# Mobile Computing Services to Support Flood Disaster App

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Abstract: Floods are among the most severe natural disasters, requiring efficient management at three critical phases: pre-flood, during-flood, and post-flood. This project introduces a comprehensive mobile application to enhance disaster response, real-time communication, and aid distribution. The system facilitates seamless coordination among administrators, users, donors, and supporters to improve flood relief efforts. Donors can register, log in, view, and accept support requests, while supporters can strengthen humanitarian efforts by assisting with requests. Users can quickly access help by registering, submitting support requests, and tracking their request history. Admins authenticate supporter and request profiles to ensure legitimacy and integrity before making them available to donors. Key features include bulk flood alerts, a rescue request system, and donation management, ensuring faster response times, improved rescue coordination, and effective post-flood recovery. By integrating technology-driven flood management, this Android-based application provides an efficient solution to mitigate disaster impacts and save lives.

## 1 INTRODUCTION

Flood disasters cause widespread devastation, disrupting lives, infrastructure, and essential services. Effective disaster relief requires timely coordination and efficient resource distribution to minimize the impact on affected communities. However, traditional disaster relief efforts rely on manual coordination, fragmented communication, and inefficient resource allocation. These limitations lead to delays in aid delivery, difficulties in verifying requests and supporters, and a lack of real-time updates, reducing the overall effectiveness of disaster response efforts.

To address these challenges, this project proposes a mobile application designed to streamline flood disaster relief operations. The application facilitates seamless interaction between donors, supporters, users, and administrators, ensuring efficient communication and coordination. Users can register, submit aid requests, and track their request history, providing transparency in the relief process. Donors and supporters can view and accept verified requests, allowing for timely and organized aid distribution.

Administrators play a crucial role in verifying profiles and aid requests before making them visible, ensuring authenticity and preventing fraudulent activities. By leveraging mobile computing services, the application provides real-time updates, optimizes resource allocation, and enhances disaster response efficiency. This innovative platform bridges the gap in traditional relief efforts, enabling swift and effective aid distribution, ultimately reducing the impact of floods on affected communities.

## 2 RELATED WORKS

Some administrative and ethical questions have been raised about the human-based disaster management program. Rather of being useful, it might be harmful. There is less need for human intervention with all of these technologies thanks to the newly formed Internet of Things organization, which is sophisticated enough to build a network automatically connecting each other and predicting every function and characteristic of a flood. The goal of this project is to mitigate the negative effects of urban floods in urbanized areas by designing and



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operating a wastewater disposal system. Himanshu Rai Goyal, Sachin Sharma, 2023, The platform controls wastewater deposit networks through the use of real-time cloud computing and the internet of things. In response to the need for storm water drainage systems in urban areas, this application, mathematical model, technology, and design were developed. The floods that hit Mumbai in 2005 illustrate this concept. We can survive with this method and avoid over 40% of injuries.

Urban flooding monitoring and management is a worldwide problem as the frequency and severity of extreme precipitation events are on the rise as a result of climate change. K. Priya Menon; L. Kala , 2017 Thanks to their cheap cost, rapid data transmission, and widespread deployment, urban surveillance camera sensor networks are a valuable addition to remote sensing. By collecting localised observations that are inaccessible by satellite and aerial systems, these networks provide real-time urban flood monitoring with great spatial and temporal precision. Identifying and warning of floods becomes more challenging at night or after heavy rains, due to the increased complexity and variety of flooded area image features. One solution is an invariant feature extraction method for surveillance film, while another is a picture model for floodlit low-light circumstances. For the purpose of training and testing models, a new dataset called UWs is constructed, which contains low-light surveillance flood pictures. Clinical trials confirm the strategy's efficacy, with mRecall=0.88, mF1_score=0.91, and mIoU= 0.85. Improved mRecall by 4.9%, mF1_score by 3.0%, and mIoU by 4.4% when compared to Res-UNet, LRASPP Demonstrating its all-weather adaptability, the technique also does well in real-world studies, such as daytime flood monitoring Reduced catastrophe occurrences would be a direct result of an urban flood monitoring network that uses all-weather surveillance cameras and emergency management in cities, according to this study.

