```
import pandas as pd
import plotly.io as pio
import plotly.graph_objects as go
pio.templates.default = "plotly_white"
data = pd.read_csv('AirQualityExcel.csv')
print(data.head())
```

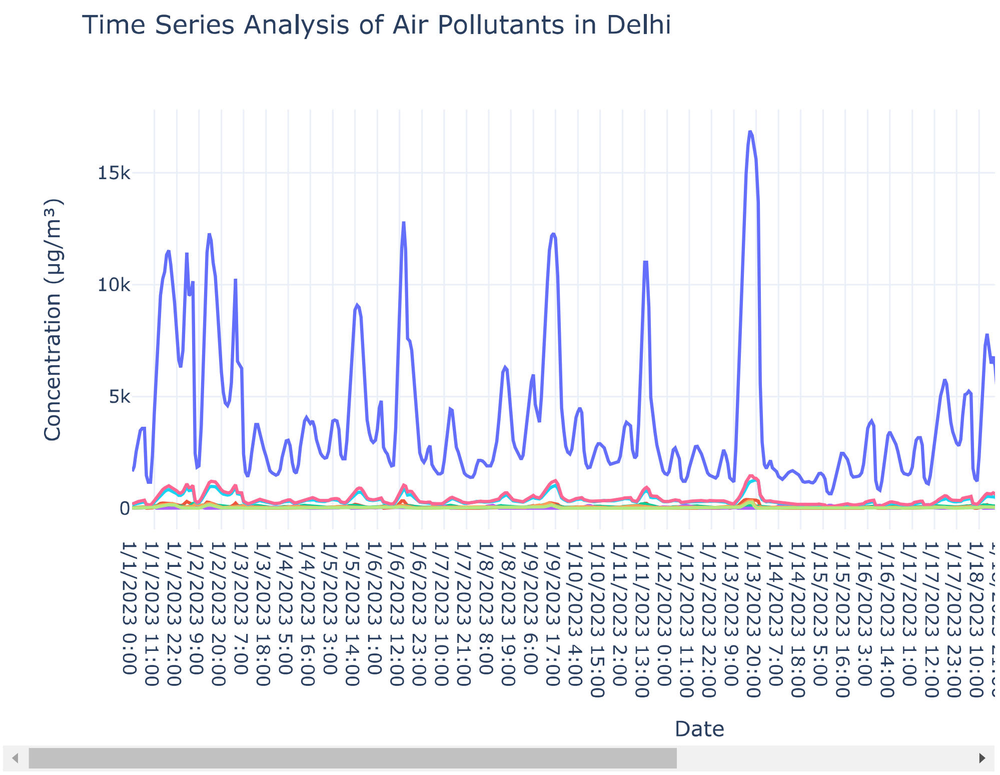
```
             date       co     no    no2    o3    so2   pm2_5    pm10    nh3
0  1/1/2023 0:00  1655.58   1.66  39.41  5.90  17.88  169.29  194.64   5.83
1  1/1/2023 1:00  1869.20   6.82  42.16  1.99  22.17  182.84  211.08   7.66
2  1/1/2023 2:00  2510.07  27.72  43.87  0.02  30.04  220.25  260.68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

```
data['date'] = pd.to_datetime(data['date'])
```

```
print(data.describe())
```

```
                      date            co          no         no2          o3  \
count                  561    561.000000  561.000000  561.000000  561.000000
mean   2023-01-12 16:00:00   3814.942210   51.181979   75.292496   30.141943
min    2023-01-01 00:00:00    654.220000    0.000000   13.370000    0.000000
25%    2023-01-06 20:00:00   1708.980000    3.380000   44.550000    0.070000
50%    2023-01-12 16:00:00   2590.180000   13.300000   63.750000   11.800000
75%    2023-01-18 12:00:00   4432.680000   59.010000   97.330000   47.210000
max    2023-01-24 08:00:00  16876.220000  425.580000  263.210000  164.510000
std                    NaN   3227.744681   83.904476   42.473791   39.979405

              so2        pm2_5         pm10         nh3
count  561.000000   561.000000   561.000000  561.000000
mean    64.655936   358.256364   420.988414   26.425062
min      5.250000    60.100000    69.080000    0.630000
25%     28.130000   204.450000   240.900000    8.230000
50%     47.210000   301.170000   340.900000   14.820000
75%     77.250000   416.650000   482.570000   26.350000
max    511.170000  1310.200000  1499.270000  267.510000
std     61.073080   227.359117   271.287026   36.563094
```

