Sensing Technologies and Mathematics for Geomatics
GEO1001.2020
MSc Geomatics
Delft University of Technology

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1 A1

1.1 A1.1

From the results i have there no many things that i could say.

1.2 A1.2

The number of bins it is really important because if we use too few number of bins, the histogram does not really portray the data very well (Figure 1). From the other side if we have too many bins, we get a broken comb look, which also does not give a good sense of the distribution (Figure 2). A good example is visible in to the next histograms.

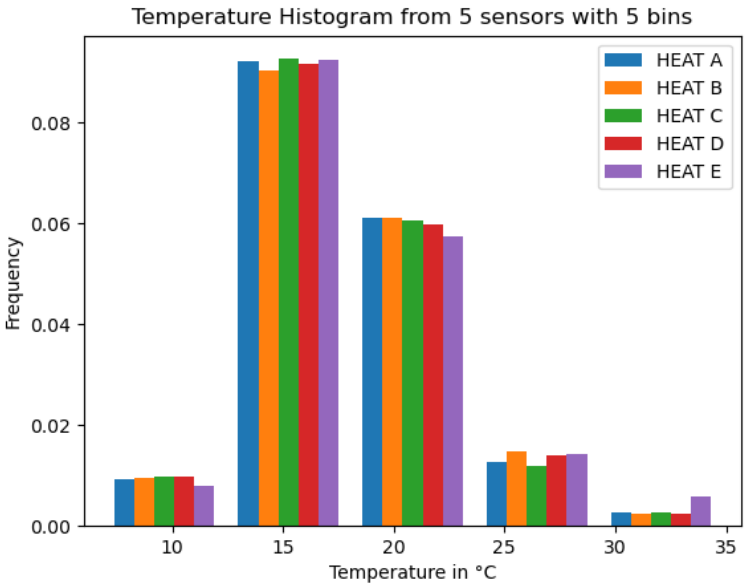

Figure 1: Temperature Histogram from 5 sensors with 5 bins
[1]

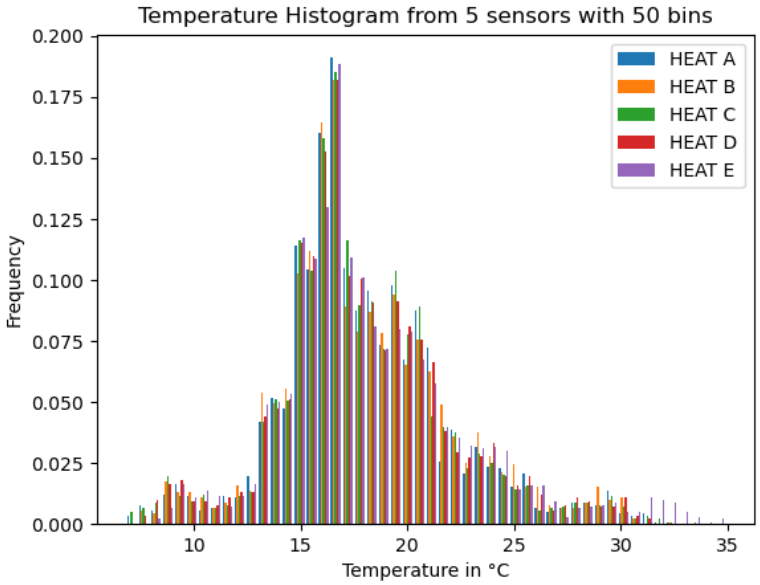

Figure 2: Temperature Histogram from 5 sensors with 50 bins
[1]

