Weather Data Analysis Testing

April 15, 2022

0.1 Weather Dataset

The Weather Dataset is a time-series data set with per-hour information about weather conditions at a particular location. It records temperature, dew point temperature, relative humidity, wind speed, visibility, pressure and conditions.

```
[2]: import pandas as pd
```

0.1.1 Import the Data

```
[3]: data = pd.read_csv('WeatherData.csv')
     data
```

```
[3]:            Date/Time  Temp_C  Dew Point Temp_C  Rel Hum_%  Wind Speed_km/h  \
     0        1/1/2012 0:00    -1.8              -3.9         86                4
     1        1/1/2012 1:00    -1.8              -3.7         87                4
     2        1/1/2012 2:00    -1.8              -3.4         89                7
     3        1/1/2012 3:00    -1.5              -3.2         88                6
     4        1/1/2012 4:00    -1.5              -3.3         88                7
     ...               ...     ...               ...        ...              ...
     8779  12/31/2012 19:00     0.1              -2.7         81               30
     8780  12/31/2012 20:00     0.2              -2.4         83               24
     8781  12/31/2012 21:00    -0.5              -1.5         93               28
     8782  12/31/2012 22:00    -0.2              -1.8         89               28
     8783  12/31/2012 23:00     0.0              -2.1         86               30

           Visibility_km  Press_kPa               Weather
     0                8.0     101.24                   Fog
     1                8.0     101.24                   Fog
     2                4.0     101.26  Freezing Drizzle,Fog
     3                4.0     101.27  Freezing Drizzle,Fog
     4                4.8     101.23                   Fog
     ...              ...        ...                   ...
     8779             9.7     100.13                  Snow
     8780             9.7     100.03                  Snow
     8781             4.8      99.95                  Snow
     8782             9.7      99.91                  Snow
     8783            11.3      99.89                  Snow
```

```
[8784 rows x 8 columns]
```

0.1.2 Analyze the DataFrame

```python
[4]: # Shows the first n (Default 5) rows
     data.head()
```

```
[4]:        Date/Time  Temp_C  Dew Point Temp_C  Rel Hum_%  Wind Speed_km/h  \
     0  1/1/2012 0:00    -1.8              -3.9         86                4
     1  1/1/2012 1:00    -1.8              -3.7         87                4
     2  1/1/2012 2:00    -1.8              -3.4         89                7
     3  1/1/2012 3:00    -1.5              -3.2         88                6
     4  1/1/2012 4:00    -1.5              -3.3         88                7

        Visibility_km  Press_kPa               Weather
     0            8.0     101.24                   Fog
     1            8.0     101.24                   Fog
     2            4.0     101.26  Freezing Drizzle,Fog
     3            4.0     101.27  Freezing Drizzle,Fog
     4            4.8     101.23                   Fog
```

```python
[6]: # Shows the total number of rows and columns of the dataframe
     data.shape
```

```
[6]: (8784, 8)
```

```python
[7]: # Provides the index of the dataframe
     data.index
```

```
[7]: RangeIndex(start=0, stop=8784, step=1)
```

```python
[8]: # Shows the name of each column
     data.columns
```

```
[8]: Index(['Date/Time', 'Temp_C', 'Dew Point Temp_C', 'Rel Hum_%',
            'Wind Speed_km/h', 'Visibility_km', 'Press_kPa', 'Weather'],
           dtype='object')
```

```python
[9]: # Provides the data-type of each column
     data.dtypes
```

```
[9]: Date/Time           object
     Temp_C             float64
     Dew Point Temp_C   float64
     Rel Hum_%            int64
     Wind Speed_km/h      int64
     Visibility_km      float64
```

```
Press_kPa            float64
Weather              object
dtype: object
```

[10]:
```python
# Shows all unique values, can only be applied to one column and NOT the
 ↪dataframe
data['Dew Point Temp_C'].unique()
```

[10]:
```
array([ -3.9,  -3.7,  -3.4,  -3.2,  -3.3,  -3.1,  -3.6,  -2.3,  -2.1,
        -2. ,  -1.7,  -1.1,  -0.4,  -0.2,   0. ,   1. ,   1.3,   1.7,
         1.9,   2. ,   1.5,  -0.9,  -1.5,  -2.6,  -2.9,  -4.1,  -3.5,
        -6.2,  -6.5,  -6.8,  -7. ,  -8.7,  -9.5, -11.4, -12.1, -13.4,
       -12.8, -14.7, -14.1, -16. , -17.2, -15.8, -18.7, -20.1, -19.1,
       -19.3, -19.5, -21.3, -21.9, -22.2, -22.6, -22.4, -22.9, -23.2,
       -23.8, -24.8, -25.4, -24.6, -24.2, -24.1, -24. , -22.5, -20.6,
       -21.1, -21.7, -19. , -16.3, -15.5, -13.2, -12.6, -12.7, -11.6,
       -11.7, -10.2,  -8.3,  -7.7, -10.7,  -9.7,  -9.1, -10.1, -10. ,
        -9.6, -12. , -14.4, -15.4, -15.7, -14.8, -16.8, -17.3, -16.5,
       -16.1, -16.2, -16.7, -15.6, -14.3, -13.6, -13. , -12.5, -12.2,
       -11.1, -10.8, -10.5,  -9. ,  -8. ,  -7.8,  -7.2,  -6.9,  -6.1,
        -5.9,  -5.4,  -5.3,  -5. ,  -3. ,  -4.6,  -9.2, -10.3, -11.9,
       -12.4, -12.9, -13.3, -13.8, -13.9, -13.7, -14. , -14.5, -11. ,
        -6.6,  -5.8,  -5.1,  -5.7,  -5.6,  -6.3,  -5.2,  -2.5,  -1.2,
        -0.7,  -0.8,  -7.9, -10.9, -17.8, -18.9, -19.4, -21. , -21.4,
       -20.8, -20.9, -20.4, -20. , -19.9, -19.2, -18.1, -15.2, -15. ,
       -13.1, -11.3,  -8.9,  -8.6,  -8.5,  -7.6,  -7.3,  -8.1,  -7.5,
        -7.4,  -6. ,  -4.8,  -4.5, -11.2, -19.8, -23.5, -23.6, -23.9,
       -23.4, -24.3, -24.4, -25.8, -25.9, -26. , -26.2, -26.8, -26.6,
       -26.1, -26.5, -28.5, -28. , -27.8, -25.5, -22.8, -22.7, -23. ,
       -23.3, -21.5, -20.7, -17.7, -16.9, -17.5, -18.3, -17.1, -14.6,
       -10.4,  -9.9,  -4.9,   0.7,  -4. ,  -8.2, -16.6, -17.6, -18. ,
       -18.4, -18.8, -18.2, -17.4, -21.6, -19.7, -14.9,  -8.4,  -9.3,
       -20.3, -21.2, -22.1, -23.7, -25.6, -25.1, -24.5, -21.8, -22. ,
       -20.2, -17. ,  -2.4,  -0.3,   1.2,   1.4,   2.2,   2.5,   2.3,
         2.1,   3.6,  -0.6,  -1.8,  -1.9,  -2.2,  -2.8, -11.8, -11.5,
       -13.5,  -8.8,  -4.2,  -1.4,  -1. ,  -1.3,  -1.6,  -2.7,  -4.4,
        -4.3, -15.1, -14.2, -15.3, -15.9, -12.3,  -7.1,  -6.7,  -6.4,
       -17.9, -18.6,  -4.7,  -3.8, -16.4,  -5.5, -23.1, -25.3, -19.6,
       -10.6,   0.1,   0.2,   0.3,  -0.5,   1.1,   1.6,   0.9,  -9.8,
         0.4,  -9.4, -18.5, -22.3, -20.5,   0.8,   2.9,   3.8,   4. ,
         5.2,   5.9,   6.6,   6.4,   6.9,   7.8,   3.2,   0.6,   1.8,
         3. ,   4.5,   3.3,   2.8,  -0.1,   0.5,   3.5,   3.7,   3.4,
         2.7,   2.6,   5.3,   6.2,   4.3,   4.4,   4.1,   4.7,   5.4,
         5.5,   4.9,   2.4,   5.8,   6.7,   7.6,   8.7,   9.9,  10.5,
        10.4,  10.7,  11. ,  10.1,   9.8,   8.6,   9.2,   8.9,   7.9,
         8.5,   8.3,   9. ,   8.1,   9.4,  11.6,  12. ,  10. ,   9.7,
         9.1,  10.8,  11.8,  12.3,  12.1,  11.7,  10.9,  10.3,   8.8,
```

```
 11.5,  12.5,  12.6,   9.5,   7.4,   8.4,  11.4,  11.9,  12.8,
 12.2,   6.8,   7.2,   7.1,   7.5,   6.5,   6.3,   4.6,   4.8,
  5.7,   3.1,   8. ,  10.6,  11.2,  11.1,  13.3,  13.5,  13.6,
 12.4,  11.3,  15.6,  15.8,  14.7,  14.2,   9.6,   6.1,   3.9,
  4.2,   5.1,   5.6,   7. ,   8.2,   7.7,   7.3,  10.2,  13. ,
 12.9,   9.3,   5. ,   6. ,  12.7,  13.1,  13.8,  13.9,  14.5,
 15. ,  14.3,  14.6,  14.4,  15.2,  15.4,  15.3,  15.1,  14. ,
 13.2,  14.1,  13.4,  16. ,  16.2,  16.4,  16.1,  16.5,  16.9,
 16.3,  17.3,  16.7,  15.9,  17. ,  17.7,  17.5,  15.5,  15.7,
 16.8,  17.2,  17.1,  18.3,  18.5,  18.1,  14.8,  18.7,  18.4,
 19. ,  17.4,  17.6,  17.8,  17.9,  13.7,  18. ,  16.6,  14.9,
 18.9,  19.2,  19.4,  19.1,  19.3,  18.8,  18.2,  19.8,  20. ,
 20.4,  19.6,  20.3,  19.9,  21.1,  21. ,  20.2,  20.1,  18.6,
 20.8,  20.6,  20.7,  19.7,  20.9,  21.2,  21.7,  21.9,  20.5,
 19.5,  21.3,  22.3,  23.1,  22. ,  22.2,  22.6,  23.2,  23. ,
 22.9,  24.4,  21.8])
```

```
[11]: # Shows the total number of unique values for each column, can be applied to␣
      ↪either one column OR the dataframe
      data.nunique()
```

```
[11]: Date/Time         8784
      Temp_C             533
      Dew Point Temp_C   489
      Rel Hum_%           83
      Wind Speed_km/h     34
      Visibility_km       24
      Press_kPa          518
      Weather             50
      dtype: int64
```

```
[13]: # shows the total number of non-null values of each column (single OR dataframe)
      data.count()
```

```
[13]: Date/Time         8784
      Temp_C            8784
      Dew Point Temp_C  8784
      Rel Hum_%         8784
      Wind Speed_km/h   8784
      Visibility_km     8784
      Press_kPa         8784
      Weather           8784
      dtype: int64
```

```
[14]: # Shows all the unique values with their count, it can only be applied to a␣
      ↪single column
      data['Weather'].value_counts()
```

```
[14]: Mainly Clear                              2106
      Mostly Cloudy                             2069
      Cloudy                                    1728
      Clear                                     1326
      Snow                                       390
      Rain                                       306
      Rain Showers                               188
      Fog                                        150
      Rain,Fog                                   116
      Drizzle,Fog                                 80
      Snow Showers                                60
      Drizzle                                     41
      Snow,Fog                                    37
      Snow,Blowing Snow                           19
      Rain,Snow                                   18
      Thunderstorms,Rain Showers                  16
      Haze                                        16
      Drizzle,Snow,Fog                            15
      Freezing Rain                               14
      Freezing Drizzle,Snow                       11
      Freezing Drizzle                             7
      Snow,Ice Pellets                             6
      Freezing Drizzle,Fog                         6
      Snow,Haze                                    5
      Freezing Fog                                 4
      Snow Showers,Fog                             4
      Moderate Snow                                4
      Rain,Snow,Ice Pellets                        4
      Freezing Rain,Fog                            4
      Freezing Drizzle,Haze                        3
      Rain,Haze                                    3
      Thunderstorms,Rain                           3
      Thunderstorms,Rain Showers,Fog               3
      Freezing Rain,Haze                           2
      Drizzle,Snow                                 2
      Rain Showers,Snow Showers                    2
      Thunderstorms                                2
      Moderate Snow,Blowing Snow                   2
      Rain Showers,Fog                             1
      Thunderstorms,Moderate Rain Showers,Fog      1
      Snow Pellets                                 1
      Rain,Snow,Fog                                1
      Moderate Rain,Fog                            1
      Freezing Rain,Ice Pellets,Fog                1
      Drizzle,Ice Pellets,Fog                      1
      Thunderstorms,Rain,Fog                       1
      Rain,Ice Pellets                             1
```

```
Rain,Snow Grains                          1
Thunderstorms,Heavy Rain Showers          1
Freezing Rain,Snow Grains                 1
Name: Weather, dtype: int64
```

