International Journal of Advances in Engineering and Management (IJAEM)
Volume 7, Issue 08 Aug. 2025, pp: 238-246 www.ijaem.net ISSN: 2395-5252

Revolutionizing Ngo Workflow Optimization: An Ai-Based Approach for Automated Volunteer Deployment and Impact Reporting Using K-Nearest Neighbors

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Date of Submission: 01-08-2025 Date of Acceptance: 10-08-2025

ABSTRACT
Workflow optimization in NGOs involves streamlining processes to improve efficiency, reduce costs, and enhance impact. In existing system, NGO system operates without a centralized platform, making difficult for collaboration and resource sharing Volunteer deployment is manual. It is leading to slow response times. It lacks intelligent algorithms for matching nearby volunteers, resulting in uncoordinated and inefficient relief efforts.
In proposed system,this paper is focused on the Volunteer Disaster Management System(VDMS), a web-based application designed to support collaboration among multiple non-governmental organizations during disaster situations. It automates the coordination and assignment of volunteers using the K-Nearest Neighbors algorithm to match individuals based on their geographical location. The system includes real-time notification features to alert volunteers during emergencies and task deployments. Additionally, it offers tools for tracking volunteer activities, task status, and overall impact, ensuring transparency and accountability. The platform streamlines disaster response efforts, improves resource utilization, and connects organizations with nearby volunteers and affected communities effectively.
KEYWORDS: Volunteer Disaster Management System (VDMS), KNN (K-Nearest Neighbor), LVM (Location-based Volunteer Matching), ENM (Email Notification Module), VIR(Volunteer Impact Report), and NGO (Non-Government Organization).

I.INTRODUCTION

Over the past few years, natural disasters like floods, earthquakes, and cyclones have been on the rise, causing extensive human and economic damage. Effective and coordinated disaster response becomes essential in order to reduce these effects. Non-Government Organizations (NGOs) and community volunteers tend to be the first line of response in these situations. Yet, conventional disaster response infrastructures are subject to several challenges such as manual coordination of volunteers, ineffective deployment, no real-time communications, and no centralized reporting systems.

In order to overcome these limitations, the present paper suggests that VDMS (Volunteer Disaster Management System) — an AI-powered, web-enabled platform to consolidate different NGOs and make the end-to-end volunteer management process streamlined — should be created. The system applies the K-Nearest Neighbors (KNN) algorithm to put LVM (Location-based Volunteer Matching) into place so that the nearest volunteers to the disaster location are identified immediately and allocated to the appropriate task in terms of proximity as well as skill relevance.

VDMS has an ENM (Email Notification Module) for instant communication with volunteers in case of emergencies or task notifications. This minimizes delay and enhances interaction. Further, the software features VIR (Volunteer Impact Reporting), enabling NGOs to track task completion, volunteer mobilization, and response

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effectiveness as a whole, aiding data-informed decision-making and post-disaster assessment.

By incorporating smart algorithms, real-time notification, and structured reporting, VDMS converts conventional volunteer management into a proactive, effective, and scalable disaster management tool. It serves as a central hub between NGOs, volunteers, and affected communities, ultimately improving the speed, quality, and accountability of humanitarian intervention efforts.

The remainder of this paper is organized follows. Section II described with related works, Section III deals with the implementation of the Revolutionizing NGO Workflow Optimization: An AI-Based Approach for Automated Volunteer Deployment and Impact Reporting Using K-Nearest Neighbors, Section IV discussed with conclusion and future enhancement.

II. RELATED WORKS

Acloud computing framework for NGOs to manage data like donors, events, volunteers, and reports through a shared infrastructure. The main idea is to centralize NGO services using the cloud model (IaaS, SaaS) for better scalability and cost-efficiency and focused on infrastructure. It doesn't explore the automation of volunteer tasks, AI matching, or emergency communication, nor does it present any prototype implementation.[1]

Th use of the K-Nearest Neighbors (KNN) algorithm to match volunteers with tasks based on location and task history. It validates the KNN model's efficiency in improving assignment accuracy and reducing response time during emergencies. The research highlights how geographic data and volunteer profiles can be used effectively to support decision-making in volunteer deployment. The study is theoretical and demonstrates KNN's potential but does not build a web platform or implement features like notifications or reporting.[2]

