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Assignment 5

Class : SE IV ROLL NO : 21430
Batch - F4 DOS : 22/03/2020

Problem statement:
Write a python program to store second year percentage of students in array. Write function for sorting array of floating point members in ascending order using a) Insertion sort b) Shell sort. c) Display top five scores.

Objective:-
To learn and implement sorting algorithm of shell sort and inseration sort.

Outcome:
Learnt to implement insertion sort and shell sort to sort given floating numbers in ascending order using lists, loops and decision statement

S/W requirement:
Python IDE (pychairm), Python

H/W requirement:
Laptop or PC

Theory:-
i) Insertion Sort:
Insertion sort is sorting mechanism where the sorted array is built having one item at a time. The elements are compared with each

Other sequentially & then arranged simultaneously in some particular order. As it works by inserting an element at a particular position, it is known as insertion sort.

ii) Insertion sort:

ii) Shell Sort:
The shell sort is an improvement in insertion sort which works by breaking the original list into number of small sublists after which each one is sorted using an insertion sort.

Insted of breaking list into sublist of contiguous elements, it uses an increment 'i' which is called as gap to create a sublist by choosing all items that are i elements apart.

Psuedocode & Algorithm:

i. Insertion Sort:

```
Insertion_sort()
    for i = 1 to n
        key = self.percentage[i]
        j = i - 1
        while j >= 0 and p[j] > key :
            percentage[j+1] = percentage[j]
            j = j - 1
```

END of while

END of for

11) Psuedocode for shell sort

```
Shell-sort()
    n = len(self,percentages)
    gap = n//2

    for i in range(gap,0):
        for j in range(gap,n):
            for k in range(j-gap,-1):
                if(p[k+gap] > p[k]):
                    break
                else
                    swap(p[k+gap],p[k])
                i = i-gap
        j = j+1
    gap = gap//2
END
```

* Algorithm for main function:

1. Start
2. Create object of class student
3. Display Menu to users
4. Input choice from user
5. If choice==1:
   Input data from user.

elif choice == 2
    sort data using insertion sort
elif choic == 3
    sort data using shell sort
elif choice == 4
    END while loop
else
    print ("Invalid input")

6. END

* Complexity :

i) Insertion sort :
Best case complexity = O(n)
Worst / average case complexity = $O(n^2)$
space complexity : O(1)

ii) Shell sort :
Best case complexity = O(n)
Worst case complexity = O(nlog n)
space complexity : O(1)

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* Test cases:

	Description	Input	Expected O/P	Actual O/P	Result
1.	Enter Data	n = 3 [72.3, 76.0, 90.4]	-	-	-
2.	Insertion sort	n = 3 [72.3, 76.0, 90.4]	[72.3, 76.0 90.4]	[72.3, 76.0 90.4]	Pass
3.	Shell Sort	n = 3 [90.4, 72.3 76.0]	[72.3, 76.0, 90.4]	[72.3, 76.0 90.4]	Pass

Conclusion:
Students learnt the concept of insertion and shell sort and how to implement them.

```python
def insortt(p ):
    n=len(p)
    for i in range(1,n):
        temp=p[i]
        j = i - 1
        while j >= 0 and temp < p[j]:
            p[j + 1] = p[j]
            j -= 1
        p[j + 1] = temp
    print("List is sorted by Insertion sort ",p)
def shell_sort(p):
    n = len(p)
    gap = n // 2
    while gap > 0:
        for i in range(gap, n):
            temp = p[i]
            j = i
            while j >= gap and arr[j - gap] > temp:
                p[j] = p[j - gap]
                j -= gap
            p[j] = temp
        gap =gap// 2
    print("List is sorted by Shell sort ", p)
```

Analyzing...

shell_sort() › while gap > 0

```python
def top_five(p):
    i=-1
    print('\nTop five percentage : ')
    while(i>-6):
        print(p[i])
        i=i-1
arr =[]
n=int(input("How many elments do you want "))
for i in range (0,n):
    m=int(input("enter elemnt "))
    arr.append(m)
for i in range (0,n):
    print(arr[i]," ")
while(True):
    print("Enter Your Choice")
    print("1. Insertion Sort")
    print("2. Shell Sort")
    print("3.Top 5 Score")
    print("0. Exit")
    ch = int(input("Enter your choice : "))
    if(ch==1):
        insortt(arr)
    elif(ch==2):
```

```
    m=int(input("enter elemnt "))
    arr.append(m)
for i in range (0,n):
    print(arr[i]," ")
while(True):
    print("Enter Your Choice")
    print("1. Insertion Sort")
    print("2. Shell Sort")
    print("3.Top 5 Score")
    print("0. Exit")
    ch = int(input("Enter your choice : "))
    if(ch==1):
        insortt(arr)
    elif(ch==2):
        shell_sort(arr)
    elif(ch==3):
        top_five(arr)
    elif(ch==0):
        print('Thank You!')
        break
    else:
        print('Enter valid input')
```

```
How many elments do you want >? 5
enter elemnt >? 14
enter elemnt >? 74
enter elemnt >? 65
enter elemnt >? 20
enter elemnt >? 99
14
74
65
20
99
Enter Your Choice
1. Insertion Sort
2. Shell Sort
3.Top 5 Score
0. Exit
Enter your choice : >? 1
List is sorted by Insertion sort  [14, 20, 65, 74, 99]
Enter Your Choice
1. Insertion Sort
2. Shell Sort
>?
```

Python Console × main × FDS ASSIGNMENT3 × FDS ASSIGNMENT3 (1) ×

```
3.Top 5 Score
0. Exit
Enter your choice : >? 2
List is sorted by Shell sort  [14, 20, 65, 74, 99]
Enter Your Choice
1. Insertion Sort
2. Shell Sort
3.Top 5 Score
0. Exit
Enter your choice : >? 3

Top five percentage :
99
74
65
20
14
Enter Your Choice
1. Insertion Sort
2. Shell Sort
3.Top 5 Score
>?
```

Python Console × main × FDS ASSIGNMENT3 × FDS ASSIGNMENT3 (1) ×

```
Enter Your Choice
1. Insertion Sort
2. Shell Sort
3.Top 5 Score
0. Exit
Enter your choice : >? 3

Top five percentage :
99
74
65
20
14
Enter Your Choice
1. Insertion Sort
2. Shell Sort
3.Top 5 Score
0. Exit
Enter your choice : >? 0
Thank You!

>>>
```