Lesson 04 Demo 09

Implementing a Linear Search Algorithm

Objective: To demonstrate the linear search algorithm and explain its time and space complexity using JavaScript
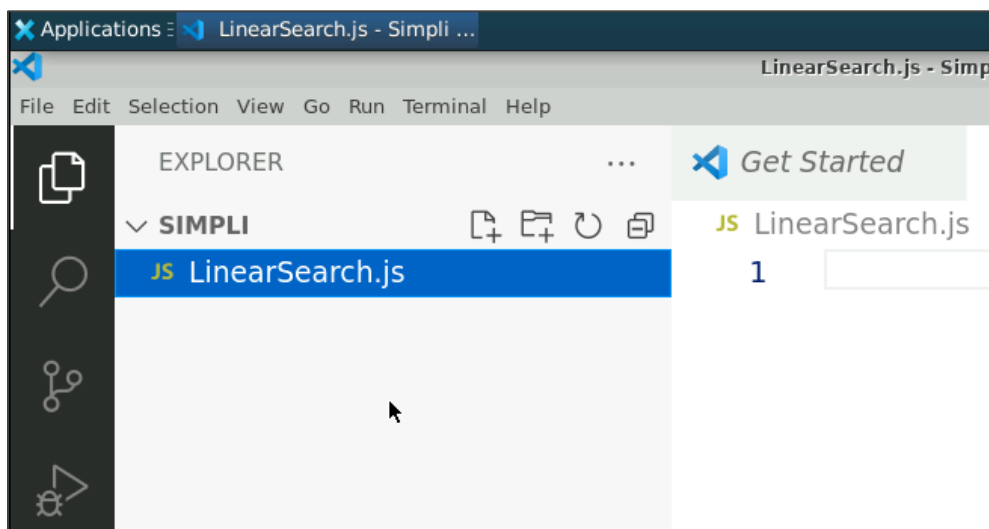
Tools required: Visual Studio Code and Node.js

Prerequisites: Basic understanding of arrays and loops in JavaScript

Steps to be followed:
1. Create and execute the JS file

Step 1: Create and execute the JS file

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

1.2 Write the code given below in the **LinearSearch.js** file:

```
// Function to perform linear search on an array
// Time Complexity: O(n) - linear time complexity
//   In the worst case, the function may need to iterate through the entire array.
// Space Complexity: O(1) - constant space complexity
//   The function only uses a constant amount of extra space regardless of the input
size.

function linearSearch(arr, target) {
  for (let i = 0; i < arr.length; i++) {
    if (arr[i] === target) {
      return i;
    }
  }
  return -1;
}

// Example usage
const arr = [1, 3, 5, 8, 9];

// Measure the execution time of linearSearch function
console.time("linearSearch");
const index = linearSearch(arr, 5);
console.timeEnd("linearSearch");

// Output the result
console.log("Index:", index);
```

```js
JS LinearSearch.js > ...
1    // Function to perform linear search on an array
2    // Time Complexity: O(n) - linear time complexity
3    //    In the worst case, the function may need to iterate through the entire array.
4    // Space Complexity: O(1) - constant space complexity
5    //    The function only uses a constant amount of extra space regardless of the input size.
6
7    function linearSearch(arr, target) {
8        for (let i = 0; i < arr.length; i++) {
9          if (arr[i] === target) {
10             return i;
11         }
12        }
13        return -1;
14    }
15
16    // Example usage
17    const arr = [1, 3, 5, 8, 9];
18
19    // Measure the execution time of linearSearch function
20    console.time("linearSearch");
21    const index = linearSearch(arr, 5);
22    console.timeEnd("linearSearch");
23
24    // Output the result
25    console.log("Index:", index);
```

1.3 Save the file and execute it in the terminal using the command given below:
   node LinearSearch.js

```
6
7    function linearSearch(arr, target) {
8        for (let i = 0; i < arr.length; i++) {
9          if (arr[i] === target) {
10             return i;
11         }
```

```
PROBLEMS   OUTPUT   DEBUG CONSOLE   TERMINAL                    > bash

priyanshurajsim@ip-172-31-65-5:~/Downloads/Simpli$ ls
LinearSearch.js
priyanshurajsim@ip-172-31-65-5:~/Downloads/Simpli$ node LinearSearch.js
linearSearch: 0.076ms
Index: 2
priyanshurajsim@ip-172-31-65-5:~/Downloads/Simpli$ ▮
```

In our example, we used the linear search algorithm in JavaScript to find the items in an array. It has a time complexity of O(n) and a space complexity of O(1).

By following these steps, you have successfully implemented and executed a linear search in JavaScript, including measuring its execution time.