

## DAA Tutorial 1

1. Write the following algorithms Both in iterative and in recursive algorithm form

i. Insertion sort

**Iterative:**

```
def insertion_sort(arr):
    for i in range(1, len(arr)):
        key = arr[i]
        j = i-1
        while j >= 0 and key < arr[j] :
            arr[j + 1] = arr[j]
            j -= 1
        arr[j + 1] = key
    return arr

#test
arr = [5, 2, 9, 1, 5, 6]
sorted_arr = insertion_sort(arr)
print(sorted_arr)
```

**Recursive:**

```
def insertion_sort_recursive(arr, n):
    if n <= 1:
        return
    insertion_sort_recursive(arr, n-1)
    last = arr[n-1]
    j = n-2
    while (j >= 0 and arr[j] > last):
        arr[j + 1] = arr[j]
        j = j-1
```

```
arr[j + 1] = last

def sort(arr):
    insertion_sort_recursive(arr, len(arr))
    return arr

#test
arr = [5, 2, 9, 1, 5, 6]
sorted_arr = sort(arr)
print(sorted_arr)
```

## ii. Bubble sort

### Iterative:

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

# Test
print(bubble_sort([64, 34, 25, 12, 22, 11, 90]))
```

### Recursive:

```
def bubble_sort_recursive(arr, n):
    if n == 1:
```

```

        return
    for i in range(n-1):
        if arr[i] > arr[i+1]:
            arr[i], arr[i+1] = arr[i+1], arr[i]
    bubble_sort_recursive(arr, n-1)

def bubble_sort(arr):
    bubble_sort_recursive(arr, len(arr))
    return arr

# Test
print(bubble_sort([64, 34, 25, 12, 22, 11, 90]))

```

### iii. Selection sort

#### Iterative:

```

def selection_sort(arr):
    n = len(arr)
    for i in range(n):
        min_idx = i
        for j in range(i+1, n):
            if arr[j] < arr[min_idx]:
                min_idx = j
        arr[i], arr[min_idx] = arr[min_idx], arr[i]
    return arr

# Test
print(selection_sort([64, 34, 25, 12, 22, 11, 90]))

```

#### Recursive:

```

def selection_sort_recursive(arr, n, index=0):
    if index == n:

```

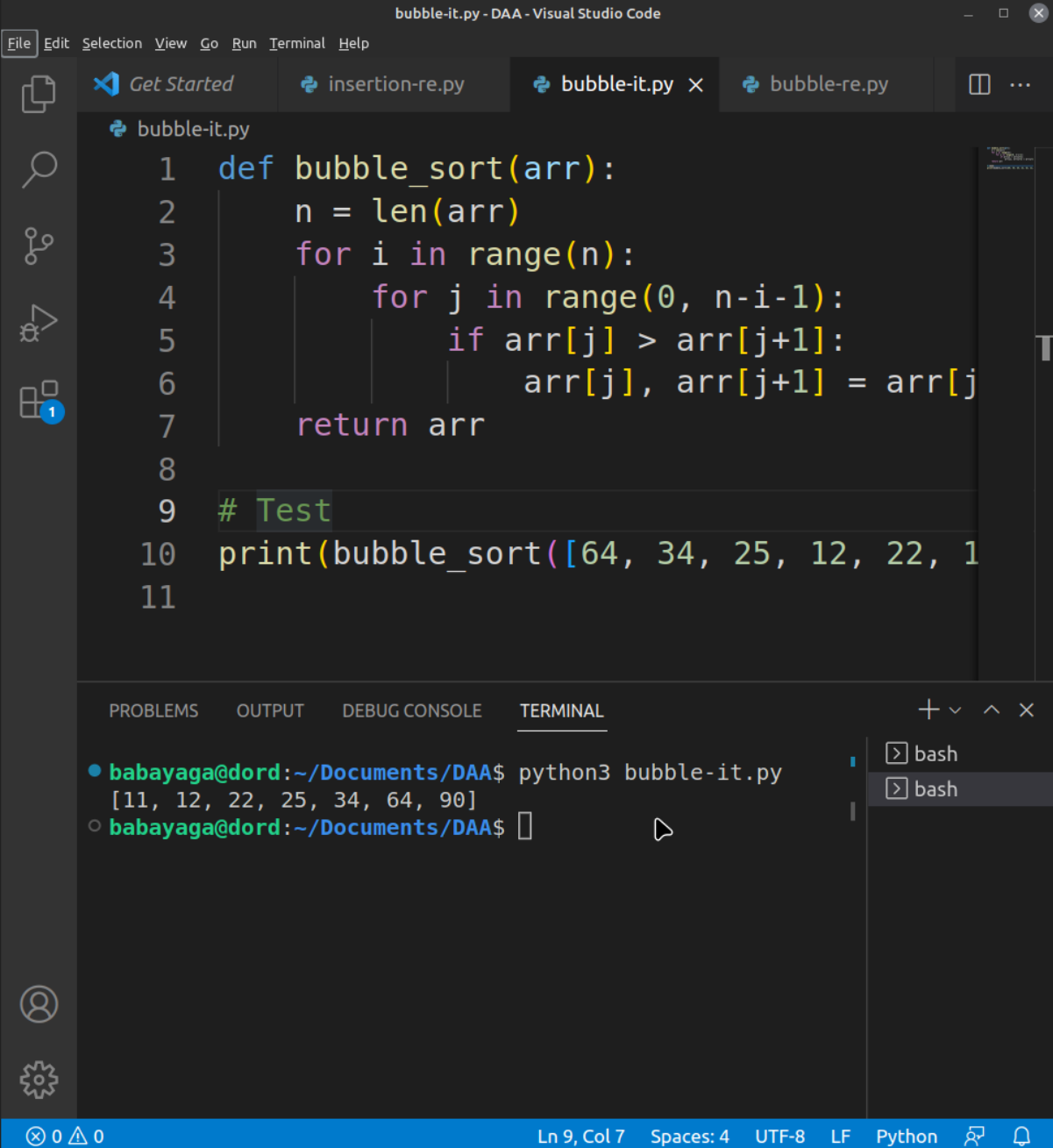
```
        return
    min_idx = index
    for i in range(index+1, n):
        if arr[i] < arr[min_idx]:
            min_idx = i
    arr[index], arr[min_idx] = arr[min_idx],
arr[index]
    selection_sort_recursive(arr, n, index+1)

def selection_sort(arr):
    selection_sort_recursive(arr, len(arr))
    return arr

# Test
print(selection_sort([64, 34, 25, 12, 22, 11, 90]))
```

2. Implement any one algorithm from above in both iterative and recursive form.

Iterative:ii. Bubble sort



The screenshot shows the Visual Studio Code editor with a file named `bubble-it.py` open. The code implements the iterative Bubble Sort algorithm. The editor interface includes a sidebar on the left with icons for Explorer, Search, Source Control, Run and Debug, and Extensions. The top menu bar shows File, Edit, Selection, View, Go, Run, Terminal, and Help. The bottom status bar indicates the current position (Ln 9, Col 7), spacing (Spaces: 4), encoding (UTF-8), line ending (LF), and the active language (Python).

```
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]
7     return arr
8
9 # Test
10 print(bubble_sort([64, 34, 25, 12, 22, 11, 90]))
11
```

The terminal at the bottom shows the execution of the script:

```
babayaga@dord:~/Documents/DAA$ python3 bubble-it.py
[11, 12, 22, 25, 34, 64, 90]
babayaga@dord:~/Documents/DAA$
```

## Recursive:ii. Bubble sort

```
File Edit Selection View Go Run Terminal Help
bubble-re.py - DAA - Visual Studio Code
Get Started insertion-re.py bubble-it.py bubble-re.py x
bubble-re.py
1 def bubble_sort_recursive(arr, n):
2     if n == 1:
3         return
4     for i in range(n-1):
5         if arr[i] > arr[i+1]:
6             arr[i], arr[i+1] = arr[i+1],
7             bubble_sort_recursive(arr, n-1)
8
9 def bubble_sort(arr):
10     bubble_sort_recursive(arr, len(arr))
11     return arr
12
13 # Test
```

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL

- babayaga@dord:~/Documents/DAA\$ python3 bubble-it.py  
[11, 12, 22, 25, 34, 64, 90]
- babayaga@dord:~/Documents/DAA\$ python3 bubble-re.py  
[11, 12, 22, 25, 34, 64, 90]
- babayaga@dord:~/Documents/DAA\$

bash  
bash

Ln 8, Col 1 Spaces: 4 UTF-8 LF Python