Design & Analysis of Algorithm (Lab)

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B-33

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https://github.com/ananya438/DAALAB_ANANYA-590013832

Kadanes Algorithma and analyze its time complexity.

```
public class KadanesAlgorithm {

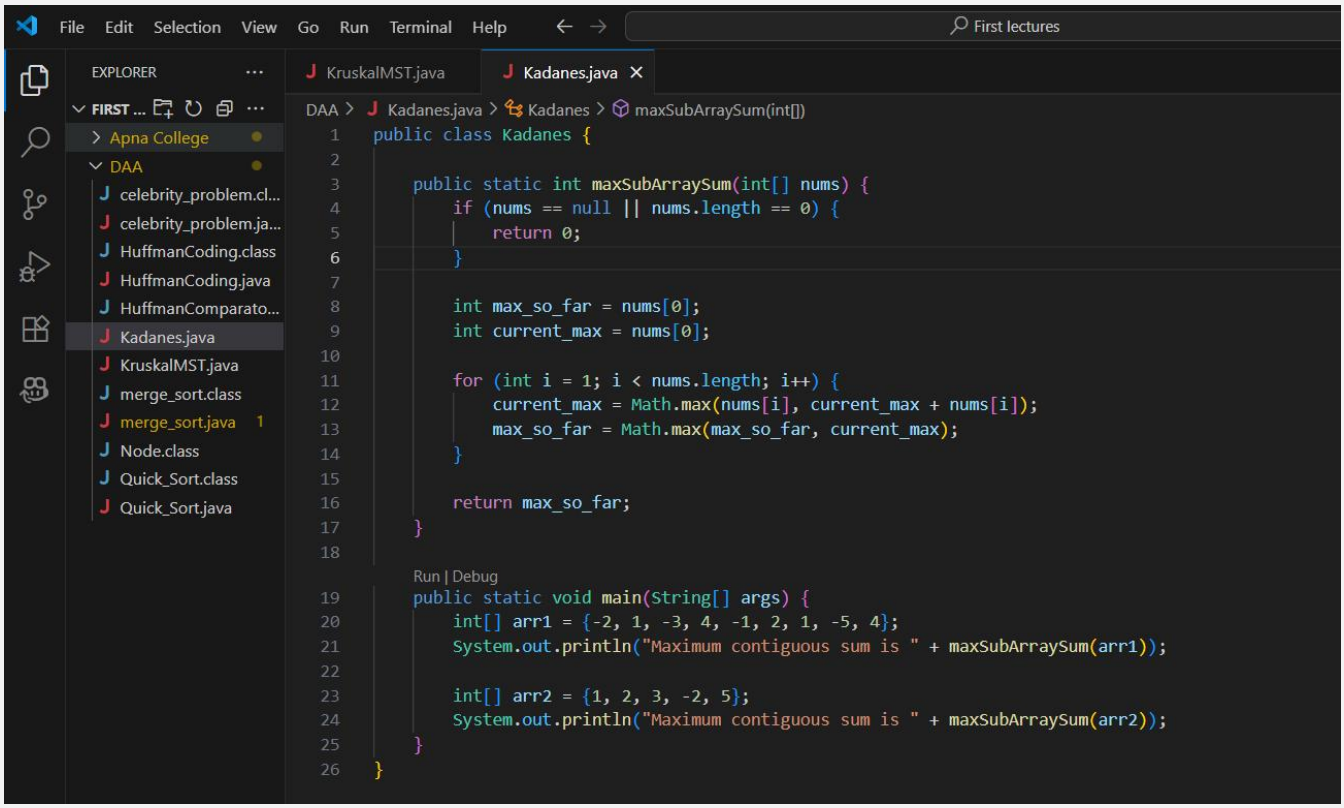

    public static int maxSubArraySum(int[] nums) {
        if (nums == null || nums.length == 0) {
            return 0;
        }


        int max_so_far = nums[0];
        int current_max = nums[0];

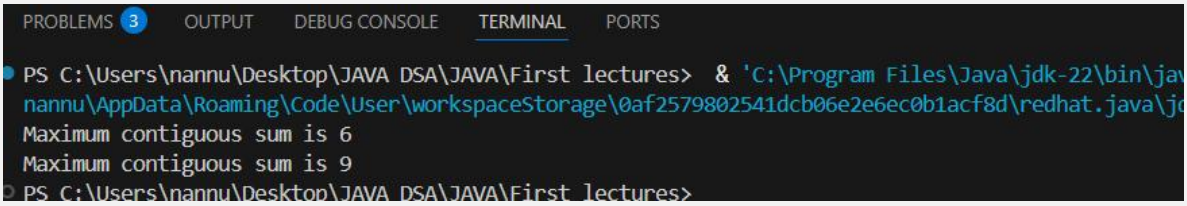

        for (int i = 1; i < nums.length; i++) {
            current_max = Math.max(nums[i], current_max + nums[i]);
            max_so_far = Math.max(max_so_far, current_max);
        }


        return max_so_far;
    }
    public static void main(String[] args) {
        int[] arr1 = {-2, 1, -3, 4, -1, 2, 1, -5, 4};
        System.out.println("Maximum contiguous sum is " + maxSubArraySum(arr1));


        int[] arr2 = {1, 2, 3, -2, 5};
        System.out.println("Maximum contiguous sum is " + maxSubArraySum(arr2));
    }
}
```



