Programming Logic and Design

Assignment 1

# 

# **Question 2: Bubble Sort**

## **What is Bubble Sort?**

A Bubble Sort is the simplest sorting algorithm that works by repeatedly swapping adjacent elements if they are in the wrong order. This algorithm is not suitable for large data sets as its average and worst-case time complexity are quite high.

To explain it in simpler terms, if the numbers are in reverse order, equivalently for each pair we swap the numbers until the result is sorted. Since the average and worst cases of time complexity are of a considerable size, the use of this algorithm for big data sets is not advised.

Imagine organizing a line of people by height. You start at the beginning, compare each person with the next one, and swap them if the taller person is in front. You repeat this process until you can go through the entire line without making any swaps.

**How Bubble Sort Works**

The algorithm traverses a list and compares adjacent elements, swapping them if they are in the wrong order. The pass through the list is repeated until the list is sorted.

**Process:**

1. Start from the first element, compare it with the next element
2. If the first element is greater than the second element, swap them
3. Move to the next pair and repeat step 2
4. Continue this process until the end of the list
5. Repeat the entire process for n-1 passes (where n is the number of elements)

**Advantages of Bubble Sort:**

* Bubble sort is easy to understand and implement.
* It does not require any additional memory space.
* It is a stable sorting algorithm, meaning that elements with the same key value maintain their relative order in the sorted output.

**Disadvantages of Bubble Sort:**

* Bubble sort has a time complexity of O(n2) which makes it very slow for large data sets.
* Bubble sort has almost no or limited real world applications. It is mostly used in academics to teach different ways of sorting.

## **Reference List**

* GeeksforGeeks. (2023). *Bubble Sort Algorithm*. Available at: <https://www.geeksforgeeks.org/bubble-sort-algorithm/> (Accessed: 4 October 2024).
* The IIE. (2024). *Student Materials: Programming Logic and Design*. [Lecture Notes] The Independent Institute of Education.
* OpenAI. (2025) *ChatGPT* [AI model]. Available at:<https://chat.openai.com/>.