Loading Dataset

In [1]:

```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sb
from sklearn.model_selection import train_test_split
from sklearn.linear_model import LinearRegression
from sklearn.metrics import mean_squared_error
from sklearn.metrics import r2_score
```

In [2]:

```
df = pd.read_csv("airquality.csv")
```

Exploratory Data Analysis

Data Info

In [3]:

```
rows_total = df.shape[0]
print(f"Total rows: {rows_total}")
```

```
Total rows: 153
```

In [4]:

```
df.head()
```

Out[4]:

	Number	Ozone	Solar.R	Wind	Temp	Month	Day
0	1	41.0	190.0	7.4	67	5	1
1	2	36.0	118.0	8.0	72	5	2
2	3	12.0	149.0	12.6	74	5	3
3	4	18.0	313.0	11.5	62	5	4
4	5	NaN	NaN	14.3	56	5	5

In [5]:

```
df.describe()
```

Out[5]:

	Number	Ozone	Solar.R	Wind	Temp	Month	Day
count	153.000000	116.000000	146.000000	153.000000	153.000000	153.000000	153.000000
mean	77.000000	42.129310	185.931507	9.957516	77.882353	6.993464	15.803922
std	44.311398	32.987885	90.058422	3.523001	9.465270	1.416522	8.864520
min	1.000000	1.000000	7.000000	1.700000	56.000000	5.000000	1.000000
25%	39.000000	18.000000	115.750000	7.400000	72.000000	6.000000	8.000000
50%	77.000000	31.500000	205.000000	9.700000	79.000000	7.000000	16.000000
75%	115.000000	63.250000	258.750000	11.500000	85.000000	8.000000	23.000000
max	153.000000	168.000000	334.000000	20.700000	97.000000	9.000000	31.000000

In [6]:

```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 153 entries, 0 to 152
Data columns (total 7 columns):
 #   Column   Non-Null Count  Dtype  
---  ------   --------------  -----  
 0   Number   153 non-null    int64  
 1   Ozone    116 non-null    float64
 2   Solar.R  146 non-null    float64
 3   Wind     153 non-null    float64
 4   Temp     153 non-null    int64  
 5   Month    153 non-null    int64  
 6   Day      153 non-null    int64  
dtypes: float64(3), int64(4)
memory usage: 8.5 KB
```

Duplicates

In [7]:

```
df.duplicated()
```

Out[7]:

```
0      False
1      False
2      False
3      False
4      False
       ...  
148    False
149    False
150    False
151    False
152    False
Length: 153, dtype: bool
```

Missing Values

```
In [8]: df.isnull().sum()
```

```
Out[8]: Number      0
        Ozone      37
        Solar.R     7
        Wind        0
        Temp        0
        Month       0
        Day         0
        dtype: int64
```

Dropping all missing values

```
In [9]: df.dropna(inplace = True)
```

```
In [10]: df.isnull().sum()
```

```
Out[10]: Number     0
         Ozone      0
         Solar.R    0
         Wind       0
         Temp       0
         Month      0
         Day        0
         dtype: int64
```

