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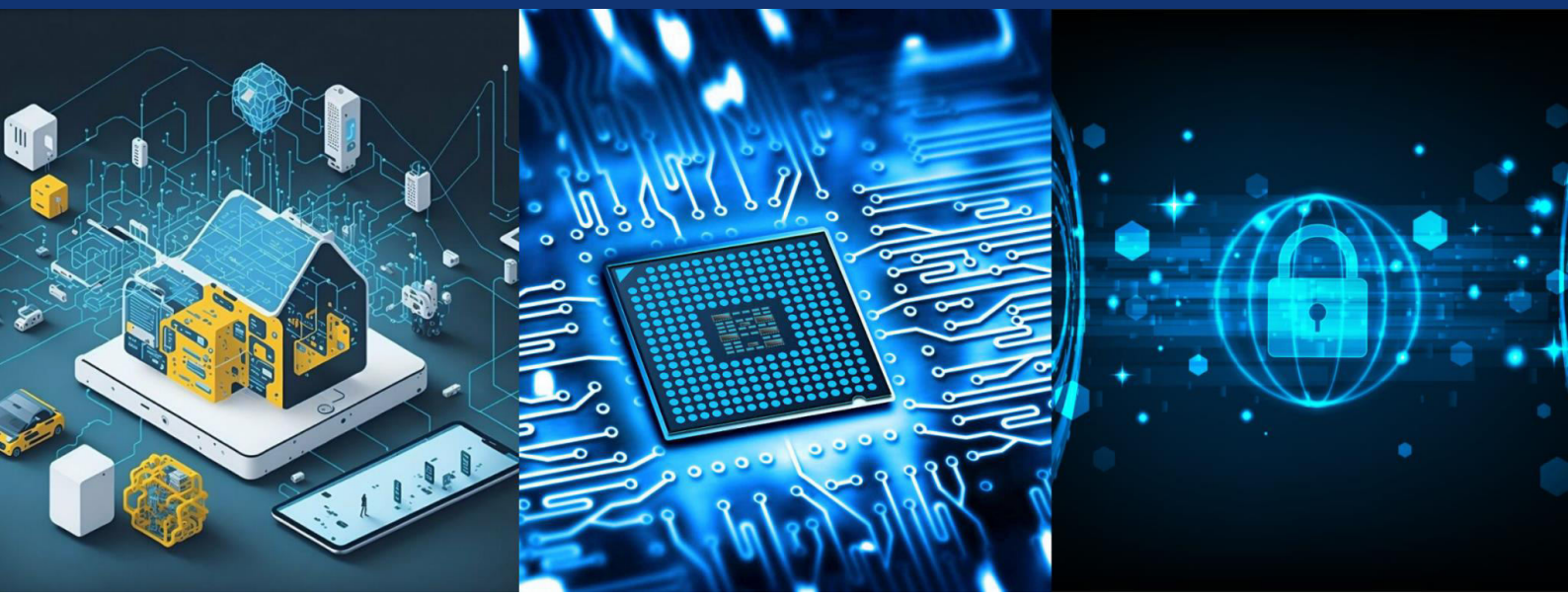

International Journal of Innovative Research in Computer and Communication Engineering