[15]:
```python
# Provides basic information about the dataframe
data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 8784 entries, 0 to 8783
Data columns (total 8 columns):
 #   Column            Non-Null Count  Dtype
---  ------            --------------  -----
 0   Date/Time         8784 non-null   object
 1   Temp_C            8784 non-null   float64
 2   Dew Point Temp_C  8784 non-null   float64
 3   Rel Hum_%         8784 non-null   int64
 4   Wind Speed_km/h   8784 non-null   int64
 5   Visibility_km     8784 non-null   float64
 6   Press_kPa         8784 non-null   float64
 7   Weather           8784 non-null   object
dtypes: float64(4), int64(2), object(2)
memory usage: 549.1+ KB
```

0.1.3   Find all the unique 'Wind Speed' Values in the data

[16]:
```python
data['Wind Speed_km/h'].unique()
```

[16]:
```
array([ 4,  7,  6,  9, 15, 13, 20, 22, 19, 24, 30, 35, 39, 32, 33, 26, 44,
       43, 48, 37, 28, 17, 11,  0, 83, 70, 57, 46, 41, 52, 50, 63, 54,  2],
      dtype=int64)
```

[17]:
```python
data['Wind Speed_km/h'].nunique()
```

[17]: 34

0.1.4   Find the number of times when the 'Weather is exactly clear'

[18]:
```python
# can use value count, filtering, or group by

# value count
data.Weather.value_counts()
```

[18]:
```
Mainly Clear                   2106
Mostly Cloudy                  2069
Cloudy                         1728
Clear                          1326
```

```
Snow                                             390
Rain                                             306
Rain Showers                                     188
Fog                                              150
Rain,Fog                                         116
Drizzle,Fog                                       80
Snow Showers                                      60
Drizzle                                           41
Snow,Fog                                          37
Snow,Blowing Snow                                 19
Rain,Snow                                         18
Thunderstorms,Rain Showers                        16
Haze                                              16
Drizzle,Snow,Fog                                  15
Freezing Rain                                     14
Freezing Drizzle,Snow                             11
Freezing Drizzle                                   7
Snow,Ice Pellets                                   6
Freezing Drizzle,Fog                               6
Snow,Haze                                          5
Freezing Fog                                       4
Snow Showers,Fog                                   4
Moderate Snow                                      4
Rain,Snow,Ice Pellets                              4
Freezing Rain,Fog                                  4
Freezing Drizzle,Haze                              3
Rain,Haze                                          3
Thunderstorms,Rain                                 3
Thunderstorms,Rain Showers,Fog                     3
Freezing Rain,Haze                                 2
Drizzle,Snow                                       2
Rain Showers,Snow Showers                          2
Thunderstorms                                      2
Moderate Snow,Blowing Snow                         2
Rain Showers,Fog                                   1
Thunderstorms,Moderate Rain Showers,Fog            1
Snow Pellets                                       1
Rain,Snow,Fog                                      1
Moderate Rain,Fog                                  1
Freezing Rain,Ice Pellets,Fog                      1
Drizzle,Ice Pellets,Fog                            1
Thunderstorms,Rain,Fog                             1
Rain,Ice Pellets                                   1
Rain,Snow Grains                                   1
Thunderstorms,Heavy Rain Showers                   1
Freezing Rain,Snow Grains                          1
Name: Weather, dtype: int64
```

```
[21]: # filtering
      data[data.Weather == 'Clear']
```

```
[21]:            Date/Time  Temp_C  Dew Point Temp_C  Rel Hum_%  Wind Speed_km/h  \
      67       1/3/2012 19:00   -16.9            -24.8         50               24
      114      1/5/2012 18:00    -7.1            -14.4         56               11
      115      1/5/2012 19:00    -9.2            -15.4         61                7
      116      1/5/2012 20:00    -9.8            -15.7         62                9
      117      1/5/2012 21:00    -9.0            -14.8         63               13
      ...                 ...     ...              ...        ...              ...
      8646    12/26/2012 6:00   -13.4            -14.8         89                4
      8698   12/28/2012 10:00    -6.1             -8.6         82               19
      8713    12/29/2012 1:00   -11.9            -13.6         87               11
      8714    12/29/2012 2:00   -11.8            -13.1         90               13
      8756   12/30/2012 20:00   -13.8            -16.5         80               24

            Visibility_km  Press_kPa Weather
      67             25.0     101.74   Clear
      114            25.0     100.71   Clear
      115            25.0     100.80   Clear
      116            25.0     100.83   Clear
      117            25.0     100.83   Clear
      ...             ...        ...     ...
      8646           25.0     102.47   Clear
      8698           24.1     101.27   Clear
      8713           25.0     101.31   Clear
      8714           25.0     101.33   Clear
      8756           25.0     101.52   Clear

      [1326 rows x 8 columns]
```

```
[23]: # groupby
      data.groupby('Weather').get_group('Clear')
```

```
[23]:            Date/Time  Temp_C  Dew Point Temp_C  Rel Hum_%  Wind Speed_km/h  \
      67       1/3/2012 19:00   -16.9            -24.8         50               24
      114      1/5/2012 18:00    -7.1            -14.4         56               11
      115      1/5/2012 19:00    -9.2            -15.4         61                7
      116      1/5/2012 20:00    -9.8            -15.7         62                9
      117      1/5/2012 21:00    -9.0            -14.8         63               13
      ...                 ...     ...              ...        ...              ...
      8646    12/26/2012 6:00   -13.4            -14.8         89                4
      8698   12/28/2012 10:00    -6.1             -8.6         82               19
      8713    12/29/2012 1:00   -11.9            -13.6         87               11
      8714    12/29/2012 2:00   -11.8            -13.1         90               13
      8756   12/30/2012 20:00   -13.8            -16.5         80               24
```

```
        Visibility_km  Press_kPa Weather
67              25.0     101.74   Clear
114             25.0     100.71   Clear
115             25.0     100.80   Clear
116             25.0     100.83   Clear
117             25.0     100.83   Clear
...              ...        ...     ...
8646            25.0     102.47   Clear
8698            24.1     101.27   Clear
8713            25.0     101.31   Clear
8714            25.0     101.33   Clear
8756            25.0     101.52   Clear

[1326 rows x 8 columns]
```

