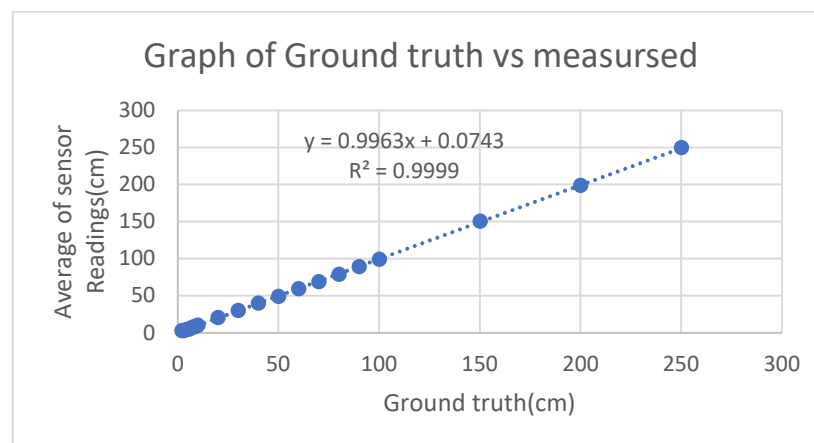


After collecting the data from all the tests we did, we complied all that data into the table below.

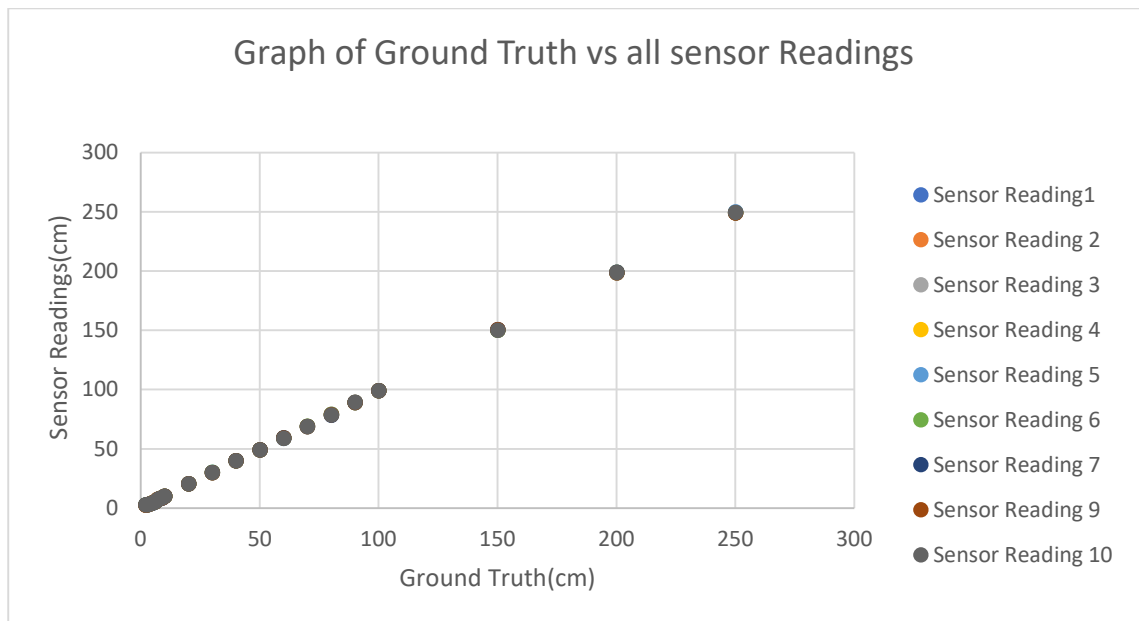
Ground Truth(cm)	Sensor Readings										Average	Std	Deviation	% Error
	1	2	3	4	5	6	7	8	9	10				
0	1126.03	1126.07	1126.12	1126.19	1126.36	1126.91	1126.88	1126.17	1126.17	1126.03	1126.293	0.33143	0.88	#DIV/0!
1	4.09	4.09	3.98	3.98	3.98	4.03	4.09	4.09	4.09	4.09	4.051	0.052377	0.11	305.1
2	2.88	2.76	2.88	2.86	2.86	2.88	2.88	2.86	2.78	2.86	2.85	0.043461	0.12	42.5
3	3.17	3.07	3.12	3.07	3.17	3.17	3.17	3.17	3.17	3.17	3.145	0.042492	0.1	4.833333
4	4.09	3.98	4.09	4.09	3.98	3.98	4.09	4.09	4.09	3.98	4.046	0.056804	0.11	1.15
5	4.59	4.69	4.71	4.69	4.59	4.69	4.71	4.69	4.69	4.59	4.664	0.051683	0.12	-6.72
6	5.6	5.6	5.6	5.6	5.5	5.62	5.5	5.5	5.62	5.5	5.564	0.055618	0.12	-7.26667
7	7.33	7.45	7.34	7.44	7.33	7.33	7.45	7.33	7.43	7.36	7.379	0.055668	0.12	5.414286
8	8.36	8.34	8.24	8.24	8.24	8.24	8.36	8.24	8.36	8.24	8.286	0.059666	0.12	3.575
9	8.93	9.02	8.91	9.03	8.93	9.02	8.91	9.02	8.91	9.02	8.97	0.055377	0.12	-0.33333
10	10.24	10.24	10.34	10.34	10.34	10.22	10.34	10.33	10.33	10.33	10.305	0.049944	0.12	3.05
20	20.86	20.86	20.86	20.84	20.84	20.84	20.74	20.74	20.74	20.84	20.816	0.053166	0.12	4.08
30	30.28	30.28	30.28	30.28	30.38	30.38	30.29	30.28	30.28	30.28	30.301	0.041753	0.1	1.003333
40	40.21	40.21	40.21	40.21	40.22	40.12	40.1	40.12	40.1	40.21	40.171	0.053009	0.12	0.4275
50	49.24	49.24	49.24	49.24	49.24	49.26	49.26	49.26	49.34	49.36	49.268	0.044422	0.12	-1.464
60	59.19	59.29	59.07	59.29	59.19	59.29	59.71	59.28	59.29	59.07	59.267	0.178889	0.64	-1.22167
70	69.12	69.12	69.12	69.12	69.21	69.22	69.12	69.22	69.12	69.21	69.158	0.049171	0.1	-1.20286
80	79.05	79.36	79.06	79.05	79.35	79.45	78.53	79.36	78.97	78.93	79.111	0.278147	0.92	-1.11125
90	89.38	89.36	89.36	89.4	89.29	89.4	89.36	89.38	89.36	89.48	89.377	0.047621	0.19	-0.69222
100	99.31	99.43	99.41	99.33	99.41	99.33	99.31	99.47	99.33	99.41	99.374	0.057966	0.16	-0.626
150	150.34	150.28	150.69	150.38	150.36	150.36	150.81	150.38	150.78	150.38	150.476	0.200344	0.53	0.317333
200	199.1	199.12	199.1	198.69	198.6	199.12	199.14	199.12	198.74	199.05	198.978	0.211912	0.54	-0.511
250	249.47	249.64	249.78	249.48	250.29	249.34	249.4	249.78	249.31	249.69	249.618	0.292567	0.98	-0.1528
300	1124.55	1124.65	1126.45	1126.45	1126.55	1126.56	1124.45	1124.45	1124.67	1124.89	1125.367	0.985743	2.11	275.1223
												0.139551	0.36125	27.18571
												0.09427	0.265238	2.14519

