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# AI-Powered Disaster Survivor Monitoring and Emergency Response System with Real-Time Analytics

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**Abstract**

Natural disasters such as earthquakes, floods, landslides, and cyclones cause large-scale destruction and pose significant challenges to emergency response teams. Rapid identification of survivors and accurate assessment of their medical condition are critical to reducing mortality rates. Traditional disaster response systems rely heavily on manual health inspection, verbal communication, and delayed reporting, which can lead to inefficient prioritization and increased human error. This project presents an AI-Powered Disaster Survivor Monitoring and Emergency Response System that integrates wearable health monitoring, rule-based Artificial Intelligence (AI), and real-time analytics. The system collects vital parameters such as heartbeat, body temperature, and movement status through IoT/LoRa-based devices (simulated in this implementation). Using AI-driven rule-based logic, survivors are automatically classified into three urgency levels: CRITICAL, INJURED, and STABLE. Based on classification results, the system provides automated first-aid recommendations and triggers alerts for critical cases. A web-based dashboard developed using Flask and SQLite displays real-time analytics, including survivor statistics, urgency distribution, and health trends through pie charts, bar graphs, and line charts. Experimental results demonstrate improved response efficiency, accurate classification, and enhanced decision-making support. The proposed system provides an intelligent, scalable, and data-driven solution to optimize disaster response operations and improve survival outcomes.

**Keywords:** Disaster Management, Artificial Intelligence, Wearable Health Monitoring, Real-Time Analytics, Emergency Response System.

## 1. Introduction

Natural disasters such as earthquakes, floods, landslides, and cyclones often result in large-scale destruction, mass casualties, and severe disruption of infrastructure. During such emergencies, one of the most critical challenges for rescue teams is the rapid identification of survivors and the assessment of their medical condition. Timely detection of critically injured victims is essential to provide immediate medical assistance and reduce mortality rates. However, traditional disaster response systems primarily rely on manual health inspection and verbal communication among rescue personnel. These methods are often slow, prone to human error, and inefficient when dealing with a large number of victims in chaotic disaster environments. Recent advancements in wearable health monitoring technologies and Artificial Intelligence (AI) have opened new possibilities for improving disaster response systems. Wearable devices can continuously monitor vital parameters such as heart rate, body temperature, and physical movement, providing real-time health information about survivors. When integrated with AI-based decision-making systems, this data can be automatically analyzed to classify victims according to the severity of their medical condition. Such automated prioritization helps emergency responders quickly identify critical cases and allocate medical resources more effectively. This project proposes an AI-Powered Disaster Survivor Monitoring and Emergency Response System that combines wearable health monitoring, rule-based AI classification, and real-time analytics. The system collects simulated health data, categorizes survivors into different urgency levels, and provides automated first-aid recommendations. A web-based dashboard built using Flask and SQLite displays real-time statistics and visualizations to assist rescue teams in monitoring survivor conditions and making informed decisions during disaster response operations. In large-scale disaster scenarios, rescue teams are often required to manage hundreds of victims simultaneously under extreme time pressure and limited resources. The absence of efficient monitoring systems makes it difficult to continuously track the health status of survivors once they are identified. As a result, some critically injured individuals may not receive immediate medical attention, leading to preventable fatalities. Therefore, there is a growing need for intelligent systems that can assist emergency responders in quickly assessing survivor conditions and prioritizing medical care based on real-time health information. Artificial Intelligence plays an important

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role in supporting decision-making during emergency situations. Rule-based AI systems can analyze physiological parameters and apply predefined medical thresholds to categorize patients according to urgency levels. This automated triage process reduces the dependency on manual judgment and enables faster response times in chaotic environments. Additionally, the integration of Internet of Things (IoT) technologies allows wearable sensors to transmit health data wirelessly to centralized monitoring platforms, enabling continuous observation of survivor conditions even in remote disaster locations. Furthermore, web-based monitoring systems provide a centralized interface for rescue teams and emergency authorities to analyze and visualize survivor data. Real-time dashboards with graphical analytics such as charts and statistics help decision-makers quickly understand the overall situation and allocate resources more efficiently. By combining wearable health monitoring, AI-based classification, and real-time analytics, intelligent disaster management systems can significantly enhance the efficiency, accuracy, and coordination of emergency response operations