1.3 A1.3

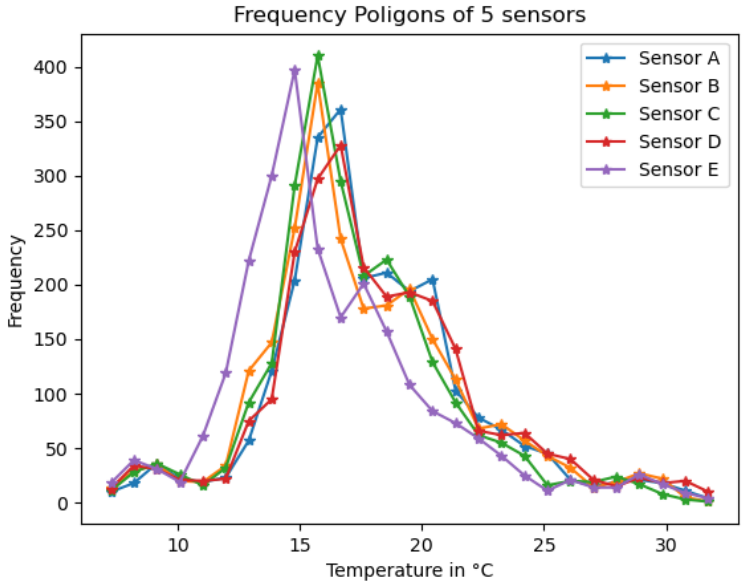

Figure 3: Frequency Poligons of 5 Sensors
[1]

1.4 A1.4

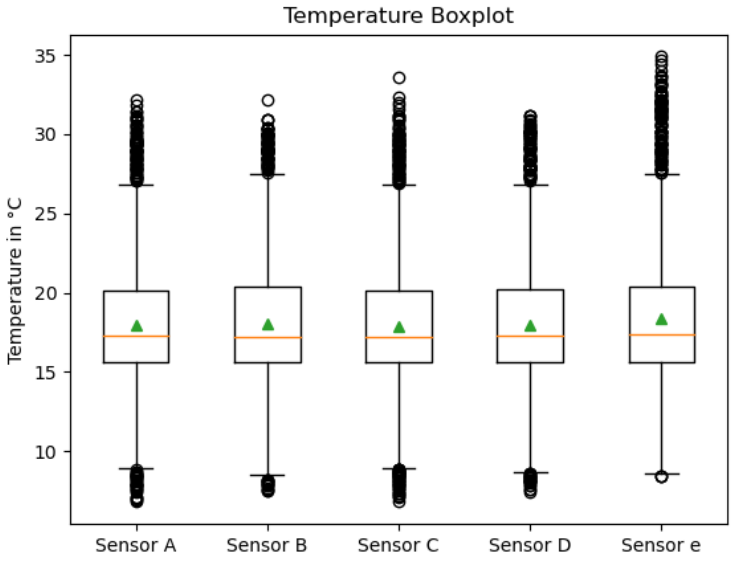

Figure 4: Temperature Boxplot
[1]

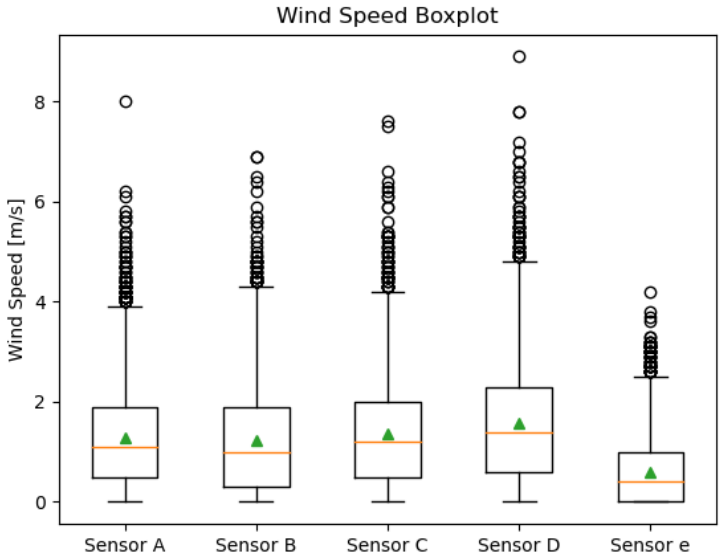

Figure 5: Wind Speed Boxplot
[1]