0.1.5 Find the number of times when the 'Wind Speed' was exactly 4 KM/H

```
[27]: # using filtering
      data[data['Wind Speed_km/h'] == 4]
```

```
[27]:             Date/Time  Temp_C  Dew Point Temp_C  Rel Hum_%  Wind Speed_km/h  \
      0        1/1/2012 0:00    -1.8              -3.9         86                4
      1        1/1/2012 1:00    -1.8              -3.7         87                4
      96       1/5/2012 0:00    -8.8             -11.7         79                4
      101      1/5/2012 5:00    -7.0              -9.5         82                4
      146      1/7/2012 2:00    -8.1             -11.1         79                4
      ...                ...     ...               ...        ...              ...
      8768  12/31/2012 8:00    -8.6             -10.3         87                4
      8769  12/31/2012 9:00    -8.1              -9.6         89                4
      8770  12/31/2012 10:00   -7.4              -8.9         89                4
      8772  12/31/2012 12:00   -5.8              -7.5         88                4
      8773  12/31/2012 13:00   -4.6              -6.6         86                4

            Visibility_km  Press_kPa         Weather
      0               8.0     101.24             Fog
      1               8.0     101.24             Fog
      96              9.7     100.32            Snow
      101             4.0     100.19            Snow
      146            19.3     100.15          Cloudy
      ...             ...        ...             ...
      8768            3.2     101.14    Snow Showers
      8769            2.4     101.09            Snow
      8770            6.4     101.05       Snow,Fog
      8772           12.9     100.78            Snow
      8773           12.9     100.63            Snow

[474 rows x 8 columns]
```

0.1.6 Find out all the null values in the data set

```
[29]: # is null command
      data.isnull()
      #however in boolean form it is not very helpful
      data.isnull().sum()
```

```
[29]: Date/Time           0
      Temp_C              0
      Dew Point Temp_C    0
      Rel Hum_%           0
      Wind Speed_km/h     0
      Visibility_km       0
      Press_kPa           0
      Weather             0
      dtype: int64
```

```
[30]: # can also you not null and sum for the opposite result but the same conclusion
      data.notnull().sum()
```

```
[30]: Date/Time           8784
      Temp_C              8784
      Dew Point Temp_C    8784
      Rel Hum_%           8784
      Wind Speed_km/h     8784
      Visibility_km       8784
      Press_kPa           8784
      Weather             8784
      dtype: int64
```

0.1.7 Rename the column name 'Weather' of the dataframe to 'Weather Condition'

```
[33]: # using rename(columns = {Column1:New Column Name}
      data.rename(columns = {'Weather': 'Weather Condition'}, inplace=True)

      #this doesn't apply to the original data set, only the command, put inplace flag␣
       ↪to make it permanent
      data
```

```
[33]:              Date/Time  Temp_C  Dew Point Temp_C  Rel Hum_%  Wind Speed_km/h  \
      0         1/1/2012 0:00    -1.8              -3.9         86                4
      1         1/1/2012 1:00    -1.8              -3.7         87                4
      2         1/1/2012 2:00    -1.8              -3.4         89                7
      3         1/1/2012 3:00    -1.5              -3.2         88                6
      4         1/1/2012 4:00    -1.5              -3.3         88                7
      ...                 ...     ...               ...        ...              ...
      8779  12/31/2012 19:00     0.1              -2.7         81               30
      8780  12/31/2012 20:00     0.2              -2.4         83               24
```

```
8781   12/31/2012 21:00      -0.5              -1.5        93              28
8782   12/31/2012 22:00      -0.2              -1.8        89              28
8783   12/31/2012 23:00       0.0              -2.1        86              30

        Visibility_km   Press_kPa        Weather Condition
0                  8.0      101.24                     Fog
1                  8.0      101.24                     Fog
2                  4.0      101.26   Freezing Drizzle,Fog
3                  4.0      101.27   Freezing Drizzle,Fog
4                  4.8      101.23                     Fog
...                ...         ...                     ...
8779               9.7      100.13                    Snow
8780               9.7      100.03                    Snow
8781               4.8       99.95                    Snow
8782               9.7       99.91                    Snow
8783              11.3       99.89                    Snow

[8784 rows x 8 columns]
```

0.1.8 What is the mean 'Visiblity'

```python
[36]: data['Visibility_km'].mean()
```

```
[36]: 27.66444672131151
```

0.1.9 What is the Standard Deviation of 'Pressure' in this data?

```python
[37]: data.Press_kPa.std()
```

```
[37]: 0.8440047459486474
```

0.1.10 What is the Variance of 'Relative Humidity' in this data?

```python
[38]: data['Rel Hum_%'].var()
```

```
[38]: 286.2485501984998
```

0.1.11 Find all the instances when 'Snow' was recorded

```python
[39]: # filtering to get the rows
      data[data['Weather Condition'] == 'Snow']
```

```
[39]:            Date/Time   Temp_C   Dew Point Temp_C   Rel Hum_%   Wind Speed_km/h  \
      55      1/3/2012 7:00    -14.0              -19.5          63                19
      84     1/4/2012 12:00    -13.7              -21.7          51                11
      86     1/4/2012 14:00    -11.3              -19.0          53                 7
      87     1/4/2012 15:00    -10.2              -16.3          61                11
```

```
88       1/4/2012 16:00      -9.4          -15.5          61          13
...                  ...      ...            ...          ...         ...
8779  12/31/2012 19:00        0.1           -2.7          81          30
8780  12/31/2012 20:00        0.2           -2.4          83          24
8781  12/31/2012 21:00       -0.5           -1.5          93          28
8782  12/31/2012 22:00       -0.2           -1.8          89          28
8783  12/31/2012 23:00        0.0           -2.1          86          30

      Visibility_km  Press_kPa Weather Condition
55             25.0     100.95              Snow
84             24.1     101.25              Snow
86             19.3     100.97              Snow
87              9.7     100.89              Snow
88             19.3     100.79              Snow
...             ...        ...               ...
8779            9.7     100.13              Snow
8780            9.7     100.03              Snow
8781            4.8      99.95              Snow
8782            9.7      99.91              Snow
8783           11.3      99.89              Snow

[390 rows x 8 columns]
```

[43]: `# value counts, although it will not give you many details, still good for`␣
`↪general purposes`
`data['Weather Condition'].value_counts()`

