Assignment 5 Part 1

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Outline

Project Description

In this project, we explored and visualized the using the Sea Temperature and Air Temperature data sourced from NOAA. By employing Tidyverse we were able to read, clean, organize, and come up with a conclusion on how temperature changed on a daily basis and on a 30 year scope with statistics tests.

Data Visualization
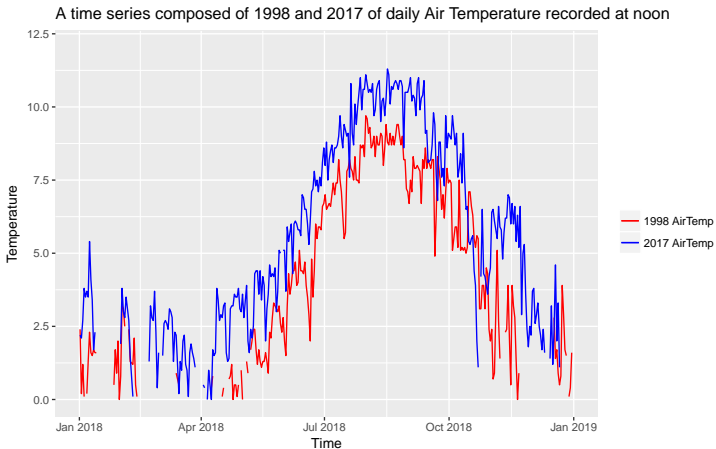## Time Series

A time series composed of 30 years of daily Air Temperature and Sea Temperature readings recorded at noon
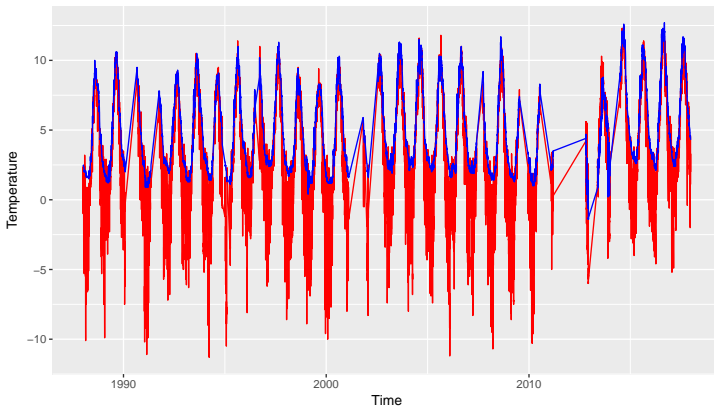
Data Visualization
Air Temperature

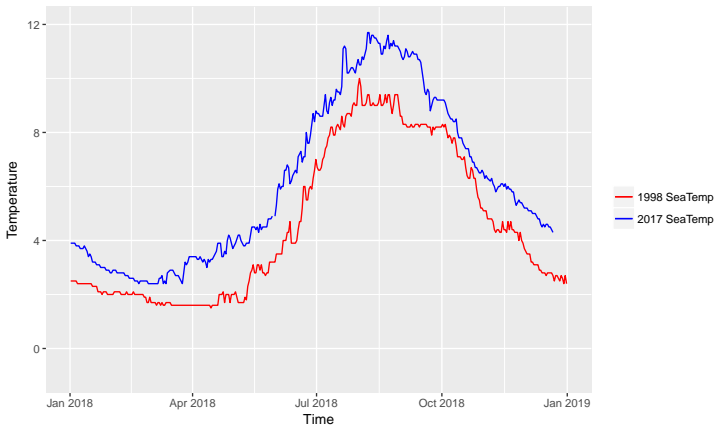A time series composed of 1998 and 2017 of daily Air Temperature recorded at noon
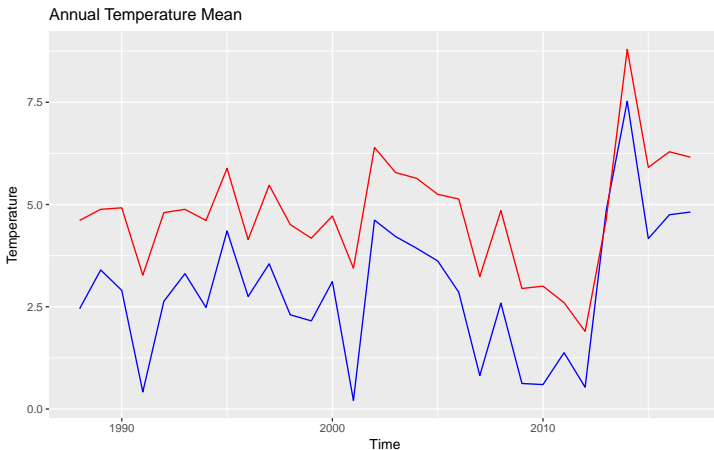
Data Visualization

Sea Temperature

A time series composed of 1998 and 2017 of daily Sea Temperature recorded at noon

Data Visualization
Annual Temperature

Annual Temperature Mean

Project Part 1

1. Test the Difference Based on Time of the day

1. Test the Difference Based on Time of the day
by Air Temperature

```
        Welch Two Sample t-test

data:  Total_Daily00$ATMP00 and Total_Daily02$ATMP02
t = 0.18225, df = 20812, p-value = 0.8554
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 -0.1051899  0.1267560
sample estimates:
mean of x mean of y
 3.531226  3.520442
```

- $p > 0.05$, we fail to reject the null hypothesis that air temperature difference is not significant based on time of the day.

1. Test the Difference Based on Time of the day
by Water Temperature

```
        Welch Two Sample t-test

data:  Total_Daily04$WTMP04 and Total_Daily06$WTMP06
t = 0.6446, df = 20813, p-value = 0.5192
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 -0.05238191  0.10371754
sample estimates:
mean of x mean of y
 4.843020  4.817352
```

- $p > 0.05$, we fail to reject the null hypothesis that sea temperature difference is not significant based on time of the day.

1. Test the Difference Based on Time of the day
Conclusion

- Both the above two t tests have shown that there is no statistical significance in temperature difference based on time of the day.

Project Part 2

2. Test the difference from 1988 to 2017

2. Test the difference from 1988 to 2017
by Air Temperature

```
        Welch Two Sample t-test

data:  Total_1988VS2017["ATMP1988"] and Total_1988VS2017["ATMP2017"]
t = -7.4843, df = 701.29, p-value = 2.162e-13
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 -3.012741 -1.760561
sample estimates:
mean of x mean of y
 2.338997  4.725648
```

- p-value $= 2.162$e-$13 < 0.05$, we conclude by rejecting the null hypothesis that in 1988 and 2017 air tmp have the same mean

2. Test the difference from 1988 to 2017
by Water Temperature

```
        Welch Two Sample t-test

data:  Total_1988VS2017["WTMP1988"] and Total_1988VS2017["WTMP2017"]
t = -7.2687, df = 695.59, p-value = 9.78e-13
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 -1.999515 -1.149048
sample estimates:
mean of x mean of y
 4.572981  6.147262
```

- p-value $= 9.78$e-13 > 0.05, we can reject the null hypothesis that in 1988 and 2017 water tmp have the same mean

2. Test the difference from 1988 to 2017
Final Conclusion

- Both the above t tests using air temperature data and sea temperature data have showed statistical meaningful differences in temperature from 1988 to 2017