

AI-Based Approach for Automated Volunteer and Impact Reporting Using K-Nearest Neighbours

Mr. Mohanraj S¹, Mr. Nikil R²

¹Assistant Professor, Department of Computer Science, Sri Ramakrishna College of Arts & Science, Coimbatore.

²III B Com CA, Sri Ramakrishna College of Arts & Science, Coimbatore.

Abstract

The 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. Automates the coordination and assignment Volunteers using a K-Nearest Neighbours Algorithm to match individuals based on their Geographical location. The system includes real-Time notification features it alert volunteers during Emergencies and task deployments. Additionally if Offers tools for tracking volunteer activities, task Status, and overall impact, ensuring transparency And accountability platform streamlines Disaster response efforts, improves resource Utilization, and connects organizations an nearby Volunteers and affected communities effectively.

Keywords: Volunteer Disaster Management System (VDMS) KNN (K-Nearest Neighbour) LVM (Location-based Volunteer Matching)ENM(Email Notification Module) VIR(Volunteer Impact Report) and NGO (Non-government organisation).

Introduction

The Non-Governmental Organizations (NGOs) often suffers from lack centralized co-ordination leading fragmented relief efforts. Current manual systems for volunteer deployment frequently slow and uncoordinated lack the intelligent frameworks necessary bridge the gap between resource availability and immediate local needs. Without unified platform for collaboration NGO face significant challenges resource sharing and real-time communication which ultimately diminishes overall impact humanitarian aid and delays critical response times during emergencies. In disaster scenario's, rapid identification and deployment of nearby volunteers critically to minimizing damage and loss life. Existing systems lack intelligent mechanisms to match volunteers based on geographical proximate and availability, leading to inefficient utilization of human resources. Moreover Limited's tools for monitoring volunteers activities and measuring impact reduced transparency and accountability.

Review of literature

Several studies have examined the challenged faced Non-Governmental Organizations (NGOs) managing volunteer during disaster situations. **Kumar and Singh** (2018) reported that many NGOs rely manually or semi-automated system's for volunteer co-ordination, which results delayed response times and inefficient use of resources. Their study highlighted the absences of a centralized platform limited collaboration among multiple NGOs and makes real-time decision-making difficulty during emergencies.

Similarly, **Patel, Shah, and Mehta** (2019) emphasizes that manually volunteer assignment methods often lead uncoordinated relief efforts. Their research found assigning volunteer without considering factors such

geographical proximity and availability significantly reduced operational efficiency and increases response time during disaster management activities.

With the advancement of web technologies several researchers have proposed digital platforms support disaster responses operations. **Sharma and Varma** (2020) introduced a web-based disaster management system that improved information sharing among relief Organization's. However their system lacked intelligent algorithms for automated volunteer matching and relied heavily human intervention for task assignment. This limitation reduced the system's effectiveness time-critical disaster scenarios.

Further research by **Rao, Kulkarni and Deshmukh** (g) focuses a developing online disasters response platform to co-ordinate relief activities. While their system improved communication between agencies the authors noted challenged quickly assigning nearby volunteer to disaster sites due to the absence of location-based matching mechanisms.

Machine learning techniques have increasingly been applied to decision-support and recommendation systems. **Jain and Mishra** (2019) applied the K-Nearest Neighbour (KNN) algorithm location-based recommendation system's and achieves accurate proximity-based results. Their findings indicates that KNN effective for similarity matching using distanced metrics. Additionally **Lee, Park, and Kim** (2020) highlighted that KNN is well-suited for real-time applications due to its simplicity and low computational complexity, making it suitable for volunteer matching based geographical data.

Effective communication is another critically factor in disaster management. **Gupta and Mehta** (2021) emphasizes that real-time email and notification system's significantly improves volunteer participation and response rated during emergencies. Their research showed that timely alerts reduced communication delays commonly associated with manually co-ordination system.

The above studied, it is evident that existing literature highlights a lack integrates approach combining centralized co-ordination, intelligent location-based volunteer matching, real-time notifications and impact reporting. These gaps in literature motivated the development of proposed Volunteer Disaster Management System (VDMS) using the K-Nearest Neighbour (KNN) algorithm for efficient and automated volunteer co-ordination. The need for centralized intelligent and automated system communication and impact reporting these research gaps from foundation for algorithms.

Existing System

The Non-Governmental Organizations (NGOs) manage volunteer using manually semi-automated methods such spreadsheets emails phone calls or simple web portals. These systems lack a centralized platform making co-ordination through among multiple NGO difficult and often leading fragmented relief efforts. Volunteer assignments are performed manually administrators which results slow response times, inefficient use resources, and delays disaster response.

