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CSA0669

Analytical Assignment-5

(1) To Implement the median of median algorithm Ensure that you handle the worst-case time complexity Efficiency while finding the kth smallest Element in an insorted array.

(A) (i) arr = [12, 3, 5, 7, 19]. k=2

Given that,

arr = [12,3,5,7,19]. k=2

Arrange the array in asending order = $[\overset{0}{3}, \overset{1}{5}, \overset{2}{7}, \overset{3}{17}, \overset{4}{19}]$

Median = $\frac{low+high}{2} = \frac{0+4}{2} = 2$

Median = 7

As given k=2, the value of (k=2) = 5

(ii) arr = [12,3,5,7,4,19,26] k=3

Given that,

arr = [12,3,5,7,4,19,26], k=3

Arrange the array in ascending order = $[\overset{0}{3}, \overset{1}{4}, \overset{2}{5}, \overset{3}{7}, \overset{4}{12}, \overset{5}{19}, \overset{6}{26}]$

Median = $\frac{low+h}{2} = \frac{0+6}{2} = 3$

Median = 7

As given, k=2

The value of (k=3)
= 5

(iii) arr = [1,2,3,4,5,6,7,8,9,10] k=6

Given that,

arr = [1,2,3,4,5,6,7,8,9,10] k=6

Arrange the older in assending order, its already arranged

$\Rightarrow [\overset{0}{1}, \overset{1}{2}, \overset{2}{3}, \overset{3}{4}, \overset{4}{5}, \overset{5}{6}, \overset{6}{7}, \overset{7}{8}, \overset{8}{9}, \overset{9}{10}]$

$M = \frac{L+h}{2} = \frac{0+9}{2} = 4.5 \simeq 5$

Median = 6

As given k=6, The value of (k=6) = 6

(2) To Implement a function Median of Median (arr, k) that take an unsorted array are and an integer k and returns the k^th Smallest Element in the array.

(i) array = [1,2,3,4,5,6,7,8,9,10] k=6

Given that,

arr = [1,2,3,4,5,6,7,8,9,10) k=6

Arrange it in asending order, bot it is already

arranged = $[\overset{0}{1}, \overset{1}{2}, \overset{2}{3}, \overset{3}{4}, \overset{4}{5}, \overset{5}{6}, \overset{6}{7}, \overset{7}{8}, \overset{8}{9}, \overset{9}{10}]$

$M = \frac{L+h}{2} = 4.5 \simeq 5$

M = 6.

As given k=6, the value of (k=6) = 6

(ii) arr = [23, 17, 31, 44, 55, 21, 20, 18, 19, 27) k=5

Given that,

arr = $[\overset{0}{23}, \overset{1}{17}, \overset{2}{31}, \overset{3}{44}, \overset{4}{55}, \overset{5}{21}, \overset{6}{20}, \overset{7}{18}, \overset{8}{19}, \overset{9}{27}]$

$\text{Median} = \frac{L+h}{2} = \frac{0+9}{2} = 4.5 \simeq 5$

$4.5 \simeq 4$

As given k=5, the value of (k=5) = 21.

closest Pair of Points

1. Given an array of points where point [i] = $[x_i, y_i]$ represents a point on the x-y plane & an integer k return the k-closest pair to the origin (0,0)

(i) Points = [[1,3], [-3,2), [5, 8], [0,1].] k=2

Given that

Points = [[1,3], [-3,2], [5,8], [0,1]]

Distance = $x^2 + y^2$

$(1,3) = 1^2 + 3^2 = 10$

$(-3,2) = (-3)^2 + 2^2$

$= 8$

```
            for d in D:
                complement=-(c+d)
              if complement in AB_sum_counts:
                count+=AB_sum_counts(complement)
        return count
  A=[0]
  B=[0]
  C=[0]
  D=[0]
Print (four_sum_count (A,B,C,D))
```

[5,8] = 5^2+8^2 = 25+64 = 89

[0,1] = 0^2+1^2 = 1

Distance = [10,8,89,1]

Arrange the points in that order close to the origin by ~~as~~ considering distances

$\Rightarrow$ [[0,1], [-3,2], [1,3], [5,8]]

As the value k=2,

Consider first 2 points, so the closet pair

$\Rightarrow$ [[0,1], [-2,2]

(ii) Points = [[1,3], [-3,2]] k=1

Given that,

Points = [[1,3], [-3,2]]

Distance = x^2+y^2

[1,3] = 1^2+3^2 = 10

[-3,2] = $(-2)^2+2^2$ = 4+4 = 8

Distance = [10,8]

Arrange the points in such a order that are close to the origin by considering distance = [[-2,2], [1,3]]

As the value, k=1

Consider first point, so the closet pair = [-2,2].

(iii) Points = [[3,3], [5,-1], [-2,4]] k=2

Given that,

Points = [[3,3], [5,-1], [-2,4]]

Distance = x^2+y^2

[3,3] = 3^2+3^2 = 9+9 = 18

[5,-1] = $5^2+(-1)^2$ = 25+1 = 26

[-2,4] = $(-2)^2+(4)^2$ = 4+16 = 20

Distance = [18, 26, 20]

Arrangement of points should be done in such a way that ax close to origin cosidering dis. As the value k=2, Take two points. into Consideration [3,3], [-2,4]

(4) Given four Lists A,B,C,D of integer values. write a Program to compute how many tuples (i,j,k,l), are Such that A[i]+B[j]+C[k]+D[l] is zero.

(i) A=[1,2], B=[-2,-1], C=[-1,2], D=[0,2]

```
from collection import defaultdict
 def forliste (A,B,C,D):
      AB-for lists = defaultdict (int)
     for a in A:
         for b in B:
       AB sum counts [a+b]+=1
   count=0
     for c in C:
         for d in D:
             complement =-(c+d)
          if complement ~~ABc+d~~ in AB sum-count:
             Count + = AB-sum_counts (complement)
     return count
A =(1,2]
B = [-2,-1]
C = [-1,2]
D= [0,2]
Print (four_sum, count (A,B,C,D))
```

(ii) A=[0], B=[0], C=[0], D=[0]

```
from collections import default dict
 def four-sum-count (A,B,C,D):
     AB-sum_counts = default dict (int)
    for a in A:
        for b in B:
            AB-sum-counts [a+b] + =1
        Count =0
         for c in c:
```