[43]:
```
Mainly Clear                        2106
Mostly Cloudy                       2069
Cloudy                              1728
Clear                              1326
Snow                                390
Rain                                306
Rain Showers                        188
Fog                                 150
Rain,Fog                            116
Drizzle,Fog                          80
Snow Showers                         60
Drizzle                              41
Snow,Fog                             37
Snow,Blowing Snow                    19
Rain,Snow                            18
Thunderstorms,Rain Showers           16
Haze                                 16
Drizzle,Snow,Fog                     15
Freezing Rain                        14
Freezing Drizzle,Snow                11
```

```
Freezing Drizzle                               7
Snow,Ice Pellets                               6
Freezing Drizzle,Fog                           6
Snow,Haze                                      5
Freezing Fog                                   4
Snow Showers,Fog                               4
Moderate Snow                                  4
Rain,Snow,Ice Pellets                          4
Freezing Rain,Fog                              4
Freezing Drizzle,Haze                          3
Rain,Haze                                      3
Thunderstorms,Rain                             3
Thunderstorms,Rain Showers,Fog                 3
Freezing Rain,Haze                             2
Drizzle,Snow                                   2
Rain Showers,Snow Showers                      2
Thunderstorms                                  2
Moderate Snow,Blowing Snow                     2
Rain Showers,Fog                               1
Thunderstorms,Moderate Rain Showers,Fog        1
Snow Pellets                                   1
Rain,Snow,Fog                                  1
Moderate Rain,Fog                              1
Freezing Rain,Ice Pellets,Fog                  1
Drizzle,Ice Pellets,Fog                        1
Thunderstorms,Rain,Fog                         1
Rain,Ice Pellets                               1
Rain,Snow Grains                               1
Thunderstorms,Heavy Rain Showers               1
Freezing Rain,Snow Grains                      1
Name: Weather Condition, dtype: int64
```

[46]: # consider all columns that contain snow
      data[data['Weather Condition'].str.contains('Snow')]

[46]:   Date/Time Temp_C Dew Point Temp_C Rel Hum_% Wind Speed_km/h \
      41   1/2/2012 17:00   -2.1   -9.5   57   22
      44   1/2/2012 20:00   -5.6   -13.4   54   24
      45   1/2/2012 21:00   -5.8   -12.8   58   26
      47   1/2/2012 23:00   -7.4   -14.1   59   17
      48   1/3/2012 0:00   -9.0   -16.0   57   28
      ...   .
      8779 12/31/2012 19:00   0.1   -2.7   81   30
      8780 12/31/2012 20:00   0.2   -2.4   83   24
      8781 12/31/2012 21:00   -0.5   -1.5   93   28
      8782 12/31/2012 22:00   -0.2   -1.8   89   28
      8783 12/31/2012 23:00   0.0   -2.1   86   30

```
      Visibility_km  Press_kPa Weather Condition
41             25.0      99.66      Snow Showers
44             25.0     100.07      Snow Showers
45             25.0     100.15      Snow Showers
47             19.3     100.27      Snow Showers
48             25.0     100.35      Snow Showers
...             ...        ...               ...
8779            9.7     100.13              Snow
8780            9.7     100.03              Snow
8781            4.8      99.95              Snow
8782            9.7      99.91              Snow
8783           11.3      99.89              Snow

[583 rows x 8 columns]
```

0.1.12 Find all the instances when 'Wind Speed is above 24' and 'Visiblity is 25'

```
[54]: # Use filtering with the & (and) operator
      data[(data['Wind Speed_km/h'] > 24) & (data['Visibility_km'] == 25)]
```

```
[54]:            Date/Time  Temp_C  Dew Point Temp_C  Rel Hum_%  Wind Speed_km/h  \
      23      1/1/2012 23:00     5.3               2.0         79               30
      24       1/2/2012 0:00     5.2               1.5         77               35
      25       1/2/2012 1:00     4.6               0.0         72               39
      26       1/2/2012 2:00     3.9              -0.9         71               32
      27       1/2/2012 3:00     3.7              -1.5         69               33
      ...               ...     ...               ...        ...              ...
      8705  12/28/2012 17:00    -8.6             -12.0         76               26
      8753  12/30/2012 17:00   -12.1             -15.8         74               28
      8755  12/30/2012 19:00   -13.4             -16.5         77               26
      8759  12/30/2012 23:00   -12.1             -15.1         78               28
      8760   12/31/2012 0:00   -11.1             -14.4         77               26

            Visibility_km  Press_kPa Weather Condition
      23             25.0      99.31            Cloudy
      24             25.0      99.26      Rain Showers
      25             25.0      99.26            Cloudy
      26             25.0      99.26     Mostly Cloudy
      27             25.0      99.30     Mostly Cloudy
      ...             ...        ...               ...
      8705           25.0     101.34      Mainly Clear
      8753           25.0     101.26      Mainly Clear
      8755           25.0     101.47      Mainly Clear
      8759           25.0     101.52     Mostly Cloudy
      8760           25.0     101.51            Cloudy
```

```
[308 rows x 8 columns]
```

0.1.13 What is the mean value of each column against each 'Weather Condition'

```
[56]: # using group by
      data.groupby('Weather Condition').mean()

      # can sort the data by temp using sort_values()
      data.groupby('Weather Condition').mean().sort_values('Temp_C', ascending=True)
```

```
[56]:                                     Temp_C  Dew Point Temp_C  \
      Weather Condition
      Snow Showers,Fog                 -10.675000        -11.900000
      Freezing Fog                      -7.575000         -9.250000
      Freezing Drizzle                  -5.657143         -8.000000
      Moderate Snow                     -5.525000         -7.250000
      Moderate Snow,Blowing Snow        -5.450000         -6.500000
      Freezing Drizzle,Haze             -5.433333         -8.000000
      Snow,Blowing Snow                 -5.410526         -7.621053
      Freezing Drizzle,Snow             -5.109091         -7.072727
      Snow,Fog                          -5.075676         -6.364865
      Freezing Rain,Snow Grains         -5.000000         -7.300000
      Freezing Rain,Haze                -4.900000         -7.450000
      Snow                              -4.524103         -7.623333
      Snow,Haze                         -4.020000         -6.860000
      Freezing Rain                     -3.885714         -6.078571
      Snow Showers                      -3.506667         -7.866667
      Freezing Rain,Ice Pellets,Fog     -2.600000         -3.700000
      Freezing Drizzle,Fog              -2.533333         -4.183333
      Freezing Rain,Fog                 -2.225000         -3.750000
      Snow,Ice Pellets                  -1.883333         -3.666667
      Haze                              -0.200000         -2.975000
      Drizzle,Ice Pellets,Fog            0.400000         -0.700000
      Rain,Ice Pellets                   0.600000         -0.600000
      Drizzle,Snow,Fog                   0.693333          0.120000
      Snow Pellets                       0.700000         -6.400000
      Rain,Snow,Fog                      0.800000          0.300000
      Drizzle,Snow                       1.050000          0.150000
      Rain,Snow                          1.055556         -0.566667
      Rain,Snow,Ice Pellets              1.100000         -0.175000
      Moderate Rain,Fog                  1.700000          0.800000
      Rain,Snow Grains                   1.900000         -2.100000
      Rain Showers,Snow Showers          2.150000         -1.500000
      Fog                                4.303333          3.159333
      Rain,Haze                          4.633333          2.066667
      Clear                              6.825716          0.089367
      Drizzle                            7.353659          5.504878
```

Cloudy	7.970544	2.375810
Drizzle,Fog	8.067500	7.033750
Rain,Fog	8.273276	7.219828
Rain	9.786275	7.042810
Mostly Cloudy	10.574287	3.131174
Thunderstorms,Heavy Rain Showers	10.900000	9.000000
Mainly Clear	12.558927	4.581671
Rain Showers,Fog	12.800000	12.100000
Rain Showers	13.722340	9.187766
Thunderstorms,Moderate Rain Showers,Fog	19.600000	18.500000
Thunderstorms,Rain Showers	20.037500	17.618750
Thunderstorms,Rain	20.433333	18.533333
Thunderstorms,Rain,Fog	20.600000	18.600000
Thunderstorms,Rain Showers,Fog	21.600000	18.700000
Thunderstorms	24.150000	19.750000

	Rel Hum_%	Wind Speed_km/h \
Weather Condition		
Snow Showers,Fog	90.750000	13.750000
Freezing Fog	87.750000	4.750000
Freezing Drizzle	83.571429	16.571429
Moderate Snow	87.750000	33.750000
Moderate Snow,Blowing Snow	92.500000	40.000000
Freezing Drizzle,Haze	82.000000	10.333333
Snow,Blowing Snow	84.473684	34.842105
Freezing Drizzle,Snow	86.090909	16.272727
Snow,Fog	90.675676	17.324324
Freezing Rain,Snow Grains	84.000000	32.000000
Freezing Rain,Haze	82.500000	7.500000
Snow	79.307692	20.038462
Snow,Haze	80.600000	5.000000
Freezing Rain	84.642857	19.214286
Snow Showers	72.350000	19.233333
Freezing Rain,Ice Pellets,Fog	92.000000	28.000000
Freezing Drizzle,Fog	88.500000	17.000000
Freezing Rain,Fog	89.500000	15.500000
Snow,Ice Pellets	87.666667	23.833333
Haze	81.625000	10.437500
Drizzle,Ice Pellets,Fog	92.000000	20.000000
Rain,Ice Pellets	92.000000	24.000000
Drizzle,Snow,Fog	95.866667	15.533333
Snow Pellets	59.000000	35.000000
Rain,Snow,Fog	96.000000	9.000000
Drizzle,Snow	93.500000	14.000000
Rain,Snow	89.000000	28.388889
Rain,Snow,Ice Pellets	91.500000	23.250000
Moderate Rain,Fog	94.000000	17.000000