The digital tools and leadership practices can enhance remote or online volunteer coordination and focuses on management strategy, especially for virtual NGOs or remote campaigns. However, it lacks a technical system design, and there is no mention of AI, automation, or real-time coordination features.[3]

A mathematical model to dynamically manage volunteer engagement by considering volunteer availability, fatigue, motivation, and event urgency. The goal is to optimize long-term volunteer retention and short-term deployment efficiency. The model uses probabilistic and behavioural factors but remains conceptual—it does not propose or implement a full-fledged software system or UI. No real-time location handling or integration with GIS/ML algorithms like KNN is attempted.[4]

SmartNGO is a modular web-based system designed to facilitate NGOs in managing their volunteer database, event scheduling, and activity tracking. It includes volunteer sign-up, event registration, and basic reporting functionalities. It focuses on centralizing operations and improving transparency between volunteers and NGO coordinators.However, the system lacks intelligent automation. There is no use of AI algorithms like KNN for task assignments or matching, nor does it support real-time alerts or performance tracking.[5]

StratusLIVE announced the development of an AI-enhanced community engagement platform aimed at nonprofits and NGOs. This solution claims to use data analytics and machine learning to personalize volunteer outreach, improve donor communication, and streamline service delivery, it's a proprietary platform, and technical implementation details (e.g., algorithms used, architecture) are not disclosed. It likely focuses on donor/volunteer CRM but may not include location-based matching or emergency response features.[6]

III IMPLEMETATION OF PROPOSED SYSTEM

3.1.SYSTEM ARCHITECTURE:

The system architecture illustrates a cloud-based web application where volunteers, staff, and admins can register, log in, and interact is shown in Fig 1. The platform uses the K-Nearest Neighbors algorithm within its Emergency Management System to assign nearby volunteers to tasks. It includes modules for task management, reporting, and intelligent volunteer matching, ensuring efficient disaster response coordination.

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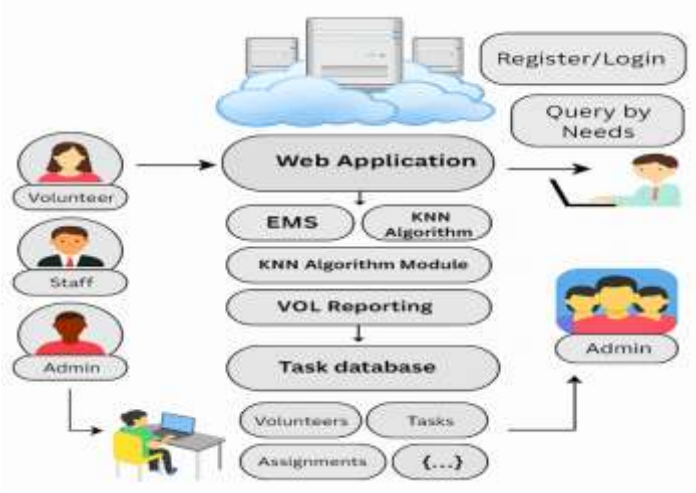
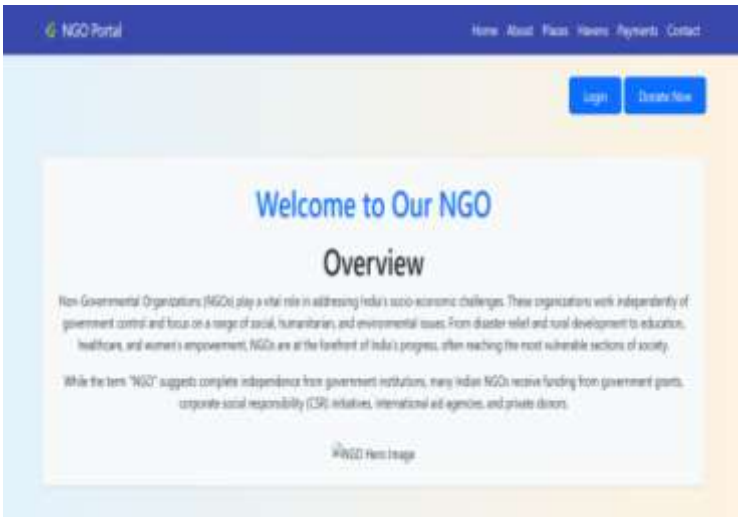


Fig.1.System Architecture

This paper contain several functional modules, and each module handling significant aspects of volunteer coordination, task execution, and disaster mitigation. The paper is designed as a web application with the help of ASP.NET and C#, supported by a SQL Server database for storing data.

