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Assignment 1

Run - Time Analysis

Algorithm	Dataset	Size	Run 1(sec)	Run 2(sec)	Run 3(sec)	Avg Time(sec)
Brute Force	Random	10	0.00118	0.00059	0.00045	0.00074
	Random	100	0.04389	0.06403	0.05210	0.05334
	Random	500	0.79460	1.05146	0.95137	0.93247
	Random	1000	4.17337	4.26085	3.90596	4.11339
	Random	5000	121.92036	126.33976	121.33304	123.19772
	Random	10000	TLE	TLE	TLE	TLE
	Random	1000000	TLE	TLE	TLE	TLE
Graham Scan	Random	10	0.00013	0.00010	0.00006	0.0009
	Random	100	0.00132	0.00108	0.00075	0.00105
	Random	500	0.00337	0.00397	0.00542	0.00425
	Random	1000	0.01080	0.01168	0.01182	0.01143
	Random	5000	0.02717	0.04988	0.04692	0.04132
	Random	10000	0.08472	0.11423	0.08209	0.09368
	Random	1000000	13.70791	13.57784	13.39142	13.55905

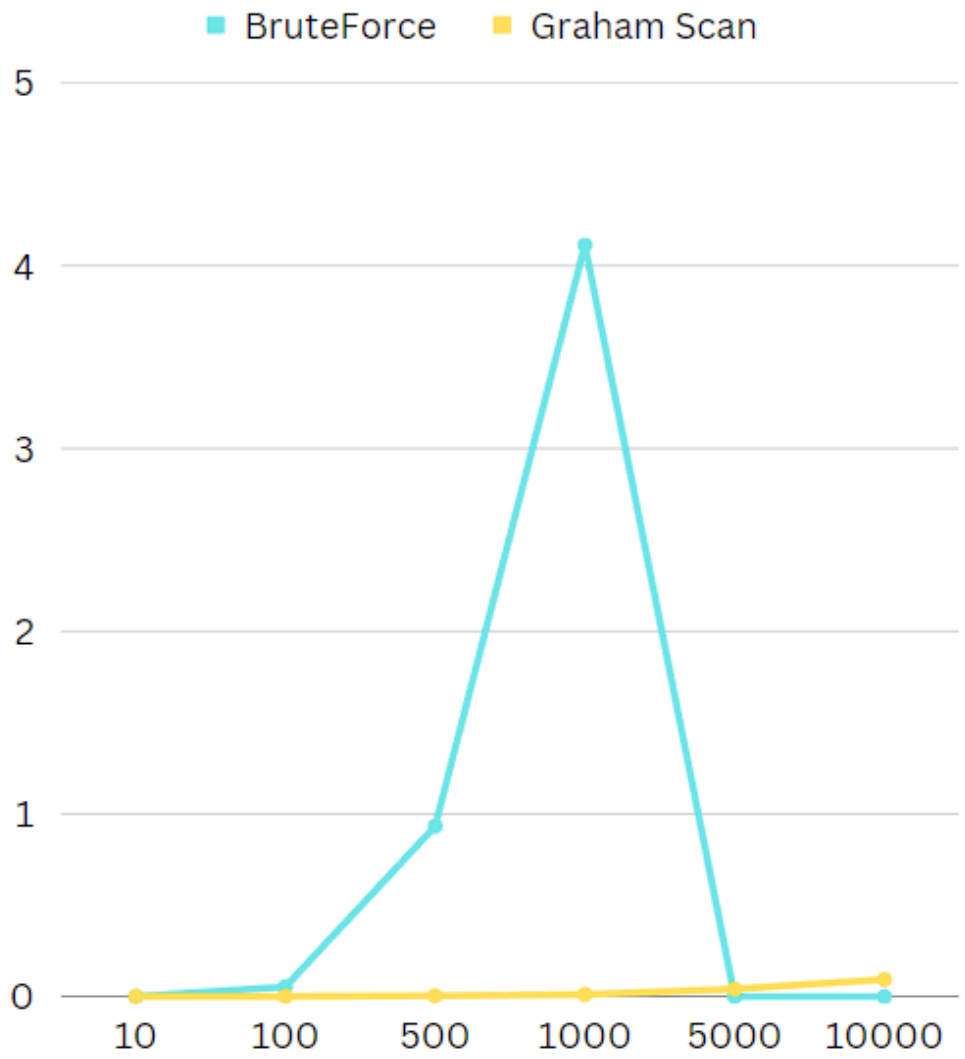
* TLE = Time Limit Exceeded - Program took more than 5 mins to execute *

- We can see that from the Start the Graham Scan Algorithm is Faster than the BruteForce Algorithm. And the BruteForce gives a TLE over 10000 sample points

- This is because the time complexity for the BruteForce Algorithm is O(n^3), whereas the Time complexity of Graham Scan Algorithm is O(n) + O(nLogn) + O(n) + O(n) which is O(nLogn)

- We can see that for 1000000 data points it only takes 13.55 seconds on an average for the Graham Scan Algorithm to execute

We can see a clear comparison between the two in the graph below



We have the number of data points on the x-axis and time in seconds on the y-axis. We have considered the time of Brute Force algorithm for 5000 and 10000 data points to be 0 so that we can better visualize it. And have only considered 10000 data points as the final example.

We can see the logarithmic growth for the Yellow line which was expected and Cubic growth for the Blue line