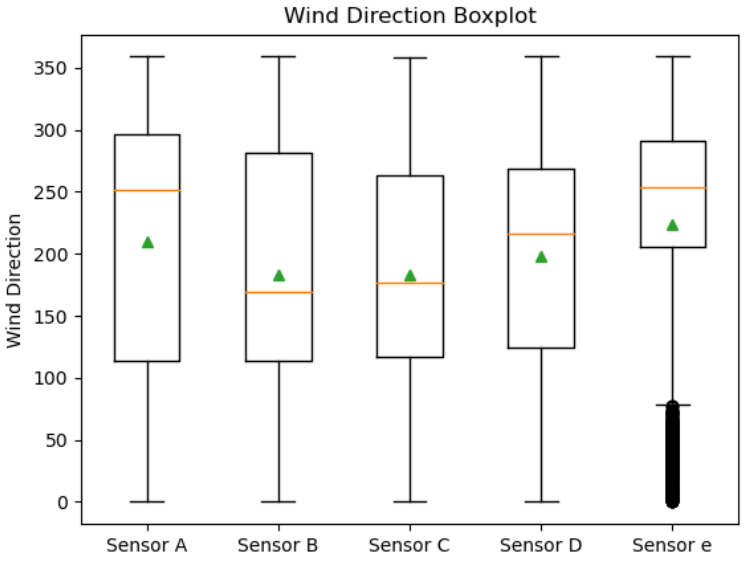

Figure 6: Wind Direction Boxplot
[1]

2 A2

2.1 A2.1

From the the figures below we can realize that the behavior of the distributions for each Sensor's Temperature look pretty similar.

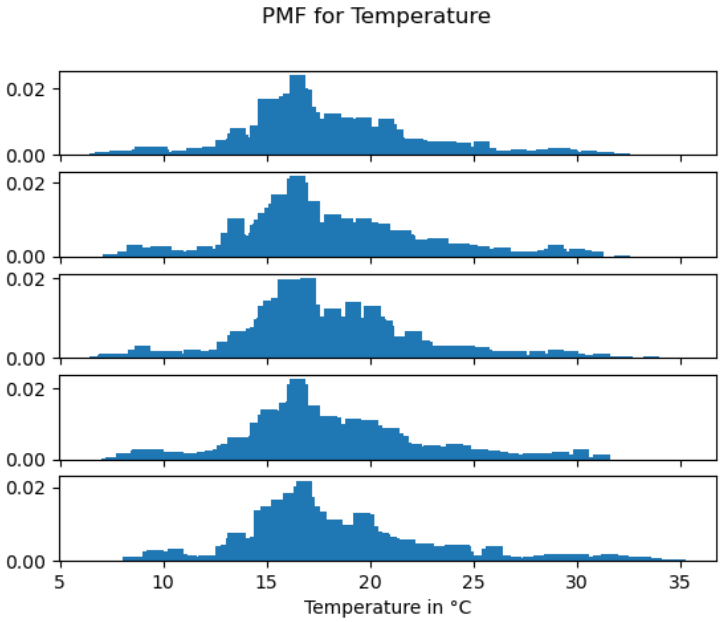

Figure 7: PMF for Temperature
[1]

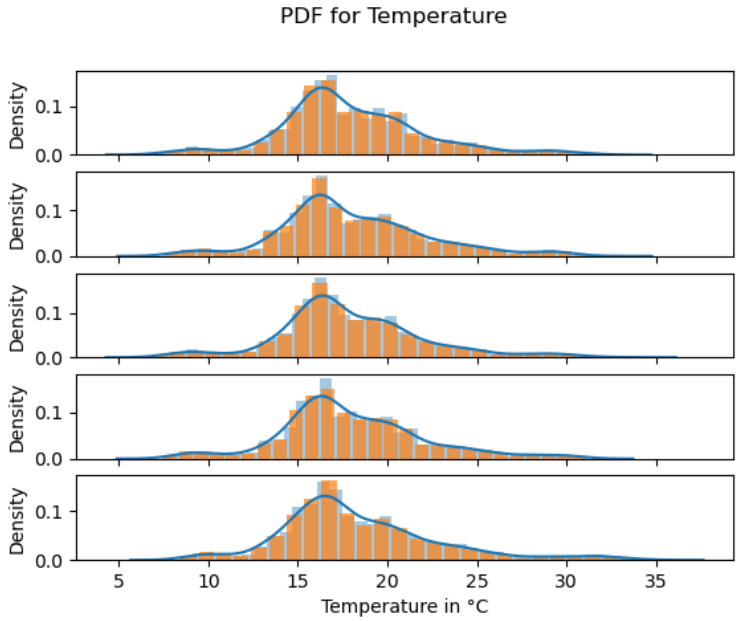

Figure 8: PDF for Temperature
[1]

