K.Ramakrishnan College of Technology

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Affiliated to Anna University Chennai, Approved by AICTE New Delhi, Accredited by NBA and with 'A+' grade by NAAC

Samayapuram, Tiruchirappalli - 621 112, Tamilnadu, India.

Incubating Minds, Catalyzing Careers

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

20CS7503 & DESIGN PROJECT 3

END SEMESTER PRACTICAL EXAMINATION- NOV / DEC 2025

REVIEW PRESENTATION

Batch No.: 13

Date:

Session:

REAL TIME ATMOSPHERIC POLLUTANT MONTORING DASHBOARD

Guide Name:

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OBJECTIVE OF THE PROJECT

1. **Provide Immediate Air Quality Data:** Deliver real-time pollutant level information to guide public health decisions and raise community awareness.

2. **Pollution Sources:** Detect pollution trends and sources, enabling authorities to design focused and effective mitigation strategies.

3. **Enhance Environmental Policies:** Supply reliable and precise data to strengthen the formulation and enforcement of environmental regulations.

4. **Support Sustainable Urban Planning:** Assist city planners and policymakers with insights to design cleaner transport systems, greener infrastructure, and healthier living spaces.

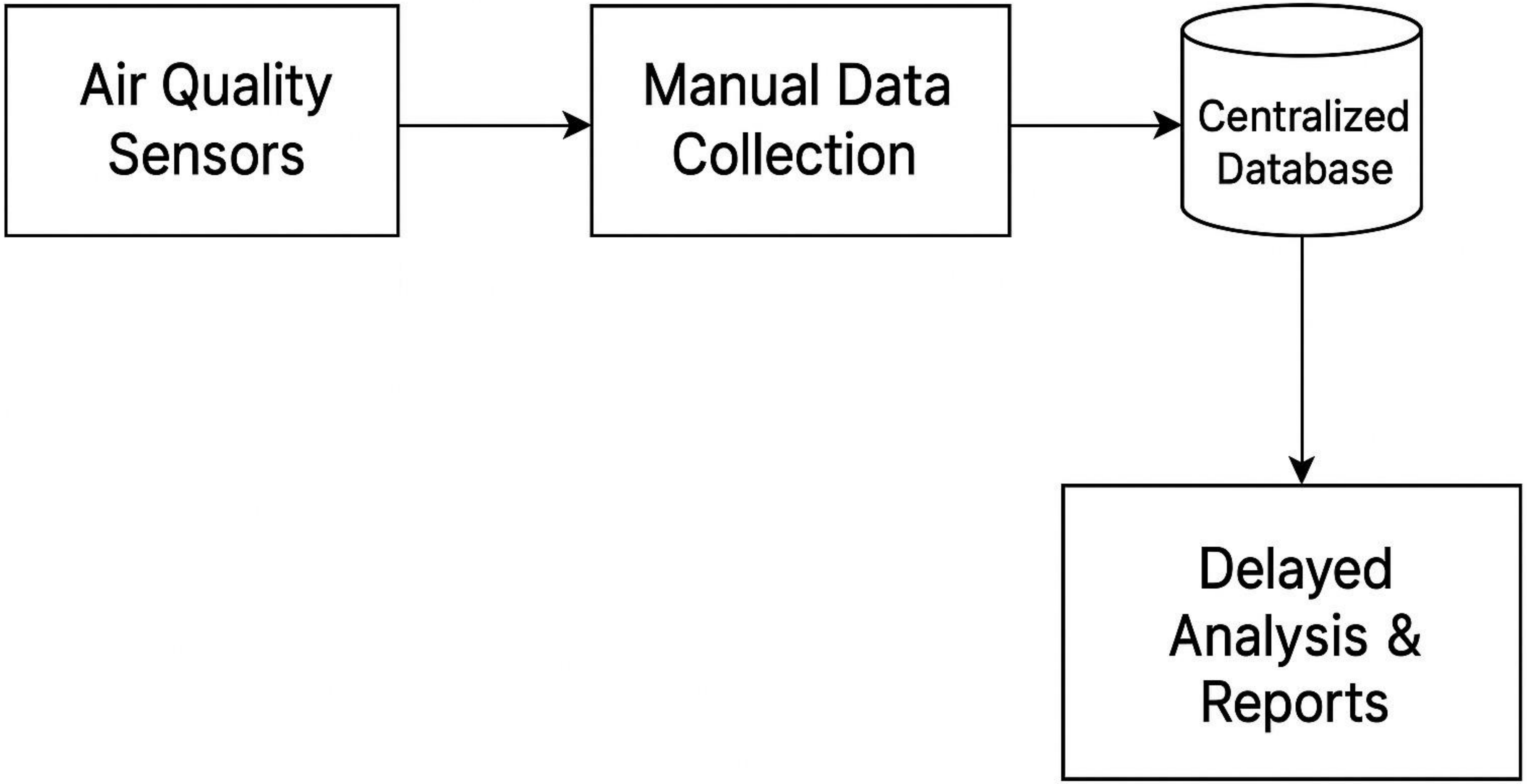
INTRODUCTION

1. Air pollution remains one of the most critical global challenges, posing serious risks to human health and damaging ecosystems.
2. Real-time monitoring systems enable continuous tracking of harmful pollutants, including PM2.5, PM10, CO, NOx, SO_2, and O_3.