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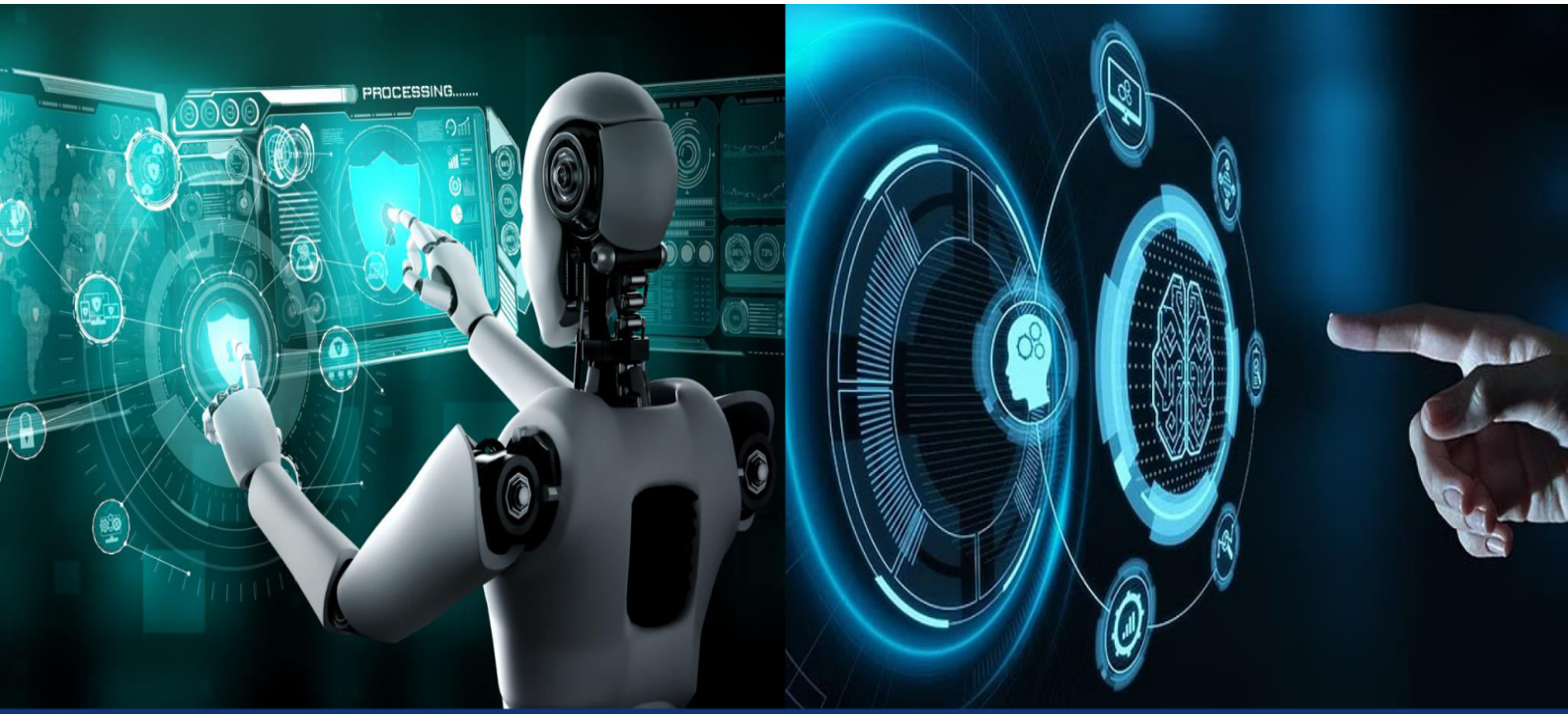

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Real Time Flood Monitoring and Alert System

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ABSTRACT: Floods are catastrophic natural disasters requires the better and efficient predictive systems, monitoring. comprehensive real-time flood monitoring and alert system leveraging Arduino software, IoT sensors, cloud computing, and machine learning to enhance flood preparedness. The system collects all the environmental data from sensors, including DHT11, ultrasonic, raindrop, vibration, soil moisture, sensors, processed by an ESP32 microcontroller. Data is dynamically transmitted to Google Sheets using App Script and stored in Google Cloud storage like buckets and Big Query for advanced analysis. The flood status is determined based on predefined thresholds and analysis using Looker Studio. Alerts are sent to people who are in flood areas.

KEYWORDS: Flood monitoring, IoT, ESP32, Google Cloud, Buckets, Big Query, Machine learning, Looker Studio, Appsheet , flood app.

I. INTRODUCTION

One of the most damaging natural disasters are floods , these have a terrible effect on both people, infrastructure and animals. This unique real-time flood monitoring and alert system which integrates sensor data to cloud computing, machine learning, and Internet of Things sensors in order to effectively analyze, anticipate, and measure flood scenarios. In alongside monitoring data in an app and generating timely alerts for proactive a flood management, the system provides an interface to collect, analyze, and visualize flood data.

With this system in communities, localities, place can be better prepared and respond more Fastly to potential and fast flooding events. Families and government can receive early warnings to evacuate safely, reducing the risk to lives ,local authorities can allocate resources more efficiently, ensuring that help reaches those in need as quickly as possible.

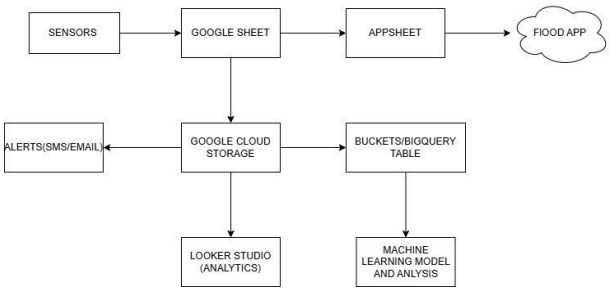

Figure 1.1 System architecture.

II. RELATED WORK

[1] Jong-uk Lee. Jae-Eon Kim, Daeyoung Kim, Poh Kit Chong, Jungsik Kim, Philjae Jang, developed a RFMS, a real-time flood monitoring system using wireless sensor networks for high accuracy and reliability in data transmission.
[2] Diogo de Souza, Iago Freitas Cardoso, Marcos Rodrigo Momo proposed a mobile application integrated with flood alert systems, focusing on improving accessibility and responsiveness.
[3] P. William, Oluwadare Joshua Oyebode ,Gandikota Ramu,Sorabh Lakhanpal, Keerat Kumar Gupta, Hassan M. Al-Jawahry , implemented an IoT-based monitoring system employing an LSTM network for flood prediction based on rainfall and water levels.