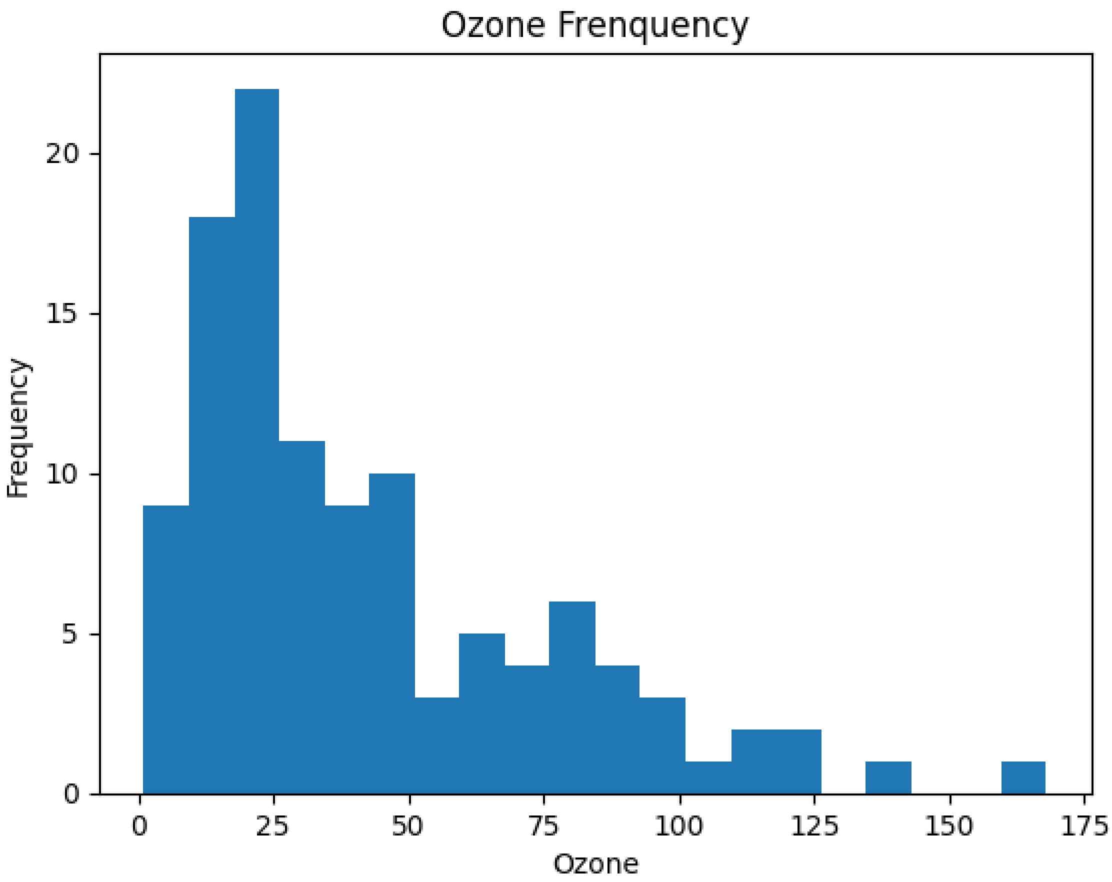
```
In [11]: new_total_rows = df.shape[0]
         print(f"After dropping mising values, new total rows: {new_total_rows}")
         print(f"Dropped rows: {rows_total - new_total_rows}")
```

```
After dropping mising values, new total rows: 111
Dropped rows: 42
```

```
In [12]: df.to_csv("cleaned_data.csv", index = False)
```

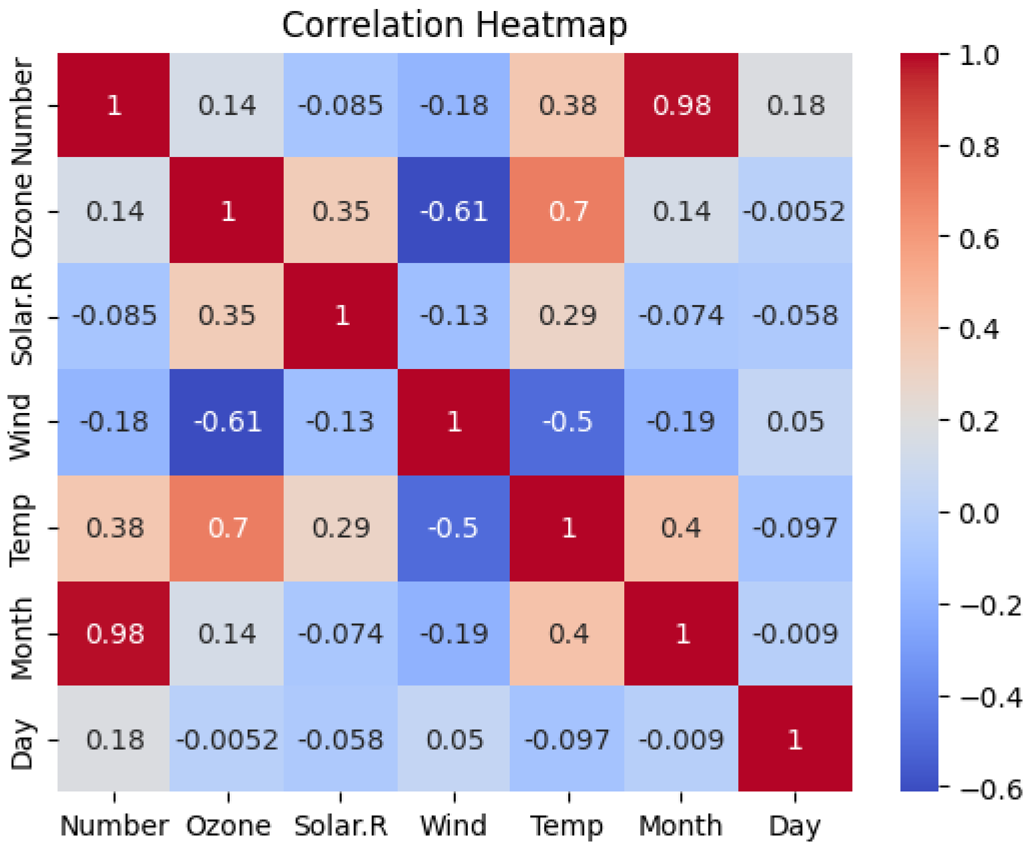
Visual

```
In [13]: plt.hist(df['Ozone'], bins = 20)
         plt.xlabel("Ozone")
         plt.ylabel("Frequency")
         plt.title("Ozone Frenquency")
         plt.show()
```