Moreover, existing systems do not use intelligent location-based matching assign. Volunteer are allocated task without considering their geographical proximity availability suitability which reduced efficiency and effectiveness of relief operations. Task may be far from volunteers' locations increasing response times during emergencies.

the current scenario, volunteer management NGOs is largely handled through conventional administrative that are not optimized for disaster situations. The absence of digital framework effective and timely decision-making. Communication with volunteer often delayed because most systems do not have real-time notification features. In addition there limited tools track volunteer activities or generate impact reports which restricts transparency accountability and overall efficiency managing volunteer operational. These limitations make current system's less capable responding effectively during disaster situations.

Proposed system

The Volunteer Disaster Management System (VDMS) web-based platform designed to automated volunteers co-ordination and improve disaster responses. Unlike traditionally manually system's, VDMS uses the K-Nearest

Neighbour (KNN) algorithm to implement Location-based Volunteer Matching (LVM). This ensured volunteer are assigned to task based on their geographical location, availability and suitability, helping reduce response times and improved the effectiveness relied operations.

VDMS features real-time Email Notification Module (ENM) to send soars to volunteer about urgent task emergencies or updates. This ensured volunteers are informed promptly increasing their participation and enhancing co-ordination among multiple NGO. The system also provided centralized platform where organizations can share resources, monitored ongoing activities and plan responses efficiently, reducing duplication efforts and streamlining collaboration.

Another key feature the Volunteer Impact Report (VIR) module which recorded volunteer activities, task completion and overall contribution's. This promoted transparency and accountability, allowing NGOs track performance, evaluated resource usage and make informed decisions for future disaster management. Detailed report's also help NGO maintaining donor trust showing measurable outcomes of volunteer efforts.

By combining AI-based volunteer matching, instant notifications and automated impact reporting, VDMS improved operationally efficiency, strengthened collaboration among NGO, and ensures timely assistance reaches affected communities. This integrates approached addresses the shortcomings of existing systems and enhanced overall disaster management effectiveness.

Methodology

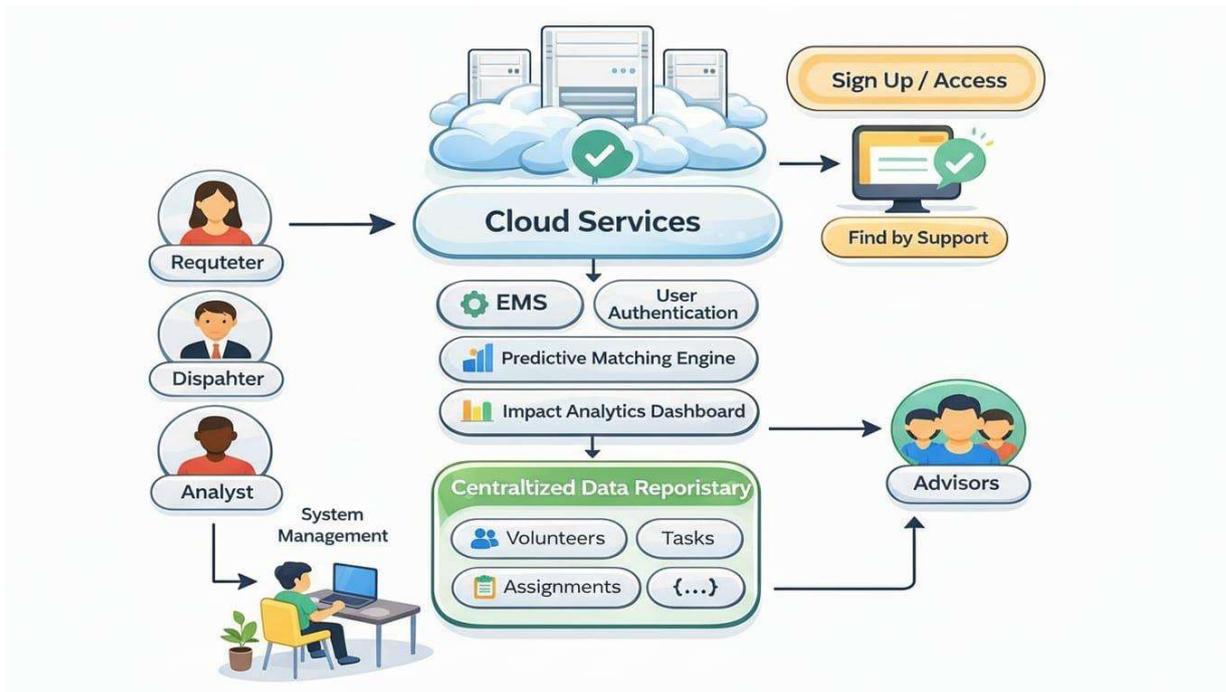
The Proposed Volunteer Disaster Management System (VDMS) designed automate and improve volunteer co-ordination during disaster situations using simple AI-based approach. Initially NGOs and volunteer register on web-based platform providing basic details such location availability and skill information. This data is stored in centralized database enabling effective data management and collaboration among multiple NGO.

