Smoke and Fire Detection System

The Fire and Smoke Detection System uses a DHT11 temperature sensor and MQ2 gas sensor to monitor environmental conditions in real-time. Data is processed by a Raspberry Pi 4 and sent to the ThingSpeak cloud for analysis. The system triggers alerts, including a buzzer, LED, SMS notifications via Twilio, and an MP4 danger alert when thresholds are exceeded. Users can sign up, log in, and access a web interface with real-time monitoring, a Fahrenheit conversion tool, and CSV file downloads. The project integrates IoT, AI, and cloud technologies for a comprehensive safety solution.

Prerequisite Libraries (pip commands)

- **Flask** – For creating the web application.

  pip install Flask
- **Flask-SQLAlchemy** – For handling the SQLite database integration.

  pip install Flask-SQLAlchemy
- **Flask-Werkzeug** – For password hashing and checking.

  pip install Werkzeug
- **Adafruit-DHT** – For reading from the DHT11 sensor.

  pip install Adafruit-DHT
- **Adafruit-MCP3008** – For interacting with the MCP3008 ADC for the MQ2 gas sensor.

  pip install Adafruit-MCP3008
- **Twilio** – For sending SMS notifications via Twilio.

  pip install twilio
- **Requests** – For making HTTP requests (used for sending data to ThingSpeak).

  pip install requests

Project Setup

1. Hardware Setup:

- **Raspberry Pi 4**: Acts as the central processing unit for data collection and communication.
- **DHT11 Sensor**: Connect wire between RM19 to RM2
- **MQ2 Gas Sensor**: Connect wire between RM22 to RM12

- **Buzzer**: Connect the wire between RM9 to RM17.
- **LED:** Connect the wire between CN9 to CN4.
- **Speaker**: Provides audible feedback for safety alerts.

NOTE: All the Connections are based on Xtrans solutions kit.

2.Software Setup:

- **Twilio:** Create an account in twilio.
- **ThingSpeak Cloud:** Create an account in ThingSpeak Cloud.
- **Hugging Face:** Create an account in Hugging face.

3.Configuration:

Twilio: In app.py replace the credentials which are been generated after creating the twilio account.

- TWILIO_PHONE_NUMBER = ' Your Twilio phone number '.
- TWILIO_SID = ' Your Twilio SID'.
- TWILIO_AUTH_TOKEN = ' Your Twilio AUTH TOKEN'.

ThingSpeak Cloud: In app.py replace the credentials which are been generated after creating the ThingSpeak Cloud account.
Create a new Channel by giving your preferred name and create three fields namely

1. temperature
2. Humidity
3. Gas_level

Replace the API key where you can get in the API keys the API key should be write API key

- THINGSPEAK_API_KEY = 'Replace with your write API key'
- THINGSPEAK_URL = 'https://api.thingspeak.com/update.json'

Hugging Face: In dashboard.html replace the credentials with your hugging face API key the key can be generated in settings ->Access tokens generate read API key.

- const apiKey = 'Replace with your Hugging Face API key’.

4.Execution:

Start Flask server:

- Python3 app.py

Open the URL in the browser after successful running

- Access http://<RaspberryPi_IP>:5000

5.Testing:

- After Successful running as the user won't exists so the user needs to signup first and then needs to login.
- After successful login the data will be stored in the sqlite3 database the file will be created within the directory folder naming instances → within that Users.db folder will be created the data can be seen by the user only the Gmail will be visible and the password will be in a hashed.
- The data in the dashboard will be RealTime data temperature, humidity and gas_level. The data will be sent to the ThingSpeak Cloud and with the initial readings of the sensor the AI Suggestions will be given and the charts will be updated continuously if the sensors reaches the threshold then for temperature buzzer sound and for gas level led light and there will be a alert sound and the message will be sent by the twilio.

NOTES:

- Ensure that the zip files are extracted in the in the Raspberry Pi software.
- Ensure weather all the sensors are working or not by individually testing it.
- Ensure all the hardware connections are properly connected.
- Ensure all the software credentials are been replaced.

