```
!pip install pandas numpy matplotlib seaborn folium gdown
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
import folium
from branca.colormap import linear

sns.set(style="whitegrid")
```

```
Requirement already satisfied: pandas in /usr/local/lib/python3.12/dist-packages (2.2.2)
Requirement already satisfied: numpy in /usr/local/lib/python3.12/dist-packages (2.0.2)
Requirement already satisfied: matplotlib in /usr/local/lib/python3.12/dist-packages (3.10.0)
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Requirement already satisfied: contourpy>=1.0.1 in /usr/local/lib/python3.12/dist-packages (from matplotlib) (1.3.3)
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Requirement already satisfied: kiwisolver>=1.3.1 in /usr/local/lib/python3.12/dist-packages (from matplotlib) (1.4.9)
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Requirement already satisfied: pillow>=8 in /usr/local/lib/python3.12/dist-packages (from matplotlib) (11.3.0)
Requirement already satisfied: pyparsing>=2.3.1 in /usr/local/lib/python3.12/dist-packages (from matplotlib) (3.2.5)
Requirement already satisfied: branca>=0.6.0 in /usr/local/lib/python3.12/dist-packages (from folium) (0.8.2)
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Requirement already satisfied: MarkupSafe>=2.0 in /usr/local/lib/python3.12/dist-packages (from jinja2>=2.9->folium) (3.0.3)
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Requirement already satisfied: idna<4,>=2.5 in /usr/local/lib/python3.12/dist-packages (from requests->folium) (3.11)
Requirement already satisfied: urllib3<3,>=1.21.1 in /usr/local/lib/python3.12/dist-packages (from requests->folium) (2.5.0)
Requirement already satisfied: certifi>=2017.4.17 in /usr/local/lib/python3.12/dist-packages (from requests->folium) (2025.10.5)
Requirement already satisfied: PySocks!=1.5.7,>=1.5.6 in /usr/local/lib/python3.12/dist-packages (from requests[socks]->gdown) (
```

```
#Example path - replace with your file name
df = pd.read_csv('/content/delhiaqi.csv')
#If using file id from shared Drive link (example only):
# IMPORTANT: Replace <file_id> with the actual file ID from your Google Drive link.
#!gdown --id <file_id> -O delhi_aqi.csv
# df = pd.read_csv("delhi_aqi.csv")

df.head()
```

	date	co	no	no2	o3	so2	pm2_5	pm10	nh3
0	2023-01-01 00:00:00	1655.58	1.66	39.41	5.90	17.88	169.29	194.64	5.83
1	2023-01-01 01:00:00	1869.20	6.82	42.16	1.99	22.17	182.84	211.08	7.66
2	2023-01-01 02:00:00	2510.07	27.72	43.87	0.02	30.04	220.25	260.68	11.40
3	2023-01-01 03:00:00	3150.94	55.43	44.55	0.85	35.76	252.90	304.12	13.55
4	2023-01-01 04:00:00	3471.37	68.84	45.24	5.45	39.10	266.36	322.80	14.19

Next steps: Generate code with df New interactive sheet

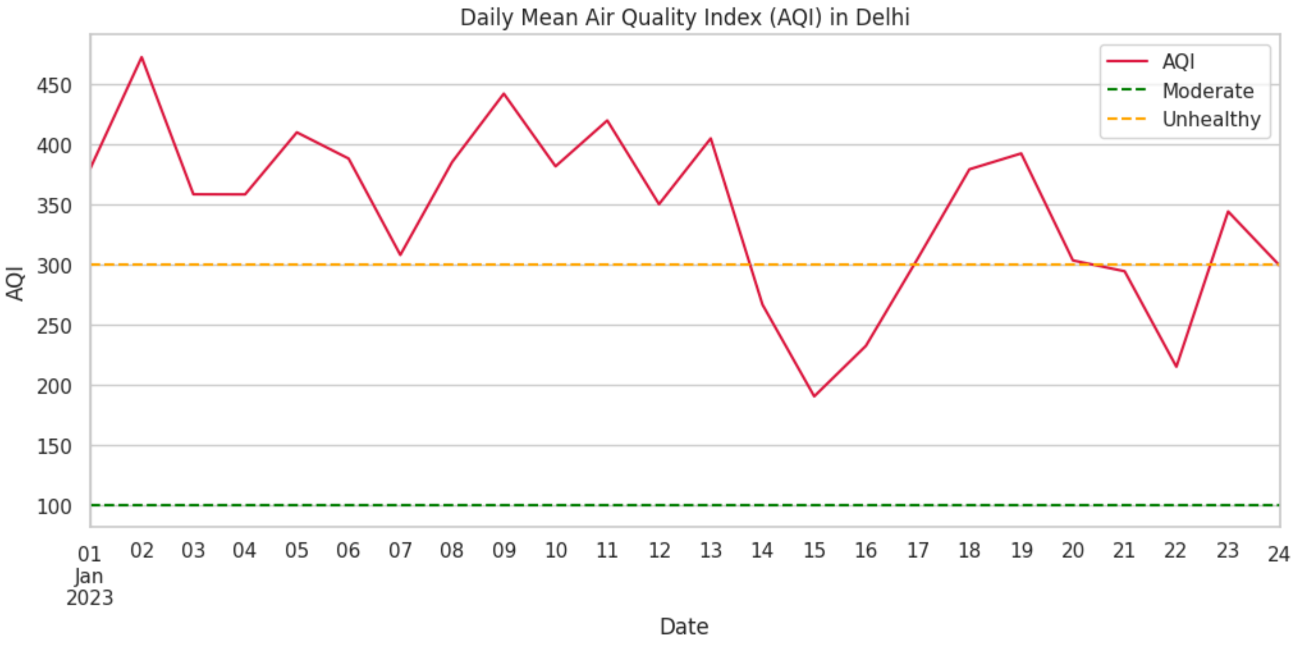
```
df['date'] = pd.to_datetime(df['date'], errors='coerce')
df = df.dropna(subset=['date']).reset_index(drop=True)

#Convert pollutant columns (adjust names if needed)
for col in['pm2_5','pm10']:
  df[col] = pd.to_numeric(df[col], errors='coerce')
  # Fill missing values (forward fill as simple approach)
  df[['pm2_5','pm10']] = df[['pm2_5','pm10']].fillna(method='ffill')
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 561 entries, 0 to 560
Data columns (total 9 columns):
 #   Column  Non-Null Count  Dtype
---  ------  --------------  -----
 0   date    561 non-null    datetime64[ns]
 1   co      561 non-null    float64
 2   no      561 non-null    float64
 3   no2     561 non-null    float64
 4   o3      561 non-null    float64
 5   so2     561 non-null    float64
 6   pm2_5   561 non-null    float64
 7   pm10    561 non-null    float64
 8   nh3     561 non-null    float64
dtypes: datetime64[ns](1), float64(8)
memory usage: 39.6 KB
/tmp/ipython-input-860098366.py:8: FutureWarning: DataFrame.fillna with 'method' is deprecated and will raise in a future versio
  df[['pm2_5','pm10']] = df[['pm2_5','pm10']].fillna(method='ffill')
/tmp/ipython-input-860098366.py:8: FutureWarning: DataFrame.fillna with 'method' is deprecated and will raise in a future versio
  df[['pm2_5','pm10']] = df[['pm2_5','pm10']].fillna(method='ffill')
```

```
# breakpoints (US EPA). REplace with CPCB if asked.
pm25_breakpoints = [
    (0.0, 12.0, 0, 50),
    (12.1, 35.4, 51, 100),
    (35.5, 55.4, 101, 150),
    (55.5, 150.4, 151, 200),
    (150.5, 250.4, 201, 300),
    (250.5, 350.4, 301, 400),
    (350.5, 1000.4, 401, 500),
]

pm10_breakpoints = [
    (0.0, 54.0, 0, 50),
    (54.1, 154.0, 51, 100),
    (154.1, 254, 101, 150),
    (254.1, 354, 151, 200),
    (354.1, 424, 201, 300),
    (425.1, 504, 301, 400),
    (504.1, 604, 401, 500)
]

def calc_subindex(conc, breakpoints):
  if np.isnan(conc): return np.nan
  for (B_lo, B_hi, I_lo, I_hi) in breakpoints:
    if B_lo <= conc <= B_hi:
      return ((I_hi - I_lo)/(B_hi - B_lo)) * (conc - B_lo) + I_lo
  return 500.0

df['aqi_pm25'] = df['pm2_5'].apply(lambda x: calc_subindex(x, pm25_breakpoints))
df['aqi_pm10'] = df['pm10'].apply(lambda x: calc_subindex(x, pm10_breakpoints))
# Overall AQI = max of subindices
df['AQI'] = df[['aqi_pm25', 'aqi_pm10']].max(axis=1)
df[['date','pm2_5','aqi_pm25','pm10', 'aqi_pm10','AQI']].head()
```

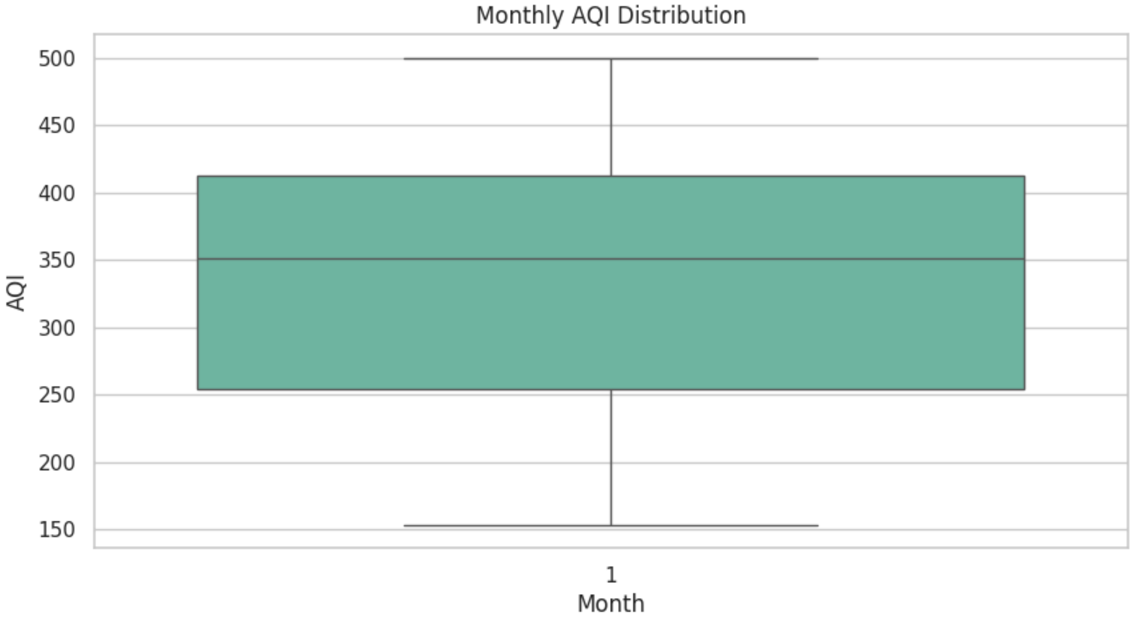
	date	pm2_5	aqi_pm25	pm10	aqi_pm10	AQI
0	2023-01-01 00:00:00	169.29	219.620721	194.64	120.884484	219.620721
1	2023-01-01 01:00:00	182.84	233.048649	211.08	128.948148	233.048649
2	2023-01-01 02:00:00	220.25	270.121622	260.68	154.227427	270.121622
3	2023-01-01 03:00:00	252.90	303.378378	304.12	175.534334	303.378378
4	2023-01-01 04:00:00	266.36	316.717117	322.80	184.696697	316.717117

```
# Daily average AQi
daily = df.set_index('date').resample('D')['AQI'].mean().dropna()
plt.figure(figsize=(12,5))
daily.plot(color="crimson")
plt.title("Daily Mean Air Quality Index (AQI) in Delhi")
plt.ylabel("AQI")
plt.xlabel("Date")
plt.axhline(100, color='green', linestyle='--', label="Moderate")
plt.axhline(300, color='orange', linestyle='--', label="Unhealthy")
plt.legend()
plt.show()
```

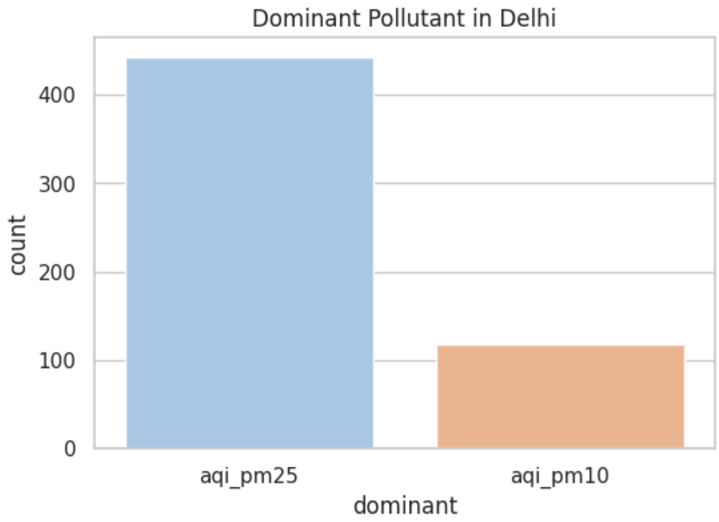


```
df['month'] = df['date'].dt.month
plt.figure(figsize=(10,5))
sns.boxplot(x='month', y='AQI', data=df, palette="Set2")
plt.title("Monthly AQI Distribution")
plt.ylabel("AQI")
plt.xlabel("Month")
plt.show()
```

```
/tmp/ipython-input-3176615326.py:3: FutureWarning:

Passing `palette` without assigning `hue` is deprecated and will be removed in v0.14.0. Assign the `x` variable to `hue` and set

  sns.boxplot(x='month', y='AQI', data=df, palette="Set2")
```



```
df['dominant'] = df[['aqi_pm25', 'aqi_pm10']].idxmax(axis=1)
plt.figure(figsize=(6,4))
sns.countplot(x='dominant', data=df, palette="pastel", hue='dominant', legend=False)
plt.title("Dominant Pollutant in Delhi")
plt.show()
```



```
# Example if Dataset has 'station', 'lat', 'lon'
if all(col in df.columns for col in ['station', 'lat', 'lon']):
  m = folium.Map(location=[28.6, 77.2], zoom_start=10)
  sample = df.dropna(subset=['lat', 'lon', 'AQI']).groupby(['station', 'lat', 'lon'])['AQI'].mean().reset_index()
  colormap = linear.YlOrRd_09.scale(sample['AQI'].min(), sample['AQI'].max())
  for _, row in sample.iterrows():
    folium.CircleMarker(
        location=[row['lat'], row['lon']],
        radius=5,
        color=colormap(row['AQI']),
        fill=True,
        fill_opacity=0.7,
        popup=f"Station: {row['station']}<br>AQI: {row['AQI']}"
    ).add_to(m)
    colormap.add_to(m)
  m
```

AQI Categories (EPA standard)

- 0-50: Good(Green)
- 51-100: Moderate(Yellow)
- 101-150: Unhealthy for Sensitive Groups(Orange)
- 151-200: Unhealthy(Red)
- 201-300: Very Unhealthy(Purple)
- 301-500: Hazardous(Maroon)

Close

```
which month had worst AQI (see boxplot)  -> 400 in 1 month

Which pollutant dominated(see dominant count)  -> aqi_pm25

Daily trend (see Time-series)  ->

Public health insight(AQI often exceeds 200 -> unhealthy) 300 has
JAN 2023
```

which month had worst AQI (see boxplot) -> 400 in 1 month

Which pollutant dominated(see dominant count) -> aqi_pm25

Daily trend (see Time-series) ->

Public health insight(AQI often exceeds 200 -> unhealthy) 300 has more AQI in JAN 2023

Start coding or generate with AI.