Import software libraries

In [1]:
```python
import sys                          # Read system parameters
import os                           # Interact with the operating system
import numpy as np                  # Work with multi-dimensional arrays and matrices
import pandas as pd                 # Manipulate and analyze data
import matplotlib                   # Create 2D charts
import matplotlib as mpl
import matplotlib.pyplot as plt
import scipy as sp                  # Perform scientific computing and advanced mathematics
import sklearn                      # Perform data mining and analysis
import seaborn as sns               # Perform data visualization

# Summarize software libraries used
print('Libraries used in this project:')
print('- NumPy {}'.format(np.__version__))
print('- Pandas {}'.format(pd.__version__))
print('- Matplotlib {}'.format(matplotlib.__version__))
print('- SciPy {}'.format(sp.__version__))
print('- Scikit-learn {}'.format(sklearn.__version__))
print('- Python {}\n'.format(sys.version))
```

```
Libraries used in this project:
- NumPy 1.19.2
- Pandas 1.1.3
- Matplotlib 3.3.2
- SciPy 1.5.2
- Scikit-learn 0.23.2
- Python 3.8.5 (default, Sep  3 2020, 21:29:08) [MSC v.1916 64 bit (AMD64)]
```

Load the dataset

In [2]:
```python
# Load the dataset as a pandas DataFrame from ./seoul_bike_data/seoul_bike_data.csv
df = pd.read_csv("seoul_bike_data.csv")
df
```

Out[2]:

	bikes_rented	temp	humidity	wind_speed	visibility	dew_temp	solar_rad	rainfall	snowfall
0	254	-5.2	37	2.2	2000	-17.6	0.0	0.0	0.0
1	204	-5.5	38	0.8	2000	-17.6	0.0	0.0	0.0
2	173	-6.0	39	1.0	2000	-17.7	0.0	0.0	0.0
3	107	-6.2	40	0.9	2000	-17.6	0.0	0.0	0.0
4	78	-6.0	36	2.3	2000	-18.6	0.0	0.0	0.0
...	...	...	...	...	...	...	...	...	...
8389	1003	4.2	34	2.6	1894	-10.3	0.0	0.0	0.0
8390	764	3.4	37	2.3	2000	-9.9	0.0	0.0	0.0
8391	694	2.6	39	0.3	1968	-9.9	0.0	0.0	0.0
8392	712	2.1	41	1.0	1859	-9.8	0.0	0.0	0.0
8393	584	1.9	43	1.3	1909	-9.3	0.0	0.0	0.0

8394 rows × 9 columns

Get acquainted with the dataset

In [3]:
```python
# View data types and see if there are missing entries.
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 8394 entries, 0 to 8393
Data columns (total 9 columns):
 #   Column        Non-Null Count  Dtype  
---  ------        --------------  -----  
 0   bikes_rented  8394 non-null   int64  
 1   temp          8394 non-null   float64
 2   humidity      8394 non-null   int64  
 3   wind_speed    8394 non-null   float64
 4   visibility    8394 non-null   int64  
 5   dew_temp      8394 non-null   float64
 6   solar_rad     8394 non-null   float64
 7   rainfall      8394 non-null   float64
 8   snowfall      8394 non-null   float64
dtypes: float64(6), int64(3)
memory usage: 590.3 KB
```

In [4]:
```python
df.isnull().sum()
```

Out[4]:
```
bikes_rented    0
temp            0
humidity        0
wind_speed      0
visibility      0
dew_temp        0
solar_rad       0
rainfall        0
snowfall        0
dtype: int64
```

Show example records

In [5]:
```python
# View first 10 records.
df.head(10)
```

Out[5]:

	bikes_rented	temp	humidity	wind_speed	visibility	dew_temp	solar_rad	rainfall	snowfall
0	254	-5.2	37	2.2	2000	-17.6	0.00	0.0	0.0
1	204	-5.5	38	0.8	2000	-17.6	0.00	0.0	0.0
2	173	-6.0	39	1.0	2000	-17.7	0.00	0.0	0.0
3	107	-6.2	40	0.9	2000	-17.6	0.00	0.0	0.0
4	78	-6.0	36	2.3	2000	-18.6	0.00	0.0	0.0
5	100	-6.4	37	1.5	2000	-18.7	0.00	0.0	0.0
6	181	-6.6	35	1.3	2000	-19.5	0.00	0.0	0.0
7	460	-7.4	38	0.9	2000	-19.3	0.00	0.0	0.0
8	930	-7.6	37	1.1	2000	-19.8	0.01	0.0	0.0
9	490	-6.5	27	0.5	1928	-22.4	0.23	0.0	0.0

