

ASSIGNMENT

Objective: Implementation and Analysis of Heap sort using python

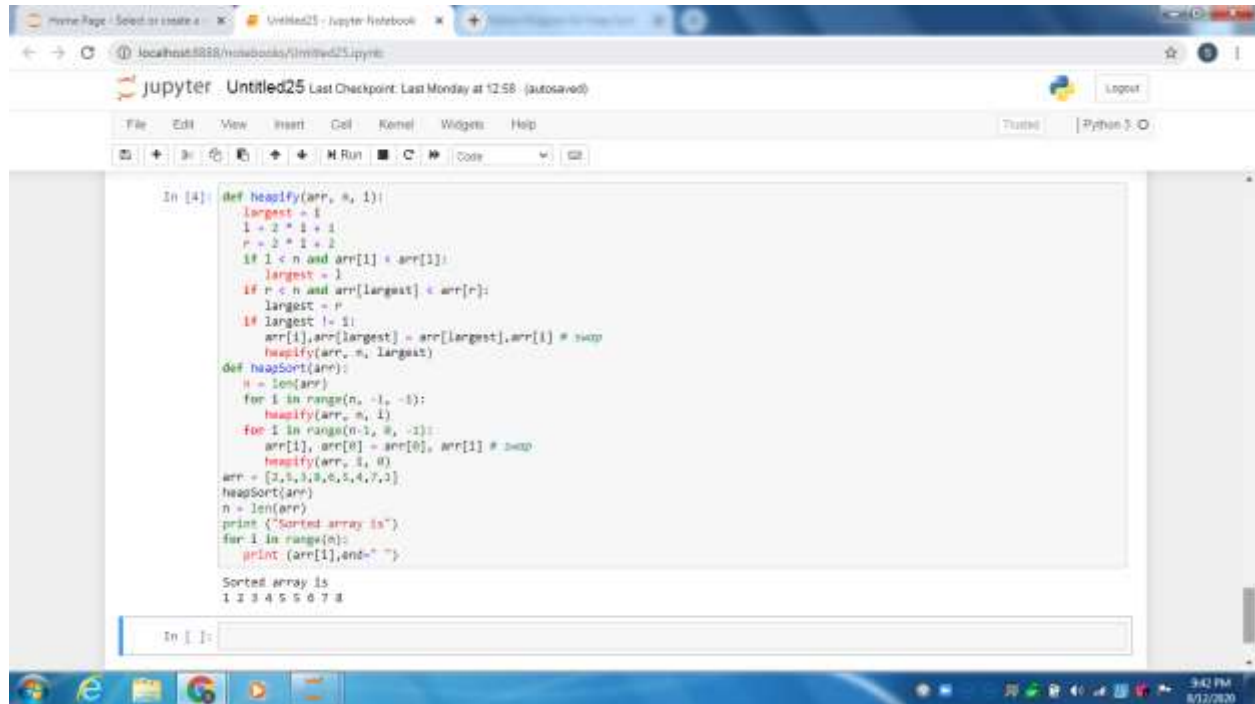
Code:

```
def heapify(arr, n, i):  
    largest = i  
  
    l = 2 * i + 1  
  
    r = 2 * i + 2  
  
    if l < n and arr[i] < arr[l]:  
        largest = l  
  
    if r < n and arr[largest] < arr[r]:  
        largest = r  
  
    if largest != i:  
        arr[i], arr[largest] = arr[largest], arr[i] # swap  
  
        heapify(arr, n, largest)  
  
def heapSort(arr):  
    n = len(arr)  
  
    for i in range(n, -1, -1):  
        heapify(arr, n, i)  
  
    for i in range(n-1, 0, -1):  
        arr[i], arr[0] = arr[0], arr[i] # swap  
  
        heapify(arr, i, 0)  
  
arr = [2,5,3,8,6,5,4,7,1]  
  
heapSort(arr)  
  
n = len(arr)
```

```
print ("Sorted array is")
```

```
for i in range(n):
```

```
    print (arr[i],end=" ")
```



The screenshot shows a Jupyter Notebook window titled "Untitled25" with a Python 3 kernel. The code in the notebook implements the heap sort algorithm. It defines a `heapify` function that maintains the heap property by swapping the root with the largest child and then recursively heapifying the affected subtree. The `heapSort` function uses `heapify` to sort the array in descending order. The array `arr` is initialized with the values `[2, 1, 3, 8, 6, 5, 4, 7, 3]`. The output of the code is "Sorted array is" followed by the sorted array elements "1 2 3 4 5 6 7 8" on the same line.

```
In [4]: def heapify(arr, n, i):  
        largest = i  
        l = 2 * i + 1  
        r = 2 * i + 2  
        if l < n and arr[l] > arr[i]:  
            largest = l  
        if r < n and arr[r] > arr[l]:  
            largest = r  
        if largest != i:  
            arr[i], arr[largest] = arr[largest], arr[i] # swap  
            heapify(arr, n, largest)  
    def heapSort(arr):  
        n = len(arr)  
        for i in range(n // 2 - 1, -1, -1):  
            heapify(arr, n, i)  
        for i in range(n - 1, 0, -1):  
            arr[i], arr[0] = arr[0], arr[i] # swap  
            heapify(arr, i, 0)  
    arr = [2, 1, 3, 8, 6, 5, 4, 7, 3]  
    heapSort(arr)  
    n = len(arr)  
    print ("Sorted array is")  
    for i in range(n):  
        print (arr[i],end=" ")  
  
Sorted array is  
1 2 3 4 5 6 7 8
```