AkronAshevilleAnalysis

December 2, 2018

1 Akron, OH - Asheville, NC Weather Analysis

```
In [1]: import math
        import pandas as pd
        import seaborn as sns
        import matplotlib.pyplot as plt
        %matplotlib notebook
```

1.1 Load CSV data files

```
In [2]: akron = pd.read_csv("AkronWeather.csv", parse_dates=["DATE"])
```

```
In [3]: ash = pd.read_csv("AshevilleWeather.csv", parse_dates=["DATE"])
```

1.2 Change data frames to only include needed fields

```
In [4]: akron = akron[["STATION", "DATE", "TAVG"]]
```

```
In [5]: ash = ash[["STATION", "DATE", "TAVG"]]
```

1.3 Analysis of all months

1.3.1 Generate descriptive statistics

Akron

```
In [6]: akron["TAVG"].describe()
```

```
Out[6]: count    1461.000000
        mean       51.930869
        std        19.175898
        min        -6.000000
        25%        38.000000
        50%        55.000000
        75%        69.000000
        max        83.000000
        Name: TAVG, dtype: float64
```

```
In [7]: akron["TAVG"].median()
```

```
Out[7]: 55.0
```

Asheville

```
In [8]: ash["TAVG"].describe()
```

```
Out[8]: count    1461.000000
        mean       56.988364
        std        14.726939
        min         7.000000
        25%        46.000000
        50%        59.000000
        75%        70.000000
        max        80.000000
        Name: TAVG, dtype: float64
```

```
In [9]: ash["TAVG"].median()
```

```
Out[9]: 59.0
```

1.3.2 Combine the two datasets into one for generating charts

```
In [10]: datasets = [akron, ash]
         data = pd.concat(datasets)
```

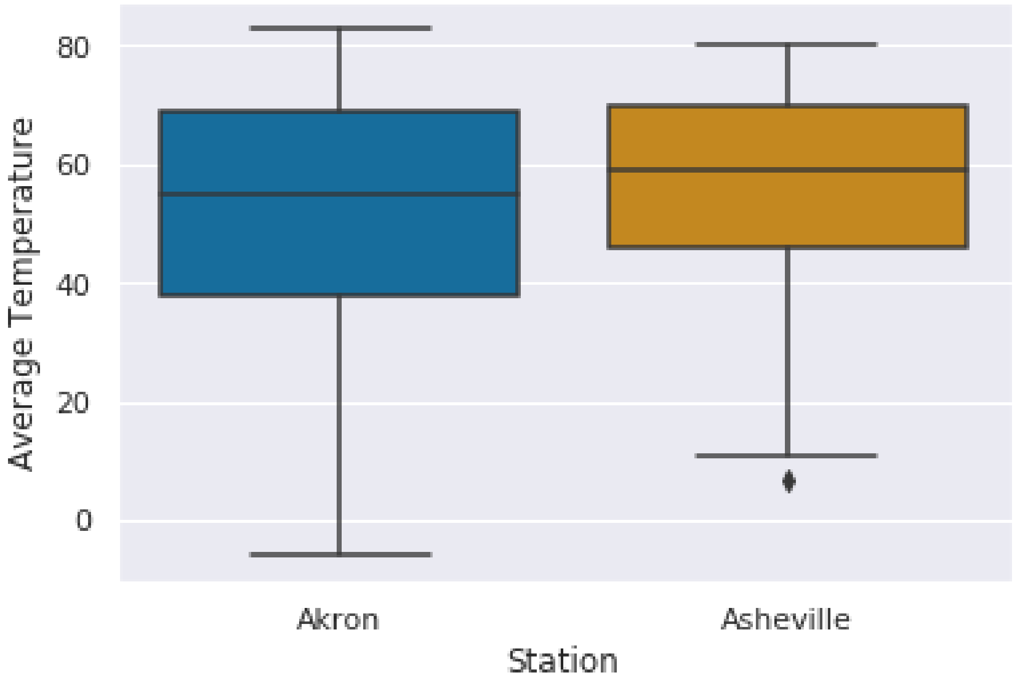
1.3.3 Add station name and month name to datasets for charts

```
In [11]: data.loc[data["STATION"]=="USW00014895","STATIONNAME"] = "Akron"
         data.loc[data["STATION"]=="USW00003812","STATIONNAME"] = "Asheville"
         data["MONTH"] = data["DATE"].dt.month
```