SCREENSHOTS

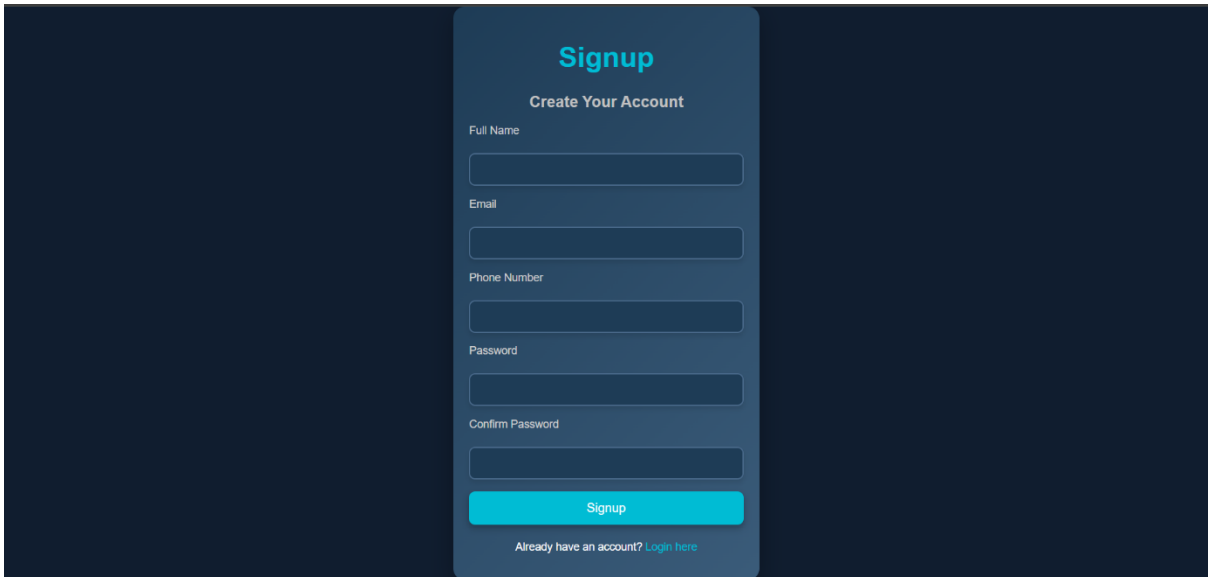

FIG 1: Signup Form

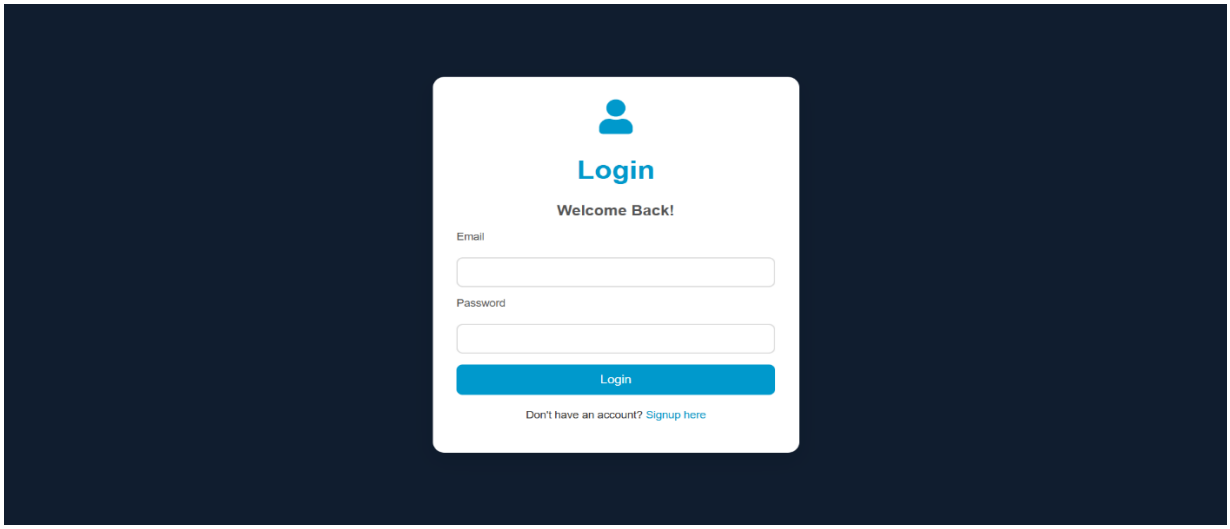

FIG 2: Login Form