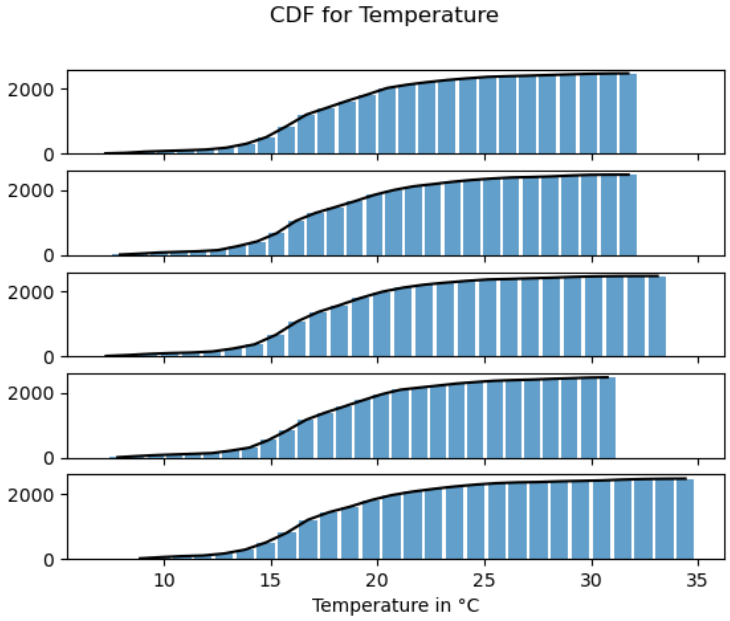

Figure 9: CDF for Temperature
[1]

2.2 A2.2

From the figures below we can see that there is no actual diference between the PDF and the Kernel Density Estimation (KDE) for the Wind Speed and that happens because the KDE is actually an algorithm that takes a sample and finds an appropriately smooth PDF that fits the data. So the only diference is that the KDE shows less information in the graph and makes it easier for the audience to understand it.

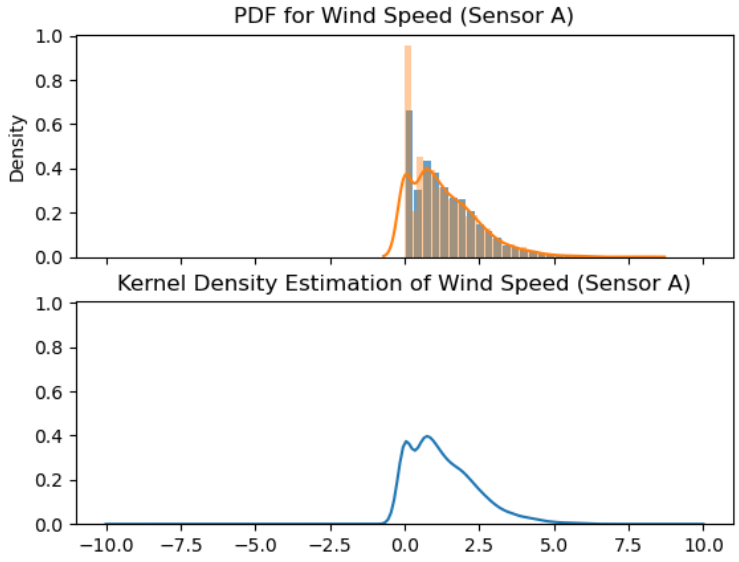

Figure 10: PDF for Wind Speed (Sensor A)
[1]

