For this senor, some of the characteristics were harder to measure due the testing materials we had access to so we settled for characteristics that we could measure but at the same time provided enough data for analysis and these included as mentioned before drift, static error and linearity

Results (of the characteristics measured to quantify the performance of the sensor)

- Drift

  For drift, we put the sensor outside to measure the temperature of the surrounding and check the verified the actual temperature using the reliable weather app on a phone. We then kept the sensor running for one minute, and the data we got from the sensor after one minute is below

  Ground truth

  Ground truth temperature (measured using the phone was about) 11*C

  Ground truth humidity was about 63%

  Sensor Readings

  19:58:54.085 -> Humidity: 66.50 % Temperature: 10.20 *C
  19:58:56.110 -> Humidity: 66.60 % Temperature: 10.20 *C
  19:58:58.156 -> Humidity: 66.70 % Temperature: 10.20 *C
  19:59:00.187 -> Humidity: 66.80 % Temperature: 10.20 *C
  19:59:02.215 -> Humidity: 66.80 % Temperature: 10.20 *C
  19:59:04.229 -> Humidity: 66.80 % Temperature: 10.20 *C
  19:59:06.269 -> Humidity: 66.90 % Temperature: 10.10 *C
  19:59:08.287 -> Humidity: 67.00 % Temperature: 10.10 *C
  19:59:30.593 -> Humidity: 67.80 % Temperature: 9.90 *C

  We observed the drift to be within -1.1 *C.

- Static Error

  Varying the temperature and thus humidity inside a car, we kept the sensor inside to measure (or try to measure) that same temperature and humidity, the data gotten from the sensor at these varying temperatures is provided below and then we went ahead to calculate the static error whose data is also included in the table below

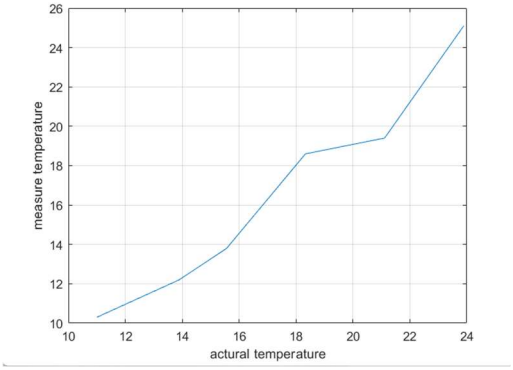
actural temperature	measure temperature	%error	actural humidity	measure humidity	%error
11	10.3	6.36	58	66.8	13.17
13.89	12.2	12.16	55	63.7	15.81
15.56	13.8	11.31	53	60.3	13.77
18.33	18.6	1.47	40	44.9	12.25
21.11	19.4	8.1	36	39.6	10
23.89	25.1	5.06	30	32.8	9.33

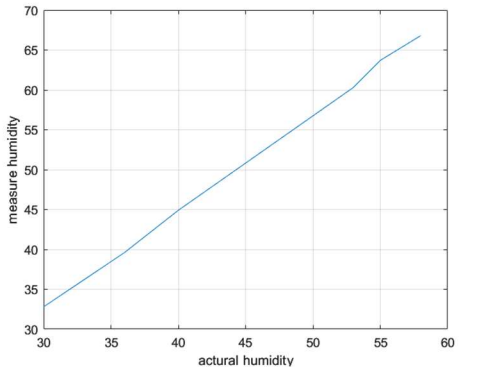
We can see that the % error ranged from a low as 1 to as high as 12 and with information we can quantify the true value actually measured by the sensor to within 7% of the measured value

While the error is quite on the large side for the humidity, we still see considerable accuracy to within 12% but this is expected as humidity is easily affected and external sources such opening the car of the door, getting in to change the temperature contributed to varying the humidity past what we set it to.

- Linearity

  This was another one of those characteristics that could only be quantified and to do that, we plotted the values (actual and measured against each other) and extracted the information needed to determine linearity. The plots of humidity and temperature are included below





  As we can see from the graph above, this relationship is quite linear which is as expected from the sensor although this relationship was only possible through time and effort

Summary and Conclusion

The sensor was almost well within expectation but to get to that level, we had to figure out its weakness and modify a lot of factors.