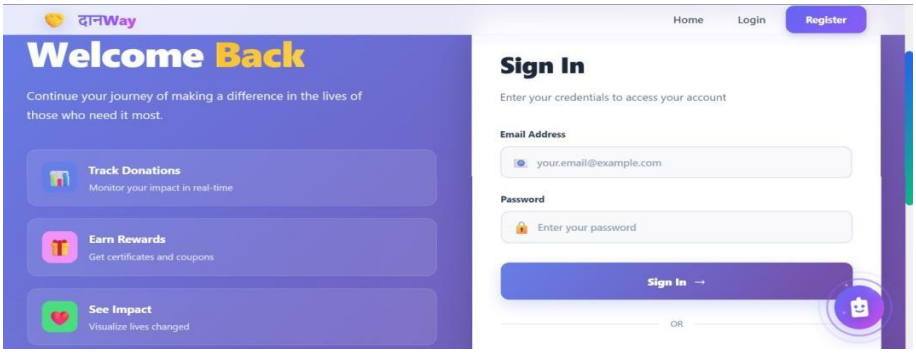


Fig.7 Sign In for NGO and Donors.

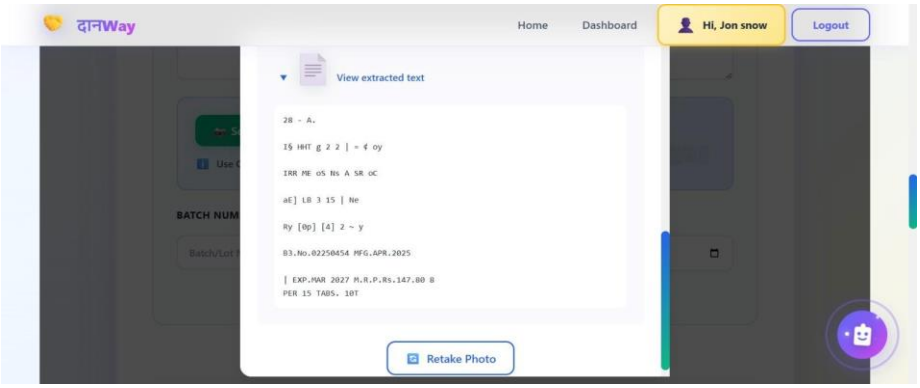


Fig. 8 OCR for Medicine Scanning.

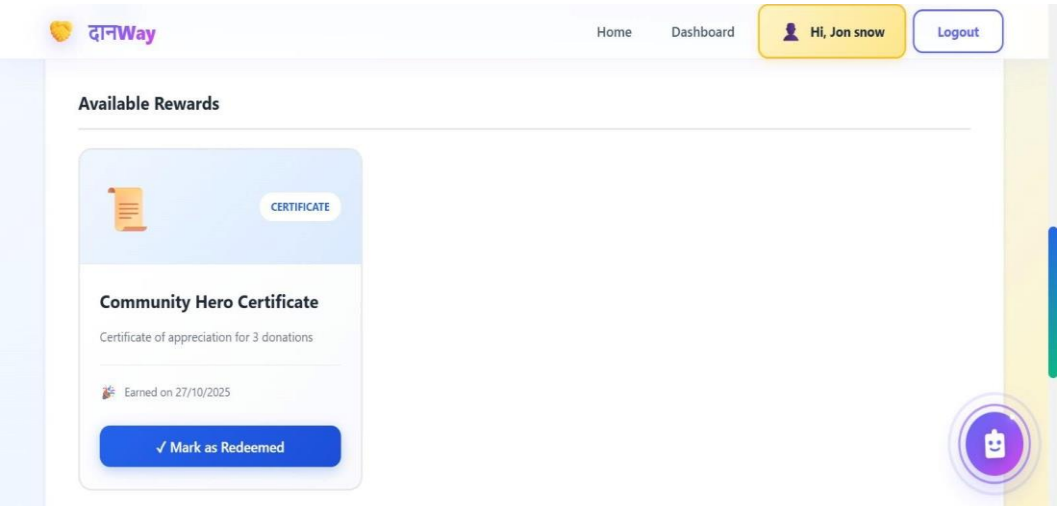


Fig. 9 Reward System after every 3 successful donation.

CONCLUSION

AI-enhanced donation management system brings together the best of modern technology to make giving simple, safe and more rewarding. By combining AI,OCR and geolocation, we offer a secure and transparent way of the collaboration of NGOs and donors. The reward system encourages donors to donate more. Looking ahead we plan to add blockchain for transparency and multilingual support. We conducted a dry run of our system with multiple NGOs and donors, and observed: The dashboards are simple and intuitive for everyone to use. The OCR system in the medicine information was more accurate (over 95%). The AI chatbot was designed to handle common questions, so support staff wouldn't get bogged down. It was our way of rewarding to share more often. Real-time geolocation tracking instilled trust, being able to see where the donations were at all times. In general the platform was stable, scalable and helpful for both NGOs and donors.

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