

Assignment - 6.

Class - SEI (FI)

Sub - DSL.

Roll No. 21123.

Title: quick sort

Problem Statement: Write a python program to store first year percentage of student in an array. Write function for sorting array of floating point numbers in ascending order using quick sort and display top 5 score.

Objectives:

- 1) To understand the concept of sorting and its application.
- 2) To implement quick sort and display the top five per.

Outcomes.

- 1) To implement quick sort algorithm after reading the scores of students and then display the top 5 score.
- 2) To make the program objected with user defined functions.
- 3) To write a menu driven, modular program in python.

Hardware Requirement.

operating system - 64bit, windows 10, intel core i5 9th Generation.

Software Requirements.

Python 3.8, Pycharm IDE

#1 Theory: Sorting algorithm put element of a list in a certain orders.

Most frequently used ordered are numerical and lexicographical orders.

Sorting is useful for canonicalizing data and produce human readable output.

Efficient sorting algorithm are important for optimizing efficiency of search algorithm.

Quicksort is the fastest internal sorting algorithm. The basic algorithm to sort array `arr[]` of n element can be described recursively as.

- 1) If $n \leq 1$ return
- 2) Pick an element as pivot and arrange all larger to right and smaller to left.
- 3) Then call for left and right partitions as pivot is now at correct position.

#1 Algorithm.

Algorithm for Input Array.

1. Start.
2. `list1 = []`
3. Read the total number of student in SE if total number is less than five then write total number must be greater than five
4. if total number is greater than five then read the % of each student
if percentage is less than zero or greater than 100 write invalid percentage
else read the percentage of each student.
5. Append all the percentage in `list1`.
6. Write `list1`.

Algorithm for keeping the pivot element at correct position.

1. Start
2. Create the fn of name pivot element with argument (list, first, last)
3. Set first element of list as pivot element and set the two variable as left and right. left as first+1 and right as last
4. While (left < right) and (list[left] <= pivot) increment left
5. While (left < right) and (list[right] >= pivot) decrement right.
6. If (right > left) then swap the first
7. Else swap the list[left], list[right] = list[right], list[left]
8. If (left > right) break
9. Stop.

Algorithm for Dividing the list.

1. Start.
2. Create the fn with name quick sort with argument (list, first, last)
3. Divide the list in two parts from list element to pivot element and pivot to last element
4. Initialize n = pivot (list, first, last)
5. Set quick sort (list, first, n-1)
6. And quick-sort (list, n+1, last).

Pseudocode

1. list1 = []
2. Read total NO. of student.
3. Total NO. must be greater than 5 if less then break.
4. Read the % of each student if % is greater than 100 or less than 0 Write 'invalid %'.
else Read % of each student.
5. Append each % in list1 and write list1.

2. Pseudocode for keeping the pivot element at correct position.

1. set $\text{pivot} = \text{list1}[\text{first}]$

2. And others two variables $\text{left} = \text{first} + 1$ & $\text{right} = \text{last}$

3. while (True):

while ($\text{left} \leq \text{right}$ & $\text{list1}[\text{left}] \leq \text{pivot}$):

increment left.

while ($\text{left} \leq \text{right}$ & $\text{list1}[\text{right}] \geq \text{pivot}$)

right = right - 1.

if ($\text{left} > \text{right}$)

break

else.

Swap $\text{list1}[\text{left}], \text{list1}[\text{right}] = \text{list1}[\text{right}], \text{list1}[\text{left}]$

$\text{list1}[\text{first}], \text{list1}[\text{right}] = \text{list1}[\text{right}], \text{list1}[\text{first}]$

3. Pseudocode for Dividing the list.

1. if ($\text{first} < \text{last}$)

$n = \text{pivot_element}(\text{list1}, \text{first}, \text{last})$

$\text{quick_sort}(\text{list1}, \text{first}, n-1)$

$\text{quick_sort}(\text{list1}, n+1, \text{last})$.

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list1=[] #Empty list
num=int(input("Enter Total Number of Student in Second Year - "))
if(num<5):
    print("Entered Number should be greater than five! Empty list will
considered !\n          RUN AGAIN          ")
else:
    print("Enter the Percentage of all student one by one - ")
    print("-----")
    while(num>0):
        x=float(input("Enter Percentage:"))
        if(x>100 or x<0):
            print("Percentage Range can to 0 to 100 !")
            continue
        else:
            list1.append(x)
            num=num-1
    print("-----")
    print(list1)
    #1.to get the correct position of pivot element
    #Quick Sort - Its an divide and conquer method
    #Three steps need to be follow - 1.left <= right 2.list1[left] <= pivot
    3.list1[right] >= pivot

    def pivot_element(list1,first,last): #first(zero^th index) , last=last
    element of list
        pivot=list1[first] #first element as pivot elelemnt
        left=first+1 #left is variable element which is 1st index of
list/array
        right=last
        while(True):
            while (left <= right and list1[left] <= pivot):
                left = left + 1
            while (left <= right and list1[right] >= pivot):
                right = right - 1
            if (left > right):
                break
            else:
                list1[left],list1[right] = list1[right],list1[left]
        print(list1)
        list1[first],list1[right] = list1[right] ,list1[first] # list1[first]
is nothing but the pivot elelemnt
        return right
    # 2.Dividing the list after the pivot element is at right element.
    def quick_sort(list1,first,last):
        if(first<last):
            n = pivot_element(list1, first, last) #index of pivot element
            #Dividing of list!
            quick_sort(list1,first,n - 1)
            quick_sort(list1,n + 1,last)
    while(True):
        print("-----")
        print("MAIN MENU\n1.QUICK SORT\n2.EXIT")
        print("-----")
        choice=int(input("Enter the Choice - "))
        print("\n")
        if(choice==1):
            i=0

```

```

        j=len(list1)
        quick_sort(list1,i,j-1)
        print("*** FINAL SORTED LIST ***")
        print(list1)
        print("-----")
        print("TOP 5 Student Percentage - ")
        print(list1[-1])
        print(list1[-2])
        print(list1[-3])
        print(list1[-4])
        print(list1[-5])
    else:
        break
    print("THANK YOU!")
    stop = input("Would you like to continue(y/n):")
    if(stop=='n'):
        print("THANK YOU!")
        break

```

OUTPUT :

Enter Total Number of Student in Second Year - 6

Enter the Percentage of all student one by one -

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Enter Percentage:121

Percentage Range can to 0 to 100 !

Enter Percentage:-20

Percentage Range can to 0 to 100 !

Enter Percentage:20

Enter Percentage:41

Enter Percentage:63

Enter Percentage:74

Enter Percentage:96

Enter Percentage:12

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[20.0, 41.0, 63.0, 74.0, 96.0, 12.0]

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MAIN MENU

1.QUICK SORT

2.EXIT

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Enter the Choice - 1

[20.0, 12.0, 63.0, 74.0, 96.0, 41.0]

[12.0, 20.0, 63.0, 41.0, 96.0, 74.0]

[12.0, 20.0, 41.0, 63.0, 96.0, 74.0]

** FINAL SORTED LIST **

[12.0, 20.0, 41.0, 63.0, 74.0, 96.0]

TOP 5 Student Percentage -

96.0

74.0

63.0

41.0

20.0
