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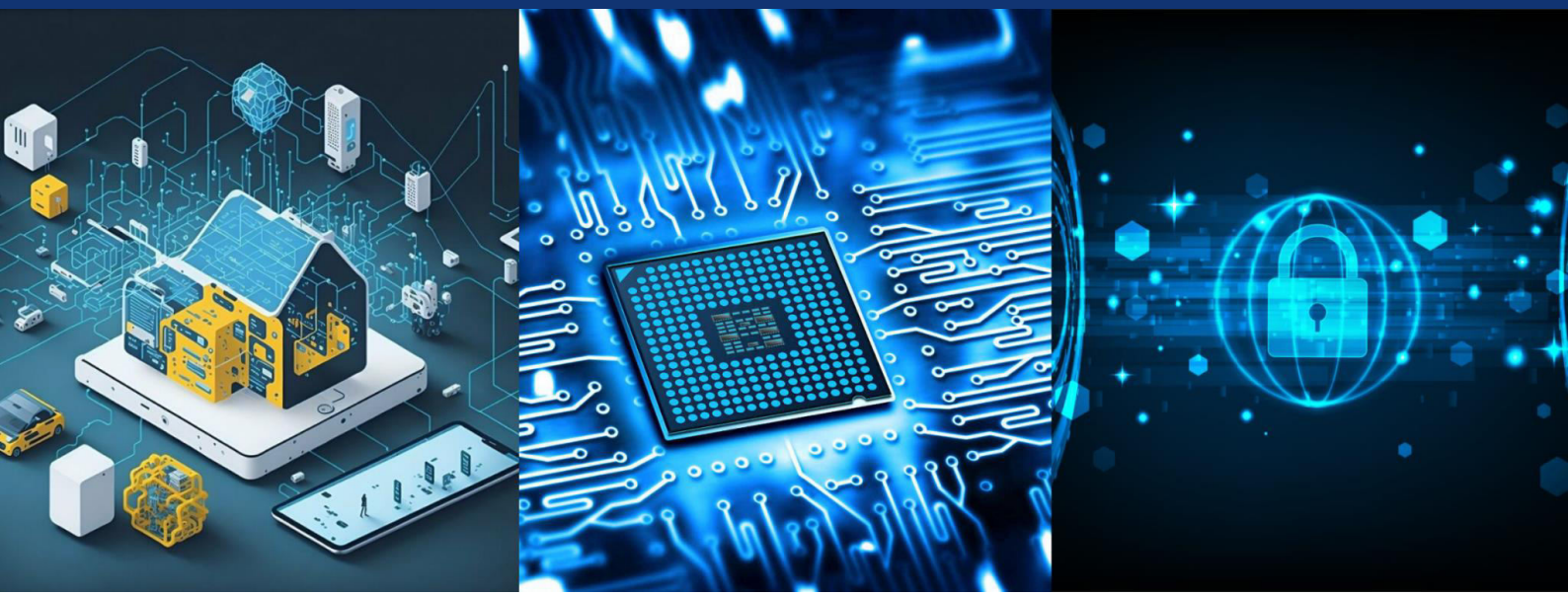

