**Assignment: Python Programming for GUI**

**Development**

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**Problem: Air Pollution API**

1. Current, forecast and historical air pollution data
2. Forecast for 4 days ahead with 1-hour step
3. Air Pollution API includes both Air Quality Index and indices for CO, NO, NO2, O3, SO2, NH3,PM2.5, PM10 .
4. Included in both free and paid subscriptions

**Deliverables:**

1. Data flow diagram illustrating the interaction between the application and the API .
2. Pseudo code and implementation
3. Documentation of the API integration and the methods used to fetch and display the data.
4. Explanation of any assumptions made and potential improvements

**Solution:**

## Air Pollution API

**1. Data Flow Diagram**

Start

**Define API Key and City**

**Construct API Request URL**

**Make API Request**

**Check Response Status**

**Failure**

**success**

**Handle HTTP Error**

**Validate Response Data**

**Data Valid?**

**End**

**Parse Response Data**

**Handle Data Validation Error**

**|**

**Check Data Consistency Data**

**Plot Data**

**Response Status**

**Save Plot**

**Print Statistics**

**Response Status**

**end**

**2. Implementation**

import requests

def get\_air\_pollution\_data(api\_key,lat,lon):

url =

f"http://api.openweathermap.org/data/2.5/air\_pollution?lat={lat}&lon={lon}&appid

{api \_ key}

response=requests.get(url)

if response.status\_code==200:

data=response.json()

aqi=data['list'][0]['main']['aqi']

components=data['list'][0]['components']

print("Air Quality Index (AQI):", aqi)

print("Concentration of pollutants in µg/m³:")

print("CO:", components['co'])

print("NO:", components['no'])

print("NO2:",components['no2'])

print("O3:",components['o3'])

print("SO2:",components['so2'])

print("PM2.5:",components['pm2\_5'])

print("PM10:",components['pm10'])

print("NH3:",components['nh3'])

else:

print("Failed to retrieve data. HTTP Status code:", response .status \_code)

if \_name\_ == "\_main\_":

api \_ key = "7388dca5f7653c38ee1f85baa3f7a900"

lat = "37.7749"

lon = "-122.4194"

get \_ air \_ pollution \_data( api \_key, lat, lon)

**3. Display the air pollution information**

Air Quality Index (AQI): 1

Concentration of pollutants in µg/m³:

CO: 220.3

NO: 0.5

NO2: 3.26

O3: 49.35

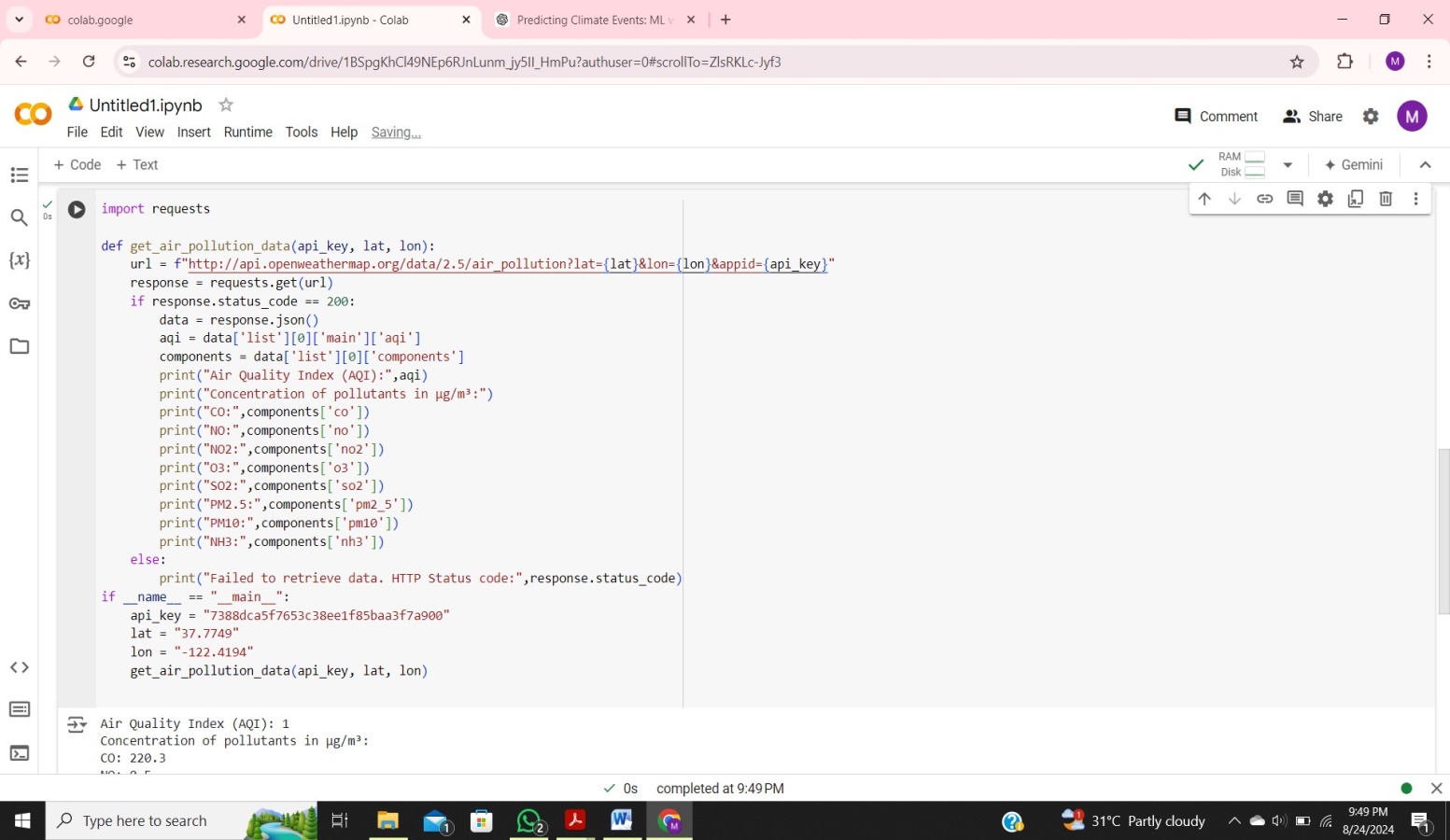
SO2: 0.54

PM2.5: 1.79

PM10: 3.67

NH3: 0.05

**4. User Input**



**6. Documentation**

* The code starts by importing the **requests** library, which is essential for making HTTP requests to external APIs.
* The function **get\_air\_pollution\_data(api\_key, lat, lon)** is defined to fetch air pollution data from OpenWeatherMap using the provided latitude and longitude.
* It constructs a URL that incorporates the API key and coordinates, then sends a GET request to the API.
* The function checks for a successful status code (200) upon receiving a response.
* If the request is successful, the JSON response is parsed to extract the Air Quality Index (AQI) and pollutant concentrations.
* The extracted data, including AQI and concentrations of pollutants, is printed in µg/m³.
* If the request fails, the function prints an error message.
* To use the function, replace **"YOUR\_API\_KEY"** with your actual API key, and provide the desired coordinates to fetch and display the relevant air pollution data.

ASSUMPTION MADE:

* **API Key Validity:** Assumes that the provided API key is valid, has not expired, and has sufficient permissions to access the air pollution data.
* **Endpoint Availability:** Assumes that the API endpoint (**http://api.openweathermap.org/data/2.5/air\_pollution**) is available and functioning correctly.
* **Response Format:** Assumes that the API response follows the documented format, including a **'list'** key with pollution data, a **'main'** key for AQI, and a **'components'** key for pollutant concentrations.
* **Geographical Coordinates:** Assumes that the provided latitude and longitude coordinates are valid and correctly formatted, enabling the API to return data based on these coordinates.
* **Data Completeness:** Assumes that the API response includes all expected data fields, such as AQI and pollutant concentrations; additional handling might be needed if data is missing.
* **Rate Limits:** Assumes that API usage adheres to the rate limits and usage policies specified by the API provider, as exceeding these limits could result in throttling or denial of service.
* **Localization:** Assumes that the data returned by the API is in a standard format, typically in a universal unit like µg/m³ (micrograms per cubic meter) for pollutant concentrations.
* **Error Handling:** Assumes that the code includes appropriate error handling for unexpected responses, such as API outages or errors in the request

LIMITATIONS:

**Data Accuracy**: Variable accuracy and coverage, especially in less monitored areas.

**API Limits**: Rate and quota limits restrict the number of requests and data volume.

**Granularity**: Limited parameters and data resolution may affect detail and precision.

**Cost**: Higher-quality or more frequent data often requires a paid subscription.

**Reliability:** Dependence on third-party service availability and potential API errors.