1-Ozone

July 9, 2017

1 Practical Pandas with Ozone Data

```
In [1]: %matplotlib inline
        import matplotlib.pyplot as plt
        import pandas as pd

        data = pd.read_csv('../data/ozone.csv')
```

What are the column names in this dataset?

```
In [2]: data.columns
```

```
Out[2]: Index([u'Ozone', u'Solar.R', u'Wind', u'Temp', u'Month', u'Day'], dtype='object')
```

```
In [3]: list(data.columns)
```

```
Out[3]: ['Ozone', 'Solar.R', 'Wind', 'Temp', 'Month', 'Day']
```

What are the data types?

```
In [4]: data.dtypes
```

```
Out[4]: Ozone      float64
        Solar.R    float64
        Wind       float64
        Temp         int64
        Month        int64
        Day          int64
        dtype: object
```

Extract the first 5 rows of the data frame.

```
In [5]: data.head()
```

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

Extract the first 2 rows of the data frame.

```
In [6]: data.head(2)
```

```
Out[6]:    Ozone  Solar.R  Wind  Temp  Month  Day
        0   41.0    190.0   7.4    67      5    1
        1   36.0    118.0   8.0    72      5    2
```

```
In [7]: data.iloc[0:2]
```

```
Out[7]:    Ozone  Solar.R  Wind  Temp  Month  Day
        0   41.0    190.0   7.4    67      5    1
        1   36.0    118.0   8.0    72      5    2
```

Extract the 1st and 3rd rows of the data frame.

```
In [8]: data.iloc[[0,2]]
```

```
Out[8]:    Ozone  Solar.R  Wind  Temp  Month  Day
        0   41.0    190.0   7.4    67      5    1
        2   12.0    149.0  12.6    74      5    3
```

How many observations (i.e. rows) are in this data frame?

```
In [9]: len(data)
```

```
Out[9]: 153
```

```
In [10]: # number of rows x columns
         data.shape
```

```
Out[10]: (153, 6)
```

Extract the last 2 rows of the data frame.

```
In [11]: data.tail(2)
```

```
Out[11]:      Ozone  Solar.R  Wind  Temp  Month  Day
         151   18.0    131.0   8.0    76      9   29
         152   20.0    223.0  11.5    68      9   30
```

```
In [12]: data.iloc[151:]
```

```
Out[12]:      Ozone  Solar.R  Wind  Temp  Month  Day
         151   18.0    131.0   8.0    76      9   29
         152   20.0    223.0  11.5    68      9   30
```

What is the value of Ozone in the 47th row?

```
In [13]: data.Ozone[46]

Out[13]: 21.0

In [14]: data['Ozone'][46]

Out[14]: 21.0

In [15]: data.ix[46]

Out[15]: Ozone       21.0
         Solar.R    191.0
         Wind        14.9
         Temp        77.0
         Month        6.0
         Day         16.0
         Name: 46, dtype: float64
```

How many missing values are in the Ozone column of this data frame?

```
In [16]: data.Ozone.isnull().sum()

Out[16]: 37

In [17]: # real values
         data.Ozone.notnull().sum()

Out[17]: 116
```

What is the mean of the Ozone column in this dataset?

```
In [18]: data.Ozone.mean()

Out[18]: 42.12931034482759

In [19]: # Excludes missing values (coded as NA)
         data[data.Ozone.notnull()].Ozone.mean()

Out[19]: 42.12931034482759
```