Examine a general summary of statistics

In [6]:
```python
# View summary statistics (mean, standard deviation, min, max, etc.) for each feature.
df.describe()
```

Out[6]:

	bikes_rented	temp	humidity	wind_speed	visibility	dew_temp	solar_rad	rainfall	snowfall
count	8394.000000	8394.000000	8394.000000	8394.000000	8394.000000	8394.000000	8394.000000	8394.000000	8394.000000
mean	731.374792	12.812009	58.074696	1.740481	1433.226590	3.964260	0.572427	0.149261	0.077949
std	643.616638	12.108977	20.483539	1.026341	609.803729	13.242399	0.870429	1.126075	0.445800
min	2.000000	-17.800000	0.000000	0.100000	27.000000	-30.600000	0.000000	0.000000	0.000000
25%	214.000000	3.100000	42.000000	1.000000	932.250000	-5.100000	0.000000	0.000000	0.000000
50%	546.000000	13.600000	57.000000	1.500000	1690.000000	4.800000	0.010000	0.000000	0.000000
75%	1088.000000	22.700000	74.000000	2.300000	2000.000000	15.200000	0.940000	0.000000	0.000000
max	3556.000000	39.400000	98.000000	7.400000	2000.000000	27.200000	3.520000	35.000000	8.800000

Look for columns that correlate with `bikes_rented`

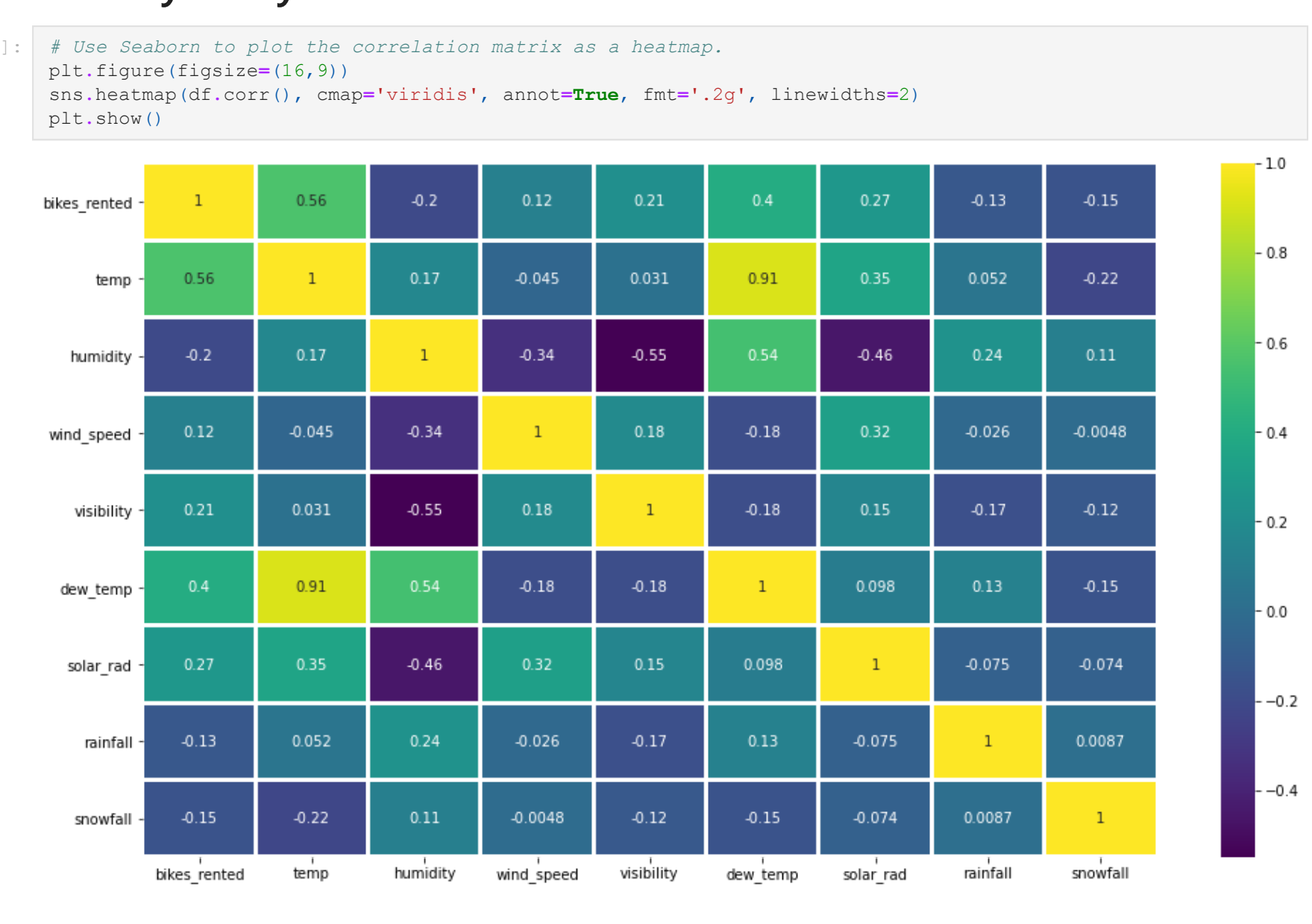
In [7]:
```python
# View the correlation values for each feature compared to the label.
df.corr()
```

