

# They-Means and They-Nearest Neighbors

## Introduction:

They-Means/They-Nearest Neighbors uses a class "Classifier" which has many attributes and methods. The object is initialized with the input **points** (which can be a list, array, or integer), number of clusterheads or nearest neighbors **k**, error tolerance **tolerance**, and verbosity mode **verboseMode**. There is an optional input for min and max values **minmax**, which should be used if **points** is an integer. If **points** is an integer, the class will use method **\_getpoints** to create a set of points between the minimum and maximum values normally distributed about **k** centers with a variance of 1/16 the distance between the minimum and maximum values. Otherwise, it will use the data given to operate either K-means or K-nearest neighbors. General methods are a distance method **\_distance**, and **readPointsFile** which will make a file with data into an array of points. Specific methods for K-means include **\_formCluster** which assigns points to a clusterhead, **\_updateClusterhead** which finds the mean of the points assigned to that clusterhead, and **KMeans** which runs these two functions while the distance between the new and old clusterhead locations is greater than the tolerance. They-Nearest Neighbors has similar functions to calculate the distance and generate data. However, there are many aspects in which they differ. KNN begins by creating sample dataSet with its **makeDataSet** function and it is classified into a learning set and training set with the *createTrainingAndTestingSet*. When run *randomTestingPoint\** selects a point to sort from the testingSet. It then calculates the distance between the testingPoint and every index in the TrainingSet via **distanceCalculator**. Using the function **findNeighbors** it finds the k(amount of neighbors) number of points with the smallest distance and places them in a list in ascending order. To determine the group the point belongs to it uses the function **findMostCommonneigbor** which takes in the list of closest points and by using the groups they belong to output the group that appears the most. The random point is then sorted into that group. To check if the point was sorted into the correct group **CheckIfCorrect** takes in the point and finds the original point and compares the group number they were sorted in, returning True if the numbers are the same and False if they are not. The program then runs 10 times to populate information on how often the points were sorted correctly.

## Libraries and Tools:

- NumPy: NumPy is used to organize and process data. All matrices are NumPy arrays, random numbers are generated using NumPy random functions, and the NumPy mean, min, and max functions
- matplotlib.pyplot is used to plot two-dimensional data sets visually.
- re is used to comprehend file input.

- `sklearn.datasets`: was used to import `make_blob` which allowed to create a data sample with a given number of points pre-sorted into a predetermined number of clusters
- `collections`: was used to import `Counter` which was a pre-existing function that helped to determine how many instances of a certain value were in a given list
- `random`: was used to generate random numbers in order to create a randomly generated dataset

### Lessons Learned:

Conducting this project, we learned how to practically apply our Python knowledge to solve a (relatively) complex problem. We gained valuable experience in conceptualizing code structure, problem-solving, and using data structures efficiently to implement the KNN and K-means algorithms. We also felt that this project gave us a lot of experience in object oriented programming. We would have liked to refine the point generator and the error-checking, to see how effective each K-means attempt is. We also would have liked to spend a little bit more time on the file reader so it is more seamless. Future students should start thinking about this project early in the semester and use large blocks of time to get as much done as they can at once. For KNN, we learned that the number of KNN works is dependent on the number of groups. More groups means a greater likelihood of interspersing different groups which in turn led our program to be less effective. A large portion learned through KNN was being able to apply functions throughout nested lists and iterate correctly to output/get the correct information. Especially throughout the project we were able to create complex data structures and use this data to predict the sorting group.

### Instructions:

If you have a file of points:

- Make sure they are organized in the format

`point1\n point2\n...pointn`. Points can be a list or tuple or just values separated by a space. Points must be separated by a white space character.

- Use `data = Classifier.readPointsFile(filename)` then `classifierName = Classifier(data, k, tolerance, verbosity)` to import your data.

If you have a list or array:

- `classifierName = Classifier(listOrArray, k, tolerance, verbosity)`

If you want to generate random data:

- `classifierName = Classifier(numberOfPoints, k, tolerance, verbosity, min, max)`

For KNN:

- The perform KNN function must be called

'''KNN.performKNN(numSamples, numClusters, kNeighbors, nFeatures)''' This will generate a randomized data set with the given sample size and number of cluster heads. The user also gets to input the amount of dimensions it wants the data to have(nFeatures) and the amount of neighbors it wants the program to use when classifying the data(kNeighbors)

```
In [ ]: import numpy as np
import matplotlib.pyplot as plt
import re
from sklearn.datasets import make_blobs
import random
from collections import Counter

# Function to make a file with nPoints, nDims, between minVal and maxVal.
# Chooses a random number of centers and creates points normally distributed around
def makePointsFile(nPoints, nDims, minVal, maxVal, filename):
    middleVal = np.mean([abs(maxVal), abs(minVal)])
    nCenters = np.random.randint(1,10)
    evenDiv = int(np.floor(nPoints/nCenters))
    extraPoints = nPoints-(nCenters*evenDiv)
    ptz = np.zeros((nDims,nPoints))
    for k in range(nCenters):
        np.random.seed()
        center = np.random.randint(np.floor(2*minVal/3),np.floor(2*maxVal/3))
        stupidList = [[np.random.normal(center, middleVal/8) for j in range(eve
        trifecta = np.array(stupidList)
        ptz[:,k*evenDiv:(k+1)*evenDiv] = trifecta
    if extraPoints:
        ptz[:, -extraPoints:] = [[np.random.normal(center, middleVal/8) for i in r
    ptzUse = ptz.T

    with open(filename, 'w') as curPoints:
        for point in ptzUse:
            ptz2write = np.array2string(point) + '\n'
            curPoints.write(ptz2write)

#main class which contains KMeans, KNN, and related attribuites and functions
class Classifier:
    def __init__(self, points, k, verboseMode, tolerance=.05, *minmaxVal): #add inp
        if minmaxVal and isinstance(points, int):
            self.__maxVal = max(minmaxVal)
            self.__minVal = min(minmaxVal)
        elif isinstance(points, int):
            raise ValueError('Must have min and max values to generate points')
        else:
            self.__maxVal = np.max(points)
            self.__minVal = np.min(points)
        self.k = k
        self.verbosity = verboseMode
        self.n = points
        self.tolerance = tolerance
```

```

@property #getter for numPoints
def n(self):
    return self._n

@n.setter #setter for _points and _n - must be positive int or List
def n(self, newPoints):
    if isinstance(newPoints, int) and newPoints > 0:
        self._n = newPoints
        self._numDims = int(input('How many dimensions?'))
        self.genData = True
    elif isinstance(newPoints, list):
        self._points = np.array(newPoints)
        self._points = newPoints
        nDim, x = self._points.shape
        if x < nDim:
            self._points.T
        self._n = max(x,nDim)
        self._numDims = min(x,nDim)
        self.genData = False
    elif isinstance(newPoints, np.ndarray):
        self._points = newPoints
        nDim, x = self._points.shape
        if x < nDim:
            self._points.T
        self._n = max(x,nDim)
        self._numDims = min(x,nDim)
        self.genData = False
    else:
        raise ValueError('# of points must be positive int')

@property #getter for num of cluster heads
def k(self):
    return self._k

@k.setter #setter for num of cluster heads - must be more than 1 for now
def k(self, clusterhead):
    if isinstance(clusterhead, int) and clusterhead > 1:
        self._k = clusterhead
    else:
        raise ValueError('# of clusterheads must be more than 1!')

def _getPoints(self, numPoints):
    #Make an array of random points between maxVal and minVal
    plt.figure()
    middleVal = np.mean([abs(self._maxVal), abs(self._minVal)])
    evenDiv = int(np.floor(self.n/self.k))
    extraPoints = self.n-(self.k*evenDiv)
    pointz = np.zeros((self._numDims, self.n))
    clustersList = []
    for k in range(self.k):
        np.random.seed()
        center = np.random.randint(np.floor(self._minVal*.8),np.floor(self._m
        trifecta = np.array([[np.random.normal(center, middleVal/10) for j in r
        pointz[:,k*evenDiv:(k+1)*evenDiv] = trifecta

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        clusterSet = set({})
        for j in trifecta.T:
            clusterSet.add(tuple(j))
        clustersList.append(clusterSet)
        if extraPoints:
            pointz[:, -extraPoints:] = [[np.random.normal(0, middleVal/8) for i in range(extraPoints)] for j in range(len(trifecta.T)-len(clustersList))]
        self._trueAsst = clustersList
        if self.verbosity == 1:
            print(f'data: \n{pointz}')
    return pointz

def _firstClusterhead(self):
    # This function creates an array for the coordinates of clusterheads.
    # Initialized as random points chosen from self._points

    #initialize clusterhead array
    self.clusterheads = np.zeros(shape = (self._numDims, self.k))
    for m in range(self.k):
        self.clusterheads[:,m] = self._points[:,np.random.randint(self.n)]
    #2d plotting
    if self._numDims == 2:
        if self.verbosity == 1:
            plt.figure()
            plt.axis([self._minVal*1.5, self._maxVal*1.5, self._minVal*1.5, self._maxVal*1.5])
            headCounter = 0
            for heads in self.clusterheads.T:
                plt.plot(heads[0], heads[1], '+', label= f'Clusterhead {headCounter}')
                headCounter+=1

    #forms the assignment matrix - random clusterhead placement comes later
    self.assignmentMat = np.zeros((self._numDims+1, self.n))
    self.assignmentMat[1:,:] = np.array([self._points[0:,l] for l in range(self.n)])
    self.assignmentMat[0,:] = self._trueAsst[0].copy()

def _formCluster(self):
    #compares each point to a clusterhead
    distMat = np.zeros((self.n, self.k))

    #iterate points
    for i in range(self.n):
        pointDist = np.array([])
        for j in range(self.k): #for each clusterhead check the distance
            pointDist = np.append(pointDist, self._distance(self._points[:,i], self.clusterheads[:,j]))
        for ind in np.where(pointDist == pointDist.min()):
            if ind.any():
                self.assignmentMat[0, i] = ind[0]

        distMat[i,:] = pointDist

    self._distances = distMat

def _updateClusterhead(self):
    #Going to plot the points
    if self._numDims == 2:
        # Plotting in 2d
        if self.verbosity == 1:
            plt.figure()

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        plt.axis([self.__minVal-5, self.__maxVal+5, self.__minVal-5, self.__maxVal+5])

# Saving the last cluster heads to compare for end condition of K-means
self.lastClusterheads = np.ndarray.copy(self.clusterheads)
for k in range(self.k):
    if k in self.assignmentMat[0,:]:
        self.clusterheads[:,k] = np.mean(self.assignmentMat[1:, self.assignmentMat[0,:] == k], axis=0)
    else:
        print(f'cluster head: {self.clusterheads[:,k]} has no points assigned')
if self.verbosity == 1:
    #2d plot
    if self._numDims == 2:
        plt.plot(self.assignmentMat[1, self.assignmentMat[0] == k], self.assignmentMat[0, self.assignmentMat[0] == k])
        print(f'new cluster heads: \n{self.clusterheads}\n last heads: \n{self.lastClusterheads}')

if self._numDims == 2:
    headCounter = 0
    #2d plotting clusterheads
    if self.verbosity == 1:
        for heads in self.clusterheads.T:
            plt.plot(heads[0], heads[1], '+', label=f'Clusterhead {headCounter}')
            headCounter+=1

def _distance(self, item1, item2):
    #_distance method takes input of two iterables each with numDim values
    #squared distance formula
    squareNum = np.square(item2 - item1)
    findsum = np.sum(squareNum)
    return findsum

def readPointsFile(filename):
    if isinstance(filename, str):
        with open(filename, 'r') as readPoints:
            pointsList = readPoints.read()
            curPattern = re.compile(r'[\[\(\]?([0-9\.-]{6,12})[ ,]{1,3}([0-9\.-]{6,12})')
            curMatch = curPattern.findall(pointsList)
            dataIn = []
            for match in curMatch:
                newPt = [float(match.group(1)), float(match.group(2))]
                dataIn.append(newPt)
            dataIn = np.array(dataIn).T
        return dataIn
    else:
        raise ValueError('File name must be a string.')

def seePlot(self):
    plt.legend()
    plt.xlabel('X-values')
    plt.ylabel('Y-Values')
    plt.title('K-means results')
    plt.show()

def errorCheck(self):
    numError = 0
    for k in range(self.k):

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    clusAsst = set({})
    for point in self.assignmentMat[1:, self.assignmentMat[0] == k].T:
        clusAsst.add(tuple(point))
    for j in range(self.k):
        #print(f'{self._trueAsst[j]}')
        if self._trueAsst[j].intersection(clusAsst):
            if self._trueAsst[j].intersection(clusAsst) != self._trueAsst[j]:
                numError += len(self._trueAsst[j].difference(clusAsst))
                #print(f'difference is {self._trueAsst[j].difference(clusAsst)}')

    return numError/self.k

def KMeans(self):
    if self.genData == True:
        self._points = self._getPoints(self.n)
    for j in range(10):
        self._firstClusterhead()
        self._formCluster()
        self._updateClusterhead()
        numIter = 1
        iterList = []
        if self.genData == True:
            errorList = []
        while self._distance(self.clusterheads, self.lastClusterheads) > self.tolerance:
            print(f'distance between old and new heads: {self._distance(self.clusterheads, self.lastClusterheads)}')
            self._formCluster()
            self._updateClusterhead()
            numIter+=1
            # Error checking
            if self.genData == True:
                nError = self.errorCheck()
                print(f'error was {nError/self.n}')
                errorList.append(nError/self.n)
            if self.verbosity == 1 and self._numDims == 2:
                self.seePlot()
        iterList.append(numIter)
        print(f'Finished try! Distance between old and new heads: {self._distance(self.clusterheads, self.lastClusterheads)}')

    if self.genData == True:
        return iterList, errorList
    else:
        return iterList

#KNN methods
def makeDataSet(self, numSamples, numClusters, standardDev, nFeatures):
    # X : array of shape [n_samples, n_features]
    # y : array of shape [n_samples]
    X,y= make_blobs(
        # number of points divided in clusters
        n_samples = numSamples,
        # how many features do u want the sample to have (x,y)
        # basically how complex is the data
        n_features = nFeatures,
        # how many clusters

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        centers = numClusters,
        center_box =(self.__minVal,self.__maxVal),
        # standard deviation of the cluster
        # smaller the standard deviation the better
        cluster_std = standardDev,)

    dataSet = []
    data = []
    if self.verbosity == 1:
        plt.figure()
        plt.scatter(X[:,0],
                    X[:,1],
                    c = y)
        plt.title('KNN Points')
    #print(X.shape)
    for vv in range(len(y)):
        data = [X[vv],y[vv]]
        dataSet.append(data)
    return dataSet

def createTrainingAndTestingSet(self,dataSet):
    # Creates a training set that is 80% of the data and a testing set that is
    TrainingSet = dataSet
    TestingSet = []
    dataSetNum = len(dataSet)
    for vv in range(round(len(dataSet)*.2)):
        randomIndex = random.randrange(0,dataSetNum)
        TestingSet.append(TrainingSet[randomIndex])
        TrainingSet.pop(randomIndex)
        dataSetNum -= 1
    return TrainingSet, TestingSet

def distanceCalculator(self,dataP1, dataP2):
    # Calculates the distance between two points given any number of dimensions
    point1 = np.array(dataP1[:-1])
    point2 = np.array(dataP2[0])
    sqaureNum = np.square(point1-point2)
    findsum = np.sum(sqaureNum)
    euclideanDistance = np.sqrt(findsum)
    return euclideanDistance

def sortList(self,dataDistanceList):
    # sorts the the list of points with distances from smallest distance to lar
    return(sorted(dataDistanceList, key = lambda x : x[1]))

def randomTestingPoint(self,TrainingAndTestingSet):
    # generates a random point to test from the training set
    TrainingSet = TrainingAndTestingSet[1]
    randomIndex = random.randrange(0,len(TrainingAndTestingSet))
    testPoint = TrainingSet[randomIndex]
    TrainingSet.pop(randomIndex)
    return testPoint

def findNeigbors(self,TestSet,randomPoint, k):
    # find the K nerest neigbors from testing point to all points in the traing
    # outputs the nearest neigbor

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        distanceBetweenP = []
        for vv in range(len(TestSet)):
            distance = self.distanceCalculator(TestSet[vv], randomPoint)
            distanceBetweenP.append([TestSet[vv], distance])
        distanceInOrder = self.sortList(distanceBetweenP)
        nearestK = []
        for vv in range(k):
            nearestK.append(distanceInOrder[vv])
        return nearestK

    def findMostCommonneigbor(self, ListNeigborGroups):
        countFrequen = Counter(ListNeigborGroups)
        mostFreq = countFrequen.most_common(1)[0][0]
        return mostFreq

    def ListOfBelongingGroup(self, findKNeighbors):
        ListNeigborGroups = []
        for vv in range(len(findKNeighbors)):
            group = findKNeighbors[vv][0][1]
            ListNeigborGroups.append(group)
        belongingGroup = self.findMostCommonneigbor(ListNeigborGroups)
        return belongingGroup

    def CheckIfCorrect(self, TestPointWithGroup):
        realGroup = TestPointWithGroup[0][1]
        KNNSORTEDGROUP = TestPointWithGroup[1]
        if realGroup == KNNSORTEDGROUP:
            return True
        else:
            return False

    def performKNN(self, numClusters):
        # creates a Standard Devation of 10% of the amount of data
        standardDev = round(self.n * .01)
        timesCorrect = 0
        timesInccorect = 0
        officialDataSet = self.makeDataSet(self.n, numClusters, standardDev, self._num
        # Repeated 10 times
        for vv in range(10):
            TrainAndTest = self.createTrainingAndTestingSet(officialDataSet)
            TrainingSet = TrainAndTest[0]
            TestSet = TrainAndTest[1]
            RandomPoint = self.randomTestingPoint(TrainAndTest)
            findKNeigbors = self.findNeigbors(TrainingSet, RandomPoint, self.k)
            GroupPointBelongsTO = self.ListOfBelongingGroup(findKNeigbors)
            TestPointWithGroup = [RandomPoint, GroupPointBelongsTO]
            TestPointCheck = self.CheckIfCorrect(TestPointWithGroup)
            if TestPointCheck == True:
                timesCorrect += 1
            else:
                timesInccorect += 1

        print("Amount of Time KNN sorts Correctly: ", timesCorrect, "Times KNN sorts

KNNTTest = Classifier(10000,5,1,0,-1000,1000)

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KNNTest.performKNN(6)

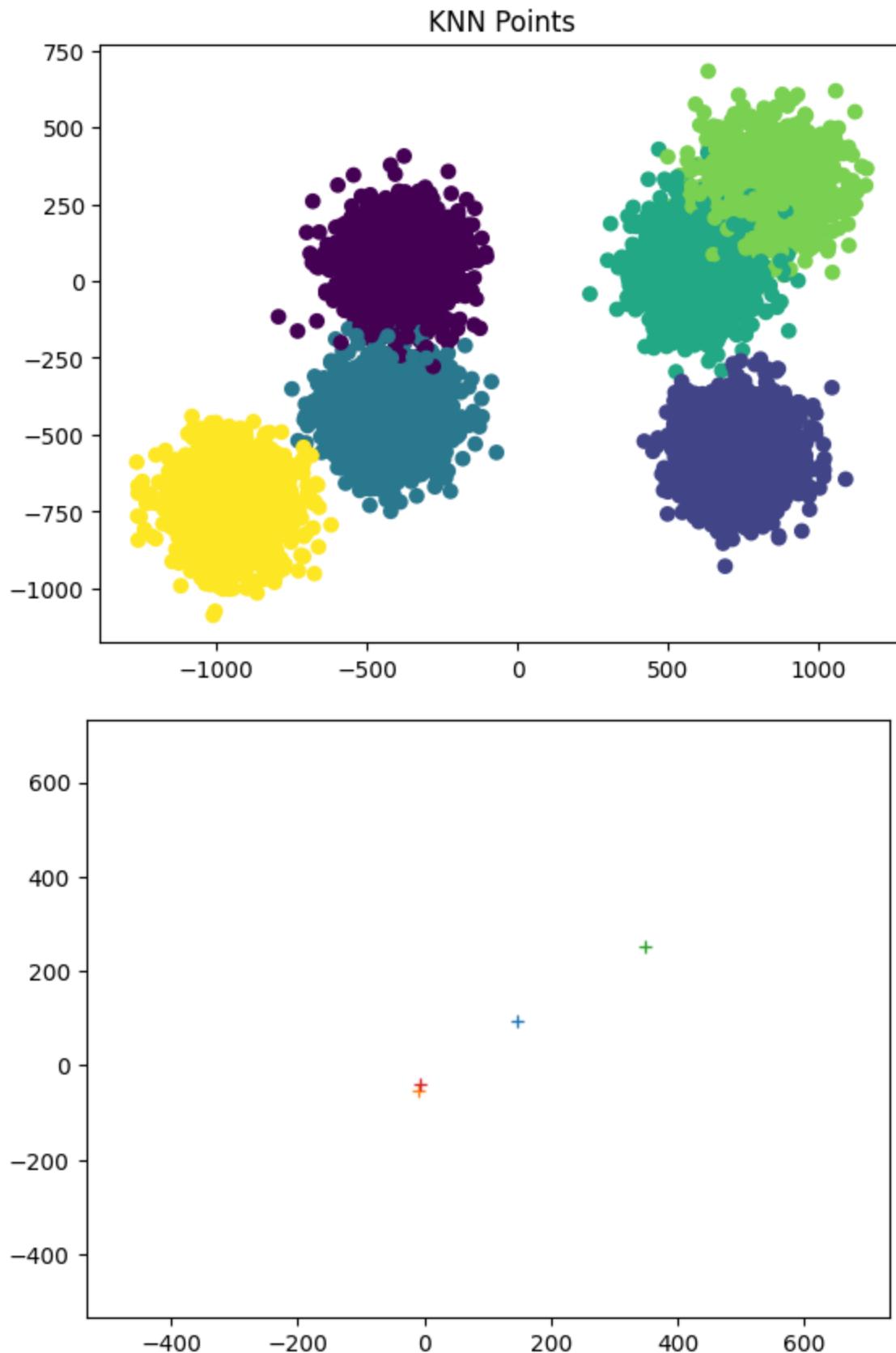
fileName = 'randptz.txt'
makePointsFile(1000, 2, -500, 500, fileName)
inputData = Classifier.readPointsFile(fileName)
firstClass = Classifier(inputData, 4, 1, .05)

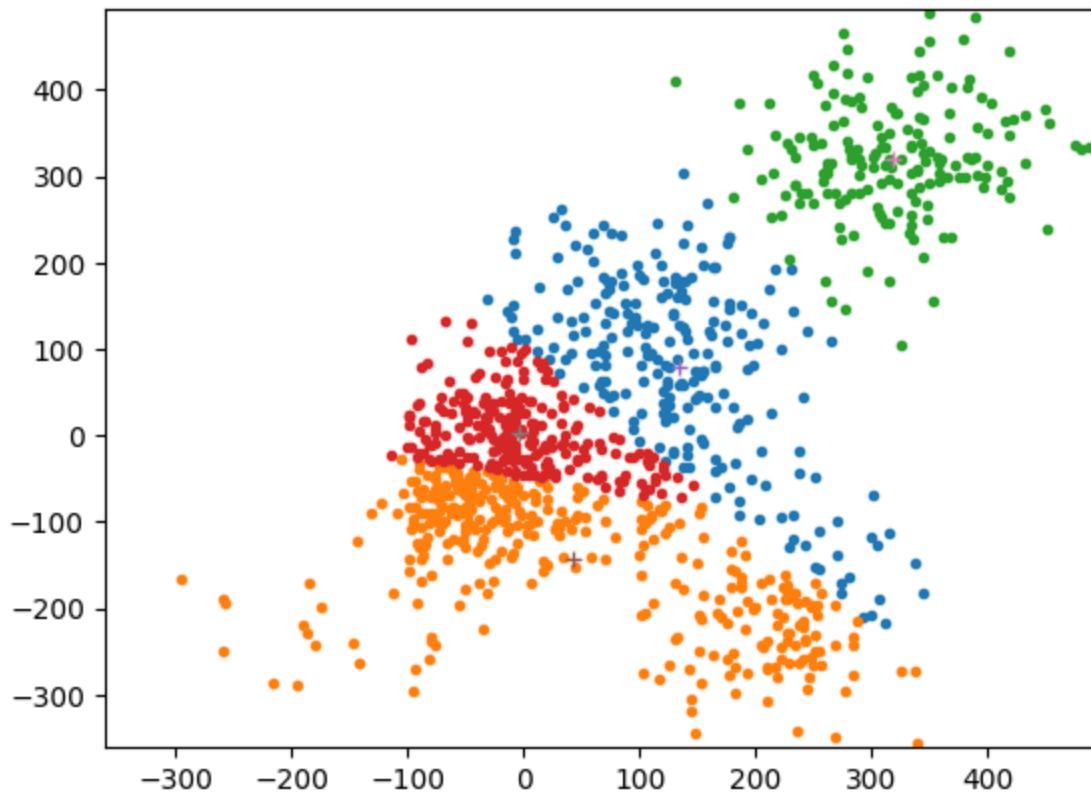
#Testing the K-means function times
iterList = firstClass.KMeans()
print(f'Fewest number of iterations was {min(iterList)} on try {iterList.index(min(iterList)) + 1} iterations')

randPtz = Classifier(1000, 4, 0, .05, -1000, 1000)
iterList, errorList = randPtz.KMeans()

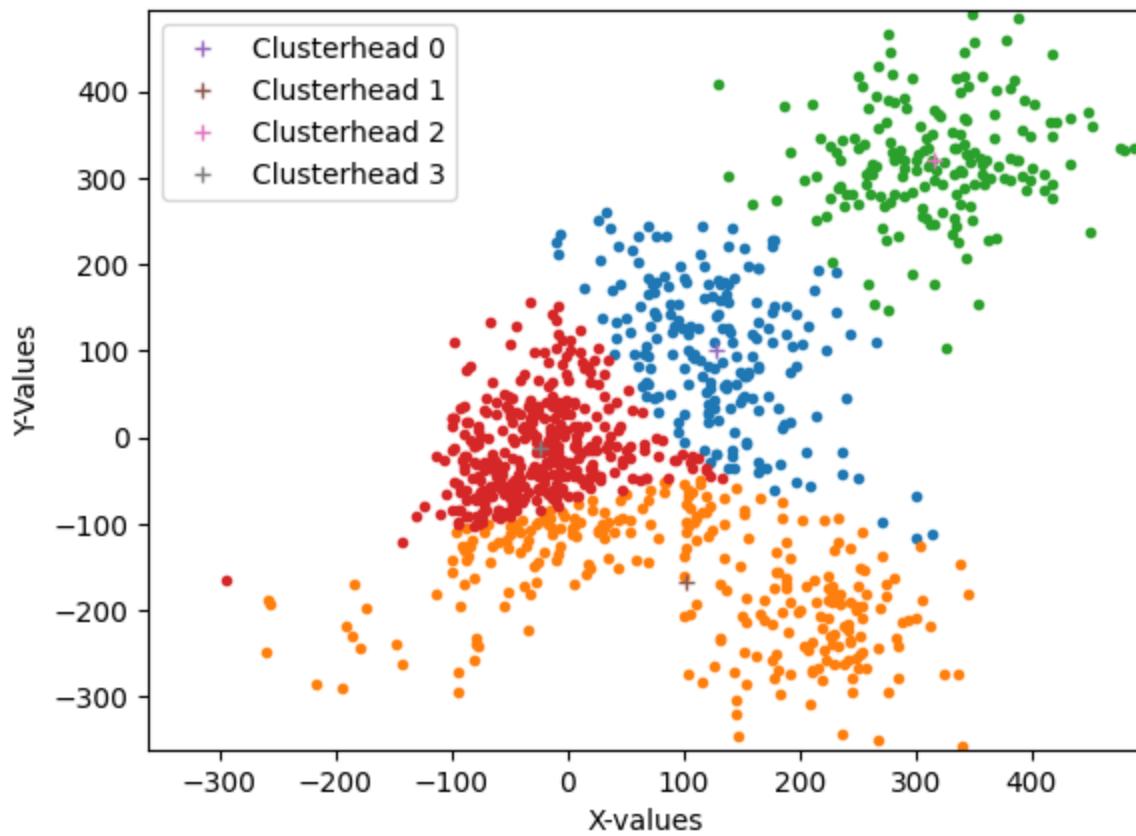
print(f'Fewest number of iterations was {min(iterList)} on try {iterList.index(min(errorList)) + 1} iterations
    \nLowest error was {min(errorList)} on try {errorList.index(min(errorList)) + 1} iterations')
```

```
Amount of Time KNN sorts Correctly: 9 Times KNN sorts Inccorectly: 1
new cluster heads:
[[134.52633738 -9.5551754 348.06753873 -6.49437035]
 [ 78.91854036 -53.95644303 250.50886036 -40.26335127]]
last heads:
[[145.73017509 -9.5551754 348.06753873 -6.49437035]
 [ 94.93606232 -53.95644303 250.50886036 -40.26335127]]
new cluster heads:
[[ 134.52633738 43.51530242 348.06753873 -6.49437035]
 [ 78.91854036 -143.57369006 250.50886036 -40.26335127]]
last heads:
[[145.73017509 -9.5551754 348.06753873 -6.49437035]
 [ 94.93606232 -53.95644303 250.50886036 -40.26335127]]
new cluster heads:
[[ 134.52633738 43.51530242 317.957689 -6.49437035]
 [ 78.91854036 -143.57369006 320.6880963 -40.26335127]]
last heads:
[[145.73017509 -9.5551754 348.06753873 -6.49437035]
 [ 94.93606232 -53.95644303 250.50886036 -40.26335127]]
new cluster heads:
[[ 134.52633738 43.51530242 317.957689 -4.03222802]
 [ 78.91854036 -143.57369006 320.6880963 2.98724651]]
last heads:
[[145.73017509 -9.5551754 348.06753873 -6.49437035]
 [ 94.93606232 -53.95644303 250.50886036 -40.26335127]]
distance between old and new heads: 18938.22
new cluster heads:
[[ 128.71944561 43.51530242 317.957689 -4.03222802]
 [ 100.66956489 -143.57369006 320.6880963 2.98724651]]
last heads:
[[ 134.52633738 43.51530242 317.957689 -4.03222802]
 [ 78.91854036 -143.57369006 320.6880963 2.98724651]]
new cluster heads:
[[ 128.71944561 102.52244922 317.957689 -4.03222802]
 [ 100.66956489 -168.38943619 320.6880963 2.98724651]]
last heads:
[[ 134.52633738 43.51530242 317.957689 -4.03222802]
 [ 78.91854036 -143.57369006 320.6880963 2.98724651]]
new cluster heads:
[[ 128.71944561 102.52244922 316.03154275 -4.03222802]
 [ 100.66956489 -168.38943619 320.29734362 2.98724651]]
last heads:
[[ 134.52633738 43.51530242 317.957689 -4.03222802]
 [ 78.91854036 -143.57369006 320.6880963 2.98724651]]
new cluster heads:
[[ 128.71944561 102.52244922 316.03154275 -24.57810308]
 [ 100.66956489 -168.38943619 320.29734362 -12.41233683]]
last heads:
[[ 134.52633738 43.51530242 317.957689 -4.03222802]
 [ 78.91854036 -143.57369006 320.6880963 2.98724651]]
```





K-means results

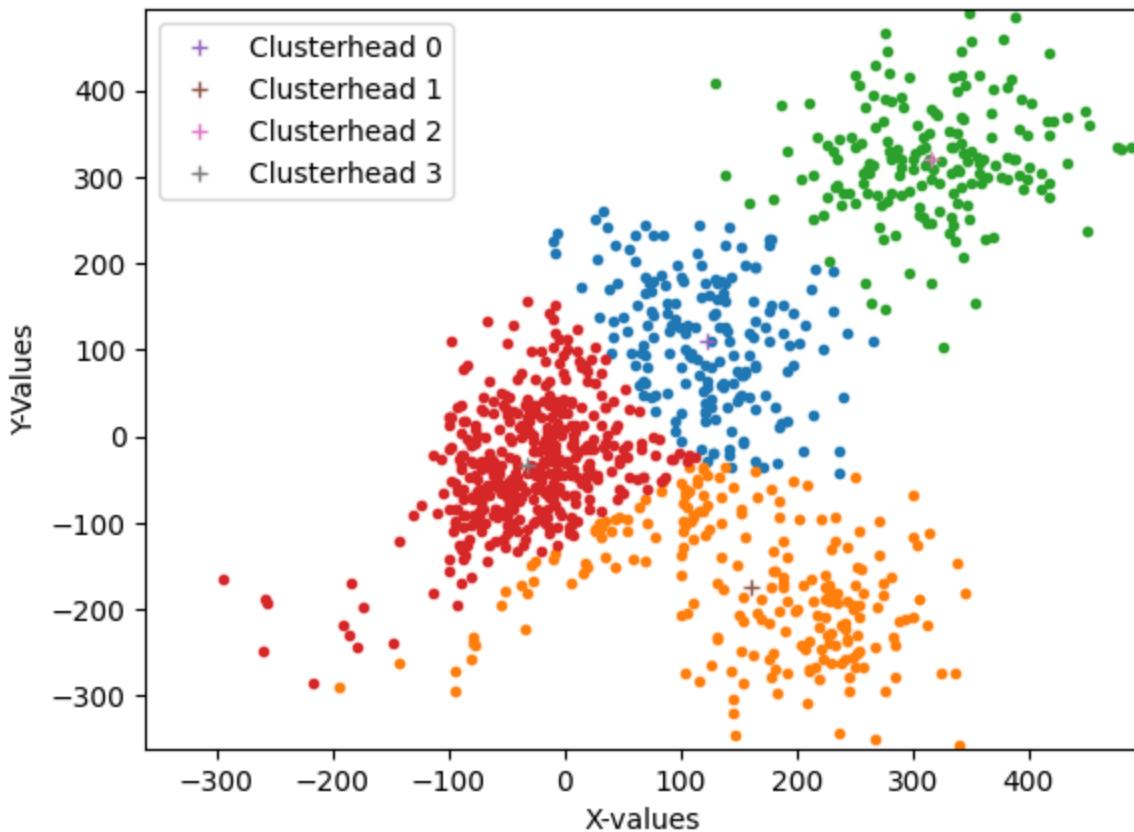


```

distance between old and new heads: 5267.63
new cluster heads:
[[ 123.06233431  102.52244922  316.03154275 -24.57810308]
 [ 109.9437671 -168.38943619  320.29734362 -12.41233683]]
last heads:
[[ 128.71944561  102.52244922  316.03154275 -24.57810308]
 [ 100.66956489 -168.38943619  320.29734362 -12.41233683]]
new cluster heads:
[[ 123.06233431  160.69601096  316.03154275 -24.57810308]
 [ 109.9437671 -174.38381436  320.29734362 -12.41233683]]
last heads:
[[ 128.71944561  102.52244922  316.03154275 -24.57810308]
 [ 100.66956489 -168.38943619  320.29734362 -12.41233683]]
new cluster heads:
[[ 123.06233431  160.69601096  316.03154275 -24.57810308]
 [ 109.9437671 -174.38381436  320.29734362 -12.41233683]]
last heads:
[[ 128.71944561  102.52244922  316.03154275 -24.57810308]
 [ 100.66956489 -168.38943619  320.29734362 -12.41233683]]
new cluster heads:
[[ 123.06233431  160.69601096  316.03154275 -32.48453918]
 [ 109.9437671 -174.38381436  320.29734362 -32.34922613]]
last heads:
[[ 128.71944561  102.52244922  316.03154275 -24.57810308]
 [ 100.66956489 -168.38943619  320.29734362 -12.41233683]]

```

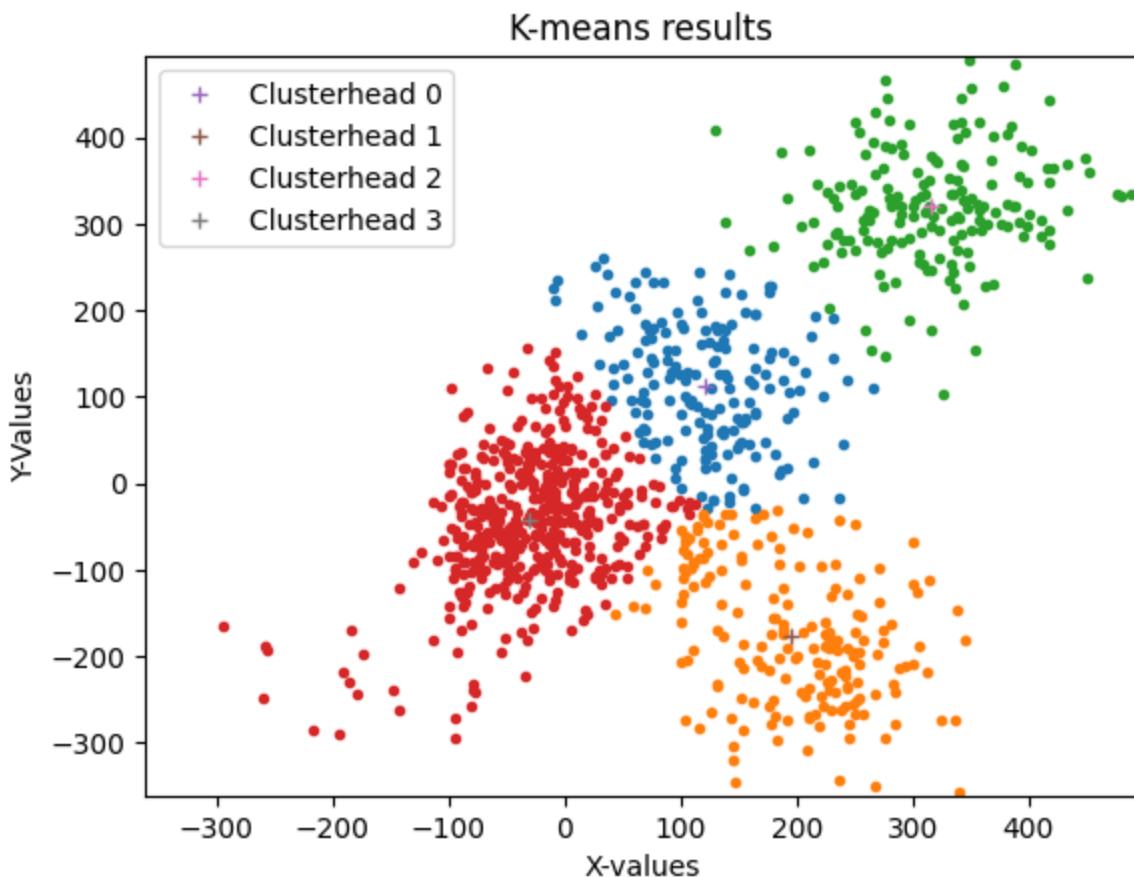
K-means results



```

distance between old and new heads: 3998.10
new cluster heads:
[[ 121.71291849  160.69601096  316.03154275  -32.48453918]
 [ 113.21873772 -174.38381436  320.29734362  -32.34922613]]
last heads:
[[ 123.06233431  160.69601096  316.03154275  -32.48453918]
 [ 109.9437671 -174.38381436  320.29734362  -32.34922613]]
new cluster heads:
[[ 121.71291849  195.5505665   316.03154275  -32.48453918]
 [ 113.21873772 -175.75200117  320.29734362  -32.34922613]]
last heads:
[[ 123.06233431  160.69601096  316.03154275  -32.48453918]
 [ 109.9437671 -174.38381436  320.29734362  -32.34922613]]
new cluster heads:
[[ 121.71291849  195.5505665   316.03154275  -32.48453918]
 [ 113.21873772 -175.75200117  320.29734362  -32.34922613]]
last heads:
[[ 123.06233431  160.69601096  316.03154275  -32.48453918]
 [ 109.9437671 -174.38381436  320.29734362  -32.34922613]]
new cluster heads:
[[ 121.71291849  195.5505665   316.03154275  -30.15821366]
 [ 113.21873772 -175.75200117  320.29734362  -42.95386973]]
last heads:
[[ 123.06233431  160.69601096  316.03154275  -32.48453918]
 [ 109.9437671 -174.38381436  320.29734362  -32.34922613]]

```

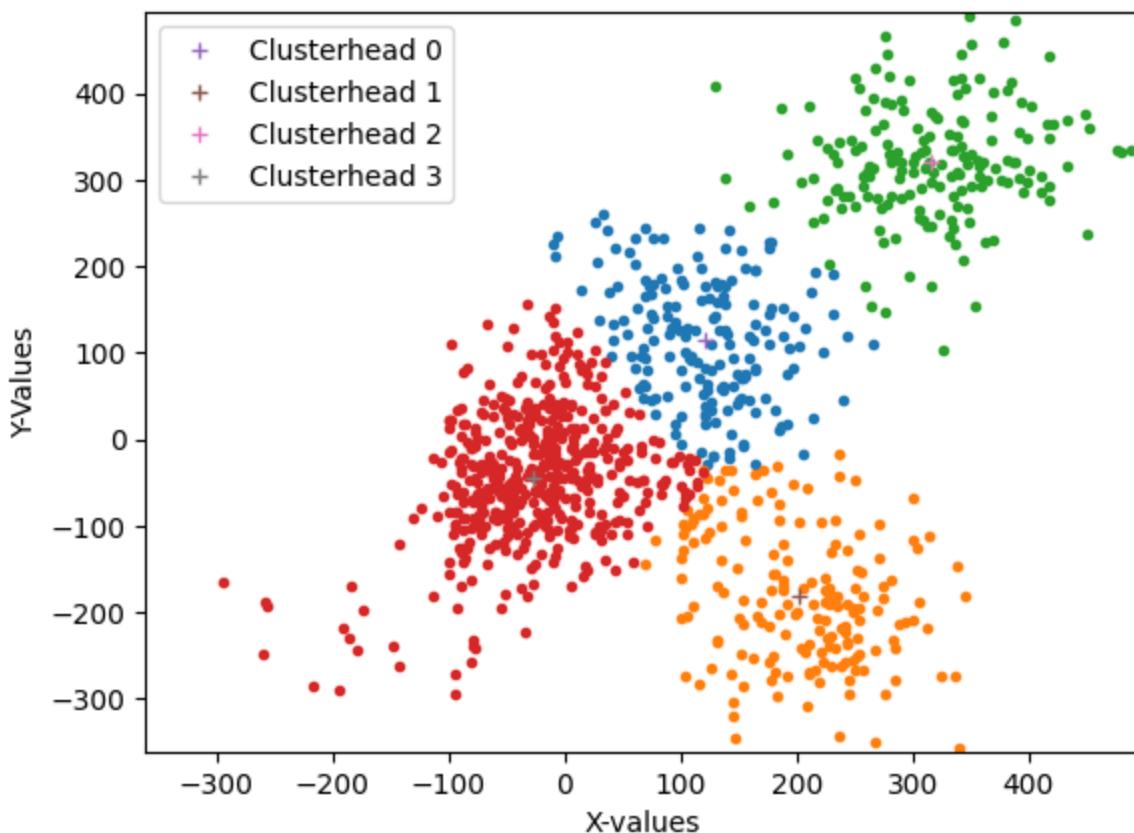


```

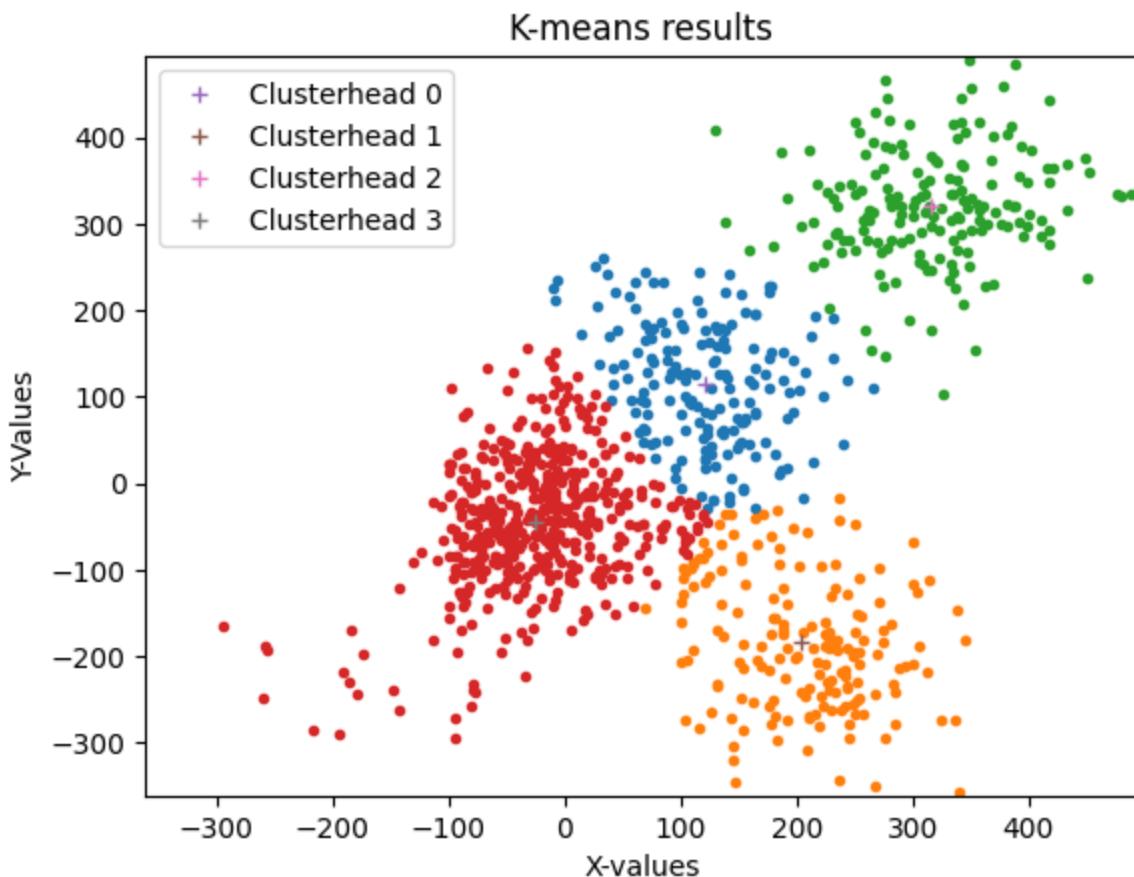
distance between old and new heads: 1347.13
new cluster heads:
[[ 121.064385   195.5505665   316.03154275  -30.15821366]
 [ 113.95570531 -175.75200117  320.29734362  -42.95386973]]
last heads:
[[ 121.71291849  195.5505665   316.03154275  -30.15821366]
 [ 113.21873772 -175.75200117  320.29734362  -42.95386973]]
new cluster heads:
[[ 121.064385   201.99392151   316.03154275  -30.15821366]
 [ 113.95570531 -180.88064444  320.29734362  -42.95386973]]
last heads:
[[ 121.71291849  195.5505665   316.03154275  -30.15821366]
 [ 113.21873772 -175.75200117  320.29734362  -42.95386973]]
new cluster heads:
[[ 121.064385   201.99392151   316.03154275  -30.15821366]
 [ 113.95570531 -180.88064444  320.29734362  -42.95386973]]
last heads:
[[ 121.71291849  195.5505665   316.03154275  -30.15821366]
 [ 113.21873772 -175.75200117  320.29734362  -42.95386973]]
new cluster heads:
[[ 121.064385   201.99392151   316.03154275  -27.15813193]
 [ 113.95570531 -180.88064444  320.29734362  -43.7962369 ]]
last heads:
[[ 121.71291849  195.5505665   316.03154275  -30.15821366]
 [ 113.21873772 -175.75200117  320.29734362  -42.95386973]]

