

United International University
Department of Computer Science and Engineering
Course Title: Data Structure and Algorithm II
Lab 3: Basics of Divide and Conquer
Semester: Fall 2024

Lab Tasks:

Lab 1: Merge Sort

Merge Sort is a divide-and-conquer algorithm that splits the array into halves, recursively sorts them, and then merges the sorted halves. It ensures $O(n \log n)$ time complexity. In this task, you have to write a program that takes a number n , which is followed by a variable p that includes the size of the array and the array itself, and the output of the program is to sort each of the arrays in an ascending order.

Input:	Output:
2	[1,2,3,5]
4	[1,2,4]
[1,5,3,2]	
3	
[1,4,2]	

Lab 2: Quick Sort

Quick Sort is a divide-and-conquer algorithm that selects a pivot element, partitions the array around the pivot, and recursively sorts the subarrays. Its average-case time complexity is $O(n \log n)$. In this task, you have to write a program that will sort an array in ascending order using a quick sort algorithm. You have to implement Quick Sort and allow the user to select the pivot strategy:

1. First element as pivot.
2. Last element as pivot.
3. Middle element as pivot.

For each of the strategies, calculate the total time required to run the program using [clock\(\) function in c](#) and find out the most efficient element to be selected as pivot for your input.

Lab 3: Maximum Subarray Sum using divide and conquer

You are given a one dimensional array that may contain both positive and negative integers, find the sum of contiguous subarray of numbers which has the largest sum.

For example, if the given array is $\{-2, -5, 6, -2, -3, 1, 5, -6\}$, then the maximum subarray sum is 7

Largest Subarray Sum Problem

-2	-3	4	-1	-2	1	5	-3
0	1	2	3	4	5	6	7

$$4 + (-1) + (-2) + 1 + 5 = 7$$

Maximum Contiguous Array Sum is 7