Carlos Castro-Correa., et al., 2014, Hundreds of millions of people are impacted by natural disasters annually. Data on population migrations and other emergencies must be available quickly. Call Detail Records (CDR) aggregated and anonymised from mobile phone infrastructure can provide insight into human behaviour during significant events [3]. We investigate the possibility of using CDR data along with other sources to describe the floods that hit Tabasco, Mexico in 2009. An impact map of the flood was made using Landsat-7 camera images. Here, we compared NASA-TRMM rainfall data with CDR communication activity signals. Flood signatures might be derived from the numbers of active phones linked to each cell tower in the areas most impacted by the floods, both during and after the event. These patterns could be utilised for assessing the damage on infrastructure and raising awareness among the people. Using data from the census and civil protection, we checked if the analysis was representative. Preliminary findings suggest that data on cell tower activity could improve catastrophe preparedness and early warning systems, but more extensive proof is required.

Annual floods wreak havoc on communities, annihilating crops, homes, and buildings. Flooding can be influenced by both hydrological and meteorological factors. The fields of flood catastrophe management and food prediction have both seen a great deal of research. Smart flood prediction systems that involve stakeholders and floods affecting everyone equally should replace individual monitoring and prediction frameworks, especially in light of recent technological improvements. Swapnil Bande; Virendra V. Shete., 2017 Through the use of wireless communication networks and embedded system hardware, the IoT allows for the real-time transfer of sensed data to computing devices. Mathematical or hydrological models have been supplanted by algorithmic flood prediction research. A flood's data is dynamic and non-linear. One use of artificial neural networks is in the development of flood prediction systems. Improve the scalability and durability of flood control systems. Rainfall, humidity, temperature, pressure, and river levels are all tracked by this system so that flood predictions may be made based on temporal connections. For sensor data collection and Wi-Fi connectivity, we employ the IoT, and for flood prediction data processing, we use artificial neural networks (ANN).

Qing Yang; Qiang Zhang, 2007 Emergency management for flood disasters should incorporate pre-, mid-, and post-phases, not only for flood emergency response. Providing a methodical framework for emergency management and outlining the goal of each application subsystem, this study investigates the necessity and practicability of a decision support system (DSS) for flood disaster emergency management.

T. Sravani., et al., 2022, During disasters, getting help quickly can save lives. A mobile app has been designed to provide emergency survival services, collecting real-time data from users and their surroundings to assist in rescue operations. It uses service agents to track locations, suggest escape routes, and connect people with rescuers. By

integrating cloud computing and mobile technology, the system links with public and government services for better coordination. To speed up response times, a smart scheduling algorithm prioritizes urgent requests. It has been tested in real-life situations, like the 2013 Ya'an earthquake in China, where it successfully handled thousands of rescue requests. The results show that this system improves disaster response, enhances teamwork, and helps save more lives.

Disasters, both natural and man-made, pose significant risks to life and property, making effective disaster management crucial. This study highlights the various disasters affecting Andhra Pradesh, including cyclones, floods, droughts, earthquakes, tsunamis, and fires, along with statistical data on their impact. The research emphasizes the importance of pre-disaster planning, such as mitigation and preparedness, to minimize the severity of post-disaster response efforts like rescue and rehabilitation. L.Tejaswi and R. P. Kumar, 2011 Despite its central location in India, Andhra Pradesh frequently experiences disasters due to its geographical and climatic conditions. The paper suggests efficient risk mitigation strategies, including early warning systems, improved infrastructure, and better coordination between government agencies. The findings stress the need for public awareness and education on disaster preparedness to reduce casualties and economic losses.

Anam Ubaid, 2017 Service-oriented disaster response system that operates in both online and offline modes using mobile and cloud computing for real-time data collection and rescue coordination. It features automated service agents, an emergency distress mode, and a bio-inspired scheduling algorithm to prioritize critical requests. Tested in real-world disasters like the 2013 Ya'an Earthquake, it enhances rescue efficiency, reduces delays, and improves coordination. Future upgrades aim to integrate IoT technology for better real-time monitoring and response.

V. Astarita, et al., 2020, Mobile computing enhances disaster management by enabling real-time data collection, coordination, and communication through wireless networks, smartphones, and cloud computing [9]. A cooperative crowdsourced system gathers critical information on infrastructure, movement, and urgent needs, processed by a central decision support system for efficient response. Integrating GIS, IoT, and ITS improves disaster resilience and emergency operations.

R. Koul., et al., 2015 social media enhances disaster management by enabling real-time communication, rescue coordination, and information sharing. During the Jammu and Kashmir floods, platforms like Facebook and WhatsApp helped locate missing persons, guide rescuers, and organize relief efforts using hashtags and open groups. Structured data management improved efficiency, making rescue operations faster and more effective.