3. Interactive dashboards gather sensor data and convert it into visual formats, making complex air quality information easier to interpret..
4. They play a vital role in issuing early warnings, strengthening pollution control strategies, and supporting sustainable urban development.

LITERATURE SURVEY

TITLE OF PAPER	AUTHOR(S)	PAPER GIST	TECHNOLOGY USED
Advances in Air Quality Monitoring (2024)	Advances in Air Quality Monitoring (2024)	Integrating sensor, satellite, and image data enhances monitoring accuracy.	Lensless holography (DIH) + deep learning
community-Empowered Air Quality Monitoring System (2018)	Yen-Chia Hsu et al.	Emphasis on developing fast, scalable, real-time AQM systems for smart cities.	CNN + LSTM applied to visual image data for PM/AQI estimation
GASDUINO: Wireless Air Quality Monitoring System Using IoT (2020)	M. E. Karar, A. M. Al-Masaad, Omar Reyad	Vision-based models using cameras and AI (like CNNs) are emerging for pollution estimation.	DustTrak monitor, GPS, IoT sensors, cloud, ML models
Predicting AQI Using an Attention-Hybrid Deep Model (2024)	A.T. Nguyen et al.	Develops a hybrid AI model combining Attention-CNN, ARIMA, LSTM, and XGBoost for AQI forecasting	Deep Learning (CNN + LSTM), ARIMA, XGBoost, Quantum Particle Swarm Optimization.
Low-Cost Sensors as an Alternative for Long-Term Air	X. Liu et al	Evaluates the performance of low-cost air quality sensors	IoT Sensors, Calibration Algorithms, Data Quality

