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:
```

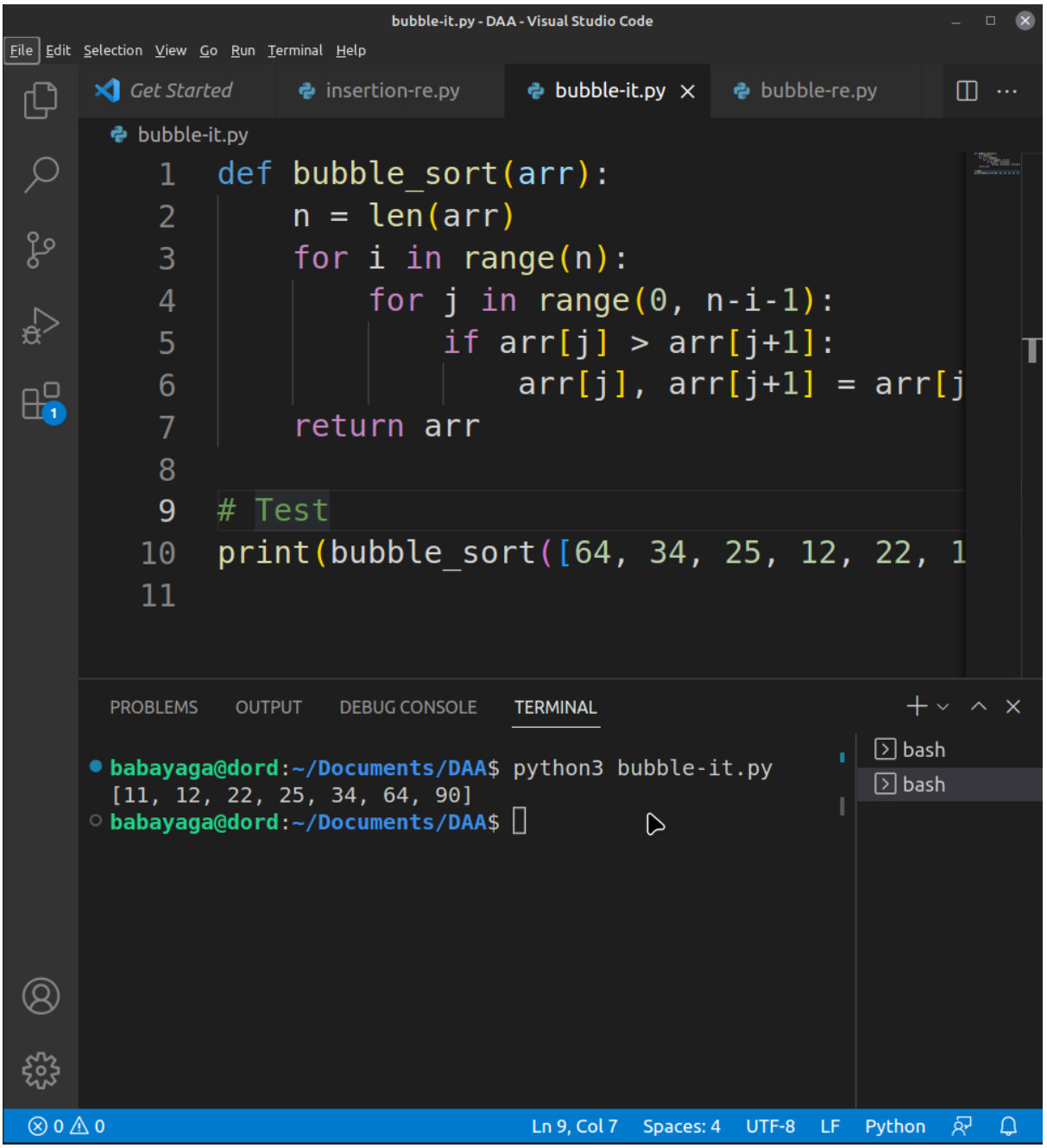
```
        return
    min_idx = index
    for i in range(index+1, n):
        if arr[i] < arr[min_idx]:
            min_idx = i
    arr[index], arr[min_idx] = arr[min_idx],
arr[index]
    selection_sort_recursive(arr, n, index+1)

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



Recursive:ii. Bubble sort