3.2.MODULE DESCRIPTION:

3.2.1.HOME PAGE:-The platform features secure admin and user login, an integrated donation and payment gateway, a contact support module, and real-time access to service functionalities.



3.2.1.1. LOGIN -Admin Module:-Admin login provides secure access to manage volunteers, assign tasks using KNN-based suggestions, and track donation distribution. This portal ensures efficient coordination during disaster relief efforts.

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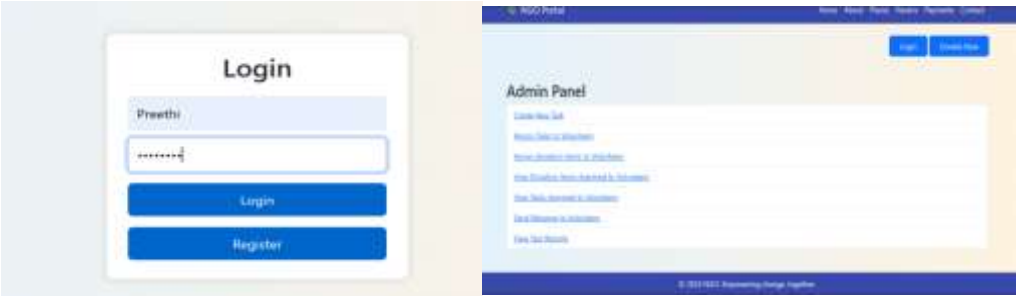
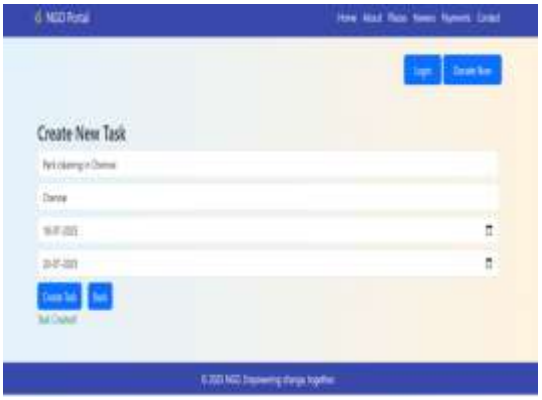
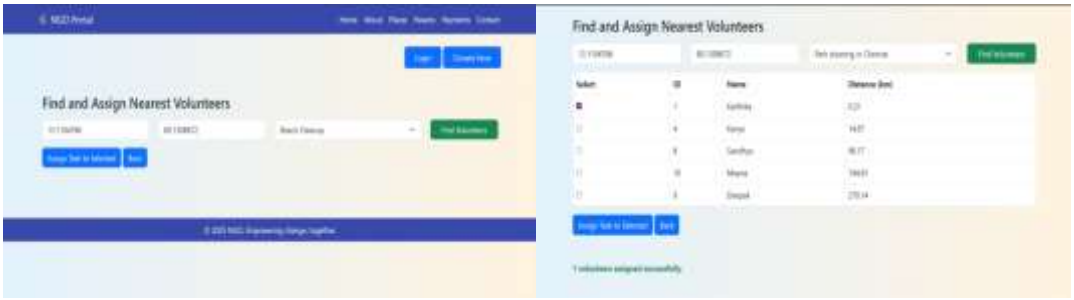


3.2.1.1.1.CREATE A NEW TASK:-Admin can create a new task according to the query that user need. Then only they can assign task to the volunteer.



3.2.1.1.2.ASSIGN TASK TO VOLUNTEER:- This module is used for smart allocation of field tasks (e.g., relief work, delivering donations, or emergency aid) to volunteers according to their local geographical area near the task spot. It makes use of the K-Nearest Neighbors (KNN) algorithm to find out the nearest volunteers and allocate the best one.



3.2.1.1.3. ASSIGN DONATION ITEM TO VOLUNTEER :-This module assigns donated items like food, clothes, or medicine to nearby volunteers for delivery. It uses location data and optionally the KNN algorithm to find the closest suitable volunteer. This ensures timely and efficient distribution to those in need.

