

1. A compiled language is one where the source code, is translated into machine code by compiler before it is run. This machine code can be executed directly by hardware. Examples of compiled languages include C, C++ & Rust. An interpreted language, on the other hand is one where source code is translated & executed by line an interpreter. Examples of interpreted language always require a virtual machine to run compiled code which is not necessary.

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2. Big O notation is used to describe the performance or complexity of an algorithm, particularly in terms of time & space. It provides an upper bound on the growth rate of the run-time or space requirements as the input size increases. For example, an algorithm with a time complexity of  $O(n)$  means that the time it takes to complete the task grows linearly with input size. Big O notation helps computer scientists & engineers to compare efficiency of different algorithm & to make informed decisions about which algorithm to use in given context. However, Big O notation also describes the average case performance of an algorithm.

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3. A dead lock is situation in an operating system where two or more processes are unable to proceed because each is waiting for other



to release a resource. This creates a cycle of dependencies that halt all the process involved.

Deadlocks can be prevented using several strategies such as:

**Avoidance:** Ensuring that the system never enters an unsafe state by careful allocation of resources.

**Prevention:** Designating protocols to prevent one or more of the necessary conditions for deadlocks.

**Detection and Recovery:** Allowing the system to enter a dead lock state but having mechanisms in place to detect it & recover, such as preempting resources or terminating one of processes. Another approach is to use priority-based scheduling to ensure higher priority process never enters deadlock.