Out[7]:

	bikes_rented	temp	humidity	wind_speed	visibility	dew_temp	solar_rad	rainfall	snowfall
bikes_rented	1.000000	0.563440	-0.201466	0.120961	0.213989	0.401160	0.272748	-0.128794	-0.151881
temp	0.563440	1.000000	0.165484	-0.044827	0.031410	0.914372	0.354692	0.052120	-0.218070
humidity	-0.201466	0.165484	1.000000	-0.336857	-0.549300	0.538730	-0.457904	0.237436	0.110487
wind_speed	0.120961	-0.044827	-0.336857	1.000000	0.184935	-0.182518	0.321812	-0.025538	-0.004840
visibility	0.213989	0.031410	-0.549300	0.184935	1.000000	-0.180199	0.154676	-0.169727	-0.123300
dew_temp	0.401160	0.914372	0.538730	-0.182518	-0.180199	1.000000	0.098152	0.127034	-0.149969
solar_rad	0.272748	0.354692	-0.457904	0.321812	0.154676	0.098152	1.000000	-0.074607	-0.073923
rainfall	-0.128794	0.052120	0.237436	-0.025538	-0.169727	0.127034	-0.074607	1.000000	0.008712
snowfall	-0.151881	-0.218070	0.110487	-0.004840	-0.123300	-0.149969	-0.073923	0.008712	1.000000

Visually analyze cross correlations

In [8]:
```python
# Use Seaborn to plot the correlation matrix as a heatmap.
plt.figure(figsize=(16,9))
sns.heatmap(df.corr(), cmap='viridis', annot=True, fmt='.2g', linewidths=2)
plt.show()
```



Use histograms to visualize the distribution of all features

In [9]:
```python
# Use Matplotlib to plot distribution histograms for all features.

plt.figure(figsize=(20,20))
plt.subplot(4,2,1)
df["bikes_rented"].plot(kind="hist")
plt.title("Bikes Rented")
plt.subplot(4,2,2)
df["temp"].plot(kind="hist")
plt.title("Temp")
plt.subplot(4,2,3)
df["humidity"].plot(kind="hist")
plt.title("Humidity")
plt.subplot(4,2,4)
df["wind_speed"].plot(kind="hist")
plt.title("wind_speed")
plt.subplot(4,2,5)
df["visibility"].plot(kind="hist")
plt.title("visibility")
plt.subplot(4,2,6)
df["dew_temp"].plot(kind="hist")
plt.title("dew_temp")
plt.subplot(4,2,7)
df["solar_rad"].plot(kind="hist")
plt.title("solar_rad")
plt.subplot(4,2,8)
df["rainfall"].plot(kind="hist")
plt.title("rainfall")
plt.show()
```

Split the data into training and testing sets and labels

In [10]:
```python
# Split the training and test datasets and their labels.

# Compare the number of rows and columns in the original data to the training and test sets.

from sklearn.model_selection import train_test_split
```