Extract the subset of rows of the data frame where Ozone values are above 31 and Temp values are above 90. What is the mean of Wind in this subset?

```
In [20]: # and query
         data2 = data[(data.Ozone > 31) & (data.Temp > 90)]
         data2.Wind.mean()

Out[20]: 5.6
```

```
In [21]: # or query
         data3 = data[(data.Ozone > 31) | (data.Temp > 90)]
         data3.Wind.mean()
```

```
Out[21]: 8.477419354838709
```

```
In [22]: data[(data.Ozone > 31) & (data.Temp > 90)]
```

```
Out[22]:      Ozone  Solar.R  Wind  Temp  Month  Day
         68    97.0    267.0   6.3    92      7    8
         69    97.0    272.0   5.7    92      7    9
         119   76.0    203.0   9.7    97      8   28
         120  118.0    225.0   2.3    94      8   29
         121   84.0    237.0   6.3    96      8   30
         122   85.0    188.0   6.3    94      8   31
         123   96.0    167.0   6.9    91      9    1
         124   78.0    197.0   5.1    92      9    2
         125   73.0    183.0   2.8    93      9    3
         126   91.0    189.0   4.6    93      9    4
```

```
In [23]: data[(data.Ozone > 31) & (data.Temp > 90)].mean()
```

```
Out[23]: Ozone       89.5
         Solar.R    212.8
         Wind         5.6
         Temp        93.4
         Month        8.2
         Day         14.5
         dtype: float64
```

```
In [24]: data[(data.Ozone > 31) & (data.Temp > 90)].Wind.mean()
```

```
Out[24]: 5.6
```

How about Solar.R?

```
In [25]: data[(data.Ozone > 31) & (data.Temp > 90)]['Solar.R']
```

```
Out[25]: 68     267.0
         69     272.0
         119    203.0
         120    225.0
         121    237.0
         122    188.0
         123    167.0
         124    197.0
         125    183.0
         126    189.0
         Name: Solar.R, dtype: float64
```

```
In [26]: data[(data.Ozone > 31) & (data.Temp > 90)]['Solar.R'].mean()
```

```
Out[26]: 212.8
```

What is the mean of "Temp" when "Month" is equal to 6?

```
In [27]: data[data.Month == 6].Temp.mean()

Out[27]: 79.1
```

What was the maximum ozone value in the month of May (i.e. Month = 5)?

```
In [28]: data[data.Month == 5].Ozone.max()

Out[28]: 115.0

In [29]: # max of both ozone and temp during month of may
         data[data.Month == 5][['Ozone','Temp']].max()

Out[29]: Ozone    115.0
         Temp      81.0
         dtype: float64
```

What are the unique values for 'Month'?

```
In [30]: data.Month.unique()

Out[30]: array([5, 6, 7, 8, 9])
```

What is mean Temp for each month?

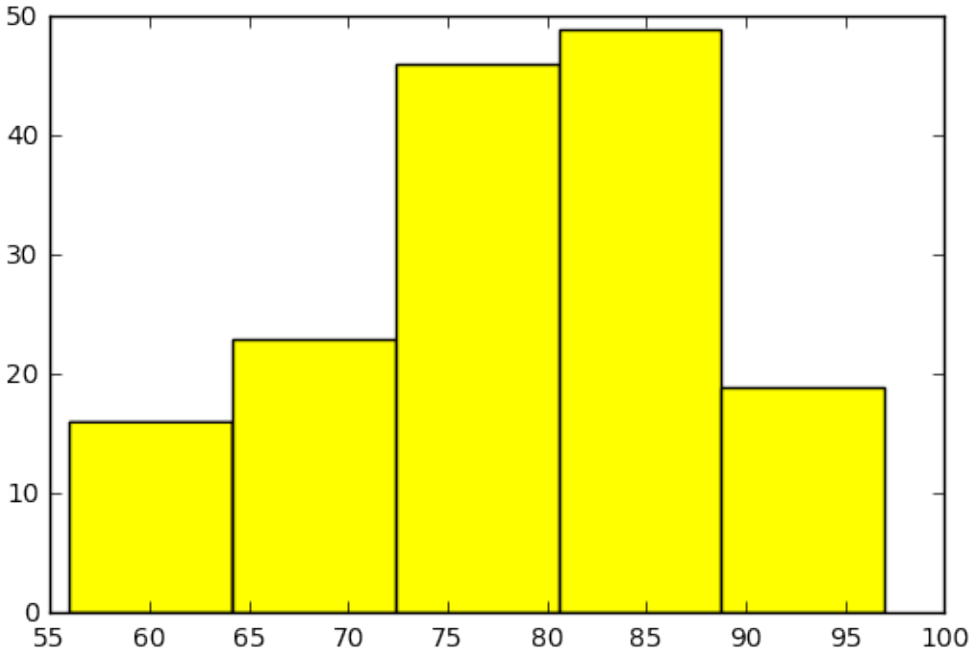
```
In [31]: data.groupby('Month').Temp.mean()

Out[31]: Month
         5    65.548387
         6    79.100000
         7    83.903226
         8    83.967742
         9    76.900000
         Name: Temp, dtype: float64
```

