

Quick Sort

Problem Statement :-

Write a python program to store first year percentage of students in array. Write function for sorting array of floating numbers using quick sort & display top 5 scores.

Objective:- To

Implement quick sort function to sort array of floats.

Outcomes: Student will be able to write & execute a python program to perform quick sort.

S/W & H/W requirements:-

VS code, Python 3, Windows 10, 8 GB RAM, 512 GB SSD.

Theory: Sorting algorithms put elements of a list in a certain order.

Most frequently used orders are numerical & lexicographical. Efficient sorting algorithms are important for optimizing efficiency of search algorithms.

Quick sort is the fastest internal sorting algorithm. The basic algorithm is to sort the array $a[0:n]$ of n elements, can be described recursively as:-

- 1) If $n \leq 1$, return .
- 2) Pick an element as pivot & arrange all larger to right & smaller to left of the element.

Algorithm for partition (start, end, arr, currArr)

1. Select last element as pivot.
 2. set pivot index = start.
 3. Iterate from start to end.
-
1. If element is less than or equal to pivot, swap the elements with index pivot index & pivotindex+1.
 4. Swap last element with pivot index.
 5. If currArr is true, print array after loop.
 6. Return pivotindex.

Algorithm for Quick sort.

1. If start > end:
 - a) $p = \text{partition}(\text{start}, \text{end}, \text{arr}, \text{currArr})$
 - b) $\text{quicksort}(\text{start}, p-1, \text{arr}, \text{currArr})$
 - c) $\text{quicksort}(p+1, \text{end}, \text{arr}, \text{currArr})$

Algorithm for TS (arr)

1. Initialize n to size of arr.
2. Sort the arr using quick sort.
3. Run loop from 1 to n.
 - i) print ($\text{arr}[n-i]$)

Algorithm for Main Menu:

1. Declare arr as empty list & origArr = arr.
2. Run while loop until break is called.
3. Print (Main Menu)
4. Input ch;
5. If choice is '1' (Enter a new list)
 1. Input tempArr as a new list
 2. Assign arr = tempArr origArr = tempArr
6. If ch = '2' Top (5)
 1. Call Top 5 (arr)
7. Elif ch = '3' (Quick Sort)
 1. call quickSort (0, len(arr) - 1, arr, True)
 2. Assign arr = list (origArr).
8. Else :
print ("Enter valid choice").