In [11]:
```python
df.shape
```

Out[11]:
```
(8394, 9)
```

In [12]:
```python
X = df.iloc[:,1:]
y = df.iloc[:,0]
```

In [13]:
```python
X.values, y.values
```

Out[13]:
```
(array([[-5.2, 37. ,  2.2, ...,  0. ,  0. ,  0. ],
        [-5.5, 38. ,  0.8, ...,  0. ,  0. ,  0. ],
        [-6. , 39. ,  1. , ...,  0. ,  0. ,  0. ],
        ...,
        [ 2.6, 39. ,  0.3, ...,  0. ,  0. ,  0. ],
        [ 2.1, 41. ,  1. , ...,  0. ,  0. ,  0. ],
        [ 1.9, 43. ,  1.3, ...,  0. ,  0. ,  0. ]]),
 array([254, 204, 173, ..., 694, 712, 584], dtype=int64))
```

In [14]:
```python
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, random_state=0)
```

In [15]:
```python
X_train.shape, y_train.shape
```

Out[15]:
```
((6715, 8), (6715,))
```

Build and test an initial linear regression model

In [16]:
```python
# Create a linear regression model.

# Fit the model using training data and labels.

from sklearn.linear_model import LinearRegression
```

In [17]:
```python
lr = LinearRegression()
```

In [18]:
```python
lr.fit(X_train,y_train)
```

Out[18]:
```
LinearRegression()
```

Use the holdout dataset to test the model

In [19]:
```python
# Print the regressor model's score using the test data and labels.

lr.score(X_test,y_test)
```

Out[19]:
```
0.4478627291734715
```

Compare the first ten predictions to actual values

In [20]:
```python
# Make predictions on the test set.

# View examples comparing actual bike rentals to predicted bike rentals.
```

In [21]:
```python
lr_pred = lr.predict(X_test)
```

In [22]:
```python
lr_pred[:10]
```

Out[22]:
```
array([ 857.323119  ,  751.8098849 ,  655.08069967, 1226.26561471,
       1590.38483999,  285.88722901, 1454.77870554,  711.79165875,
        325.36163583,  598.10222996])
```

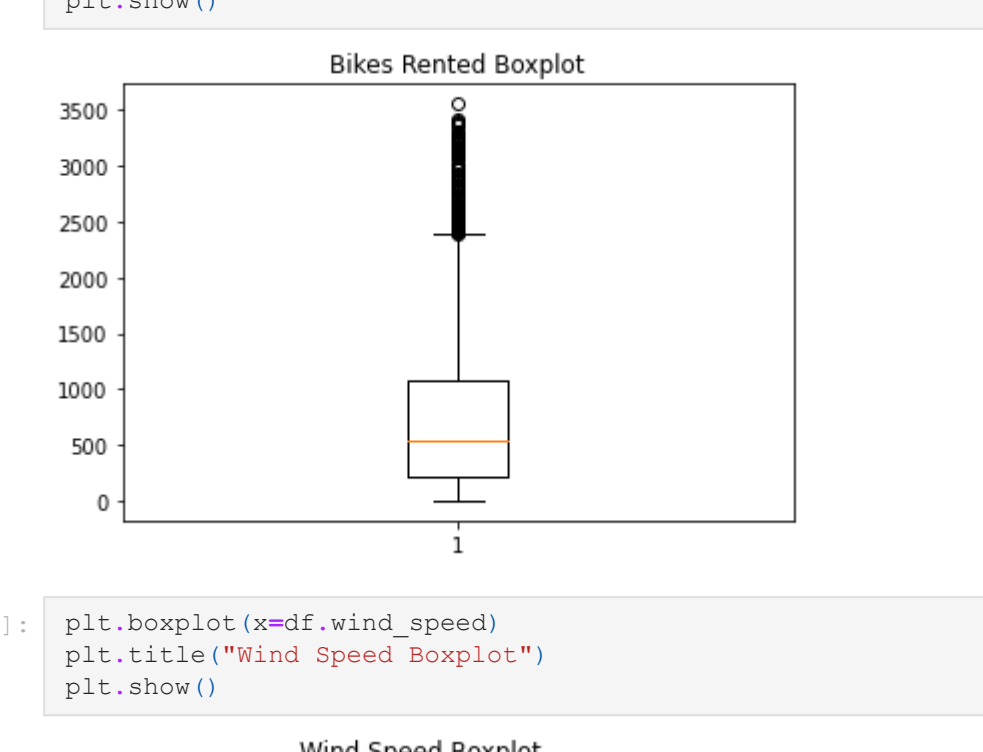
In [23]:
```python
y_test[:10]
```

Out[23]:
```
2417     946
2933    1033
7268    1255
6342    2022
5697    1697
1259     184
5622     920
2431     616
1916     388
2650     668
Name: bikes_rented, dtype: int64
```