Rain,Snow Grains	75.000000	26.000000
Rain Showers,Snow Showers	76.500000	22.500000
Fog	92.286667	7.946667
Rain,Haze	83.333333	11.666667
Clear	64.497738	10.557315
Drizzle	88.243902	16.097561
Cloudy	69.592593	16.127315
Drizzle,Fog	93.275000	11.862500
Rain,Fog	93.189655	14.793103
Rain	83.624183	19.254902
Mostly Cloudy	62.102465	15.813920
Thunderstorms,Heavy Rain Showers	88.000000	9.000000
Mainly Clear	60.667142	14.144824
Rain Showers,Fog	96.000000	13.000000
Rain Showers	75.159574	17.132979
Thunderstorms,Moderate Rain Showers,Fog	93.000000	15.000000
Thunderstorms,Rain Showers	86.375000	18.312500
Thunderstorms,Rain	89.000000	15.666667
Thunderstorms,Rain,Fog	88.000000	19.000000
Thunderstorms,Rain Showers,Fog	84.000000	19.666667
Thunderstorms	77.000000	7.500000

	Visibility_km	Press_kPa
Weather Condition		
Snow Showers,Fog	7.025000	101.292500
Freezing Fog	0.650000	102.320000
Freezing Drizzle	9.200000	100.202857
Moderate Snow	0.750000	100.275000
Moderate Snow,Blowing Snow	0.600000	100.570000
Freezing Drizzle,Haze	2.666667	100.316667
Snow,Blowing Snow	4.105263	99.704737
Freezing Drizzle,Snow	5.872727	100.520909
Snow,Fog	4.537838	100.688649
Freezing Rain,Snow Grains	4.800000	98.560000
Freezing Rain,Haze	2.400000	100.375000
Snow	11.171795	100.536103
Snow,Haze	4.640000	100.782000
Freezing Rain	8.242857	99.647143
Snow Showers	20.158333	100.963500
Freezing Rain,Ice Pellets,Fog	8.000000	100.950000
Freezing Drizzle,Fog	5.266667	100.441667
Freezing Rain,Fog	7.550000	99.945000
Snow,Ice Pellets	7.416667	100.548333
Haze	7.831250	101.482500
Drizzle,Ice Pellets,Fog	4.000000	100.790000
Rain,Ice Pellets	9.700000	100.120000
Drizzle,Snow,Fog	5.513333	99.281333

```
Snow Pellets                                        2.400000    99.700000
Rain,Snow,Fog                                       6.400000   100.730000
Drizzle,Snow                                       10.500000   100.890000
Rain,Snow                                          11.672222    99.951111
Rain,Snow,Ice Pellets                               6.000000   100.105000
Moderate Rain,Fog                                   6.400000    99.980000
Rain,Snow Grains                                   25.000000   100.600000
Rain Showers,Snow Showers                          21.700000   101.100000
Fog                                                 6.248000   101.184067
Rain,Haze                                           6.700000   100.540000
Clear                                              30.153243   101.587443
Drizzle                                            17.931707   100.435366
Cloudy                                             26.625752   100.911441
Drizzle,Fog                                         5.257500   100.786625
Rain,Fog                                            6.873276   100.500862
Rain                                               18.856536   100.233333
Mostly Cloudy                                      31.253842   101.025288
Thunderstorms,Heavy Rain Showers                    2.400000   100.260000
Mainly Clear                                       34.264862   101.248832
Rain Showers,Fog                                    6.400000    99.830000
Rain Showers                                       22.816489   100.404043
Thunderstorms,Moderate Rain Showers,Fog             3.200000   100.010000
Thunderstorms,Rain Showers                         15.893750   100.233750
Thunderstorms,Rain                                 19.833333   100.420000
Thunderstorms,Rain,Fog                              4.800000   100.080000
Thunderstorms,Rain Showers,Fog                      9.700000   100.063333
Thunderstorms                                      24.550000   100.230000
```

0.1.14 What is the Minimum and Maximum Value of each column against each weather condition

```
[58]: data.groupby('Weather Condition').min().sort_values('Temp_C')
```

```
[58]:                               Date/Time   Temp_C  \
      Weather Condition
      Clear                      1/11/2012 1:00    -23.3
      Mostly Cloudy              1/1/2012 16:00    -23.2
      Mainly Clear              1/10/2012 11:00    -22.8
      Cloudy                     1/1/2012 17:00    -21.4
      Freezing Fog               1/22/2012 6:00    -19.0
      Snow                       1/10/2012 1:00    -16.7
      Fog                         1/1/2012 0:00    -16.0
      Snow Showers               1/12/2012 7:00    -13.3
      Snow,Blowing Snow         1/13/2012 21:00    -12.0
      Haze                      1/22/2012 12:00    -11.5
      Snow Showers,Fog          12/26/2012 9:00    -11.3
      Snow,Fog                 12/16/2012 15:00    -10.1
```

```
Freezing Drizzle                                    1/13/2012 10:00      -9.0
Freezing Drizzle,Snow                                1/13/2012 3:00      -8.3
Freezing Rain                                       1/13/2012 11:00      -6.5
Freezing Drizzle,Fog                                  1/1/2012 2:00      -6.4
Moderate Snow                                       1/12/2012 15:00      -6.3
Freezing Rain,Fog                                   1/17/2012 23:00      -6.1
Freezing Drizzle,Haze                                2/1/2012 11:00      -5.8
Moderate Snow,Blowing Snow                         12/27/2012 10:00      -5.5
Freezing Rain,Snow Grains                            1/13/2012 9:00      -5.0
Freezing Rain,Haze                                   2/1/2012 14:00      -4.9
Snow,Haze                                            2/1/2012 17:00      -4.3
Snow,Ice Pellets                                    12/10/2012 3:00      -4.3
Freezing Rain,Ice Pellets,Fog                       12/17/2012 3:00      -2.6
Drizzle,Fog                                         1/23/2012 20:00       0.0
Rain,Fog                                            1/23/2012 18:00       0.0
Rain                                                 1/1/2012 18:00       0.3
Drizzle,Snow,Fog                                    12/18/2012 21:00      0.3
Drizzle,Ice Pellets,Fog                             12/17/2012 9:00       0.4
Rain,Ice Pellets                                    12/18/2012 5:00       0.6
Rain,Snow                                            1/10/2012 5:00       0.6
Snow Pellets                                       11/24/2012 15:00       0.7
Rain,Snow,Fog                                       12/8/2012 21:00       0.8
Rain,Snow,Ice Pellets                               12/21/2012 1:00       0.9
Drizzle,Snow                                        12/17/2012 15:00      0.9
Drizzle                                             1/23/2012 21:00       1.1
Rain Showers                                         1/1/2012 22:00       1.6
Moderate Rain,Fog                                   12/10/2012 8:00       1.7
Rain,Snow Grains                                    12/21/2012 0:00       1.9
Rain Showers,Snow Showers                            11/4/2012 8:00       2.1
Rain,Haze                                            3/13/2012 7:00       4.0
Thunderstorms,Heavy Rain Showers                     5/29/2012 6:00      10.9
Thunderstorms,Rain Showers                          5/29/2012 16:00      11.0
Rain Showers,Fog                                    10/20/2012 3:00      12.8
Thunderstorms,Rain                                  5/25/2012 20:00      19.4
Thunderstorms,Rain Showers,Fog                       6/29/2012 3:00      19.5
Thunderstorms,Moderate Rain Showers,Fog              7/17/2012 6:00      19.6
Thunderstorms,Rain,Fog                               7/17/2012 5:00      20.6
Thunderstorms                                        7/16/2012 1:00      21.6

                                       Dew Point Temp_C  Rel Hum_%  \
Weather Condition
Clear                                              -28.5          20
Mostly Cloudy                                      -28.5          18
Mainly Clear                                       -28.0          20
Cloudy                                             -26.8          18
Freezing Fog                                       -22.9          71
Snow                                               -24.6          41
```