```
# Import necessary modules
import pandas as pd
import plotly.graph_objects as go

# Load the data from the CSV file
data = pd.read_csv("AirQualityExcel.csv")

# Create a new figure
fig = go.Figure()

# Iterate over each air pollutant and add a trace to the figure
for pollutant in ['co', 'no', 'no2', 'o3', 'so2', 'pm2_5', 'pm10', 'nh3']:
    fig.add_trace(go.Scatter(x=data['date'], y=data[pollutant], mode='lines',
                             name=pollutant))

# Update layout of the figure
fig.update_layout(title='Time Series Analysis of Air Pollutants in Delhi',
                  xaxis_title='Date', yaxis_title='Concentration (µg/m³)')

# Show the figure
fig.show()
```

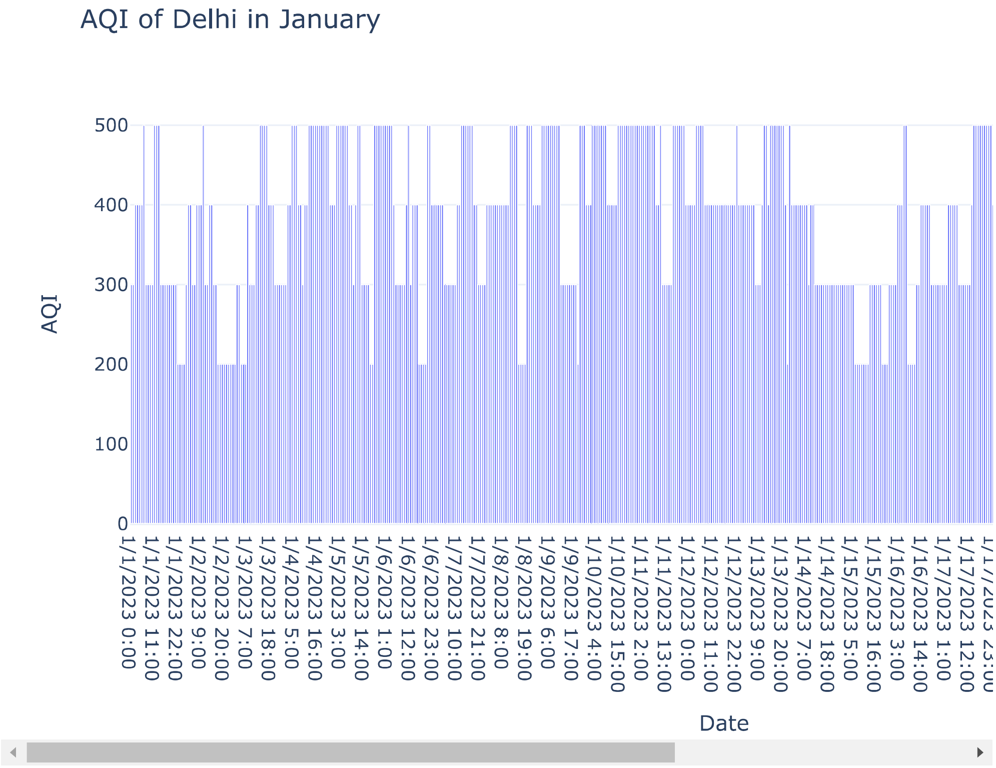


```
# Define AQI breakpoints and corresponding AQI values
aqi_breakpoints = [
    (0, 12.0, 50), (12.1, 35.4, 100), (35.5, 55.4, 150),
    (55.5, 150.4, 200), (150.5, 250.4, 300), (250.5, 350.4, 400),
    (350.5, 500.4, 500)
]

def calculate_aqi(pollutant_name, concentration):
    for low, high, aqi in aqi_breakpoints:
        if low <= concentration <= high:
            return aqi
    return None

def calculate_overall_aqi(row):
    aqi_values = []
    pollutants = ['co', 'no', 'no2', 'o3', 'so2', 'pm2_5', 'pm10', 'nh3']
    for pollutant in pollutants:
        aqi = calculate_aqi(pollutant, row[pollutant])
        if aqi is not None:
            aqi_values.append(aqi)
    return max(aqi_values)