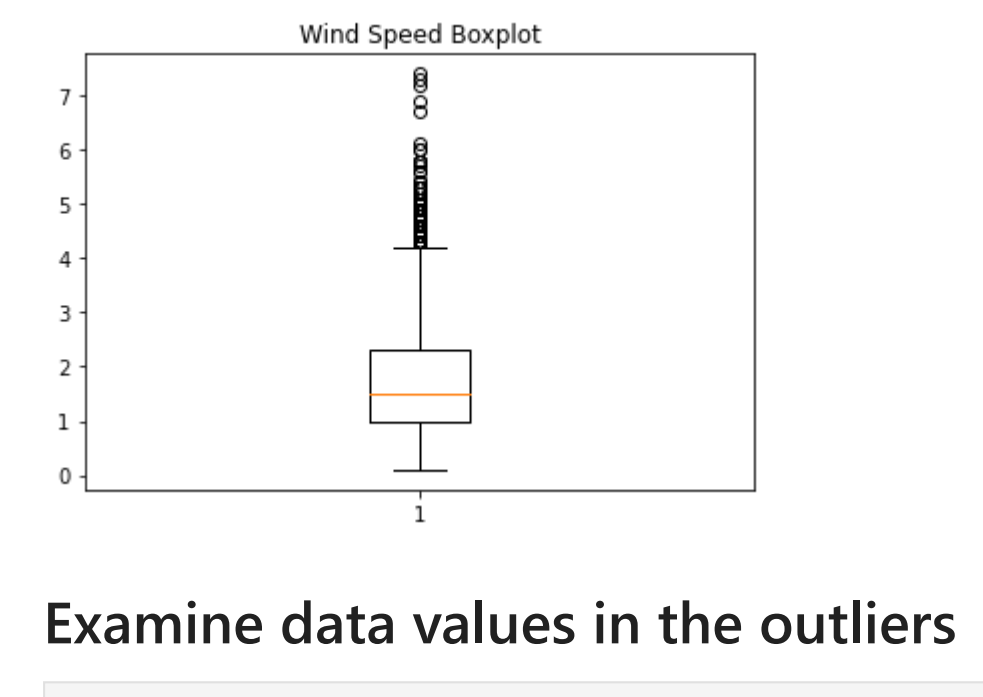
Identify outliers

In [24]:
```python
# Use Matplotlib to create box plot distributions for bikes rented and wind speed.

plt.boxplot(x=df.bikes_rented)
plt.title("Bikes Rented Boxplot")
plt.show()
```



In [25]:
```python
plt.boxplot(x=df.wind_speed)
plt.title("Wind Speed Boxplot")
plt.show()
```



Examine data values in the outliers

In [26]:
```python
# Show rows that exceed 3,500 bikes rented.
df[df["bikes_rented"] > 3500]
```

Out[26]:

	bikes_rented	temp	humidity	wind_speed	visibility	dew_temp	solar_rad	rainfall	snowfall
4743	3556	24.1	57	2.9	1301	15.0	0.56	0.0	0.0

In [27]:
```python
# Show rows with wind speed greater than 6 meters per second.
df[df["wind_speed"] > 6]
```

Out[27]:

	bikes_rented	temp	humidity	wind_speed	visibility	dew_temp	solar_rad	rainfall	snowfall
909	146	0.7	77	6.7	692	-2.8	0.0	0.9	1.0
3108	913	21.2	35	7.4	1992	5.1	1.8	0.0	0.0
3112	1805	19.7	52	7.2	2000	9.5	0.2	0.0	0.0
3114	336	19.1	58	6.1	2000	10.6	0.0	0.0	0.0
3115	133	17.5	70	7.3	1634	11.9	0.0	0.5	0.0
6230	49	25.3	70	6.9	925	19.4	0.0	0.4	0.0

Drop outliers from the training dataset

In [28]:
```python
# Keep only the rows where number of bikes rented is less than 3,500.

df1 = df[df["bikes_rented"] < 3500]

df1

# Keep only the rows where the wind speed is less than 6 m/s.
```