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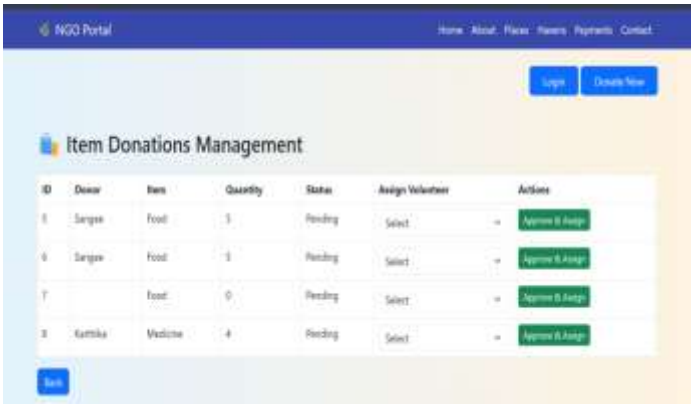
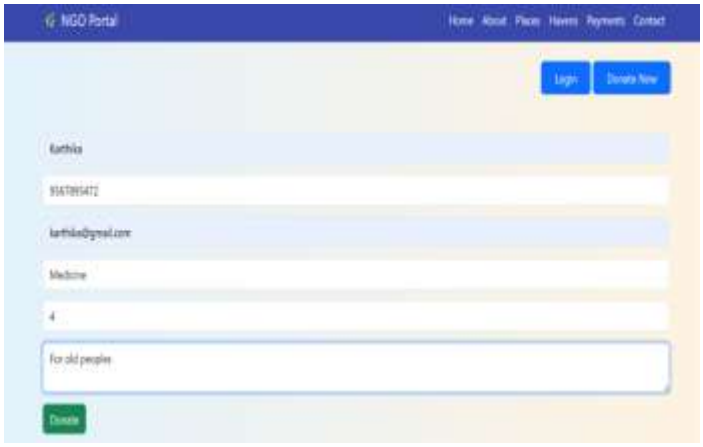
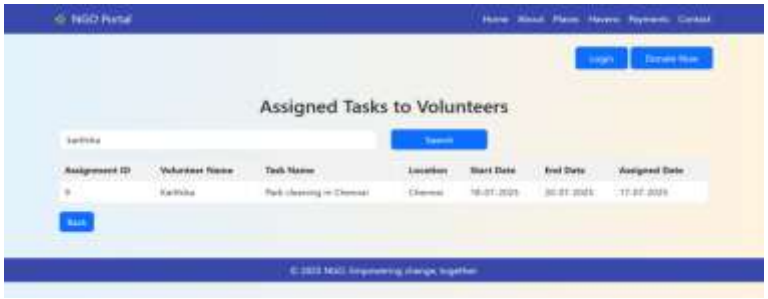


3.2.1.1.4. DONATE NOW:-The **"Donate Now"** module allows donors to contribute essential items such as **food**, **medicine**, **clothes**, and **other materials** through a simple and user-friendly interface. This module plays a crucial role in collecting resources for those in need, especially during emergencies or disaster situations.



3.2.1.1.5. VIEW DONATION ITEM ASSIGNED TO VOLUNTEERS:-This module allows volunteers and admins to view donation items assigned for delivery or distribution. It provides clear visibility into who is responsible for each donation. This ensures efficient tracking and fair resource allocation during campaigns..



3.2.1.1.6. VIEW TASK ASSIGNED TO VOLNTEERS:- This module enables volunteers to view all field tasks assigned to them by the NGO. Tasks may include disaster relief, donation delivery, or community services. It keeps volunteers informed and ready to act on their responsibilities.

