Special Assignment

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1 Plots:-

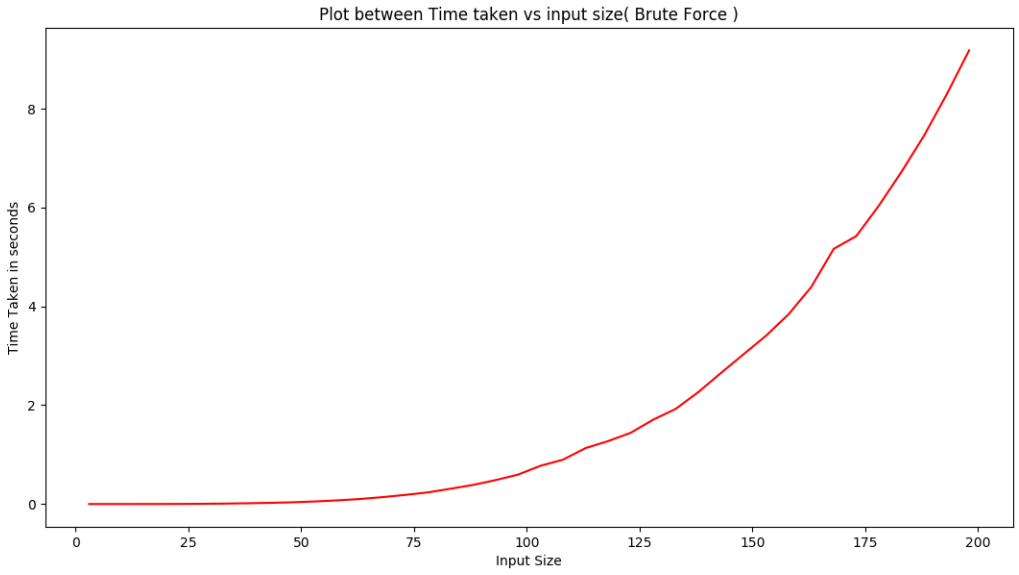

Figure 1: Plot showing graph of input vs time taken (brute force)

- *Brute Force:-* For each pair as well as triplet of points, we find the corresponding circle passing through them and see if it encloses all the points as well. Among all such circles, we report the circle of least radius.
- Finding circle for each pair of points takes $O(n^3)$ time. Finding circle for each triplet of points takes $O(n^4)$ time. Overall time complexity is $O(n^4)$ time.
- For input as small as $n = 200$, time taken goes to 8 seconds for brute force algorithm.

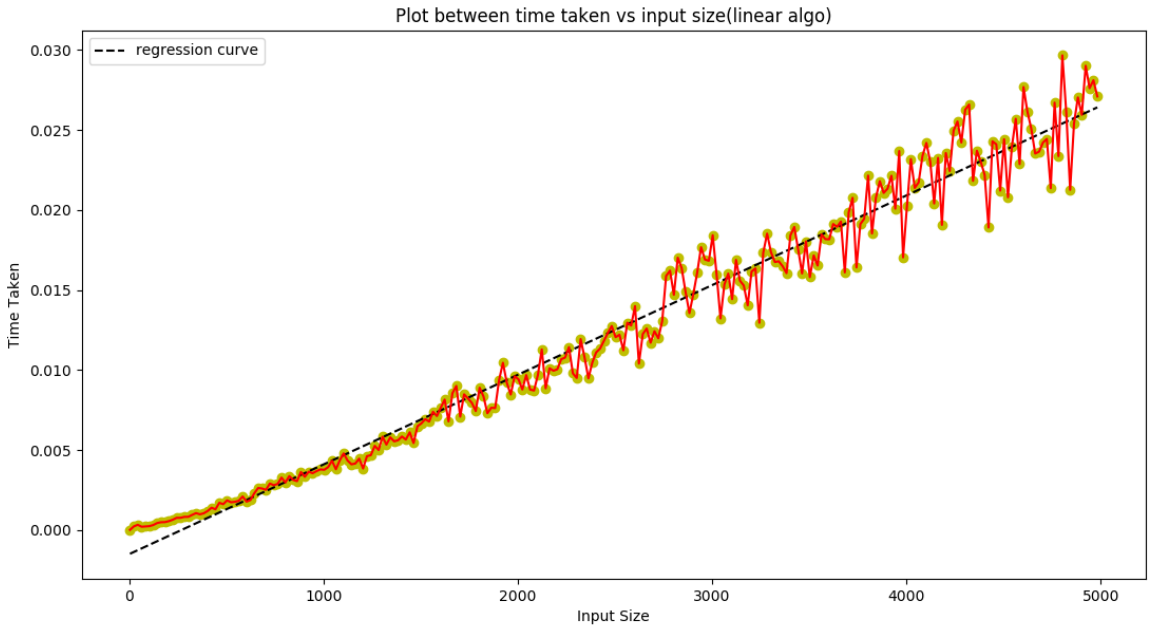

Figure 2: Plot showing graph of input vs time taken (Linear Algo)

- *Randomized Linear Time Algorithm:-* The algorithm takes O(n) average time.
- The red curve in the plot is the time taken for different values of inputs. The black line is linear regression curve that fits the data with some noise.
- A particular input is permuted many times and time taken for all permutations is averaged out to find the final time for that input.
- The *deviation* as is evident from the plot is of the order of few milliseconds for inputs as high as 5000. But on average the linear curve is able to fit the data points with very marginal error.