

Lesson 2

"Think Big"

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Asymptotic analysis

Overview

- In 2019, Twitter users send more than 500,000 tweets every minute.
- In 2019, 8.1 billion internet users.
- In 2018, 2.375 billion monthly active users in Facebook.

How can we decide which algorithm is better?



Scalability

Definition

A method of defining the mathematical boundation of the run-time performance or space usage of programs. With this, we can estimate the running time or space usage as function of the input size. Particularly, the order of growth in time o space of one algorithm according to input size.

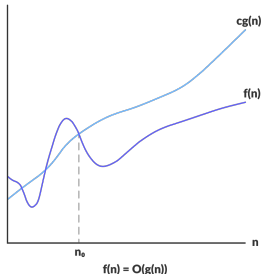
Using the asymptotic analysis we can easily estimate:

- Average Case - $\Theta(n)$ Theta notation
- Best Case - $\Omega(n)$ Omega notation
- Worst Case - $O(n)$ Big oh notation

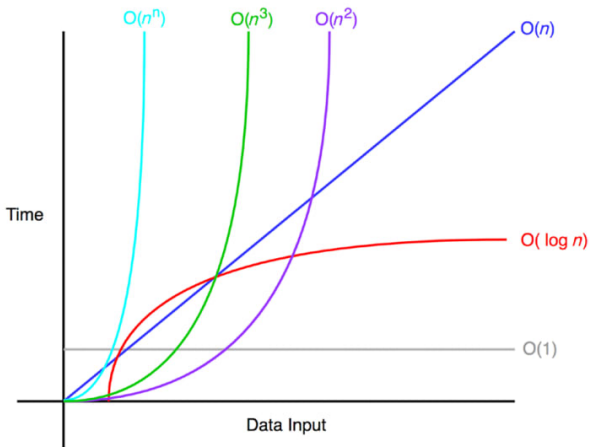
Big O Notation

The formal way to express the upper bound of an algorithm running time.

- Sometimes the constant factor makes a considerable difference.
- Ommit lower terms.
- Start from a particular input size (n_0)



Examples of Time Complexity



There exists almost always a **trade-off** in an algorithm between used space and run-time performance. Sometimes, we need to save computed values for future actions in order to improve the running time.

Example

Fibonnaci Algorithm