## 2. Review of Literature

Recent research highlights the growing role of Artificial Intelligence (AI) in disaster management and emergency response systems. Foundational concepts presented in Artificial Intelligence: A Modern Approach emphasize rule-based reasoning and intelligent decision-making, which are widely applied in medical triage and classification systems. Likewise, Pattern Recognition and Machine Learning and Deep Learning discuss classification algorithms and predictive models that support automated risk assessment. These AI techniques reduce human dependency, minimize classification errors, and improve prioritization in time-sensitive scenarios such as disasters. In parallel, IoT-based wearable health monitoring systems have gained attention for tracking vital parameters like heart rate, body temperature, and movement status. Continuous monitoring through sensor-enabled devices enhances early detection of abnormal physiological conditions. Communication technologies such as LoRa further enable long-range data transmission in environments where conventional networks may fail. The World Health Organization emphasizes technology integration in its Emergency and Disaster Risk Management framework to strengthen rapid response and reduce mortality rates during large-scale emergencies. Web-based real-time analytics platforms also play a significant role in improving situational awareness. Lightweight frameworks such as Flask, databases like SQLite, and visualization tools such as Chart.js enable centralized monitoring and interactive dashboards for decision support. The United Nations Office for Disaster Risk Reduction further advocates digital transformation and AI-driven systems to enhance disaster resilience. However, existing research often addresses AI classification, IoT monitoring, or analytics dashboards independently. Limited studies integrate all these components into a unified system for real-time survivor monitoring, urgency classification, automated alerts, and centralized reporting. The proposed system aims to bridge this gap by combining wearable health monitoring, rule-based AI logic, and real-time analytics into a scalable and intelligent emergency response framework. Swarm Optimization with Neural Networks for Effective Classification Techniques" by K.Kalyani (2021) introduces a hybrid EHBMO-NN model, combining Extended Honey Bee Mating Optimization with Artificial Neural Networks to improve classification accuracy and reduce training time. It uses HBMO to select optimal weights for neural network hidden layers, outperforming conventional methods on benchmark datasets. The accurate cancer classification is very important task for cancer treatment. Recently the informative genes are identified from the thousands of genes for correct cancer classification. The collection of microscopic Deoxyribo Nucleic Acid (DNA) microarray is attached in the solid surface. In this study, DNA microarray data is used for cancer classification. The accurate cancer classification is very important task for cancer treatment. Recently the informative genes are identified from the thousands of genes for correct cancer classification. The collection of microscopic Deoxyribo Nucleic Acid (DNA) microarray is attached in the solid surface. In this study, DNA microarray data is used for cancer classification (6).

## 3. Existing System

In traditional disaster management operations, the process of identifying survivors and assessing their medical condition is mainly carried out manually by rescue personnel. Rescue teams physically examine victims at the disaster site and check basic vital parameters such as pulse rate, breathing pattern, body temperature, and responsiveness. The collected information is typically communicated through verbal communication or radio systems among emergency responders. In many cases, the data is recorded using paper-based documentation or simple digital records, which do not provide centralized monitoring or real-time data analysis. Most emergency response teams follow the Simple Triage and Rapid Treatment (START) algorithm to prioritize victims in disaster situations. This algorithm categorizes patients into different urgency levels based on observable factors such as respiration, circulation, and mental status. While this method helps rescue teams perform rapid triage during emergencies, it still depends heavily on human observation and decision-making. The effectiveness of the system largely relies on the experience and availability of trained medical personnel at the disaster location. However, in large-scale disasters involving hundreds of victims, manual triage and health assessment become time-consuming and prone to human error. Rescue workers often operate under extreme pressure, limited resources, and chaotic environmental conditions, which can lead to delays in identifying critically injured survivors. Additionally, traditional systems lack continuous health monitoring, automated alert mechanisms, and real-time data visualization, making it difficult to track the condition of survivors over time. As a result, the existing system is not sufficiently scalable or efficient for managing mass-casualty disaster scenarios.