```

K-means results



```
distance between old and new heads: 78.49
new cluster heads:
[[ 121.064385    201.99392151   316.03154275   -27.15813193]
 [ 113.95570531  -180.88064444   320.29734362   -43.7962369 ]]
last heads:
[[ 121.064385    201.99392151   316.03154275   -27.15813193]
 [ 113.95570531  -180.88064444   320.29734362   -43.7962369 ]]
new cluster heads:
[[ 121.064385    204.17452273   316.03154275   -27.15813193]
 [ 113.95570531  -183.41770361   320.29734362   -43.7962369 ]]
last heads:
[[ 121.064385    201.99392151   316.03154275   -27.15813193]
 [ 113.95570531  -180.88064444   320.29734362   -43.7962369 ]]
new cluster heads:
[[ 121.064385    204.17452273   316.03154275   -27.15813193]
 [ 113.95570531  -183.41770361   320.29734362   -43.7962369 ]]
last heads:
[[ 121.064385    201.99392151   316.03154275   -27.15813193]
 [ 113.95570531  -180.88064444   320.29734362   -43.7962369 ]]
new cluster heads:
[[ 121.064385    204.17452273   316.03154275   -25.99760482]
 [ 113.95570531  -183.41770361   320.29734362   -44.02259758]]
last heads:
[[ 121.064385    201.99392151   316.03154275   -27.15813193]
 [ 113.95570531  -180.88064444   320.29734362   -43.7962369 ]]
```

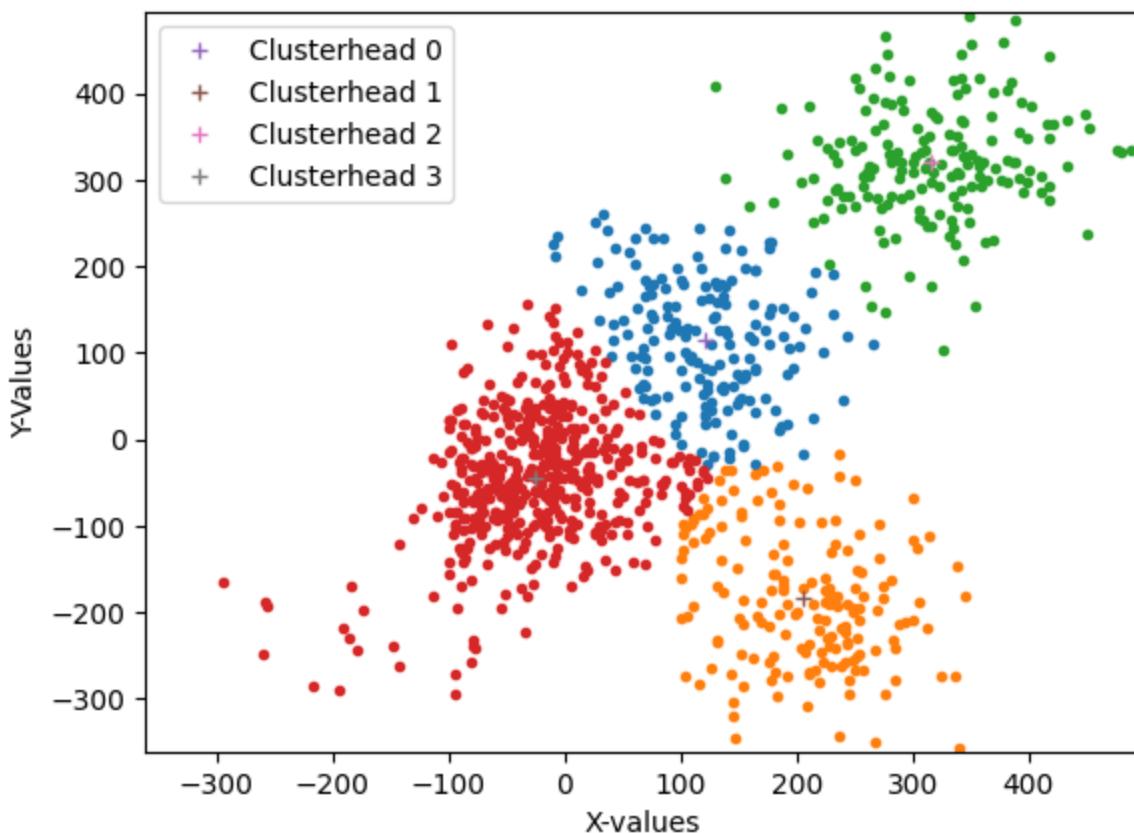


```

distance between old and new heads: 12.59
new cluster heads:
[[ 121.064385    204.17452273   316.03154275   -25.99760482]
 [ 113.95570531 -183.41770361   320.29734362   -44.02259758]]
last heads:
[[ 121.064385    204.17452273   316.03154275   -25.99760482]
 [ 113.95570531 -183.41770361   320.29734362   -44.02259758]]
new cluster heads:
[[ 121.064385    204.94581791   316.03154275   -25.99760482]
 [ 113.95570531 -183.64852516   320.29734362   -44.02259758]]
last heads:
[[ 121.064385    204.17452273   316.03154275   -25.99760482]
 [ 113.95570531 -183.41770361   320.29734362   -44.02259758]]
new cluster heads:
[[ 121.064385    204.94581791   316.03154275   -25.99760482]
 [ 113.95570531 -183.64852516   320.29734362   -44.02259758]]
last heads:
[[ 121.064385    204.17452273   316.03154275   -25.99760482]
 [ 113.95570531 -183.41770361   320.29734362   -44.02259758]]
new cluster heads:
[[ 121.064385    204.94581791   316.03154275   -25.78988454]
 [ 113.95570531 -183.64852516   320.29734362   -44.2373858 ]]
last heads:
[[ 121.064385    204.17452273   316.03154275   -25.99760482]
 [ 113.95570531 -183.41770361   320.29734362   -44.02259758]]

```

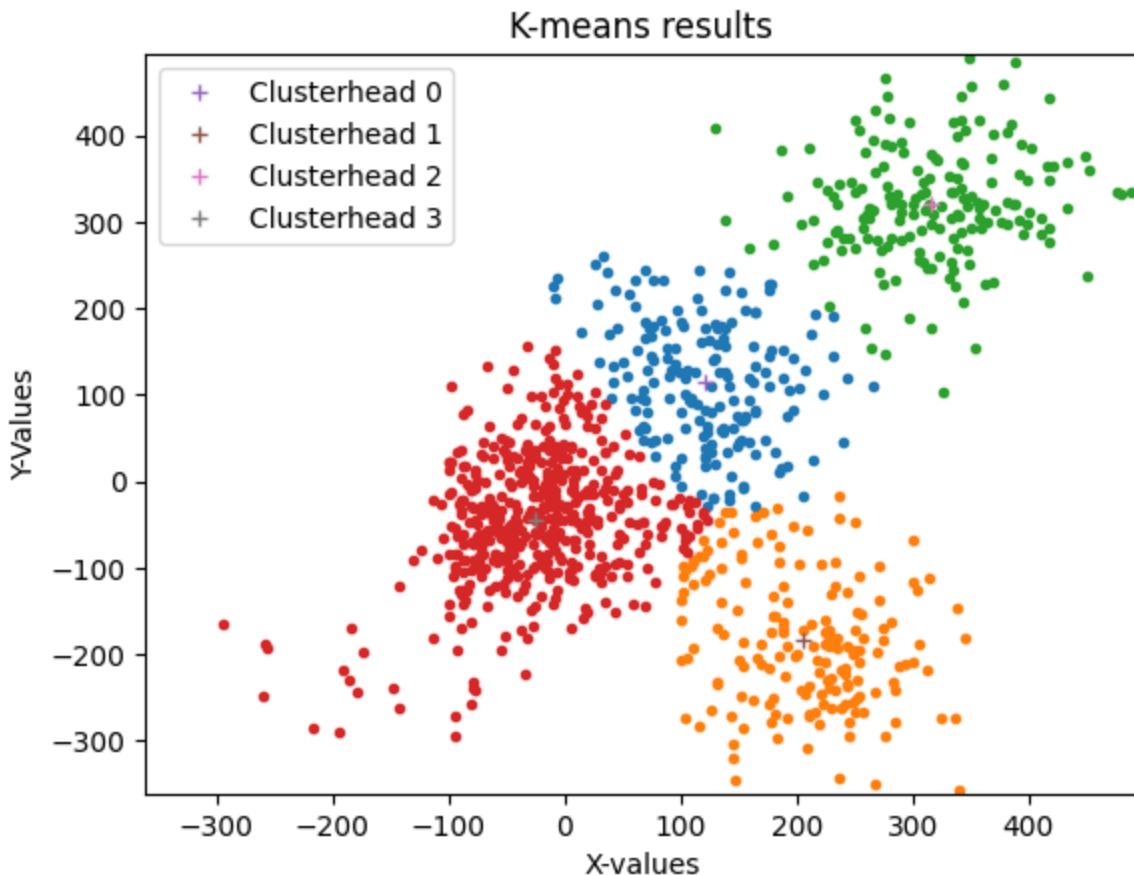
K-means results



```

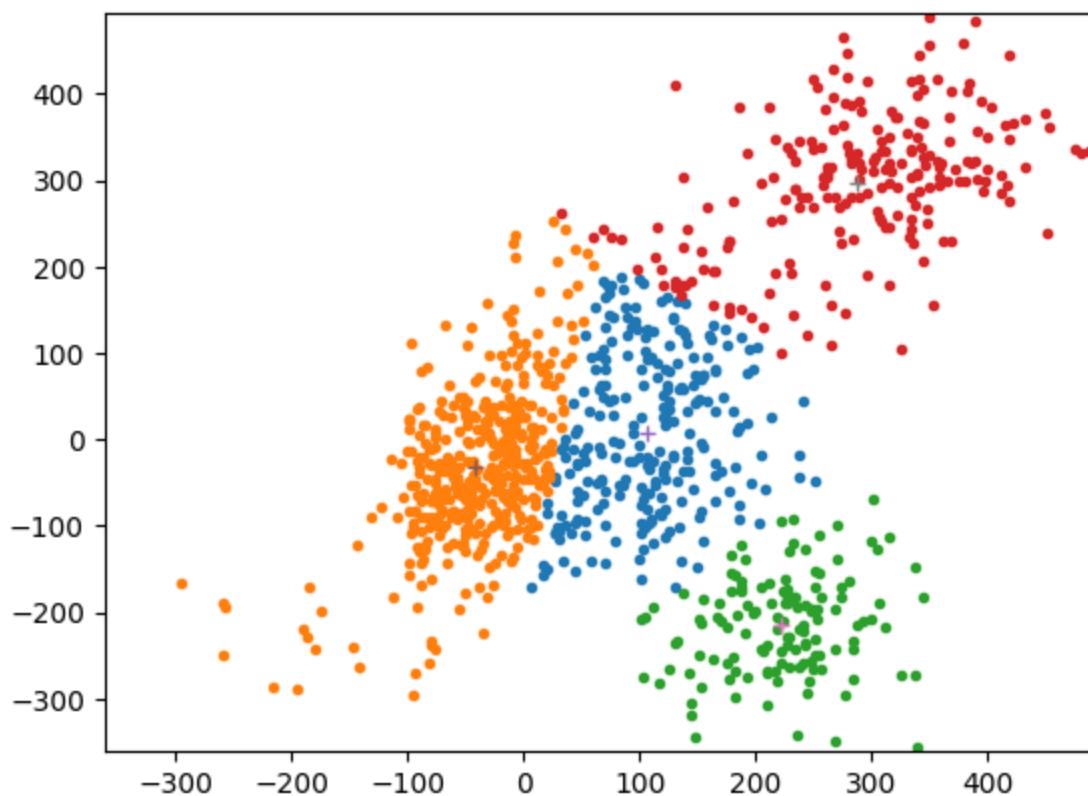
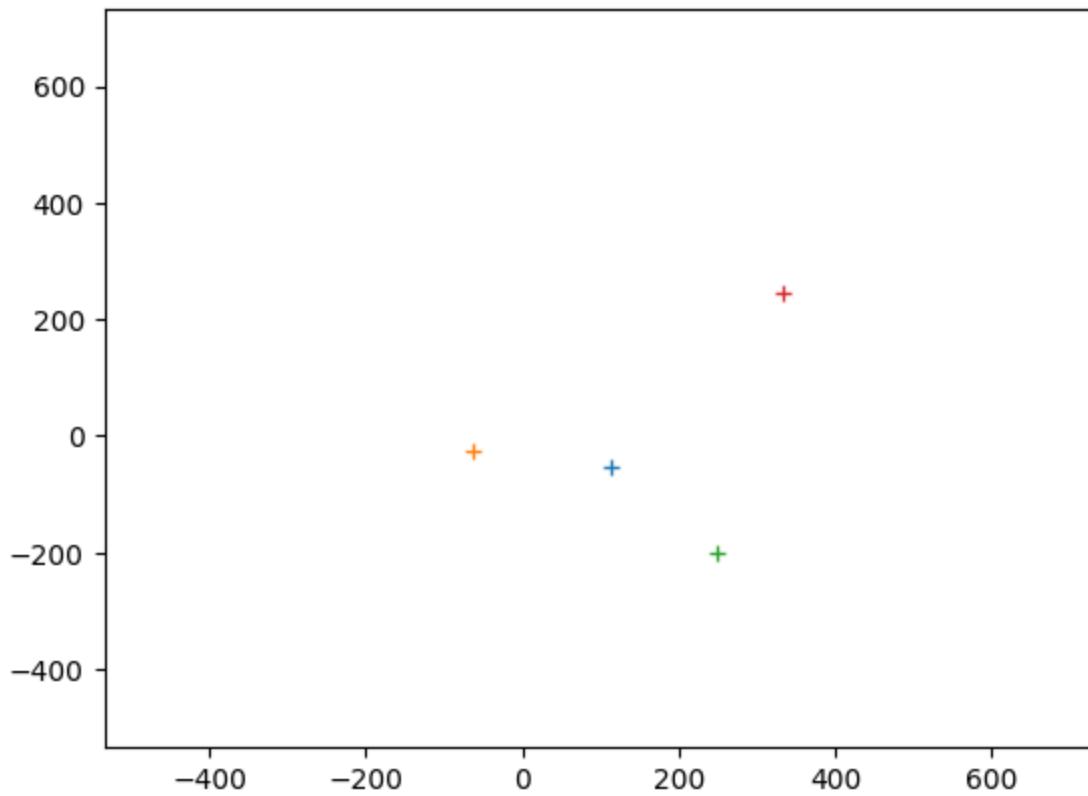
distance between old and new heads: 0.74
new cluster heads:
[[ 121.064385    204.94581791   316.03154275   -25.78988454]
 [ 113.95570531  -183.64852516   320.29734362   -44.2373858 ]]
last heads:
[[ 121.064385    204.94581791   316.03154275   -25.78988454]
 [ 113.95570531  -183.64852516   320.29734362   -44.2373858 ]]
new cluster heads:
[[ 121.064385    204.94581791   316.03154275   -25.78988454]
 [ 113.95570531  -183.64852516   320.29734362   -44.2373858 ]]
last heads:
[[ 121.064385    204.94581791   316.03154275   -25.78988454]
 [ 113.95570531  -183.64852516   320.29734362   -44.2373858 ]]
new cluster heads:
[[ 121.064385    204.94581791   316.03154275   -25.78988454]
 [ 113.95570531  -183.64852516   320.29734362   -44.2373858 ]]
last heads:
[[ 121.064385    204.94581791   316.03154275   -25.78988454]
 [ 113.95570531  -183.64852516   320.29734362   -44.2373858 ]]
new cluster heads:
[[ 121.064385    204.94581791   316.03154275   -25.78988454]
 [ 113.95570531  -183.64852516   320.29734362   -44.2373858 ]]
last heads:
[[ 121.064385    204.94581791   316.03154275   -25.78988454]
 [ 113.95570531  -183.64852516   320.29734362   -44.2373858 ]]

```

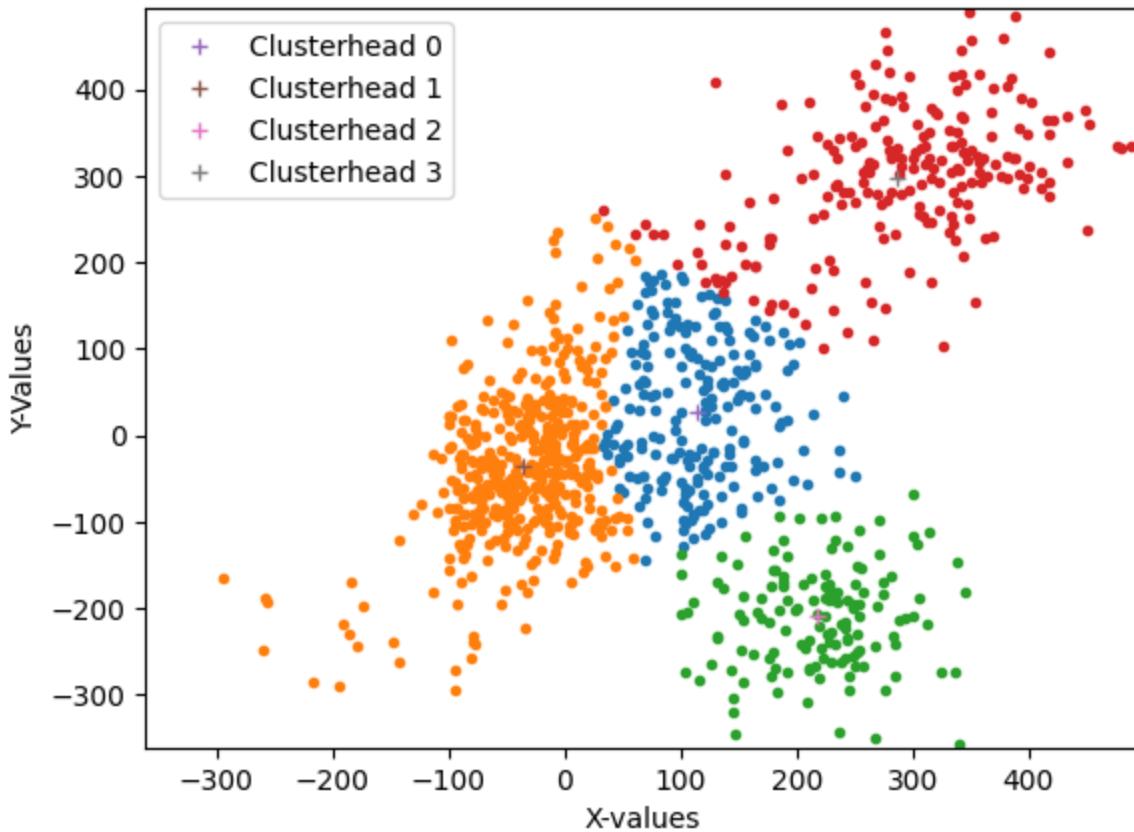


Finished try! Distance between old and new heads: 0.000000

```
new cluster heads:  
[[ 107.22458417 -63.17608471 248.19955185 334.00441273]  
 [ 7.72363631 -25.31322156 -199.4146494 244.05573233]]  
last heads:  
[[ 113.70851976 -63.17608471 248.19955185 334.00441273]  
 [-53.23237716 -25.31322156 -199.4146494 244.05573233]]  
new cluster heads:  
[[ 107.22458417 -41.01472001 248.19955185 334.00441273]  
 [ 7.72363631 -31.81268913 -199.4146494 244.05573233]]  
last heads:  
[[ 113.70851976 -63.17608471 248.19955185 334.00441273]  
 [-53.23237716 -25.31322156 -199.4146494 244.05573233]]  
new cluster heads:  
[[ 107.22458417 -41.01472001 222.68717651 334.00441273]  
 [ 7.72363631 -31.81268913 -213.92814278 244.05573233]]  
last heads:  
[[ 113.70851976 -63.17608471 248.19955185 334.00441273]  
 [-53.23237716 -25.31322156 -199.4146494 244.05573233]]  
new cluster heads:  
[[ 107.22458417 -41.01472001 222.68717651 287.38942982]  
 [ 7.72363631 -31.81268913 -213.92814278 296.84612663]]  
last heads:  
[[ 113.70851976 -63.17608471 248.19955185 334.00441273]  
 [-53.23237716 -25.31322156 -199.4146494 244.05573233]]  
distance between old and new heads: 10112.35  
new cluster heads:  
[[ 114.57677173 -41.01472001 222.68717651 287.38942982]  
 [ 26.54734388 -31.81268913 -213.92814278 296.84612663]]  
last heads:  
[[ 107.22458417 -41.01472001 222.68717651 287.38942982]  
 [ 7.72363631 -31.81268913 -213.92814278 296.84612663]]  
new cluster heads:  
[[ 114.57677173 -36.64404081 222.68717651 287.38942982]  
 [ 26.54734388 -36.18897169 -213.92814278 296.84612663]]  
last heads:  
[[ 107.22458417 -41.01472001 222.68717651 287.38942982]  
 [ 7.72363631 -31.81268913 -213.92814278 296.84612663]]  
new cluster heads:  
[[ 114.57677173 -36.64404081 218.27442694 287.38942982]  
 [ 26.54734388 -36.18897169 -209.351094 296.84612663]]  
last heads:  
[[ 107.22458417 -41.01472001 222.68717651 287.38942982]  
 [ 7.72363631 -31.81268913 -213.92814278 296.84612663]]  
new cluster heads:  
[[ 114.57677173 -36.64404081 218.27442694 287.38942982]  
 [ 26.54734388 -36.18897169 -209.351094 296.84612663]]  
last heads:  
[[ 107.22458417 -41.01472001 222.68717651 287.38942982]  
 [ 7.72363631 -31.81268913 -213.92814278 296.84612663]]
```



## K-means results



distance between old and new heads: 487.06

new cluster heads:

```
[[ 118.82856221 -36.64404081  218.27442694  287.38942982]
 [ 34.22882519 -36.18897169 -209.351094   296.84612663]]
```

last heads:

```
[[ 114.57677173 -36.64404081  218.27442694  287.38942982]
 [ 26.54734388 -36.18897169 -209.351094   296.84612663]]
```

new cluster heads:

```
[[ 118.82856221 -34.02388252  218.27442694  287.38942982]
 [ 34.22882519 -36.7416802   -209.351094   296.84612663]]
```

last heads:

```
[[ 114.57677173 -36.64404081  218.27442694  287.38942982]
 [ 26.54734388 -36.18897169 -209.351094   296.84612663]]
```

new cluster heads:

```
[[ 118.82856221 -34.02388252  216.05685248  287.38942982]
 [ 34.22882519 -36.7416802   -207.49753721  296.84612663]]
```

last heads:

```
[[ 114.57677173 -36.64404081  218.27442694  287.38942982]
 [ 26.54734388 -36.18897169 -209.351094   296.84612663]]
```

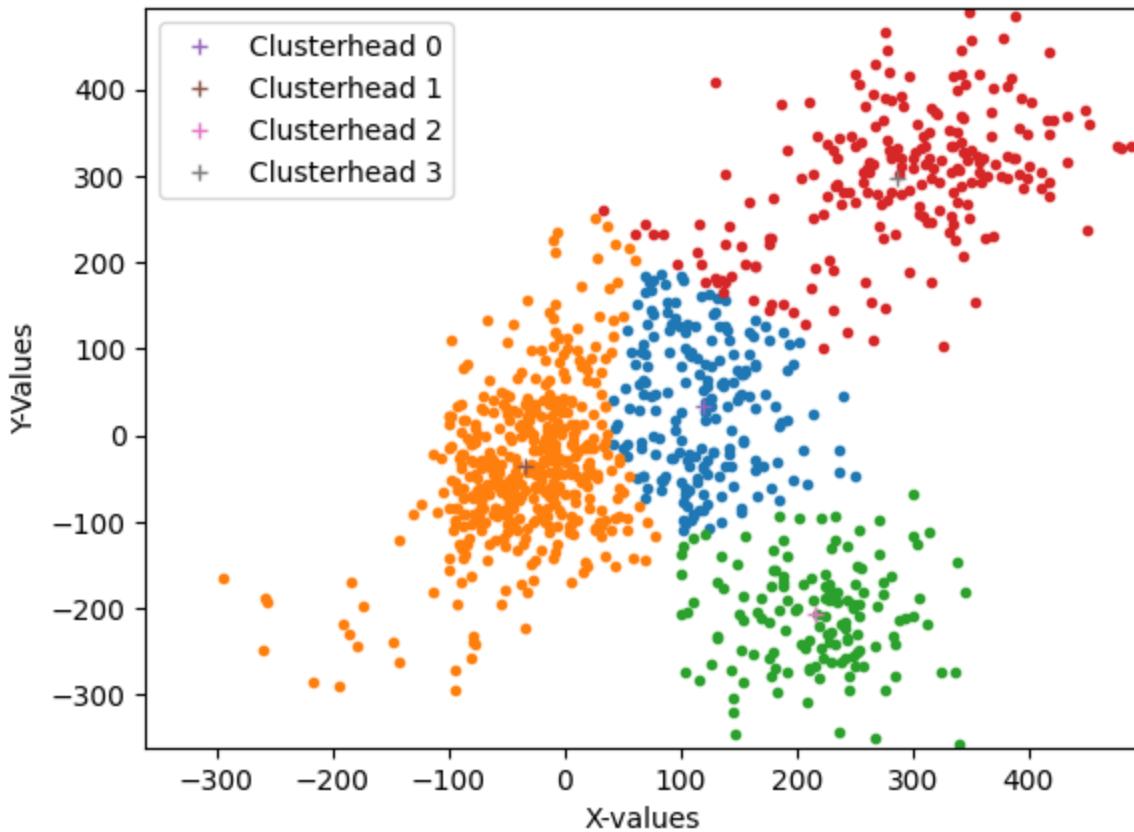
new cluster heads:

```
[[ 118.82856221 -34.02388252  216.05685248  287.38942982]
 [ 34.22882519 -36.7416802   -207.49753721  296.84612663]]
```

last heads:

```
[[ 114.57677173 -36.64404081  218.27442694  287.38942982]
 [ 26.54734388 -36.18897169 -209.351094   296.84612663]]
```

## K-means results



distance between old and new heads: 92.61

new cluster heads:

```
[[ 119.67153334 -34.02388252 216.05685248 287.38942982]
 [ 36.9247644 -36.7416802 -207.49753721 296.84612663]]
```

last heads:

```
[[ 118.82856221 -34.02388252 216.05685248 287.38942982]
 [ 34.22882519 -36.7416802 -207.49753721 296.84612663]]
```

new cluster heads:

```
[[ 119.67153334 -33.39580123 216.05685248 287.38942982]
 [ 36.9247644 -36.79521006 -207.49753721 296.84612663]]
```

last heads:

```
[[ 118.82856221 -34.02388252 216.05685248 287.38942982]
 [ 34.22882519 -36.7416802 -207.49753721 296.84612663]]
```

new cluster heads:

```
[[ 119.67153334 -33.39580123 214.87589681 287.38942982]
 [ 36.9247644 -36.79521006 -206.07501026 296.84612663]]
```

last heads:

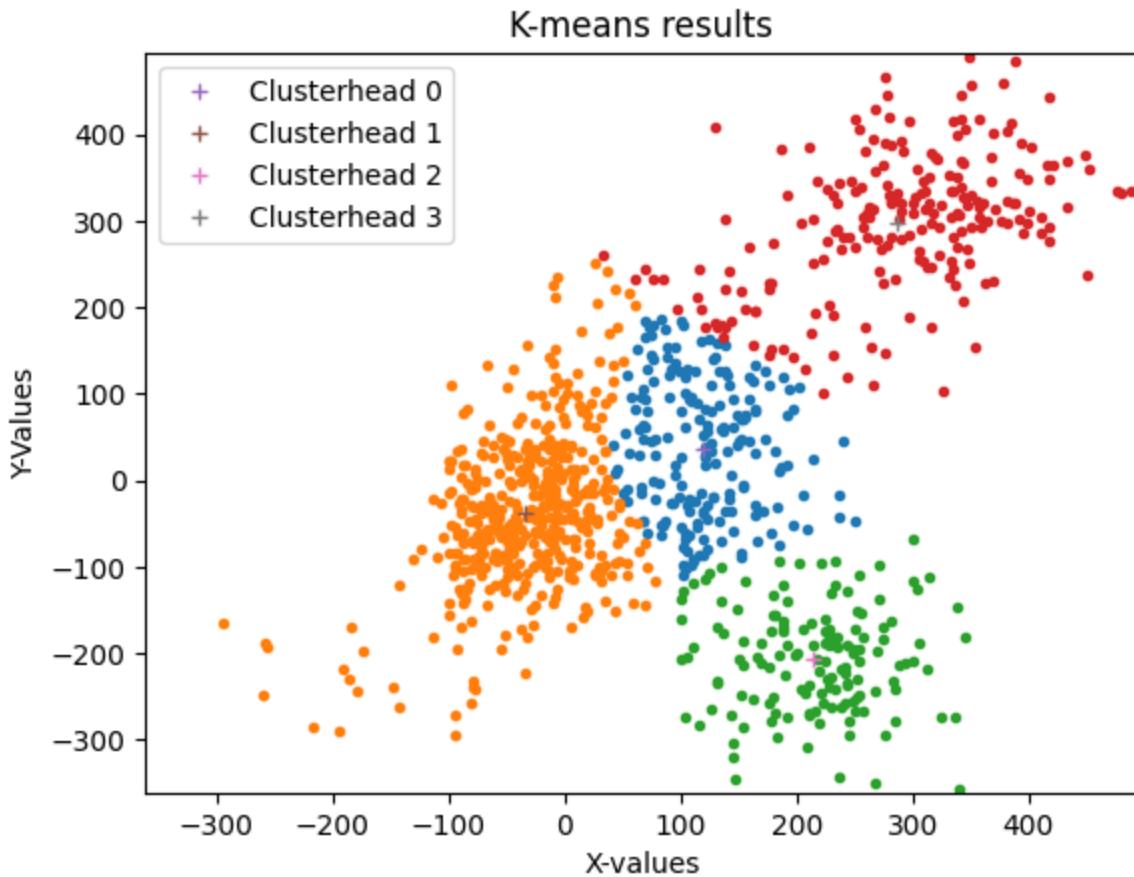
```
[[ 118.82856221 -34.02388252 216.05685248 287.38942982]
 [ 34.22882519 -36.7416802 -207.49753721 296.84612663]]
```

new cluster heads:

```
[[ 119.67153334 -33.39580123 214.87589681 287.38942982]
 [ 36.9247644 -36.79521006 -206.07501026 296.84612663]]
```

last heads:

```
[[ 118.82856221 -34.02388252 216.05685248 287.38942982]
 [ 34.22882519 -36.7416802 -207.49753721 296.84612663]]
```



distance between old and new heads: 11.79

new cluster heads:

```
[[ 120.65462934 -33.39580123 214.87589681 287.38942982]
 [ 38.05137891 -36.79521006 -206.07501026 296.84612663]]
```

last heads:

```
[[ 119.67153334 -33.39580123 214.87589681 287.38942982]
 [ 36.9247644 -36.79521006 -206.07501026 296.84612663]]
```

new cluster heads:

```
[[ 120.65462934 -32.7742142 214.87589681 287.38942982]
 [ 38.05137891 -36.77154638 -206.07501026 296.84612663]]
```

last heads:

```
[[ 119.67153334 -33.39580123 214.87589681 287.38942982]
 [ 36.9247644 -36.79521006 -206.07501026 296.84612663]]
```

new cluster heads:

```
[[ 120.65462934 -32.7742142 214.87589681 287.38942982]
 [ 38.05137891 -36.77154638 -206.07501026 296.84612663]]
```

last heads:

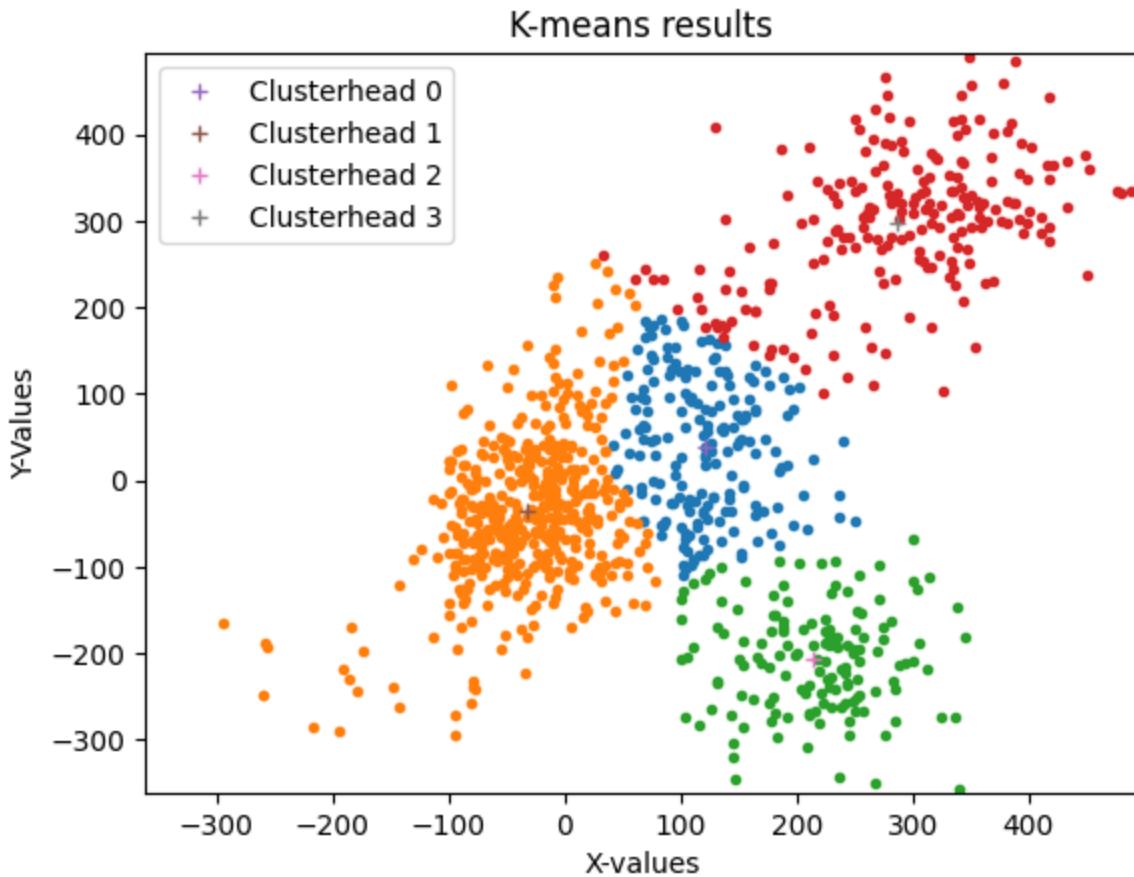
```
[[ 119.67153334 -33.39580123 214.87589681 287.38942982]
 [ 36.9247644 -36.79521006 -206.07501026 296.84612663]]
```

new cluster heads:

```
[[ 120.65462934 -32.7742142 214.87589681 287.38942982]
 [ 38.05137891 -36.77154638 -206.07501026 296.84612663]]
```

last heads:

```
[[ 119.67153334 -33.39580123 214.87589681 287.38942982]
 [ 36.9247644 -36.79521006 -206.07501026 296.84612663]]
```



distance between old and new heads: 2.62

new cluster heads:

```
[[ 120.65462934 -32.7742142   214.87589681  287.38942982]
 [ 38.05137891 -36.77154638 -206.07501026  296.84612663]]
```

last heads:

```
[[ 120.65462934 -32.7742142   214.87589681  287.38942982]
 [ 38.05137891 -36.77154638 -206.07501026  296.84612663]]
```

new cluster heads:

```
[[ 120.65462934 -32.7742142   214.87589681  287.38942982]
 [ 38.05137891 -36.77154638 -206.07501026  296.84612663]]
```

last heads:

```
[[ 120.65462934 -32.7742142   214.87589681  287.38942982]
 [ 38.05137891 -36.77154638 -206.07501026  296.84612663]]
```

new cluster heads:

```
[[ 120.65462934 -32.7742142   214.87589681  287.38942982]
 [ 38.05137891 -36.77154638 -206.07501026  296.84612663]]
```

last heads:

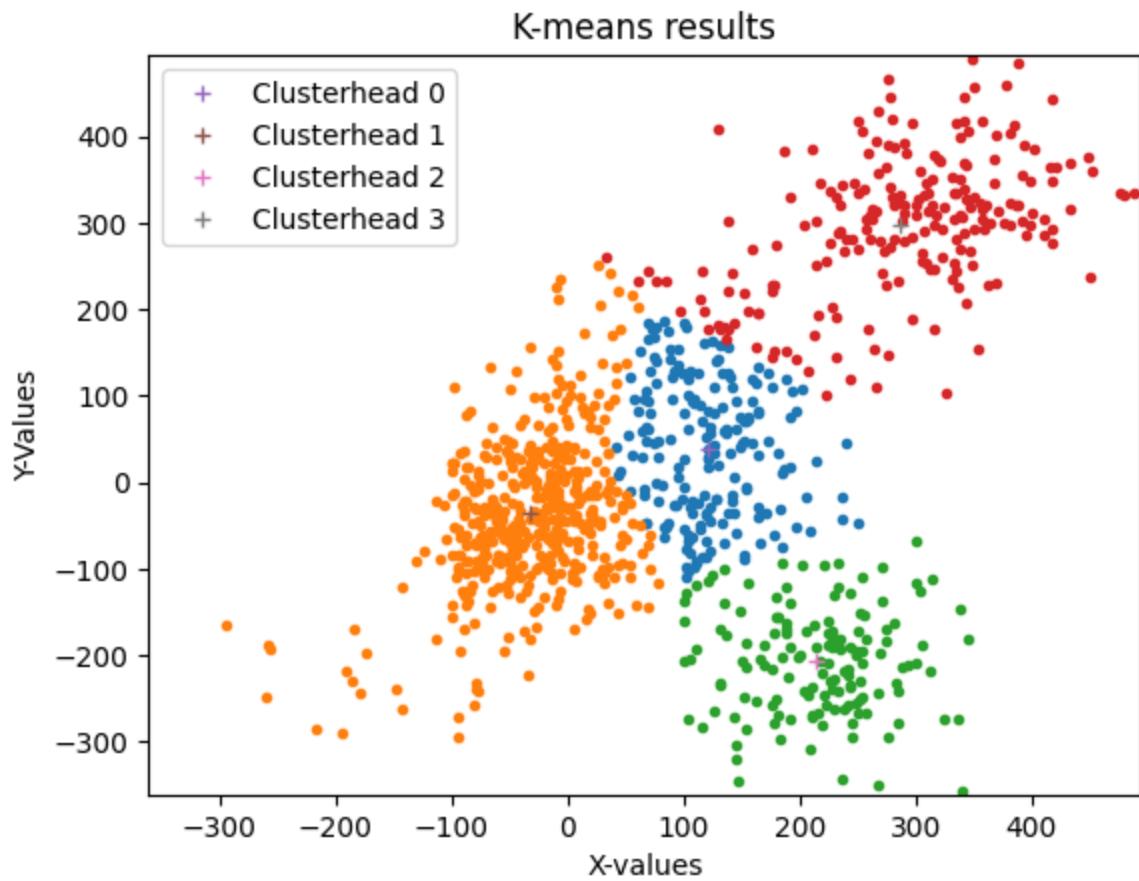
```
[[ 120.65462934 -32.7742142   214.87589681  287.38942982]
 [ 38.05137891 -36.77154638 -206.07501026  296.84612663]]
```

new cluster heads:

```
[[ 120.65462934 -32.7742142   214.87589681  287.38942982]
 [ 38.05137891 -36.77154638 -206.07501026  296.84612663]]
```

