

## Sorting (8.3)

### 1. Selection Sort:

Idea: The inner loop selects the minimum element in the unsorted array and places the elements in increasing order.

Time complexity:  $O(N^2)$

```
for (int i = 0; i < n - 1; i++) {  
    for (int j = i + 1; j < n; j++) {  
        if (arr[j] < arr[i]) {  
            int temp = arr[j];  
            arr[j] = arr[i];  
            arr[i] = temp;  
        }  
    }  
}
```

find the minimum element in the unsorted array and swap it with the element at the beginning

yaha array 2 subarray m divide ho jata hai, ek sorted subarray and 2nd unsorted subarray. ham unsorted array s minimum elements ko pick karke sorted array m dalte jate hai (by putting the minimum element of the unsorted array at the beginning of the unsorted array).

### 2. Bubble Sort:

Idea: if  $arr[i] > arr[i+1]$  swap them. To place the element in their respective position, we have to do the following operation  $N-1$  times.

Time Complexity:  $O(N^2)$

```
int counter = 0;  
while (counter < n - 1) {  
    for (int i = 0; i < n - counter - 1; i++) {  
        if (arr[i] > arr[i + 1]) {  
            int temp = arr[i];  
            arr[i] = arr[i + 1];  
            arr[i + 1] = temp;  
        }  
    }  
    counter++;  
}
```

### 3. Insertion Sort:

Idea: Take an element from the unsorted array, place it in its corresponding position in the sorted part, and shift the elements accordingly.

Time Complexity:  $O(N^2)$

```
for (int i = 1; i < n; i++) {  
    int current = arr[i];  
    int j = i - 1;  
    while (arr[j] > current && j >= 0) {  
        arr[j + 1] = arr[j];  
        j--;  
    }  
    arr[j + 1] = current;  
}
```

**Homework:** Implement selection sort, bubble sort, insertion sort on your own.