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[4] Yung-Chung Tsao, Yin Te Tsai, Yaw-Wen Kuo, Chaokung Hwang, explored IoT-based weather monitoring systems to address environmental challenges, focusing on efficient data handling and analysis.
These works highlights the increasing role of IoT , monitoring and analytics, which our project builds upon by integrating IoT sensors, cloud computing, and advanced visualization.

III. DESIGN AND IMPLEMENTATION

3.1 System components.
Sensors which include DHT11 to sense temperature,
Humidity, ultrasonic sensor which sense the water level distance, vibration sensor detects the vibration levels, soil sensor measures moisture, raindrop sensor for intensity of rainfall, these sensors sense the environment and uses the ESP32 microcontroller which is WIFI module, collects and transmits the data dynamically to storage .
Where the data collected is sent to cloud through google sheets via appscript for logging and monitoring , where this data is shown in appsheet app known as flood app which displays the data dynamically, data is imported to google cloud storage ,like buckets and Big query , stores the tables for large scale analysis, and visualises trends and displays the real time analytics.
Custom app which linked to google sheets , which administrator to monitor live data and receive the feedbacks, and sent alert messages .
Machine learning integration where model are developed to analyze data trends and predicts floods , google colab where model is trained and evaluate the accuracy with a confusion matrix.

3.2 Implementation
A. Data Collection and Transmission:
Iot sensor collects the data ,processed by esp32 microcontroller and connected wifi , and transmitted to google sheets dynamically through the Appscript which the extension in sheets and data parameters like water level, raindrop intensity, vibration, and soil moisture [1][2].where these thresholds are predetermined and determine the flood status in a new column.
B. Cloud Storage:
Data from google sheets are synchronized with query or imported to google cloud storage , where the project are created in google cloud , enabled the api services like bigquery api, googlesheets api , and enabled the credits for the project and data is imported to buckets for further process and notification.
C. Visualization and Alerts
The data which dynamically generated in sheets and sent to cloud storage, where the data is imported to looker studio where the analytical tool from google services, we can create charts . it detects give the analysed charts or can create the custom charts through selected parameters and metrics and these are analysed and created the report used for analysing the trends of future and present trends.
And the alerts are sent to users through sms or emails.
D. Machine learning
The data present in google cloud storage is used for training, where the vertexai provides the automl and custom ml model creation, we used custom where the data is trained and confusion matrix and graph is monitored[3][4].
E. Flood app
The data in the sheet is used for displaying the weather data to users , all andriod ,iphone and web browers can acces the data, which synchonize data regularly , this data is deployed in appsheet and designed the app.

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IV. RESULTS

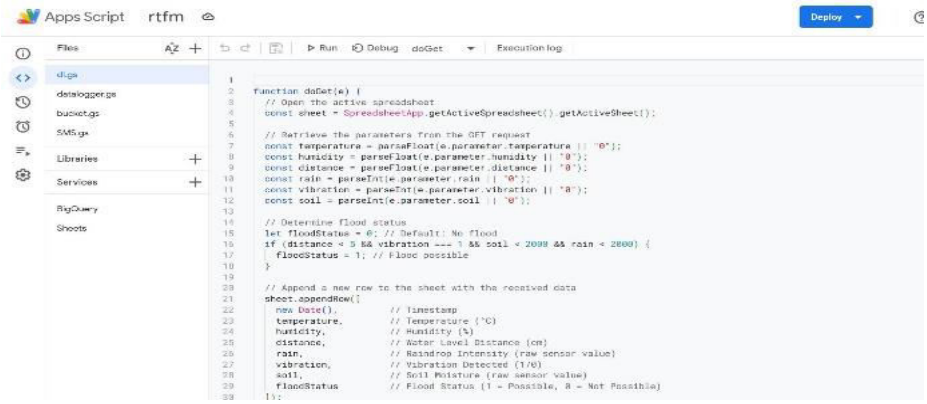

Figure 4.1 Appscript code .