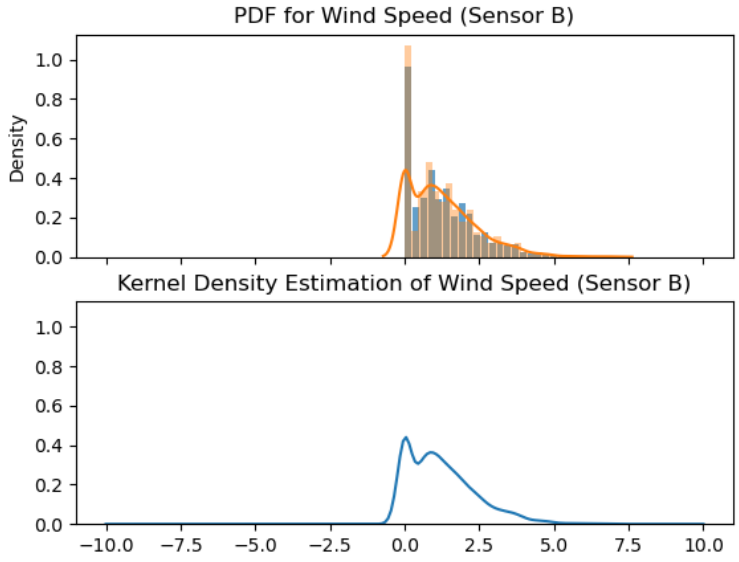

Figure 11: PDF for Wind Speed (Sensor B)
[1]

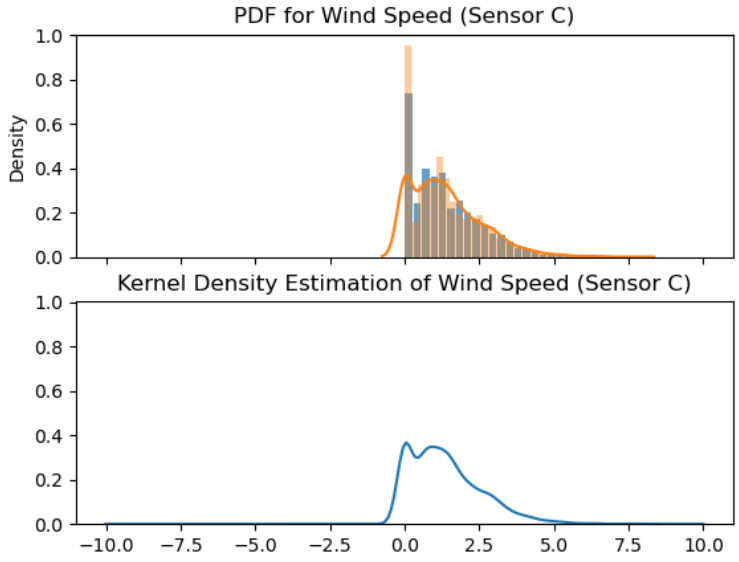

Figure 12: PDF for Wind Speed (Sensor C)
[1]

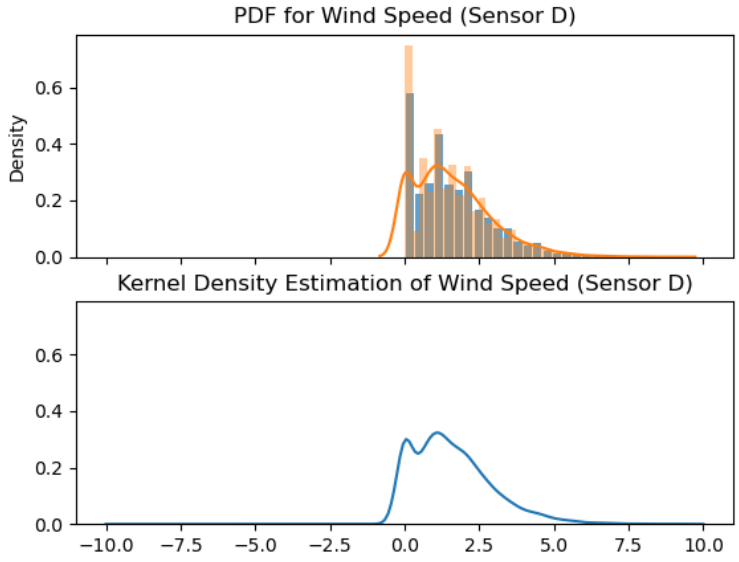

Figure 13: PDF for Wind Speed (Sensor D)
[1]