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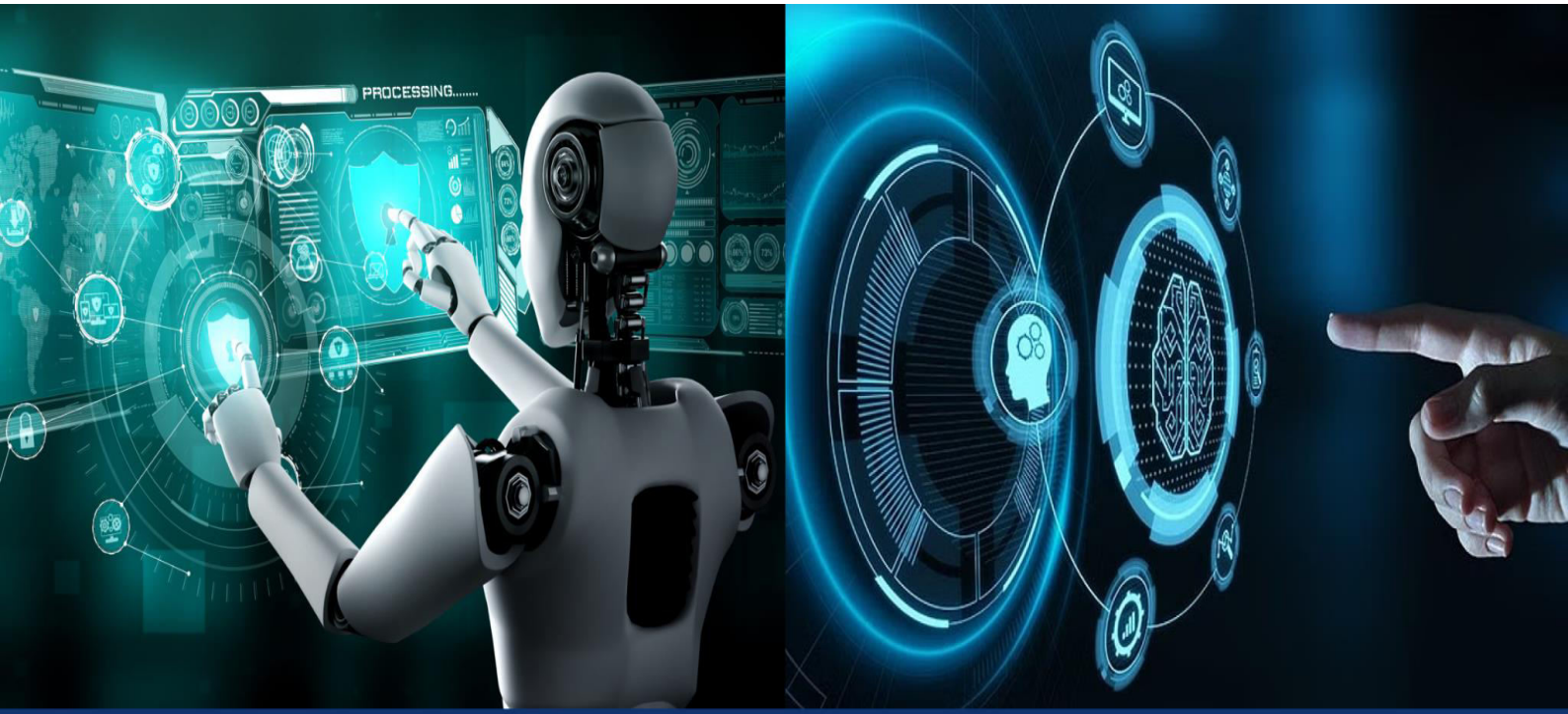

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International Journal of Innovative Research in Computer and Communication Engineering (IJIRCCE)

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Flood Alert Application

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ABSTRACT: In an era where climate change and extreme weather events are becoming increasingly prevalent, effective flood management and timely information dissemination are critical. This paper presents the development of a comprehensive flood alert and reporting mobile application. The aim was to develop a flood alert and reporting mobile application for Kolhapur City. The application, developed in Android Studio using Java and XML programming languages, empowers users by enabling them to check their flood risk status and alerts them if they in a flood risk zone. Additionally, the application performs distance and area calculations. The mobile application offers a user-friendly and informative platform for updating Kolhapur Residents about floods. By serving as a critical communication channel and providing essential spatial guidance, the Flood Alert Notification System aims to enhance public safety.

KEYWORDS: Edge Computing, Fog Computing, and Cloud Computing, Arduino UNO, Raspberry Pi, IoT Sensors.

I. INTRODUCTION

Floods are a major concern for people living in many parts of the world. With unpredictable weather patterns and increasing impervious cover due to urbanization, the risk of floods is higher than ever before. Flooding can have a devastating impact on people's lives and properties. For example, on August 04, 2019, the Kolhapur Municipal Corporation (KMC) reported the following on floods in Kolhapur: In Kolhapur as many as 223 villages were hit, out of which 18 villages were completely marooned and around 29,000 people were affected in this district. “The Kolhapur Municipal Corporation (KMC) with the Disaster Management and White army both are relocating temporary accommodation which had been arranged near School and Temples, due to house collapses caused by flooding. " This is one vivid example of floods occurring in Kolhapur City. To address the floods issue, a mobile application has been developed that will help users stay informed about floods within Kolhapur.

Development of mobile Application is an advancement that is essential for flood control. The development of a mobile application designed to address flood-related challenges is a critical and timely initiative in today's world.

II. RELATED WORK

Flood alert applications have evolved significantly to address the growing need for real-time water level monitoring and disaster preparedness. Various existing solutions, such as Flood Hub by Google, MyFloodRisk, and government-backed alert systems, provide flood predictions, real-time warnings, and emergency response coordination. However, these solutions often lack direct integration with IoT-based water level detection and require users to rely on multiple platforms for monitoring, alerts, and decision-making.

Comparison with Existing Solutions:

Google Flood Hub & MyFloodRisk**: These platforms offer flood risk assessment and predictions based on historical data and AI-driven models. However, they do not provide real-time water level detection at a local scale, making them less effective for immediate response.

Government Alert Systems (FEMA, IMD, CWC Flood Forecasting)**: These services provide nationwide flood warnings but rely on centralized data collection, which may lead to delays in localized alerts.