Once a disaster event reported the system collects task location and required volunteer details. The K-Nearest Neighbour (KNN) algorithm is applied perform Location-Based Volunteer Matching (LVM). Using geographical co-ordinates the distance between disaster site and registered volunteer calculated and nearest available volunteer are identified and automatically assigned to the task.

After volunteer assignment the Email Notification Module (ENM) sends real-time alerts selected volunteers informing them about task details and deployment instructions. This ensures faster communication and reduces delays commonly found manually system's.

The system monitors volunteer activities and task completion status. Based on data the Volunteer Impact Report (VIR) module generated report's that summarize volunteer contribution's and overall impact. These reports are support transparency, accountability and performance evaluation making the system suitable for efficient disaster response management of undergraduate level.

The proposed methodology emphasized simplicity, scalability and practically applicability, making well-suited for undergraduate-level researcher and real-world NGO operationally. By integrating AI-based matching with centralized data management and automated reporting, VDMS offer's efficiently and reliable solutions for disasters volunteers management.



Result and Discussion

Result

The proposed Volunteer Disaster Management System (VDMS) tested using sample disaster scenarios registered NGOs and volunteer. The system successfully applied K-Nearest Neighbour (KNN) algorithm identify and assign the nearest available volunteer based on geographical location. Automates volunteer assignment Reduced time required for deployment compared manually methods.

The Location-based Volunteer Matching (LVM) module ensured volunteer closer of disasters area were prioritized leading faster responses and better utilization of resources. The Email Notifications Module (ENM) effectively delivered real-time task alerts volunteer improving communication and participation during emergencies.

The Volunteer Impact Report (VIR) modules generated clear report’s of volunteer activities and task completion. These report’s helped NGOs monitored performance and ensured transparency disaster response operations.

Discussion

The results show that using simple AI technique such KNN on significantly improve volunteer co-ordination disaster management. Unlike traditional manually system’s, VDMS provided automated, centralized and efficient volunteer allocation. KNN is suitable for this application due to its simplicity and effectiveness distance-based matching.

Real-time notifications further enhances responses efficiency with impact reporting improved accountability. Although the system mainly focused location-based matching it provides strong foundation for future enhancements such skill-based matching and mobile integration. Overall VDMS proves to effective and practical solution for undergraduate-level research and AI-based humanitarian systems.

Conclusion

The Volunteer Disaster Management System (VDMS) provides effective AI-driven solution improving volunteer co-ordination and disaster response among multiple NGOs. utilizing the K-Nearest Neighbour (KNN) algorithm for Location-based Volunteer Matching (LVM) successfully automated significantly identification of the nearest available volunteers to reduced response time compared to traditional manually or semi-automated methods and

ensured utilization of available human resources during emergencies. The system ensures volunteer closest to disaster site are automatically assigned reducing response times and optimizing resource utilization. The Email Notifications Modules (ENM) enabled real-time communication. Volunteers Impact Reporting (VIR) module provided systematically tracking of volunteer activities and tasks completion, promoting transparency, accountability and performance evaluation. Disasters response tracksuit activities outcomes promoting transparency and accountability.

To Overall VDMS addresses the limitations traditional manually and semi-automated volunteer management systems offering a centralized, scalable and user-friendly platform. The integration intelligent volunteer matching, instant notifications and impact tracking improves operational efficiency enhances collaboration among NGOs and supports more co-ordinated and timely disaster relief efforts. These approach demonstrates practical benefits combining AI-based and location-based services volunteer management providing foundation future advancements humanitarian response systems.

Future Enhancement

To improved the platforms future enhancements included developing mobile app for faster access and integrating GPS for real-time volunteers tracking. Machinery learnings can be used to prediction volunteers needs during future disasters. Supported for regionals languages will expand accessibility. Automatic alerts via SMS or push notifications will ensure timely emergency communication. The system can be enhances adding multi-language support voice-based assistance and chatbot functionality improved accessibility for users from different region's and backgrounds. Offline model can be introduces allow data collection and synchronization area's with limited or no internet connectivity. Additionally improvement's may included integration government disaster management systems weather forecasting services and social media platforms provide real-time alerts and early warnings. Security can base strengthened through data encryption, authentication mechanisms and role-based accessibility controls. future enhancements will make the system more robust intelligent and reliable significantly improving disasters responses efficiency and volunteer management.

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