Reading Material

FIGURE 2: SPACE COMPLEXITY

2.2 Algorithm Analysis

Any Algorithm can be analyzed in two ways – prior to the execution and post the execution of the algorithm as a computer program.

When we collect statistics about the algorithm's consumption of time and space requirements in the computer when it is being executed as a program, then that is referred to as *A Posteriori* analysis. In this analysis, external factors like Network latency and Hardware delays can influence the performance making the same algorithm behave differently on different systems. A Profiler tool is a popular tool that can be used for performing a posteriori analysis

On the other hand, it is beneficial to analyze the algorithm at the earlier stage of the software life cycle – even before the algorithm has been implemented. This analysis is referred to as *A priori* analysis. This would require the knowledge of mathematical equations to analyze the step counts in the algorithm.

Three types of analysis are usually performed:

1. ***Worst Case Analysis*** - Under what condition/s does the algorithm, when executed, consume the maximum amount of resources? It is the maximum amount of resources the algorithm can consume for any value of problem size.
2. ***Best Case Analysis*** - Under what condition/s does the algorithm, when executed, consume the minimum amount of resources?
3. ***Average Case Analysis***: This is between worst case and best-case analyses. It is probabilistic in nature.

Average case running times are calculated by determining the average nature of the input, and then doing an analysis of the algorithm for this input.

Average case analysis is performed because every possibility is equally likely to happen. Even though average case is more indicative of the real situation, worst case analysis is preferred due to the following reasons:

- It's better to get an upper bound of the execution time, making programs more deterministic in execution
- It's easy to perform worst case analysis compared to the computation of best and average case.

4