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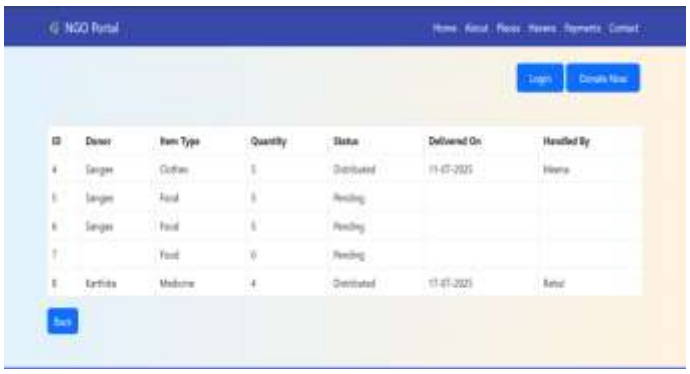
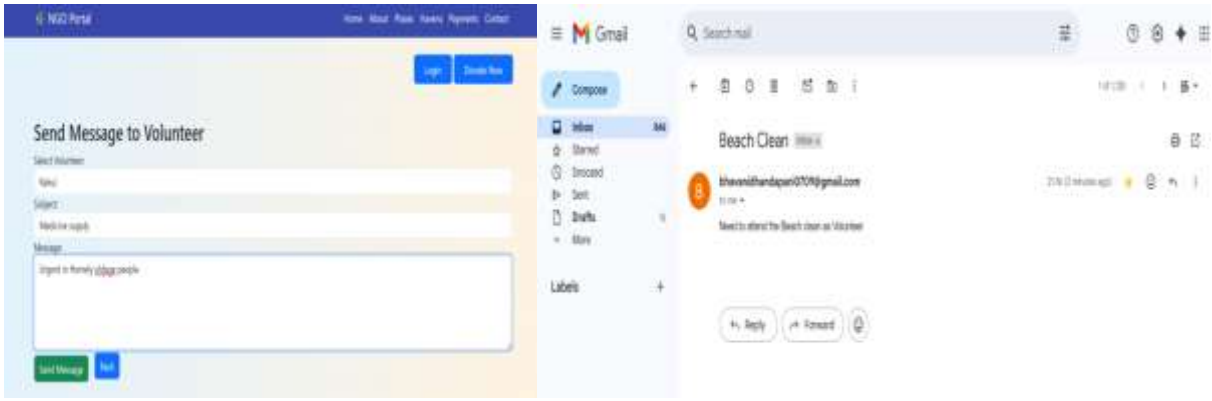
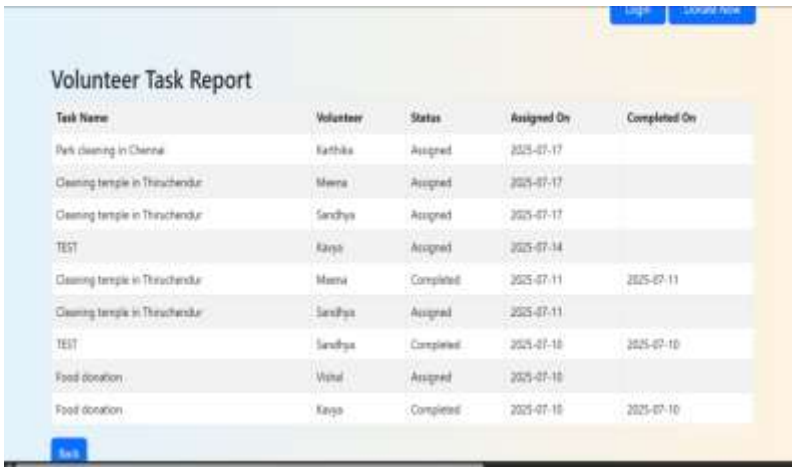


3.2.1.1.7. SEND MESSAGE TO VOLUNTEERS:-The "Send Message to Volunteers" module enables direct communication between admins and volunteers. It allows sending updates, alerts, and instructions related to tasks or events. This ensures timely coordination and improves overall response efficiency.



3.2.1.1.8. VIEW TASK REPORTS:-The "View Task Reports" module helps administrators track and evaluate all tasks completed by volunteers. It displays task details such as status, assigned volunteer, location, and progress. This ensures transparency, accountability, and effective monitoring of field operations.



3.2.1.2.VOLUNTEER REGISTRATION:-The module enables individuals to sign up and offer their services to the NGO. It collects personal details, location, and skills to match volunteers with suitable tasks. This helps build a reliable volunteer database for effective deployment.

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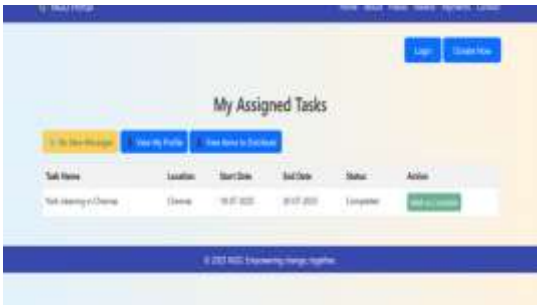
3.2.1.2.1.TASK COMPLETED:- The assigned task has been successfully completed by the volunteer and marked as **Completed** in the system. This status update ensures proper tracking and helps the admin monitor field progress effectively.