# 3 METHODOLOGY

**Proposed System:** The proposed system is a mobile application designed to enhance flood disaster relief efforts by improving coordination, transparency, and efficiency in aid distribution. The application features role-specific functionalities for donors, supporters, users, and administrators. Users can register, log in, submit aid requests, and track their request history, ensuring a structured and transparent relief process. Donors and supporters can view and accept verified requests, enabling timely assistance to affected individuals. This system streamlines communication, eliminates manual inefficiencies, and ensures real-time updates for all stakeholders.

Administrators play a critical role in verifying supporter profiles and aid requests before they become visible to donors, ensuring the authenticity of all interactions. By leveraging mobile computing services, the application optimizes resource allocation and minimizes delays in providing aid. With real-time tracking and efficient management of disaster relief efforts, this system enhances the overall effectiveness of flood response operations, ensuring that help reaches those in need swiftly and efficiently.

**System Architecture:** The system architecture of the proposed flood disaster relief mobile application consists of multiple interconnected components to ensure efficient coordination and management of aid distribution. The architecture includes four main user roles: Donor, Supporter, User, and Admin. Each role interacts with key system modules such as Request Management, Safety System, Authentication, and Verification. Donors and Supporters can register/login, view requests, and accept or donate towards assistance. Users can register, add aid requests, and view safety information, while Admins are responsible for verifying supporter profiles and aid requests before they become visible.

The Request Management module handles the creation, tracking, and acceptance of aid requests, storing relevant data in a centralized Database. The Safety System fetches and provides real-time safety information for users in flood-affected areas. Authentication ensures secure access control for all

roles, while the Verification module allows Admins to authenticate supporters and aid requests. This well-structured architecture ensures seamless data flow, real-time updates, and effective coordination, ultimately enhancing disaster response efficiency and ensuring that aid reaches affected individuals in a timely manner.

## 3.1 Modules

### 3.1.1 User Module

- sers can create an account by providing their necessary details, such as name, contact information, and a secure password.
- Once registered, users can log in to their accounts using their credentials.
- Secure authentication mechanisms ensure data privacy and protection. Registered users can submit requests for aid, specifying their needs such as food, shelter, medical assistance, or other forms of support.
- The system allows users to track the status of their aid requests, providing updates on progress, approvals, and expected delivery times.
- Users can access a history of their past aid requests, enabling them to monitor their received assistance over time the system offers real-time safety updates related to flood-affected areas, including evacuation notices, emergency shelters, and road conditions.
- Users can view essential guidelines on flood preparedness, including first aid tips and emergency contact numbers.

### 3.1.2 Donor Module

- Donors can create an account by providing their details, such as name, organization (if applicable), contact information, and a secure password.
- Once registered, donors can log in to access the platform and manage their contributions.
- Secure authentication ensures that donor information remains protected. Donors can browse a list of aid requests submitted by users affected by floods.
- Each request provides details about the type of assistance needed, such as food, water, clothing, medical supplies, or temporary shelter.
- Donors can accept specific aid requests based on their ability to aid. Donors can contribute resources in various forms, including financial donations, essential goods, and logistical support.
- The platform may provide options for direct donations, coordinating drop-off locations, or collaborating with local relief organizations.
- Donors receive updates on their contributions, ensuring transparency and tracking of their impact.

### 3.1.3 Supporter Module

- Supporters can create an account by providing their details, such as name, contact information, and a secure password.
- Once registered, supporters can log in to access the platform and engage in relief activities.
- Secure authentication measures ensure data privacy and authorized access Supporters can browse a list of aid requests submitted by users affected by floods.
- Requests may include needs such as medical assistance, food distribution, transportation, or temporary shelter arrangements.
- Supporters can accept requests based on their availability and capacity to provide help.
- Once a request is accepted, the system updates the status and notifies the requesting user to coordinate assistance Supporters play a crucial role in ensuring that relief resources are distributed efficiently to those in need.
- They may assist in coordinating logistics, verifying user needs, and delivering aid in collaboration with donors and relief organizations.

### 3.1.4 Admin Module

- The Admin reviews and verifies supporter registrations to ensure only genuine individuals or organizations participate in relief efforts.
- Supporters may be required to provide identification or relevant credentials for validation. The Admin ensures that only verified users, supporters, and donors can interact within the system.
- They monitor aid request approvals, ensuring fair distribution and preventing misuse.
- Any suspicious activity, such as false requests or unauthorized support claims, is flagged and investigated. The Admin supervises the

overall functioning of the platform, maintaining a smooth workflow.

