

Selection Sort - Complete Guide

Selection Sort Kya Hai

Selection Sort ek simple comparison-based sorting algorithm hai. Yeh array ko sort karne ke liye har step par sabse chhota element dhoondta hai aur use correct position par place karta hai.

Algorithm Steps

1. Array ke first element se shuru karo.
2. Pure array mein sabse chhota element dhoondo.
3. Us element ko current position ke sath swap karo.
4. Next index se repeat karo jab tak array sort na ho jaye.

JavaScript Code Example

```
let arr = [29, 10, 14, 37, 13];
for (let i = 0; i < arr.length; i++) {
    let minIndex = i;
    for (let j = i + 1; j < arr.length; j++) {
        if (arr[j] < arr[minIndex]) {
            minIndex = j;
        }
    }
    let temp = arr[i];
    arr[i] = arr[minIndex];
    arr[minIndex] = temp;
}
console.log(arr); // [10, 13, 14, 29, 37]
```

Step-by-Step Example

Original Array: [29, 10, 14, 37, 13]

Pass 1: 10 is smallest, swap with 29 -> [10, 29, 14, 37, 13]

Pass 2: 13 is smallest, swap with 29 -> [10, 13, 14, 37, 29]

Pass 3: 14 is smallest, already in place

Pass 4: 29 is smallest, swap with 37 -> [10, 13, 14, 29, 37]

Pass 5: Done

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Time & Space Complexity

Best Case: $O(n^2)$

Average Case: $O(n^2)$

Worst Case: $O(n^2)$

Space Complexity: $O(1)$ (In-place)

Bubble Sort vs Selection Sort

- Bubble Sort adjacent elements ko bar bar swap karta hai.
- Selection Sort har pass mein sirf ek swap karta hai.
- Time Complexity dono ka same hai ($O(n^2)$), lekin Selection Sort mein swaps kam hote hain.