Out[28]:

	bikes_rented	temp	humidity	wind_speed	visibility	dew_temp	solar_rad	rainfall	snowfall
0	254	-5.2	37	2.2	2000	-17.6	0.0	0.0	0.0
1	204	-5.5	38	0.8	2000	-17.6	0.0	0.0	0.0
2	173	-6.0	39	1.0	2000	-17.7	0.0	0.0	0.0
3	107	-6.2	40	0.9	2000	-17.6	0.0	0.0	0.0
4	78	-6.0	36	2.3	2000	-18.6	0.0	0.0	0.0
...	...	...	...	...	...	...	...	...	...
8389	1003	4.2	34	2.6	1894	-10.3	0.0	0.0	0.0
8390	764	3.4	37	2.3	2000	-9.9	0.0	0.0	0.0
8391	694	2.6	39	0.3	1968	-9.9	0.0	0.0	0.0
8392	712	2.1	41	1.0	1859	-9.8	0.0	0.0	0.0
8393	584	1.9	43	1.3	1909	-9.3	0.0	0.0	0.0

8393 rows × 9 columns

In [29]:
```python
df2 = df1[df1["wind_speed"] < 6]
```

In [30]:
```python
df2
```

Out[30]:

	bikes_rented	temp	humidity	wind_speed	visibility	dew_temp	solar_rad	rainfall	snowfall
0	254	-5.2	37	2.2	2000	-17.6	0.0	0.0	0.0
1	204	-5.5	38	0.8	2000	-17.6	0.0	0.0	0.0
2	173	-6.0	39	1.0	2000	-17.7	0.0	0.0	0.0
3	107	-6.2	40	0.9	2000	-17.6	0.0	0.0	0.0
4	78	-6.0	36	2.3	2000	-18.6	0.0	0.0	0.0
...	...	...	...	...	...	...	...	...	...
8389	1003	4.2	34	2.6	1894	-10.3	0.0	0.0	0.0
8390	764	3.4	37	2.3	2000	-9.9	0.0	0.0	0.0
8391	694	2.6	39	0.3	1968	-9.9	0.0	0.0	0.0
8392	712	2.1	41	1.0	1859	-9.8	0.0	0.0	0.0
8393	584	1.9	43	1.3	1909	-9.3	0.0	0.0	0.0

8385 rows × 9 columns

In [31]:
```python
df2.reset_index(drop=True)
```

Out[31]:

	bikes_rented	temp	humidity	wind_speed	visibility	dew_temp	solar_rad	rainfall	snowfall
0	254	-5.2	37	2.2	2000	-17.6	0.0	0.0	0.0
1	204	-5.5	38	0.8	2000	-17.6	0.0	0.0	0.0
2	173	-6.0	39	1.0	2000	-17.7	0.0	0.0	0.0
3	107	-6.2	40	0.9	2000	-17.6	0.0	0.0	0.0
4	78	-6.0	36	2.3	2000	-18.6	0.0	0.0	0.0
...	...	...	...	...	...	...	...	...	...
8380	1003	4.2	34	2.6	1894	-10.3	0.0	0.0	0.0
8381	764	3.4	37	2.3	2000	-9.9	0.0	0.0	0.0
8382	694	2.6	39	0.3	1968	-9.9	0.0	0.0	0.0
8383	712	2.1	41	1.0	1859	-9.8	0.0	0.0	0.0
8384	584	1.9	43	1.3	1909	-9.3	0.0	0.0	0.0

8385 rows × 9 columns

In [32]:
```python
#df2.to_csv("part2.csv",index=False)
```

Compare the scale and distribution of `bikes_rented` and `wind_speed`

In [33]:
```python
# Define a function that uses Matplotlib to visually compare the scale and distribution of bikes rented and

# Call the function.

plt.figure(figsize=(20,5))
plt.subplot(1,2,1)
df2["bikes_rented"].plot(kind="hist")
plt.title("Bikes Rented")
plt.subplot(1,2,2)
df2["wind_speed"].plot(kind="hist")
plt.title("Wind Speed")

plt.show()
```

Transform `bikes_rented` and `wind_speed`, and compare results

In [34]:
```python
df2 = pd.read_csv("part2.csv")
```

In [35]:
```python
# Apply a log transformation (np.log) to scale bikes rented and wind speed.

# Compare scale and distribution of bikes rented and wind speed by calling the function you defined earlier.

df2.head()
```