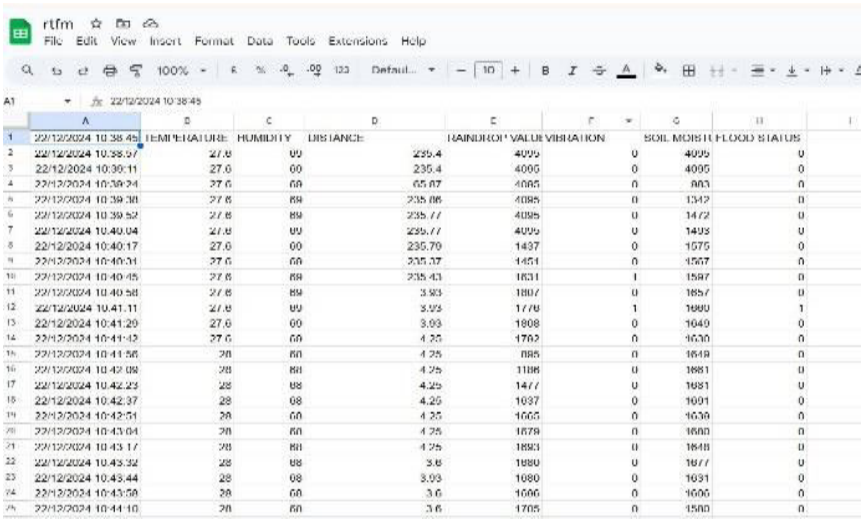

Figure 4.2 google sheet

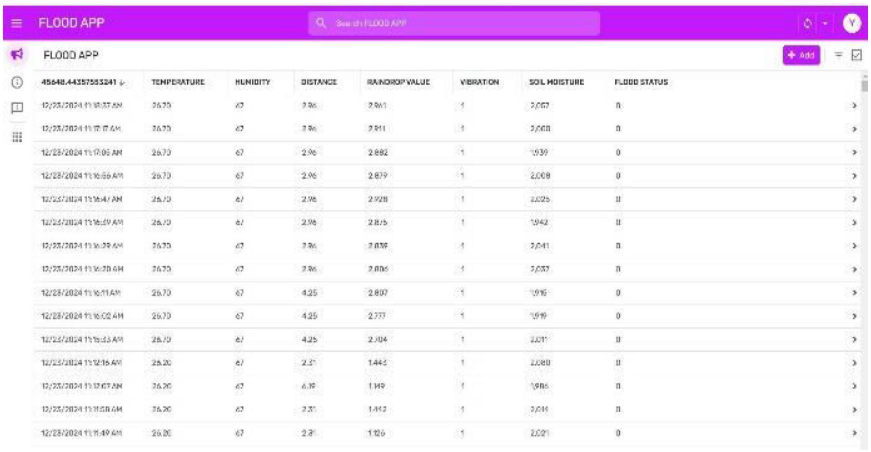

Figure 4.3 Flood app data.

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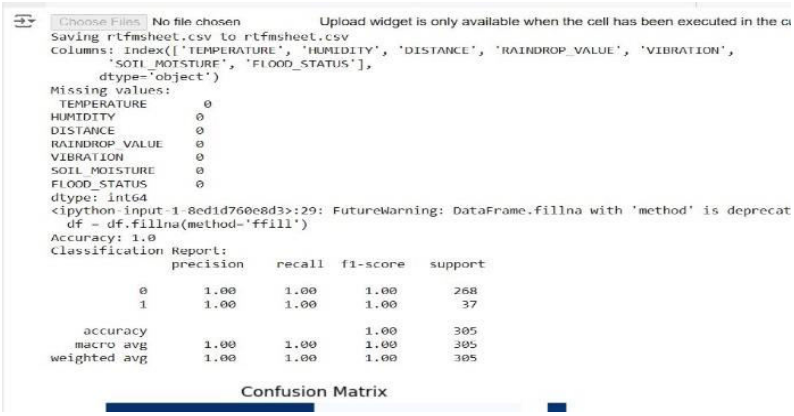

Figure 4.4 confusion matrix in vertex ai colab.

V. CONCLUSION AND FUTURE SCOPE

In summary, the promise of combining IoT, cloud computing, and machine learning for real-time environmental monitoring is demonstrated by the suggested flood monitoring and alert system. By using the sensors such as DHT11, vibration, raindrop sensor , soil moisture, ultrasonic sensor the system effectively collects and sends environmental data to cloud storage. While Looker Studio analytical tool which provides user-friendly visualization to in decision-making, Google Sheets and Google Cloud Big Query provides data storage and analysis. The mobile application and web application which improves readiness during flood disasters ,monitor data in real-time and receive notifications. The technology generates dependable forecasts with an accuracy of over 93% thanks to a machine learning model that was built on actual data in vertex ai . the system is scalable, effective, and has a significant impact on reducing the effects of floods.

In order to give more coverage and prediction accuracy, future versions of the system will try to extend its deployment throughout many flood-prone areas. The system may produce more accurate forecasts by expanding the number of sensors and including more environmental factors like wind speed, sun radiation, and river flow data. Predictive capacities will be further improved by developments in machine learning models, such as the application of neural networks and real-time model training. Reliability in remote locations will also be increased by enabling offline functioning and integrating energy-efficient solutions like solar power. The goal is to establish a worldwide network of linked flood monitoring systems that are capable of real-time flood prediction and response anywhere.

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