# Calculate AQI for each row
data['AQI'] = data.apply(calculate_overall_aqi, axis=1)

# Define AQI categories
aqi_categories = [
    (0, 50, 'Good'), (51, 100, 'Moderate'), (101, 150, 'Unhealthy for Sensitive Groups'),
    (151, 200, 'Unhealthy'), (201, 300, 'Very Unhealthy'), (301, 500, 'Hazardous')
]

def categorize_aqi(aqi_value):
    for low, high, category in aqi_categories:
        if low <= aqi_value <= high:
            return category
    return None

# Categorize AQI
data['AQI Category'] = data['AQI'].apply(categorize_aqi)
print(data.head())
```

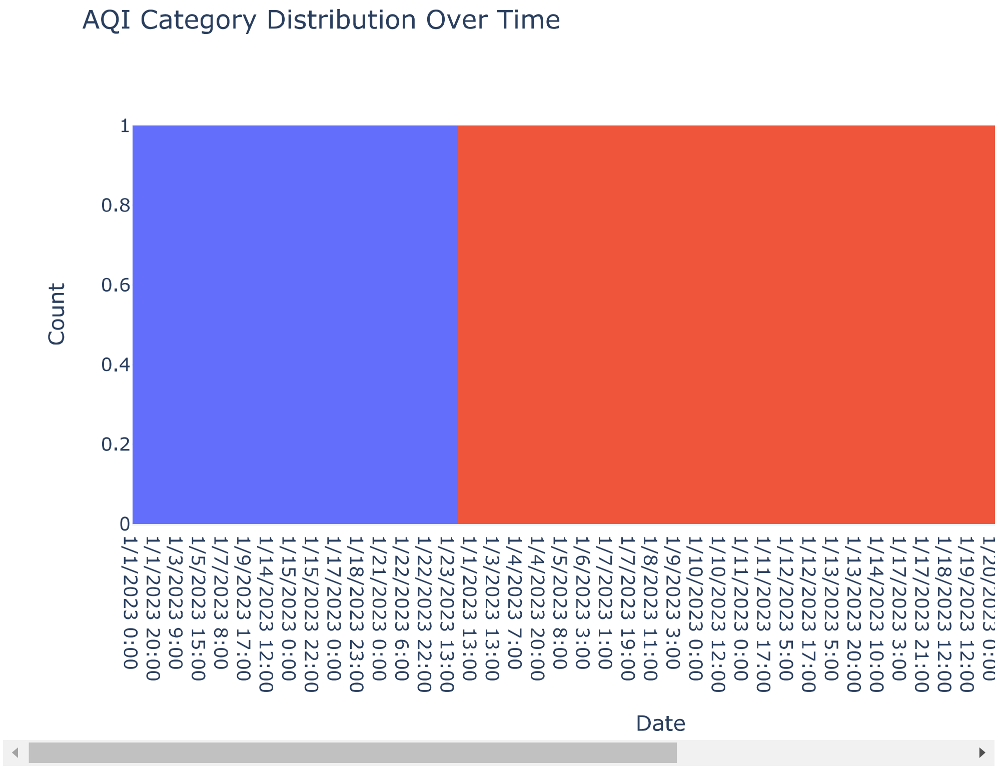
```
            date       co    no    no2    o3    so2   pm2_5    pm10   nh3  \
0  1/1/2023 0:00  1655.58  1.66  39.41  5.90  17.88  169.29  194.64  5.83
```

```
    1  1/1/2023 1:00  1869.20   6.82  42.16  1.99  22.17  182.84  211.08   7.66
    2  1/1/2023 2:00  2510.07  27.72  43.87  0.02  30.04  220.25  260.68  11.40
    3  1/1/2023 3:00  3150.94  55.43  44.55  0.85  35.76  252.90  304.12  13.55
    4  1/1/2023 4:00  3471.37  68.84  45.24  5.45  39.10  266.36  322.80  14.19