- They enforce data security measures, protecting user information and ensuring compliance with privacy policies.
- Regular system audits and reports are conducted to enhance transparency in aid distribution and resource management.

## 4 RESULTS AND ANALYSIS

The experimental results provide a comprehensive evaluation of various aspects of the system, including user authentication, data security, system performance, and overall functionality. The user registration and authentication process ensure secure credential management, effectively preventing unauthorized access through robust validation mechanisms. System performance and efficiency were analyzed, revealing optimal response times under normal conditions, though improvements may be required under high-load scenarios to mitigate latency.

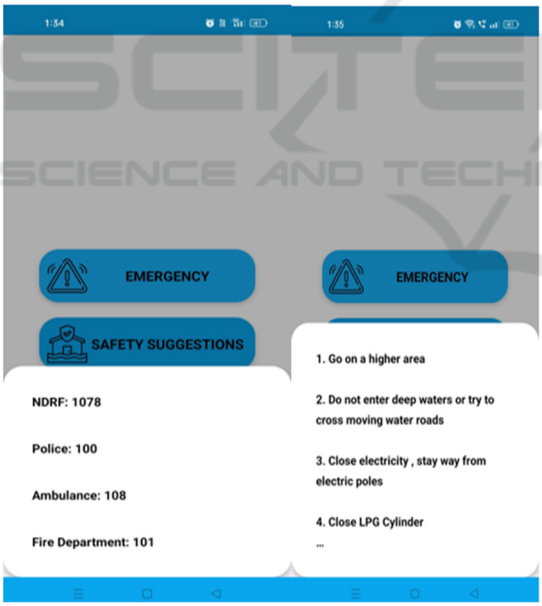


Figure 1: Emergency and Safety Suggestions Page.

The above figure 1 represents quick access to emergency assistance and safety suggestions, allowing users to seek immediate help or access critical safety guidelines during a flood disaster. The overall findings highlight the system's reliability in authentication, data security, and operational efficiency. While it effectively manages user registration and request handling, additional enhancements in high-load performance optimization and advanced security features could further strengthen its capabilities. Overall, the system presents a robust and secure framework that successfully handles critical functionalities with efficiency and reliability.

Furthermore, the request processing and database transaction capabilities were examined, indicating efficient query execution and simultaneous user request handling. However, further optimization in query processing could enhance performance, especially during high-traffic periods.

Additionally, the system incorporates strong encryption techniques for user credentials and sensitive data, ensuring confidentiality and data integrity across different modules. Figure 3 show the User Details. Error handling mechanisms were also tested, demonstrating that the system provides appropriate feedback for invalid inputs and unexpected failures, enabling smooth recovery and uninterrupted user experience. The above figure 2 represents Calling Page and screen displays an ongoing emergency call, providing the user's real-time location details to ensure prompt assistance during a crisis and user details and user request. Figure 6 and 7 shows the Request Page and Tracking Page respectively.


Figure 2: Offline Services.

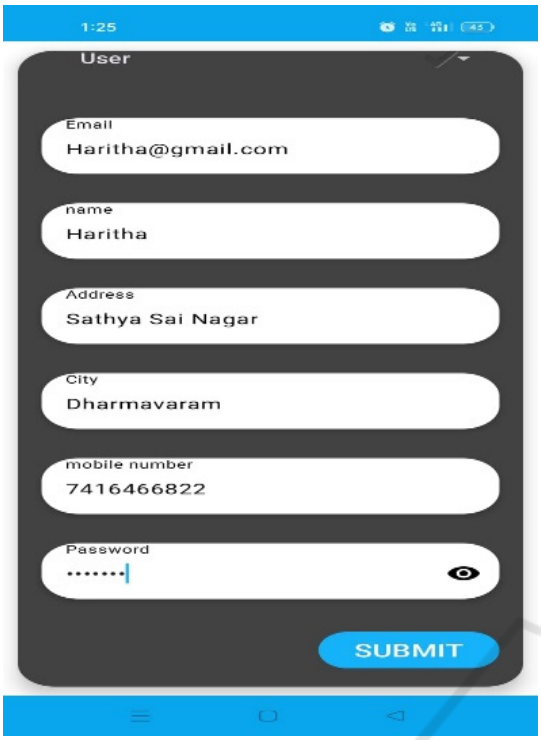


Figure 3: show the User Details.