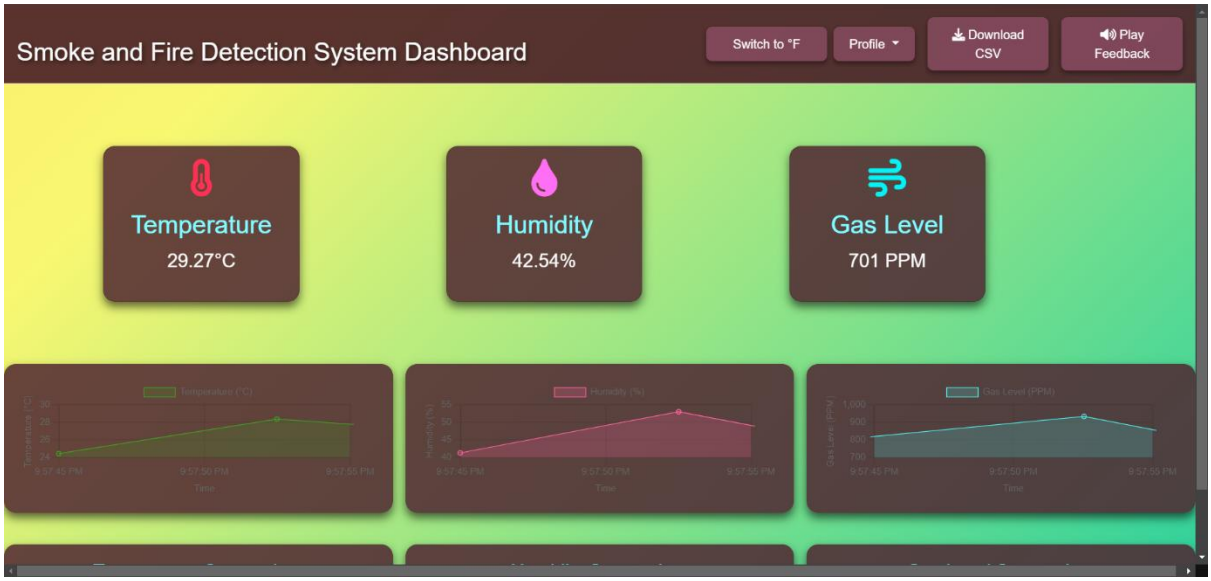

FIG 3: Dashboard Sensor Data and Charts

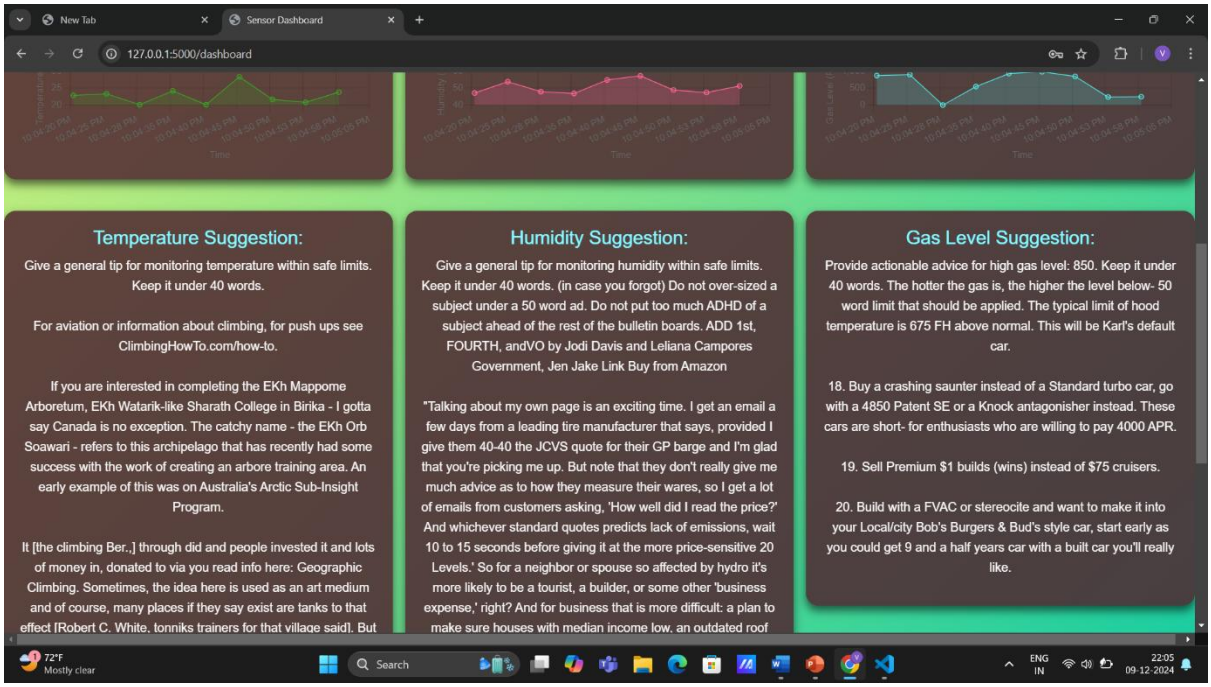

FIG 4: Dashboard AI Suggestion

