

In [43]: `import math`

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In [44]: # K mediod
def diff(a,m):
    s=0
    for i in range(len(a)):
        s+=abs(a[i]-m[i]) # changed from pow( ,2) to abs( )
    # print(s)
    return round(s,4)

x=[1,2,20,25,22,33,100]
y=[1,2,30,40,30,42,200]

arr=[]
for i in range(len(x)):
    arr.append([ x[i],y[i] ])
cost =99999999

costf=cost
c1f=[]
c2f=[]
af = 0
bf = 0
k=0
for a in arr:
    for b in arr:
        if a != b:
            c1=[]
            c2=[]
            # print("x \t y \t dis1 \t dis2")
            cost=0
            for i in range(len(arr)):
                # print(arr[i][0], "\t", arr[i][1] , "\t", diff(arr[i],a) , "\t"
                if diff(arr[i],a) < diff(arr[i] , b):
                    c1.append(arr[i])
                    cost+=diff(arr[i],a)
                else:
                    c2.append(arr[i])
                    cost+=diff(arr[i],b)
            cost=round(cost,4)
            # print("cost = ", cost)
            # print("cluster1 ",c1)
            # print("cluster2 " ,c2)
            k+=1
            if costf>cost:
                c1f = c1
                c2f = c2
                af=a
                bf=b
                costf=cost

a=af
b=bf
c1=[]
c2=[]
print("x \t y \t dis1 \t dis2")
cost=0
for i in range(len(arr)):
    print(arr[i][0], "\t", arr[i][1] , "\t", diff(arr[i],a) , "\t", diff(arr[i]
    if diff(arr[i],a) < diff(arr[i] , b):
        c1.append(arr[i])
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        cost+=diff(arr[i],a)
    else:
        c2.append(arr[i])
        cost+=diff(arr[i],b)
print("m1: ",a)
print("m2:",b)
print("cost = ", cost)
print("cluster1 ",c1)
print("cluster2 " ,c2,end="\n\n\n\n")

a=arr[0]
b=arr[len(arr)-1]
c1=[]
c2=[]
print("x \t y \t dis1 \t dis2")
cost=0
for i in range(len(arr)):
    print(arr[i][0], "\t" , arr[i][1] , "\t" , diff(arr[i],a) , "\t" , diff(arr[i]
    if diff(arr[i],a) < diff(arr[i] , b):
        c1.append(arr[i])
        cost+=diff(arr[i],a)
    else:
        c2.append(arr[i])
        cost+=diff(arr[i],b)
print("m1: ",a)
print("m2:",b)
print("cost = ", cost)
print("cluster1 ",c1)
print("cluster2 " ,c2)

```

x	y	dis1	dis2
1	1	48	298
2	2	46	296
20	30	0	250
25	40	15	235
22	30	2	248
33	42	25	225
100	200	250	0

m1: [20, 30]
m2: [100, 200]
cost = 136
cluster1 [[1, 1], [2, 2], [20, 30], [25, 40], [22, 30], [33, 42]]
cluster2 [[100, 200]]

x	y	dis1	dis2
1	1	0	298
2	2	2	296
20	30	48	250
25	40	63	235
22	30	50	248
33	42	73	225
100	200	298	0

m1: [1, 1]
m2: [100, 200]
cost = 236
cluster1 [[1, 1], [2, 2], [20, 30], [25, 40], [22, 30], [33, 42]]
cluster2 [[100, 200]]

In [45]: `# K means`

In [46]: `import math
x=[1,2,20,25,22,33,100]
y=[1,2,30,40,30,42,200]`

```

arr=[]
for i in range(len(x)):
    arr.append([ x[i],y[i] ])
# print(arr)
b=[ round(sum(x[0:round(len(x)/2)])/len(x[0:round(len(x)/2)]),4),round(sum(y[0:round
c=[ round(sum(x[0:round(len(x)/2)])/len(x[round(len(x)/2):len(x)-1]),4) ,round(sum(y
print("M1 = ",b)
print("M2 = ",c)
def diff(a,m):
    s=0
    for i in range(len(a)):
        s+=pow(a[i]-m[i],2)
    # print(s)
    return round(math.sqrt(s),4)
def avg(a,k=1):
    av=[]
    for j in range(len(a[0])):
        sum=0
        for i in range(len(a)):
            sum+=a[i][j]
        sum/=len(a)
        av.append(round(sum,4))
    print("M"+str(k),"=",av)
    return av

def km(b,c):
    arr1=[]
    arr2=[]
    print("x \t y \t M1 \t\t M2")
    for i in arr:
        print( i[0],"\t",i[1], "\t", diff(i,b), " \t" ,diff(i,c) )
        if diff(i,b) < diff(i,c) :
            arr1.append(i)
        else :
            arr2.append(i)
    print("cluster 1 = ",arr1)
    print("cluster 2 = ",arr2,end="\n\n\n")
    if len(arr1)>0:
        b=avg(arr1)
    if len(arr2)>0:
        c=avg(arr2,2)
    arr1o=[]
    arr2o=[]
    while arr1o != arr1:
        arr1o=arr1
        arr2o=arr2
        arr1=[]
        arr2=[]
        print("x \t y \t M1 \t\t M2")
        for i in arr1o+arr2o:
            print( i[0],"\t",i[1], "\t", diff(i,b), " \t" ,diff(i,c) )
            if diff(i,b) < diff(i,c) :
                arr1.append(i)
            else :
                arr2.append(i)
        print("cluster 1 = ",arr1)
        print("cluster 2 = ",arr2, end="\n\n\n")
        if len(arr1)>0:
            b=avg(arr1)
        if len(arr2)>0:
            c=avg(arr2)

km(b,c)

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```
M1 = [12.0, 18.25]
M2 = [24.0, 272]
x      y      M1      M2
1      1      20.4588  271.9743
2      2      19.0804  270.8948
20     30     14.2149  242.0331
25     40     25.339   232.0022
22     30     15.4293  242.0083
33     42     31.7027  230.176
100    200    201.9333  104.69
cluster 1 = [[1, 1], [2, 2], [20, 30], [25, 40], [22, 30], [33, 42]]
cluster 2 = [[100, 200]]
```

```
M1 = [17.1667, 24.1667]
M2 = [100.0, 200.0]
x      y      M1      M2
1      1      28.2499  222.2656
2      2      26.8587  220.9253
20     30     6.485   187.8829
25     40     17.665  176.706
22     30     7.5755  187.0401
33     42     23.8479  171.6188
100    200    194.3674  0.0
cluster 1 = [[1, 1], [2, 2], [20, 30], [25, 40], [22, 30], [33, 42]]
cluster 2 = [[100, 200]]
```

```
M1 = [17.1667, 24.1667]
M1 = [100.0, 200.0]
```

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