Lesson 04 Demo 04

Implementing the Merge Sort Algorithm

Objective: To use merge sort in JavaScript for efficiently organizing large data sets like customer orders or medical records

Tools required: Visual Studio Code and Node.js

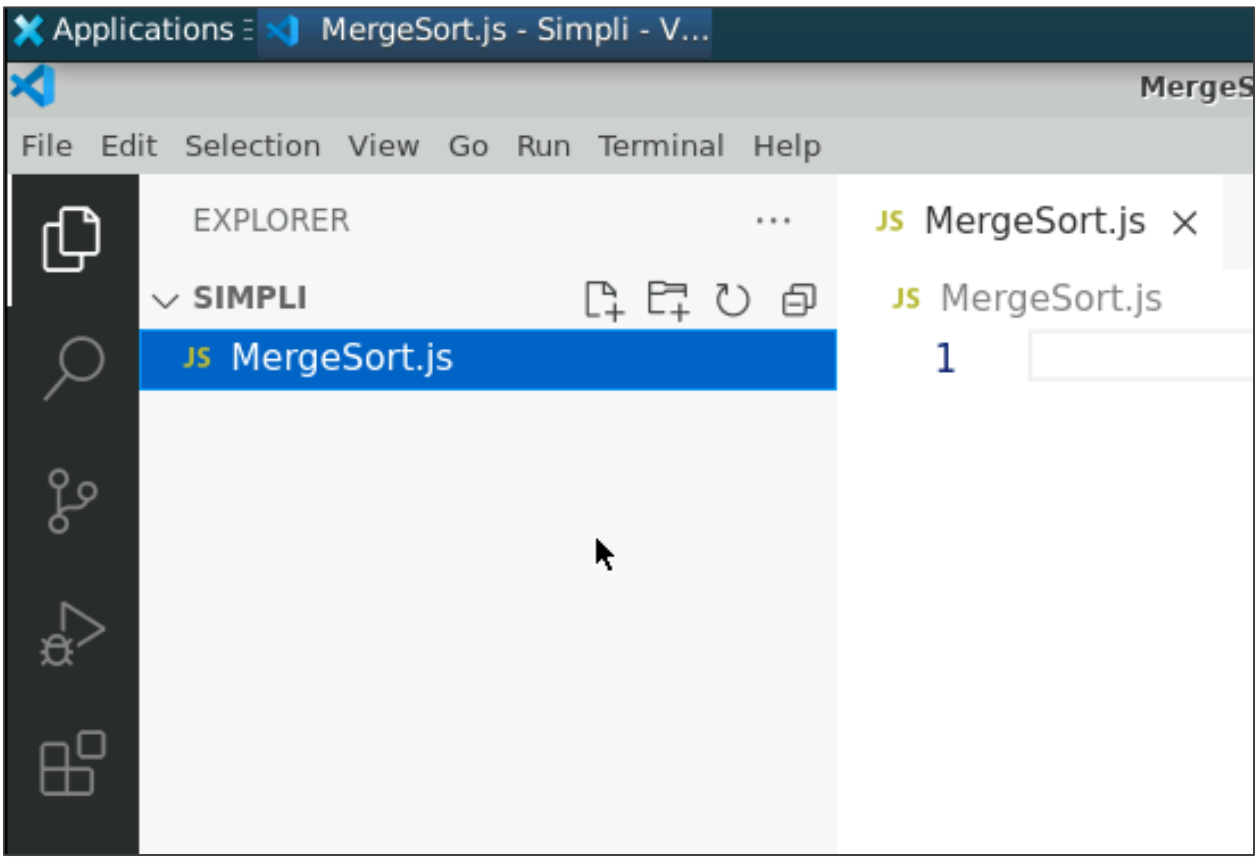
Prerequisites: A basic understanding of arrays and loops in JavaScript

Steps to be followed:

1. Create a JavaScript file and execute it

Step 1: Create a JavaScript file and execute it

1.1 Open the Visual Studio Code editor and create a JavaScript file named **MergeSort.js**



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1.2 Add the following code to the file:

```
// Merge sort implementation
function mergeSort(array) {
  // Base case: if the array has 1 or 0 elements, it is already sorted
  if (array.length <= 1) return array;

  // Find the middle index of the array
  const middleIndex = Math.floor(array.length / 2);

  // Divide the array into two halves
  const leftHalf = array.slice(0, middleIndex);
  const rightHalf = array.slice(middleIndex);

  // Recursively sort the left and right halves
  const sortedLeft = mergeSort(leftHalf);
  const sortedRight = mergeSort(rightHalf);

  // Merge the sorted left and right halves
  return merge(sortedLeft, sortedRight);
}

// Merge function for merging two sorted arrays
function merge(leftArray, rightArray) {
  const mergedArray = [];
  let leftIndex = 0;
  let rightIndex = 0;

  // Merge the two sorted arrays
  while (leftIndex < leftArray.length && rightIndex < rightArray.length) {
    if (leftArray[leftIndex] <= rightArray[rightIndex]) {
      mergedArray.push(leftArray[leftIndex]);
      leftIndex++;
    } else {
      mergedArray.push(rightArray[rightIndex]);
      rightIndex++;
    }
  }

 // Concatenate the remaining elements from both arrays (if any)
  return
mergedArray.concat(leftArray.slice(leftIndex)).concat(rightArray.slice(rightIndex));
}
```

.

```
// Example usage
const unsortedArray = [5, 2, 4, 1, 3];

// Measure execution time using console.time and console.timeEnd
console.time('mergeSort');
const sortedArray = mergeSort(unsortedArray);
console.timeEnd('mergeSort');

console.log(sortedArray);
```

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1.3 Press **Ctrl** + **S** to save the file and then execute it in the **TERMINAL** using the commands given below:

ls

node MergeSort.js

```
PROBLEMS   OUTPUT   DEBUG CONSOLE   TERMINAL

priyanshurajsim@ip-172-31-40-74:~/Downloads/Simpli$ ls
MergeSort.js
priyanshurajsim@ip-172-31-40-74:~/Downloads/Simpli$ node MergeSort.js
mergeSort: 0.133ms
[ 1, 2, 3, 4, 5 ]
priyanshurajsim@ip-172-31-40-74:~/Downloads/Simpli$
```

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By following these steps, you have successfully used the merge sort algorithm in JavaScript to organize large datasets like customer orders or records using a divide-and-conquer approach, and learned that it has a time complexity of O(n log n) and space complexity of O(n).