**INTERACTIVE SIMULATION OF VARIOUS DATA STRUCTURE AND ALGORITHM**

**Data Structure**: A data structure is a particular way of organizing data in a computer so that it can be used effectively. Example: Array, Linked List, Queue, Stack, etc.

**Algorithms:** A process or set of rules to be followed in calculations or other problem-solving operations, especially by a computer.

The Algorithm we are specifically considered is Sorting Algorithm. Sorting algorithms deal with the procedure to sort the required data structure in an appropriate order.

When studying Data Structures and Algorithm students often wonder how does this data structure would be present in memory, how data structures like Stack and Queues are different from each other, What are the relations between the elements in any data structure? Many students find it confusing just because they cannot visualize what is taught in their class. The same thing happens when they learn different sorting algorithms. They wonder how each element in an array moves while running a sorting algorithm such that it finally leads to a sorted array. Why only certain elements are swapped and certain are just skipped. Such questions tease the brains of the student but the visualization of how things are working could help them understand the concept well. Teachers could also use this application to help students imagine Data Structures and Algorithms.

The aim behind the implementation of this project to make a clear understandability of various data structures and Algorithms. Using a web page simulates the data structure operations such as searching, sorting, insertion, deletion, etc., and algorithms like Bubble Sort, Insertion Sort, Quick Sort, Merge Sort, etc.

Thus, our web page provides effective and efficient knowledge of data structures and algorithms. This also provides some theoretical knowledge regarding the data structure and algorithm.

The objective of this project is to study how the operations on data structure and algorithms are performed and how the values are compared in a sorting algorithm and swapped. This page will show the total number of comparisons performed for some sorting algorithms. It will also show how much time it would take to sort in a real system.

**Main Functionality:**

1) The application will simulate various data structures and algorithms with an attractive Graphical User Interface (GUI).

2) Users will be allowed to enter their values to data structures and perform operations like insert and delete.

3) Users will be allowed to enter values or get default values for stimulation of different sorting algorithms like Quicksort, merge sort, insertion sort, etc.

4) While stimulation user will also be able to look at the code along with the stimulation.

5) Users can tweak the speed of the animation. He may wish to slow down the animation or he may increase the speed according to his choice.

The user does not need to register or login to use this application. This is made solely for educational purposes and is open to all.

**Users Interaction with Application:**

When the user visits the home page of the web-app he would be provided with different data structures and algorithms. He may choose any of his interests. If he opts to choose a data structure, he would be able to observe how data is organized for the chosen data structure. He would be able to stimulate and observe how various operations like data insertion and deletion are performed. He could then switch to some other data structure and then observe the difference between those two. He could also see the code for that data structure.

If the user chooses to learn an Algorithm. He would be provided a bar-chart where the height of each bar would represent some value. These values can be considered to be some value of an array. As we sort an array using some algorithm the bars start to rearrange so that they align in a sorted manner. The user can see the details like the run time of that algorithm for the provided input.