       AQI    AQI Category
    0  300  Very Unhealthy
    1  300  Very Unhealthy
    2  400       Hazardous
    3  400       Hazardous
    4  400       Hazardous
```

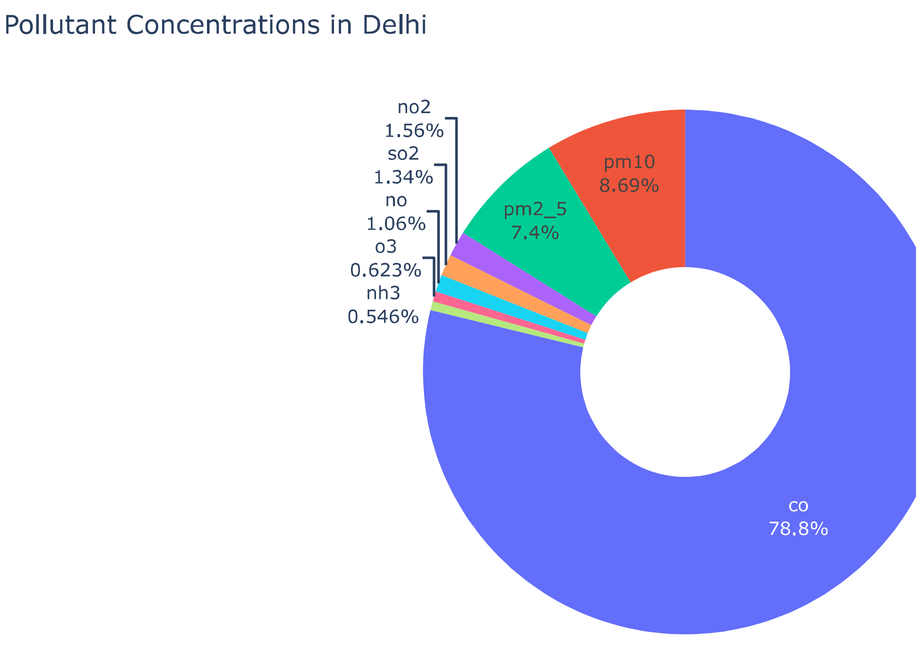
```
# AQI over time

import plotly.express as px
fig = px.bar(data, x="date", y="AQI",
             title="AQI of Delhi in January")
fig.update_xaxes(title="Date")
fig.update_yaxes(title="AQI")
fig.show()
```



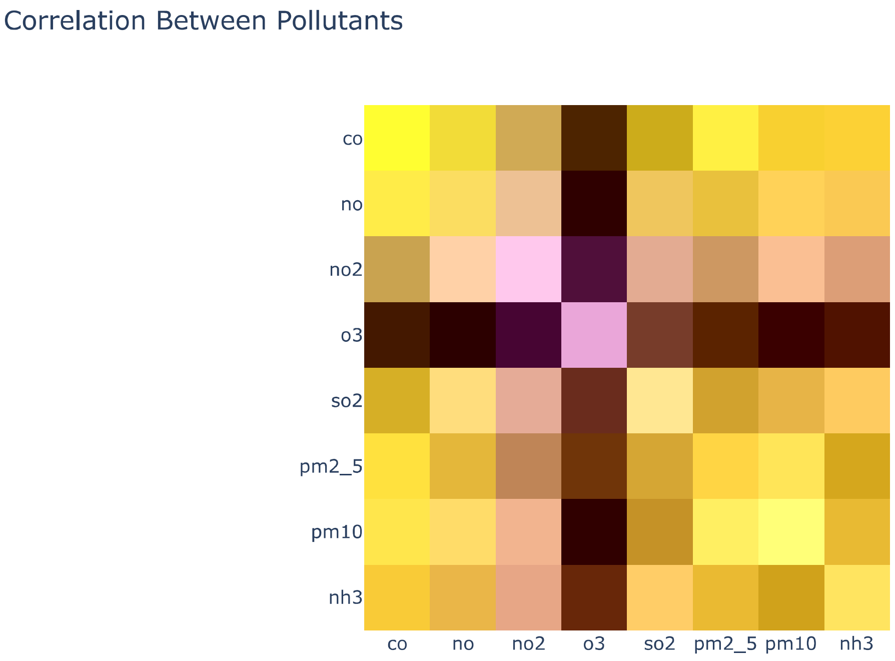
```
fig = px.histogram(data, x="date",
                   color="AQI Category",
                   title="AQI Category Distribution Over Time")
fig.update_xaxes(title="Date")
fig.update_yaxes(title="Count")
fig.show()
```



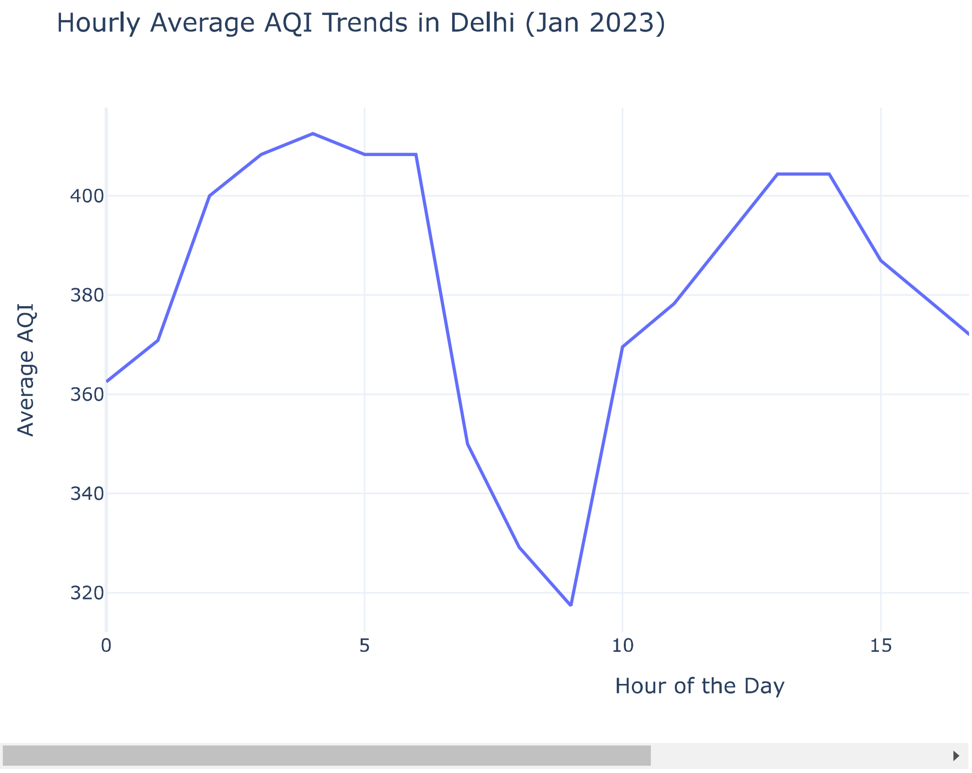
```
 #Define pollutants and their colors
pollutants = ["co", "no", "no2", "o3", "so2", "pm2_5", "pm10", "nh3"]
pollutant_colors = px.colors.qualitative.Plotly