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IoT-Based Flood Monitoring Systems**: Several IoT-based solutions exist for real-time water level monitoring, but they often require separate dashboards for data visualization, alerting, and manual setup, making them less user-friendly for non-technical users.

Unique Features of the Water Level Detection App

Unlike these existing solutions, our Water Level Detection App provides a fully integrated flood alert system with:

Real-Time Water Level Monitoring (IoT sensor integration for instant updates)

Automated Alerts & Notifications (SMS, app push notifications, email alerts)

User-Friendly Dashboard (Simplified visualization of flood risk levels)

Community-Based Reporting(Crowdsourced flood data for enhanced accuracy)

Offline Accessibility & Emergency Response Guidance(Critical information available even with limited connectivity)

By combining IoT-based real-time monitoring, automated alert mechanisms, and an intuitive user interface, this app eliminates the need for switching between multiple tools. Its mobile-first approach ensures that users, including local communities, emergency responders, and government agencies, can access and respond to critical flood warnings efficiently.

Additionally, while many flood alert platforms rely on subscription-based services or government backing, this app remains free and open-source, making it accessible to students, researchers, and small communities with limited resources.

III. PROPOSED SYSTEM

This paper presents a robust health monitoring system that utilizes IoT and various computing layers to intelligently monitor patients. The system employs edge computing, which processes data closer to the source (e.g., smartwatches, sensors, smartphones) to reduce delays. Fog computing, which includes devices like Raspberry Pi and routers, brings data storage and computation near the network edge, minimizing the need for cloud resources. Cloud computing, on the other hand, offers services like servers, storage, and software via the internet, allowing users to access resources without maintaining physical infrastructure. The paper also discusses the Arduino Uno, a versatile microcontroller popular for prototyping, and the Raspberry Pi 4 Model B, a powerful single-board computer widely used in IoT applications and home automation.

IV. CORE TECHNOLOGIES

The Flood Alert Application is developed using Flutter, Dart, and Firebase, ensuring a scalable, real-time, and reliable flood monitoring experience. The choice of these technologies allows seamless integration of key features such as real-time flood alerts, location-based notifications, user authentication, and data synchronization within a unified platform.

- Flutter (Frontend Framework): Provides a fast, responsive, and visually appealing UI for mobile and web, allowing real-time updates and smooth navigation. It enables features like push notifications and location tracking.
- Dart (Programming Language): The language behind Flutter, offering efficient, high-performance code for managing UI, real-time data, and flood alerts.
- Firebase (Backend): A cloud platform offering real-time database services (Firestore), user authentication, push notifications, and analytics. Firebase ensures real-time flood alerts, seamless data synchronization, and secure user management.

V. WORKING

A. Home Dashboard

The home section of the Flood Alert Application provides a user-friendly interface with the following features:

- Current flood alerts: Displays real-time flood warnings and alerts for the user's location.
- Flood risk map: Provides an interactive map with flood-prone areas and current water levels.
- Weather and water level updates: View the latest weather conditions, rainfall, and river water levels.
- Alert subscription: Users can subscribe to receive personalized flood alerts based on their location.

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B. Flood Monitoring Dashboard

The flood monitoring dashboard is the central hub for users to manage flood alerts and receive real-time information.

- Water level monitoring: Shows the water levels in nearby rivers and reservoirs.
- Real-time notifications: Users receive timely alerts and updates when water levels reach critical thresholds.
- Risk area identification: Identifies areas at risk based on live sensor data and weather predictions.
- Flood status: Visual representation of flood status in various locations, including color-coded risk levels (Safe, Risky, Dangerous).

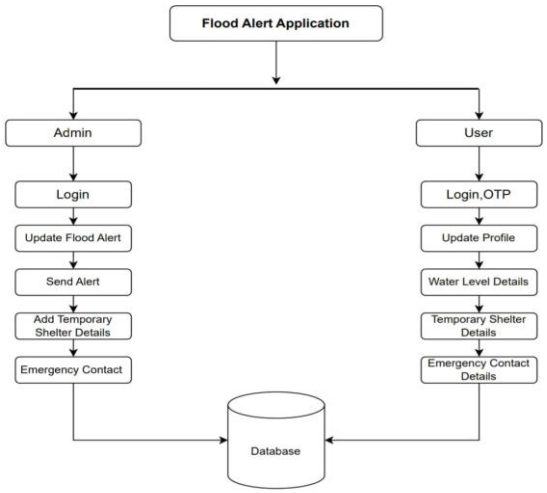
C. Flood Alert System

- Automatic alerts: The app sends automatic push notifications to users when flood warnings are issued in their area.
- Manual alerts: Authorities can send manual alerts for specific locations or situations.
- Location-based alerts: Alerts are triggered based on the user's current location and proximity to flood-prone areas.

