**Module 1 – Critical Thinking Project**

# Algorithm Overview

An algorithm is any well-defined computational procedure that takes some value, or set of values, as input and produces some value, or set of values, as output. An algorithm is thus a sequence of computational steps that transform the input into the output.

Algorithms are fundamental to computer science and play a crucial role in solving various problems efficiently.

Problem

Design an algorithm that, when given an arrangement of the digits 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, rearranges the digits so that the new arrangement represents the next larger value that can be represented by these digits (or reports that no such rearrangement exists if no rearrangement produces a larger value). Thus, 5647382901 would produce 5647382910.

## Algorithm

1. Start from the rightmost digit.
2. Iterate leftward until you find a digit that is smaller than the digit to its right. If no such digit is found, the number is already the largest possible rearrangement, so report "No larger arrangement exists".
3. Find the smallest digit to the right of the identified digit (from step 2) that is greater than it.
4. Swap the positions of the two digits identified in steps 2 and 3.

**Example:**

**Number =** 5647382901

Start with the rightmost digit (1). We found(0) which is smaller than (1)

The next digit to the left (0) is also smaller than its neighbor (9), so move to step 3.

The smallest digit to the right of 0 that is greater than it is 1 (the digit we started with).

Swap 0 and 1. The number becomes 5647382910.

## Complexity

This algorithm has a time complexity of O(n), where n is the number of digits, making it efficient for practical use.

Ref - [Algorithms Tutorial - GeeksforGeeks](https://www.geeksforgeeks.org/fundamentals-of-algorithms/)