## 4. Proposed System

The proposed system introduces an AI-Powered Disaster Survivor Monitoring and Emergency Response System designed to improve the efficiency and accuracy of disaster response operations. The system integrates wearable health monitoring devices, rule-based Artificial Intelligence, and a web-based analytics platform to automatically monitor survivor health conditions. Vital parameters such as heartbeat, body temperature, and movement status are collected through wearable sensors or simulated IoT devices. These health parameters are transmitted to a centralized server where they are processed and analyzed in real time. The system uses a Rule-Based Artificial Intelligence Algorithm to classify survivors into different urgency levels based on predefined medical thresholds. The AI engine evaluates the collected health data and automatically categorizes survivors into three levels: CRITICAL, INJURED, and STABLE. This automated classification helps rescue teams quickly identify individuals who require immediate medical attention. In addition, the system generates automated first-aid recommendations based on the survivor's condition, assisting emergency responders in providing timely assistance before professional medical treatment becomes available. To support decision-making, the system includes a web-based dashboard developed using Flask, SQLite, HTML, CSS, JavaScript, and Chart.js. The dashboard provides real-time analytics such as total survivor count, urgency level distribution, average health parameters, and graphical visualizations including pie charts, bar graphs, and line charts. All survivor data is stored in a centralized database with timestamps for tracking and reporting. The system also triggers alerts for critical cases, enabling faster response and better coordination among rescue teams. Overall, the proposed system provides an intelligent, scalable, and data-driven solution to enhance disaster management and emergency response efficiency.

## 5. Experimental Result

The proposed AI-Powered Disaster Survivor Monitoring and Emergency Response System was evaluated using 100 simulated survivor records containing vital signs such as heartbeat, body temperature, and movement status. The system applied a Rule-Based AI Algorithm to classify survivors into three urgency levels: CRITICAL, INJURED, and STABLE, and presented the results on a real-time web-based dashboard. During testing, the system correctly classified 94 out of 100 survivors (94% accuracy), accurately identifying 24 out of 25 critical cases (96% accuracy), 33 out of 35 injured cases (94% accuracy), and 37 out of 40 stable cases (92.5% accuracy). Each record was processed with an average response time of 0.8 seconds, while alerts for critical cases were generated within 1 second, allowing immediate prioritization of medical attention. Database operations, including reading and writing records, averaged 0.5 seconds per operation, and the system maintained 100% uptime, demonstrating high reliability. The dashboard dynamically updated survivor statistics and health trends through pie charts, bar charts, and line graphs, enabling rescue teams to make informed, real-time decisions. Performance Metrics. In addition to classification accuracy, the system's alert generation efficiency and dashboard responsiveness were thoroughly evaluated. All critical alerts were triggered promptly, ensuring that emergency responders could focus on the most urgent cases first. The real-time visualization of survivor distribution by urgency level helped in planning resource allocation, such as sending medical personnel and first-aid supplies to high-priority areas. The system also successfully handled simultaneous updates from multiple simulated survivors without any lag, indicating strong scalability for larger-scale disaster scenarios. Furthermore, the centralized storage in the SQLite database allowed easy retrieval of historical records, making it possible to generate reports or analyze trends in survivor health over time. Finally, the experiment highlighted the robustness and reliability of the integrated AI-powered monitoring approach. The combination of wearable health monitoring, rule-based AI classification, and real-time analytics reduced human error, minimized delays in decision-making, and ensured that all survivors were continuously monitored. The performance metrics—including 94% overall accuracy, 0.8-second response time, 1-second alert generation, 0.5-second database operations, and 100% system uptime—demonstrate that the system is both efficient and practical for real-world disaster response operations. These results confirm that integrating AI and IoT technologies can significantly enhance emergency management, improve survivor prioritization, and optimize rescue team efficiency.

## 6. Conclusion

The AI-Powered Disaster Survivor Monitoring and Emergency Response System successfully demonstrates the integration of wearable health monitoring, rule-based Artificial Intelligence, and real-time analytics to enhance disaster management operations. The system accurately classifies survivors into CRITICAL, INJURED, and STABLE categories, generates immediate alerts for urgent cases, and provides dynamic real-time visualization of survivor statistics through a web-based dashboard. Experimental results show high classification accuracy, fast response times, reliable database operations, and 100% system uptime, indicating that the system is both efficient and dependable. By reducing human error, enabling rapid prioritization of critical patients, and supporting data-driven decision-making, this system offers a scalable and intelligent solution for managing mass-casualty disaster scenarios. The proposed framework lays the foundation for further enhancements, such as integration with real IoT/LoRa devices, GPS-based survivor tracking, machine learning–based predictive analytics, and cloud deployment for multi-location disaster response. Overall, the system provides a proactive, efficient, and reliable approach to improving survival outcomes during emergencies.

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