Weather Condition	Temperature_C	Humidity_%
Fog	-17.2	80
Snow Showers	-19.3	52
Snow,Blowing Snow	-16.2	70
Haze	-16.0	68
Snow Showers,Fog	-12.7	89
Snow,Fog	-12.0	77
Freezing Drizzle	-12.2	78
Freezing Drizzle,Snow	-10.4	79
Freezing Rain	-9.0	81
Freezing Drizzle,Fog	-9.0	82
Moderate Snow	-7.6	83
Freezing Rain,Fog	-8.7	82
Freezing Drizzle,Haze	-8.3	81
Moderate Snow,Blowing Snow	-6.6	92
Freezing Rain,Snow Grains	-7.3	84
Freezing Rain,Haze	-7.5	82
Snow,Haze	-7.2	80
Snow,Ice Pellets	-5.9	76
Freezing Rain,Ice Pellets,Fog	-3.7	92
Drizzle,Fog	-1.6	85
Rain,Fog	-1.2	83
Rain	-5.7	40
Drizzle,Snow,Fog	-0.1	92
Drizzle,Ice Pellets,Fog	-0.7	92
Rain,Ice Pellets	-0.6	92
Rain,Snow	-1.7	81
Snow Pellets	-6.4	59
Rain,Snow,Fog	0.3	96
Rain,Snow,Ice Pellets	-0.7	88
Drizzle,Snow	0.1	92
Drizzle	-0.2	74
Rain Showers	-7.2	37
Moderate Rain,Fog	0.8	94
Rain,Snow Grains	-2.1	75
Rain Showers,Snow Showers	-1.8	75
Rain,Haze	1.0	81
Thunderstorms,Heavy Rain Showers	9.0	88
Thunderstorms,Rain Showers	7.0	68
Rain Showers,Fog	12.1	96
Thunderstorms,Rain	18.2	83
Thunderstorms,Rain Showers,Fog	16.1	80
Thunderstorms,Moderate Rain Showers,Fog	18.5	93
Thunderstorms,Rain,Fog	18.6	88
Thunderstorms	19.4	67

```
                                Wind Speed_km/h  Visibility_km  \
Weather Condition
```

Clear	0	11.3
Mostly Cloudy	0	11.3
Mainly Clear	0	12.9
Cloudy	0	11.3
Freezing Fog	0	0.2
Snow	0	1.0
Fog	0	0.2
Snow Showers	0	2.4
Snow,Blowing Snow	24	0.6
Haze	0	4.8
Snow Showers,Fog	7	4.0
Snow,Fog	4	1.2
Freezing Drizzle	6	4.8
Freezing Drizzle,Snow	6	2.4
Freezing Rain	7	2.8
Freezing Drizzle,Fog	6	3.6
Moderate Snow	26	0.6
Freezing Rain,Fog	7	2.8
Freezing Drizzle,Haze	9	2.0
Moderate Snow,Blowing Snow	39	0.6
Freezing Rain,Snow Grains	32	4.8
Freezing Rain,Haze	6	2.0
Snow,Haze	0	4.0
Snow,Ice Pellets	19	2.8
Freezing Rain,Ice Pellets,Fog	28	8.0
Drizzle,Fog	0	1.0
Rain,Fog	0	2.0
Rain	0	4.0
Drizzle,Snow,Fog	7	2.4
Drizzle,Ice Pellets,Fog	20	4.0
Rain,Ice Pellets	24	9.7
Rain,Snow	13	2.4
Snow Pellets	35	2.4
Rain,Snow,Fog	9	6.4
Rain,Snow,Ice Pellets	17	4.8
Drizzle,Snow	9	9.7
Drizzle	0	6.4
Rain Showers	0	6.4
Moderate Rain,Fog	17	6.4
Rain,Snow Grains	26	25.0
Rain Showers,Snow Showers	17	19.3
Rain,Haze	7	4.0
Thunderstorms,Heavy Rain Showers	9	2.4
Thunderstorms,Rain Showers	7	6.4
Rain Showers,Fog	13	6.4
Thunderstorms,Rain	4	16.1
Thunderstorms,Rain Showers,Fog	7	9.7

Thunderstorms,Moderate Rain Showers,Fog	15	3.2
Thunderstorms,Rain,Fog	19	4.8
Thunderstorms	0	24.1

	Press_kPa
Weather Condition	
Clear	99.52
Mostly Cloudy	98.36
Mainly Clear	98.67
Cloudy	98.39
Freezing Fog	101.97
Snow	97.75
Fog	98.31
Snow Showers	99.49
Snow,Blowing Snow	98.11
Haze	100.35
Snow Showers,Fog	100.63
Snow,Fog	99.38
Freezing Drizzle	98.44
Freezing Drizzle,Snow	99.19
Freezing Rain	98.22
Freezing Drizzle,Fog	98.74
Moderate Snow	99.88
Freezing Rain,Fog	98.32
Freezing Drizzle,Haze	100.28
Moderate Snow,Blowing Snow	100.50
Freezing Rain,Snow Grains	98.56
Freezing Rain,Haze	100.34
Snow,Haze	100.61
Snow,Ice Pellets	99.40
Freezing Rain,Ice Pellets,Fog	100.95
Drizzle,Fog	98.65
Rain,Fog	98.61
Rain	97.52
Drizzle,Snow,Fog	97.79
Drizzle,Ice Pellets,Fog	100.79
Rain,Ice Pellets	100.12
Rain,Snow	98.18
Snow Pellets	99.70
Rain,Snow,Fog	100.73
Rain,Snow,Ice Pellets	99.85
Drizzle,Snow	100.63
Drizzle	97.84
Rain Showers	98.51
Moderate Rain,Fog	99.98
Rain,Snow Grains	100.60
Rain Showers,Snow Showers	101.09

```
Rain,Haze                               100.50
Thunderstorms,Heavy Rain Showers        100.26
Thunderstorms,Rain Showers               99.65
Rain Showers,Fog                         99.83
Thunderstorms,Rain                      100.19
Thunderstorms,Rain Showers,Fog           99.71
Thunderstorms,Moderate Rain Showers,Fog 100.01
Thunderstorms,Rain,Fog                  100.08
Thunderstorms                            99.84
```

[62]: `data.groupby('Weather Condition').max().sort_values('Temp_C')`

[62]:

```
                                   Date/Time   Temp_C  \
Weather Condition
Snow Showers,Fog            12/29/2012 13:00    -10.0
Moderate Snow,Blowing Snow  12/27/2012 12:00     -5.4
Freezing Rain,Snow Grains     1/13/2012 9:00     -5.0
Freezing Drizzle,Haze         2/1/2012 13:00     -5.0
Freezing Rain,Haze            2/1/2012 15:00     -4.9
Moderate Snow                12/27/2012 9:00     -4.9
Snow,Haze                     2/1/2012 21:00     -3.6
Freezing Drizzle,Snow         3/2/2012 12:00     -3.3
Freezing Rain,Ice Pellets,Fog 12/17/2012 3:00    -2.6
Freezing Drizzle              2/1/2012 5:00      -2.3
Snow,Blowing Snow            2/25/2012 9:00      -1.4
Freezing Drizzle,Fog         12/10/2012 5:00     -0.3
Freezing Fog                 3/17/2012 6:00      -0.1
Freezing Rain,Fog            12/17/2012 1:00      0.1
Freezing Rain                 2/1/2012 7:00       0.3
Drizzle,Ice Pellets,Fog      12/17/2012 9:00      0.4
Rain,Ice Pellets             12/18/2012 5:00      0.6
Snow Pellets                11/24/2012 15:00      0.7
Snow,Ice Pellets              3/3/2012 4:00       0.8
Rain,Snow,Fog                12/8/2012 21:00      0.8
Drizzle,Snow,Fog             12/22/2012 3:00      1.1
Snow,Fog                     3/14/2012 19:00      1.1
Drizzle,Snow                 12/19/2012 18:00     1.2
Rain,Snow,Ice Pellets        12/21/2012 5:00      1.3
Rain,Snow                     4/23/2012 3:00      1.7
Moderate Rain,Fog            12/10/2012 8:00      1.7
Rain,Snow Grains             12/21/2012 0:00      1.9
Rain Showers,Snow Showers    12/5/2012 10:00      2.2
Snow Showers                  3/4/2012 21:00      2.9
Snow                          4/27/2012 9:00      3.7
Rain,Haze                     3/13/2012 9:00      5.5
Thunderstorms,Heavy Rain Showers 5/29/2012 6:00  10.9
Rain Showers,Fog             10/20/2012 3:00     12.8
```

```
Haze                                      3/13/2012 23:00    14.1
Drizzle                                    9/30/2012 3:00    18.8
Thunderstorms,Moderate Rain Showers,Fog    7/17/2012 6:00    19.6
Drizzle,Fog                                9/30/2012 2:00    19.9
Thunderstorms,Rain,Fog                     7/17/2012 5:00    20.6
Fog                                        9/22/2012 0:00    20.8
Thunderstorms,Rain                        7/23/2012 18:00    21.3
Rain,Fog                                  9/30/2012 23:00    21.7
Rain                                        9/5/2012 2:00    22.8
Thunderstorms,Rain Showers,Fog           7/31/2012 20:00    22.9
Thunderstorms,Rain Showers                 9/8/2012 4:00    25.5
Rain Showers                              9/8/2012 16:00    26.4
Thunderstorms                              7/4/2012 16:00    26.7
Cloudy                                     9/9/2012 23:00    30.5
Mostly Cloudy                              9/9/2012 2:00    32.4
Clear                                      9/9/2012 5:00    32.8
Mainly Clear                               9/9/2012 9:00    33.0

                                Dew Point Temp_C  Rel Hum_%  \
Weather Condition
Snow Showers,Fog                            -11.1         92
Moderate Snow,Blowing Snow                   -6.4         93
Freezing Rain,Snow Grains                    -7.3         84
Freezing Drizzle,Haze                        -7.7         83
Freezing Rain,Haze                           -7.4         83
Moderate Snow                                -6.7         93
Snow,Haze                                    -6.4         81
Freezing Drizzle,Snow                        -4.6         94
Freezing Rain,Ice Pellets,Fog               -3.7         92
Freezing Drizzle                             -3.3         93
Snow,Blowing Snow                            -2.9         91
Freezing Drizzle,Fog                         -2.3         94
Freezing Fog                                 -0.3         99
Freezing Rain,Fog                            -0.9         93
Freezing Rain                                -1.7         92
Drizzle,Ice Pellets,Fog                      -0.7         92
Rain,Ice Pellets                             -0.6         92
Snow Pellets                                 -6.4         59
Snow,Ice Pellets                             -1.7         92
Rain,Snow,Fog                                 0.3         96
Drizzle,Snow,Fog                              0.6         98
Snow,Fog                                      0.8         99
Drizzle,Snow                                  0.2         95
Rain,Snow,Ice Pellets                         0.1         94
Rain,Snow                                     0.5         94
Moderate Rain,Fog                             0.8         94
Rain,Snow Grains                             -2.1         75
```