3.2.2. ABOUT PAGE:-This page is used founded on the core values of compassion, dignity, and sustainability. We operate through strategic partnerships, focusing on high-impact areas to serve communities in need. Behind our mission is a dedicated team of leaders and volunteers driving real change.

3.2.3. PLACES PAGE:-This application can be used in disaster-prone areas, rural villages, urban relief centers, and across multiple NGO networks. It supports coordinated volunteer deployment, donation tracking, and efficient response in any location needing organized aid.

3.2.4.HAVENS PAGE:-Havens are safe spaces dedicated to supporting women, children, and the homeless by offering temporary shelter, counseling, and basic health services. Those in need can access help through this platform, while

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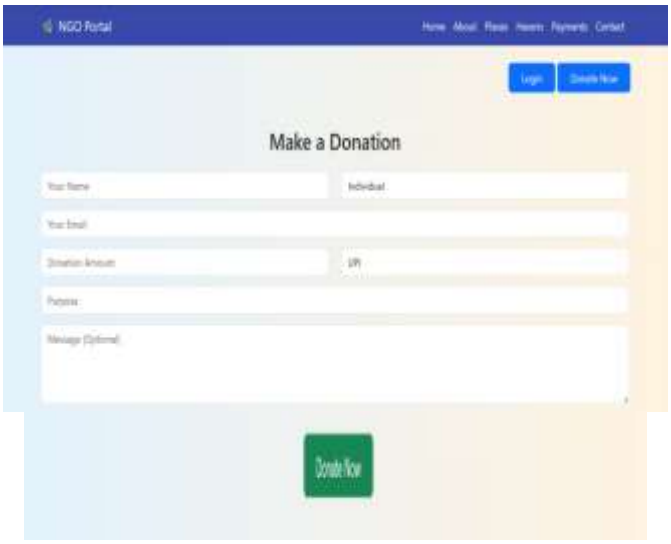
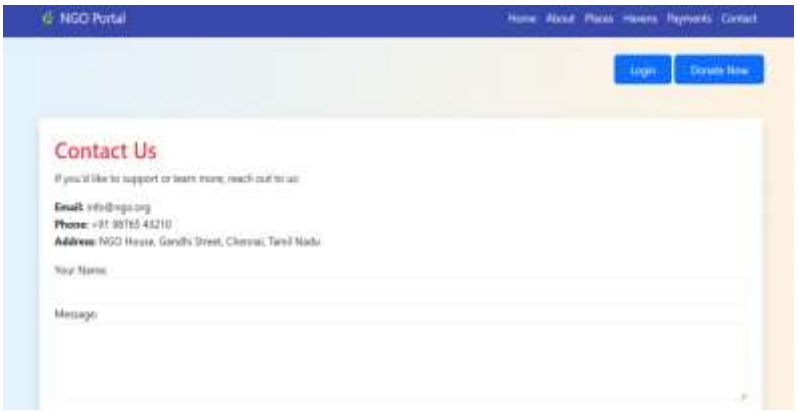
donors can support or sponsor a haven to extend its reach.

3.2.5. PAYMENT PAGE:-You can donate using UPI, debit/credit card, net banking, or direct bank transfer in a secure and simple process.All contributions are used transparently, and a donation receipt will be provided for your reference and records.



3.2.6. CONTACT PAGE:-Users can contact us through this page for any service inquiries or to learn more about our website and its features. We're here to assist with all your questions and support needs.



IV.CONCLUSION AND FUTURE ENCHANCEMENT

4.1.CONCLUSION:

Thispaper provides a centralized platform to connect multiple NGOs and volunteers during disasters. It uses the KNN algorithm to assign the

nearest suitable volunteers for faster response. This improves coordination, transparency, and timely support delivery. The platform promotes social welfare through smart and efficient resource allocation.

4.2.FUTURE ENCHANCEMENT:

To improve the platform, future enhancements include developing a mobile app for faster access and integrating GPS for real-time volunteer tracking. Machine learning can be used to predict volunteer needs during future disasters. Support for regional languages will expand accessibility. Automatic alerts via SMS or push notifications will ensure timely emergency communication.

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