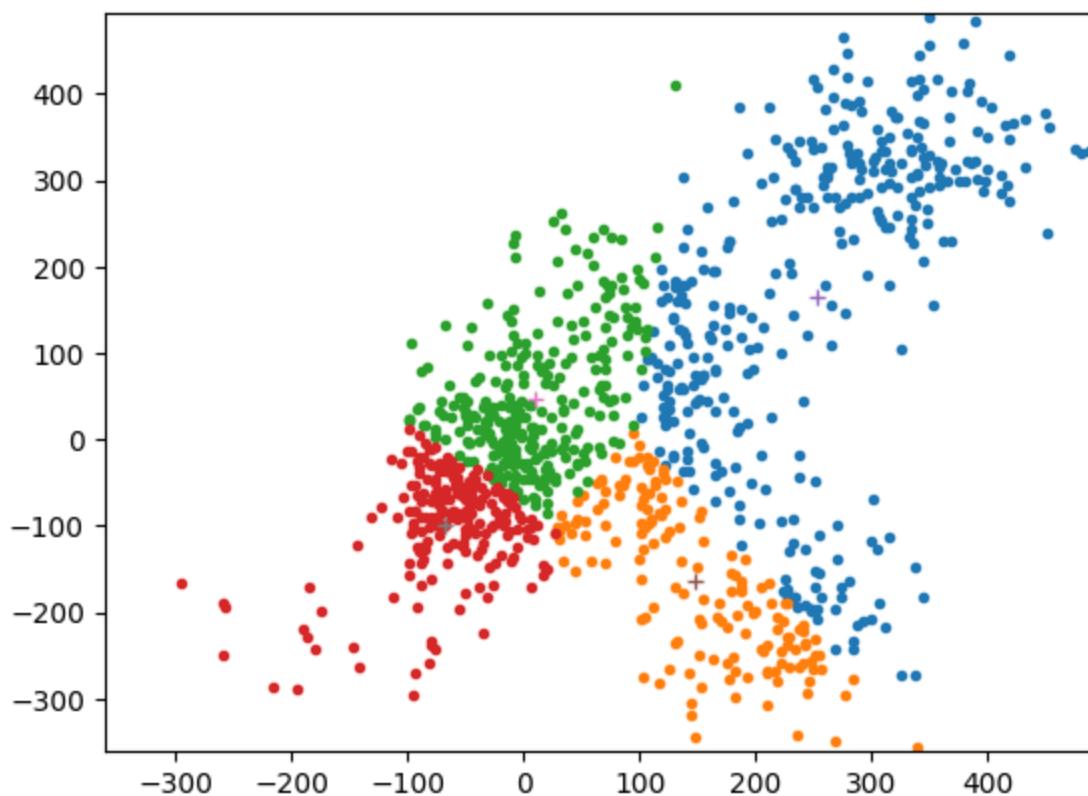
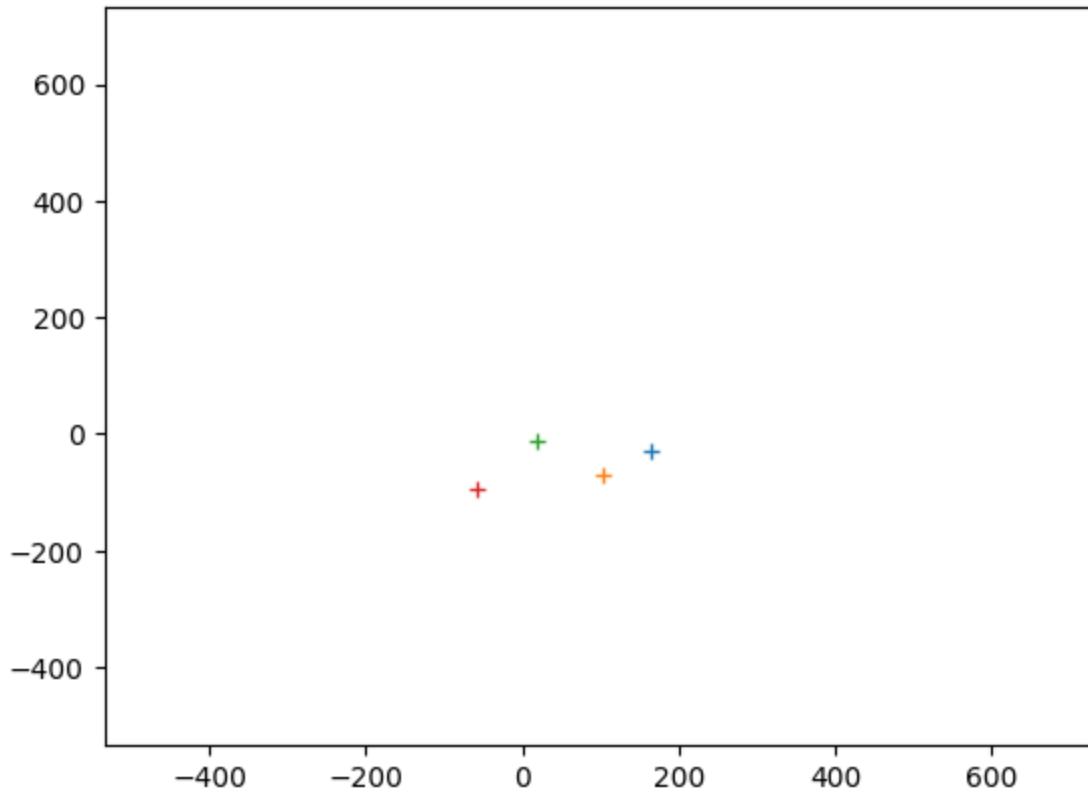
last heads:

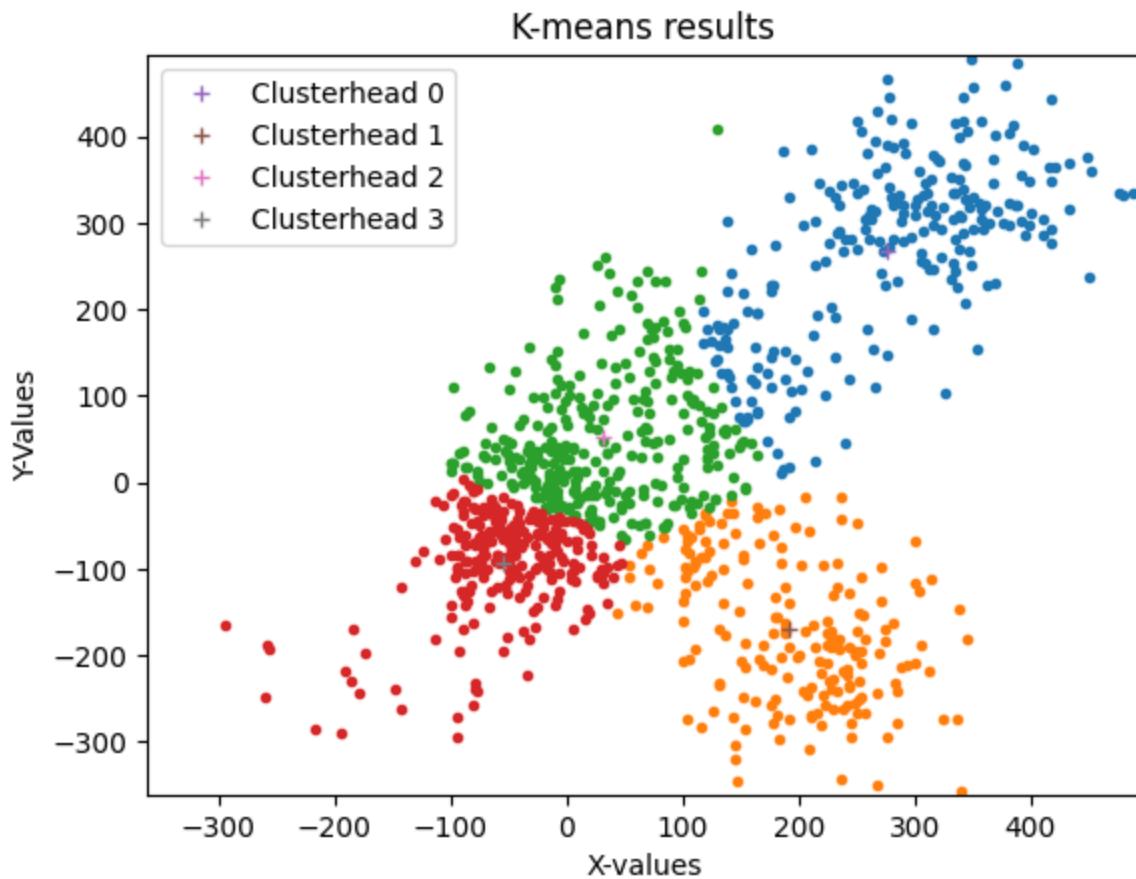
```
[[ 120.65462934 -32.7742142   214.87589681  287.38942982]
 [ 38.05137891 -36.77154638 -206.07501026  296.84612663]]
```



Finished try! Distance between old and new heads: 0.000000

```
new cluster heads:  
[[252.8992536 103.78097232 18.57840682 -58.12504878]  
 [164.50859879 -68.87233654 -10.49937066 -93.06157927]]  
last heads:  
[[164.95152252 103.78097232 18.57840682 -58.12504878]  
 [-28.03378902 -68.87233654 -10.49937066 -93.06157927]]  
new cluster heads:  
[[ 252.8992536 148.56172805 18.57840682 -58.12504878]  
 [ 164.50859879 -164.25488288 -10.49937066 -93.06157927]]  
last heads:  
[[164.95152252 103.78097232 18.57840682 -58.12504878]  
 [-28.03378902 -68.87233654 -10.49937066 -93.06157927]]  
new cluster heads:  
[[ 252.8992536 148.56172805 9.78109408 -58.12504878]  
 [ 164.50859879 -164.25488288 47.68847922 -93.06157927]]  
last heads:  
[[164.95152252 103.78097232 18.57840682 -58.12504878]  
 [-28.03378902 -68.87233654 -10.49937066 -93.06157927]]  
new cluster heads:  
[[ 252.8992536 148.56172805 9.78109408 -66.95115407]  
 [ 164.50859879 -164.25488288 47.68847922 -98.56829761]]  
last heads:  
[[164.95152252 103.78097232 18.57840682 -58.12504878]  
 [-28.03378902 -68.87233654 -10.49937066 -93.06157927]]  
distance between old and new heads: 59481.96  
new cluster heads:  
[[ 276.43121883 148.56172805 9.78109408 -66.95115407]  
 [ 268.34446329 -164.25488288 47.68847922 -98.56829761]]  
last heads:  
[[ 252.8992536 148.56172805 9.78109408 -66.95115407]  
 [ 164.50859879 -164.25488288 47.68847922 -98.56829761]]  
new cluster heads:  
[[ 276.43121883 192.08040126 9.78109408 -66.95115407]  
 [ 268.34446329 -170.3427117 47.68847922 -98.56829761]]  
last heads:  
[[ 252.8992536 148.56172805 9.78109408 -66.95115407]  
 [ 164.50859879 -164.25488288 47.68847922 -98.56829761]]  
new cluster heads:  
[[ 276.43121883 192.08040126 31.19974072 -66.95115407]  
 [ 268.34446329 -170.3427117 51.80611005 -98.56829761]]  
last heads:  
[[ 252.8992536 148.56172805 9.78109408 -66.95115407]  
 [ 164.50859879 -164.25488288 47.68847922 -98.56829761]]  
new cluster heads:  
[[ 276.43121883 192.08040126 31.19974072 -54.91648403]  
 [ 268.34446329 -170.3427117 51.80611005 -93.15023961]]  
last heads:  
[[ 252.8992536 148.56172805 9.78109408 -66.95115407]  
 [ 164.50859879 -164.25488288 47.68847922 -98.56829761]]
```





distance between old and new heads: 13916.48

new cluster heads:

```
[[ 300.75674043  192.08040126  31.19974072 -54.91648403]
 [ 301.43186366 -170.3427117   51.80611005 -93.15023961]]
```

last heads:

```
[[ 276.43121883  192.08040126  31.19974072 -54.91648403]
 [ 268.34446329 -170.3427117   51.80611005 -93.15023961]]
```

new cluster heads:

```
[[ 300.75674043  201.7630107   31.19974072 -54.91648403]
 [ 301.43186366 -180.43655436   51.80611005 -93.15023961]]
```

last heads:

```
[[ 276.43121883  192.08040126  31.19974072 -54.91648403]
 [ 268.34446329 -170.3427117   51.80611005 -93.15023961]]
```

new cluster heads:

```
[[ 300.75674043  201.7630107   55.9704469  -54.91648403]
 [ 301.43186366 -180.43655436   62.44034562 -93.15023961]]
```

last heads:

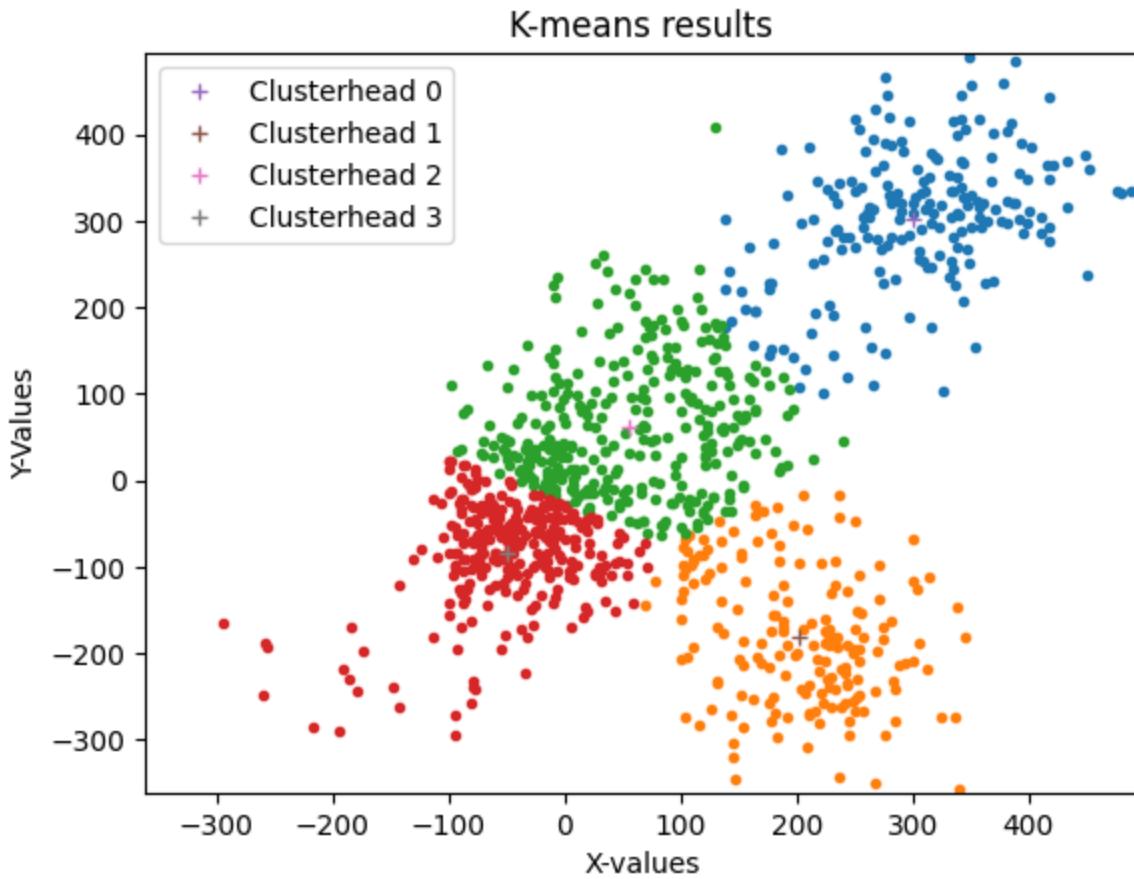
```
[[ 276.43121883  192.08040126  31.19974072 -54.91648403]
 [ 268.34446329 -170.3427117   51.80611005 -93.15023961]]
```

new cluster heads:

```
[[ 300.75674043  201.7630107   55.9704469  -48.95536551]
 [ 301.43186366 -180.43655436   62.44034562 -84.67086063]]
```

last heads:

```
[[ 276.43121883  192.08040126  31.19974072 -54.91648403]
 [ 268.34446329 -170.3427117   51.80611005 -93.15023961]]
```



distance between old and new heads: 2716.26

new cluster heads:

```
[[ 310.2911499  201.7630107   55.9704469  -48.95536551]
 [ 311.98950055 -180.43655436   62.44034562  -84.67086063]]
```

last heads:

```
[[ 300.75674043  201.7630107   55.9704469  -48.95536551]
 [ 301.43186366 -180.43655436   62.44034562  -84.67086063]]
```

new cluster heads:

```
[[ 310.2911499  204.93846594   55.9704469  -48.95536551]
 [ 311.98950055 -183.96537762   62.44034562  -84.67086063]]
```

last heads:

```
[[ 300.75674043  201.7630107   55.9704469  -48.95536551]
 [ 301.43186366 -180.43655436   62.44034562  -84.67086063]]
```

new cluster heads:

```
[[ 310.2911499  204.93846594   69.59308256  -48.95536551]
 [ 311.98950055 -183.96537762   71.66445669  -84.67086063]]
```

last heads:

```
[[ 300.75674043  201.7630107   55.9704469  -48.95536551]
 [ 301.43186366 -180.43655436   62.44034562  -84.67086063]]
```

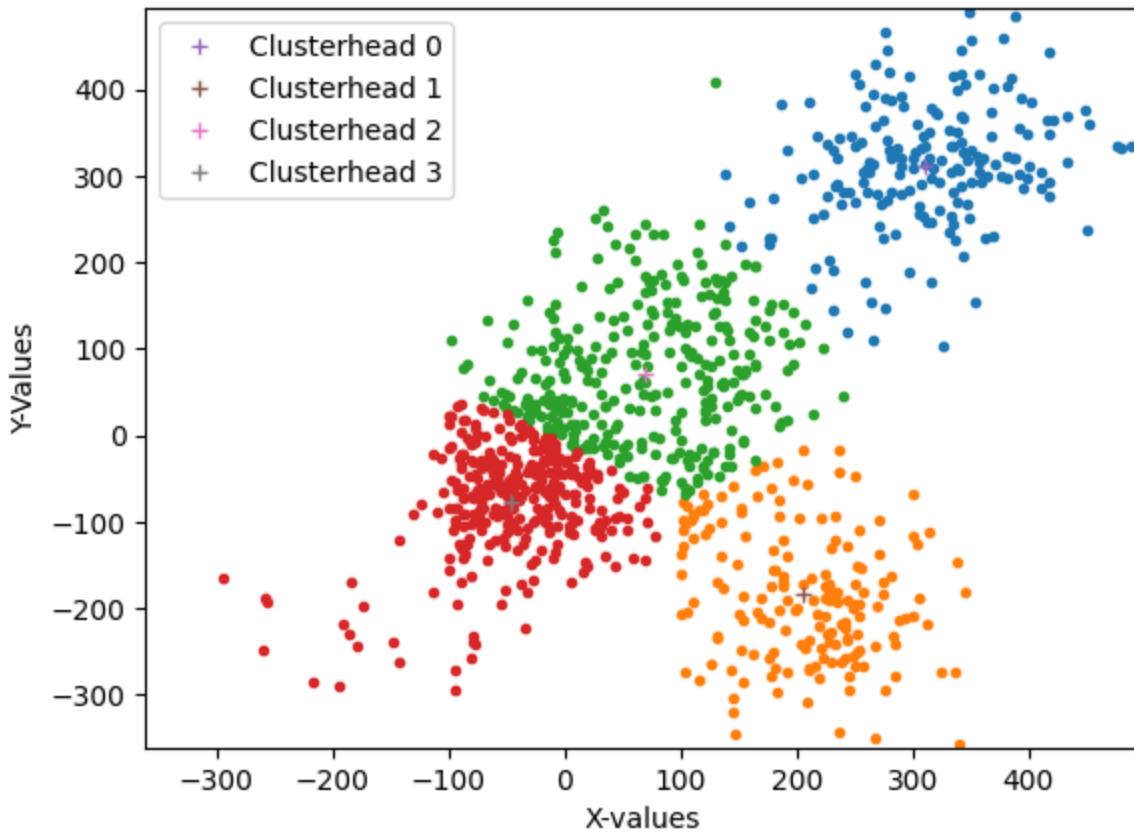
new cluster heads:

```
[[ 310.2911499  204.93846594   69.59308256  -45.64638174]
 [ 311.98950055 -183.96537762   71.66445669  -77.2395011 ]]
```

last heads:

```
[[ 300.75674043  201.7630107   55.9704469  -48.95536551]
 [ 301.43186366 -180.43655436   62.44034562  -84.67086063]]
```

## K-means results



distance between old and new heads: 561.74

new cluster heads:

```
[[ 312.7578967  204.93846594  69.59308256 -45.64638174]
 [ 316.40477058 -183.96537762  71.66445669 -77.2395011 ]]
```

last heads:

```
[[ 310.2911499  204.93846594  69.59308256 -45.64638174]
 [ 311.98950055 -183.96537762  71.66445669 -77.2395011 ]]
```

new cluster heads:

```
[[ 312.7578967  206.12051503  69.59308256 -45.64638174]
 [ 316.40477058 -188.20968992  71.66445669 -77.2395011 ]]
```

last heads:

```
[[ 310.2911499  204.93846594  69.59308256 -45.64638174]
 [ 311.98950055 -183.96537762  71.66445669 -77.2395011 ]]
```

new cluster heads:

```
[[ 312.7578967  206.12051503  81.53074831 -45.64638174]
 [ 316.40477058 -188.20968992  79.46005847 -77.2395011 ]]
```

last heads:

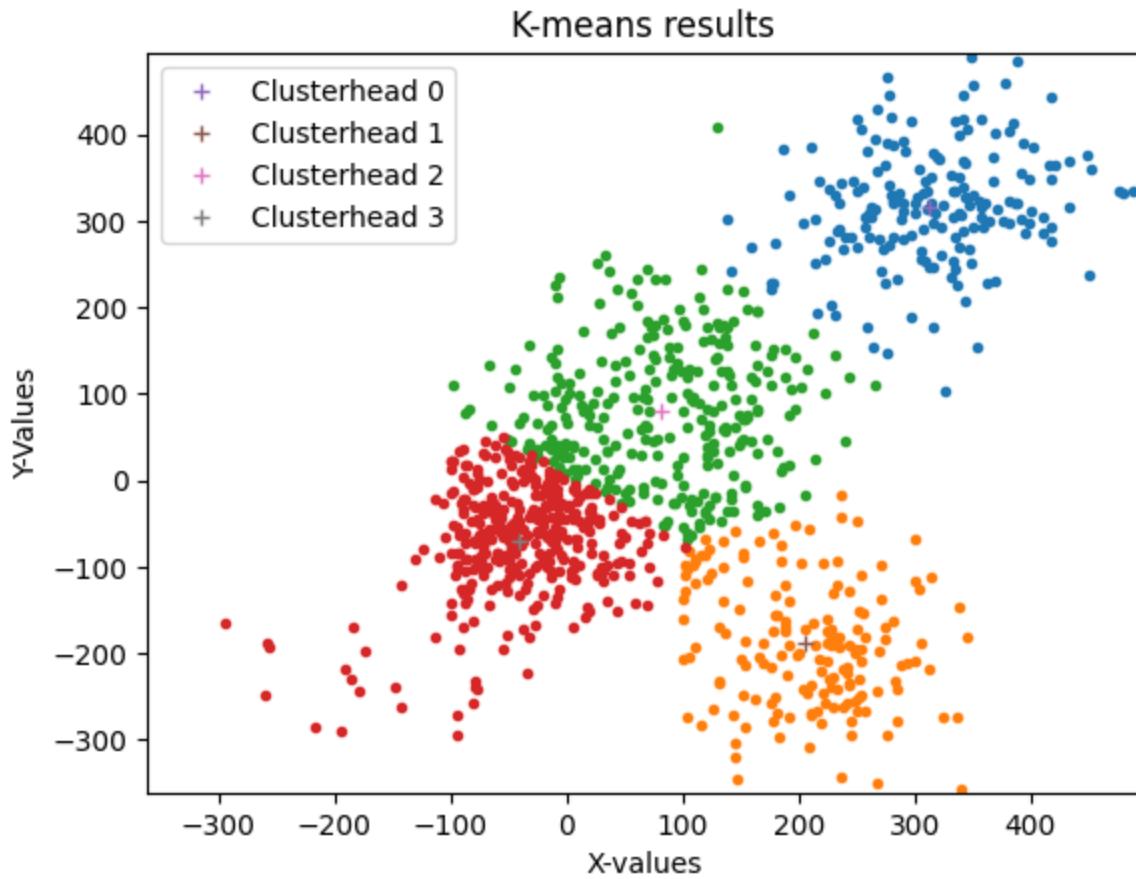
```
[[ 310.2911499  204.93846594  69.59308256 -45.64638174]
 [ 311.98950055 -183.96537762  71.66445669 -77.2395011 ]]
```

new cluster heads:

```
[[ 312.7578967  206.12051503  81.53074831 -41.18927339]
 [ 316.40477058 -188.20968992  79.46005847 -70.11560501]]
```

last heads:

```
[[ 310.2911499  204.93846594  69.59308256 -45.64638174]
 [ 311.98950055 -183.96537762  71.66445669 -77.2395011 ]]
```



distance between old and new heads: 318.89

new cluster heads:

```
[[ 313.71182928  206.12051503   81.53074831  -41.18927339]
 [ 316.81446931 -188.20968992   79.46005847  -70.11560501]]
```

last heads:

```
[[ 312.7578967   206.12051503   81.53074831  -41.18927339]
 [ 316.40477058 -188.20968992   79.46005847  -70.11560501]]
```

new cluster heads:

```
[[ 313.71182928  206.12051503   81.53074831  -41.18927339]
 [ 316.81446931 -188.20968992   79.46005847  -70.11560501]]
```

last heads:

```
[[ 312.7578967   206.12051503   81.53074831  -41.18927339]
 [ 316.40477058 -188.20968992   79.46005847  -70.11560501]]
```

new cluster heads:

```
[[ 313.71182928  206.12051503   90.29721728  -41.18927339]
 [ 316.81446931 -188.20968992   86.64294092  -70.11560501]]
```

last heads:

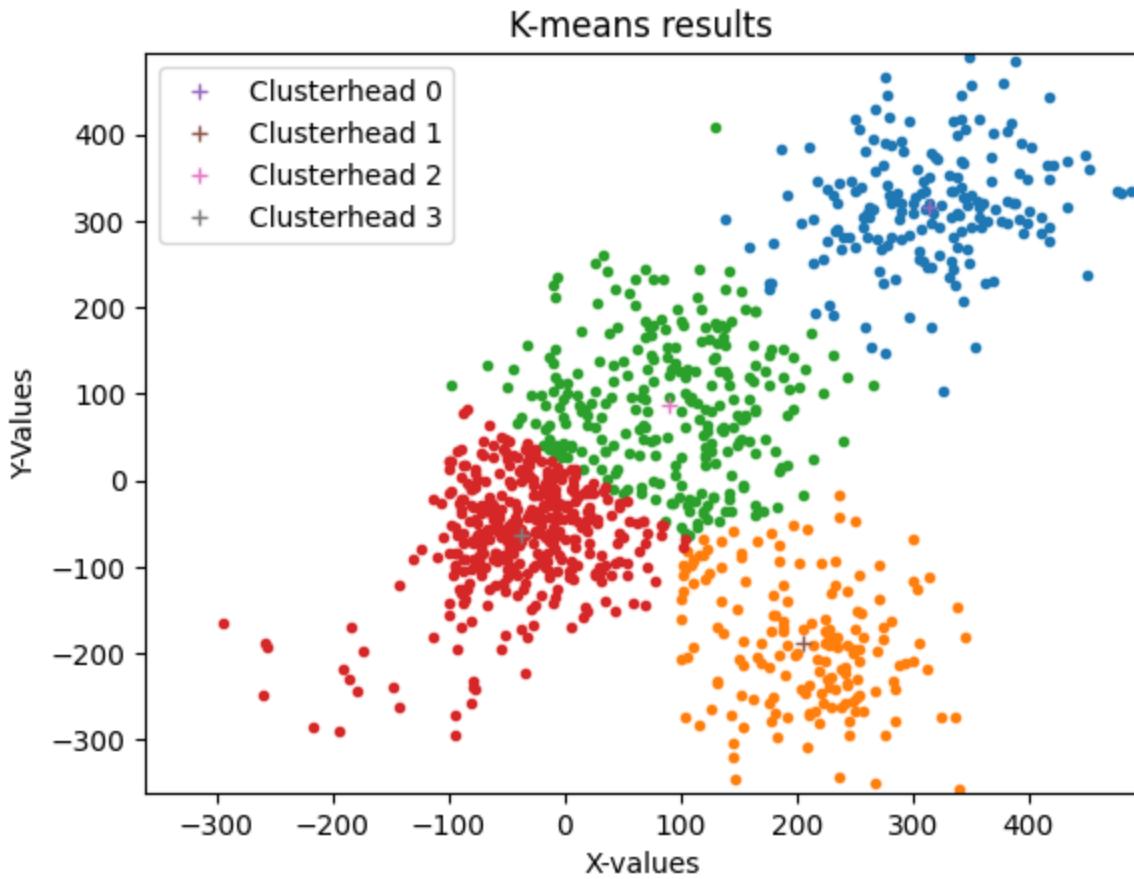
```
[[ 312.7578967   206.12051503   81.53074831  -41.18927339]
 [ 316.40477058 -188.20968992   79.46005847  -70.11560501]]
```

new cluster heads:

```
[[ 313.71182928  206.12051503   90.29721728  -38.41306239]
 [ 316.81446931 -188.20968992   86.64294092  -64.00601802]]
```

last heads:

```
[[ 312.7578967   206.12051503   81.53074831  -41.18927339]
 [ 316.40477058 -188.20968992   79.46005847  -70.11560501]]
```



distance between old and new heads: 174.56

new cluster heads:

```
[[ 314.48385906  206.12051503   90.29721728  -38.41306239]
 [ 317.34533402 -188.20968992   86.64294092  -64.00601802]]
```

last heads:

```
[[ 313.71182928  206.12051503   90.29721728  -38.41306239]
 [ 316.81446931 -188.20968992   86.64294092  -64.00601802]]
```

new cluster heads:

```
[[ 314.48385906  206.71775307   90.29721728  -38.41306239]
 [ 317.34533402 -188.84811979   86.64294092  -64.00601802]]
```

last heads:

```
[[ 313.71182928  206.12051503   90.29721728  -38.41306239]
 [ 316.81446931 -188.20968992   86.64294092  -64.00601802]]
```

new cluster heads:

```
[[ 314.48385906  206.71775307   95.36996498  -38.41306239]
 [ 317.34533402 -188.84811979   92.38847428  -64.00601802]]
```

last heads:

```
[[ 313.71182928  206.12051503   90.29721728  -38.41306239]
 [ 316.81446931 -188.20968992   86.64294092  -64.00601802]]
```

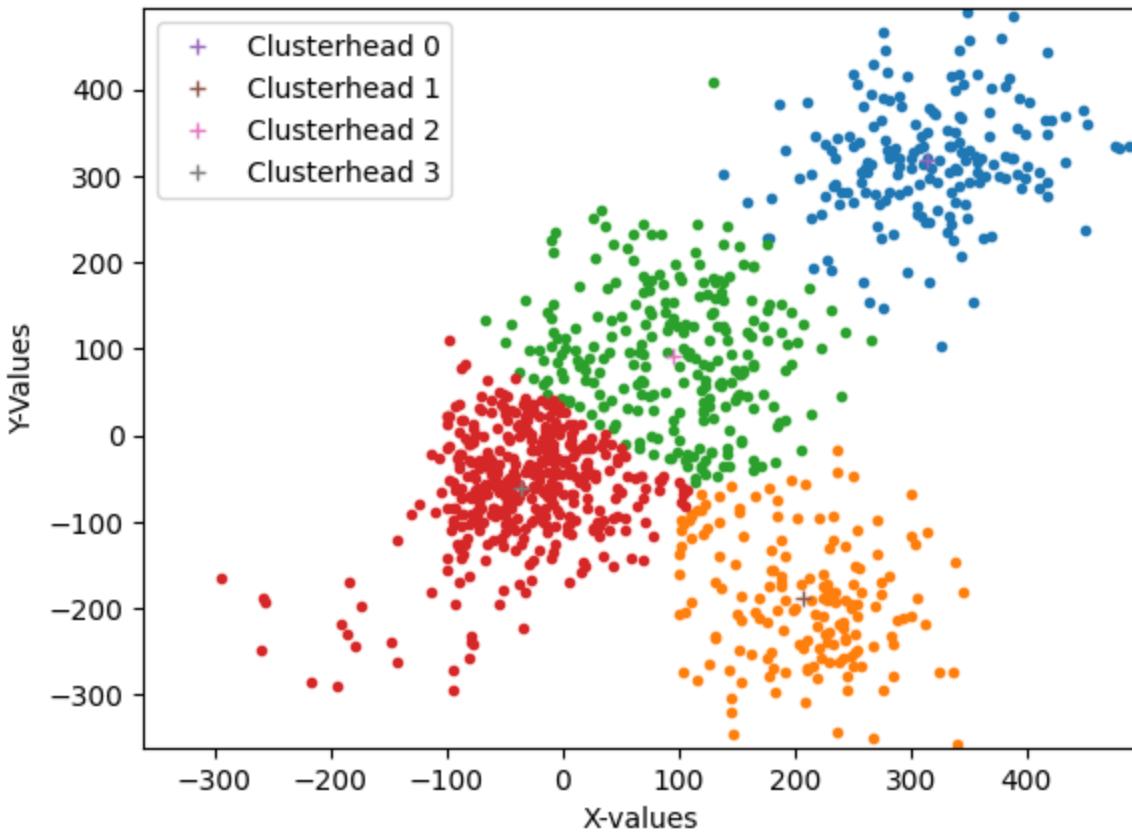
new cluster heads:

```
[[ 314.48385906  206.71775307   95.36996498  -35.48861787]
 [ 317.34533402 -188.84811979   92.38847428  -60.84355427]]
```

last heads:

```
[[ 313.71182928  206.12051503   90.29721728  -38.41306239]
 [ 316.81446931 -188.20968992   86.64294092  -64.00601802]]
```

## K-means results



distance between old and new heads: 78.94

new cluster heads:

```
[[ 316.60778821  206.71775307  95.36996498 -35.48861787]
 [ 319.06171529 -188.84811979  92.38847428 -60.84355427]]
```

last heads:

```
[[ 314.48385906  206.71775307  95.36996498 -35.48861787]
 [ 317.34533402 -188.84811979  92.38847428 -60.84355427]]
```

new cluster heads:

```
[[ 316.60778821  206.71775307  95.36996498 -35.48861787]
 [ 319.06171529 -188.84811979  92.38847428 -60.84355427]]
```

last heads:

```
[[ 314.48385906  206.71775307  95.36996498 -35.48861787]
 [ 317.34533402 -188.84811979  92.38847428 -60.84355427]]
```

new cluster heads:

```
[[ 316.60778821  206.71775307  97.89602283 -35.48861787]
 [ 319.06171529 -188.84811979  94.86431508 -60.84355427]]
```

last heads:

```
[[ 314.48385906  206.71775307  95.36996498 -35.48861787]
 [ 317.34533402 -188.84811979  92.38847428 -60.84355427]]
```

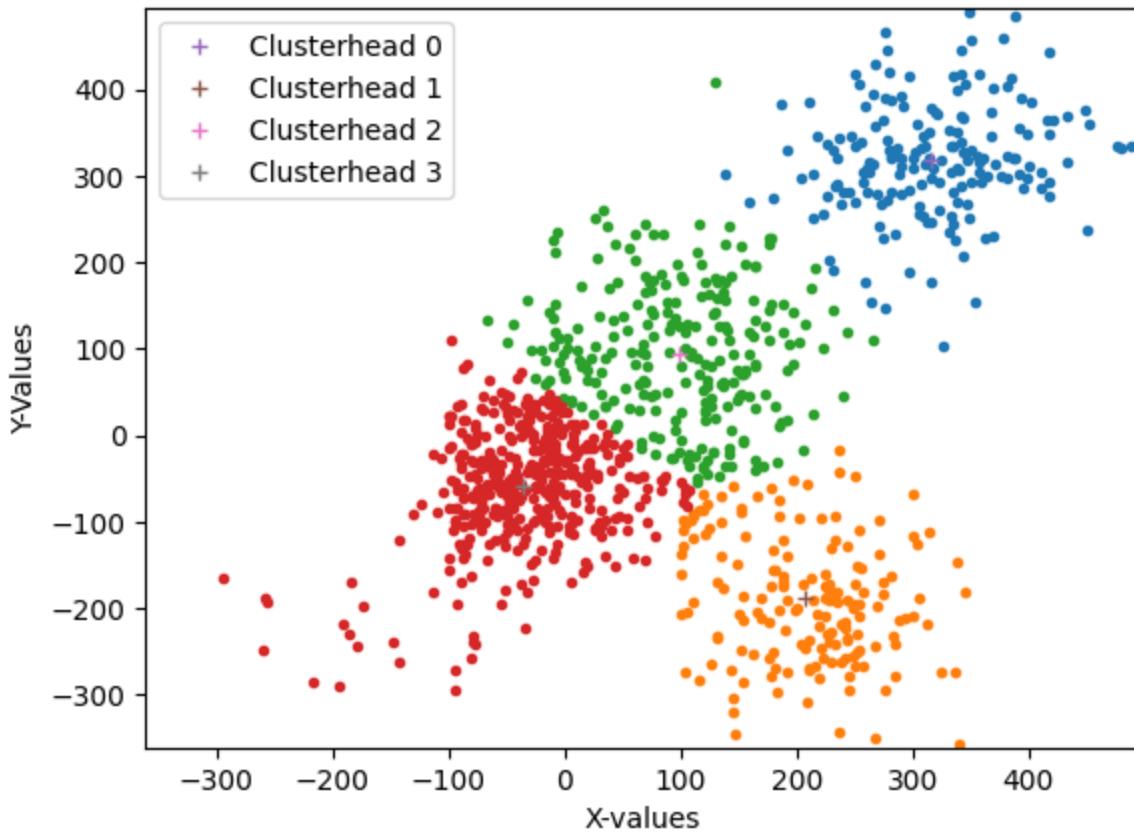
new cluster heads:

```
[[ 316.60778821  206.71775307  97.89602283 -35.0403154 ]
 [ 319.06171529 -188.84811979  94.86431508 -59.91350079]]
```

last heads:

```
[[ 314.48385906  206.71775307  95.36996498 -35.48861787]
 [ 317.34533402 -188.84811979  92.38847428 -60.84355427]]
```

## K-means results



distance between old and new heads: 21.03

new cluster heads:

```
[[ 316.60778821  206.71775307  97.89602283 -35.0403154 ]
 [ 319.06171529 -188.84811979  94.86431508 -59.91350079]]
```

last heads:

```
[[ 316.60778821  206.71775307  97.89602283 -35.0403154 ]
 [ 319.06171529 -188.84811979  94.86431508 -59.91350079]]
```

new cluster heads:

```
[[ 316.60778821  206.71775307  97.89602283 -35.0403154 ]
 [ 319.06171529 -188.84811979  94.86431508 -59.91350079]]
```

last heads:

```
[[ 316.60778821  206.71775307  97.89602283 -35.0403154 ]
 [ 319.06171529 -188.84811979  94.86431508 -59.91350079]]
```

new cluster heads:

```
[[ 316.60778821  206.71775307  98.74230078 -35.0403154 ]
 [ 319.06171529 -188.84811979  96.35513845 -59.91350079]]
```

last heads:

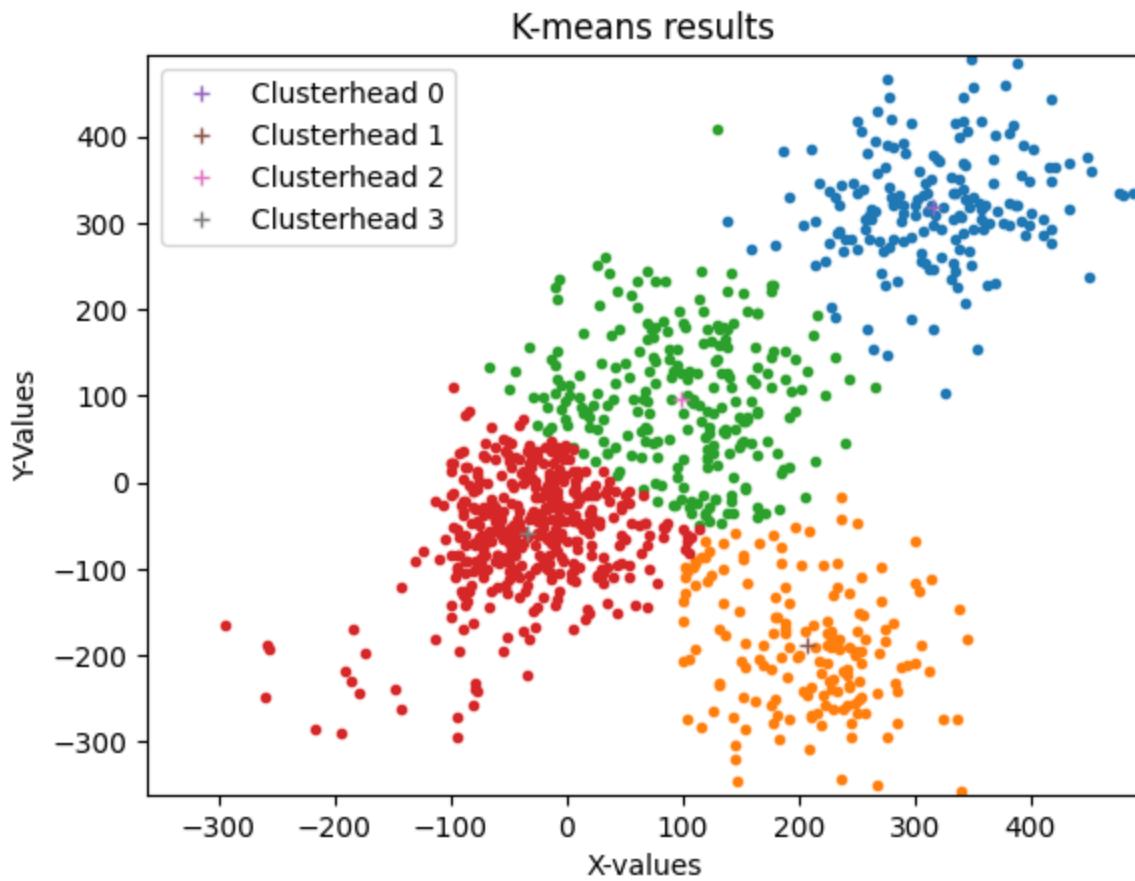
```
[[ 316.60778821  206.71775307  97.89602283 -35.0403154 ]
 [ 319.06171529 -188.84811979  94.86431508 -59.91350079]]
```

new cluster heads:

```
[[ 316.60778821  206.71775307  98.74230078 -34.23131975]
 [ 319.06171529 -188.84811979  96.35513845 -59.28043461]]
```

last heads:

```
[[ 316.60778821  206.71775307  97.89602283 -35.0403154 ]
 [ 319.06171529 -188.84811979  94.86431508 -59.91350079]]
```



distance between old and new heads: 3.99

new cluster heads:

```
[[ 316.60778821  206.71775307  98.74230078 -34.23131975]
 [ 319.06171529 -188.84811979  96.35513845 -59.28043461]]
```

last heads:

```
[[ 316.60778821  206.71775307  98.74230078 -34.23131975]
 [ 319.06171529 -188.84811979  96.35513845 -59.28043461]]
```

new cluster heads:

```
[[ 316.60778821  206.71775307  98.74230078 -34.23131975]
 [ 319.06171529 -188.84811979  96.35513845 -59.28043461]]
```

last heads:

```
[[ 316.60778821  206.71775307  98.74230078 -34.23131975]
 [ 319.06171529 -188.84811979  96.35513845 -59.28043461]]
```

new cluster heads:

```
[[ 316.60778821  206.71775307  101.02258628 -34.23131975]
 [ 319.06171529 -188.84811979  97.80303819 -59.28043461]]
```

last heads:

```
[[ 316.60778821  206.71775307  98.74230078 -34.23131975]
 [ 319.06171529 -188.84811979  96.35513845 -59.28043461]]
```