O/P:

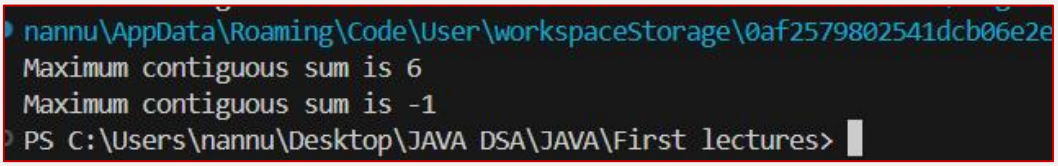


Test Case 1: Standard Case (Positive and Negative Numbers)

Input Array: {-2, 1, -3, 4, -1, 2, 1, -5, 4}

Expected Output: 6

Explanation: The maximum contiguous subarray is [4, -1, 2, 1], and its sum is 4 - 1 + 2 + 1 = 6.

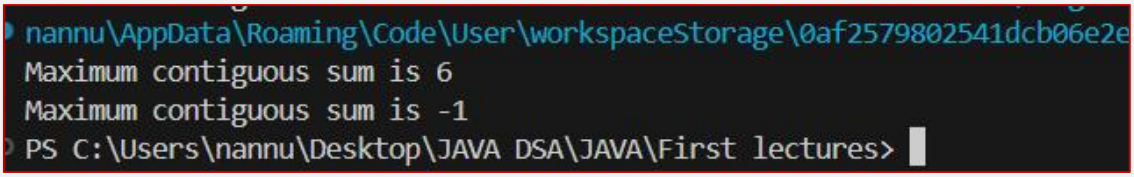


Test Case 2: All Negative Numbers

Input Array: {-5, -2, -8, -1, -3}

Expected Output: -1

Explanation: When all numbers are negative, the maximum sum is the single largest number in the array. In this case, the largest number is -1.



Time Complexity Analysis

O(n)

The algorithm uses a single for loop that runs through the array once.

Inside the loop, all operations are constant time, O(1).

Since it takes a fixed amount of time for each of the n elements, the total time is linear.

Space Complexity

O(1)

The algorithm only uses a few variables to store the current and overall maximum sums.

The memory used does not depend on the size of the array. It's constant.

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}
int max_so_far = nums[0];
int current_max = nums[0];
for (int i = 1; i < nums.length; i++) {</mark>
current_max = Math.max(nums[i], current_max + nums[i]);
max_so_far = Math.max(max_so_far, current_max);
}
return max_so_far;
}
```