Weather Analysis of Akron, OH, and Asheville, NC

# Introduction

The purpose of this study is to analyze the historical weather data from Akron, Oh and Asheville, NC and determine any differences between the two. Specifically this study will look at whether the average temperature in Asheville, NC is at least 5 degrees warmer than Akron, OH.

# Overview of the Data

That data for this study was obtained from the National Oceanic and Atmospheric Administration (NOAA). The NOAA dataset that was used is the Global Historical Climate Network Daily dataset. Daily weather data was obtained from each city starting from 01/01/2014 and going to 12/31/2017. The data for Akron, OH is from NOAA station GHCND:USW00014895 at the Akron Canton Airport in Akron, OH. The data for Asheville, NC is from NOAA station GHCND:US1NCBC0110 at the Asheville Airport in Asheville, NC.

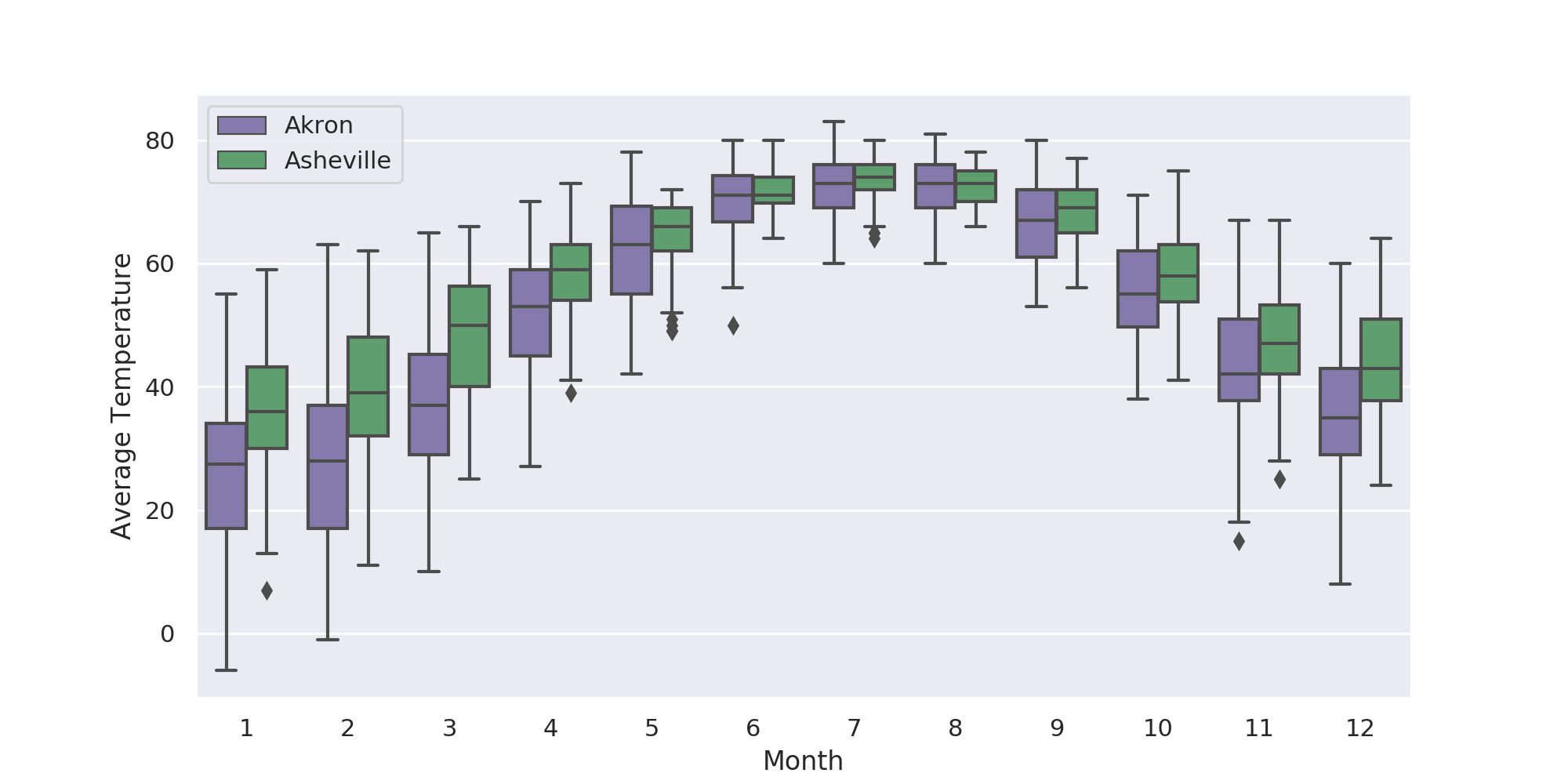
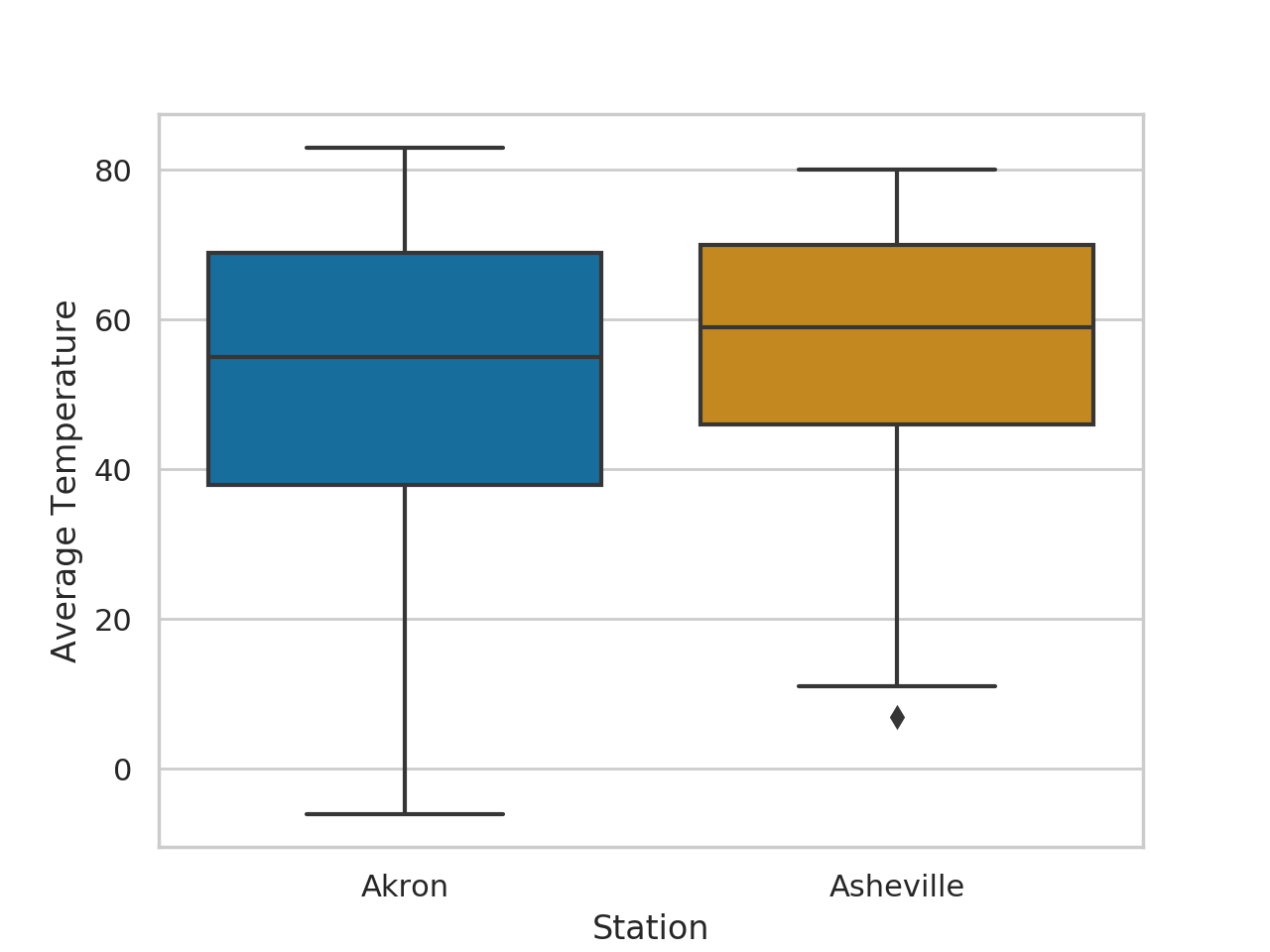
The data files I used contained one record for each day from 01/01/2014 to 12/31/2017. The fields that where used from the dataset are:

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| --- | --- | --- |
| **Field Name** | **Data Type** | **Description** |
| STATION | String | Station ID |
| Date | Date | Date of the weather record |
| TAGV | Integer | Average temperature in Fahrenheit (average of hourly values) |

Calculating descriptive statistics for the two data sets we obtain the following:

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| --- | --- |
| **Descriptive Statistics for Akron Data** | |
|  | TAVG |
| Observations | 1461 |
| Mean | 51.930869 |
| Median | 55 |
| Standard Deviation | 19.175898 |
| Minimum | -6 |
| Maximum | 83 |

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| **Descriptive Statistics For Asheville Data** | |
|  | TAVG |
| Observations | 1,461 |
| Mean | 56.988364 |
| Median | 59 |
| Standard Deviation | 14.726939 |
| Minimum | 7 |
| Maximum | 80 |



After looking at the descriptive statistics, and the box plots we can make the following observations:

* The Asheville sample mean is higher than the Akron sample mean.
* The Asheville sample standard deviation is smaller than the Akron standard deviation.
* Asheville appears to be warmer in the winter, but close to the same temperature in the summer.

Normally warmer temperatures are desirable in the winter, but not desirable in the summer. Because of that, descriptive statistics for just the winter months (December, January, February) where also calculated.

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| **Descriptive Statistics for Akron Winter** | |
|  | TAVG |
| Observations | 361 |
| Mean | 29.700831 |
| Median | 31 |
| Standard Deviation | 13.16368 |
| Minimum | -6 |
| Maximum | 63 |

|  |  |
| --- | --- |
| **Descriptive Statistics For Asheville Winter** | |
|  | TAVG |
| Observations | 361 |
| Mean | 39.936288 |
| Median | 40 |
| Standard Deviation | 10.420004 |
| Minimum | 7 |
| Maximum | 64 |

# Methods Used

In this study the distribution, mean, and variance of the population is unknown. However our sample size is of 1,461 for the test including all months, and 361 for the test only including the winter months is large enough to assume a normal distribution by the central limit theorem. The two sample Z test was used to to the test hypothesis. A 95% confidence level was used for all tests.

# Analysis

## Test with all months

The first test performed include all months and tested the following hypothesis:

H0: Akron average temperature – Asheville average temperature = -5

Ha: Akron average temperature – Asheville average temperature < -5

The test statistic is:

z = -0.090892

This is a lower-tailed test with a significance level of 0.05, so our hypothesis should be rejected if our test statistic is less than -1.645. Our test statistic of -0.090892 is not less than -1.645, so we fail to reject the null hypothesis. The test is inconclusive.

## Test with only winter months (December, January, February)

The second test will just look at the data from the winter months (December, January, February) and tested the following hypothesis:

H0: Akron average winter temperature – Asheville average winter temperature = -5

Ha: Akron average winter temperature – Asheville average winter temperature < -5

The test statistics is:

Z = -5.925

This is a lower-tailed test with a significance of 0.05, so our hypothesis should be rejected if our test statistic is less than -1.645. Our test statistic of -5.925 is less than - -1.645, so we reject the null hypothesis, the Akron average winter temperature – Asheville average winter temperature < -5.

# Conclusion

The tests that was performed with the data from all months of the year was inconclusive. However when the the test was performed with just the winter months null hypothesis was rejected. So we cannot make any conclusions about differences in temperature across the entire year, we can say with 95% confidence that during the winter months Asheville on average is at least 5 degrees warmer than Akron.