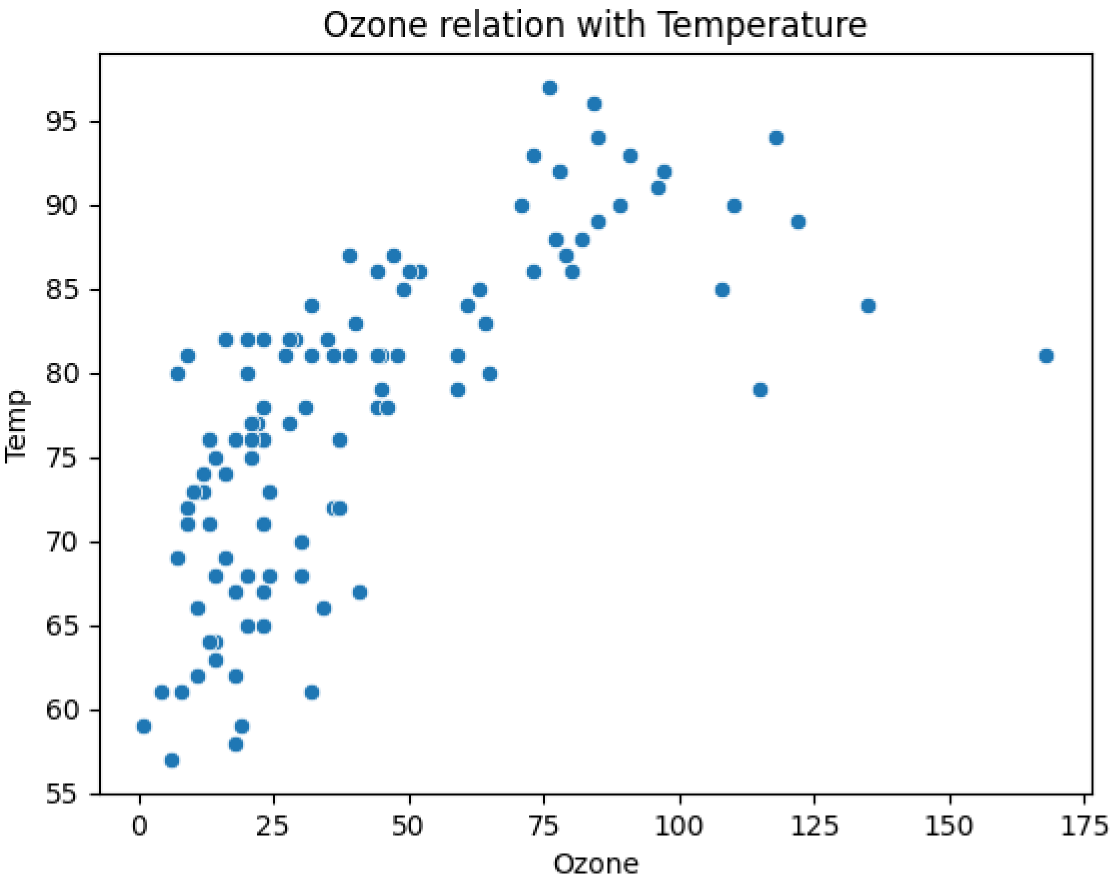
In [14]:

```
correlation_matrix = df.corr()
sb.heatmap(correlation_matrix, annot=True, cmap='coolwarm')
plt.title('Correlation Heatmap')
plt.show()
```