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

- Range: As can be observed from the table, accurate within the manufacture spec (2 – 250cm). Measurements before 2cm and after 250cm were highly inaccurate.
- Linearity/ Sensitivity: These are measurements that can only be gotten through further analysis and one of the fastest and best ways is through plotting a graph of the ground truth vs the average of the sensor readings.



- From the graph above, we can see that R^2 has a value of 0.9999 which shows that the sensor is very linear meaning the relationship between the actual readings and sensor readings is quite direct!
- We can also qualify the sensor to be quite sensitive with a sensitivity of 0.9963.
- Resolution: This was a characteristic we would not quite quantify due to too much uncertainty! Looking at the error column in the table above, we could see how much uncertainty we were dealing with thus making resolution hard to quantify
- Accuracy/Precision/Repeatability: These are measurements that can also only be gotten through further analysis and one of the fastest and best ways is through plotting a graph of the ground truth vs all the sensor readings.



- From the graph above, we can see that all the points overlap the ground truth and from the table above we can standard that the average standard deviation is less than 1 which shows that the sensor is reliably accurate and precise
- Repeatability was one that we observed much more than ever through the whole testing process. We did this test more than once and we notice almost if not same readings for values within the range every time the test was carried out which even if we boil down to the graph and table above, we can notice the %error being almost negligible

- Drift

Ground truth		Sensor Readings (showing drift)							Average Std Deviation % Error					
40	40.21	40.21	40.21	40.21	40.22	40.12	40.1	40.12	40.1	40.21	40.171	0.053009	0.12	0.4275
50	49.24	49.24	49.24	49.24	49.24	49.26	49.26	49.26	49.34	49.36	49.268	0.044422	0.12	-1.464

As we can see in the rows data above, the 10 sensor readings were ± 0.1 cm within the ground truth.

Summary and Conclusion

The sensor was mostly well within the specifications provided by the manufacturer with a few gives or takes but considering educational setting the sensor was made to be used in, we safely conclude that the sensor does work well for that sensor and since we have now made up for its lack with our time effort, we could very well modify the sensor to be used for complex tasks!