

Bubble Sort  
Insertion Sort  
Selection Sort

# Bubble Sort



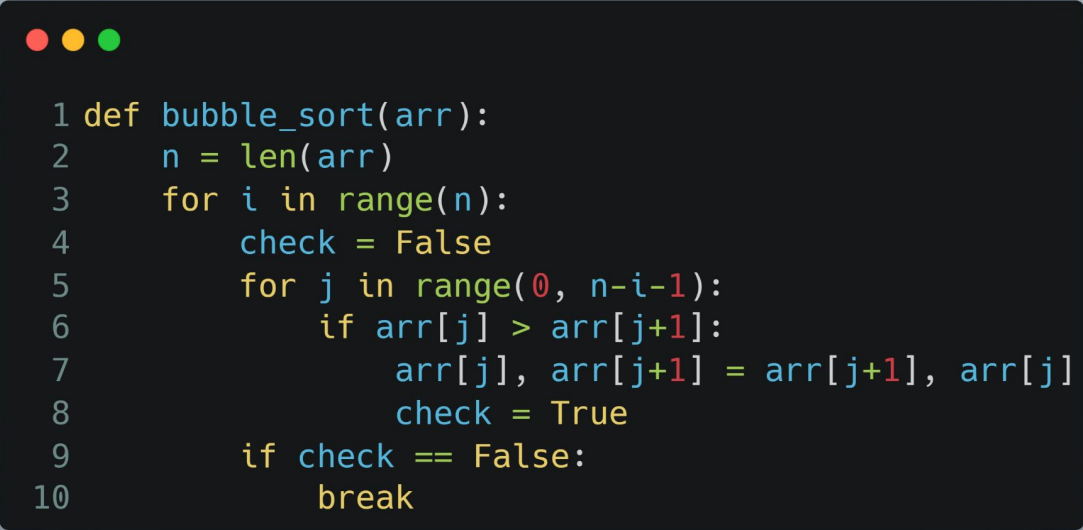
```
1 def bubble_sort(arr):  
2     n = len(arr)  
3     for i in range(n):  
4         for j in range(0, n-i-1):  
5             if arr[j] > arr[j+1]:  
6                 arr[j], arr[j+1] = arr[j+1], arr[j]
```

Best Case : Already Sorted. Time Complexity :  $O(n)$ .

Average Case : Time Complexity :  $O(n^2)$ .

Worst Case : Sorted in Reverse Order. Time Complexity :  $O(n^2)$ .

# Bubble Sort



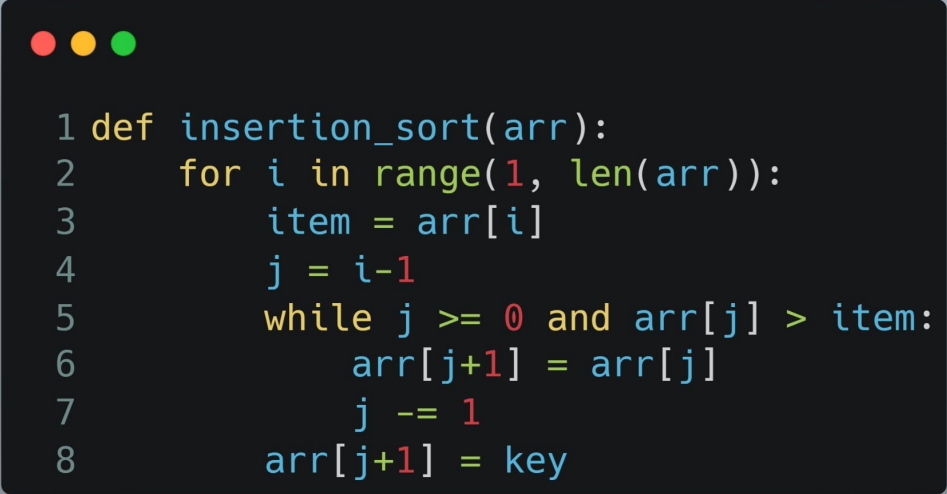
```
1 def bubble_sort(arr):
2     n = len(arr)
3     for i in range(n):
4         check = False
5         for j in range(0, n-i-1):
6             if arr[j] > arr[j+1]:
7                 arr[j], arr[j+1] = arr[j+1], arr[j]
8                 check = True
9         if check == False:
10             break
```

Best Case : Already Sorted. Time Complexity :  $O(n)$ .

Average Case : Time Complexity :  $O(n^2)$ .

Worst Case : Sorted in Reverse Order. Time Complexity :  $O(n^2)$ .

# Insertion Sort




```
1 def insertion_sort(arr):
2     for i in range(1, len(arr)):
3         item = arr[i]
4         j = i-1
5         while j >= 0 and arr[j] > item:
6             arr[j+1] = arr[j]
7             j -= 1
8         arr[j+1] = item
```

Best Case : Already Sorted. Time Complexity :  $O(n)$ .

Average Case : Time Complexity :  $O(n^2)$ .

Worst Case : Sorted in Reverse Order. Time Complexity :  $O(n^2)$ .

# Selection Sort



```
1 def selection_sort(arr):  
2     n = len(arr)  
3     for i in range(n):  
4         min_index = i  
5         for j in range(i+1, n):  
6             if arr[j] < arr[min_index]:  
7                 min_index = j  
8         arr[i], arr[min_index] = arr[min_index], arr[i]
```

Time Complexity :  $O(n^2)$  in all cases.