In [15]:

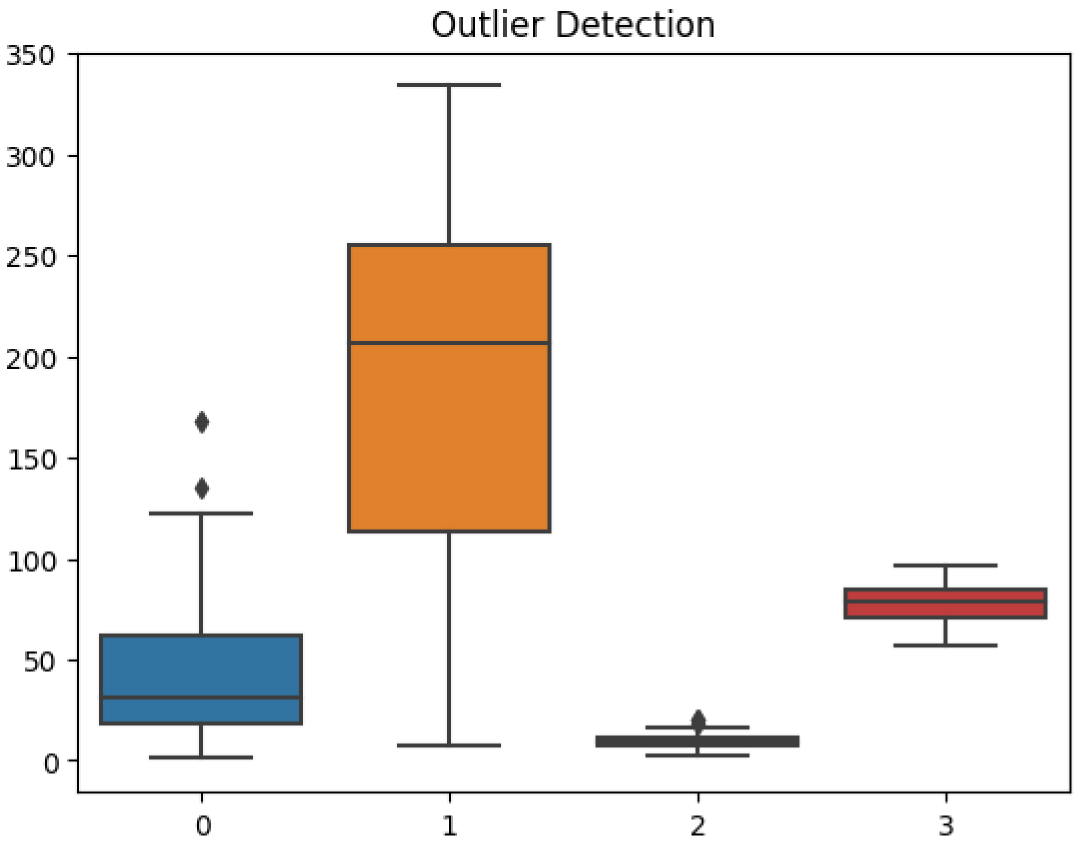
```
sb.scatterplot(x = "Ozone", y = "Temp", data = df)
plt.title("Ozone relation with Temperature")
plt.show()
```



Outliers

In [16]:

```
sb.boxplot(data = [df['Ozone'], df['Solar.R'], df['Wind'], df['Temp']])
plt.title("Outlier Detection")
plt.show()
```



No need to remove outliers

Training ML Model

Splitting Dataset

In [17]:

```
data = pd.read_csv("cleaned_data.csv")
```

In [18]:

```
features = ['Ozone', 'Solar.R']
target = ['Temp']
X = data[features]
y = data[target]
```