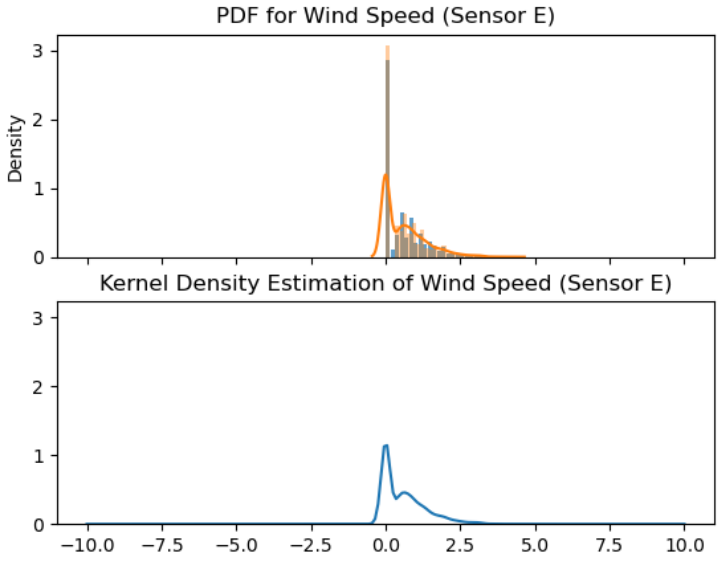

Figure 14: PDF for Wind Speed (Sensor E)
[1]

3 A3

3.1 A3.1

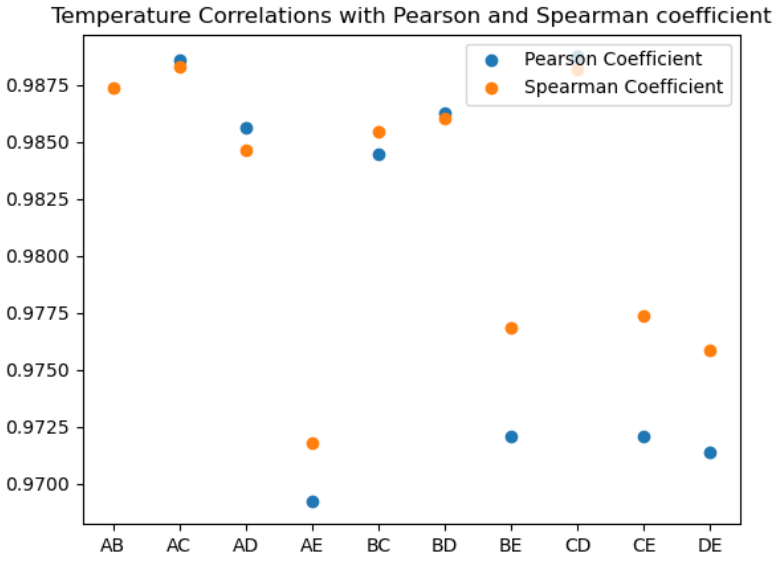

Figure 15: Temperature Correlations with P and Sp coeff
[1]

Sensors Relationships	Variables	Pearson Coefficient	Spearman Coefficient
	Temperature	0.98810313	0.987378955
AB	Crosswind	0.550352585	0.596982562
	WBGT	0.991259553	0.992132436
	Temperature	0.988608719	0.988292007
AC	Crosswind	0.51405088	0.577228891
	WBGT	0.99189585	0.992472018
	Temperature	0.985613462	0.984627239
AD	Crosswind	0.489895013	0.601889059
	WBGT	0.987013949	0.988291923
	Temperature	0.969204792	0.9717698
AD	Crosswind	0.465124685	0.537844665
	WBGT	0.949828692	0.949127535
	Temperature	0.98448517	0.985440109
BC	Crosswind	0.516102417	0.590683619
	WBGT	0.989729694	0.989863576
	Temperature	0.986265403	0.986048723
BD	Crosswind	0.488029338	0.604818597
	WBGT	0.987864209	0.987374811
	Temperature	0.972089738	0.976859613
BE	Crosswind	0.39214871	0.500281016
	WBGT	0.95440893	0.956900474
	Temperature	0.988742872	0.988185589
CD	Crosswind	0.562888199	0.635906168
	WBGT	0.991820559	0.991421934
	Temperature	0.972097215	0.977342412
CE	Crosswind	0.473233228	0.532232093
	WBGT	0.949269532	0.949345587
	Temperature	0.971365706	0.975848255
DE	Crosswind	0.465192078	0.527325327
	WBGT	0.948090212	0.94870202