D. Team Management (Admin Features)

For community-based flood monitoring, admins have additional features to manage alerts and coordination:

- Add new locations: Admins can add or update flood-prone locations for monitoring.
- Send bulk alerts: Admins can send alerts to multiple users in flood-affected areas at once.
- Manage emergency contacts: Admins can maintain a list of emergency contacts for quick communication during flood events.



UML Diagrams

VI. RESULTS

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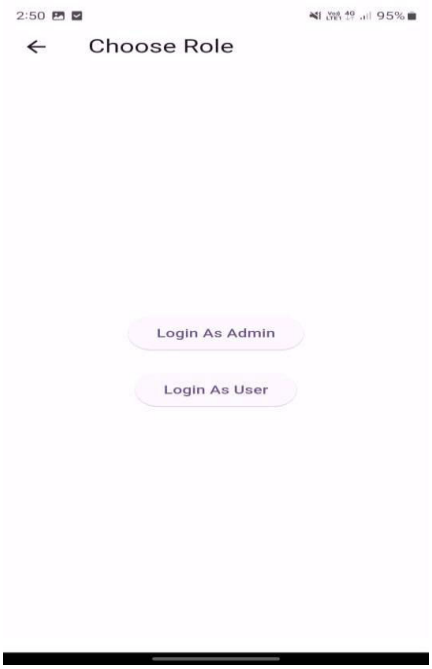

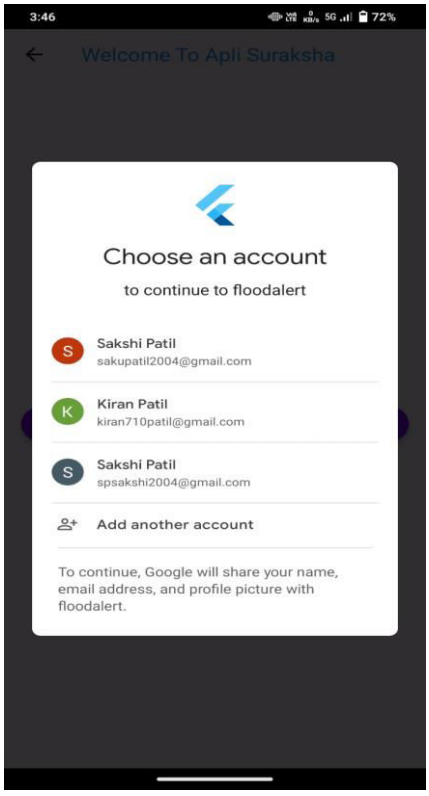

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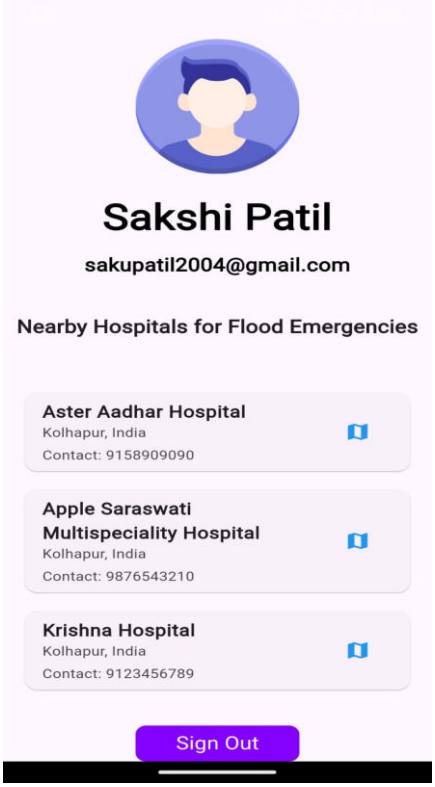

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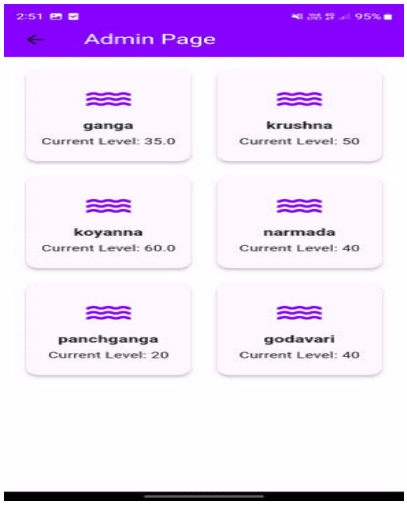

VII. CONCLUSION AND FUTURE WORK

The Flood Alert Application is a user-friendly platform designed to provide timely and accurate flood information. It helps keep people safe by sending early warnings, monitoring water levels, and sharing important alerts. By using advanced technology, the application ensures quick communication and helps communities prepare for and respond to floods effectively. .

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