1.3.4 Create boxplots

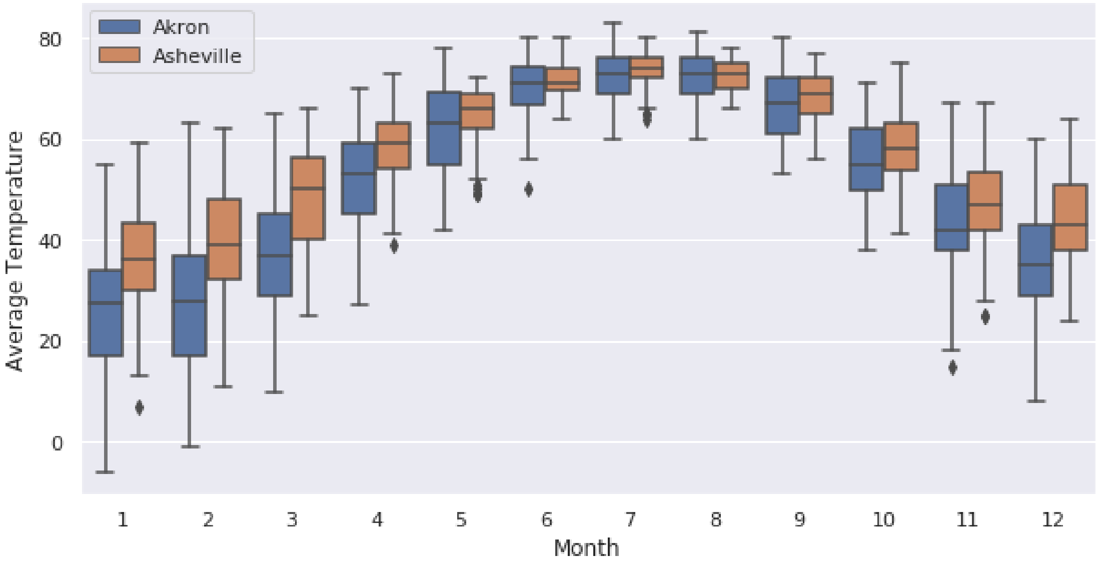
```
In [12]: sns.set(palette="colorblind")
         ax = sns.boxplot(x="STATIONNAME", y="TAVG", data=data)
         ax.set(xlabel="Station", ylabel="Average Temperature")
```

```
Out[12]: [Text(0, 0.5, 'Average Temperature'), Text(0.5, 0, 'Station')]
```



```
In [13]: sns.set(palette="colorblind")
         sns.set(rc={'figure.figsize':(10,5)})
         ax = sns.boxplot(x="MONTH", y="TAVG", hue="STATIONNAME", data=data)
         ax.set(xlabel="Month", ylabel="Average Temperature")
         plt.legend(loc='upper left', )

Out[13]: <matplotlib.legend.Legend at 0x7f032d51d0f0>
```



1.3.5 Perform test

Calculate the test statistic

$$z = \frac{\bar{x} - \bar{y} - \Delta_5}{\sqrt{\frac{\sigma_1^2}{m} + \frac{\sigma_2^2}{n}}}$$

```
In [14]: (akron["TAVG"].mean() - ash["TAVG"].mean() + 5)/math.sqrt(
             (akron["TAVG"].var()/akron["TAVG"].count()) +
             (ash["TAVG"].var()/ash["TAVG"].count())
         )
```

```
Out[14]: -0.09089198363907022
```

1.4 Analysis of winter months

1.4.1 Create dataframes for winter months

```
In [15]: akronwinter = akron[akron["DATE"].dt.month.isin([12, 1, 2])]
         ashwinter = ash[ash["DATE"].dt.month.isin([12, 1, 2])]
```

1.4.2 Create descriptive statistics for winter months

Akron

```
In [16]: akronwinter["TAVG"].describe()
```

```
Out[16]: count    361.000000
         mean      29.700831
         std       13.163680
         min       -6.000000
         25%       20.000000
         50%       31.000000
         75%       39.000000
         max       63.000000
         Name: TAVG, dtype: float64
```

```
In [17]: akronwinter["TAVG"].median()
```

```
Out[17]: 31.0
```

Asheville

```
In [18]: ashwinter["TAVG"].describe()
```

```
Out[18]: count    361.000000
         mean      39.936288
         std       10.420004
```

```
min        7.000000
25%       33.000000
50%       40.000000
75%       48.000000
max       64.000000
Name: TAVG, dtype: float64
```

```
In [19]: ashwinter["TAVG"].median()
```

```
Out[19]: 40.0
```

1.4.3 Combine the two datasets into one for generating charts

```
In [20]: winterdatasets = [akronwinter, ashwinter]
         datawinter = pd.concat(winterdatasets)
```

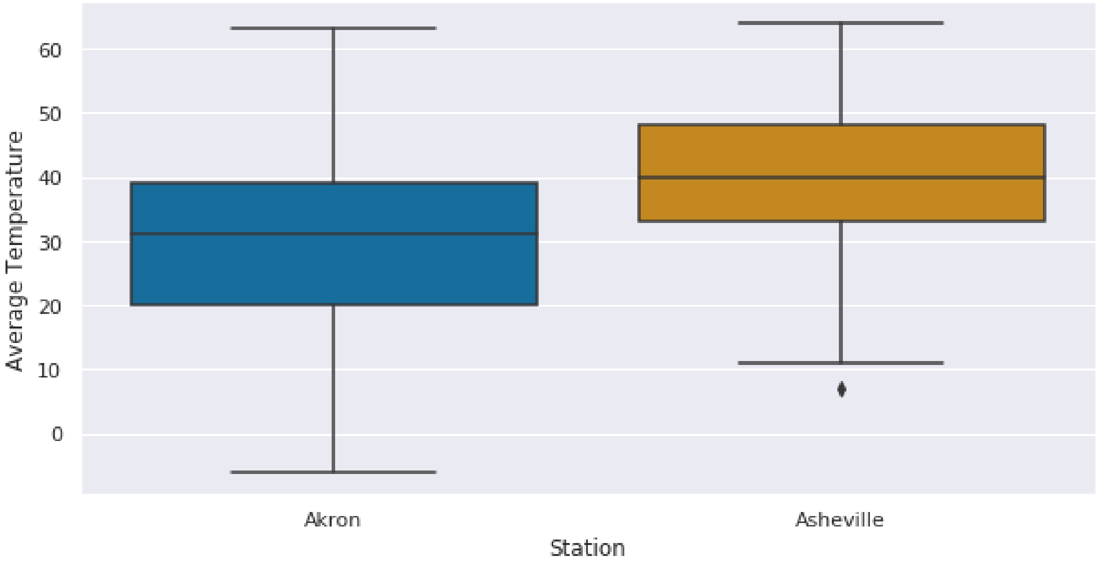
1.4.4 Add fields for station name and month for charts

```
In [21]: datawinter.loc[datawinter["STATION"]=="USW00014895","STATIONNAME"] = "Akron"
         datawinter.loc[datawinter["STATION"]=="USW00003812","STATIONNAME"] = "Asheville"
         datawinter["MONTH"] = datawinter["DATE"].dt.month
```

1.4.5 Create winter boxplots

```
In [22]: sns.set(palette="colorblind")
         ax = sns.boxplot(x="STATIONNAME", y="TAVG", data=datawinter)
         ax.set(xlabel="Station", ylabel="Average Temperature")
```

```
Out[22]: [Text(0, 0.5, 'Average Temperature'), Text(0.5, 0, 'Station')]
```



1.4.6 Perform test for winter months

Calculate the test statistic

$$z = \frac{\bar{x}-\bar{y}-\Delta_{-8}}{\sqrt{\frac{\sigma_1^2}{m}+\frac{\sigma_2^2}{n}}}$$

```
In [39]: (akronwinter["TAVG"].mean() - ashwinter["TAVG"].mean() + 8)/math.sqrt(
             (akronwinter["TAVG"].var()/akronwinter["TAVG"].count()) +
             (ashwinter["TAVG"].var()/ashwinter["TAVG"].count())
         )
```

```
Out[39]: -2.529903837542386
```

1.5 Analysis of summer months

1.5.1 Create dataframes for summer months

```
In [24]: akronsummer = akron[akron["DATE"].dt.month.isin([6,7,8])]
         ashsummer = ash[ash["DATE"].dt.month.isin([6,7,8])]
```

1.5.2 Create descriptive statistics for summer months

Akron

```
In [25]: akronsummer["TAVG"].describe()
```

```
Out[25]: count    368.000000
         mean      71.774457
         std        5.222118
         min       50.000000
         25%       68.000000
         50%       72.000000
         75%       75.250000
         max       83.000000
         Name: TAVG, dtype: float64
```

```
In [26]: akronsummer["TAVG"].median()
```

```
Out[26]: 72.0
```

Asheville

```
In [27]: ashsummer["TAVG"].describe()
```

```
Out[27]: count    368.000000
         mean      72.633152
         std        3.276319
         min       64.000000
         25%       71.000000
         50%       73.000000
         75%       75.000000
         max       80.000000
         Name: TAVG, dtype: float64
```

```
In [28]: ashsummer["TAVG"].median()
```

```
Out[28]: 73.0
```

1.5.3 Combine the two datasets into one for generating charts

```
In [29]: summerdatasets = [akronsummer, ashsummer]
         datasummer = pd.concat(summerdatasets)
```

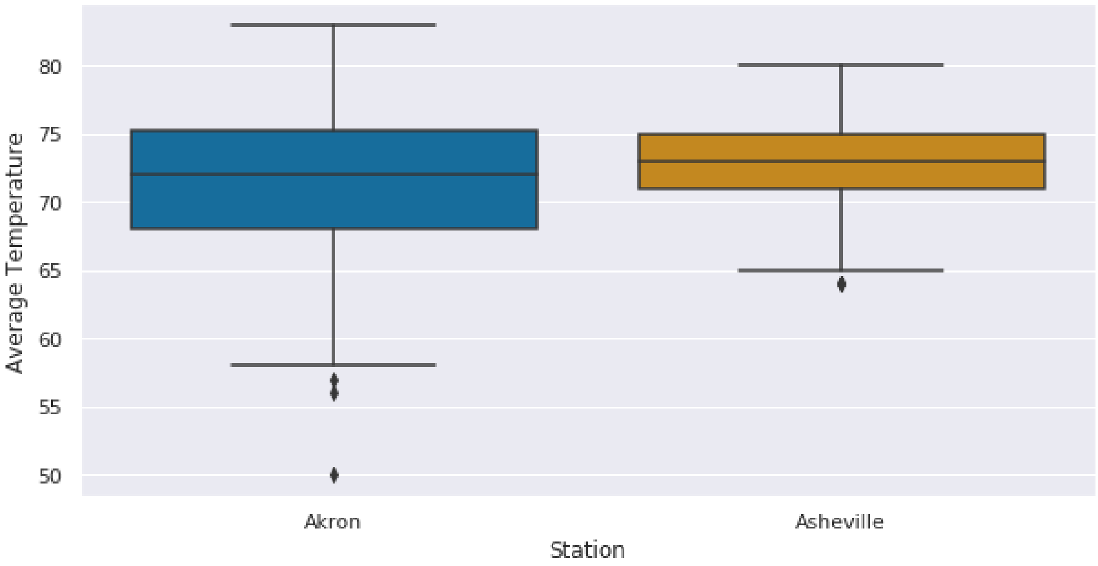
1.5.4 Add fields for stations name and month for charts

```
In [30]: datasummer.loc[datasummer["STATION"]=="USW00014895","STATIONNAME"] = "Akron"
         datasummer.loc[datasummer["STATION"]=="USW00003812","STATIONNAME"] = "Asheville"
         datasummer["MONTH"] = datasummer["DATE"].dt.month
```

1.5.5 Create summer boxplots

```
In [31]: sns.set(palette="colorblind")
         ax = sns.boxplot(x="STATIONNAME", y="TAVG", data=datasummer)
         ax.set(xlabel="Station", ylabel="Average Temperature")
```

```
Out[31]: [Text(0, 0.5, 'Average Temperature'), Text(0.5, 0, 'Station')]
```



1.5.6 Perform test for summer months

Calculate test statistic

$$z = \frac{\bar{x} - \bar{y} - \Delta_{-2}}{\sqrt{\frac{\sigma_1^2}{m} + \frac{\sigma_2^2}{n}}}$$

```
In [37]: (akronsummer["TAVG"].mean() - ashsummer["TAVG"].mean() + 2)/math.sqrt(
             (akronsummer["TAVG"].var()/akronsummer["TAVG"].count()) +
             (ashsummer["TAVG"].var()/ashsummer["TAVG"].count())
         )
```

```
Out[37]: 3.5514544699869615
```