Plot a histogram for Temp for the month of May

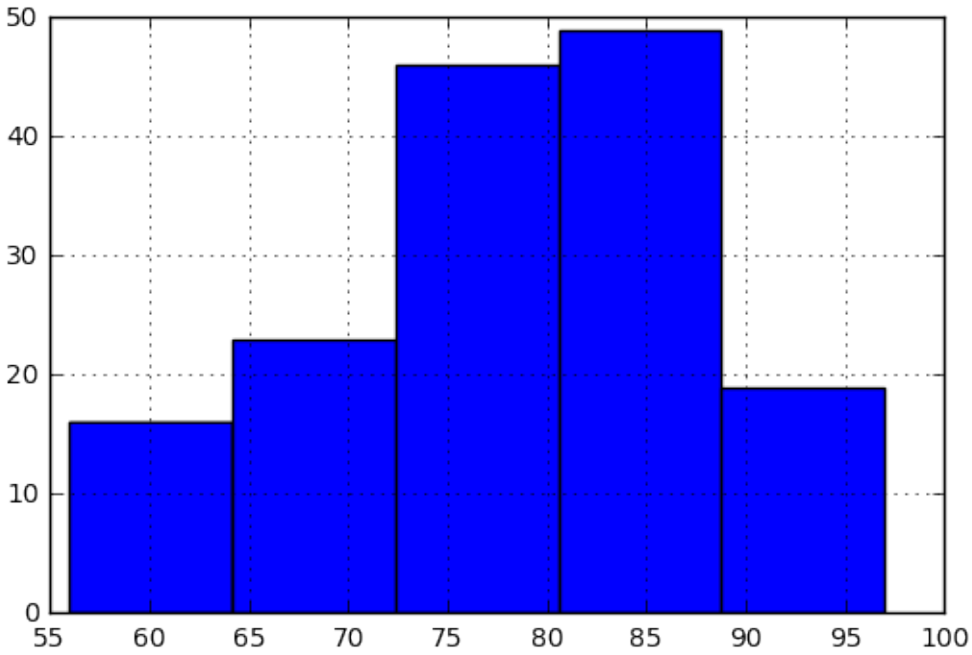
```
In [32]: plt.hist(data.Temp, 5, color="yellow")

Out[32]: (array([ 16.,  23.,  46.,  49.,  19.]),
          array([ 56. ,  64.2,  72.4,  80.6,  88.8,  97. ]),
          <a list of 5 Patch objects>)
```




```
In [33]: data.Temp.hist(bins=5)
```

```
Out[33]: <matplotlib.axes._subplots.AxesSubplot at 0x10e1b15d0>
```



2 Next Steps

Recommended Resources

Name	Description
Official Pandas Tutorials	Wes & Company's selection of tutorials and lectures
Julia Evans Pandas Cookbook	Great resource with eamples from weather, bikes and 311 calls
Learn Pandas Tutorials	A great series of Pandas tutorials from Dave Rojas

Name	Description
Research Computing	A super awesome set of python notebooks from a meetup-based course exclusively devoted to pandas
Python Data PYNBs	