

# RescueLink: A Disaster Management System Using AI

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**Abstract**—Disaster management requires rapid, coordinated, and data-driven responses to minimize loss of life and resources. The traditional disaster management systems face the challenges of delayed communication and coordination of resources during disaster management operations. This paper proposes a webbased disaster management system that utilizes intelligent decision support principles to improve the effectiveness of disaster management operations. The proposed disaster management system will provide a unified platform for disaster victims to access the nearest disaster management centers and essential commodities in real-time. The proposed system will also provide a platform for the coordination of volunteers during disaster management operations to improve the utilization of human resources during disaster management operations. The proposed system will provide the following features: real-time alert systems, emergency communication systems, and administrative monitoring systems to improve the effectiveness of disaster management operations. The proposed disaster management system will bridge the gap between disaster victims, volunteers, and authorities during disaster management operations to improve the effectiveness of disaster management operations.

**Index Terms**—Disaster management, Artificial intelligence, Emergency response, Real-time systems, Resource allocation, Volunteer coordination

## I. INTRODUCTION

Disasters, both natural and human-made, still remain a major threat to human lives and economies all over the world. However, the existing disaster management systems are still hampered by factors such as inefficient communication and utilization of resources. These factors often make disaster response operations inefficient in terms of response time and effectiveness. Therefore, a more efficient and integrated solution for disaster management is needed.

In this regard, this paper proposes a disaster management system known as RescueLink, which is an AI-based system that can be used for efficient disaster management operations. The system has been integrated with various features that can be used for efficient disaster management operations. The features of the system include real-time mapping, resource utilization, volunteer coordination, and emergency communication. The system enables disaster victims to get access to relief operations near them and allows volunteers to contribute to disaster management operations based on their location and skills. Therefore, the system can be used to bridge the gap between

disaster victims and authorities during disaster response operations.

## II. LITERATURE REVIEW

This literature review will highlight the recent developments in disaster management systems in four key domains: machine learning-based disaster prediction, AI-based damage assessment, communication and coordination technologies, and IoT-based real-time monitoring technologies. With the evolution of disaster management from conventional manual processes to more intelligent and data-driven processes, some challenges have been associated with real-time availability of data, system integration, communication, and scalability of emergency response systems.

### A. Machine Learning for Hurricane Flood Damage Risk

The study in [1] focuses on using machine learning models to predict flood damage caused by hurricanes, particularly in vulnerable regions such as Florida. It integrates historical hurricane data, geographical information, and socio-economic factors to identify high-risk areas. The approach enables proactive disaster preparedness and supports policymakers in efficient resource allocation. By leveraging algorithms such as Random Forest and Neural Networks, the system provides accurate predictions that help minimize both economic losses and human impact.

### B. Generative AI for Post-Earthquake Damage Assessment

The work in [2] explores the use of Generative AI for rapid damage assessment after earthquakes. It utilizes satellite imagery, drone footage, and computer vision techniques to classify structures as damaged or undamaged. This automated approach significantly improves the speed and accuracy of post-disaster evaluation compared to traditional manual inspection methods. The integration of AI with GIS platforms further enhances visualization and decision-making for rescue and reconstruction efforts.

### C. Blockchain-Enhanced UAV Networks for Communication

The research in [3] proposes a hybrid system combining blockchain technology with UAV networks to ensure secure and reliable communication in disaster-affected areas. UAVs act as mobile communication nodes forming ad-hoc networks, while blockchain ensures tamper-proof data sharing. This approach is particularly useful when conventional communication infrastructure fails, enabling decentralized and

trustworthy communication among rescue teams and affected populations.

#### D. UAV-Based Imaging for Crisis Management

The study in [4] highlights the use of UAVs equipped with advanced imaging technologies such as LiDAR, infrared sensors, and high-resolution cameras. These UAVs capture real-time aerial data, which is analyzed using AI techniques to assess damage and identify affected areas. This method enhances situational awareness, improves decision-making, and reduces risks for human responders operating in hazardous environments.

#### E. IoT-Based Real-Time Disaster Monitoring

The work in [5] emphasizes the role of IoT in disaster management through real-time data collection and analysis. Sensors deployed in vulnerable areas monitor environmental parameters such as temperature, humidity, and seismic activity. This data is processed using cloud computing and AI to generate early warnings and support emergency response. The system improves coordination among stakeholders and reduces response time significantly.

#### F. Blockchain for Humanitarian Logistics

The study in [6] investigates the application of blockchain technology in managing humanitarian logistics during postdisaster scenarios. It ensures transparency, accountability, and real-time tracking of relief materials and funds. Smart contracts automate processes such as aid distribution and inventory management, reducing delays and preventing mismanagement. This approach enhances trust and coordination among multiple relief agencies.

#### G. Blockchain in Disaster Management Systems

The research in [7] explores a decentralized blockchainbased framework for improving disaster management processes. It addresses issues such as data tampering, lack of coordination, and inefficiencies in relief distribution. By enabling secure data sharing and real-time tracking, the system enhances transparency and reliability across all stages of disaster management, including preparedness, response, and recovery.

