

# Asymptotic Analysis

- In Asymptotic Analysis, we check the performance of algorithms in terms of input size.

here, we calculate how much time and space is taken by an algorithm when we increase the size of input.

- Why performance analysis?

it's very important by this we can have Scale Algo.

means if the algo is speed, very quick in response than it's better than other algo which are slow in response to Analysis this we do performance analysis.

eg: A  
if a software is taking 30 mins to rotate a photo  $90^\circ$ . then, what's the use? it's taking 30 mins to just rotate.

and another Algo B is taking just some msecs. obviously Algo or software B is far more better.

- eg :- let's take two sorting algorithms.
  - (i) linear search where the order of growth (Time and space) is linear  $* (n)$
  - (ii) Binary Search order of growth is logarithm  $* (\log n)$



here, in linear search when we provide small num of input it will response very fast but in case of

Binary search it will take <sup>more time than linear search</sup> to response in that input but when it comes to large data binary search very fast as compare to linear search.

why?

because the order of growth in binary search is logarithmic where as order of growth in linear search is linear. (it takes time to process large data in sequence for linear search).

Eg:- table:-

input size	Running time for linear search	Running time for Binary Search
10	2 sec	1h
100	20 sec	1.8h
$10^{16}$	55.5h	5.5h
$10^9$	6.3 years	8.3h