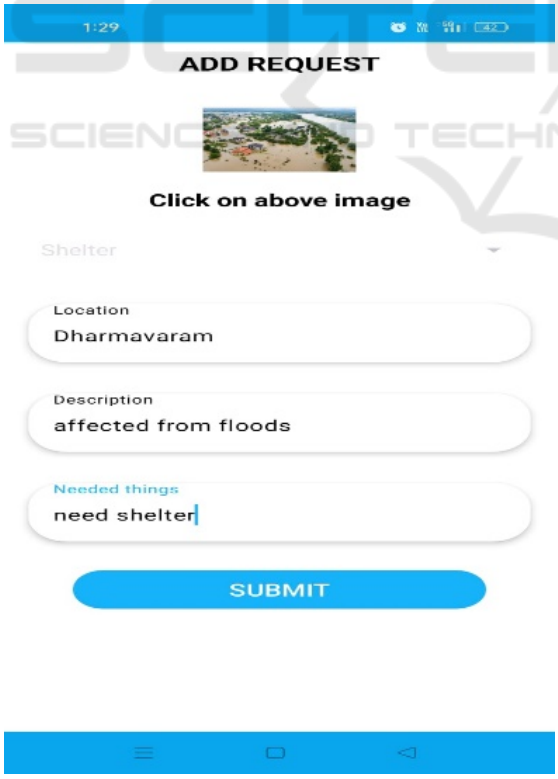


Figure 6: Request Page.

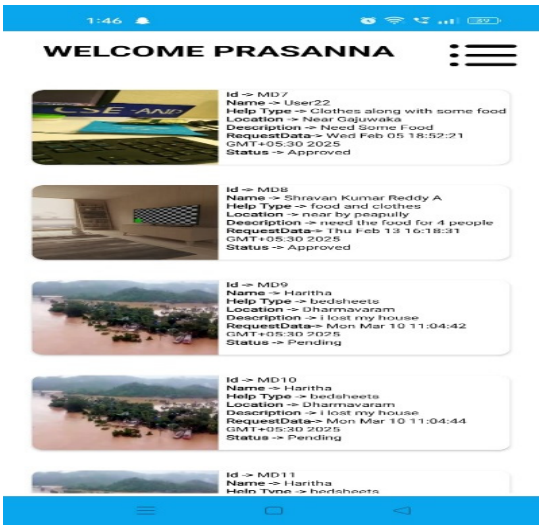


Figure 7: Tracking Page.

# 5 DISCUSSION AND FUTURE WORK

## 5.1 Discussion

The experimental results provide a comprehensive evaluation of various aspects of the system, including user authentication, data security, system performance, and overall functionality. The user registration and authentication process ensure secure credential management, effectively preventing unauthorized access through robust validation mechanisms. System performance and efficiency were analyzed, revealing optimal response times under normal conditions, though improvements may be required under high-load scenarios to mitigate latency. Additionally, the system incorporates strong encryption techniques for user credentials and sensitive data, ensuring confidentiality and data integrity across different modules. Error handling mechanisms were also tested, demonstrating that the system provides appropriate feedback for invalid inputs and unexpected failures, enabling smooth recovery and uninterrupted user experience

## 5.2 Future Work

enhanced by integrating advanced technologies such as AI-powered chatbots to assist users with real-time safety tips and resource recommendations during disasters. IoT-based flood sensors can be incorporated to provide live updates on water levels and weather conditions, improving early warning

systems. Blockchain technology can enhance transparency and security in donation tracking, ensuring efficient fund utilization. The application can be expanded with multilingual support to cater to diverse users and include crowdsourced flood mapping for better disaster response planning. An offline mode can be introduced to allow users to access critical information and submit requests even in areas with limited connectivity. Collaborations with government agencies and NGOs can further improve aid distribution and emergency response efficiency. Additionally, predictive analytics can be leveraged to identify flood-prone areas and implement preventive measures, reducing the impact of future disasters. These advancements will enhance the application's scalability, reliability, and effectiveness in managing flood relief efforts.

# 6 CONCLUSIONS

The proposed mobile application for flood disaster relief enhances coordination, communication, and aid distribution among donors, supporters, users, and administrators. By integrating modules for authentication, request management, safety information, and verification, the system ensures transparency, security, and efficiency in disaster response efforts. The application streamlines the process of requesting and aiding, reducing delays and improving resource allocation. Through real-time updates and secure interactions, the system helps affected communities receive timely support, ultimately minimizing the impact of floods and improving disaster management outcomes.

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