Out[35]:

	bikes_rented	temp	humidity	wind_speed	visibility	dew_temp	solar_rad	rainfall	snowfall
0	254	-5.2	37	2.2	2000	-17.6	0.0	0.0	0.0
1	204	-5.5	38	0.8	2000	-17.6	0.0	0.0	0.0
2	173	-6.0	39	1.0	2000	-17.7	0.0	0.0	0.0
3	107	-6.2	40	0.9	2000	-17.6	0.0	0.0	0.0
4	78	-6.0	36	2.3	2000	-18.6	0.0	0.0	0.0

In [36]:
```python
df3 = df2.copy()
```

In [37]:
```python
df3["log_wind_speed"] = np.log(df3["wind_speed"])
```

In [38]:
```python
df3
```

Out[38]:

	bikes_rented	temp	humidity	wind_speed	visibility	dew_temp	solar_rad	rainfall	snowfall	log_wind_speed
0	254	-5.2	37	2.2	2000	-17.6	0.0	0.0	0.0	0.788457
1	204	-5.5	38	0.8	2000	-17.6	0.0	0.0	0.0	-0.223144
2	173	-6.0	39	1.0	2000	-17.7	0.0	0.0	0.0	0.000000
3	107	-6.2	40	0.9	2000	-17.6	0.0	0.0	0.0	-0.105361
4	78	-6.0	36	2.3	2000	-18.6	0.0	0.0	0.0	0.832909
...	...	...	...	...	...	...	...	...	...	...
8380	1003	4.2	34	2.6	1894	-10.3	0.0	0.0	0.0	0.955511
8381	764	3.4	37	2.3	2000	-9.9	0.0	0.0	0.0	0.832909
8382	694	2.6	39	0.3	1968	-9.9	0.0	0.0	0.0	-1.203973
8383	712	2.1	41	1.0	1859	-9.8	0.0	0.0	0.0	0.000000
8384	584	1.9	43	1.3	1909	-9.3	0.0	0.0	0.0	0.262364

8385 rows × 10 columns

In [39]:
```python
df3["log_bikes_rented"] = np.log(df3["bikes_rented"])
```

In [40]:
```python
df3
```

Out[40]:

	bikes_rented	temp	humidity	wind_speed	visibility	dew_temp	solar_rad	rainfall	snowfall	log_wind_speed	log_bikes_rented
0	254	-5.2	37	2.2	2000	-17.6	0.0	0.0	0.0	0.788457	5.537334
1	204	-5.5	38	0.8	2000	-17.6	0.0	0.0	0.0	-0.223144	5.318120
2	173	-6.0	39	1.0	2000	-17.7	0.0	0.0	0.0	0.000000	5.153292
3	107	-6.2	40	0.9	2000	-17.6	0.0	0.0	0.0	-0.105361	4.672829
4	78	-6.0	36	2.3	2000	-18.6	0.0	0.0	0.0	0.832909	4.356709
...	...	...	...	...	...	...	...	...	...	...	...
8380	1003	4.2	34	2.6	1894	-10.3	0.0	0.0	0.0	0.955511	6.910751
8381	764	3.4	37	2.3	2000	-9.9	0.0	0.0	0.0	0.832909	6.638568
8382	694	2.6	39	0.3	1968	-9.9	0.0	0.0	0.0	-1.203973	6.542472
8383	712	2.1	41	1.0	1859	-9.8	0.0	0.0	0.0	0.000000	6.568078
8384	584	1.9	43	1.3	1909	-9.3	0.0	0.0	0.0	0.262364	6.369901

8385 rows × 11 columns

In [41]:
```python
df3.drop(["bikes_rented","wind_speed"], axis=1, inplace=True)
```

In [42]:
```python
df3.head()
```

Out[42]:

	temp	humidity	visibility	dew_temp	solar_rad	rainfall	snowfall	log_wind_speed	log_bikes_rented
0	-5.2	37	2000	-17.6	0.0	0.0	0.0	0.788457	5.537334
1	-5.5	38	2000	-17.6	0.0	0.0	0.0	-0.223144	5.318120
2	-6.0	39	2000	-17.7	0.0	0.0	0.0	0.000000	5.153292
3	-6.2	40	2000	-17.6	0.0	0.0	0.0	-0.105361	4.672829
4	-6.0	36	2000	-18.6	0.0	0.0	0.0	0.832909	4.356709