#### H. UAV-Aided Post-Disaster Communication Networks

The work in [8] proposes the use of UAVs as temporary aerial base stations to restore communication networks in disaster-hit regions. Using stochastic geometry models, the study optimizes UAV deployment, coverage, and signal performance. This approach ensures reliable communication, reduced latency, and improved coordination among rescue teams and affected individuals, especially in areas where ground infrastructure is damaged.

### III. METHODOLOGY

The proposed system, namely RescueLink, utilizes a structured and integrated methodology to provide an efficient means of dealing with disasters through the processing of data in realtime, location-based services, and interaction between victims, volunteers, and administrators. The system is intended to provide a centralized, efficient, and scalable platform to facilitate the exchange of information, effective decision-making, and continuous monitoring during disasters.

#### A. Data Acquisition and User Interaction

The system starts its workflow by ensuring that there is a user friendly interface to enable a smooth interaction among all the stakeholders. In this case, victims report emergencies by providing critical information concerning their location, type of disaster, level of urgency, and resources required. On the other hand, volunteers are required to create their profiles by providing information concerning their skills, availability, and location. Geolocation services are used by the system to automatically obtain critical information concerning the location of users. All this information is then conveyed to a server, where it is stored in a database.

#### B. Processing and Intelligent Coordination

When disaster reports are received by the system, it processes the information with the help of a priority-driven decision-making mechanism. In this case, the information received in the form of a request is processed based on various parameters. Moreover, the location based matching algorithm ensures that the best suited volunteers are selected to attend to the situation. In this case, the system includes mapping services to visualize the affected area, available resources, and volunteers location. Additionally, the backend of the system maintains the status of the received requests and available resources to ensure accurate information. This intelligent coordination mechanism increases the efficiency of the system, which in turn reduces the delay.

#### C. Communication, Task Execution and Monitoring

The system, after first matching and selecting the volunteers, assigns the tasks to them. It also delivers real-time notifications to all the stakeholders. Victims receive immediate updates informing them of when they will be helped, and volunteers, through an interactive map interface, are given task details and navigation options. Even during a rescue operation, the system makes it possible to communicate through alerts, and it is 100

### IV. SYSTEM ARCHITECTURE

The proposed RescueLink system is based on a modular and scalable web-based system that is capable of facilitating realtime disaster management operations. The proposed system is based on a four-tier architecture, which consists of a user interface layer, an application layer, a data management layer, and a communication layer.

#### A. User Interface Layer

The user interface layer of the proposed system is designed to enable communication between the three major stakeholders, namely victims, volunteers, and administrators. The victims of a disaster are allowed to send emergency messages, seek help, and locate the nearest relief centers by using an interactive map interface of the proposed system. The volunteers are allowed to register with the proposed system and receive assignments based on their geographical locations and skill sets, while the administrators are provided with a dashboard interface to monitor the activities and coordinate the disaster response operations.

### B. Application Layer

The application layer is the main processing unit of the system. This layer handles all the business processes and decisions that take place in the system. This layer includes the modules for handling users, volunteers, resource allocation, alert generation, and real-time mapping. This layer also includes intelligent decisions that help prioritize the request based on the level of urgency and the distance.

### C. Data Management Layer

The data management layer handles the storage and management of the data in the system. This layer includes the management of users, disaster reports, resource availability, and geographical data. This layer includes a database for the efficient storage and management of the data in the system. This layer also includes real-time data synchronization for the timely update of the data.

### D. Communication Layer

The communication layer handles the real-time communication between the system and the user through web services and APIs. This layer includes the real-time communication with the users through live alerts, notifications, and updates. This layer also includes mapping services for the identification of the affected areas and the information about the resources that are available.

Overall, the architecture of RescueLink ensures the smooth coordination of all stakeholders through the integration of real-time data processing, interactive mapping, and effective communication mechanisms, thereby ensuring the reliability, reduced response time, and increased efficiency of the system.

## V. CONCLUSION AND FUTURE SCOPE

The proposed system for rescue operations, namely RescueLink, has been found to be an efficient solution for enhancing disaster management operations by utilizing real-time coordination and smart resource allocation. The inclusion of various features such as emergency reporting, volunteer management, real-time mapping, and administrative monitoring in a single system has been seen as a significant advantage of the proposed system in overcoming the limitations of traditional disaster response mechanisms. The use of location-based services and task prioritization has been found to minimize the response time and maximize the efficiency of rescue operations.

Future enhancements to this system may be made in such a way that it includes technologies such as Artificial Intelligence, which may be used for predictive analysis in the early detection of disasters. This system may also be made to incorporate technologies such as IoT, which may be used for real-time environmental monitoring. In addition, the system may be made to incorporate technologies such as a mobile app, which may be used to make the system more user-friendly. Moreover, technologies such as blockchain and social media analysis may be made to make this system more robust, flexible, and scalable.

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