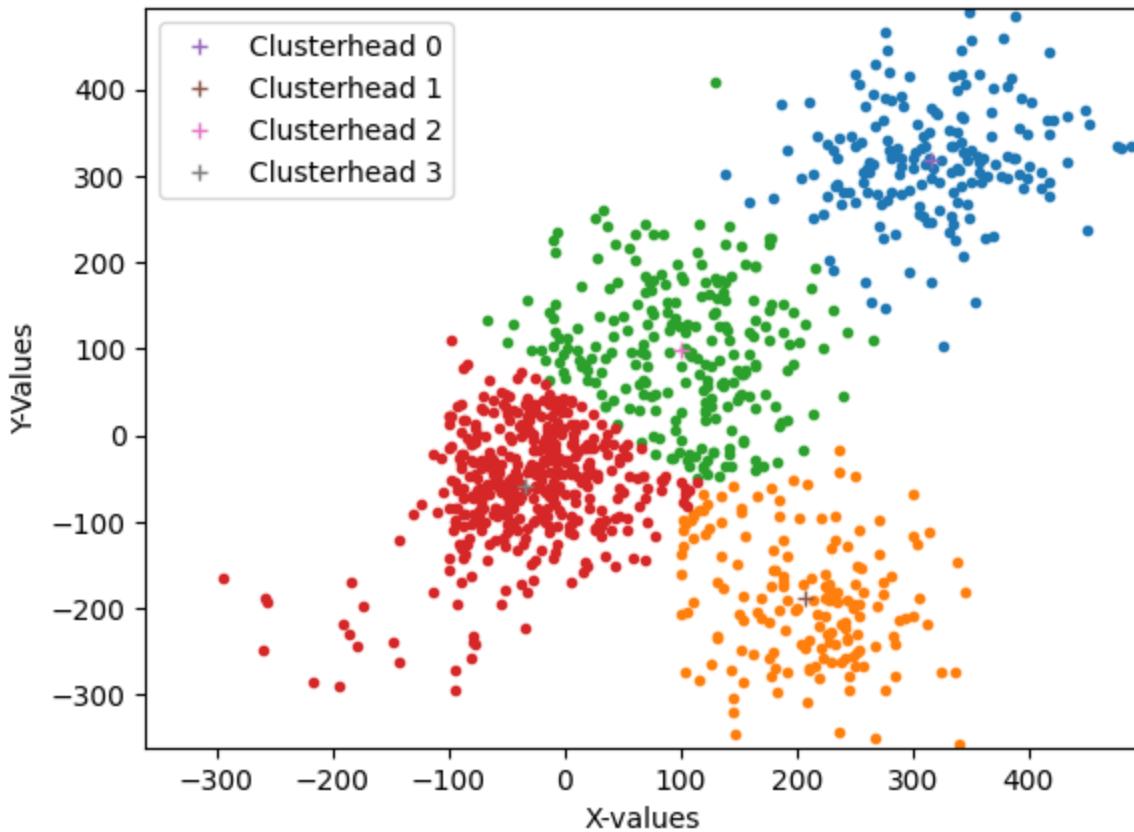
new cluster heads:

```
[[ 316.60778821  206.71775307  101.02258628 -33.61005811]
 [ 319.06171529 -188.84811979  97.80303819 -57.83629358]]
```

last heads:

```
[[ 316.60778821  206.71775307  98.74230078 -34.23131975]
 [ 319.06171529 -188.84811979  96.35513845 -59.28043461]]
```

## K-means results



distance between old and new heads: 9.77

new cluster heads:

```
[[ 316.60778821  206.71775307  101.02258628  -33.61005811]
 [ 319.06171529 -188.84811979   97.80303819  -57.83629358]]
```

last heads:

```
[[ 316.60778821  206.71775307  101.02258628  -33.61005811]
 [ 319.06171529 -188.84811979   97.80303819  -57.83629358]]
```

new cluster heads:

```
[[ 316.60778821  206.71775307  101.02258628  -33.61005811]
 [ 319.06171529 -188.84811979   97.80303819  -57.83629358]]
```

last heads:

```
[[ 316.60778821  206.71775307  101.02258628  -33.61005811]
 [ 319.06171529 -188.84811979   97.80303819  -57.83629358]]
```

new cluster heads:

```
[[ 316.60778821  206.71775307  101.21753852  -33.61005811]
 [ 319.06171529 -188.84811979   99.37772292  -57.83629358]]
```

last heads:

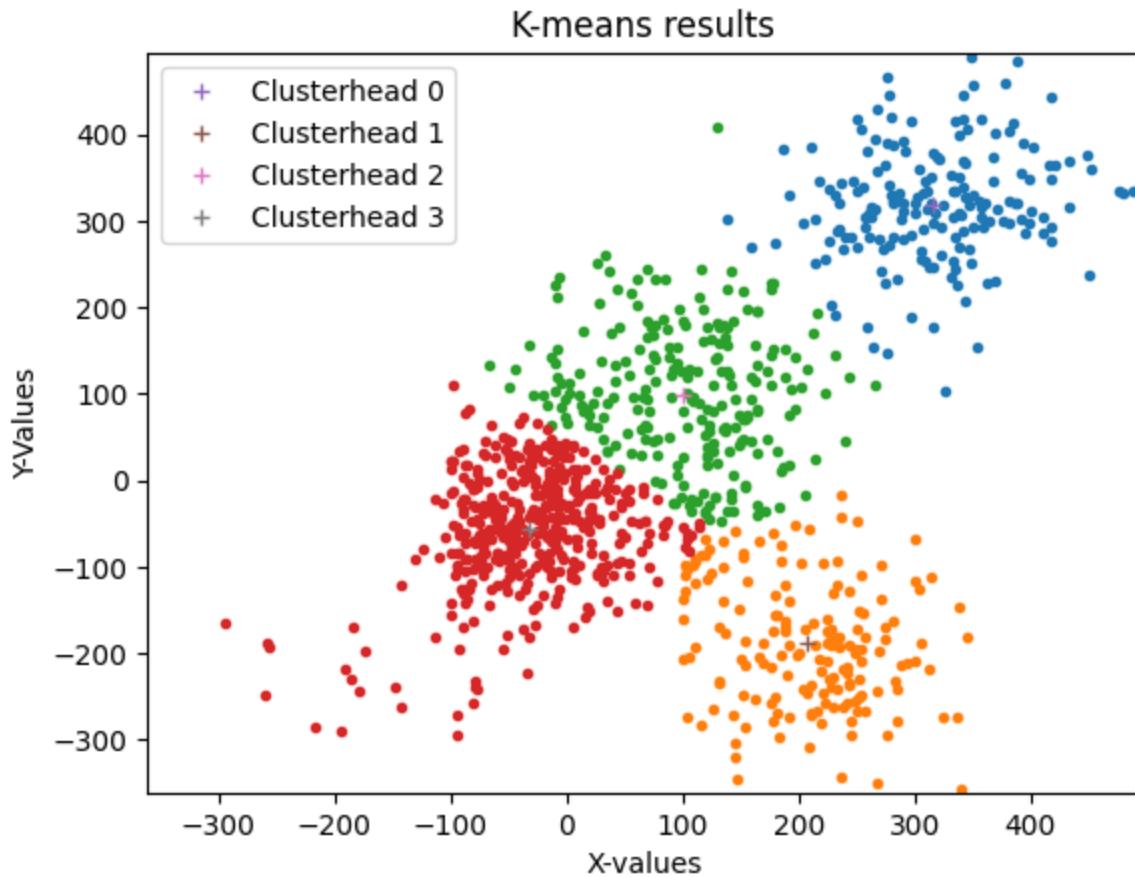
```
[[ 316.60778821  206.71775307  101.02258628  -33.61005811]
 [ 319.06171529 -188.84811979   97.80303819  -57.83629358]]
```

new cluster heads:

```
[[ 316.60778821  206.71775307  101.21753852  -32.73715761]
 [ 319.06171529 -188.84811979   99.37772292  -57.6038731 ]]
```

last heads:

```
[[ 316.60778821  206.71775307  101.02258628  -33.61005811]
 [ 319.06171529 -188.84811979   97.80303819  -57.83629358]]
```



distance between old and new heads: 3.33

new cluster heads:

```
[[ 316.9048315  206.71775307  101.21753852 -32.73715761]
 [ 320.00202926 -188.84811979   99.37772292 -57.6038731 ]]
```

last heads:

```
[[ 316.60778821  206.71775307  101.21753852 -32.73715761]
 [ 319.06171529 -188.84811979   99.37772292 -57.6038731 ]]
```

new cluster heads:

```
[[ 316.9048315  206.46880015  101.21753852 -32.73715761]
 [ 320.00202926 -187.97288351   99.37772292 -57.6038731 ]]
```

last heads:

```
[[ 316.60778821  206.71775307  101.21753852 -32.73715761]
 [ 319.06171529 -188.84811979   99.37772292 -57.6038731 ]]
```

new cluster heads:

```
[[ 316.9048315  206.46880015  101.64118472 -32.73715761]
 [ 320.00202926 -187.97288351  100.20585834 -57.6038731 ]]
```

last heads:

```
[[ 316.60778821  206.71775307  101.21753852 -32.73715761]
 [ 319.06171529 -188.84811979   99.37772292 -57.6038731 ]]
```

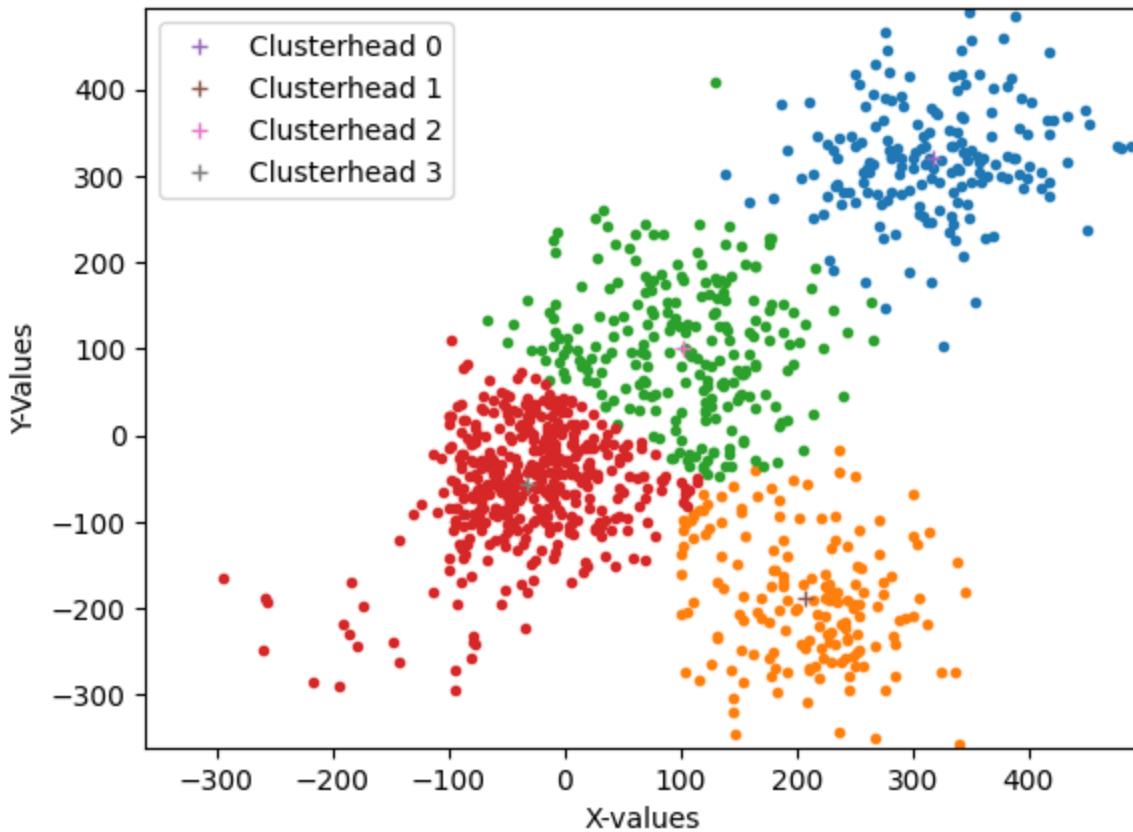
new cluster heads:

```
[[ 316.9048315  206.46880015  101.64118472 -32.73715761]
 [ 320.00202926 -187.97288351  100.20585834 -57.6038731 ]]
```

last heads:

```
[[ 316.60778821  206.71775307  101.21753852 -32.73715761]
 [ 319.06171529 -188.84811979   99.37772292 -57.6038731 ]]
```

## K-means results



distance between old and new heads: 2.67

new cluster heads:

```
[[ 316.9048315  206.46880015  101.64118472 -32.73715761]
 [ 320.00202926 -187.97288351  100.20585834 -57.6038731 ]]
```

last heads:

```
[[ 316.9048315  206.46880015  101.64118472 -32.73715761]
 [ 320.00202926 -187.97288351  100.20585834 -57.6038731 ]]
```

new cluster heads:

```
[[ 316.9048315  206.46880015  101.64118472 -32.73715761]
 [ 320.00202926 -187.97288351  100.20585834 -57.6038731 ]]
```

last heads:

```
[[ 316.9048315  206.46880015  101.64118472 -32.73715761]
 [ 320.00202926 -187.97288351  100.20585834 -57.6038731 ]]
```

new cluster heads:

```
[[ 316.9048315  206.46880015  101.64118472 -32.73715761]
 [ 320.00202926 -187.97288351  100.20585834 -57.6038731 ]]
```

last heads:

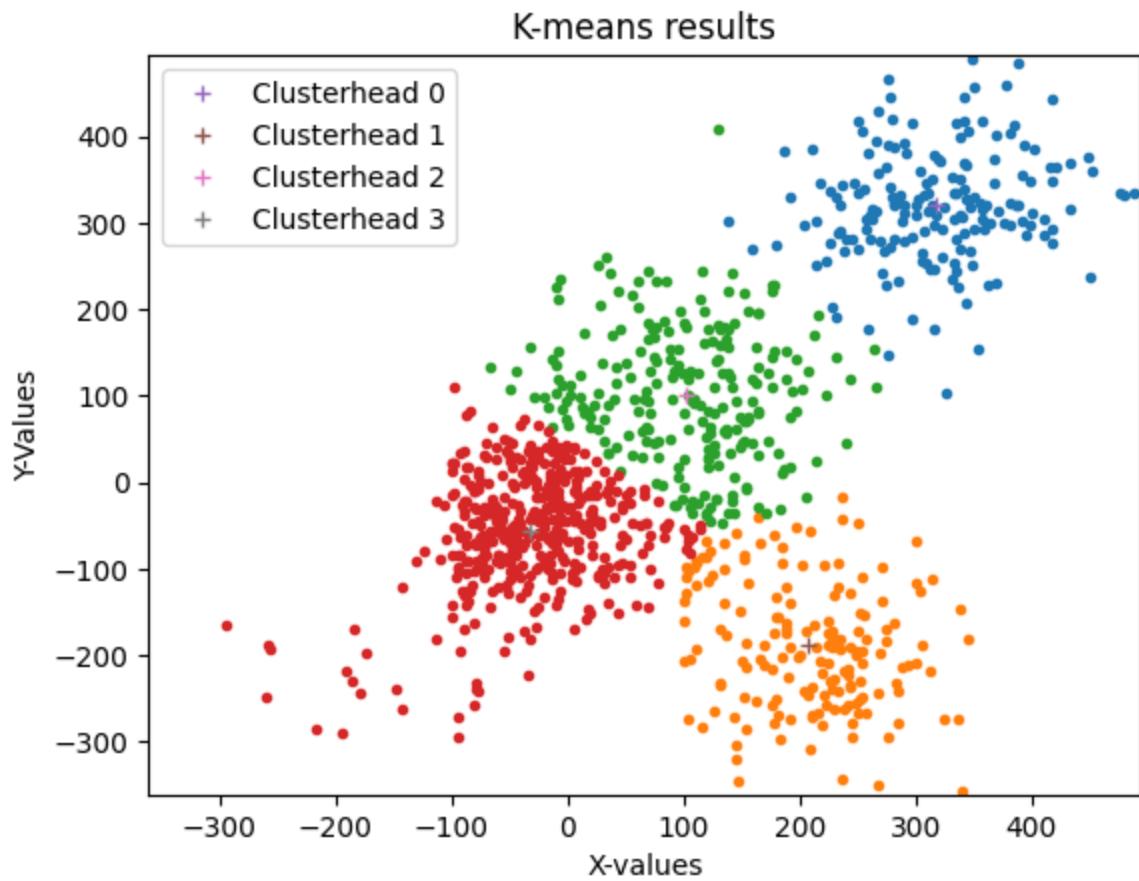
```
[[ 316.9048315  206.46880015  101.64118472 -32.73715761]
 [ 320.00202926 -187.97288351  100.20585834 -57.6038731 ]]
```

new cluster heads:

```
[[ 316.9048315  206.46880015  101.64118472 -32.73715761]
 [ 320.00202926 -187.97288351  100.20585834 -57.6038731 ]]
```

last heads:

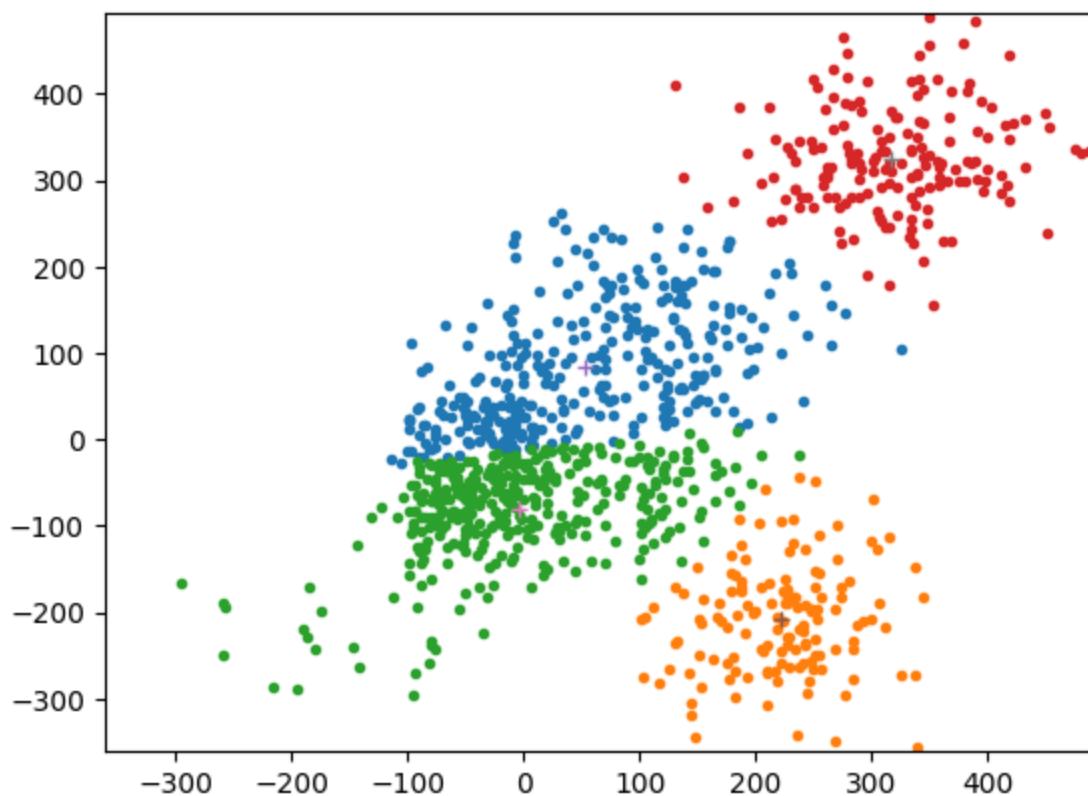
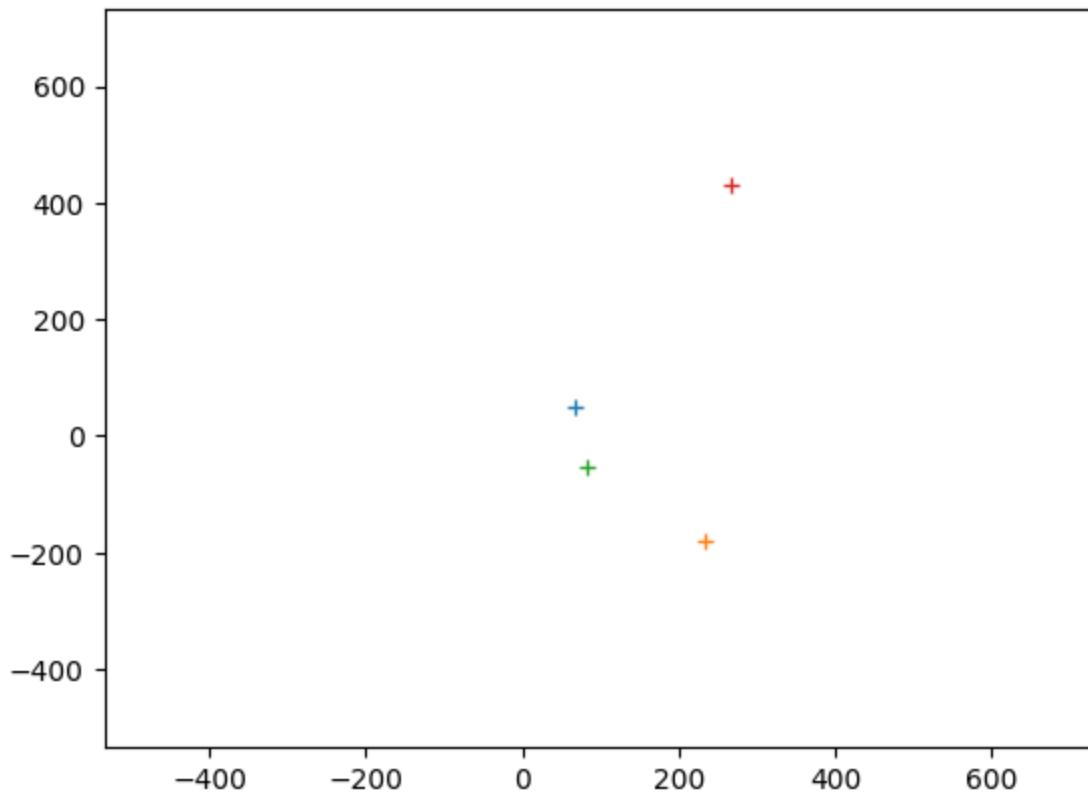
```
[[ 316.9048315  206.46880015  101.64118472 -32.73715761]
 [ 320.00202926 -187.97288351  100.20585834 -57.6038731 ]]
```

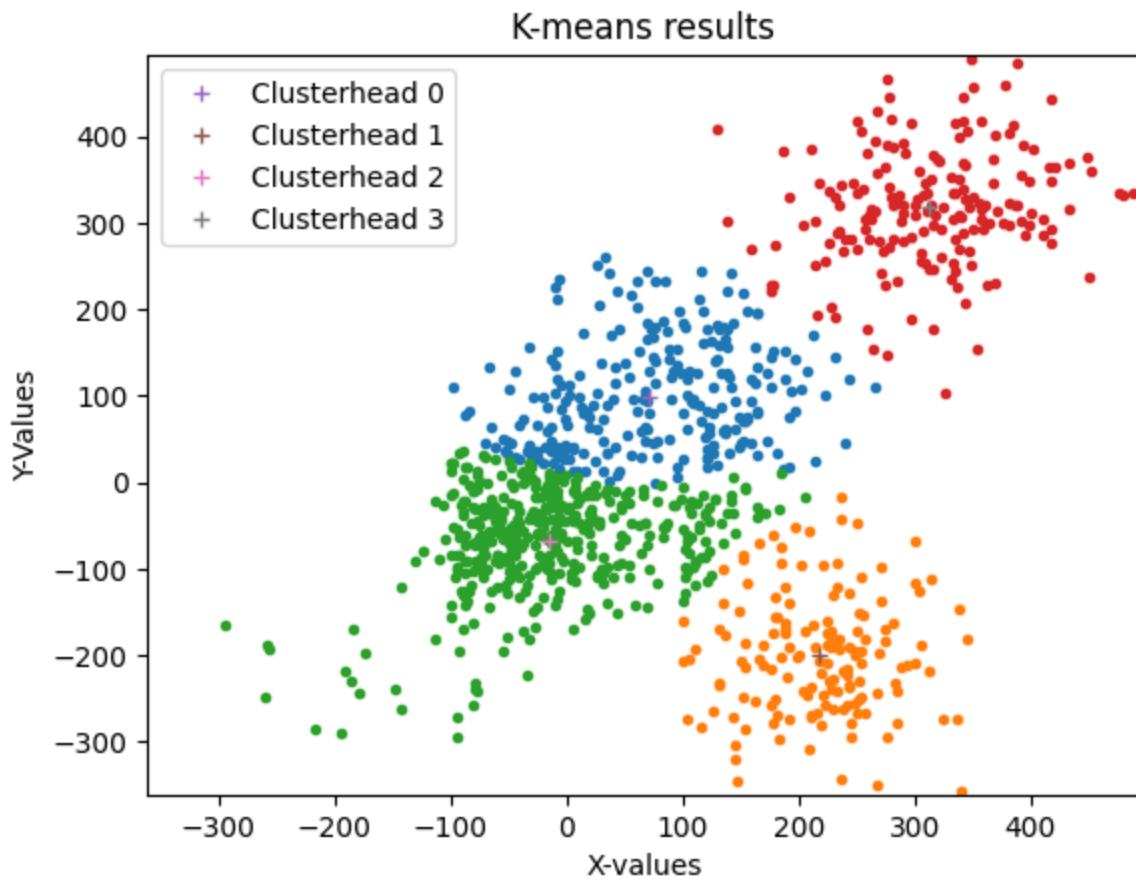


Finished try! Distance between old and new heads: 0.000000

```

new cluster heads:
[[ 53.83954449 232.21374133  82.49788962 267.37746828]
 [ 83.89179632 -181.2703881 -52.59181817 429.47099258]]
last heads:
[[ 68.19112745 232.21374133  82.49788962 267.37746828]
 [ 48.56238241 -181.2703881 -52.59181817 429.47099258]]
new cluster heads:
[[ 53.83954449 221.30257492  82.49788962 267.37746828]
 [ 83.89179632 -207.92310584 -52.59181817 429.47099258]]
last heads:
[[ 68.19112745 232.21374133  82.49788962 267.37746828]
 [ 48.56238241 -181.2703881 -52.59181817 429.47099258]]
new cluster heads:
[[ 53.83954449 221.30257492  -4.18708334 267.37746828]
 [ 83.89179632 -207.92310584 -80.48202787 429.47099258]]
last heads:
[[ 68.19112745 232.21374133  82.49788962 267.37746828]
 [ 48.56238241 -181.2703881 -52.59181817 429.47099258]]
new cluster heads:
[[ 53.83954449 221.30257492  -4.18708334 317.34989786]
 [ 83.89179632 -207.92310584 -80.48202787 325.05973234]]
last heads:
[[ 68.19112745 232.21374133  82.49788962 267.37746828]
 [ 48.56238241 -181.2703881 -52.59181817 429.47099258]]
distance between old and new heads: 23974.66
new cluster heads:
[[ 71.88188459 221.30257492  -4.18708334 317.34989786]
 [ 99.26288626 -207.92310584 -80.48202787 325.05973234]]
last heads:
[[ 53.83954449 221.30257492  -4.18708334 317.34989786]
 [ 83.89179632 -207.92310584 -80.48202787 325.05973234]]
new cluster heads:
[[ 71.88188459 217.04663807  -4.18708334 317.34989786]
 [ 99.26288626 -199.19307486 -80.48202787 325.05973234]]
last heads:
[[ 53.83954449 221.30257492  -4.18708334 317.34989786]
 [ 83.89179632 -207.92310584 -80.48202787 325.05973234]]
new cluster heads:
[[ 71.88188459 217.04663807  -15.53555156 317.34989786]
 [ 99.26288626 -199.19307486 -67.99651389 325.05973234]]
last heads:
[[ 53.83954449 221.30257492  -4.18708334 317.34989786]
 [ 83.89179632 -207.92310584 -80.48202787 325.05973234]]
new cluster heads:
[[ 71.88188459 217.04663807  -15.53555156 312.69650105]
 [ 99.26288626 -199.19307486 -67.99651389 317.32708405]]
last heads:
[[ 53.83954449 221.30257492  -4.18708334 317.34989786]
 [ 83.89179632 -207.92310584 -80.48202787 325.05973234]]
```





distance between old and new heads: 1022.25

new cluster heads:

```
[[ 85.98593586 217.04663807 -15.53555156 312.69650105]
 [ 108.87516673 -199.19307486 -67.99651389 317.32708405]]
```

last heads:

```
[[ 71.88188459 217.04663807 -15.53555156 312.69650105]
 [ 99.26288626 -199.19307486 -67.99651389 317.32708405]]
```

new cluster heads:

```
[[ 85.98593586 213.64684863 -15.53555156 312.69650105]
 [ 108.87516673 -195.25944826 -67.99651389 317.32708405]]
```

last heads:

```
[[ 71.88188459 217.04663807 -15.53555156 312.69650105]
 [ 99.26288626 -199.19307486 -67.99651389 317.32708405]]
```

new cluster heads:

```
[[ 85.98593586 213.64684863 -18.36151666 312.69650105]
 [ 108.87516673 -195.25944826 -60.48691884 317.32708405]]
```

last heads:

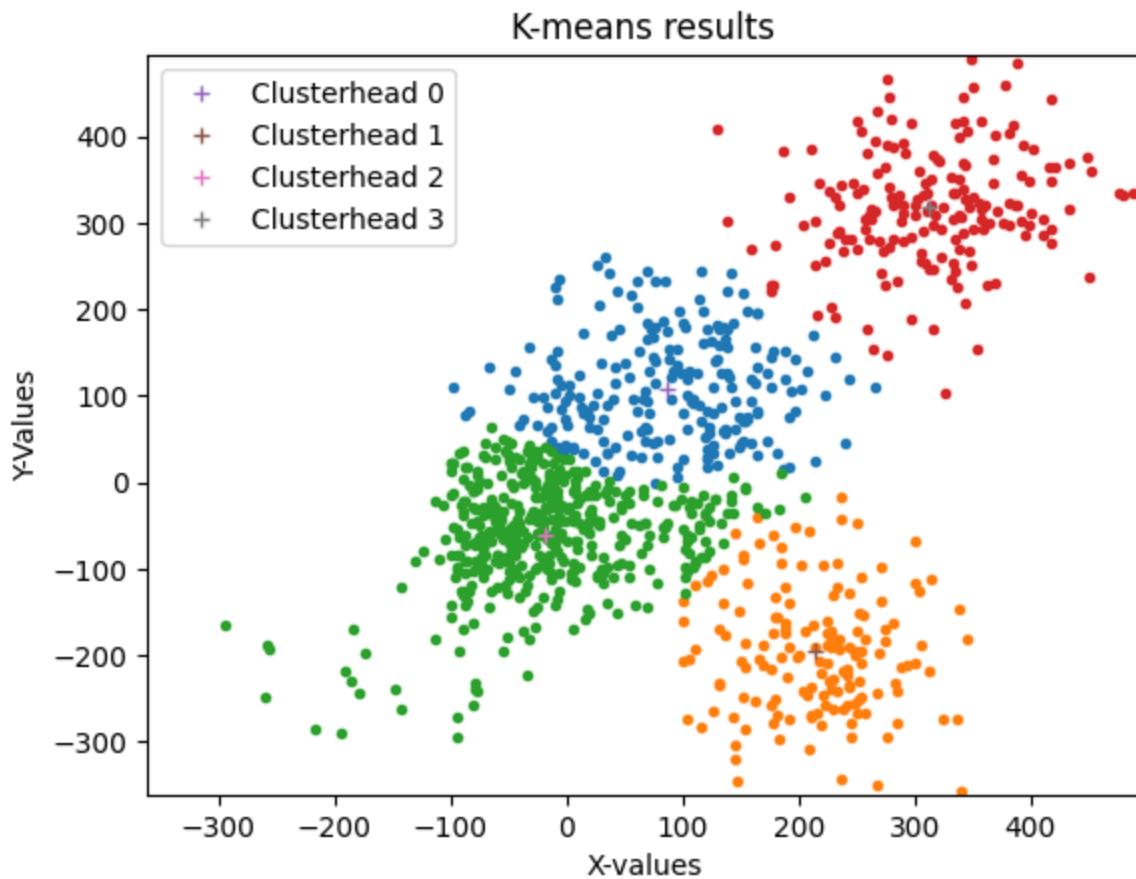
```
[[ 71.88188459 217.04663807 -15.53555156 312.69650105]
 [ 99.26288626 -199.19307486 -67.99651389 317.32708405]]
```

new cluster heads:

```
[[ 85.98593586 213.64684863 -18.36151666 312.69650105]
 [ 108.87516673 -195.25944826 -60.48691884 317.32708405]]
```

last heads:

```
[[ 71.88188459 217.04663807 -15.53555156 312.69650105]
 [ 99.26288626 -199.19307486 -67.99651389 317.32708405]]
```



distance between old and new heads: 382.73

new cluster heads:

```
[[ 92.21519406 213.64684863 -18.36151666 312.69650105]
 [ 113.57762356 -195.25944826 -60.48691884 317.32708405]]
```

last heads:

```
[[ 85.98593586 213.64684863 -18.36151666 312.69650105]
 [ 108.87516673 -195.25944826 -60.48691884 317.32708405]]
```

new cluster heads:

```
[[ 92.21519406 212.01152687 -18.36151666 312.69650105]
 [ 113.57762356 -192.05922779 -60.48691884 317.32708405]]
```

last heads:

```
[[ 85.98593586 213.64684863 -18.36151666 312.69650105]
 [ 108.87516673 -195.25944826 -60.48691884 317.32708405]]
```

new cluster heads:

```
[[ 92.21519406 212.01152687 -19.43055044 312.69650105]
 [ 113.57762356 -192.05922779 -57.25353455 317.32708405]]
```

last heads:

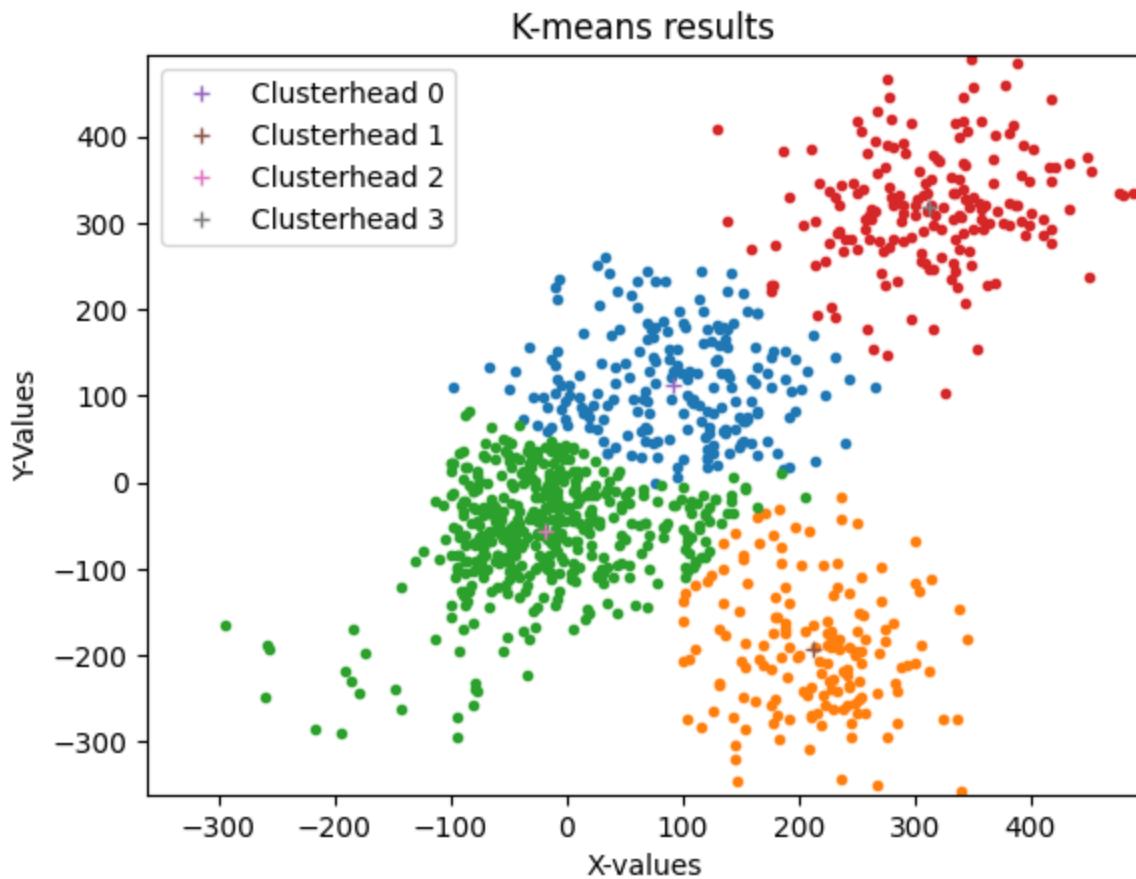
```
[[ 85.98593586 213.64684863 -18.36151666 312.69650105]
 [ 108.87516673 -195.25944826 -60.48691884 317.32708405]]
```

new cluster heads:

```
[[ 92.21519406 212.01152687 -19.43055044 312.69650105]
 [ 113.57762356 -192.05922779 -57.25353455 317.32708405]]
```

last heads:

```
[[ 85.98593586 213.64684863 -18.36151666 312.69650105]
 [ 108.87516673 -195.25944826 -60.48691884 317.32708405]]
```



distance between old and new heads: 85.43

new cluster heads:

```
[[ 95.03372641 212.01152687 -19.43055044 312.69650105]
 [ 114.87571638 -192.05922779 -57.25353455 317.32708405]]
```

last heads:

```
[[ 92.21519406 212.01152687 -19.43055044 312.69650105]
 [ 113.57762356 -192.05922779 -57.25353455 317.32708405]]
```

new cluster heads:

```
[[ 95.03372641 210.88904592 -19.43055044 312.69650105]
 [ 114.87571638 -190.72882276 -57.25353455 317.32708405]]
```

last heads:

```
[[ 92.21519406 212.01152687 -19.43055044 312.69650105]
 [ 113.57762356 -192.05922779 -57.25353455 317.32708405]]
```

new cluster heads:

```
[[ 95.03372641 210.88904592 -20.06271817 312.69650105]
 [ 114.87571638 -190.72882276 -55.80254867 317.32708405]]
```

last heads:

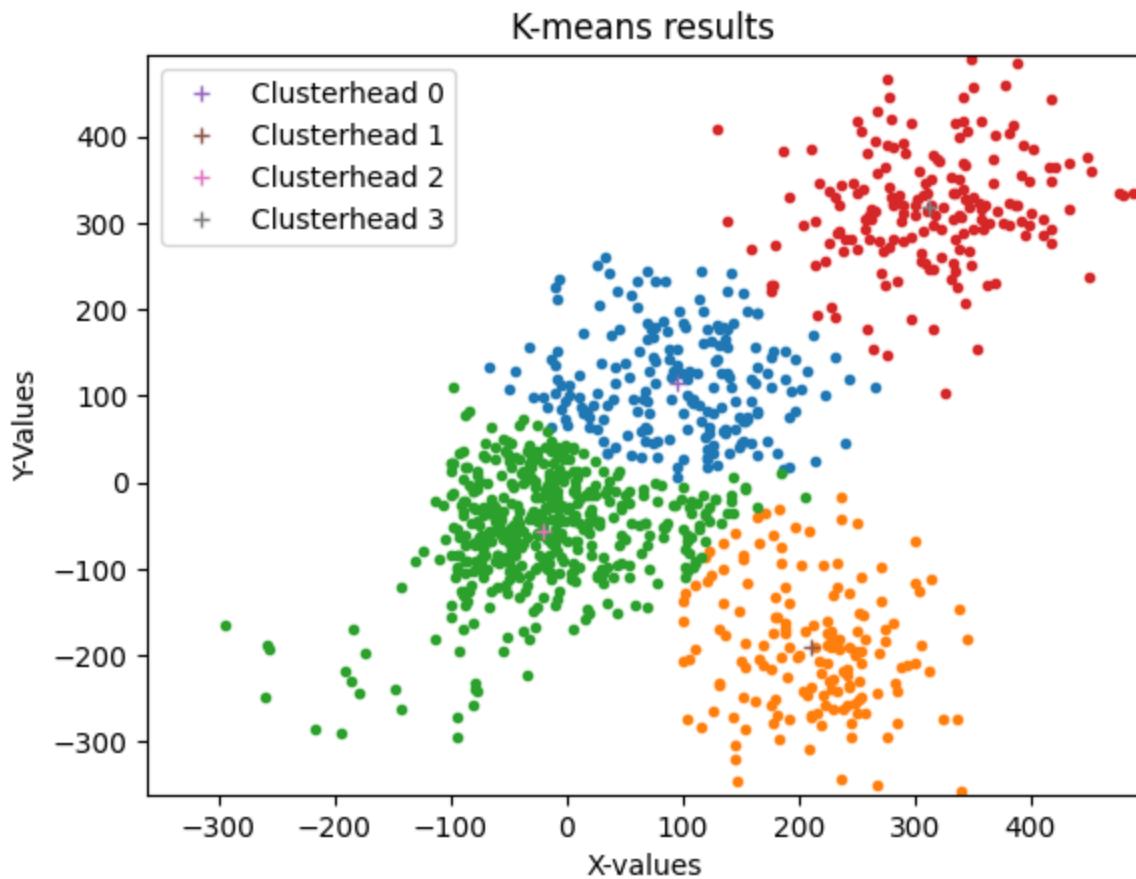
```
[[ 92.21519406 212.01152687 -19.43055044 312.69650105]
 [ 113.57762356 -192.05922779 -57.25353455 317.32708405]]
```

new cluster heads:

```
[[ 95.03372641 210.88904592 -20.06271817 312.69650105]
 [ 114.87571638 -190.72882276 -55.80254867 317.32708405]]
```

last heads:

```
[[ 92.21519406 212.01152687 -19.43055044 312.69650105]
 [ 113.57762356 -192.05922779 -57.25353455 317.32708405]]
```



distance between old and new heads: 15.16

new cluster heads:

```
[[ 95.03372641 210.88904592 -20.06271817 312.69650105]
 [ 114.87571638 -190.72882276 -55.80254867 317.32708405]]
```

last heads:

```
[[ 95.03372641 210.88904592 -20.06271817 312.69650105]
 [ 114.87571638 -190.72882276 -55.80254867 317.32708405]]
```

new cluster heads:

```
[[ 95.03372641 210.88904592 -20.06271817 312.69650105]
 [ 114.87571638 -190.72882276 -55.80254867 317.32708405]]
```

last heads:

```
[[ 95.03372641 210.88904592 -20.06271817 312.69650105]
 [ 114.87571638 -190.72882276 -55.80254867 317.32708405]]
```

new cluster heads:

```
[[ 95.03372641 210.88904592 -20.06271817 312.69650105]
 [ 114.87571638 -190.72882276 -55.80254867 317.32708405]]
```

last heads:

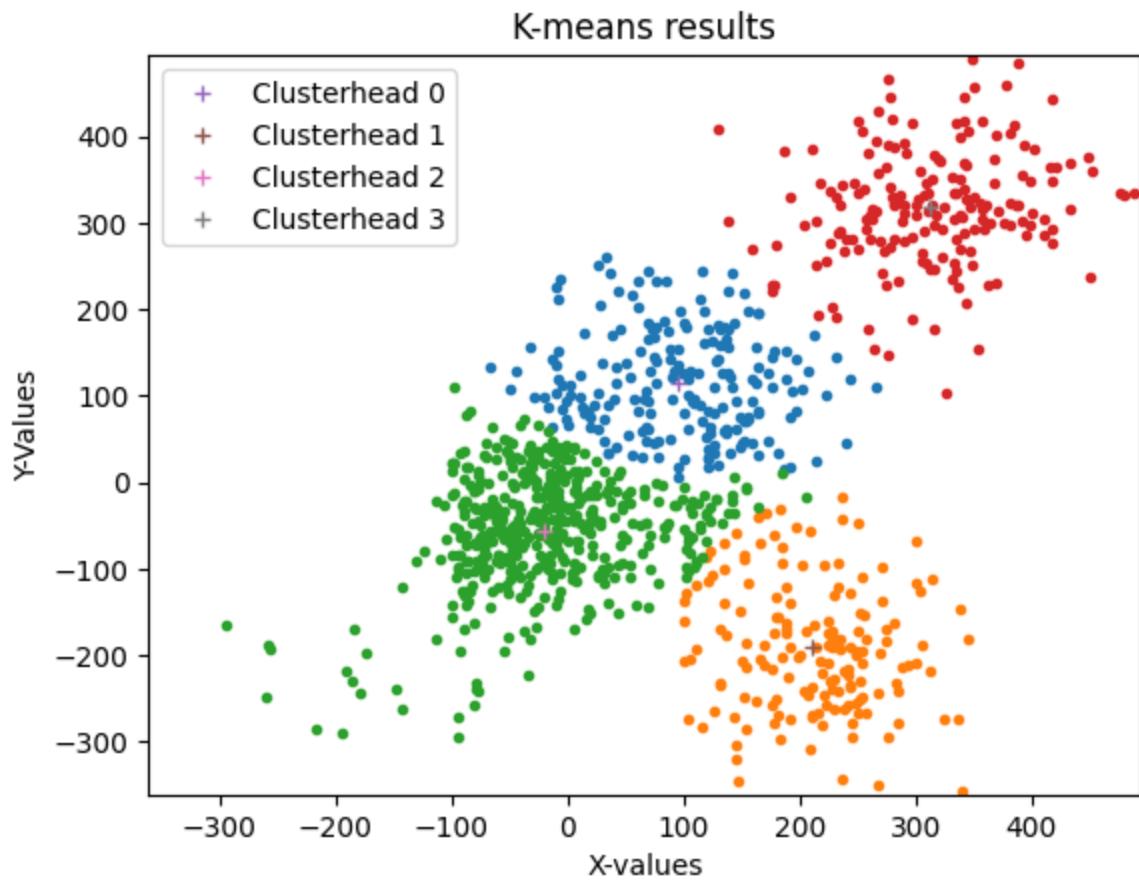
```
[[ 95.03372641 210.88904592 -20.06271817 312.69650105]
 [ 114.87571638 -190.72882276 -55.80254867 317.32708405]]
```

new cluster heads:

```
[[ 95.03372641 210.88904592 -20.06271817 312.69650105]
 [ 114.87571638 -190.72882276 -55.80254867 317.32708405]]
```

last heads:

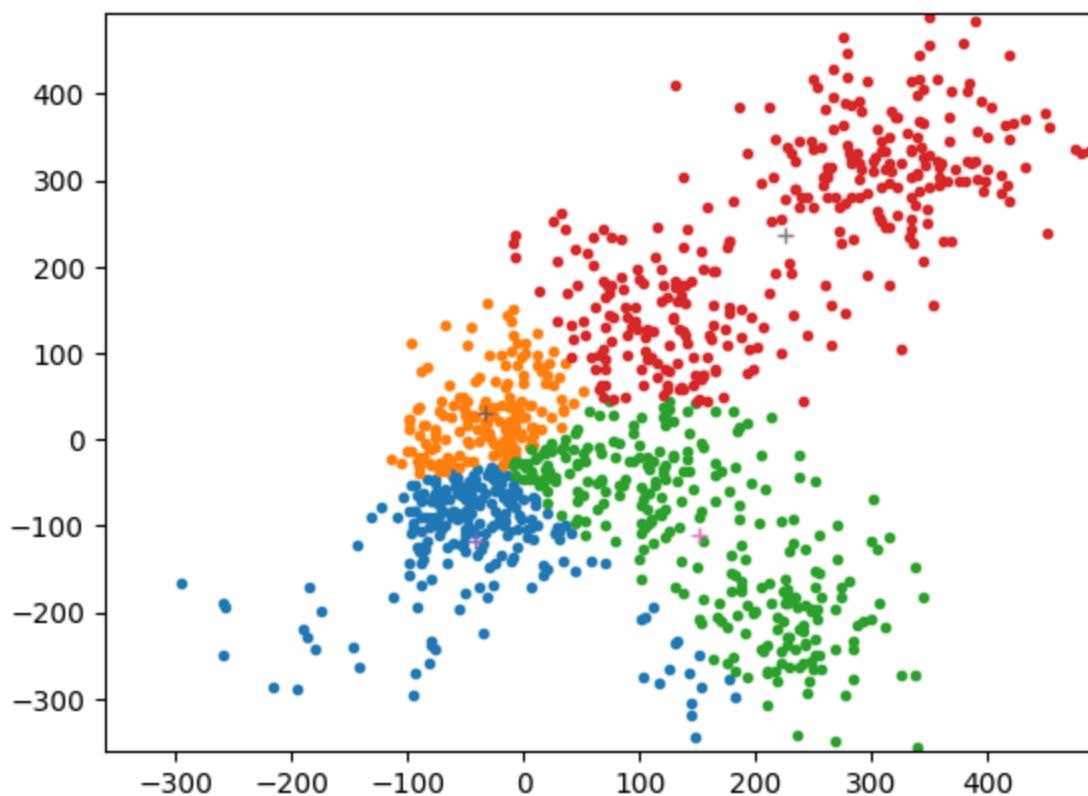
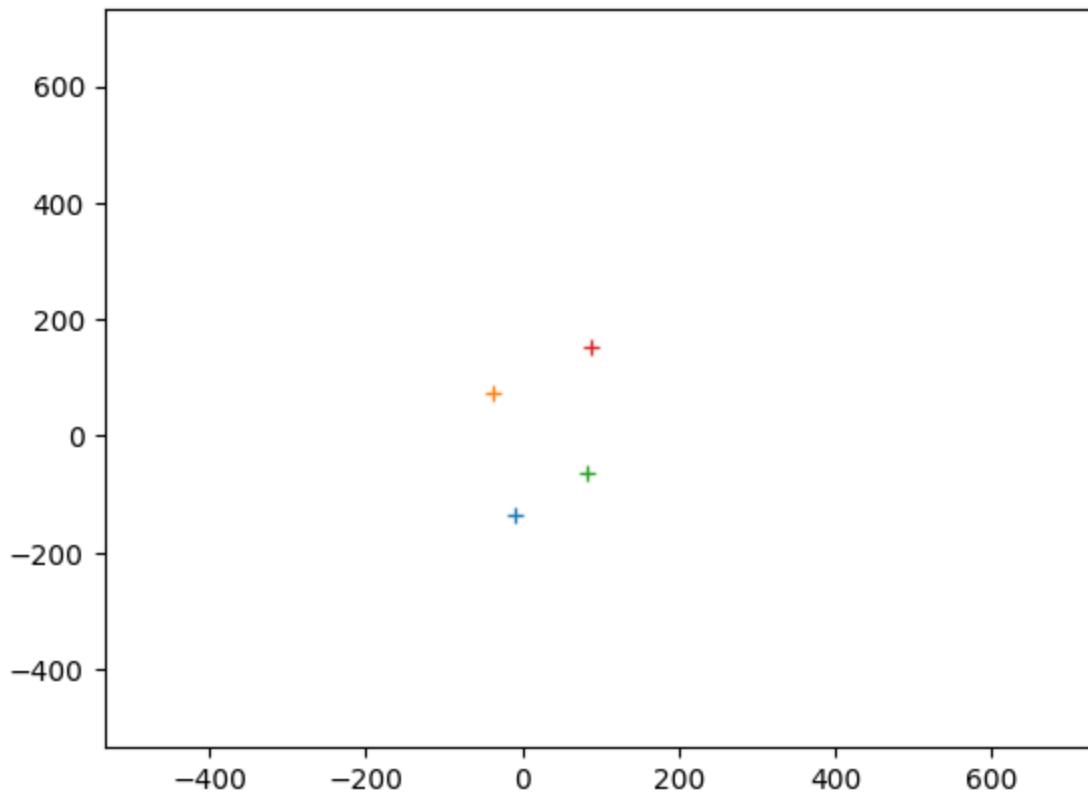
```
[[ 95.03372641 210.88904592 -20.06271817 312.69650105]
 [ 114.87571638 -190.72882276 -55.80254867 317.32708405]]
```

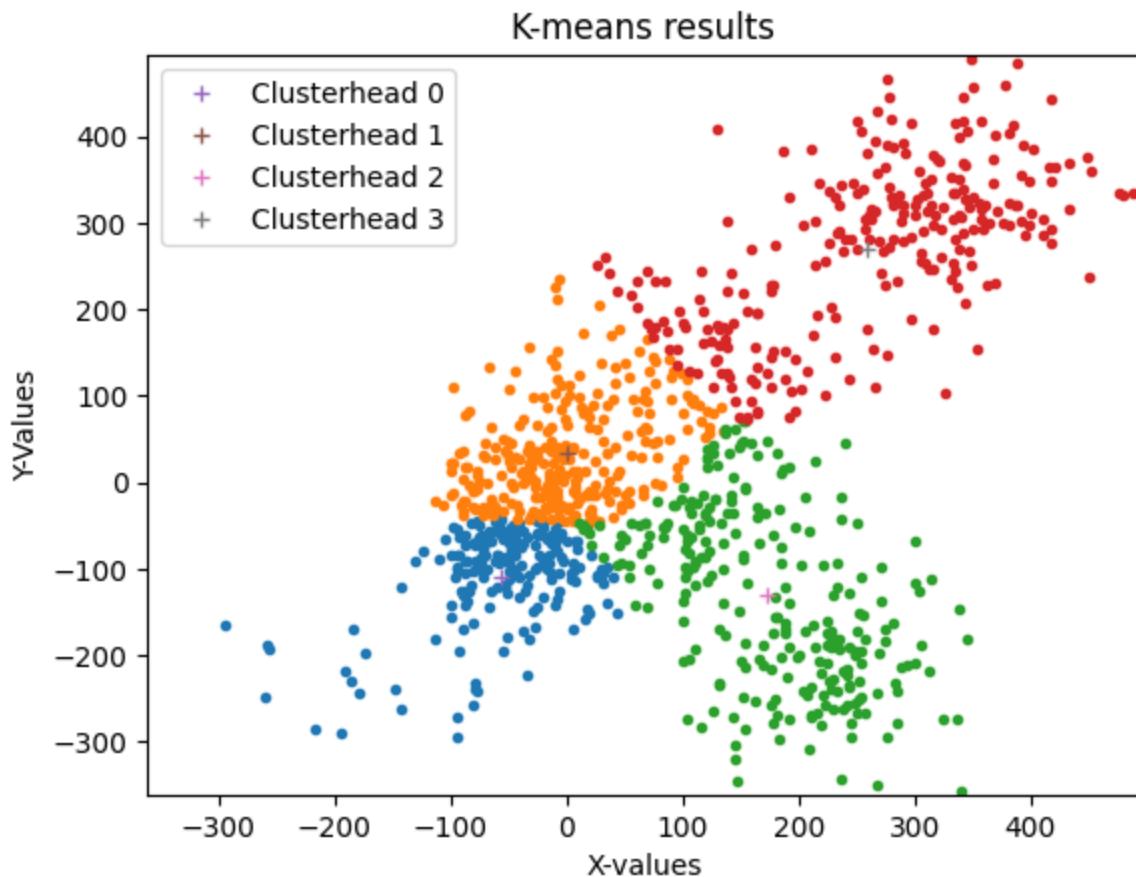


Finished try! Distance between old and new heads: 0.000000

```

new cluster heads:
[[ -41.12447954 -37.64819361  83.07773129  87.47081272]
 [-117.04690511  73.19357878 -63.29793443  153.41745483]]
last heads:
[[ -8.62549979 -37.64819361  83.07773129  87.47081272]
 [-135.9059516   73.19357878 -63.29793443  153.41745483]]
new cluster heads:
[[ -41.12447954 -32.75530962  83.07773129  87.47081272]
 [-117.04690511  29.53959334 -63.29793443  153.41745483]]
last heads:
[[ -8.62549979 -37.64819361  83.07773129  87.47081272]
 [-135.9059516   73.19357878 -63.29793443  153.41745483]]
new cluster heads:
[[ -41.12447954 -32.75530962  150.62718182  87.47081272]
 [-117.04690511  29.53959334 -109.57286319  153.41745483]]
last heads:
[[ -8.62549979 -37.64819361  83.07773129  87.47081272]
 [-135.9059516   73.19357878 -63.29793443  153.41745483]]
new cluster heads:
[[ -41.12447954 -32.75530962  150.62718182  225.93026712]
 [-117.04690511  29.53959334 -109.57286319  236.94386774]]
last heads:
[[ -8.62549979 -37.64819361  83.07773129  87.47081272]
 [-135.9059516   73.19357878 -63.29793443  153.41745483]]
distance between old and new heads: 36193.44
new cluster heads:
[[ -57.33715659 -32.75530962  150.62718182  225.93026712]
 [-108.59027284  29.53959334 -109.57286319  236.94386774]]
last heads:
[[ -41.12447954 -32.75530962  150.62718182  225.93026712]
 [-117.04690511  29.53959334 -109.57286319  236.94386774]]
new cluster heads:
[[ -5.73371566e+01 -2.20652798e-01  1.50627182e+02  2.25930267e+02]
 [-1.08590273e+02  3.40405594e+01 -1.09572863e+02  2.36943868e+02]]
last heads:
[[ -41.12447954 -32.75530962  150.62718182  225.93026712]
 [-117.04690511  29.53959334 -109.57286319  236.94386774]]
new cluster heads:
[[ -5.73371566e+01 -2.20652798e-01  1.72367005e+02  2.25930267e+02]
 [-1.08590273e+02  3.40405594e+01 -1.31466169e+02  2.36943868e+02]]
last heads:
[[ -41.12447954 -32.75530962  150.62718182  225.93026712]
 [-117.04690511  29.53959334 -109.57286319  236.94386774]]
new cluster heads:
[[ -5.73371566e+01 -2.20652798e-01  1.72367005e+02  2.58570878e+02]
 [-1.08590273e+02  3.40405594e+01 -1.31466169e+02  2.69130092e+02]]
last heads:
[[ -41.12447954 -32.75530962  150.62718182  225.93026712]
 [-117.04690511  29.53959334 -109.57286319  236.94386774]]
```





distance between old and new heads: 4466.43

new cluster heads:

```
[[ -5.73371566e+01 -2.20652798e-01 1.72367005e+02 2.58570878e+02]
 [-1.08590273e+02 3.40405594e+01 -1.31466169e+02 2.69130092e+02]]
```

last heads:

```
[[ -5.73371566e+01 -2.20652798e-01 1.72367005e+02 2.58570878e+02]
 [-1.08590273e+02 3.40405594e+01 -1.31466169e+02 2.69130092e+02]]
```

new cluster heads:

```
[[ -57.33715659 21.51417048 172.36700544 258.57087824]
 [-108.59027284 40.94502344 -131.46616871 269.13009223]]
```

last heads:

```
[[ -5.73371566e+01 -2.20652798e-01 1.72367005e+02 2.58570878e+02]
 [-1.08590273e+02 3.40405594e+01 -1.31466169e+02 2.69130092e+02]]
```

new cluster heads:

```
[[ -57.33715659 21.51417048 184.80168275 258.57087824]
 [-108.59027284 40.94502344 -153.87575006 269.13009223]]
```

last heads:

```
[[ -5.73371566e+01 -2.20652798e-01 1.72367005e+02 2.58570878e+02]
 [-1.08590273e+02 3.40405594e+01 -1.31466169e+02 2.69130092e+02]]
```

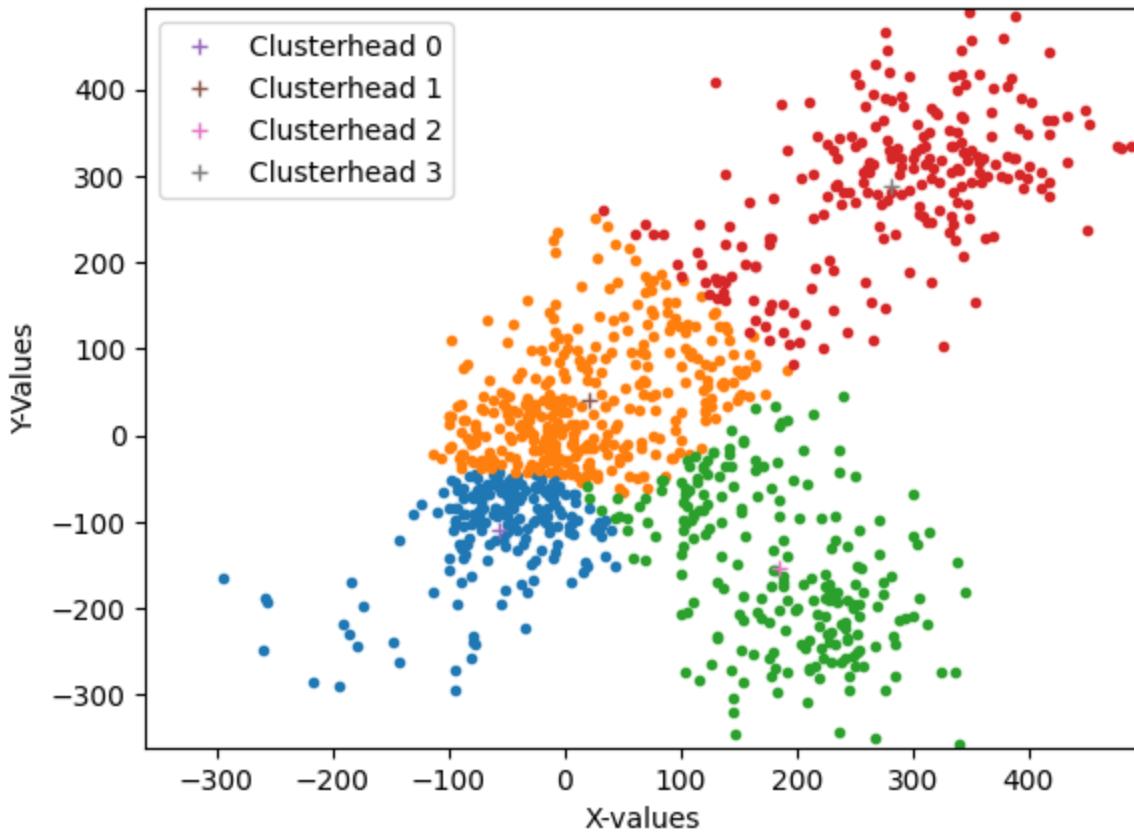
new cluster heads:

```
[[ -57.33715659 21.51417048 184.80168275 280.7447339 ]
 [-108.59027284 40.94502344 -153.87575006 288.01972743]]
```

last heads:

```
[[ -5.73371566e+01 -2.20652798e-01 1.72367005e+02 2.58570878e+02]
 [-1.08590273e+02 3.40405594e+01 -1.31466169e+02 2.69130092e+02]]
```

## K-means results



distance between old and new heads: 2025.38

new cluster heads:

```
[[ -57.33715659  21.51417048  184.80168275  280.7447339 ]
 [-108.59027284  40.94502344 -153.87575006  288.01972743]]
```

last heads:

```
[[ -57.33715659  21.51417048  184.80168275  280.7447339 ]
 [-108.59027284  40.94502344 -153.87575006  288.01972743]]
```

new cluster heads:

```
[[ -57.33715659  33.70838659  184.80168275  280.7447339 ]
 [-108.59027284  45.29881457 -153.87575006  288.01972743]]
```

last heads:

```
[[ -57.33715659  21.51417048  184.80168275  280.7447339 ]
 [-108.59027284  40.94502344 -153.87575006  288.01972743]]
```

new cluster heads:

```
[[ -57.33715659  33.70838659  191.00785488  280.7447339 ]
 [-108.59027284  45.29881457 -167.51685331  288.01972743]]
```

last heads:

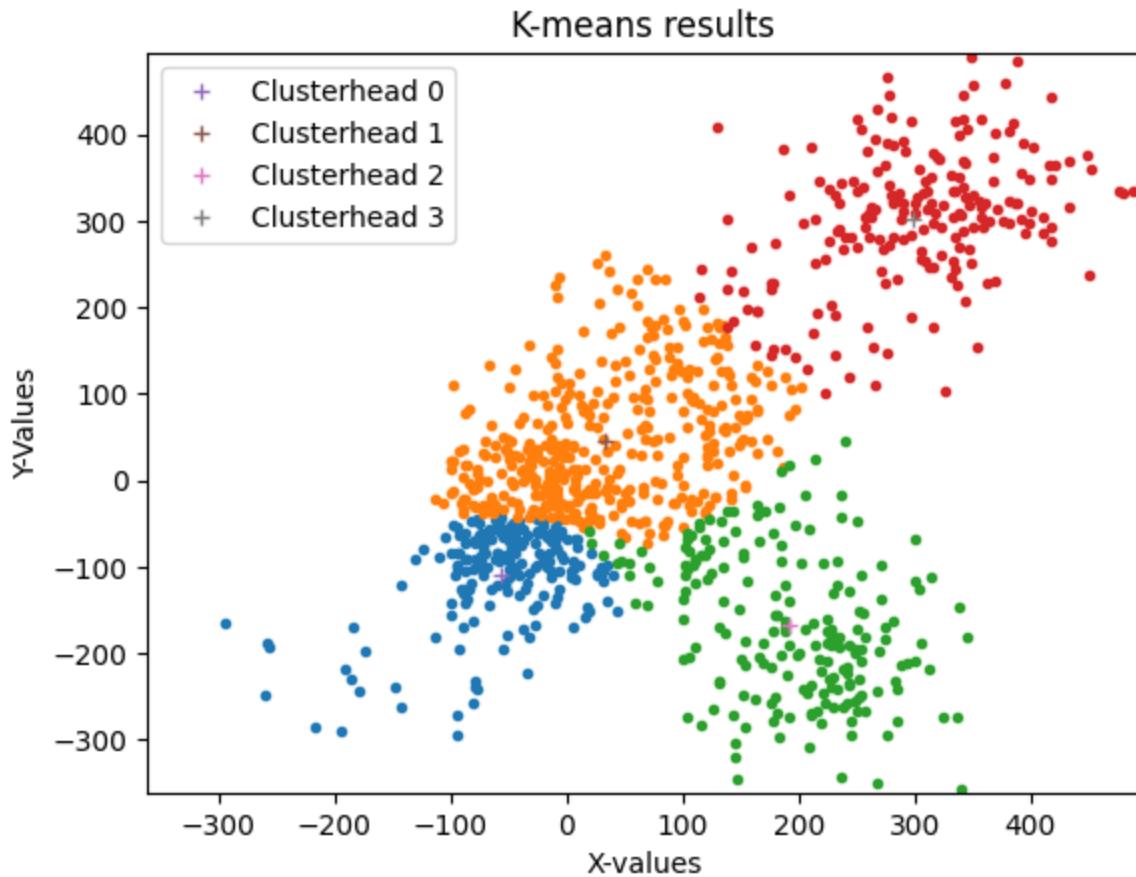
```
[[ -57.33715659  21.51417048  184.80168275  280.7447339 ]
 [-108.59027284  40.94502344 -153.87575006  288.01972743]]
```

new cluster heads:

```
[[ -57.33715659  33.70838659  191.00785488  298.5596326 ]
 [-108.59027284  45.29881457 -167.51685331  302.20301801]]
```

last heads:

```
[[ -57.33715659  21.51417048  184.80168275  280.7447339 ]
 [-108.59027284  40.94502344 -153.87575006  288.01972743]]
```



distance between old and new heads: 910.79

new cluster heads:

```
[[ -57.33715659  33.70838659  191.00785488  298.5596326 ]
 [-108.59027284  45.29881457 -167.51685331  302.20301801]]
```

last heads:

```
[[ -57.33715659  33.70838659  191.00785488  298.5596326 ]
 [-108.59027284  45.29881457 -167.51685331  302.20301801]]
```

new cluster heads:

```
[[ -57.33715659  40.20097316  191.00785488  298.5596326 ]
 [-108.59027284  46.14690045 -167.51685331  302.20301801]]
```

last heads:

```
[[ -57.33715659  33.70838659  191.00785488  298.5596326 ]
 [-108.59027284  45.29881457 -167.51685331  302.20301801]]
```

new cluster heads:

```
[[ -57.33715659  40.20097316  193.25448781  298.5596326 ]
 [-108.59027284  46.14690045 -175.91715467  302.20301801]]
```

last heads:

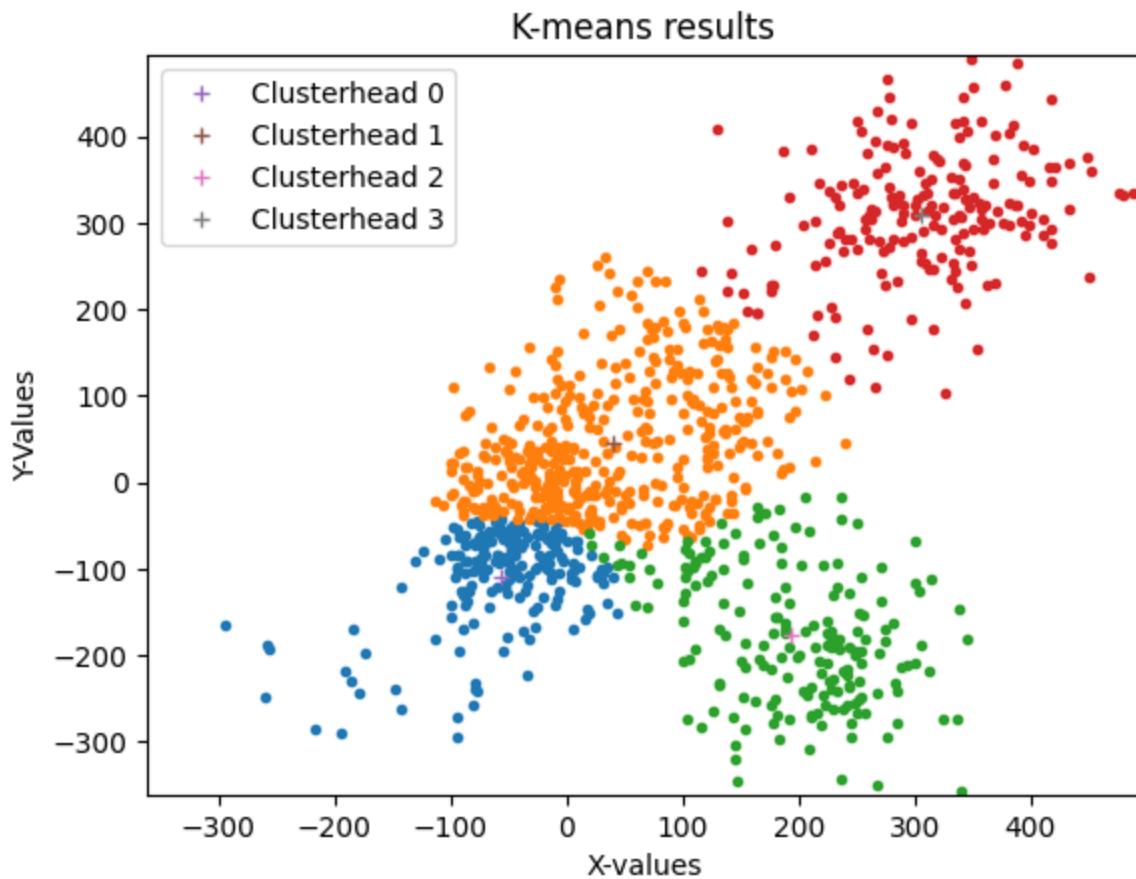
```
[[ -57.33715659  33.70838659  191.00785488  298.5596326 ]
 [-108.59027284  45.29881457 -167.51685331  302.20301801]]
```

new cluster heads:

```
[[ -57.33715659  40.20097316  193.25448781  305.10923119]
 [-108.59027284  46.14690045 -175.91715467  309.87057691]]
```

last heads:

```
[[ -57.33715659  33.70838659  191.00785488  298.5596326 ]
 [-108.59027284  45.29881457 -167.51685331  302.20301801]]
```



distance between old and new heads: 220.17

new cluster heads:

```
[[ -57.33715659  40.20097316  193.25448781  305.10923119]
 [-108.59027284  46.14690045 -175.91715467  309.87057691]]
```

last heads:

```
[[ -57.33715659  40.20097316  193.25448781  305.10923119]
 [-108.59027284  46.14690045 -175.91715467  309.87057691]]
```

new cluster heads:

```
[[ -57.33715659  40.87324523  193.25448781  305.10923119]
 [-108.59027284  45.46881781 -175.91715467  309.87057691]]
```

last heads:

```
[[ -57.33715659  40.20097316  193.25448781  305.10923119]
 [-108.59027284  46.14690045 -175.91715467  309.87057691]]
```

new cluster heads:

```
[[ -57.33715659  40.87324523  194.20716598  305.10923119]
 [-108.59027284  45.46881781 -177.9639655   309.87057691]]
```

last heads:

```
[[ -57.33715659  40.20097316  193.25448781  305.10923119]
 [-108.59027284  46.14690045 -175.91715467  309.87057691]]
```

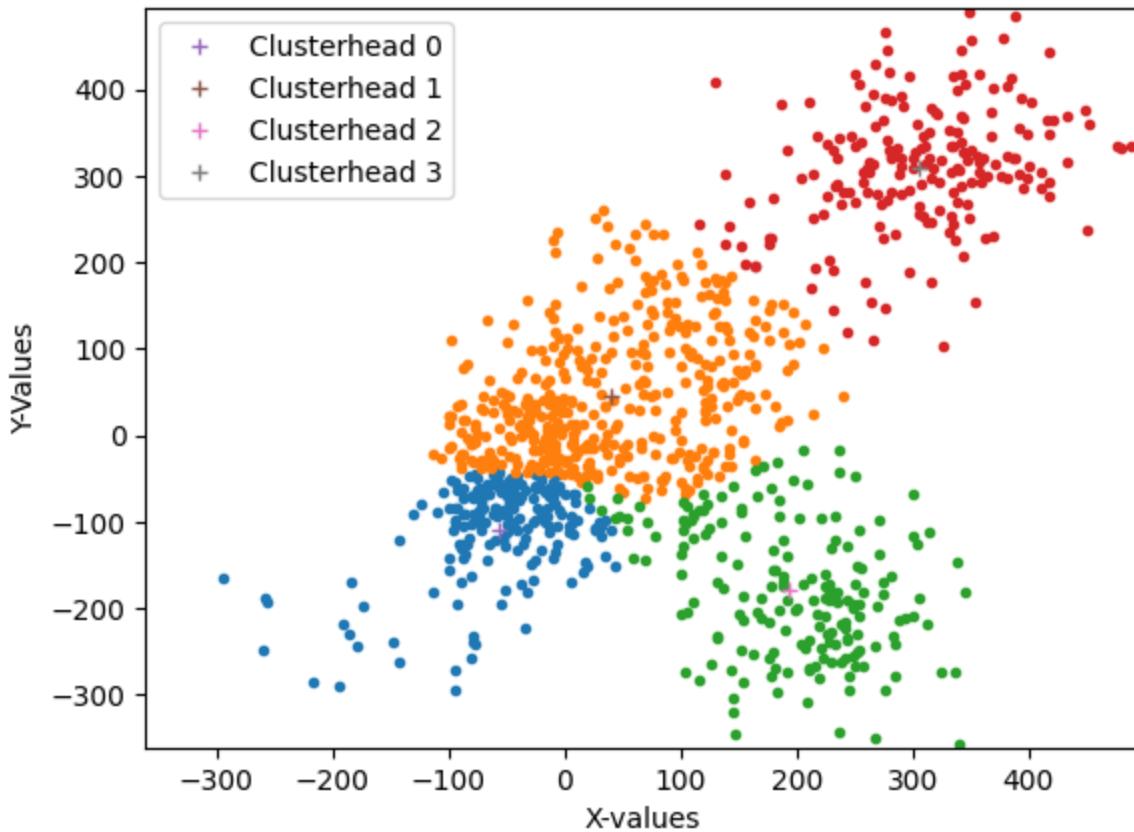
new cluster heads:

```
[[ -57.33715659  40.87324523  194.20716598  305.10923119]
 [-108.59027284  45.46881781 -177.9639655   309.87057691]]
```

last heads:

```
[[ -57.33715659  40.20097316  193.25448781  305.10923119]
 [-108.59027284  46.14690045 -175.91715467  309.87057691]]
```

## K-means results



distance between old and new heads: 6.01

new cluster heads:

```
[[ -57.33715659  40.87324523  194.20716598  305.10923119]
 [-108.59027284  45.46881781 -177.9639655   309.87057691]]
```

last heads:

```
[[ -57.33715659  40.87324523  194.20716598  305.10923119]
 [-108.59027284  45.46881781 -177.9639655   309.87057691]]
```

new cluster heads:

```
[[ -57.33715659  41.01873657  194.20716598  305.10923119]
 [-108.59027284  45.17808536 -177.9639655   309.87057691]]
```

last heads:

```
[[ -57.33715659  40.87324523  194.20716598  305.10923119]
 [-108.59027284  45.46881781 -177.9639655   309.87057691]]
```

new cluster heads:

```
[[ -57.33715659  41.01873657  194.70379527  305.10923119]
 [-108.59027284  45.17808536 -178.51028747  309.87057691]]
```

last heads:

```
[[ -57.33715659  40.87324523  194.20716598  305.10923119]
 [-108.59027284  45.46881781 -177.9639655   309.87057691]]
```

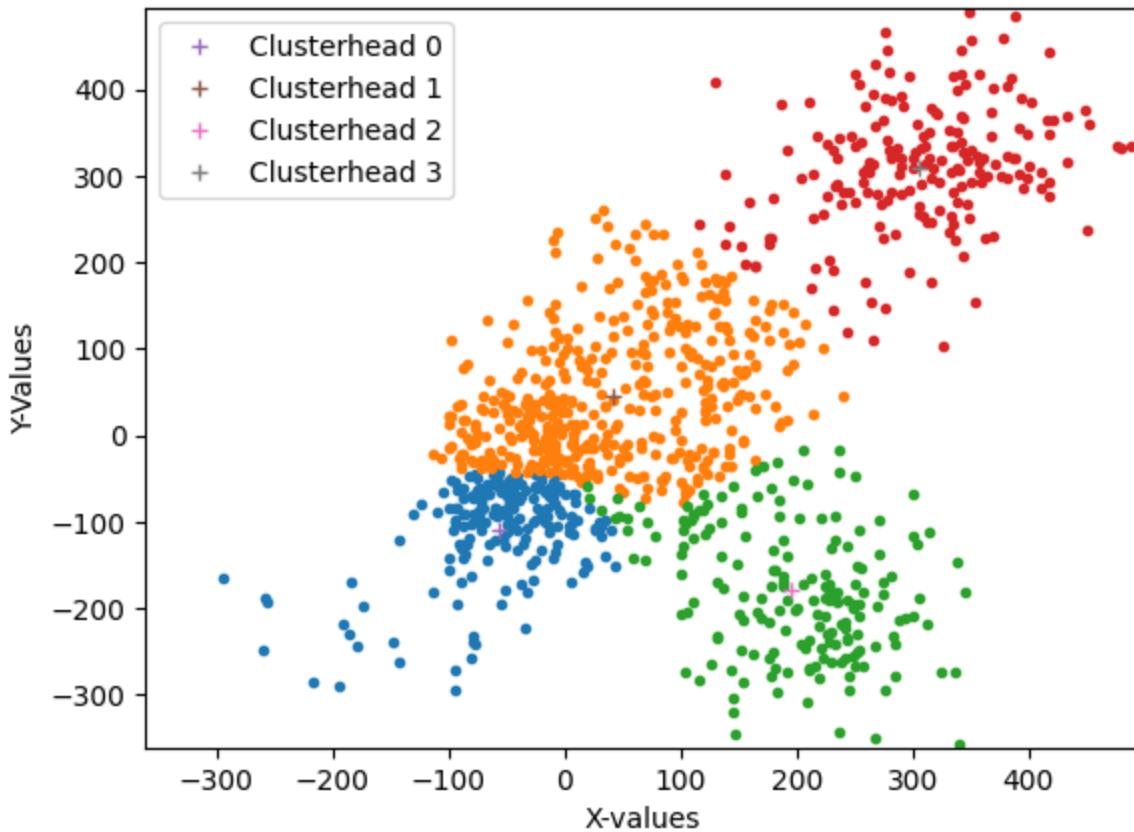
new cluster heads:

```
[[ -57.33715659  41.01873657  194.70379527  305.10923119]
 [-108.59027284  45.17808536 -178.51028747  309.87057691]]
```

last heads:

```
[[ -57.33715659  40.87324523  194.20716598  305.10923119]
 [-108.59027284  45.46881781 -177.9639655   309.87057691]]
```

## K-means results



distance between old and new heads: 0.65

new cluster heads:

```
[[ -57.33715659  41.01873657 194.70379527 305.10923119]
 [-108.59027284  45.17808536 -178.51028747 309.87057691]]
```

last heads:

```
[[ -57.33715659  41.01873657 194.70379527 305.10923119]
 [-108.59027284  45.17808536 -178.51028747 309.87057691]]
```

new cluster heads:

```
[[ -57.33715659  41.01873657 194.70379527 305.10923119]
 [-108.59027284  45.17808536 -178.51028747 309.87057691]]
```

last heads:

```
[[ -57.33715659  41.01873657 194.70379527 305.10923119]
 [-108.59027284  45.17808536 -178.51028747 309.87057691]]
```

new cluster heads:

```
[[ -57.33715659  41.01873657 194.70379527 305.10923119]
 [-108.59027284  45.17808536 -178.51028747 309.87057691]]
```

last heads:

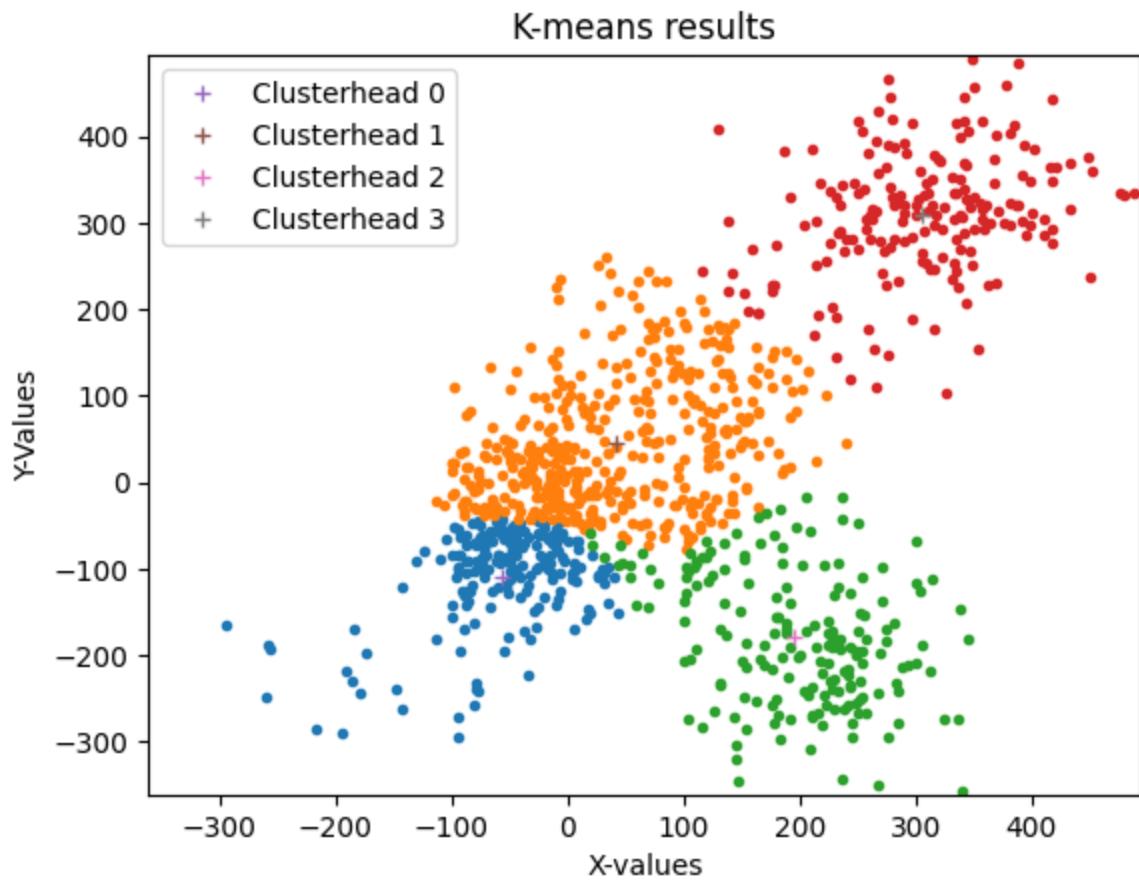
```
[[ -57.33715659  41.01873657 194.70379527 305.10923119]
 [-108.59027284  45.17808536 -178.51028747 309.87057691]]
```

new cluster heads:

```
[[ -57.33715659  41.01873657 194.70379527 305.10923119]
 [-108.59027284  45.17808536 -178.51028747 309.87057691]]
```

last heads:

```
[[ -57.33715659  41.01873657 194.70379527 305.10923119]
 [-108.59027284  45.17808536 -178.51028747 309.87057691]]
```



Finished try! Distance between old and new heads: 0.000000

new cluster heads:

```
[[ 214.87589681 -99.05132667 -34.79797155 184.19311087]
 [-206.07501026 -142.1254996 -118.8586659 10.63365179]]
```

last heads:

```
[[ 224.01204601 -99.05132667 -34.79797155 184.19311087]
 [-174.3461063 -142.1254996 -118.8586659 10.63365179]]
```

new cluster heads:

```
[[ 214.87589681 -118.46690504 -34.79797155 184.19311087]
 [-206.07501026 -157.9445668 -118.8586659 10.63365179]]
```

last heads:

```
[[ 224.01204601 -99.05132667 -34.79797155 184.19311087]
 [-174.3461063 -142.1254996 -118.8586659 10.63365179]]
```

new cluster heads:

```
[[ 214.87589681 -118.46690504 -24.62813114 184.19311087]
 [-206.07501026 -157.9445668 -38.87207689 10.63365179]]
```

last heads:

```
[[ 224.01204601 -99.05132667 -34.79797155 184.19311087]
 [-174.3461063 -142.1254996 -118.8586659 10.63365179]]
```

new cluster heads:

```
[[ 214.87589681 -118.46690504 -24.62813114 191.41723543]
 [-206.07501026 -157.9445668 -38.87207689 173.13675511]]
```

last heads:

```
[[ 224.01204601 -99.05132667 -34.79797155 184.19311087]
 [-174.3461063 -142.1254996 -118.8586659 10.63365179]]
```

distance between old and new heads: 34678.13

new cluster heads:

```
[[ 214.87589681 -118.46690504 -24.62813114 191.41723543]
 [-206.07501026 -157.9445668 -38.87207689 173.13675511]]
```

last heads:

```
[[ 214.87589681 -118.46690504 -24.62813114 191.41723543]
 [-206.07501026 -157.9445668 -38.87207689 173.13675511]]
```

new cluster heads:

```
[[ 214.87589681 -102.49773493 -24.62813114 191.41723543]
 [-206.07501026 -160.56733438 -38.87207689 173.13675511]]
```

last heads:

```
[[ 214.87589681 -118.46690504 -24.62813114 191.41723543]
 [-206.07501026 -157.9445668 -38.87207689 173.13675511]]
```

new cluster heads:

```
[[ 214.87589681 -102.49773493 -2.63785446 191.41723543]
 [-206.07501026 -160.56733438 -23.63904019 173.13675511]]
```

last heads:

