



**Department of Computer Science and Engineering
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Lecture Notes Python for Computational Problem Solving UE23CS151A

Lecture #3

Limits of Computation Problem Solving, Algorithms

By,

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Limits of Computational Problem Solving:

Computational Problem Solving depends on many factors like:

- **Complexity of the Problem:**
Related to the space and time tradeoff.
- **Efficiency of an Algorithm**
Related to the fastness and accuracy of the result.
- **Available Computing Resources**
Resources availability might be enormous or very limited.

Algorithm:

A sequence of **unambiguous instructions** for solving a problem, i.e., for obtaining a **required output for any legitimate input** in a **finite amount of time**. The word “algorithm” is derived from the **ninth-century Arab mathematician, Al-Khwarizmi**.

Characteristics of an Algorithm:

Definiteness, Finiteness, Effectiveness, Correctness

Types of Algorithms:

- **Deterministic:**
Algorithm which always produce the same output with a particular input with the underlying machine always passing through the same sequence of states.
Example: Sorting Algorithms
- **Non-deterministic:**
Provide different outputs for same input on different executions. Example:
Execution of concurrent algorithms with race condition.

Example: Write an algorithm to find the sum of the digits of a given number n.

Step 1: Start

Step 2: Read the number, n

Step 3: Declare sum as 0

Step 4: Remainder = n modulus 10 (or n remainder 10)

 sum = sum + Remainder

 n = n / 10

Step 5: if n > 0 go to step 4 else go to step 6

Step 6: print the sum

Step 7: Stop

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