

# Assignment 1 Geo1001

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September 21, 2020

# 1 Introduction

This assignment was made for the class Geo1001. A statistical analysis was done using a heat stress measurement dataset with five sensors [1]. Analysing was done in visual studio code using Python 3.7.5. Plotting was done with the use of Matplotlib. Sourcecode of this assignment can be found on GitHub: [https://github.com/Lisageers/geo1001\\_hw1](https://github.com/Lisageers/geo1001_hw1) hoi

**2 A1**

## 2.1 Mean statistics

In table 1 the calculated mean statistics of all sensors are displayed. The means of the sensors are quite similar for all variables. The means of the wind variables Direction - True, Wind Speed, Crosswind Speed and Headwind Speed differ the most between sensors. This is logical, because wind can differ greatly over short distances. This is in contrast with other variables like Temperature and Relative Humidity, which are less dynamic and thus have a similar mean for all sensors.

Table 1: Mean Statistics of all sensors

[illegible]

## 2.2 Histograms

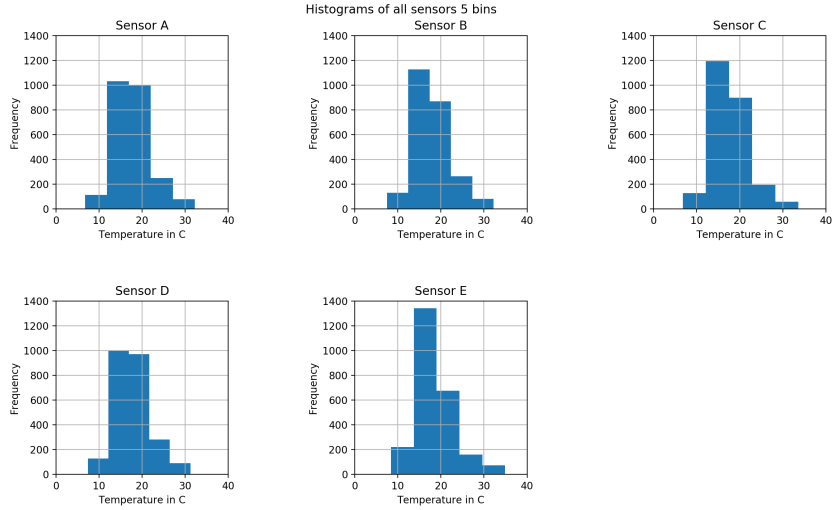


Figure 1: Histograms of all sensors with 5 bins

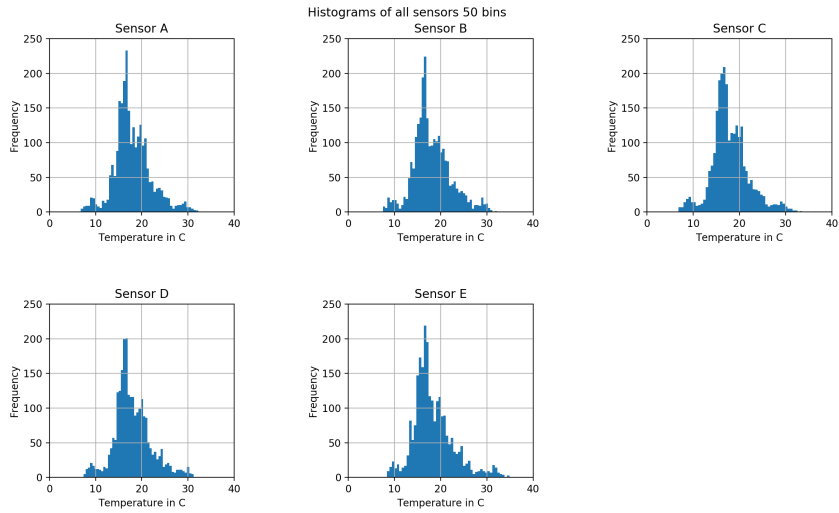


Figure 2: Histograms of all sensors with 50 bins

In figures 1 and 2, the histograms of the temperature of the five sensors are displayed. As can be seen, there is a significant difference between the figures

due to the bin sizes. Figure 2 with binsize 50 is much more detailed, which makes this figure more useful for analysis. The binsize calculated with Rice's rule is approximately in the middle between 5 and 50. Rice's rule  $2 * \sqrt[3]{N}$  with  $N = 2474$  gives 27 as a number of bins.

### 2.3 Frequency polygons

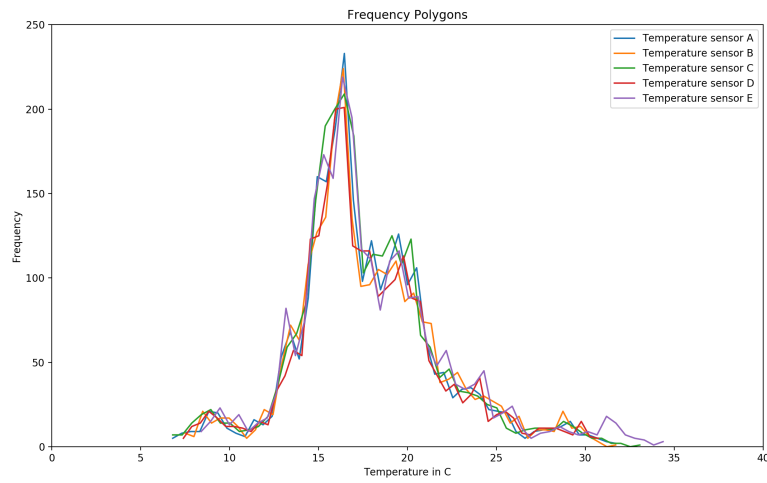


Figure 3: Frequency polygon of all sensors for the variable Temperature

## 2.4 Boxplots

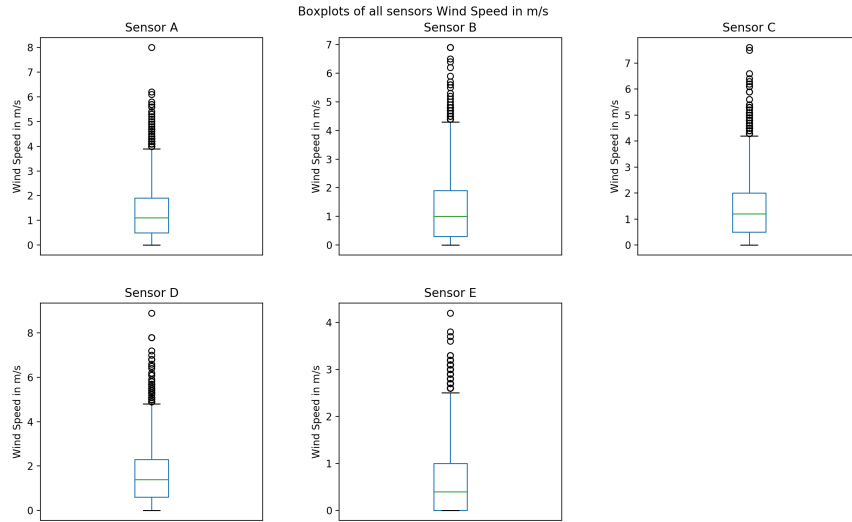


Figure 4: Boxplots of all sensors for the variable Wind Speed

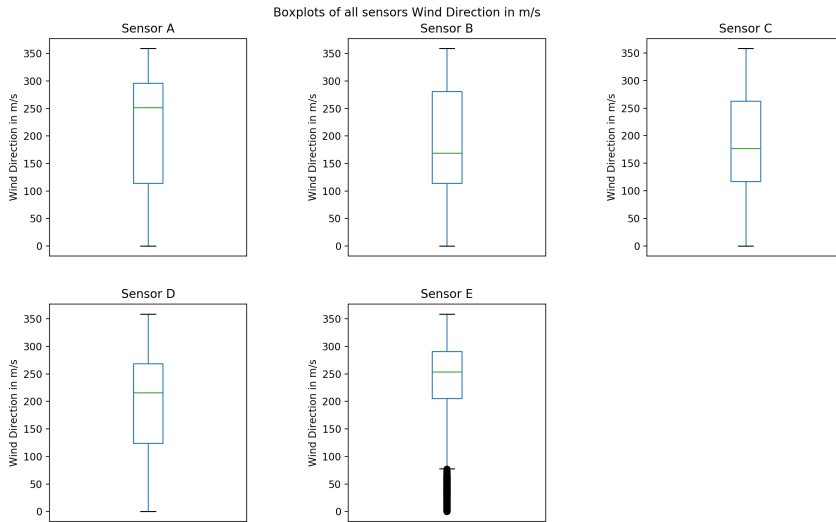


Figure 5: Boxplots of all sensors for the variable Wind Direction

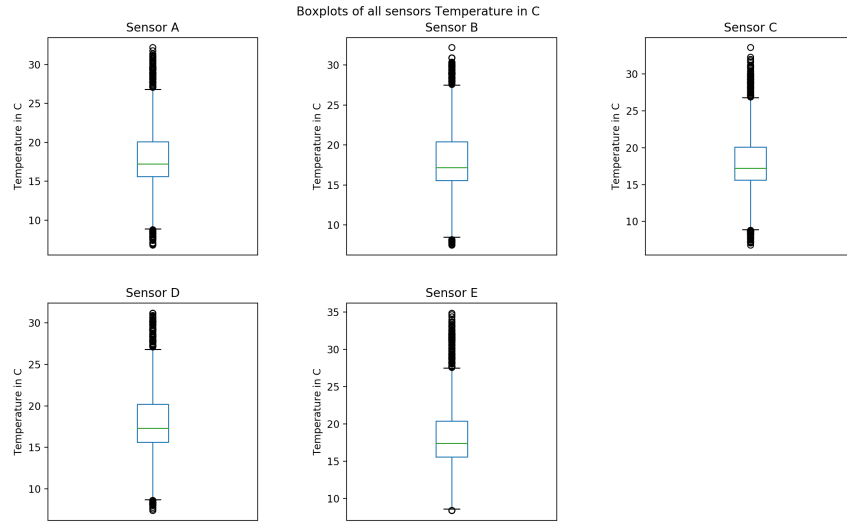


Figure 6: Boxplots of all sensors for the variable Temperature

### 3 A2

#### 3.1 Functions Temperature

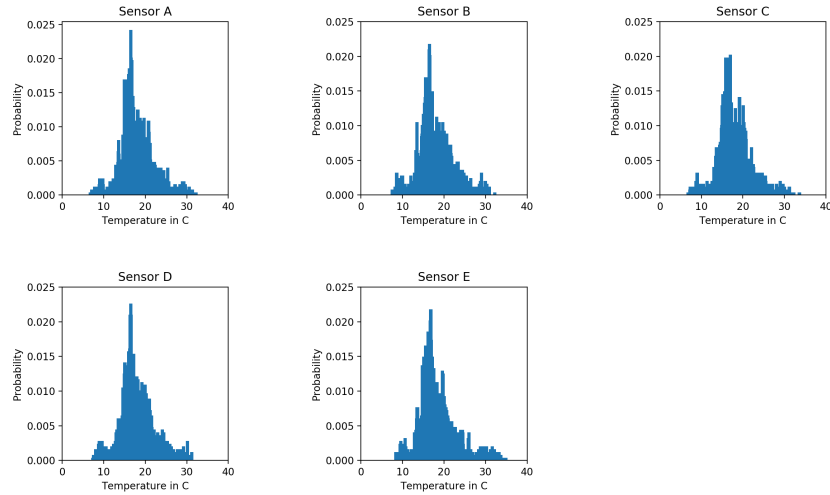


Figure 7: Probability Mass Functions of Temperature for all sensors

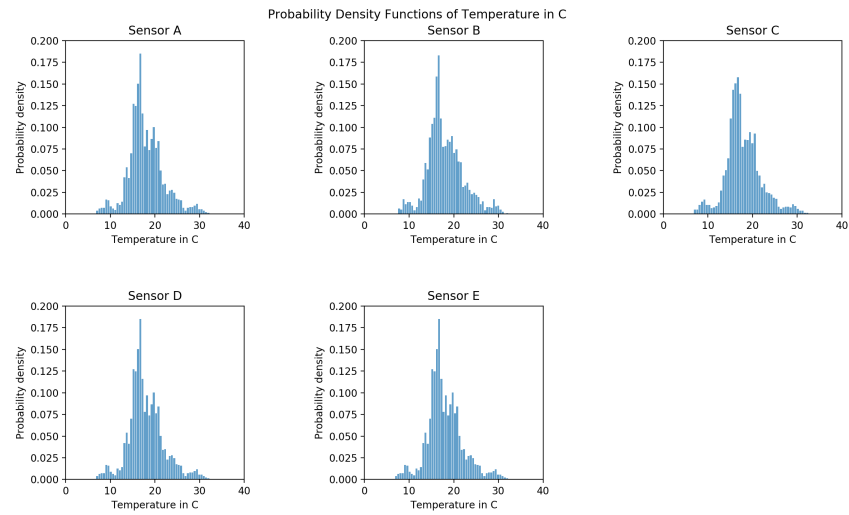


Figure 8: Probability Density Functions of Temperature for all sensors

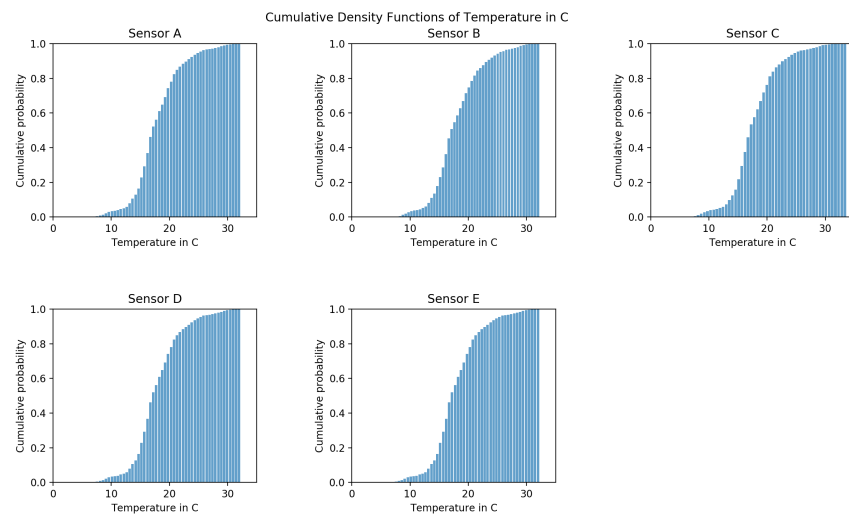


Figure 9: Cumulative Density Functions of Temperature for all sensors

### 3.2 Functions Wind Speed

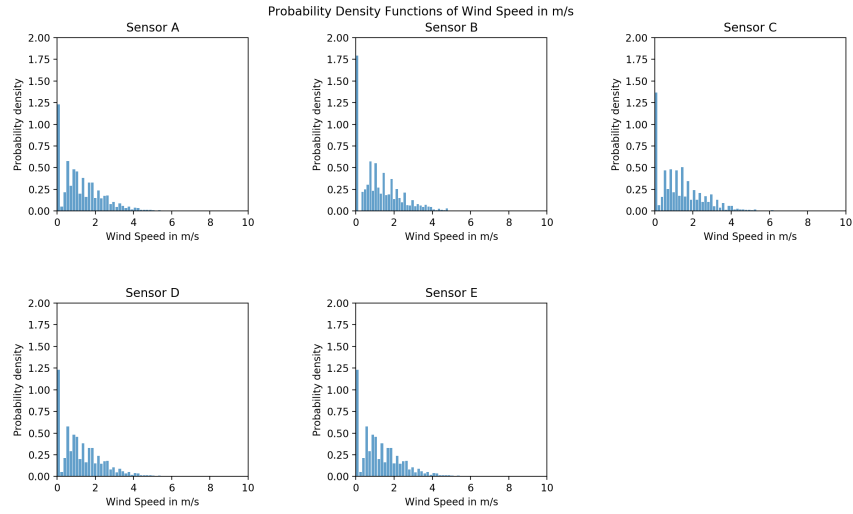


Figure 10: Probability Density Functions of Wind Speed for all sensors

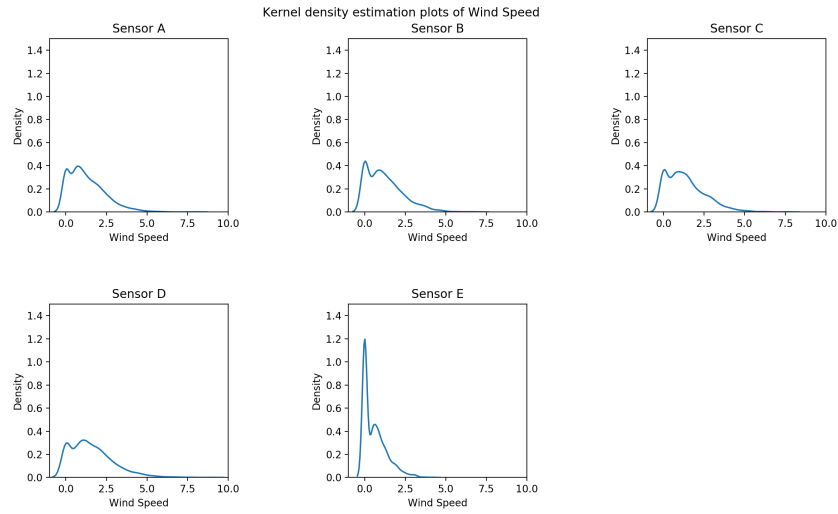


Figure 11: Kernel Density Estimation of Wind Speed for all sensors

## 4 A3

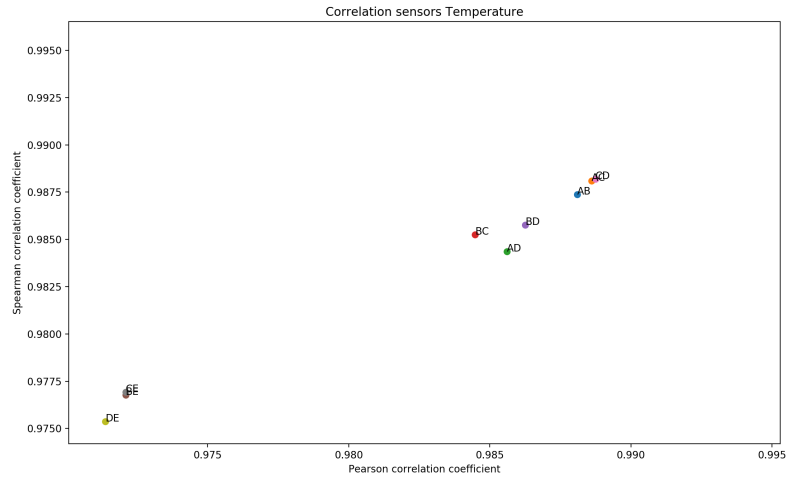


Figure 12: Spearman and Pearson correlation plot for all sensor combinations of Temperature

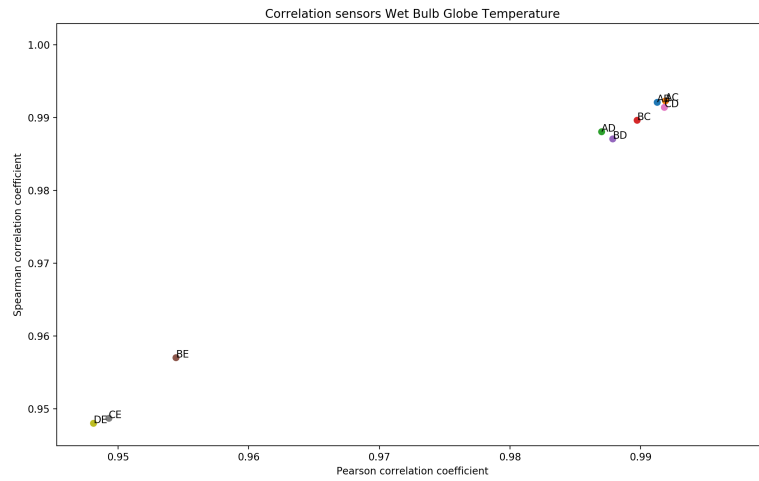


Figure 13: Spearman and Pearson correlation plot for all sensor combinations of Wet Bulb Globe Temperature



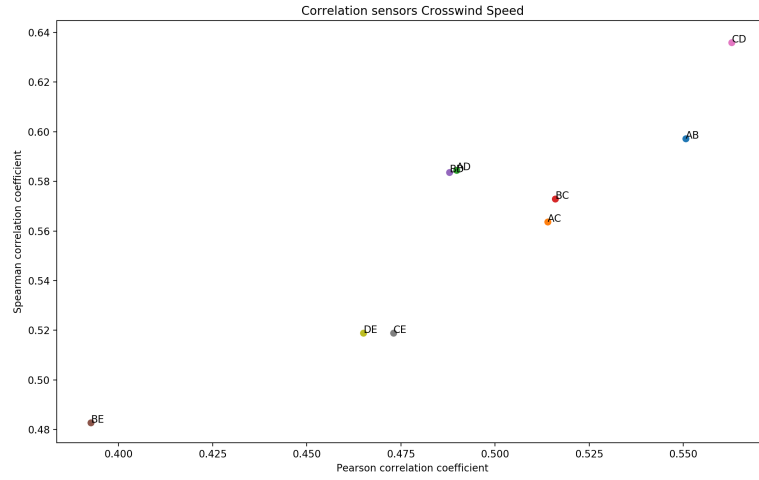


Figure 14: Spearman and Pearson correlation plot for all sensor combinations of Crosswind Speed

## 5 A4

### 5.1 Cumulative Density Functions

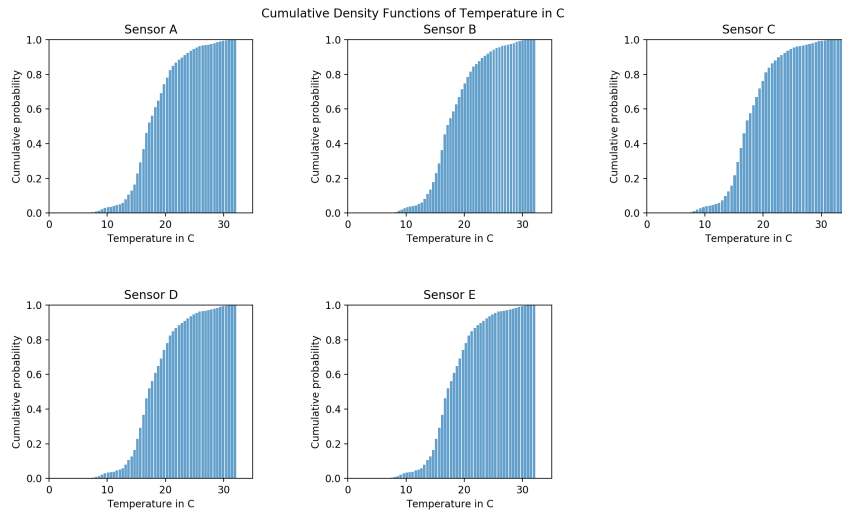


Figure 15: Cumulative Density Functions of Temperature for all sensors

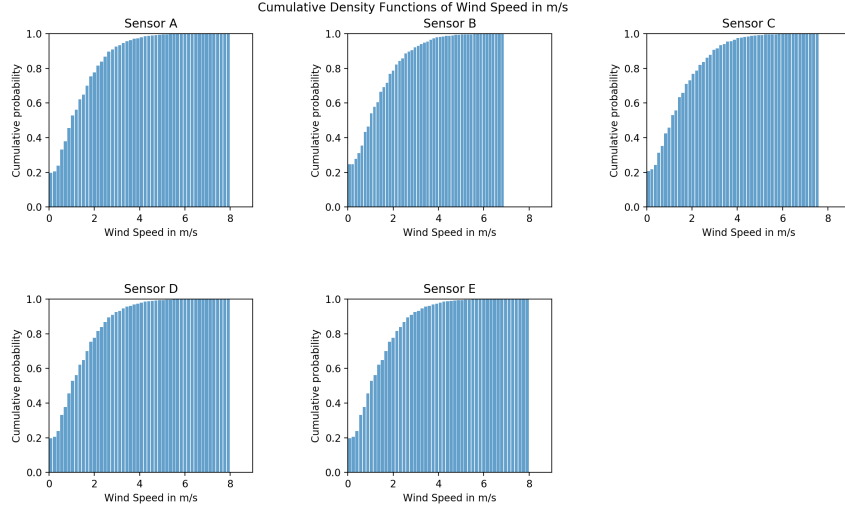


Figure 16: Cumulative Density Functions of Wind Speed for all sensors

## 5.2 Confidence Intervals

Table 2: Confidence intervals of Temperature for all sensors  
Temperature

A	(17.81214113267346, 18.126065652463858)
B	(17.90472689963894, 18.226129320070267)
C	(17.754926235060246, 18.071347006653575)
D	(17.83814660824381, 18.15457772482005)
E	(18.181933946027776, 18.525944841851015)

Table 3: Confidence intervals of Wind Speed for all sensors  
Wind Speed

A	(1.246227038990971, 1.3343868543854427)
B	(1.1971663346979249, 1.287082453670411)
C	(1.3243037885948932, 1.418622646328308)
D	(1.5296480419653757, 1.633650260379006)
E	(0.5680599051948441, 0.6244249432900044)

### 5.3 Hypothesis Test

Table 4: Confidence intervals of Wind Speed for all sensors

	Temperature	Wind Speed
p-value E, D	0.0027270117155346967	4.899592405994867e-212
p-value C, D	0.4657972008220813	4.610149126224334e-09
p-value B, C	0.18562772895626528	9.40075204600199e-05
p-value A, B	0.40185871871215073	0.13247973112544695

### References

- [1] Daniela Maiullari and Clara Garcia Sanchez. Measured Climate Data in Rijsenhout, 8 2020.