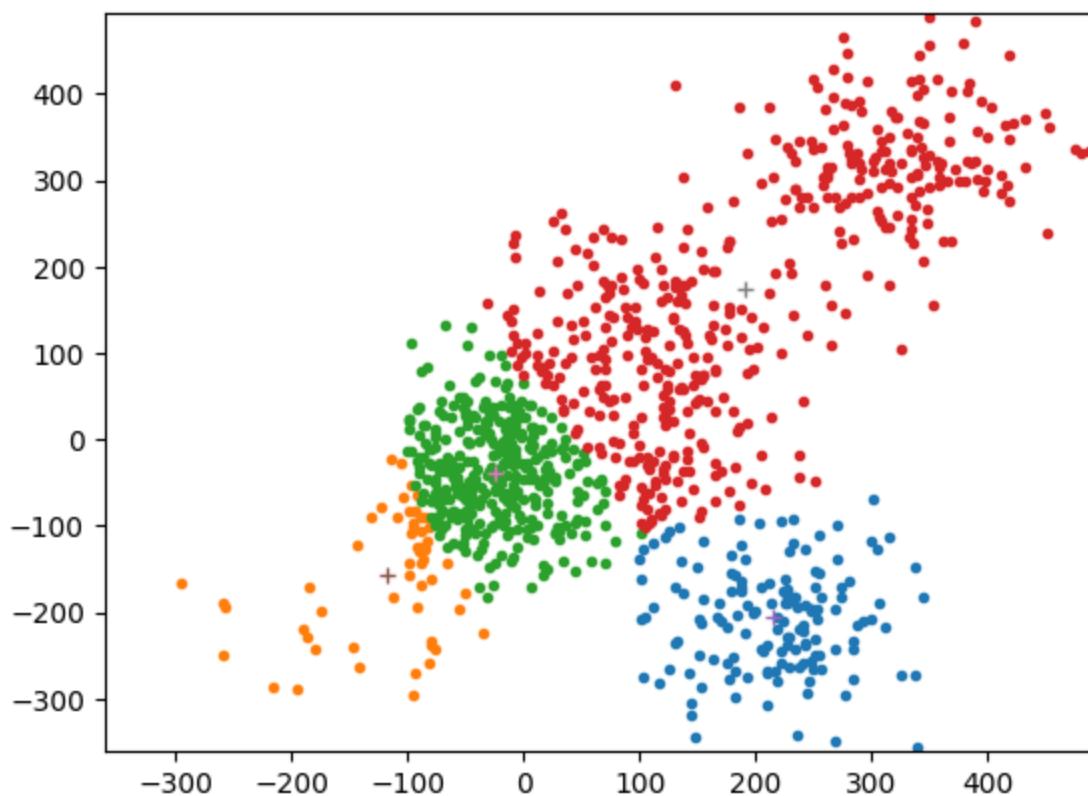
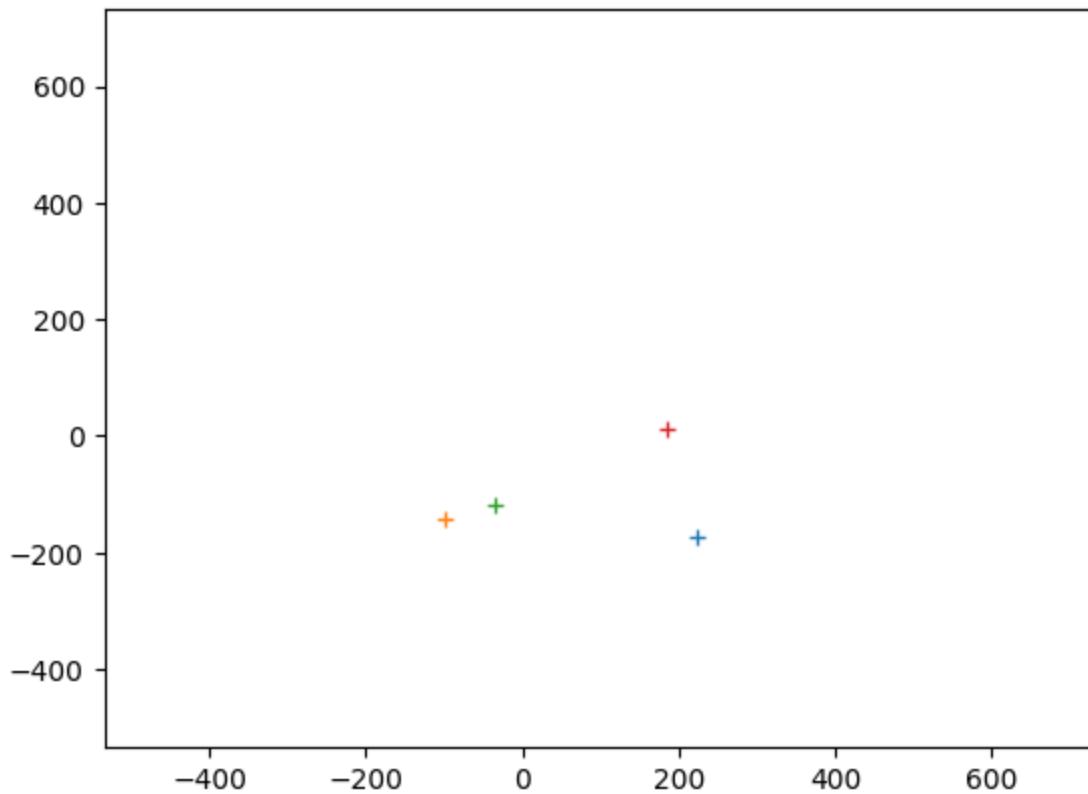
```
[[ 214.87589681 -118.46690504 -24.62813114 191.41723543]
 [-206.07501026 -157.9445668 -38.87207689 173.13675511]]
```

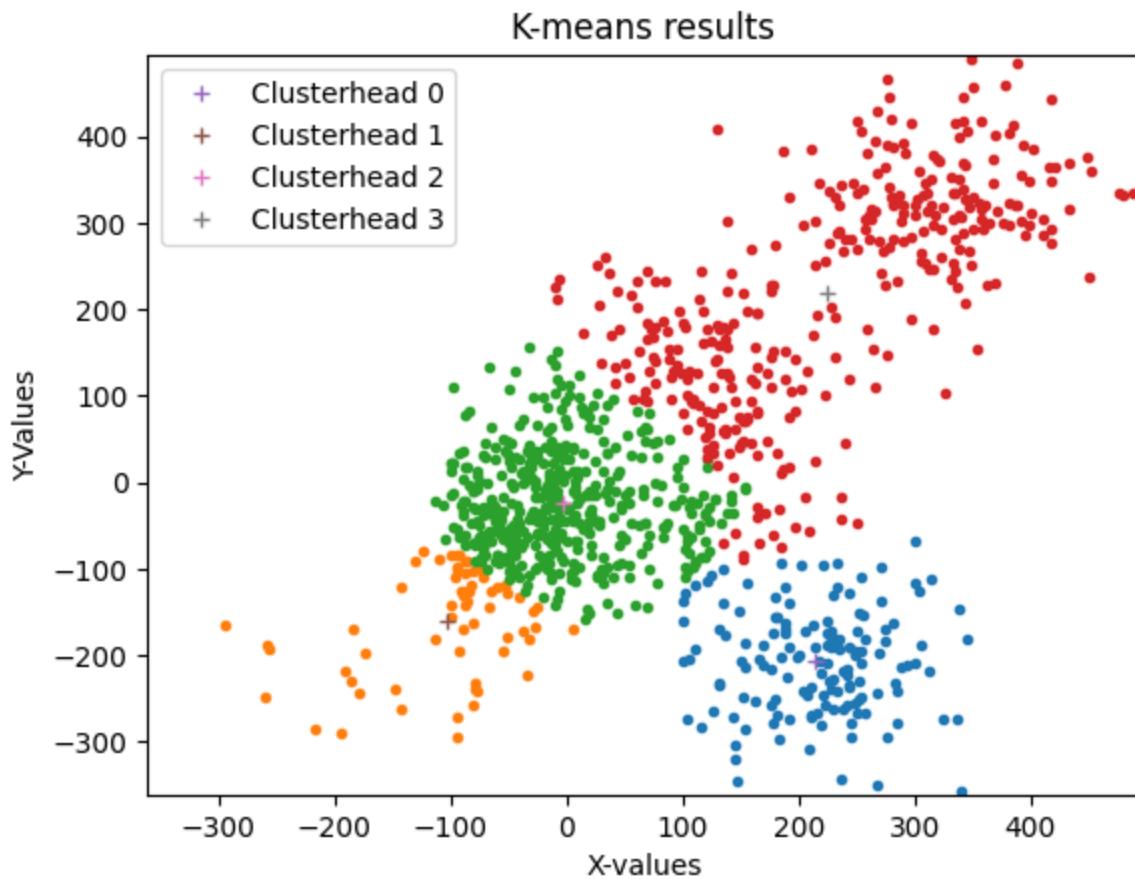
new cluster heads:

```
[[ 214.87589681 -102.49773493 -2.63785446 225.15830267]
 [-206.07501026 -160.56733438 -23.63904019 218.6269518 ]]
```

last heads:

```
[[ 214.87589681 -118.46690504 -24.62813114 191.41723543]
 [-206.07501026 -157.9445668 -38.87207689 173.13675511]]
```





distance between old and new heads: 4185.33

new cluster heads:

```
[[ 214.87589681 -102.49773493 -2.63785446 225.15830267]
 [-206.07501026 -160.56733438 -23.63904019 218.6269518 ]]
```

last heads:

```
[[ 214.87589681 -102.49773493 -2.63785446 225.15830267]
 [-206.07501026 -160.56733438 -23.63904019 218.6269518 ]]
```

new cluster heads:

```
[[ 214.87589681 -87.24879221 -2.63785446 225.15830267]
 [-206.07501026 -146.48492934 -23.63904019 218.6269518 ]]
```

last heads:

```
[[ 214.87589681 -102.49773493 -2.63785446 225.15830267]
 [-206.07501026 -160.56733438 -23.63904019 218.6269518 ]]
```

new cluster heads:

```
[[ 214.87589681 -87.24879221 12.4508023 225.15830267]
 [-206.07501026 -146.48492934 -10.08909104 218.6269518 ]]
```

last heads:

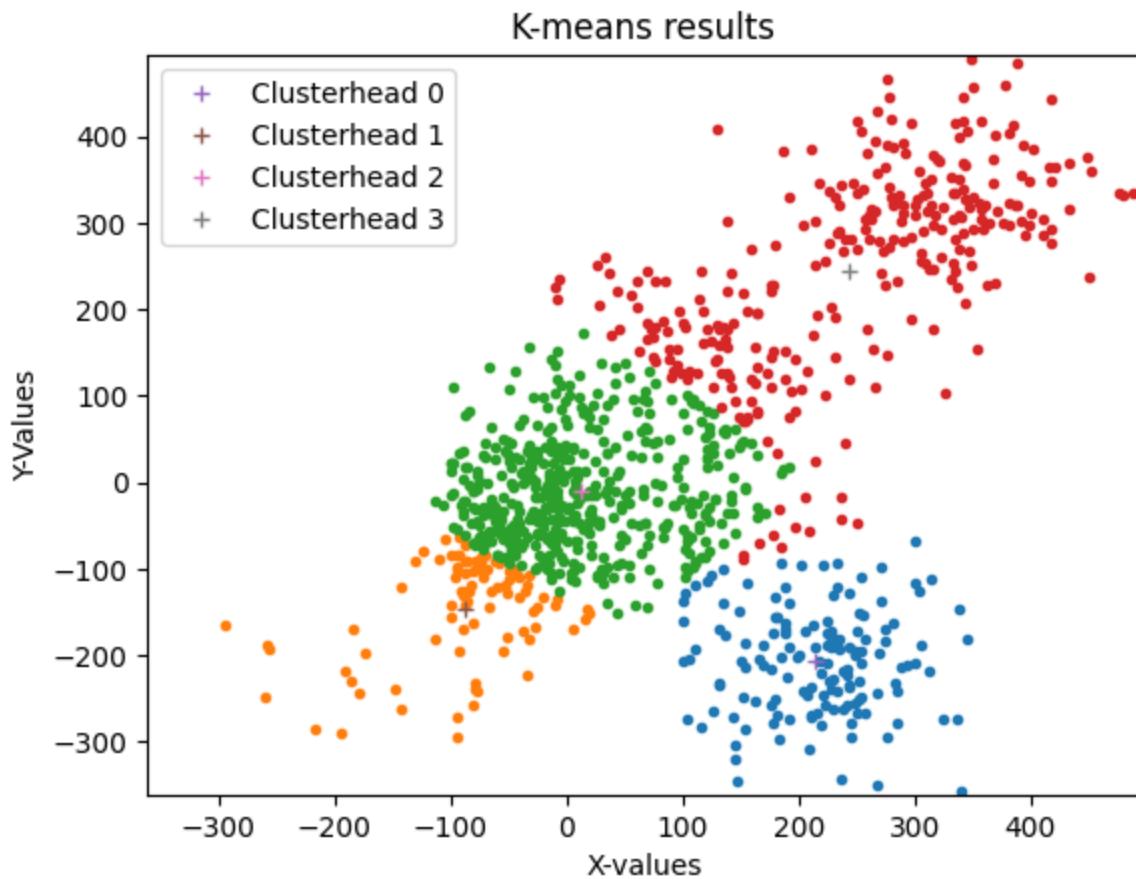
```
[[ 214.87589681 -102.49773493 -2.63785446 225.15830267]
 [-206.07501026 -160.56733438 -23.63904019 218.6269518 ]]
```

new cluster heads:

```
[[ 214.87589681 -87.24879221 12.4508023 243.77482659]
 [-206.07501026 -146.48492934 -10.08909104 245.49493001]]
```

last heads:

```
[[ 214.87589681 -102.49773493 -2.63785446 225.15830267]
 [-206.07501026 -160.56733438 -23.63904019 218.6269518 ]]
```



distance between old and new heads: 1910.58

new cluster heads:

```
[[ 214.87589681 -87.24879221  12.4508023  243.77482659]
 [-206.07501026 -146.48492934 -10.08909104  245.49493001]]
```

last heads:

```
[[ 214.87589681 -87.24879221  12.4508023  243.77482659]
 [-206.07501026 -146.48492934 -10.08909104  245.49493001]]
```

new cluster heads:

```
[[ 214.87589681 -74.55842071  12.4508023  243.77482659]
 [-206.07501026 -126.09557711 -10.08909104  245.49493001]]
```

last heads:

```
[[ 214.87589681 -87.24879221  12.4508023  243.77482659]
 [-206.07501026 -146.48492934 -10.08909104  245.49493001]]
```

new cluster heads:

```
[[ 214.87589681 -74.55842071  25.07386678  243.77482659]
 [-206.07501026 -126.09557711   6.33572441  245.49493001]]
```

last heads:

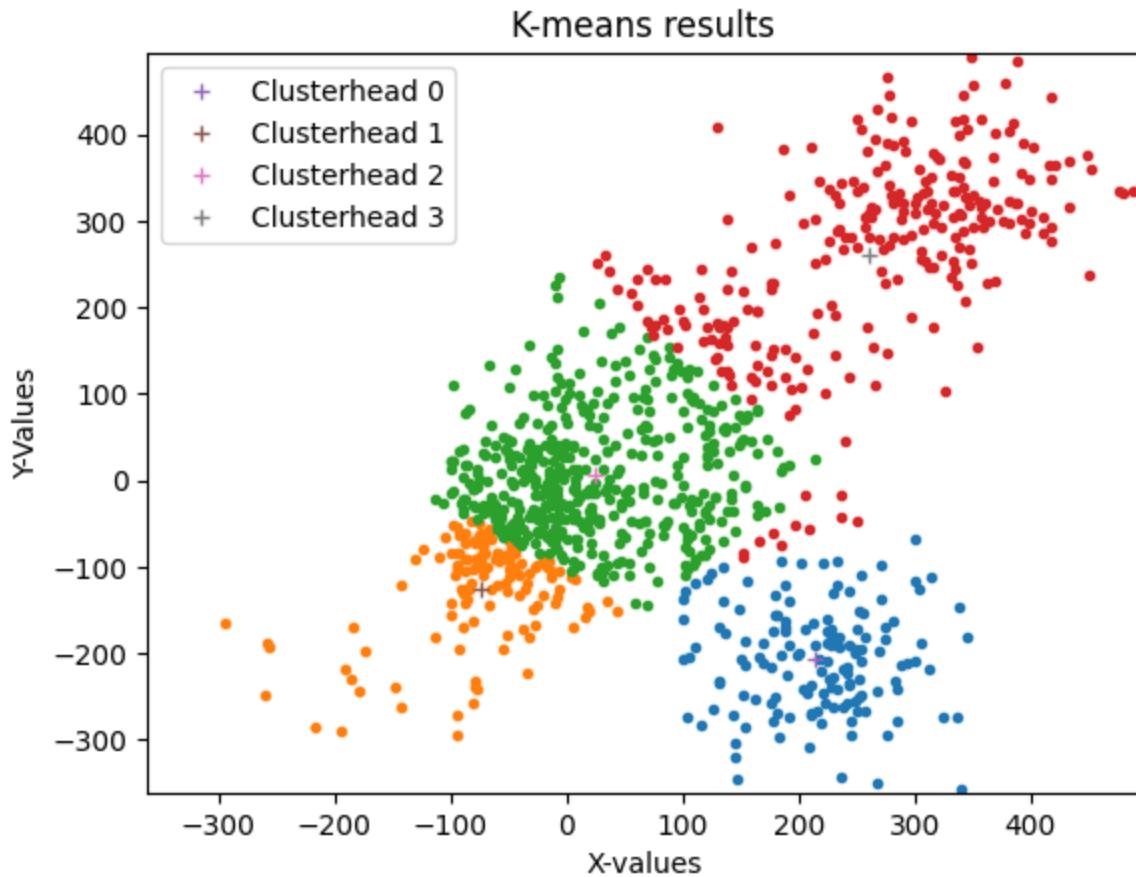
```
[[ 214.87589681 -87.24879221  12.4508023  243.77482659]
 [-206.07501026 -146.48492934 -10.08909104  245.49493001]]
```

new cluster heads:

```
[[ 214.87589681 -74.55842071  25.07386678  261.21765011]
 [-206.07501026 -126.09557711   6.33572441  261.57287232]]
```

last heads:

```
[[ 214.87589681 -87.24879221  12.4508023  243.77482659]
 [-206.07501026 -146.48492934 -10.08909104  245.49493001]]
```



distance between old and new heads: 1568.64

new cluster heads:

```
[[ 214.87589681 -74.55842071  25.07386678 261.21765011]
 [-206.07501026 -126.09557711       6.33572441 261.57287232]]
```

last heads:

```
[[ 214.87589681 -74.55842071  25.07386678 261.21765011]
 [-206.07501026 -126.09557711       6.33572441 261.57287232]]
```

new cluster heads:

```
[[ 214.87589681 -63.32314158  25.07386678 261.21765011]
 [-206.07501026 -106.81653071       6.33572441 261.57287232]]
```

last heads:

```
[[ 214.87589681 -74.55842071  25.07386678 261.21765011]
 [-206.07501026 -126.09557711       6.33572441 261.57287232]]
```

new cluster heads:

```
[[ 214.87589681 -63.32314158  38.71317815 261.21765011]
 [-206.07501026 -106.81653071  22.75408526 261.57287232]]
```

last heads:

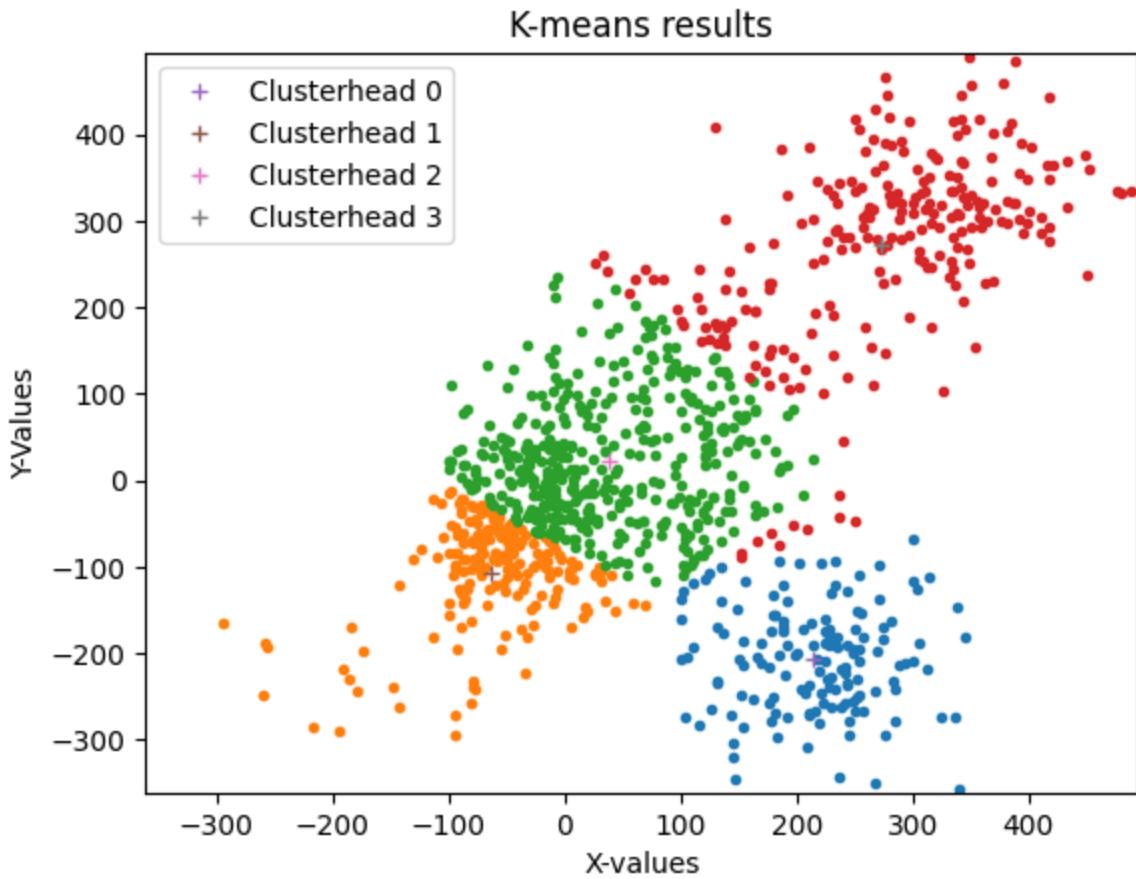
```
[[ 214.87589681 -74.55842071  25.07386678 261.21765011]
 [-206.07501026 -126.09557711       6.33572441 261.57287232]]
```

new cluster heads:

```
[[ 214.87589681 -63.32314158  38.71317815 272.99462133]
 [-206.07501026 -106.81653071  22.75408526 271.81630192]]
```

last heads:

```
[[ 214.87589681 -74.55842071  25.07386678 261.21765011]
 [-206.07501026 -126.09557711       6.33572441 261.57287232]]
```



distance between old and new heads: 1197.13

new cluster heads:

```
[[ 214.87589681 -63.32314158  38.71317815 272.99462133]
 [-206.07501026 -106.81653071  22.75408526 271.81630192]]
```

last heads:

```
[[ 214.87589681 -63.32314158  38.71317815 272.99462133]
 [-206.07501026 -106.81653071  22.75408526 271.81630192]]
```

new cluster heads:

```
[[ 214.87589681 -55.55432076  38.71317815 272.99462133]
 [-206.07501026 -92.47231012  22.75408526 271.81630192]]
```

last heads:

```
[[ 214.87589681 -63.32314158  38.71317815 272.99462133]
 [-206.07501026 -106.81653071  22.75408526 271.81630192]]
```

new cluster heads:

```
[[ 214.87589681 -55.55432076  52.60033878 272.99462133]
 [-206.07501026 -92.47231012  39.74814359 271.81630192]]
```

last heads:

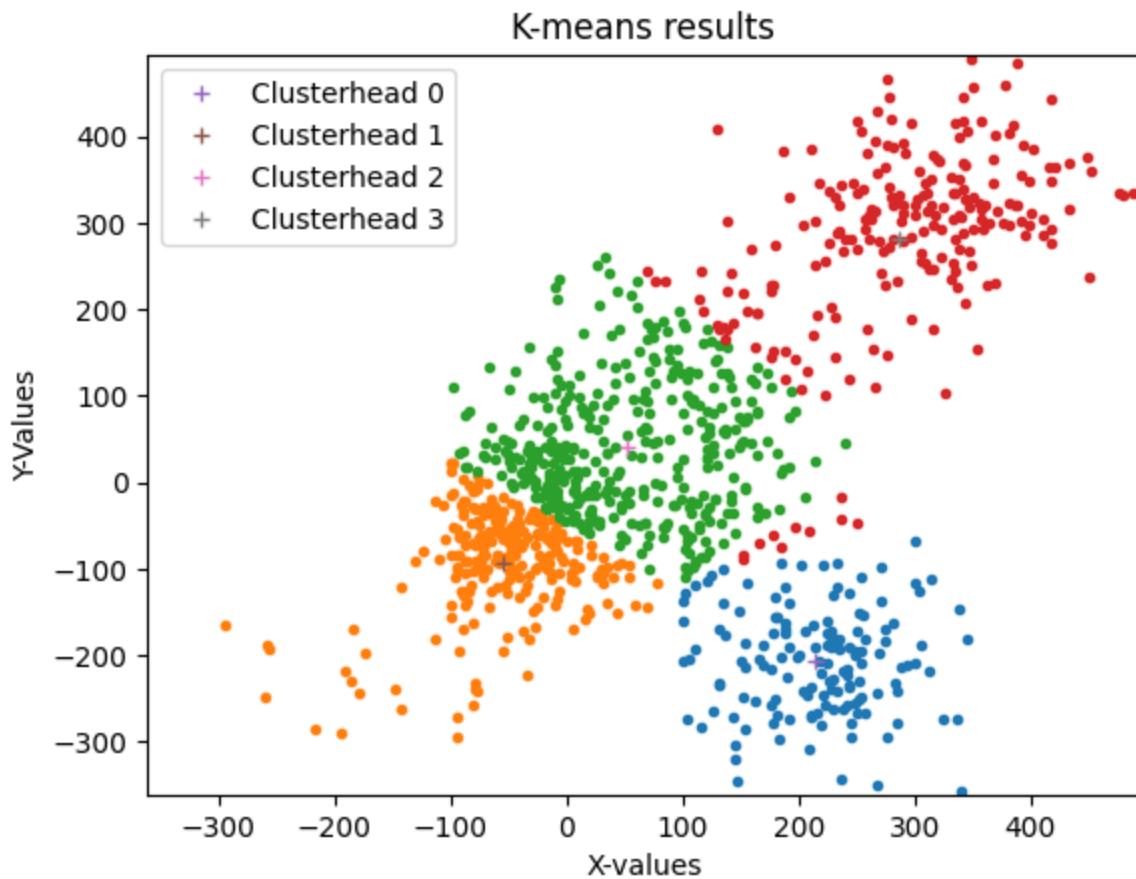
```
[[ 214.87589681 -63.32314158  38.71317815 272.99462133]
 [-206.07501026 -106.81653071  22.75408526 271.81630192]]
```

new cluster heads:

```
[[ 214.87589681 -55.55432076  52.60033878 286.22327461]
 [-206.07501026 -92.47231012  39.74814359 280.56752549]]
```

last heads:

```
[[ 214.87589681 -63.32314158  38.71317815 272.99462133]
 [-206.07501026 -106.81653071  22.75408526 271.81630192]]
```



distance between old and new heads: 999.34

new cluster heads:

```
[[ 214.87589681 -55.55432076  52.60033878 286.22327461]
 [-206.07501026 -92.47231012  39.74814359 280.56752549]]
```

last heads:

```
[[ 214.87589681 -55.55432076  52.60033878 286.22327461]
 [-206.07501026 -92.47231012  39.74814359 280.56752549]]
```

new cluster heads:

```
[[ 214.87589681 -50.47059351  52.60033878 286.22327461]
 [-206.07501026 -83.62672975  39.74814359 280.56752549]]
```

last heads:

```
[[ 214.87589681 -55.55432076  52.60033878 286.22327461]
 [-206.07501026 -92.47231012  39.74814359 280.56752549]]
```

new cluster heads:

```
[[ 214.87589681 -50.47059351  63.74264748 286.22327461]
 [-206.07501026 -83.62672975  52.62099335 280.56752549]]
```

last heads:

```
[[ 214.87589681 -55.55432076  52.60033878 286.22327461]
 [-206.07501026 -92.47231012  39.74814359 280.56752549]]
```

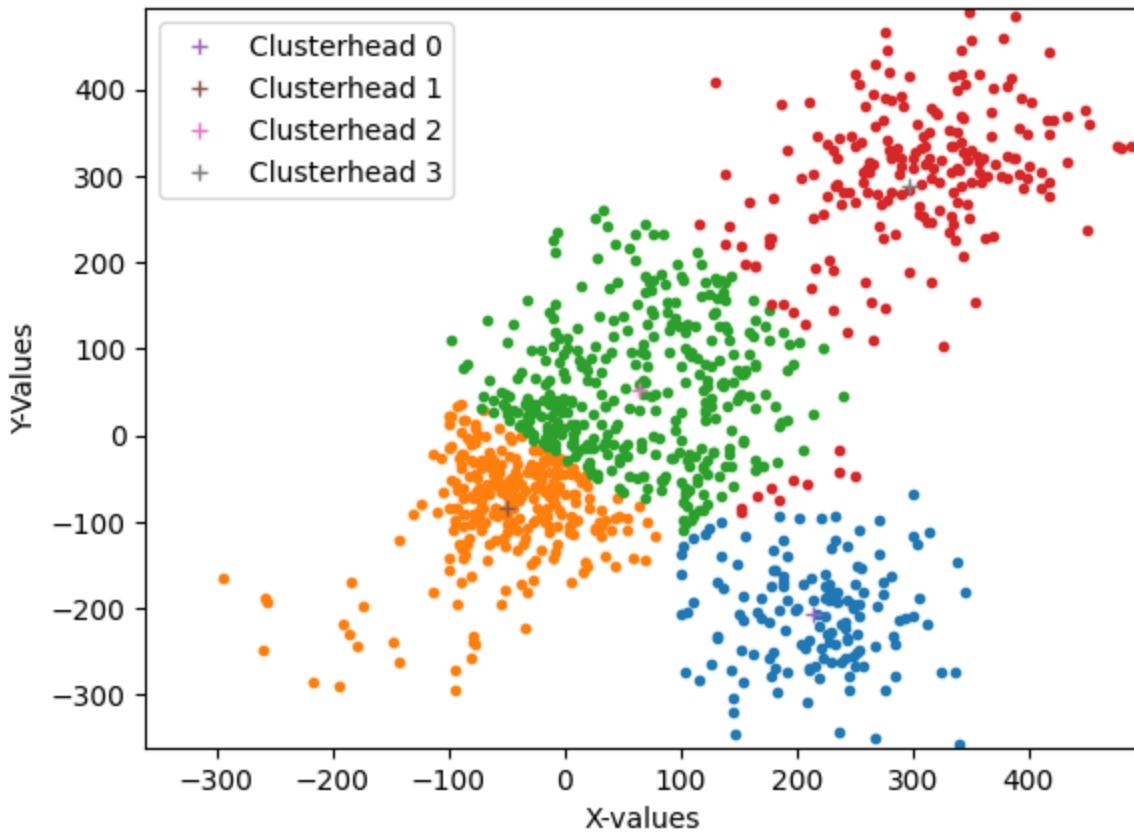
new cluster heads:

```
[[ 214.87589681 -50.47059351  63.74264748 297.63848604]
 [-206.07501026 -83.62672975  52.62099335 288.70409471]]
```

last heads:

```
[[ 214.87589681 -55.55432076  52.60033878 286.22327461]
 [-206.07501026 -92.47231012  39.74814359 280.56752549]]
```

## K-means results



distance between old and new heads: 590.46

new cluster heads:

```
[[ 214.87589681 -50.47059351  63.74264748 297.63848604]
 [-206.07501026 -83.62672975  52.62099335 288.70409471]]
```

last heads:

```
[[ 214.87589681 -50.47059351  63.74264748 297.63848604]
 [-206.07501026 -83.62672975  52.62099335 288.70409471]]
```

new cluster heads:

```
[[ 214.87589681 -45.96280338  63.74264748 297.63848604]
 [-206.07501026 -76.39101802  52.62099335 288.70409471]]
```

last heads:

```
[[ 214.87589681 -50.47059351  63.74264748 297.63848604]
 [-206.07501026 -83.62672975  52.62099335 288.70409471]]
```

new cluster heads:

```
[[ 214.87589681 -45.96280338  73.03025722 297.63848604]
 [-206.07501026 -76.39101802  60.27801765 288.70409471]]
```

last heads:

```
[[ 214.87589681 -50.47059351  63.74264748 297.63848604]
 [-206.07501026 -83.62672975  52.62099335 288.70409471]]
```

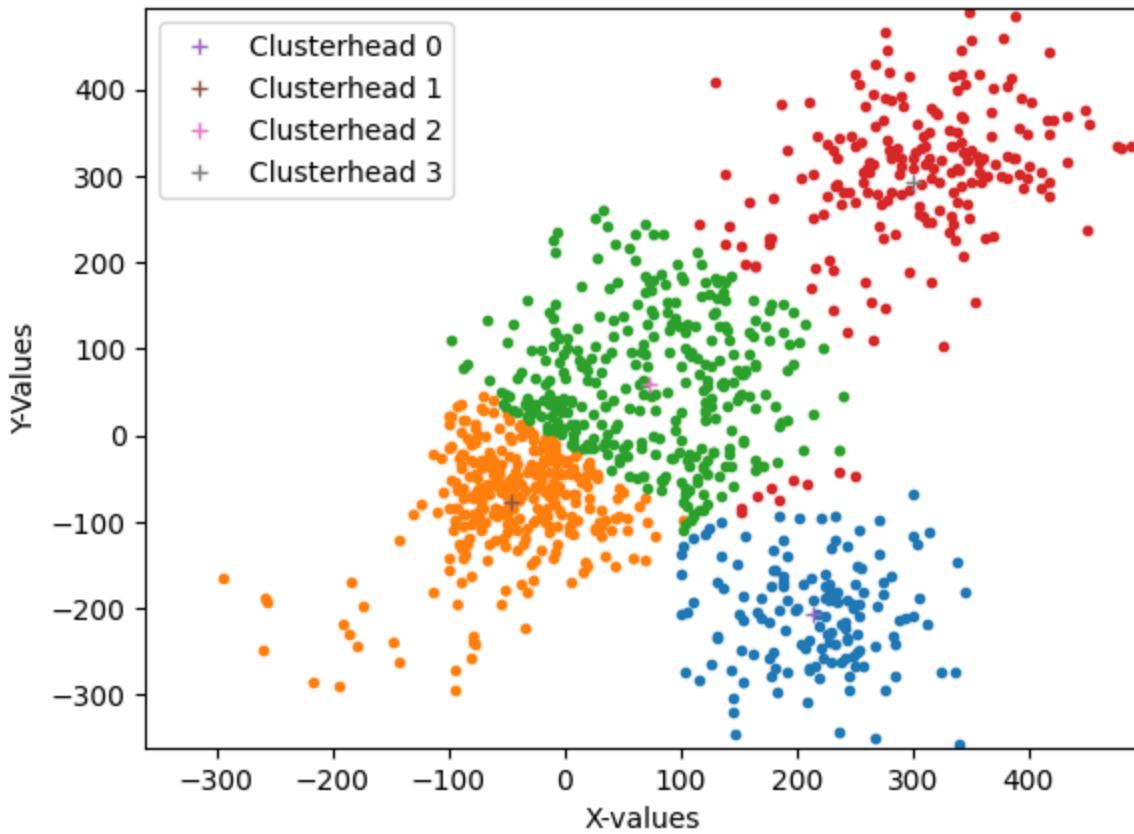
new cluster heads:

```
[[ 214.87589681 -45.96280338  73.03025722 300.03543082]
 [-206.07501026 -76.39101802  60.27801765 293.11543714]]
```

last heads:

```
[[ 214.87589681 -50.47059351  63.74264748 297.63848604]
 [-206.07501026 -83.62672975  52.62099335 288.70409471]]
```

## K-means results



distance between old and new heads: 242.77

new cluster heads:

```
[[ 214.87589681 -45.96280338  73.03025722 300.03543082]
 [-206.07501026 -76.39101802  60.27801765 293.11543714]]
```

last heads:

```
[[ 214.87589681 -45.96280338  73.03025722 300.03543082]
 [-206.07501026 -76.39101802  60.27801765 293.11543714]]
```

new cluster heads:

```
[[ 214.87589681 -43.52068102  73.03025722 300.03543082]
 [-206.07501026 -69.87427311  60.27801765 293.11543714]]
```

last heads:

```
[[ 214.87589681 -45.96280338  73.03025722 300.03543082]
 [-206.07501026 -76.39101802  60.27801765 293.11543714]]
```

new cluster heads:

```
[[ 214.87589681 -43.52068102  82.17623365 300.03543082]
 [-206.07501026 -69.87427311  67.24382028 293.11543714]]
```

last heads:

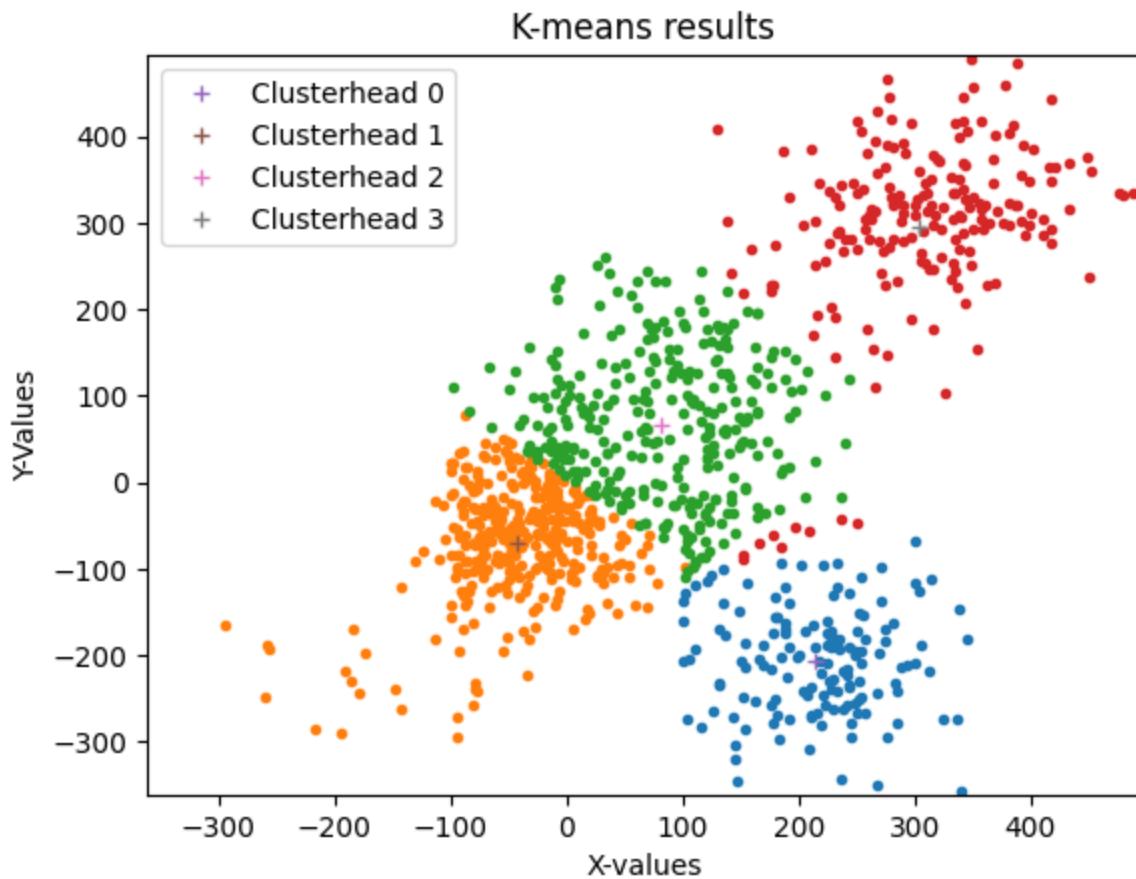
```
[[ 214.87589681 -45.96280338  73.03025722 300.03543082]
 [-206.07501026 -76.39101802  60.27801765 293.11543714]]
```

new cluster heads:

```
[[ 214.87589681 -43.52068102  82.17623365 304.23816855]
 [-206.07501026 -69.87427311  67.24382028 296.1084645 ]]
```

last heads:

```
[[ 214.87589681 -45.96280338  73.03025722 300.03543082]
 [-206.07501026 -76.39101802  60.27801765 293.11543714]]
```



distance between old and new heads: 207.22

new cluster heads:

```
[[ 214.87589681 -43.52068102  82.17623365 304.23816855]
 [-206.07501026 -69.87427311  67.24382028 296.1084645 ]]
```

last heads:

```
[[ 214.87589681 -43.52068102  82.17623365 304.23816855]
 [-206.07501026 -69.87427311  67.24382028 296.1084645 ]]
```

new cluster heads:

```
[[ 214.87589681 -39.346575    82.17623365 304.23816855]
 [-206.07501026 -65.31841852  67.24382028 296.1084645 ]]
```

last heads:

```
[[ 214.87589681 -43.52068102  82.17623365 304.23816855]
 [-206.07501026 -69.87427311  67.24382028 296.1084645 ]]
```

new cluster heads:

```
[[ 214.87589681 -39.346575    89.20072865 304.23816855]
 [-206.07501026 -65.31841852  74.60814046 296.1084645 ]]
```

last heads:

```
[[ 214.87589681 -43.52068102  82.17623365 304.23816855]
 [-206.07501026 -69.87427311  67.24382028 296.1084645 ]]
```

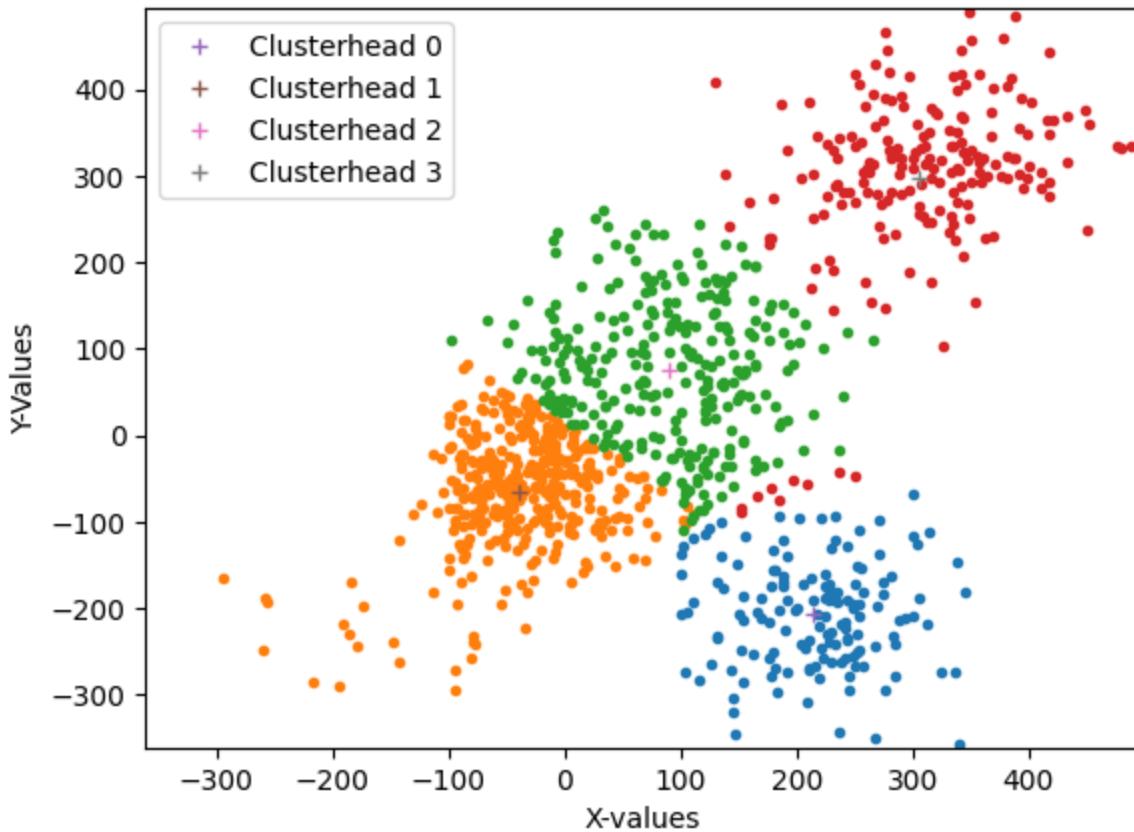
new cluster heads:

```
[[ 214.87589681 -39.346575    89.20072865 305.22827706]
 [-206.07501026 -65.31841852  74.60814046 297.48126803]]
```

last heads:

```
[[ 214.87589681 -43.52068102  82.17623365 304.23816855]
 [-206.07501026 -69.87427311  67.24382028 296.1084645 ]]
```