Weather Condition		
Rain Showers,Snow Showers	-1.2	78
Snow Showers	-0.7	94
Snow	0.3	96
Rain,Haze	2.9	86
Thunderstorms,Heavy Rain Showers	9.0	88
Rain Showers,Fog	12.1	96
Haze	11.1	86
Drizzle	17.7	96
Thunderstorms,Moderate Rain Showers,Fog	18.5	93
Drizzle,Fog	19.1	100
Thunderstorms,Rain,Fog	18.6	88
Fog	19.6	100
Thunderstorms,Rain	19.1	93
Rain,Fog	19.5	100
Rain	20.4	99
Thunderstorms,Rain Showers,Fog	21.3	91
Thunderstorms,Rain Showers	23.1	98
Rain Showers	23.0	97
Thunderstorms	20.1	87
Cloudy	22.6	99
Mostly Cloudy	24.4	100
Clear	20.4	99
Mainly Clear	21.2	99

	Wind Speed_km/h	Visibility_km \
Weather Condition		
Snow Showers,Fog	22	9.7
Moderate Snow,Blowing Snow	41	0.6
Freezing Rain,Snow Grains	32	4.8
Freezing Drizzle,Haze	11	4.0
Freezing Rain,Haze	9	2.8
Moderate Snow	39	0.8
Snow,Haze	15	6.4
Freezing Drizzle,Snow	24	12.9
Freezing Rain,Ice Pellets,Fog	28	8.0
Freezing Drizzle	26	12.9
Snow,Blowing Snow	48	9.7
Freezing Drizzle,Fog	33	8.0
Freezing Fog	9	0.8
Freezing Rain,Fog	26	9.7
Freezing Rain	28	16.1
Drizzle,Ice Pellets,Fog	20	4.0
Rain,Ice Pellets	24	9.7
Snow Pellets	35	2.4
Snow,Ice Pellets	33	11.3
Rain,Snow,Fog	9	6.4
Drizzle,Snow,Fog	32	9.7

Snow,Fog	35	9.7
Drizzle,Snow	19	11.3
Rain,Snow,Ice Pellets	28	6.4
Rain,Snow	52	25.0
Moderate Rain,Fog	17	6.4
Rain,Snow Grains	26	25.0
Rain Showers,Snow Showers	28	24.1
Snow Showers	37	48.3
Snow	57	25.0
Rain,Haze	17	9.7
Thunderstorms,Heavy Rain Showers	9	2.4
Rain Showers,Fog	13	6.4
Haze	17	9.7
Drizzle	30	25.0
Thunderstorms,Moderate Rain Showers,Fog	15	3.2
Drizzle,Fog	28	9.7
Thunderstorms,Rain,Fog	19	4.8
Fog	22	9.7
Thunderstorms,Rain	30	24.1
Rain,Fog	46	9.7
Rain	52	48.3
Thunderstorms,Rain Showers,Fog	35	9.7
Thunderstorms,Rain Showers	32	25.0
Rain Showers	41	48.3
Thunderstorms	15	25.0
Cloudy	54	48.3
Mostly Cloudy	83	48.3
Clear	33	48.3
Mainly Clear	63	48.3

	Press_kPa
Weather Condition	
Snow Showers,Fog	102.52
Moderate Snow,Blowing Snow	100.64
Freezing Rain,Snow Grains	98.56
Freezing Drizzle,Haze	100.36
Freezing Rain,Haze	100.41
Moderate Snow	100.67
Snow,Haze	100.99
Freezing Drizzle,Snow	101.18
Freezing Rain,Ice Pellets,Fog	100.95
Freezing Drizzle	101.02
Snow,Blowing Snow	100.62
Freezing Drizzle,Fog	101.27
Freezing Fog	102.85
Freezing Rain,Fog	101.01
Freezing Rain	101.00

```
Drizzle,Ice Pellets,Fog                      100.79
Rain,Ice Pellets                             100.12
Snow Pellets                                  99.70
Snow,Ice Pellets                             100.96
Rain,Snow,Fog                                100.73
Drizzle,Snow,Fog                             100.15
Snow,Fog                                     102.07
Drizzle,Snow                                 101.15
Rain,Snow,Ice Pellets                        100.47
Rain,Snow                                    101.07
Moderate Rain,Fog                             99.98
Rain,Snow Grains                             100.60
Rain Showers,Snow Showers                    101.11
Snow Showers                                 102.50
Snow                                         102.73
Rain,Haze                                    100.61
Thunderstorms,Heavy Rain Showers             100.26
Rain Showers,Fog                              99.83
Haze                                         102.97
Drizzle                                      101.56
Thunderstorms,Moderate Rain Showers,Fog      100.01
Drizzle,Fog                                  102.07
Thunderstorms,Rain,Fog                       100.08
Fog                                          103.04
Thunderstorms,Rain                           100.83
Rain,Fog                                     101.77
Rain                                         102.26
Thunderstorms,Rain Showers,Fog               100.64
Thunderstorms,Rain Showers                   101.06
Rain Showers                                 102.31
Thunderstorms                                100.62
Cloudy                                       103.65
Mostly Cloudy                                103.65
Clear                                        103.63
Mainly Clear                                 103.59
```

0.1.15 Show all the records where weather condition is fog

```
[64]: # using string contains
      data[data['Weather Condition'].str.contains('Fog')]
```

```
[64]:           Date/Time  Temp_C  Dew Point Temp_C  Rel Hum_%  Wind Speed_km/h  \
      0      1/1/2012 0:00    -1.8              -3.9         86                4
      1      1/1/2012 1:00    -1.8              -3.7         87                4
      2      1/1/2012 2:00    -1.8              -3.4         89                7
      3      1/1/2012 3:00    -1.5              -3.2         88                6
      4      1/1/2012 4:00    -1.5              -3.3         88                7
```

```
...                  ...    ...               ...     ...          ...
8739  12/30/2012 3:00   -9.1           -10.4      90           11
8740  12/30/2012 4:00   -9.3           -10.6      90           13
8741  12/30/2012 5:00   -9.1           -10.4      90           11
8742  12/30/2012 6:00   -9.3           -10.8      89           17
8770  12/31/2012 10:00  -7.4            -8.9      89            4

      Visibility_km  Press_kPa        Weather Condition
0               8.0     101.24                      Fog
1               8.0     101.24                      Fog
2               4.0     101.26  Freezing Drizzle,Fog
3               4.0     101.27  Freezing Drizzle,Fog
4               4.8     101.23                      Fog
...             ...        ...                      ...
8739            3.6     100.30                 Snow,Fog
8740            9.7     100.28                 Snow,Fog
8741            4.0     100.32                 Snow,Fog
8742            8.0     100.39                 Snow,Fog
8770            6.4     101.05                 Snow,Fog

[426 rows x 8 columns]
```