In [19]:

```
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size = 0.3, random_s
```

In [20]:

```
X_train.to_csv("xtrain.csv")
X_test.to_csv("xtest.csv")
y_train.to_csv("ytrain.csv")
y_test.to_csv("ytest.csv")
```

Training Linear Regression Model

In [21]:

```
model = LinearRegression()
model.fit(X_train, y_train)
```

Out[21]:

```
▾ LinearRegression
LinearRegression()
```

In [45]:

```
y_pred = model.predict(X_test)
```

Evaluating the model

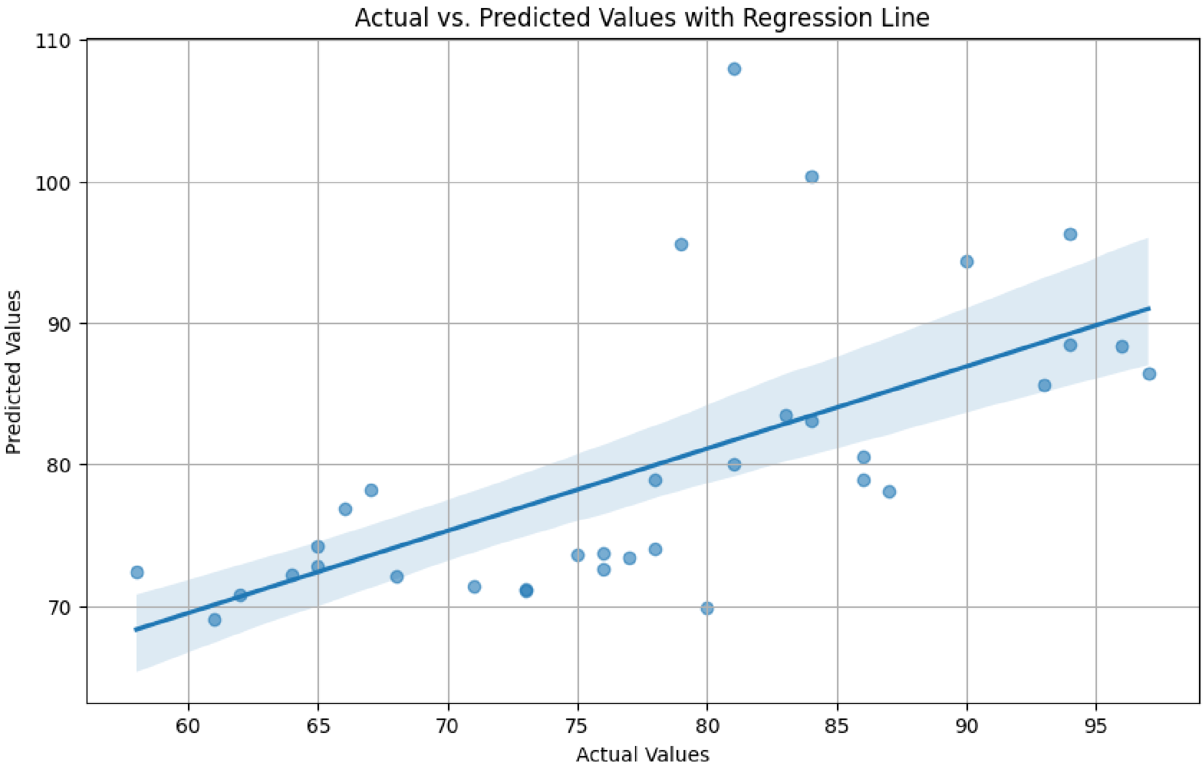
In [65]:

```
mse = mean_squared_error(y_test, y_pred)
rmse = mse ** 0.5
print(f"Root mean squared error of the prediction: {rmse}")
```

```
Root mean squared error of the prediction: 8.9073643631379
```

In [66]:

```
plt.figure(figsize=(10, 6))
sb.regplot(x=y_test, y=y_pred, scatter_kws={'alpha':0.6})
plt.title('Actual vs. Predicted Values with Regression Line')
plt.xlabel('Actual Values')
plt.ylabel('Predicted Values')
plt.grid(True)
plt.show()
```



We have successfully predicted the target variable using regression model