In [43]:
```python
X = df3.iloc[:,0:8]
y = df3.iloc[:,8]
```

In [44]:
```python
X.values, y.values
```

Out[44]:
```
(array([[-5.20000000e+00,  3.70000000e+01,  2.00000000e+03, ...,
          0.00000000e+00,  0.00000000e+00,  7.88457360e-01],
        [-5.50000000e+00,  3.80000000e+01,  2.00000000e+03, ...,
          0.00000000e+00,  0.00000000e+00, -2.23143551e-01],
        [-6.00000000e+00,  3.90000000e+01,  2.00000000e+03, ...,
          0.00000000e+00,  0.00000000e+00,  0.00000000e+00],
        ...,
        [ 2.60000000e+00,  3.90000000e+01,  1.96800000e+03, ...,
          0.00000000e+00,  0.00000000e+00, -1.20397280e+00],
        [ 2.10000000e+00,  4.10000000e+01,  1.85900000e+03, ...,
          0.00000000e+00,  0.00000000e+00,  0.00000000e+00],
        [ 1.90000000e+00,  4.30000000e+01,  1.90900000e+03, ...,
          0.00000000e+00,  0.00000000e+00,  2.62364264e-01]]),
 array([5.53733427, 5.31811999, 5.15329159, ..., 6.54247196, 6.56807791,
        6.36990098]))
```

In [45]:
```python
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, random_state=0)
```

In [46]:
```python
X_train.shape, y_train.shape
```

Out[46]:
```
((6708, 8), (6708,))
```

In [47]:
```python
X_train
```

Out[47]:

	temp	humidity	visibility	dew_temp	solar_rad	rainfall	snowfall	log_wind_speed
3357	14.6	42	2000	1.8	0.00	0.0	0.0	-0.693147
5147	20.7	58	2000	12.1	0.00	0.0	0.0	0.405465
1433	-1.7	91	167	-2.9	0.00	0.0	3.0	0.095310
4258	21.2	52	1856	10.9	0.55	0.0	0.0	1.280934
751	-3.2	69	1249	-8.0	0.00	0.0	0.0	-0.693147
...	...	...	...	...	...	...	...	...
4373	26.5	43	1671	12.8	2.36	0.0	0.0	1.360977
7891	11.3	77	433	7.4	0.00	0.0	0.0	-0.105361
4859	23.9	72	1098	18.5	0.00	0.0	0.0	-0.223144
3264	11.2	31	1299	-5.3	1.59	0.0	0.0	0.530628
2732	6.3	87	153	4.2	0.00	0.0	0.0	0.587787

6708 rows × 8 columns

Build and test a new linear regression model

In [48]:
```python
# Create a linear regression model and fit it using the transformed training data.

# Print the regressor model's score using the test data and labels.
```

In [49]:
```python
lr2 = LinearRegression()
```

In [50]:
```python
lr2.fit(X_train,y_train)
```

Out[50]:
```
LinearRegression()
```

Compare the first ten predictions to actual values for the new model

In [51]:
```python
# Make predictions on the test set.

# View examples comparing actual bike rentals to predicted bike rentals.

lr2_pred = lr2.predict(X_test)
```

In [52]:
```python
lr2_pred[:10]
```

Out[52]:
```
array([6.34222077, 5.50079794, 5.80446502, 6.58271609, 4.91259081,
       6.11679542, 5.368478  , 5.67791335, 5.80553165, 5.23262077])
```

In [53]:
```python
y_test[:10]
```

Out[53]:
```
7351    7.227662
3608    6.700731
8026    6.253829
4382    7.210818
244     3.828641
8349    6.493754
2730    5.817111
8202    6.684612
2812    6.629363
7918    5.241747
Name: log_bikes_rented, dtype: float64
```

Convert the bike rentals back to their initial scale

In [54]:
```python
# Call math.exp to convert bikes rented back to their initial scale.

# View examples comparing actual bike rentals to predicted bike rentals.

import math
```

In [55]:
```python
lr2_pred
```

Out[55]:
```
array([6.34222077, 5.50079794, 5.80446502, ..., 6.15673394, 6.19953729,
       7.56554275])
```

In [56]:
```python
np.exp(lr2_pred)
```

Out[56]:
```
array([ 568.05643407,  244.88726037,  331.77765075, ...,  471.88435189,
        492.521094  , 1930.51629143])
```

In [ ]: