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Lesson 04 Demo 06

Implementing Heap Sort Algorithm

Objective: To sort data using the heap sort algorithm in JavaScript for managing priority-based tasks such as job scheduling or leaderboard rankings

Tools required: Visual Studio Code and Node.js

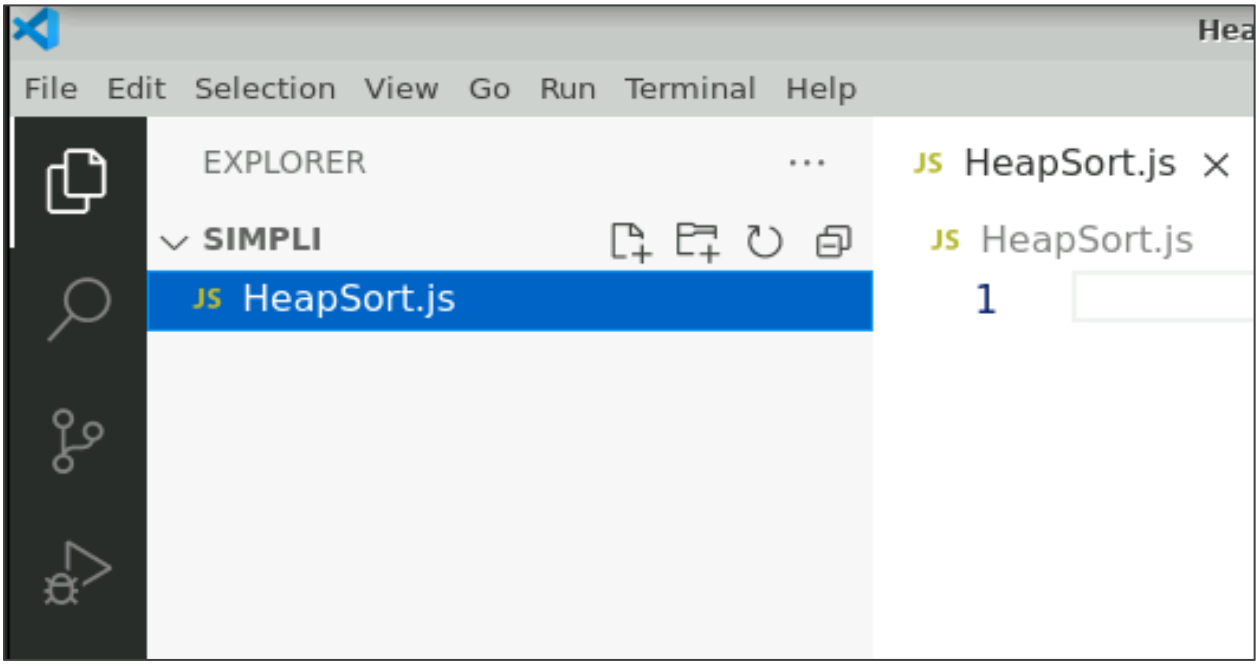
Prerequisites: A basic understanding of arrays and loops in JavaScript

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 **HeapSort.js**



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1.2 Add the following code to the file:

```
// Function to swap two elements in an array
function swap(arr, i, j) {
  const temp = arr[i];
  arr[i] = arr[j];
  arr[j] = temp;
 }

 // Function to heapify a subtree rooted at index i
 function heapify(arr, n, i) {
  const left = 2 * i + 1;
  const right = 2 * i + 2;

  let largest = i;

  // Compare with left child
  if (left < n && arr[left] > arr[largest]) {
   largest = left;
  }

  // Compare with right child
  if (right < n && arr[right] > arr[largest]) {
   largest = right;
  }

  // If the largest element is not the root, swap and heapify the affected subtree
  if (largest !== i) {
   swap(arr, i, largest);
   heapify(arr, n, largest);
  }
 }

 // Function to perform heap sort on the given array
 function heapSort(arr) {
  const n = arr.length;

  // Build a max heap (rearrange array)
  for (let i = Math.floor(n / 2) - 1; i >= 0; i--) {
   heapify(arr, n, i);
  }
```

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```
 // One by one extract elements from the heap
 for (let i = n - 1; i >= 0; i--) {
  // Move the current root to the end
  swap(arr, 0, i);

  // Call heapify on the reduced heap
  heapify(arr, i, 0);
 }
}
// Example usage
const arr = [3, 0, 2, 5, -1, 4, 1];
console.log('Unsorted array:', arr);
// Measure the execution time of heapSort
console.time('Heap Sort');
heapSort(arr);
console.timeEnd('Heap Sort');

console.log('Sorted array:', arr);
```

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heapSort(arr);
console.timeEnd('Heap Sort');

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```

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

ls

node HeapSort.js

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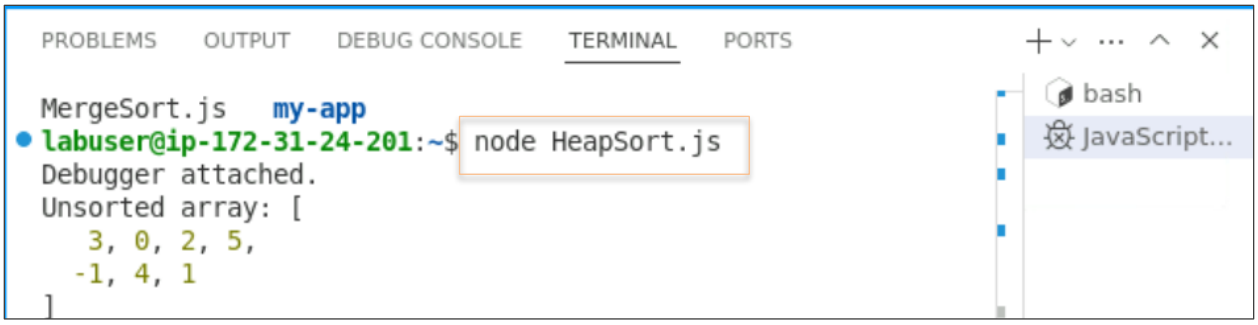

By following these steps, you have successfully used the heap sort algorithm in JavaScript to efficiently organize data such as job queues or leaderboard rankings, and learned that it has a time complexity of O(n log n) and a space complexity of O(1).