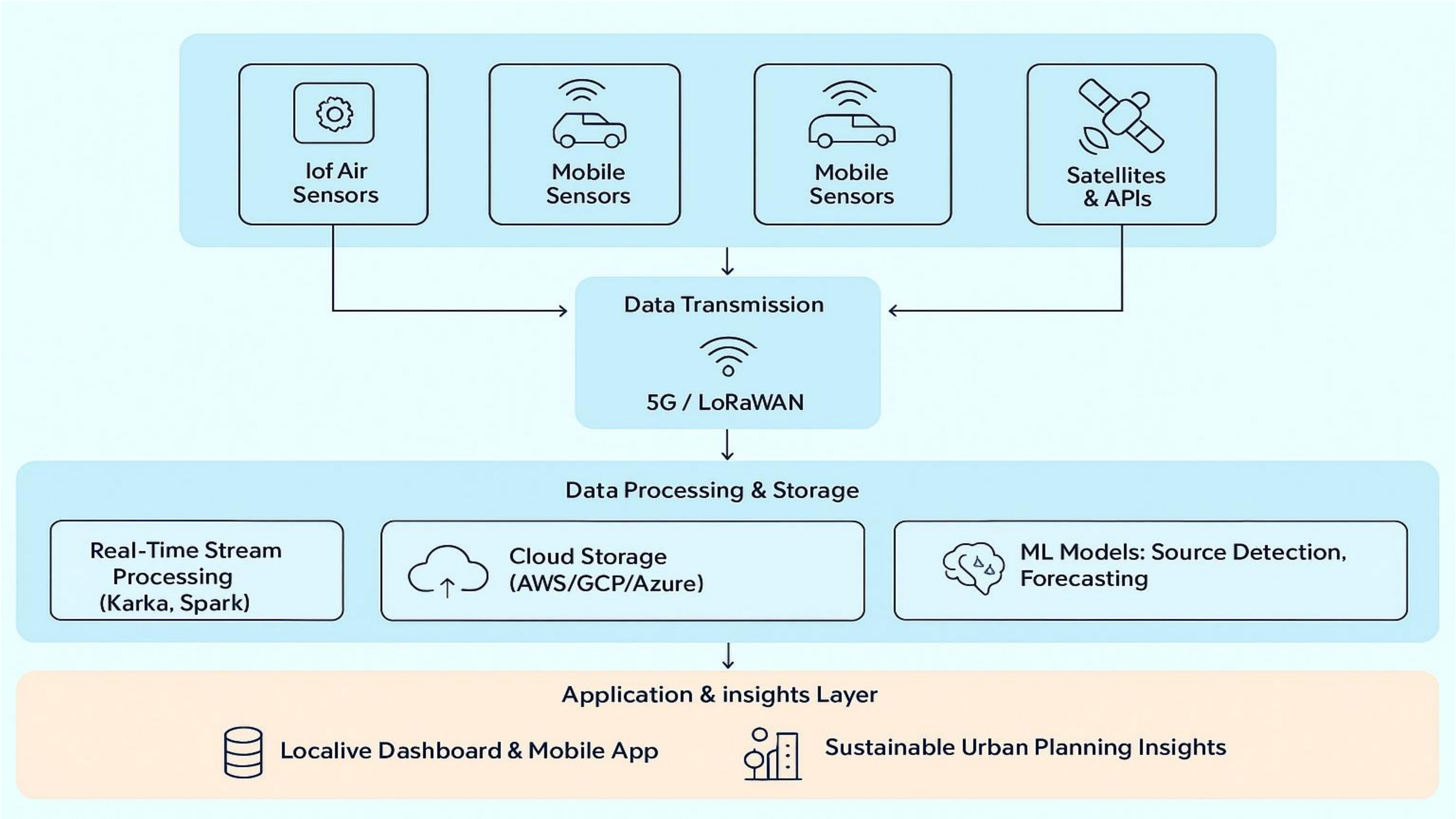
EXISTING SYSTEM ARCHITECTURE



PROBLEM IDENTIFICAITON

1. Lack of real-time air quality data limits timely public awareness and health protection measures.
2. Existing monitoring systems are insufficient to identify localized pollution sources accurately.
3. Authorities face challenges in analyzing pollution trends for effective mitigation planning.
4. Policy makers lack reliable data to frame and enforce strong environmental regulations.
5. Urban planners have limited insights for designing sustainable and pollution-free city environments.

PROPOSED SYSTEM ARCHITECTURE



SOFTWARE AND HARDWARE REQUIREMENTS

HARDWARE

1. Processor : Intel i3 or above
2. RAM : 4 GB (8 GB recommended)
3. Storage : 500 MB free space

SOFTWARE

1. OS: Windows 10 / 11 (orLinux/Mac)
2. Libraries: Streamlit, Request.
3. API: OpenWeatherMap

MODULES

1. Data Acquisition
2. Data Preprocessing
3. Data Analysis
4. Visualization and Dashboard
5. User Interaction and System Update

IMPLEMENTATION OF MODULE-1
Data Acquisition Module

1. This module connects to trusted APIs such as OpenWeatherMap.

2. It collects real-time air quality parameters continuously.

3. It retrieves pollutants including AQI, PM2.5, PM10, CO, NO_2, SO_2, and O_3.

```
# Get Coordinates
1 usage
def get_coordinates(city):
    url = f"http://api.openweathermap.org/geo/1.0/direct?q={city}&limit=1&appid=9cca211b2e1aa3778c855e09ba35522e"
    res = requests.get(url)
    if res.status_code == 200 and res.json():
        data = res.json()[0]
        return data['lat'], data['lon']
    return None, None


# Get Current AQI
1 usage
def get_air_quality(lat, lon):
    url = f"http://api.openweathermap.org/data/2.5/air_pollution?lat={lat}&lon={lon}&appid=9cca211b2e1aa3778c855e09ba35522e"
    res = requests.get(url)
    if res.status_code == 200:
        return res.json()
    return None
```

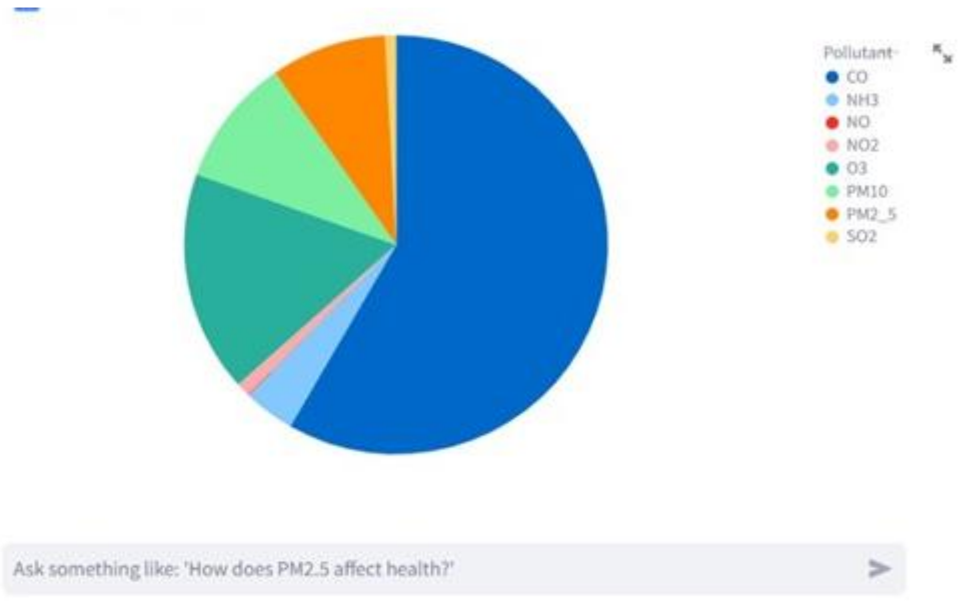
if lat and lon › if pollution_data

IMPLEMENTATION OF MODULE-2
Data Preprocessing Module

1. This module cleans and structures the raw API data.

2. The system handles missing and incorrect values effectively.

3. It removes duplicate entries and noisy records from the dataset.

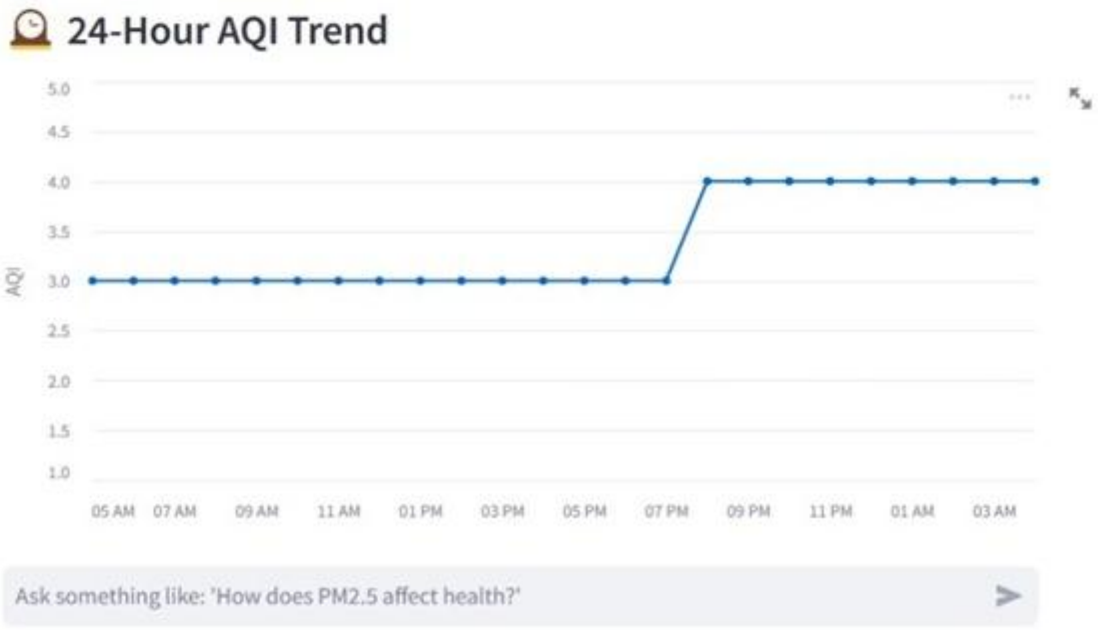


IMPLEMENTATION OF MODULE-3
Data Analysis Module

1. This module extracts all key pollution parameters from the data.

2. It applies AQI thresholds to classify air quality levels.

3. The system detects unusual pollution patterns and spikes.



IMPLEMENTATION OF MODULE-4
Visualization and Dashboard Module

1. This module creates interactive dashboards using Streamlit.

2. It displays AQI trends with dynamic charts and graphs.

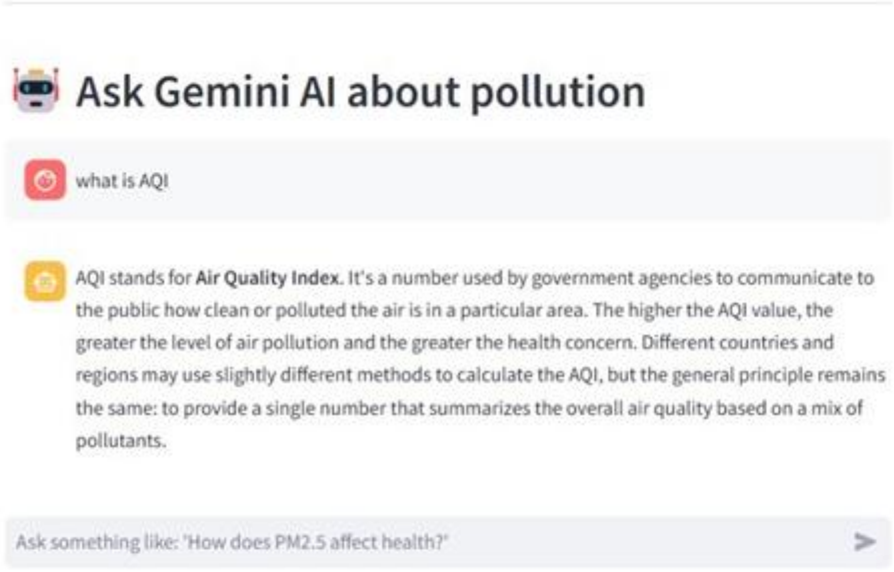
3. Air quality levels are shown with color-coded indicators.

IMPLEMENTATION OF MODULE-5
User Interaction and System Update Module

1. This module integrates an AI-powered chatbot for user queries.

2. It explains pollution levels in clear and simple language.

3. The chatbot suggests health precautions based on AQI levels.



CONCLUSION

1. Real-time air quality monitoring successfully implemented.

2. AQI tracking, historical trends, and alerts provided for user awareness.

3. APIs and IoT sensors integrated for accurate, location-based data.

4. Helps users make informed decisions about air pollution exposure.

5. Supports government agencies and environmental efforts in pollution control.

6. Future improvements: AI-based predictions, expanded IoT networks, and mobile app integration.

7. The project serves as a valuable tool for monitoring and managing air pollution.

FUTURE ENHANCEMENTS

1.Integration of AI and machine learning models to predict future pollution levels and trends.

2. Expansion of sensor networks to cover more urban and rural areas for higher accuracy.

3. Development of a mobile application for real-time air quality alerts and health recommendations.

4. Integration with smart city infrastructure to automate traffic control and reduce emissions.

5. Implementation of data visualization dashboards for policymakers and the public to monitor air quality effectively..