Table 1: Correlations between all the sensors for the variables: Temperature, Wet Bulb Globe Temperature (WBGT), Crosswind Speed

[1]

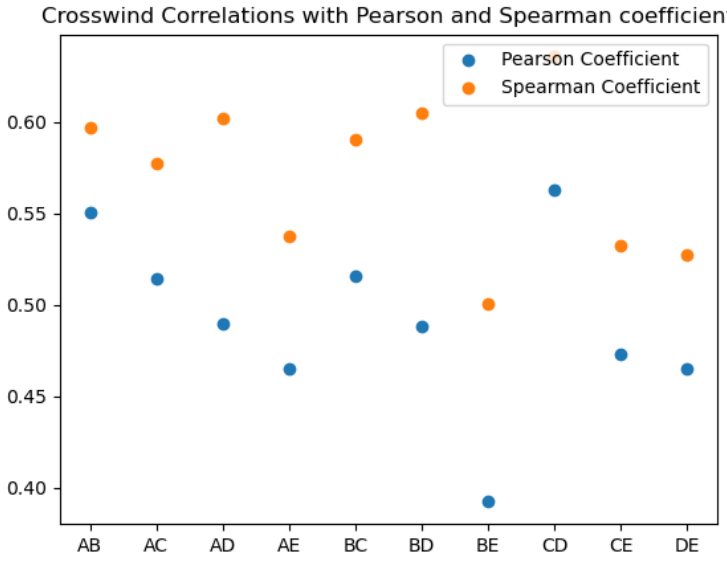

Figure 16: Crosswind Correlations with P and Sp coeff
[1]

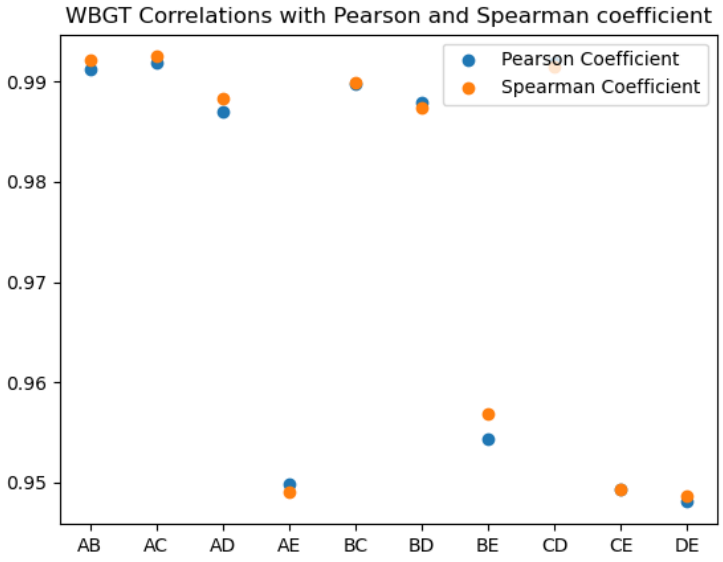

Figure 17: WBGT Correlations with P and Sp coeff
[1]

3.2 A3.2

That mostly they have high correlation since most of them are really near to 1 as about the Temperature and WBGT and not so high about Crosswind since the correlation is aroun 0.5.