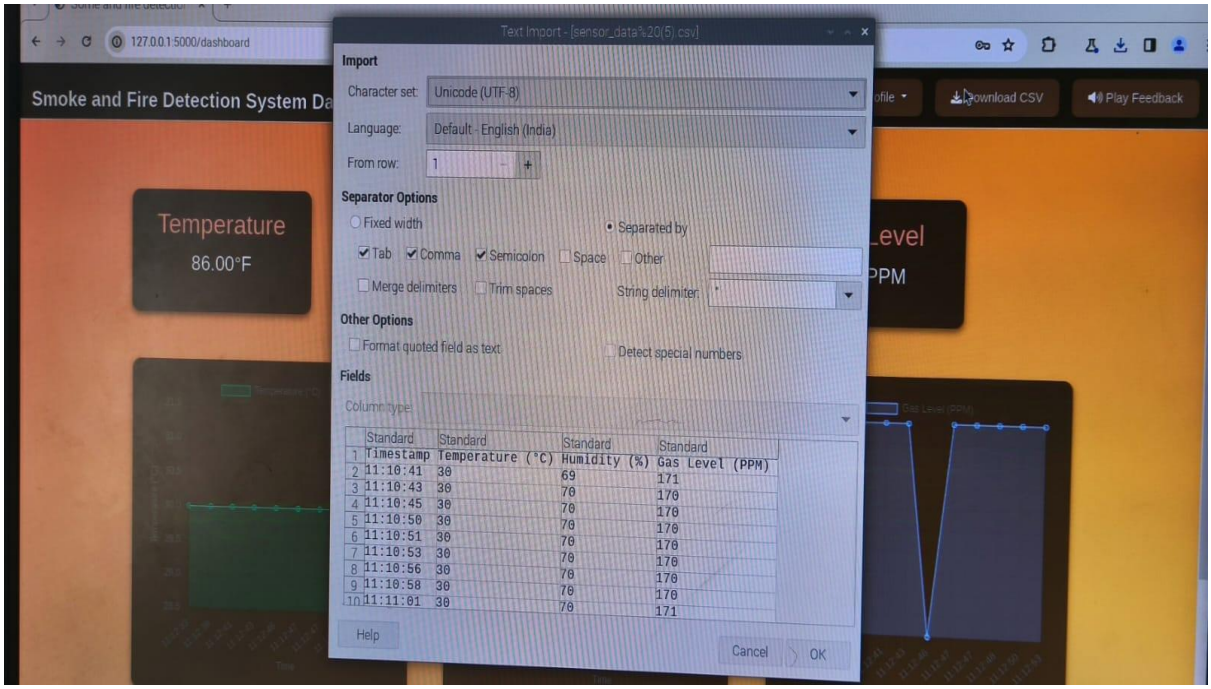

FIG 5: Dashboard .CSV File Download

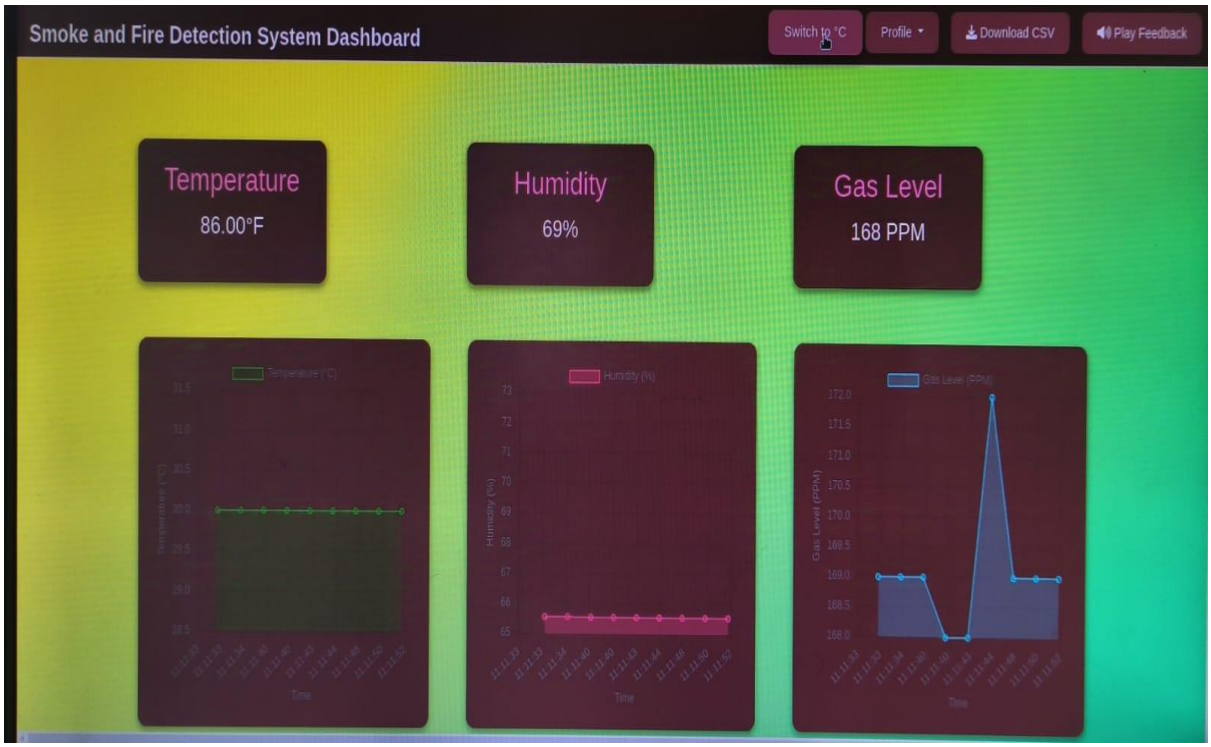

FIG 6: Dashboard Conversion deg C to deg F