[66]:
```python
# if only fog can use filtering
data[data['Weather Condition'] == 'Fog']
```

[66]:
```
                 Date/Time  Temp_C  Dew Point Temp_C  Rel Hum_%  Wind Speed_km/h  \
0            1/1/2012 0:00    -1.8              -3.9         86                4
1            1/1/2012 1:00    -1.8              -3.7         87                4
4            1/1/2012 4:00    -1.5              -3.3         88                7
5            1/1/2012 5:00    -1.4              -3.3         87                9
6            1/1/2012 6:00    -1.5              -3.1         89                7
...                    ...     ...               ...        ...              ...
8716  12/29/2012 4:00       -16.0             -17.2         90                6
8717  12/29/2012 5:00       -14.8             -15.9         91                4
8718  12/29/2012 6:00       -13.8             -15.3         88                4
8719  12/29/2012 7:00       -14.8             -16.4         88                7
8722  12/29/2012 10:00      -12.0             -13.3         90                7

      Visibility_km  Press_kPa Weather Condition
0               8.0     101.24               Fog
1               8.0     101.24               Fog
4               4.8     101.23               Fog
5               6.4     101.27               Fog
6               6.4     101.29               Fog
...             ...        ...               ...
8716            9.7     101.25               Fog
8717            6.4     101.25               Fog
```

```
8718              9.7      101.25                Fog
8719              8.0      101.22                Fog
8722              6.4      101.15                Fog

[150 rows x 8 columns]
```

0.1.16 Find all instances when 'Weather is clear' or 'Visiblity is above 40'

```
[72]:  # use the or operator
       data[(data['Weather Condition'].str.contains('Clear')) | (data['Visibility_km']␣
       ↪> 40)].tail(40)
```

```
[72]:             Date/Time   Temp_C   Dew Point Temp_C   Rel Hum_%   Wind Speed_km/h  \
       8639   12/25/2012 23:00   -10.4             -12.7          83                11
       8640    12/26/2012 0:00   -11.8             -13.5          87                 4
       8641    12/26/2012 1:00   -11.2             -12.9          87                 6
       8642    12/26/2012 2:00   -12.7             -14.4          87                 4
       8643    12/26/2012 3:00   -14.2             -15.8          88                 6
       8644    12/26/2012 4:00   -13.1             -14.7          88                 6
       8645    12/26/2012 5:00   -12.7             -14.1          89                 4
       8646    12/26/2012 6:00   -13.4             -14.8          89                 4
       8647    12/26/2012 7:00   -13.0             -14.4          89                 7
       8650   12/26/2012 10:00   -11.0             -13.2          84                15
       8651   12/26/2012 11:00   -11.3             -14.5          77                20
       8652   12/26/2012 12:00   -10.6             -14.3          74                20
       8698   12/28/2012 10:00    -6.1              -8.6          82                19
       8699   12/28/2012 11:00    -6.2              -8.8          82                24
       8700   12/28/2012 12:00    -7.2              -9.9          81                24
       8701   12/28/2012 13:00    -6.8              -9.8          79                20
       8702   12/28/2012 14:00    -6.5              -9.9          77                22
       8703   12/28/2012 15:00    -6.8             -10.3          76                24
       8704   12/28/2012 16:00    -7.7             -11.0          77                30
       8705   12/28/2012 17:00    -8.6             -12.0          76                26
       8706   12/28/2012 18:00    -9.0             -12.2          78                24
       8707   12/28/2012 19:00    -9.4             -12.3          79                22
       8708   12/28/2012 20:00    -9.8             -12.6          80                20
       8709   12/28/2012 21:00    -9.8             -12.5          81                19
       8710   12/28/2012 22:00    -9.9             -12.5          81                17
       8711   12/28/2012 23:00   -10.9             -13.2          83                13
       8712    12/29/2012 0:00   -11.6             -13.5          86                13
       8713    12/29/2012 1:00   -11.9             -13.6          87                11
       8714    12/29/2012 2:00   -11.8             -13.1          90                13
       8748   12/30/2012 12:00   -12.2             -15.7          75                26
       8749   12/30/2012 13:00   -12.4             -16.2          73                37
       8750   12/30/2012 14:00   -11.8             -16.1          70                37
       8751   12/30/2012 15:00   -11.3             -15.6          70                32
       8752   12/30/2012 16:00   -11.4             -15.5          72                26
```

```
8753  12/30/2012 17:00    -12.1            -15.8        74              28
8754  12/30/2012 18:00    -12.6            -16.0        76              24
8755  12/30/2012 19:00    -13.4            -16.5        77              26
8756  12/30/2012 20:00    -13.8            -16.5        80              24
8757  12/30/2012 21:00    -13.8            -16.5        80              20
8758  12/30/2012 22:00    -13.7            -16.3        81              19


      Visibility_km  Press_kPa Weather Condition
8639           25.0     102.45             Clear
8640           25.0     102.41             Clear
8641           25.0     102.42             Clear
8642           25.0     102.45             Clear
8643           25.0     102.52             Clear
8644           25.0     102.55             Clear
8645           25.0     102.48             Clear
8646           25.0     102.47             Clear
8647           25.0     102.46      Mainly Clear
8650           24.1     102.54      Mainly Clear
8651           48.3     102.50      Mainly Clear
8652           48.3     102.36      Mainly Clear
8698           24.1     101.27             Clear
8699           48.3     101.24      Mainly Clear
8700           48.3     101.22      Mainly Clear
8701           48.3     101.17      Mainly Clear
8702           48.3     101.17      Mainly Clear
8703           48.3     101.22      Mainly Clear
8704           48.3     101.25      Mainly Clear
8705           25.0     101.34      Mainly Clear
8706           25.0     101.37      Mainly Clear
8707           25.0     101.37      Mainly Clear
8708           25.0     101.35      Mainly Clear
8709           25.0     101.36      Mainly Clear
8710           25.0     101.38      Mainly Clear
8711           25.0     101.38      Mainly Clear
8712           25.0     101.35      Mainly Clear
8713           25.0     101.31             Clear
8714           25.0     101.33             Clear
8748           48.3     100.91     Mostly Cloudy
8749           48.3     100.92     Mostly Cloudy
8750           48.3     100.96      Mainly Clear
8751           48.3     101.05      Mainly Clear
8752           48.3     101.15      Mainly Clear
8753           25.0     101.26      Mainly Clear
8754           25.0     101.36      Mainly Clear
8755           25.0     101.47      Mainly Clear
8756           25.0     101.52             Clear
8757           25.0     101.50      Mainly Clear
```

```
8758                25.0        101.54        Mainly Clear
```

0.1.17 Find all instacnes where 'Weather is Clear' and 'Relative Humidity' is greater than 50

0.1.18 Or 'Visibility' is above 40

```python
[80]: data[((data['Weather Condition'] == 'Clear') & (data['Rel Hum_%'] > 50)) |
      ↪(data['Visibility_km'] > 40)]
```

```
[80]:            Date/Time  Temp_C  Dew Point Temp_C  Rel Hum_%  Wind Speed_km/h  \
      106     1/5/2012 10:00    -6.0             -10.0         73               17
      107     1/5/2012 11:00    -5.6             -10.2         70               22
      108     1/5/2012 12:00    -4.7              -9.6         69               20
      109     1/5/2012 13:00    -4.4              -9.7         66               26
      110     1/5/2012 14:00    -5.1             -10.7         65               22
      ...                ...     ...               ...        ...              ...
      8749  12/30/2012 13:00   -12.4             -16.2         73               37
      8750  12/30/2012 14:00   -11.8             -16.1         70               37
      8751  12/30/2012 15:00   -11.3             -15.6         70               32
      8752  12/30/2012 16:00   -11.4             -15.5         72               26
      8756  12/30/2012 20:00   -13.8             -16.5         80               24

            Visibility_km  Press_kPa Weather Condition
      106            48.3     100.45       Mainly Clear
      107            48.3     100.41       Mainly Clear
      108            48.3     100.38       Mainly Clear
      109            48.3     100.40       Mainly Clear
      110            48.3     100.46       Mainly Clear
      ...             ...        ...                ...
      8749           48.3     100.92       Mostly Cloudy
      8750           48.3     100.96       Mainly Clear
      8751           48.3     101.05       Mainly Clear
      8752           48.3     101.15       Mainly Clear
      8756           25.0     101.52              Clear

      [2921 rows x 8 columns]
```