3.3 A3.3

With a look in the correlations of the sensors we could say that

Figure 18: Sensors Location

4 A4

4.1 A4.1

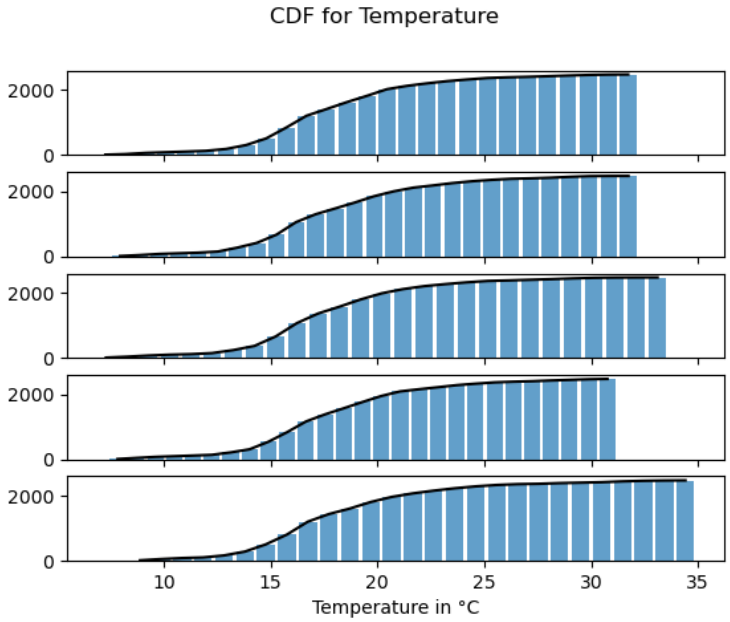

Figure 19: CDF for Temperature
[1]

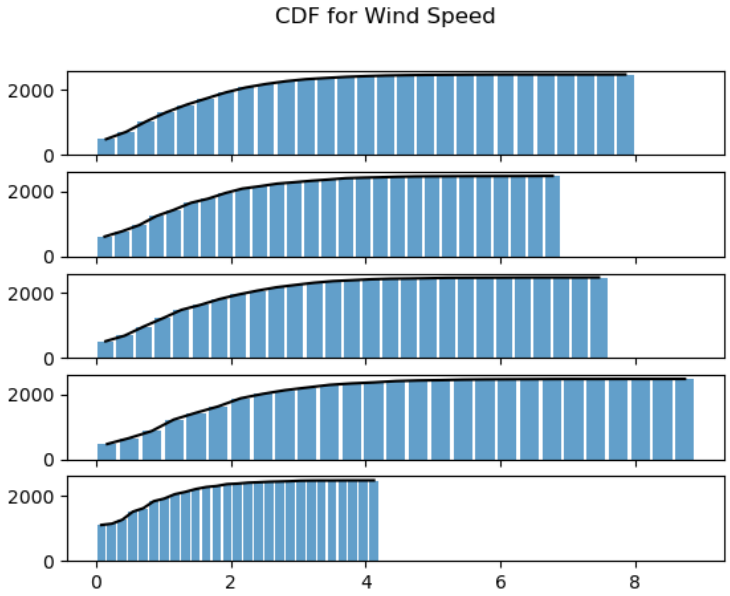

Figure 20: CDF for Wind Speed
[1]

Variables	Confidence Intervals			Sensors
	m-h	m	m+h	
Temperature	17.8121	17.9691	18.1261	A
	17.9047	18.0654	18.2261	B
	17.7549	17.9131	18.0713	C
	17.8381	17.9964	18.1546	D
	18.1819	18.3539	18.5259	E
Wind Speed	1.2462	1.2903	1.3344	A
	1.1972	1.2421	1.2871	B
	1.3243	1.3715	1.4186	C
	1.5297	1.5817	1.6337	D
	0.5681	0.5962	0.6244	E

Table 2: 95/100 confidence intervals for variables Temperature and Wind Speed for all the sensors

[1]

Sensors	Student Test	p value	Variables
ED	3.00023	0.00271	Temperature
DC	0.72939	0.46580	
CB	-1.32423	0.18549	
BA	0.84084	0.40048	
ED	-32.67317	0.00000	Wind Speed
DC	5.87115	0.00000	
CB	3.89266	0.00010	
BA	-1.50061	0.13352	

Table 3: Student Test and p-values

4.2 A4.2-3

So in the Table 3 above is visible the p-values from the requested sensors. We can conclude that most of them as about the temperature values (3 out of 4) are way above the 0.05 so we reject the Hypothesis. And totally the opposite is happening with the Wind speed.

5 Bonus Question

References

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