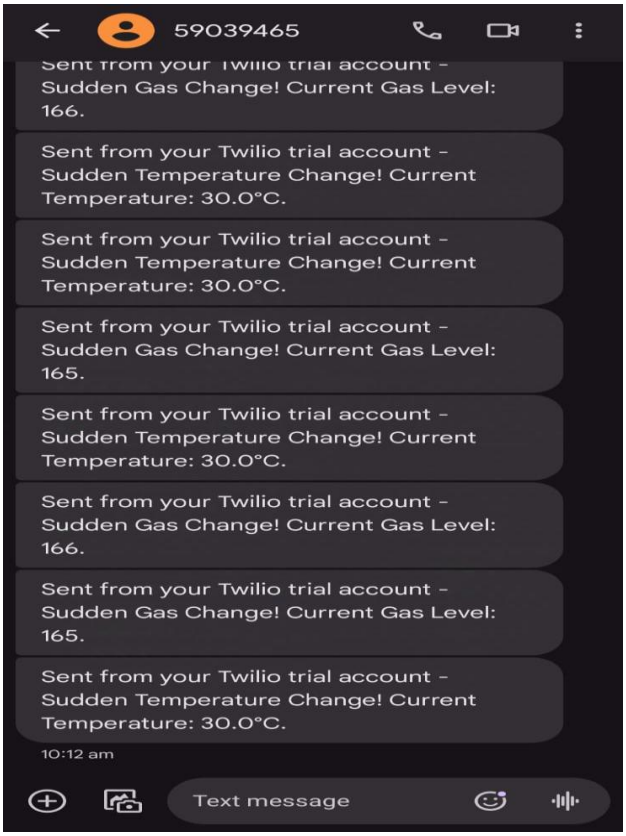

FIG 7: Twilio Notification

FIG 8: ThingSpeak Cloud

ZIP FILE :

The zip file is in the folder.