# Calculate the sum of pollutant concentrations
total_concentrations = data[pollutants].sum()

# Create a DataFrame for the concentrations
concentration_data = pd.DataFrame({
    "Pollutant": pollutants,
    "Concentration": total_concentrations
})

# Create a donut plot for pollutant concentrations
fig = px.pie(concentration_data, names="Pollutant", values="Concentration",
             title="Pollutant Concentrations in Delhi",
             hole=0.4, color_discrete_sequence=pollutant_colors)

# Update layout for the donut plot
fig.update_traces(textinfo="percent+label")
fig.update_layout(legend_title="Pollutant")

# Show the donut plot
fig.show()
```


Pollutant Concentrations in Delhi

```
# Correlation Between Pollutants
correlation_matrix = data[pollutants].corr()
fig = px.imshow(correlation_matrix, x=pollutants,
                y=pollutants, title="Correlation Between Pollutants")
fig.show()
```


Correlation Between Pollutants

```
# Extract the hour from the date
data['Hour'] = pd.to_datetime(data['date']).dt.hour

# Calculate hourly average AQI
hourly_avg_aqi = data.groupby('Hour')['AQI'].mean().reset_index()

# Create a line plot for hourly trends in AQI
fig = px.line(hourly_avg_aqi, x='Hour', y='AQI',
              title='Hourly Average AQI Trends in Delhi (Jan 2023)')
fig.update_xaxes(title="Hour of the Day")
fig.update_yaxes(title="Average AQI")
fig.show()
```



```
import pandas as pd
import plotly.express as px

# Assuming 'data' is your DataFrame
# Convert 'date' column to datetime format
data['date'] = pd.to_datetime(data['date'])

# Average AQI by Day of the Week
data['Day_of_Week'] = data['date'].dt.day_name()
average_aqi_by_day = data.groupby('Day_of_Week')['AQI'].mean().reindex(['Monday', 'Tuesday', 'Wednesday', 'Thursday', '

# Plotting
fig = px.bar(average_aqi_by_day, x=average_aqi_by_day.index, y='AQI',
              title='Average AQI by Day of the Week')
fig.update_xaxes(title="Day of the Week")
fig.update_yaxes(title="Average AQI")
fig.show()
```

Average AQI by Day of the Week