## K-means results



distance between old and new heads: 144.62

new cluster heads:

```
[[ 214.87589681 -39.346575     89.20072865  305.22827706]
 [-206.07501026 -65.31841852    74.60814046  297.48126803]]
```

last heads:

```
[[ 214.87589681 -39.346575     89.20072865  305.22827706]
 [-206.07501026 -65.31841852    74.60814046  297.48126803]]
```

new cluster heads:

```
[[ 214.87589681 -35.33597738     89.20072865  305.22827706]
 [-206.07501026 -62.80531853    74.60814046  297.48126803]]
```

last heads:

```
[[ 214.87589681 -39.346575     89.20072865  305.22827706]
 [-206.07501026 -65.31841852    74.60814046  297.48126803]]
```

new cluster heads:

```
[[ 214.87589681 -35.33597738     94.0348714   305.22827706]
 [-206.07501026 -62.80531853    82.12969508  297.48126803]]
```

last heads:

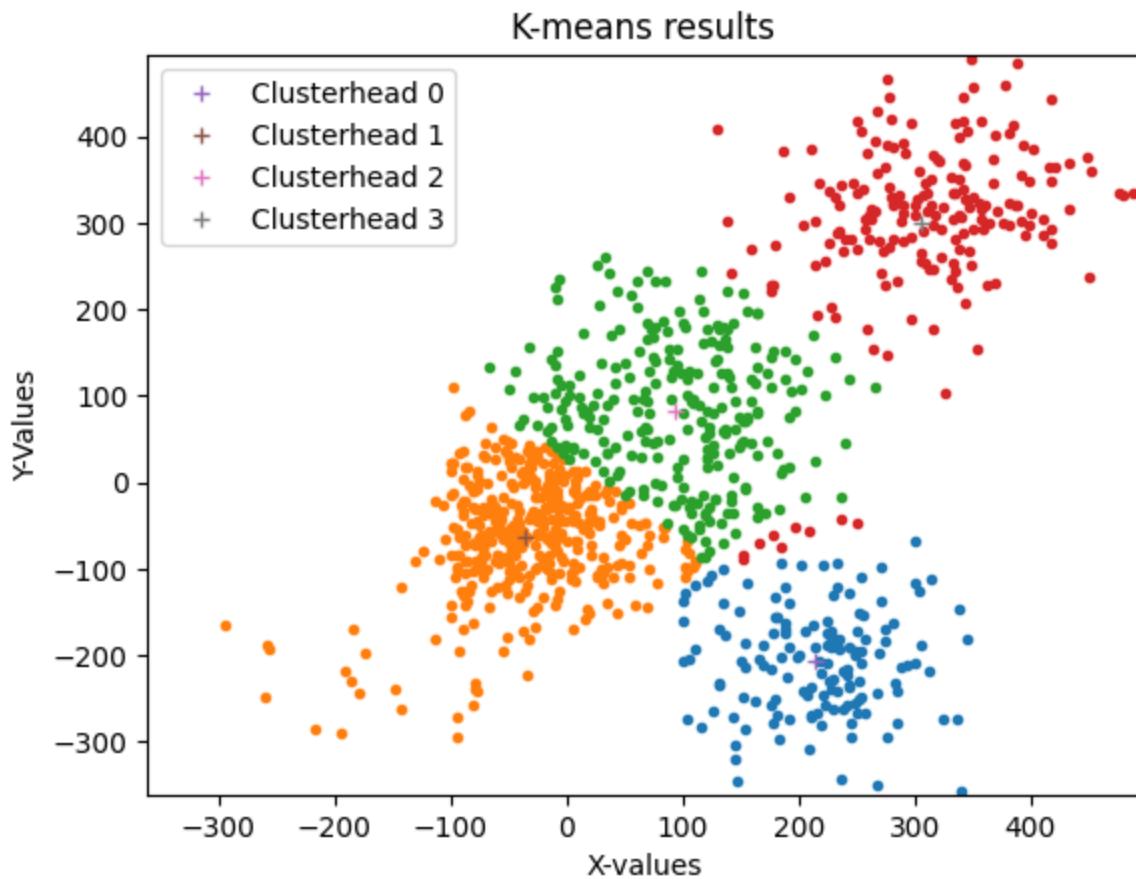
```
[[ 214.87589681 -39.346575     89.20072865  305.22827706]
 [-206.07501026 -65.31841852    74.60814046  297.48126803]]
```

new cluster heads:

```
[[ 214.87589681 -35.33597738     94.0348714   306.10086873]
 [-206.07501026 -62.80531853    82.12969508  298.95242571]]
```

last heads:

```
[[ 214.87589681 -39.346575     89.20072865  305.22827706]
 [-206.07501026 -65.31841852    74.60814046  297.48126803]]
```



distance between old and new heads: 105.27

new cluster heads:

```
[[ 214.87589681 -35.33597738  94.0348714  306.10086873]
 [-206.07501026 -62.80531853  82.12969508  298.95242571]]
```

last heads:

```
[[ 214.87589681 -35.33597738  94.0348714  306.10086873]
 [-206.07501026 -62.80531853  82.12969508  298.95242571]]
```

new cluster heads:

```
[[ 214.87589681 -33.32098317  94.0348714  306.10086873]
 [-206.07501026 -61.4932658   82.12969508  298.95242571]]
```

last heads:

```
[[ 214.87589681 -35.33597738  94.0348714  306.10086873]
 [-206.07501026 -62.80531853  82.12969508  298.95242571]]
```

new cluster heads:

```
[[ 214.87589681 -33.32098317  96.1397379   306.10086873]
 [-206.07501026 -61.4932658   86.38997117  298.95242571]]
```

last heads:

```
[[ 214.87589681 -35.33597738  94.0348714  306.10086873]
 [-206.07501026 -62.80531853  82.12969508  298.95242571]]
```

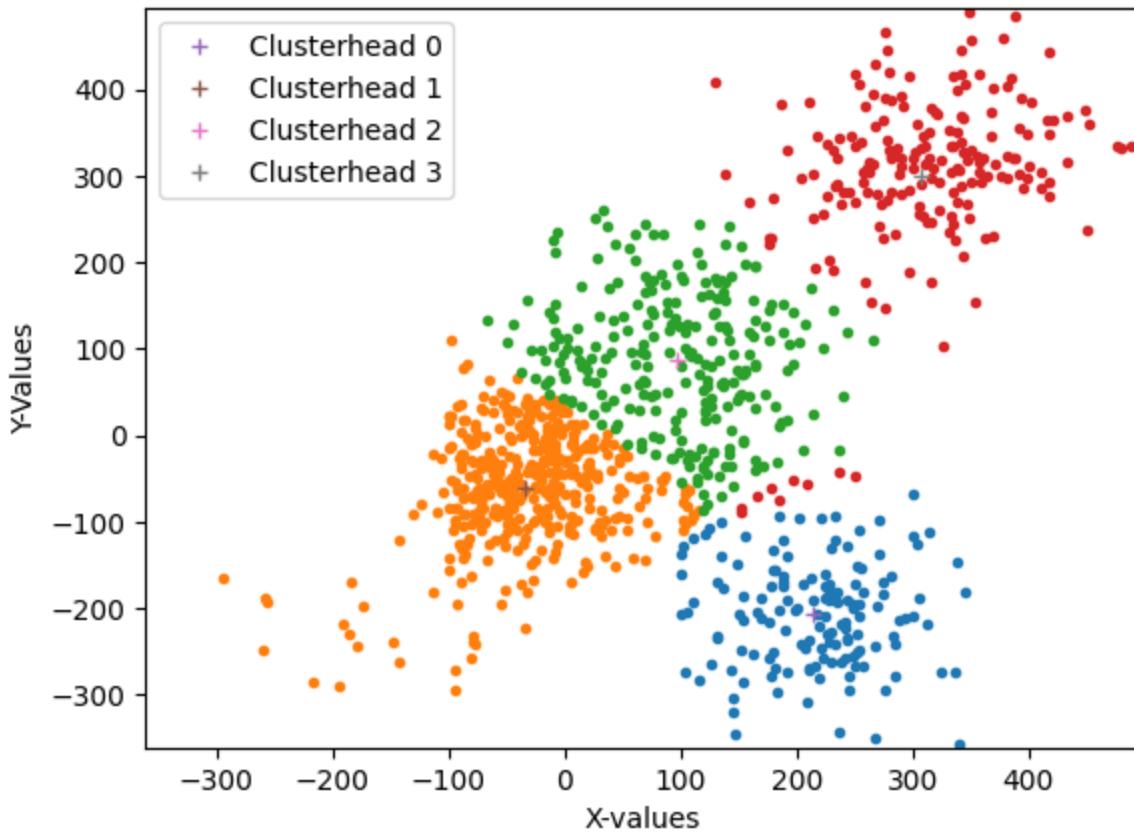
new cluster heads:

```
[[ 214.87589681 -33.32098317  96.1397379   306.96955735]
 [-206.07501026 -61.4932658   86.38997117  299.2487069 ]]
```

last heads:

```
[[ 214.87589681 -35.33597738  94.0348714  306.10086873]
 [-206.07501026 -62.80531853  82.12969508  298.95242571]]
```

## K-means results



distance between old and new heads: 29.20

new cluster heads:

```
[[ 214.87589681 -33.32098317  96.1397379  306.96955735]
 [-206.07501026 -61.4932658   86.38997117 299.2487069 ]]
```

last heads:

```
[[ 214.87589681 -33.32098317  96.1397379  306.96955735]
 [-206.07501026 -61.4932658   86.38997117 299.2487069 ]]
```

new cluster heads:

```
[[ 214.87589681 -32.34095293  96.1397379  306.96955735]
 [-206.07501026 -61.08780009  86.38997117 299.2487069 ]]
```

last heads:

```
[[ 214.87589681 -33.32098317  96.1397379  306.96955735]
 [-206.07501026 -61.4932658   86.38997117 299.2487069 ]]
```

new cluster heads:

```
[[ 214.87589681 -32.34095293  96.62934227 306.96955735]
 [-206.07501026 -61.08780009  88.09566944 299.2487069 ]]
```

last heads:

```
[[ 214.87589681 -33.32098317  96.1397379  306.96955735]
 [-206.07501026 -61.4932658   86.38997117 299.2487069 ]]
```

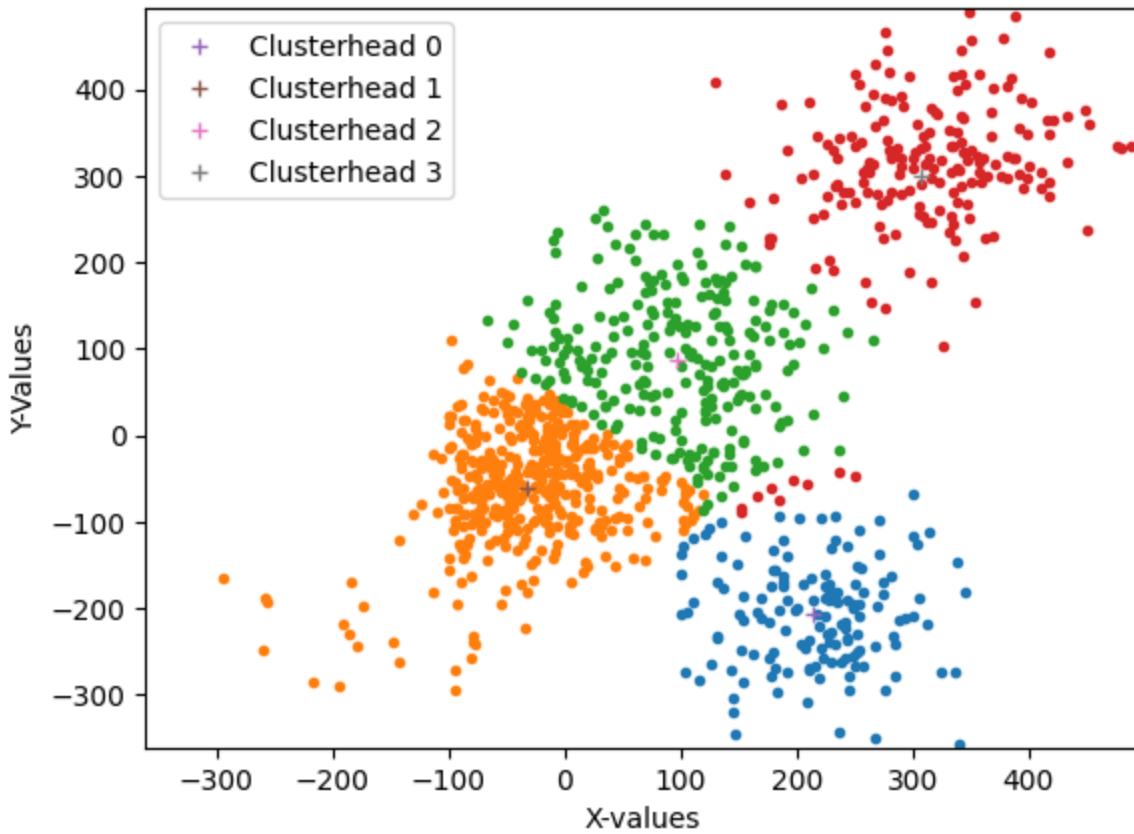
new cluster heads:

```
[[ 214.87589681 -32.34095293  96.62934227 306.96955735]
 [-206.07501026 -61.08780009  88.09566944 299.2487069 ]]
```

last heads:

```
[[ 214.87589681 -33.32098317  96.1397379  306.96955735]
 [-206.07501026 -61.4932658   86.38997117 299.2487069 ]]
```

## K-means results



distance between old and new heads: 4.27

new cluster heads:

```
[[ 214.87589681 -32.34095293  96.62934227 306.96955735]
 [-206.07501026 -61.08780009  88.09566944 299.2487069 ]]
```

last heads:

```
[[ 214.87589681 -32.34095293  96.62934227 306.96955735]
 [-206.07501026 -61.08780009  88.09566944 299.2487069 ]]
```

new cluster heads:

```
[[ 214.87589681 -31.82443275  96.62934227 306.96955735]
 [-206.07501026 -60.63577495  88.09566944 299.2487069 ]]
```

last heads:

```
[[ 214.87589681 -32.34095293  96.62934227 306.96955735]
 [-206.07501026 -61.08780009  88.09566944 299.2487069 ]]
```

new cluster heads:

```
[[ 214.87589681 -31.82443275  97.3438733 306.96955735]
 [-206.07501026 -60.63577495  89.1602993 299.2487069 ]]
```

last heads:

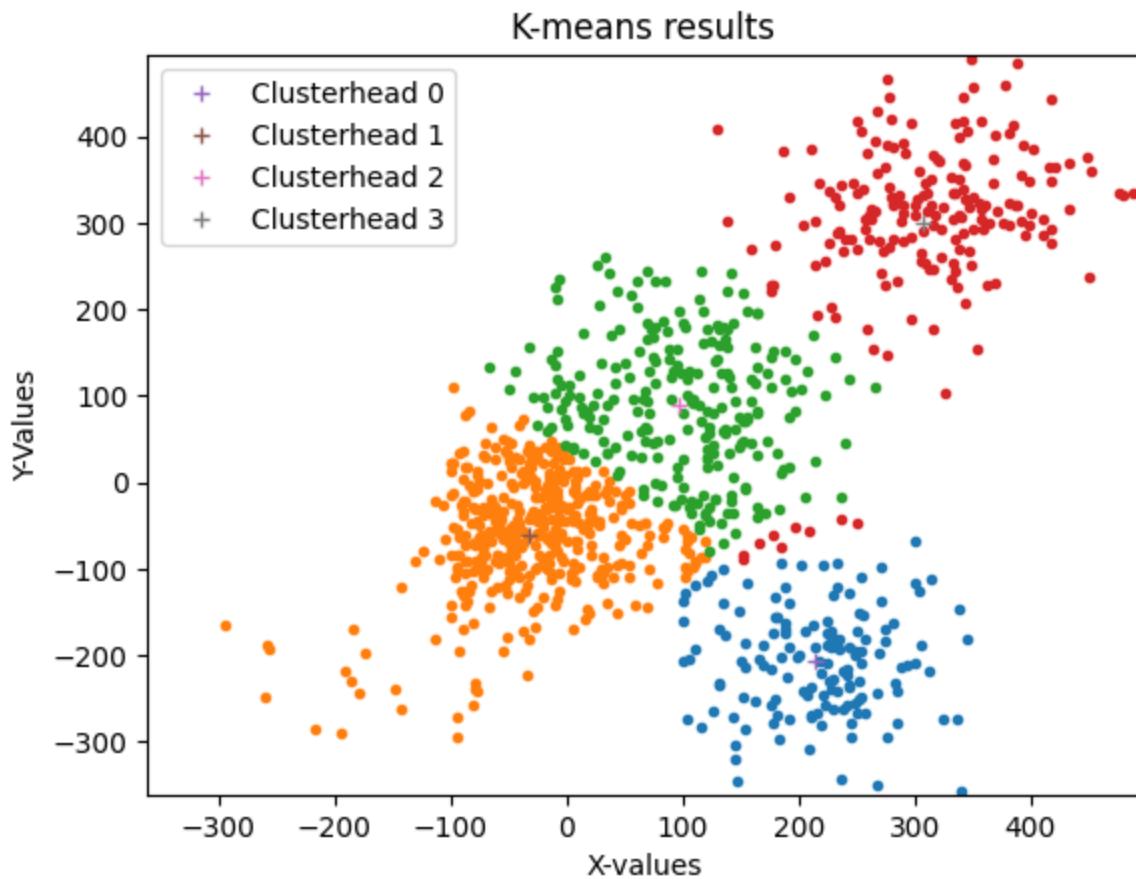
```
[[ 214.87589681 -32.34095293  96.62934227 306.96955735]
 [-206.07501026 -61.08780009  88.09566944 299.2487069 ]]
```

new cluster heads:

```
[[ 214.87589681 -31.82443275  97.3438733 306.96955735]
 [-206.07501026 -60.63577495  89.1602993 299.2487069 ]]
```

last heads:

```
[[ 214.87589681 -32.34095293  96.62934227 306.96955735]
 [-206.07501026 -61.08780009  88.09566944 299.2487069 ]]
```



distance between old and new heads: 2.12

new cluster heads:

```
[[ 214.87589681 -31.82443275  97.3438733  306.96955735]
 [-206.07501026 -60.63577495  89.1602993  299.2487069 ]]
```

last heads:

```
[[ 214.87589681 -31.82443275  97.3438733  306.96955735]
 [-206.07501026 -60.63577495  89.1602993  299.2487069 ]]
```

new cluster heads:

```
[[ 214.87589681 -31.3719939  97.3438733  306.96955735]
 [-206.07501026 -60.42988255  89.1602993  299.2487069 ]]
```

last heads:

```
[[ 214.87589681 -31.82443275  97.3438733  306.96955735]
 [-206.07501026 -60.63577495  89.1602993  299.2487069 ]]
```

new cluster heads:

```
[[ 214.87589681 -31.3719939  97.64363574  306.96955735]
 [-206.07501026 -60.42988255  90.03667348  299.2487069 ]]
```

last heads:

```
[[ 214.87589681 -31.82443275  97.3438733  306.96955735]
 [-206.07501026 -60.63577495  89.1602993  299.2487069 ]]
```

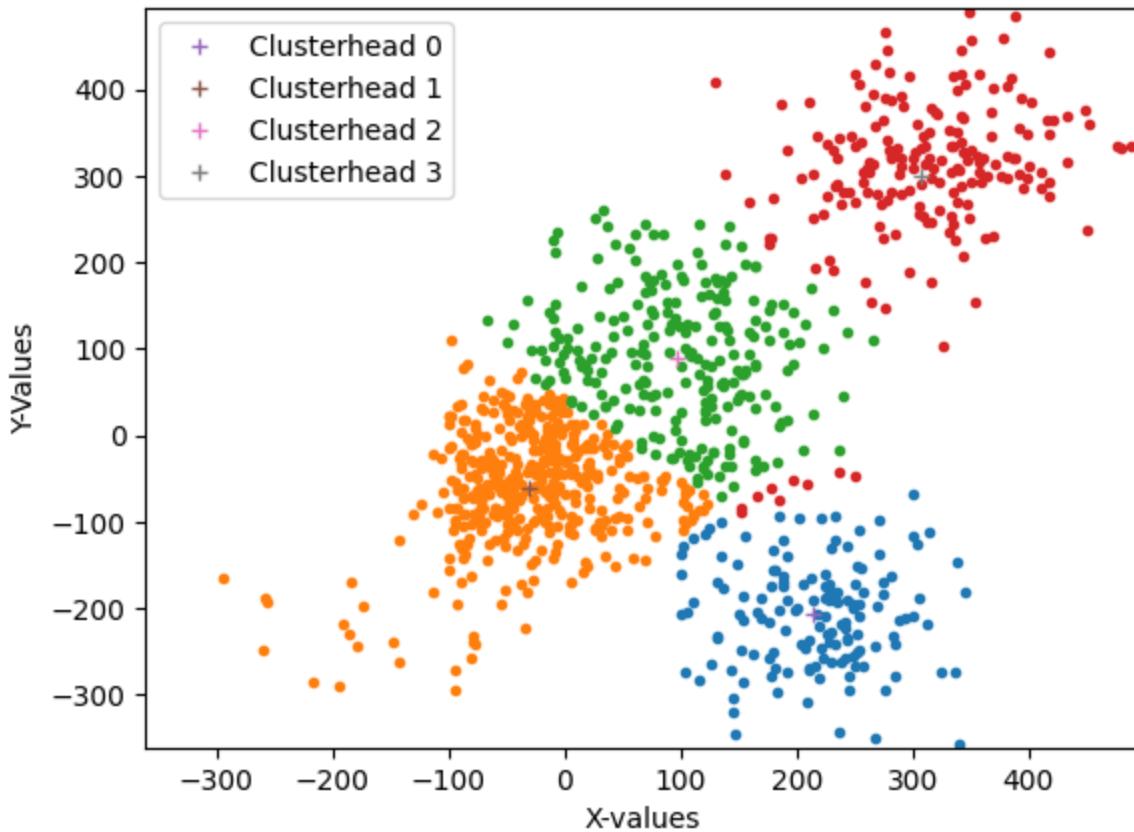
new cluster heads:

```
[[ 214.87589681 -31.3719939  97.64363574  306.96955735]
 [-206.07501026 -60.42988255  90.03667348  299.2487069 ]]
```

last heads:

```
[[ 214.87589681 -31.82443275  97.3438733  306.96955735]
 [-206.07501026 -60.63577495  89.1602993  299.2487069 ]]
```

## K-means results



distance between old and new heads: 1.10

new cluster heads:

```
[[ 214.87589681 -31.3719939  97.64363574  306.96955735]
 [-206.07501026 -60.42988255  90.03667348  299.2487069 ]]
```

last heads:

```
[[ 214.87589681 -31.3719939  97.64363574  306.96955735]
 [-206.07501026 -60.42988255  90.03667348  299.2487069 ]]
```

new cluster heads:

```
[[ 214.87589681 -31.13253714  97.64363574  306.96955735]
 [-206.07501026 -60.31806079  90.03667348  299.2487069 ]]
```

last heads:

```
[[ 214.87589681 -31.3719939  97.64363574  306.96955735]
 [-206.07501026 -60.42988255  90.03667348  299.2487069 ]]
```

new cluster heads:

```
[[ 214.87589681 -31.13253714  97.77048397  306.96955735]
 [-206.07501026 -60.31806079  90.46414881  299.2487069 ]]
```

last heads:

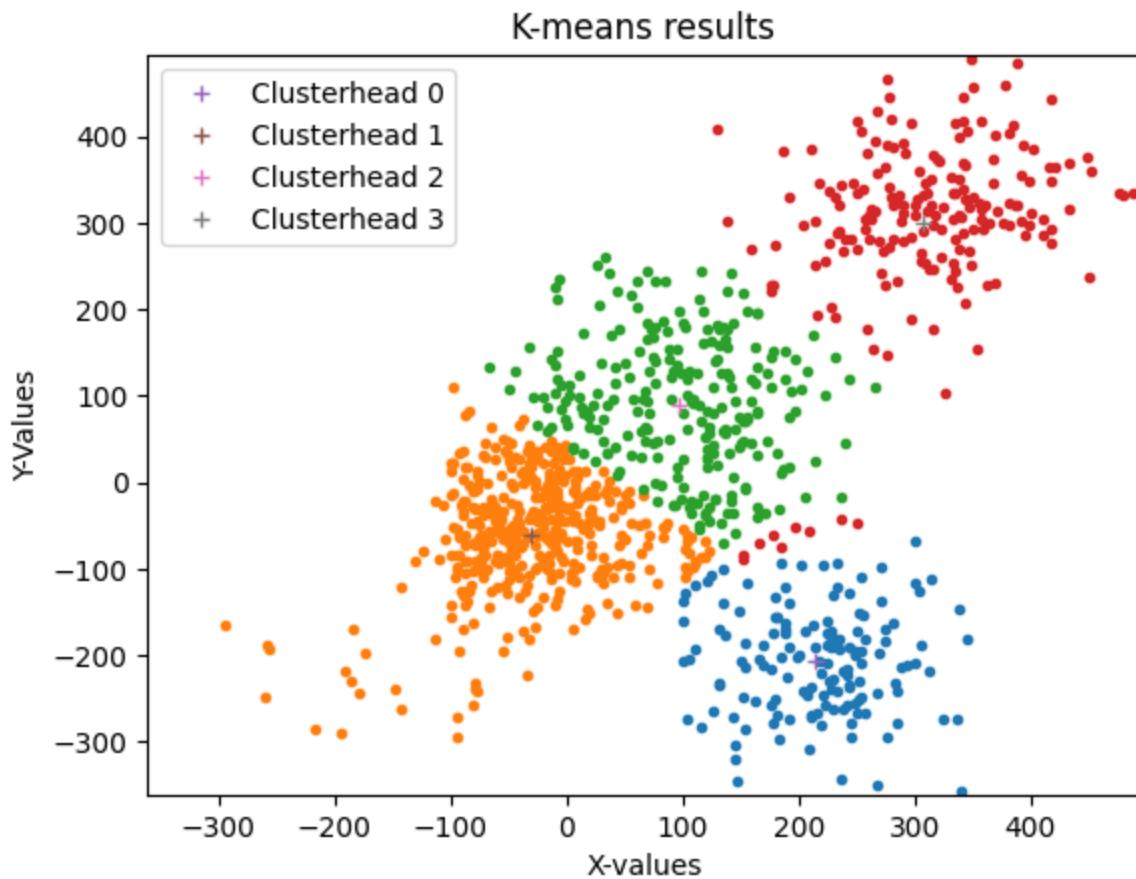
```
[[ 214.87589681 -31.3719939  97.64363574  306.96955735]
 [-206.07501026 -60.42988255  90.03667348  299.2487069 ]]
```

new cluster heads:

```
[[ 214.87589681 -31.13253714  97.77048397  306.96955735]
 [-206.07501026 -60.31806079  90.46414881  299.2487069 ]]
```

last heads:

```
[[ 214.87589681 -31.3719939  97.64363574  306.96955735]
 [-206.07501026 -60.42988255  90.03667348  299.2487069 ]]
```



distance between old and new heads: 0.27

new cluster heads:

```
[[ 214.87589681 -31.13253714  97.77048397 306.96955735]
 [-206.07501026 -60.31806079  90.46414881 299.2487069 ]]
```

last heads:

```
[[ 214.87589681 -31.13253714  97.77048397 306.96955735]
 [-206.07501026 -60.31806079  90.46414881 299.2487069 ]]
```

new cluster heads:

```
[[ 214.87589681 -31.13253714  97.77048397 306.96955735]
 [-206.07501026 -60.31806079  90.46414881 299.2487069 ]]
```

last heads:

```
[[ 214.87589681 -31.13253714  97.77048397 306.96955735]
 [-206.07501026 -60.31806079  90.46414881 299.2487069 ]]
```

new cluster heads:

```
[[ 214.87589681 -31.13253714  97.77048397 306.96955735]
 [-206.07501026 -60.31806079  90.46414881 299.2487069 ]]
```

last heads:

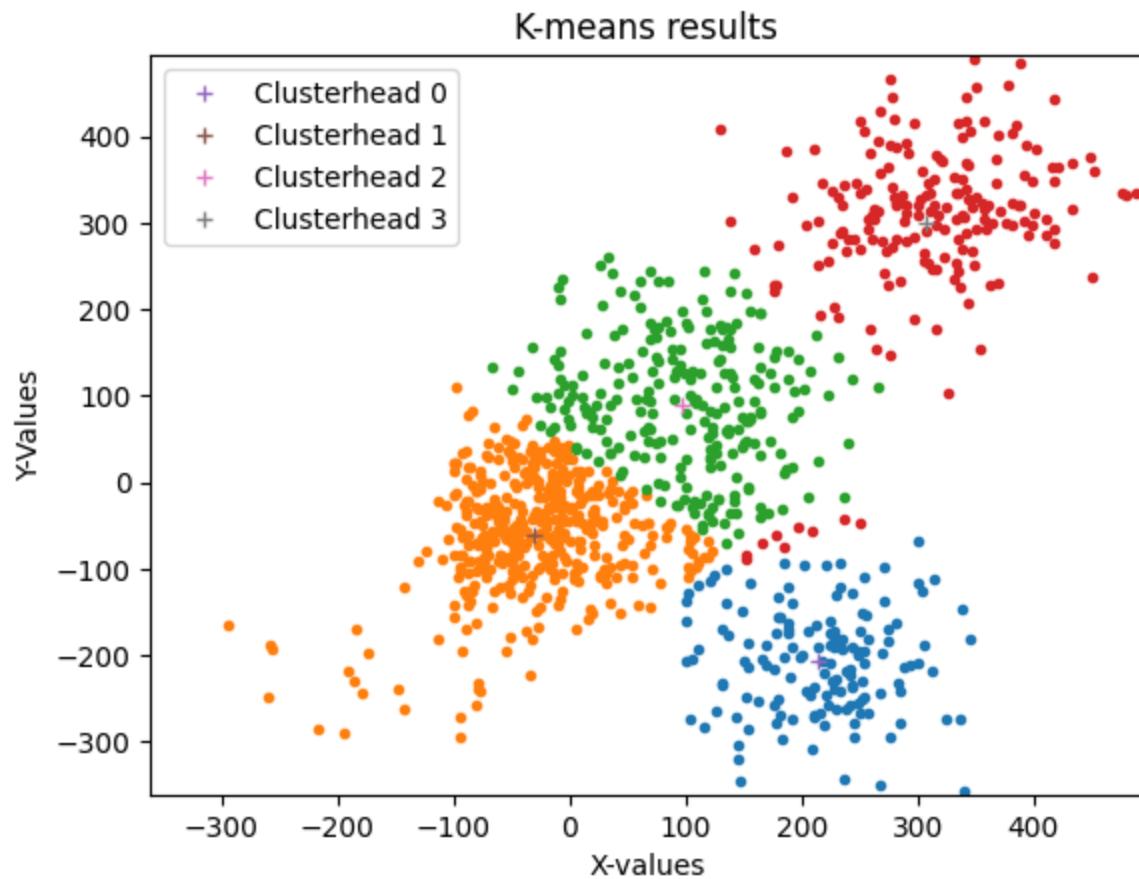
```
[[ 214.87589681 -31.13253714  97.77048397 306.96955735]
 [-206.07501026 -60.31806079  90.46414881 299.2487069 ]]
```

new cluster heads:

```
[[ 214.87589681 -31.13253714  97.77048397 306.96955735]
 [-206.07501026 -60.31806079  90.46414881 299.2487069 ]]
```

last heads:

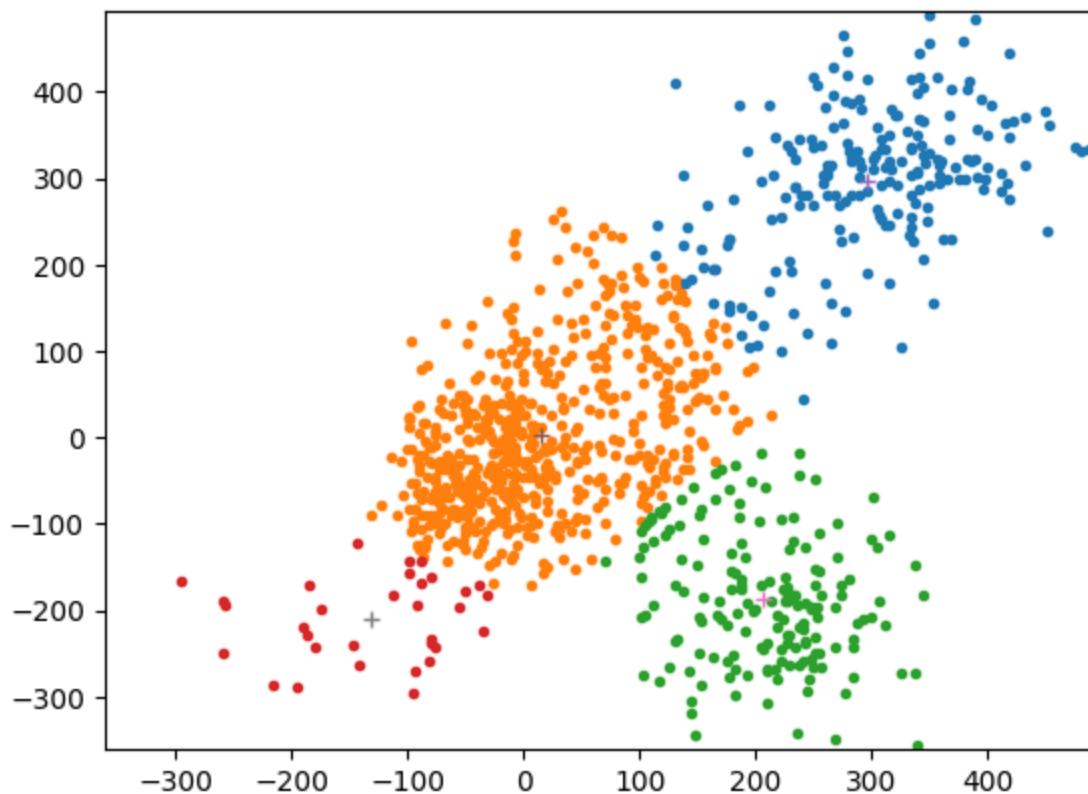
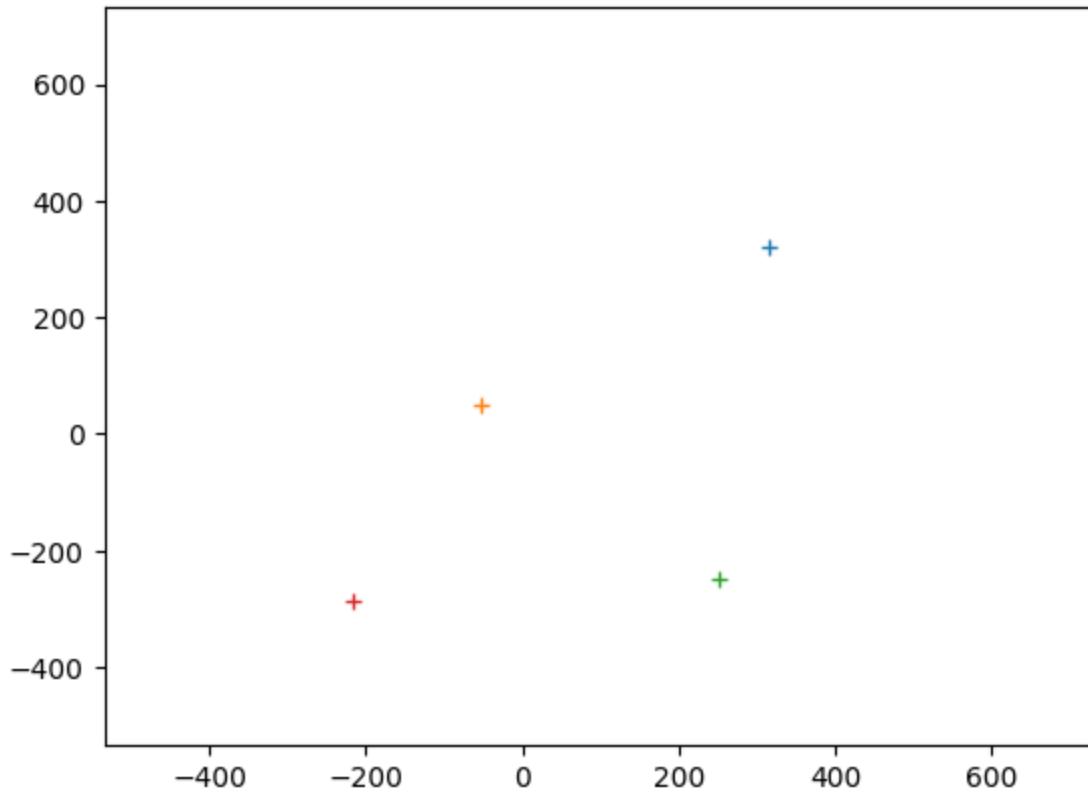
```
[[ 214.87589681 -31.13253714  97.77048397 306.96955735]
 [-206.07501026 -60.31806079  90.46414881 299.2487069 ]]
```



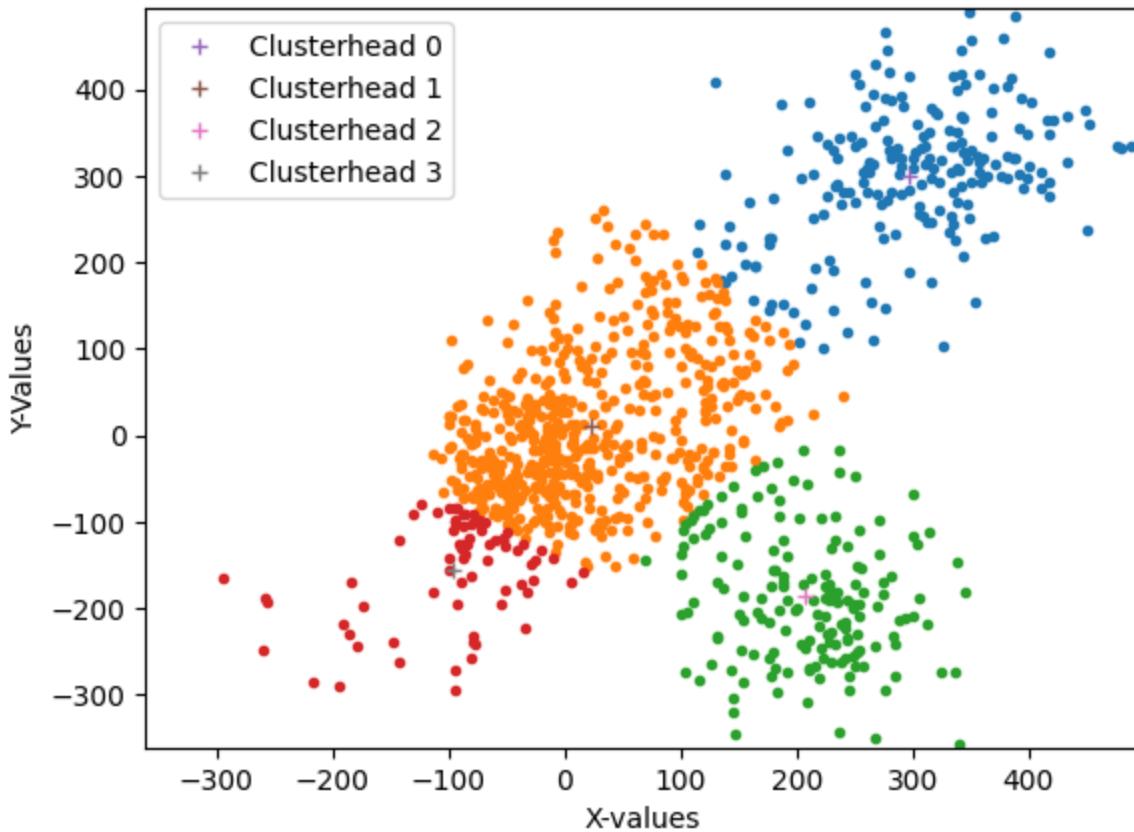
Finished try! Distance between old and new heads: 0.000000

```

new cluster heads:
[[ 295.98074347 -51.91038494 251.35681981 -216.363319 ]]
[ 297.58126927 48.03436867 -250.0108624 -286.4617099 ]]
last heads:
[[ 314.80356273 -51.91038494 251.35681981 -216.363319 ]]
[ 320.28997187 48.03436867 -250.0108624 -286.4617099 ]]
new cluster heads:
[[ 295.98074347 14.74229891 251.35681981 -216.363319 ]]
[ 297.58126927 2.05241525 -250.0108624 -286.4617099 ]]
last heads:
[[ 314.80356273 -51.91038494 251.35681981 -216.363319 ]]
[ 320.28997187 48.03436867 -250.0108624 -286.4617099 ]]
new cluster heads:
[[ 295.98074347 14.74229891 206.44158939 -216.363319 ]]
[ 297.58126927 2.05241525 -186.14520526 -286.4617099 ]]
last heads:
[[ 314.80356273 -51.91038494 251.35681981 -216.363319 ]]
[ 320.28997187 48.03436867 -250.0108624 -286.4617099 ]]
new cluster heads:
[[ 295.98074347 14.74229891 206.44158939 -131.35629192]
[ 297.58126927 2.05241525 -186.14520526 -209.21753371]]
last heads:
[[ 314.80356273 -51.91038494 251.35681981 -216.363319 ]]
[ 320.28997187 48.03436867 -250.0108624 -286.4617099 ]]
distance between old and new heads: 26715.96
new cluster heads:
[[ 297.28425322 14.74229891 206.44158939 -131.35629192]
[ 300.64069857 2.05241525 -186.14520526 -209.21753371]]
last heads:
[[ 295.98074347 14.74229891 206.44158939 -131.35629192]
[ 297.58126927 2.05241525 -186.14520526 -209.21753371]]
new cluster heads:
[[ 297.28425322 22.26580681 206.44158939 -131.35629192]
[ 300.64069857 11.28793194 -186.14520526 -209.21753371]]
last heads:
[[ 295.98074347 14.74229891 206.44158939 -131.35629192]
[ 297.58126927 2.05241525 -186.14520526 -209.21753371]]
new cluster heads:
[[ 297.28425322 22.26580681 207.00935096 -131.35629192]
[ 300.64069857 11.28793194 -186.70282941 -209.21753371]]
last heads:
[[ 295.98074347 14.74229891 206.44158939 -131.35629192]
[ 297.58126927 2.05241525 -186.14520526 -209.21753371]]
new cluster heads:
[[ 297.28425322 22.26580681 207.00935096 -96.04455766]
[ 300.64069857 11.28793194 -186.70282941 -156.94022116]]
last heads:
[[ 295.98074347 14.74229891 206.44158939 -131.35629192]
[ 297.58126927 2.05241525 -186.14520526 -209.21753371]]
```



## K-means results



distance between old and new heads: 4133.43

new cluster heads:

```
[[ 298.5596326  22.26580681  207.00935096 -96.04455766]
 [ 302.20301801 11.28793194 -186.70282941 -156.94022116]]
```

last heads:

```
[[ 297.28425322  22.26580681  207.00935096 -96.04455766]
 [ 300.64069857 11.28793194 -186.70282941 -156.94022116]]
```

new cluster heads:

```
[[ 298.5596326  34.16958352  207.00935096 -96.04455766]
 [ 302.20301801 26.17067068 -186.70282941 -156.94022116]]
```

last heads:

```
[[ 297.28425322  22.26580681  207.00935096 -96.04455766]
 [ 300.64069857 11.28793194 -186.70282941 -156.94022116]]
```

new cluster heads:

```
[[ 298.5596326  34.16958352  207.62753233 -96.04455766]
 [ 302.20301801 26.17067068 -188.33452435 -156.94022116]]
```

last heads:

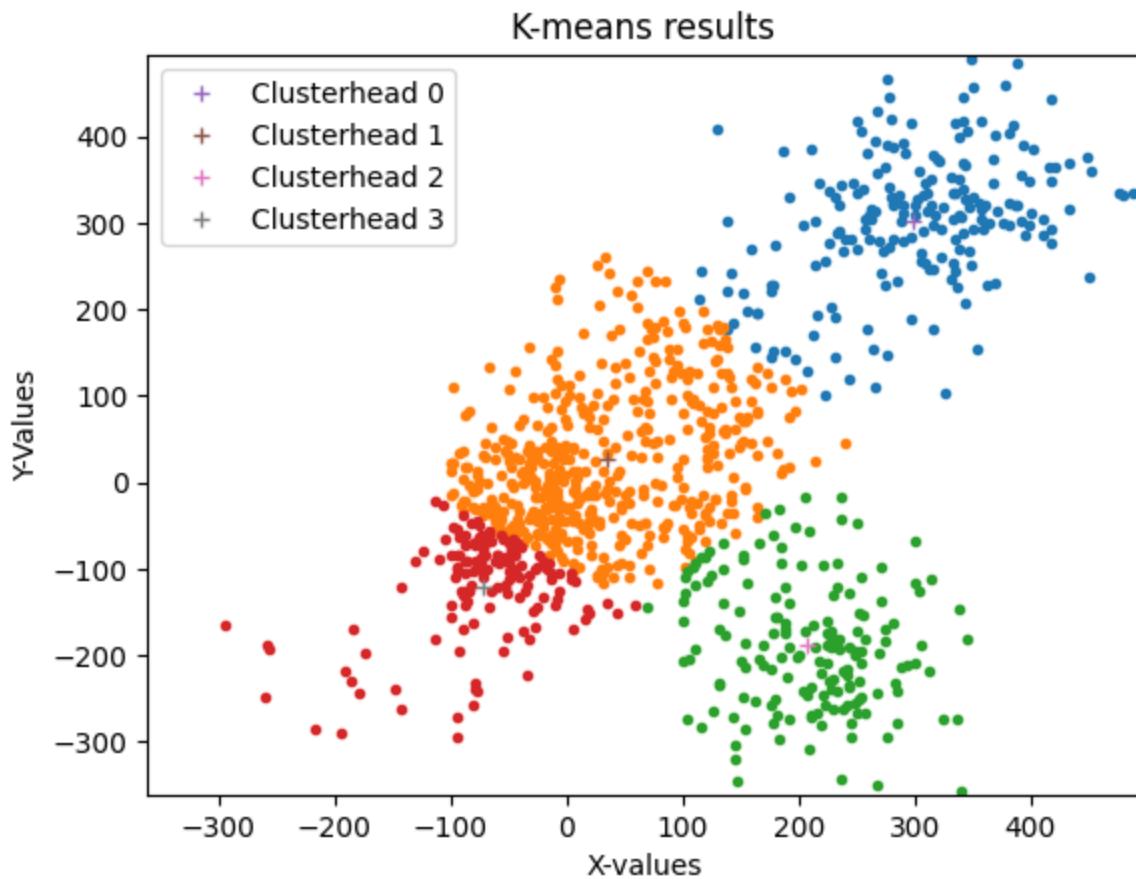
```
[[ 297.28425322  22.26580681  207.00935096 -96.04455766]
 [ 300.64069857 11.28793194 -186.70282941 -156.94022116]]
```

new cluster heads:

```
[[ 298.5596326  34.16958352  207.62753233 -72.44390124]
 [ 302.20301801 26.17067068 -188.33452435 -121.1858325 ]]
```

last heads:

```
[[ 297.28425322  22.26580681  207.00935096 -96.04455766]
 [ 300.64069857 11.28793194 -186.70282941 -156.94022116]]
```



distance between old and new heads: 2205.68

new cluster heads:

```
[[ 303.45004735  34.16958352  207.62753233 -72.44390124]
 [ 307.26793462  26.17067068 -188.33452435 -121.1858325 ]]
```

last heads:

```
[[ 298.5596326   34.16958352  207.62753233 -72.44390124]
 [ 302.20301801  26.17067068 -188.33452435 -121.1858325 ]]
```

new cluster heads:

```
[[ 303.45004735  49.05591298  207.62753233 -72.44390124]
 [ 307.26793462  45.47055409 -188.33452435 -121.1858325 ]]
```

last heads:

```
[[ 298.5596326   34.16958352  207.62753233 -72.44390124]
 [ 302.20301801  26.17067068 -188.33452435 -121.1858325 ]]
```

new cluster heads:

```
[[ 303.45004735  49.05591298  206.68857649 -72.44390124]
 [ 307.26793462  45.47055409 -187.97291052 -121.1858325 ]]
```

last heads:

```
[[ 298.5596326   34.16958352  207.62753233 -72.44390124]
 [ 302.20301801  26.17067068 -188.33452435 -121.1858325 ]]
```

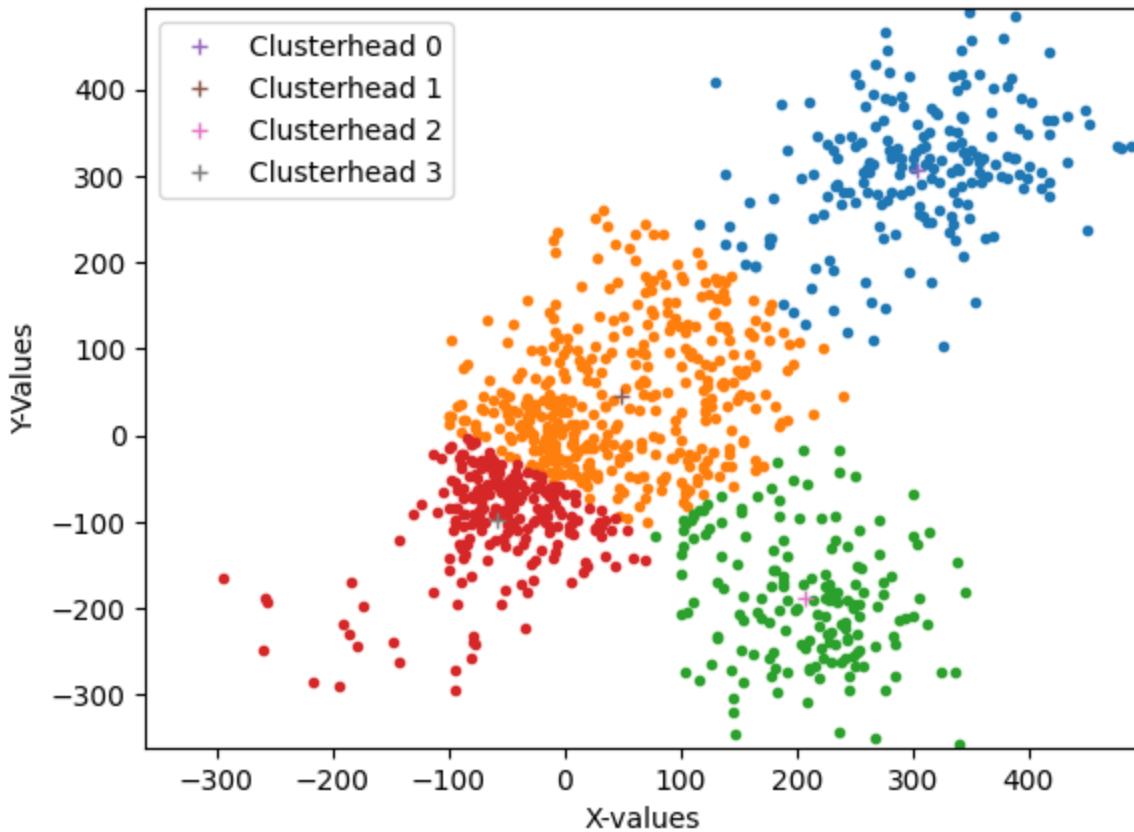
new cluster heads:

```
[[ 303.45004735  49.05591298  206.68857649 -57.62030343]
 [ 307.26793462  45.47055409 -187.97291052 -98.95114156]]
```

last heads:

```
[[ 298.5596326   34.16958352  207.62753233 -72.44390124]
 [ 302.20301801  26.17067068 -188.33452435 -121.1858325 ]]
```

## K-means results



distance between old and new heads: 1358.79

new cluster heads:

```
[[ 305.10923119  49.05591298  206.68857649 -57.62030343]
 [ 309.87057691  45.47055409 -187.97291052 -98.95114156]]
```

last heads:

```
[[ 303.45004735  49.05591298  206.68857649 -57.62030343]
 [ 307.26793462  45.47055409 -187.97291052 -98.95114156]]
```

new cluster heads:

```
[[ 305.10923119  62.29270357  206.68857649 -57.62030343]
 [ 309.87057691  57.055528   -187.97291052 -98.95114156]]
```

last heads:

```
[[ 303.45004735  49.05591298  206.68857649 -57.62030343]
 [ 307.26793462  45.47055409 -187.97291052 -98.95114156]]
```

new cluster heads:

```
[[ 305.10923119  62.29270357  207.61576936 -57.62030343]
 [ 309.87057691  57.055528   -190.36578361 -98.95114156]]
```

last heads:

```
[[ 303.45004735  49.05591298  206.68857649 -57.62030343]
 [ 307.26793462  45.47055409 -187.97291052 -98.95114156]]
```

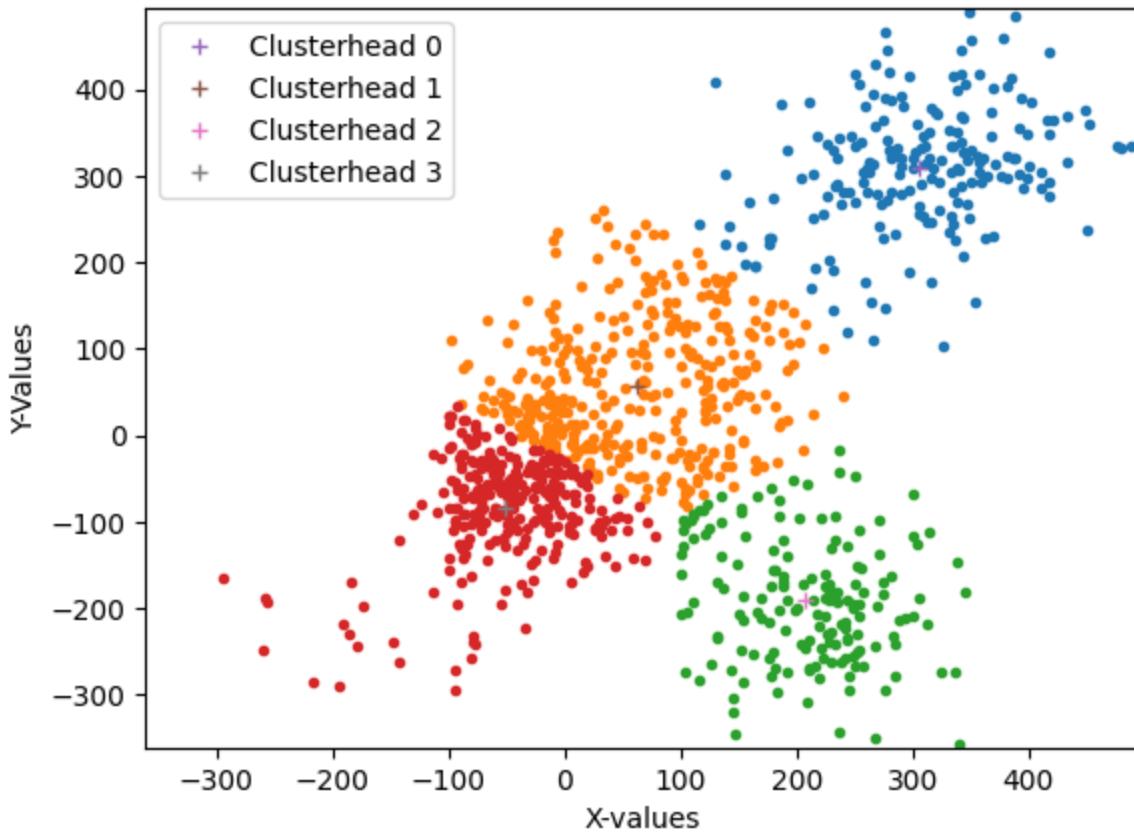
new cluster heads:

```
[[ 305.10923119  62.29270357  207.61576936 -50.6016371 ]
 [ 309.87057691  57.055528   -190.36578361 -85.20107406]]
```

last heads:

```
[[ 303.45004735  49.05591298  206.68857649 -57.62030343]
 [ 307.26793462  45.47055409 -187.97291052 -98.95114156]]
```

## K-means results



distance between old and new heads: 563.86

new cluster heads:

```
[[ 309.67899818  62.29270357  207.61576936 -50.6016371 ]
 [ 313.54891655  57.055528   -190.36578361 -85.20107406]]
```

last heads:

```
[[ 305.10923119  62.29270357  207.61576936 -50.6016371 ]
 [ 309.87057691  57.055528   -190.36578361 -85.20107406]]
```

new cluster heads:

```
[[ 309.67899818  72.63913874  207.61576936 -50.6016371 ]
 [ 313.54891655  67.19206617  -190.36578361 -85.20107406]]
```

last heads:

```
[[ 305.10923119  62.29270357  207.61576936 -50.6016371 ]
 [ 309.87057691  57.055528   -190.36578361 -85.20107406]]
```

new cluster heads:

```
[[ 309.67899818  72.63913874  207.61576936 -50.6016371 ]
 [ 313.54891655  67.19206617  -190.36578361 -85.20107406]]
```

last heads:

```
[[ 305.10923119  62.29270357  207.61576936 -50.6016371 ]
 [ 309.87057691  57.055528   -190.36578361 -85.20107406]]
```

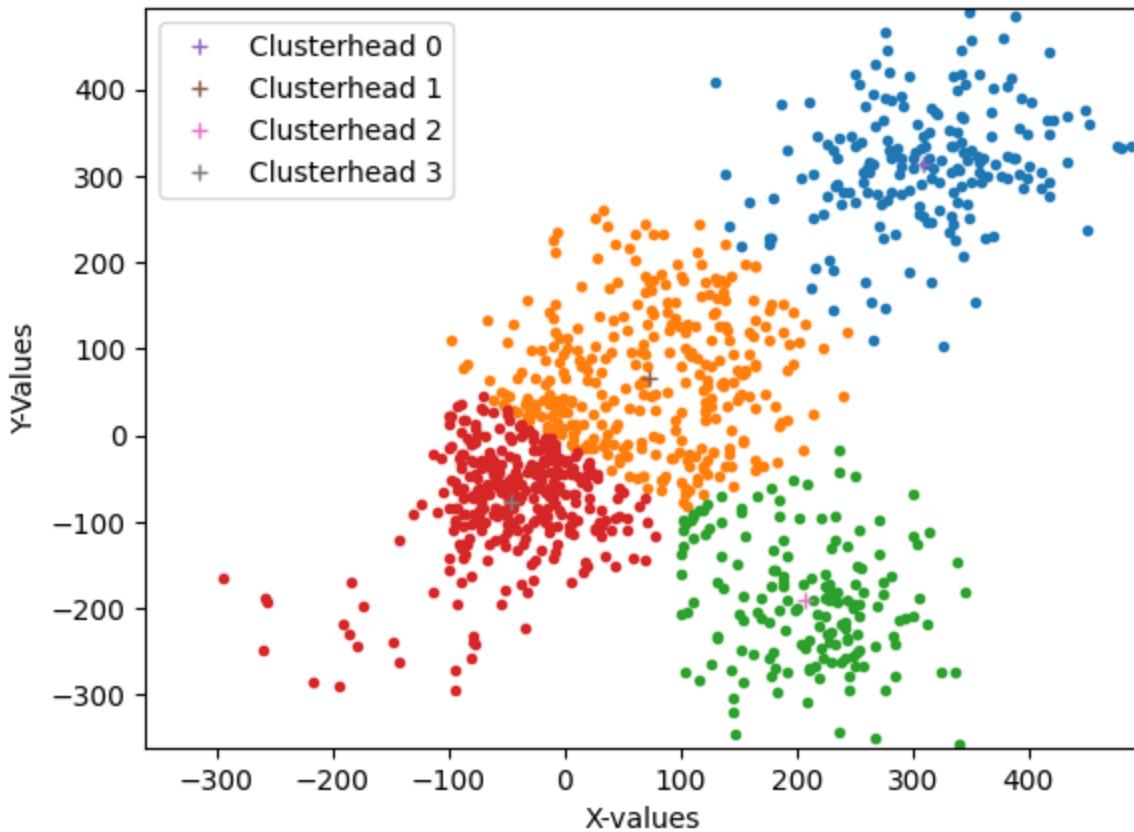
new cluster heads:

```
[[ 309.67899818  72.63913874  207.61576936 -46.38189041]
 [ 313.54891655  67.19206617  -190.36578361 -76.69359798]]
```

last heads:

```
[[ 305.10923119  62.29270357  207.61576936 -50.6016371 ]
 [ 309.87057691  57.055528   -190.36578361 -85.20107406]]
```

## K-means results



distance between old and new heads: 334.39

new cluster heads:

```
[[ 311.75338858  72.63913874  207.61576936 -46.38189041]
 [ 316.91681985  67.19206617 -190.36578361 -76.69359798]]
```

last heads:

```
[[ 309.67899818  72.63913874  207.61576936 -46.38189041]
 [ 313.54891655  67.19206617 -190.36578361 -76.69359798]]
```

new cluster heads:

```
[[ 311.75338858  82.87288909  207.61576936 -46.38189041]
 [ 316.91681985  75.50462518 -190.36578361 -76.69359798]]
```

last heads:

```
[[ 309.67899818  72.63913874  207.61576936 -46.38189041]
 [ 313.54891655  67.19206617 -190.36578361 -76.69359798]]
```

new cluster heads:

```
[[ 311.75338858  82.87288909  207.00600143 -46.38189041]
 [ 316.91681985  75.50462518 -189.71062007 -76.69359798]]
```

last heads:

```
[[ 309.67899818  72.63913874  207.61576936 -46.38189041]
 [ 313.54891655  67.19206617 -190.36578361 -76.69359798]]
```

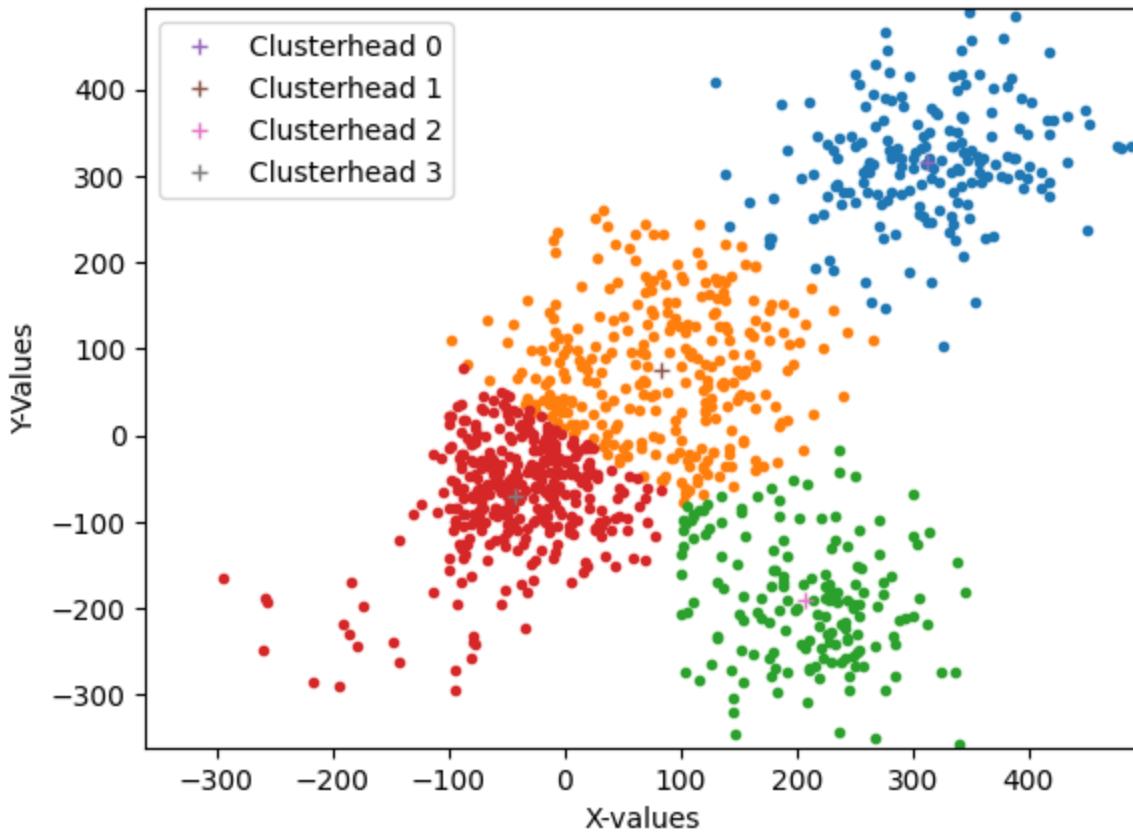
new cluster heads:

```
[[ 311.75338858  82.87288909  207.00600143 -42.89006801]
 [ 316.91681985  75.50462518 -189.71062007 -69.38473897]]
```

last heads:

```
[[ 309.67899818  72.63913874  207.61576936 -46.38189041]
 [ 313.54891655  67.19206617 -190.36578361 -76.69359798]]
```

## K-means results



distance between old and new heads: 255.89

new cluster heads:

```
[[ 312.69650105   82.87288909   207.00600143  -42.89006801]
 [ 317.32708405   75.50462518  -189.71062007  -69.38473897]]
```

last heads:

```
[[ 311.75338858   82.87288909   207.00600143  -42.89006801]
 [ 316.91681985   75.50462518  -189.71062007  -69.38473897]]
```

new cluster heads:

```
[[ 312.69650105   89.64857899   207.00600143  -42.89006801]
 [ 317.32708405   82.76607617  -189.71062007  -69.38473897]]
```

last heads:

```
[[ 311.75338858   82.87288909   207.00600143  -42.89006801]
 [ 316.91681985   75.50462518  -189.71062007  -69.38473897]]
```

new cluster heads:

```
[[ 312.69650105   89.64857899   206.64001048  -42.89006801]
 [ 317.32708405   82.76607617  -188.92869804  -69.38473897]]
```

last heads:

```
[[ 311.75338858   82.87288909   207.00600143  -42.89006801]
 [ 316.91681985   75.50462518  -189.71062007  -69.38473897]]
```

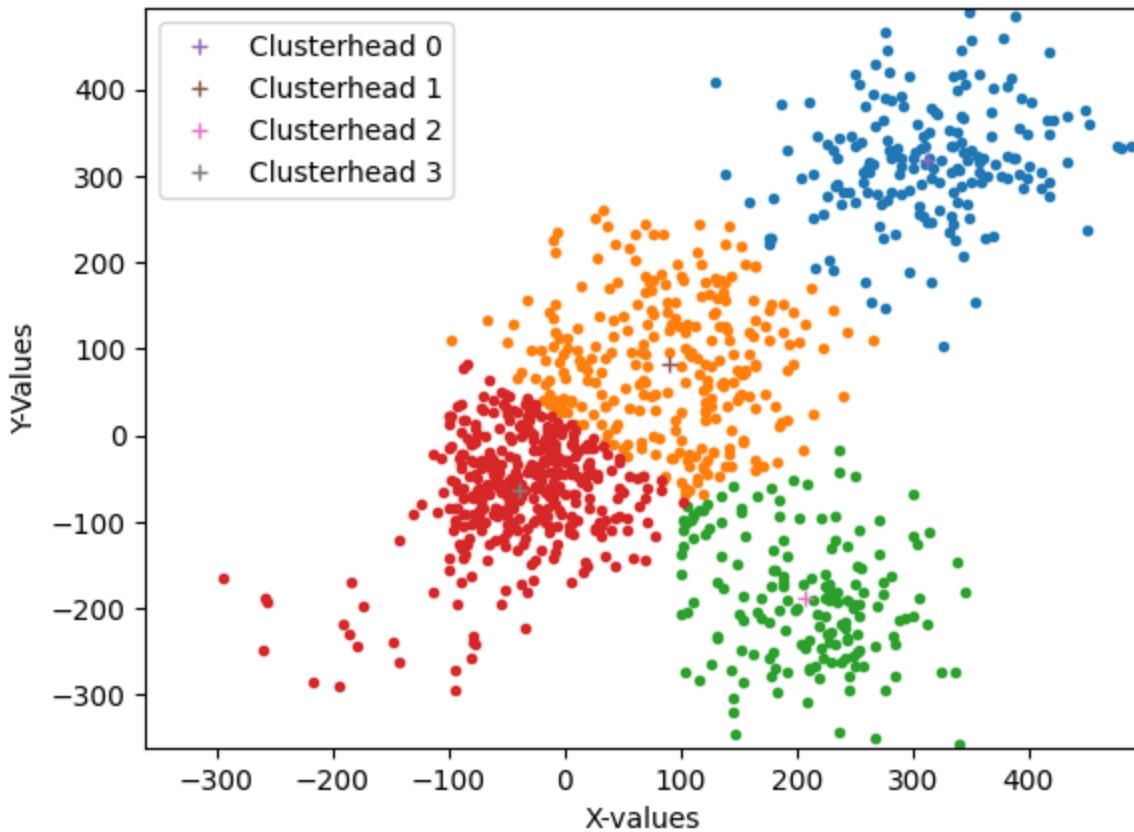
new cluster heads:

```
[[ 312.69650105   89.64857899   206.64001048  -39.70728553]
 [ 317.32708405   82.76607617  -188.92869804  -64.49150048]]
```

last heads:

```
[[ 311.75338858   82.87288909   207.00600143  -42.89006801]
 [ 316.91681985   75.50462518  -189.71062007  -69.38473897]]
```

## K-means results



distance between old and new heads: 134.52

new cluster heads:

```
[[ 313.45860106   89.64857899   206.64001048  -39.70728553]
 [ 317.85784737   82.76607617  -188.92869804  -64.49150048]]
```

last heads:

```
[[ 312.69650105   89.64857899   206.64001048  -39.70728553]
 [ 317.32708405   82.76607617  -188.92869804  -64.49150048]]
```

new cluster heads:

```
[[ 313.45860106   94.65988634   206.64001048  -39.70728553]
 [ 317.85784737   89.37624578  -188.92869804  -64.49150048]]
```

last heads:

```
[[ 312.69650105   89.64857899   206.64001048  -39.70728553]
 [ 317.32708405   82.76607617  -188.92869804  -64.49150048]]
```

new cluster heads:

```
[[ 313.45860106   94.65988634   206.71775307  -39.70728553]
 [ 317.85784737   89.37624578  -188.84811979  -64.49150048]]
```

last heads:

```
[[ 312.69650105   89.64857899   206.64001048  -39.70728553]
 [ 317.32708405   82.76607617  -188.92869804  -64.49150048]]
```

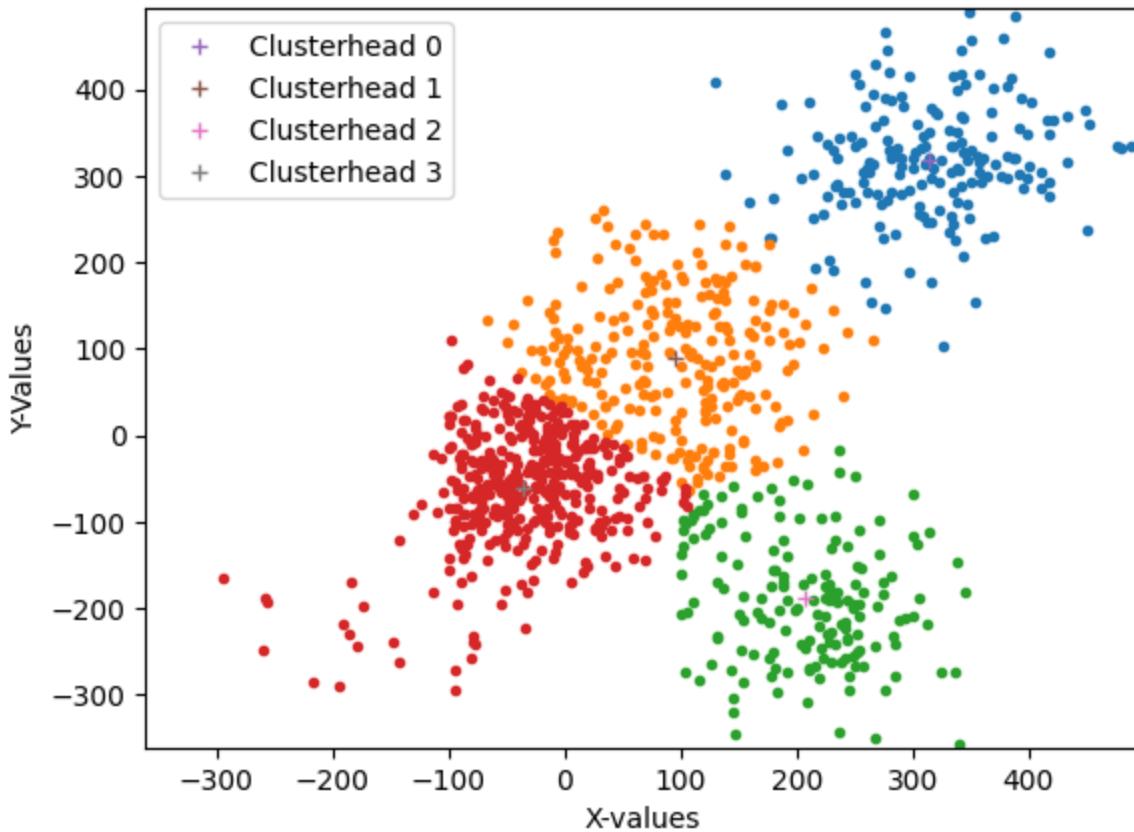
new cluster heads:

```
[[ 313.45860106   94.65988634   206.71775307  -36.46124483]
 [ 317.85784737   89.37624578  -188.84811979  -61.27554287]]
```

last heads:

```
[[ 312.69650105   89.64857899   206.64001048  -39.70728553]
 [ 317.32708405   82.76607617  -188.92869804  -64.49150048]]
```

## K-means results



distance between old and new heads: 90.56

new cluster heads:

```
[[ 314.99387833  94.65988634  206.71775307 -36.46124483]
 [ 318.85971579  89.37624578 -188.84811979 -61.27554287]]
```

last heads:

```
[[ 313.45860106  94.65988634  206.71775307 -36.46124483]
 [ 317.85784737  89.37624578 -188.84811979 -61.27554287]]
```

new cluster heads:

```
[[ 314.99387833  96.48312409  206.71775307 -36.46124483]
 [ 318.85971579  92.79529756 -188.84811979 -61.27554287]]
```

last heads:

```
[[ 313.45860106  94.65988634  206.71775307 -36.46124483]
 [ 317.85784737  89.37624578 -188.84811979 -61.27554287]]
```

new cluster heads:

```
[[ 314.99387833  96.48312409  206.71775307 -36.46124483]
 [ 318.85971579  92.79529756 -188.84811979 -61.27554287]]
```

last heads:

```
[[ 313.45860106  94.65988634  206.71775307 -36.46124483]
 [ 317.85784737  89.37624578 -188.84811979 -61.27554287]]
```

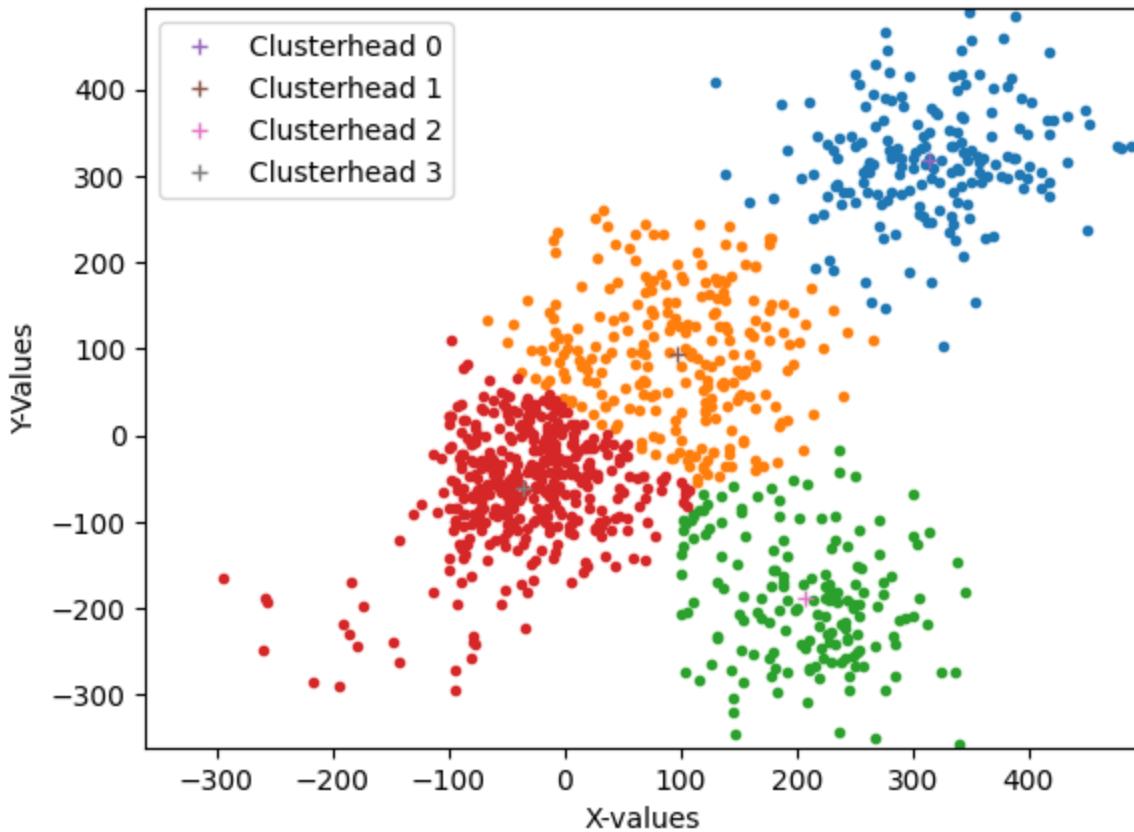
new cluster heads:

```
[[ 314.99387833  96.48312409  206.71775307 -35.20286847]
 [ 318.85971579  92.79529756 -188.84811979 -60.43706828]]
```

last heads:

```
[[ 313.45860106  94.65988634  206.71775307 -36.46124483]
 [ 317.85784737  89.37624578 -188.84811979 -61.27554287]]
```

## K-means results



distance between old and new heads: 20.66

new cluster heads:

```
[[ 315.55315336  96.48312409  206.71775307 -35.20286847]
 [ 319.57321825  92.79529756 -188.84811979 -60.43706828]]
```

last heads:

```
[[ 314.99387833  96.48312409  206.71775307 -35.20286847]
 [ 318.85971579  92.79529756 -188.84811979 -60.43706828]]
```

new cluster heads:

```
[[ 315.55315336  98.16894024  206.71775307 -35.20286847]
 [ 319.57321825  93.79896794 -188.84811979 -60.43706828]]
```

last heads:

```
[[ 314.99387833  96.48312409  206.71775307 -35.20286847]
 [ 318.85971579  92.79529756 -188.84811979 -60.43706828]]
```

new cluster heads:

```
[[ 315.55315336  98.16894024  206.71775307 -35.20286847]
 [ 319.57321825  93.79896794 -188.84811979 -60.43706828]]
```

last heads:

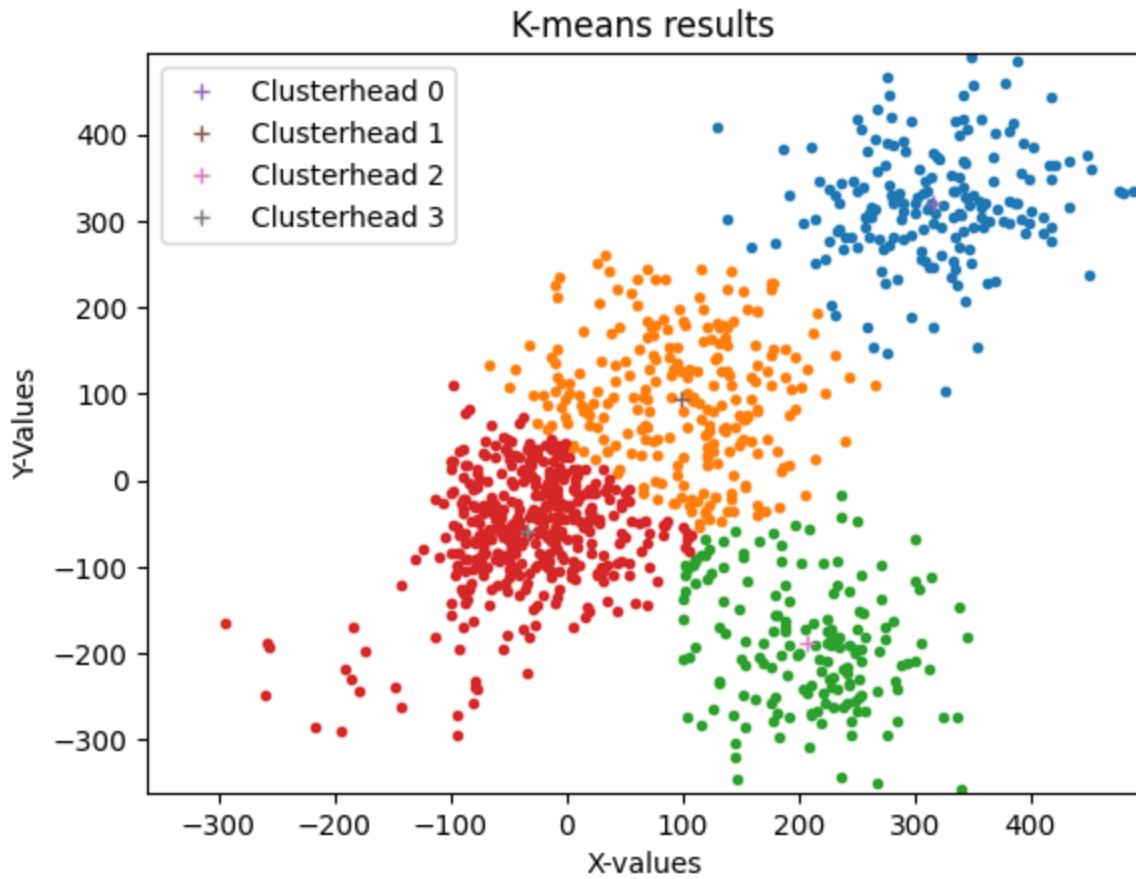
```
[[ 314.99387833  96.48312409  206.71775307 -35.20286847]
 [ 318.85971579  92.79529756 -188.84811979 -60.43706828]]
```

new cluster heads:

```
[[ 315.55315336  98.16894024  206.71775307 -34.95618389]
 [ 319.57321825  93.79896794 -188.84811979 -59.65424166]]
```

last heads:

```
[[ 314.99387833  96.48312409  206.71775307 -35.20286847]
 [ 318.85971579  92.79529756 -188.84811979 -60.43706828]]
```



distance between old and new heads: 5.34

new cluster heads:

```
[[ 315.55315336  98.16894024  206.71775307 -34.95618389]
 [ 319.57321825  93.79896794 -188.84811979 -59.65424166]]
```

last heads:

```
[[ 315.55315336  98.16894024  206.71775307 -34.95618389]
 [ 319.57321825  93.79896794 -188.84811979 -59.65424166]]
```

new cluster heads:

```
[[ 315.55315336  98.67606037  206.71775307 -34.95618389]
 [ 319.57321825  94.46603593 -188.84811979 -59.65424166]]
```

last heads:

```
[[ 315.55315336  98.16894024  206.71775307 -34.95618389]
 [ 319.57321825  93.79896794 -188.84811979 -59.65424166]]
```

new cluster heads:

```
[[ 315.55315336  98.67606037  206.71775307 -34.95618389]
 [ 319.57321825  94.46603593 -188.84811979 -59.65424166]]
```

last heads:

```
[[ 315.55315336  98.16894024  206.71775307 -34.95618389]
 [ 319.57321825  93.79896794 -188.84811979 -59.65424166]]
```

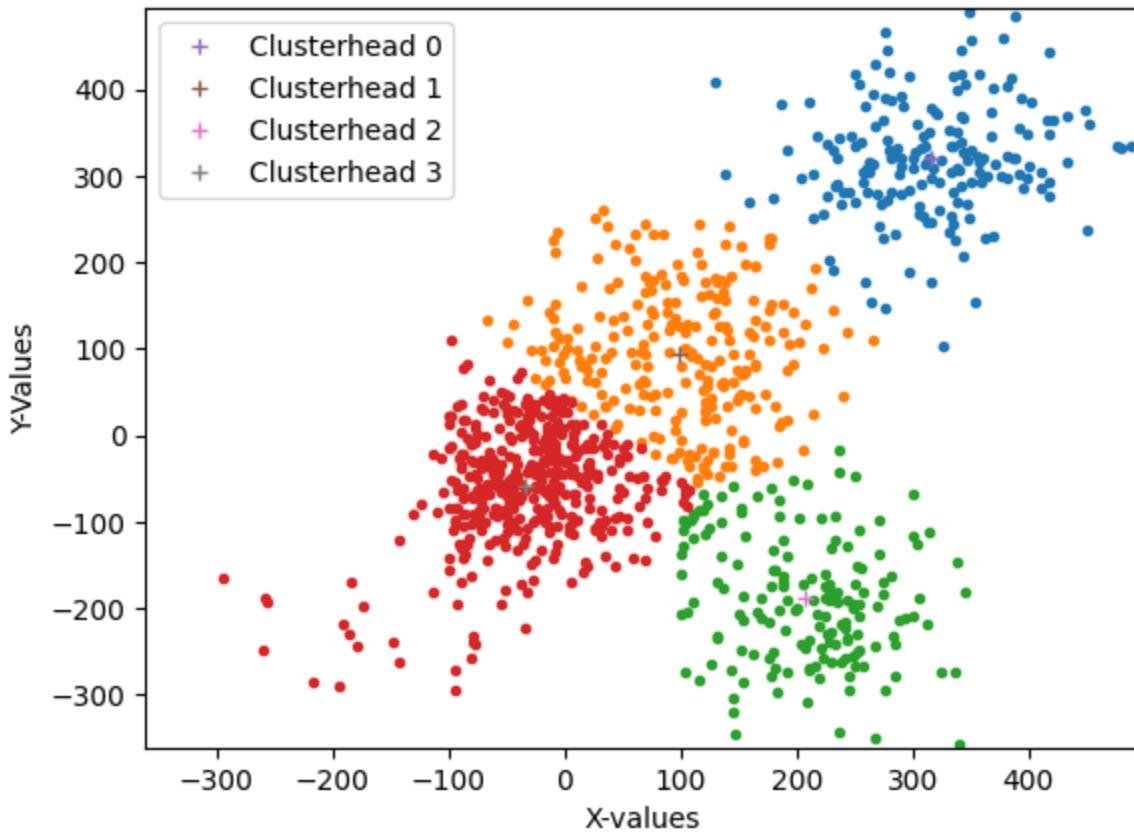
new cluster heads:

```
[[ 315.55315336  98.67606037  206.71775307 -34.60116935]
 [ 319.57321825  94.46603593 -188.84811979 -59.29555476]]
```

last heads:

```
[[ 315.55315336  98.16894024  206.71775307 -34.95618389]
 [ 319.57321825  93.79896794 -188.84811979 -59.65424166]]
```

## K-means results



distance between old and new heads: 0.96

new cluster heads:

```
[[ 315.55315336  98.67606037  206.71775307 -34.60116935]
 [ 319.57321825  94.46603593 -188.84811979 -59.29555476]]
```

last heads:

```
[[ 315.55315336  98.67606037  206.71775307 -34.60116935]
 [ 319.57321825  94.46603593 -188.84811979 -59.29555476]]
```

new cluster heads:

```
[[ 315.55315336  99.12350615  206.71775307 -34.60116935]
 [ 319.57321825  95.18943411 -188.84811979 -59.29555476]]
```

last heads:

```
[[ 315.55315336  98.67606037  206.71775307 -34.60116935]
 [ 319.57321825  94.46603593 -188.84811979 -59.29555476]]
```

new cluster heads:

```
[[ 315.55315336  99.12350615  206.71775307 -34.60116935]
 [ 319.57321825  95.18943411 -188.84811979 -59.29555476]]
```

last heads:

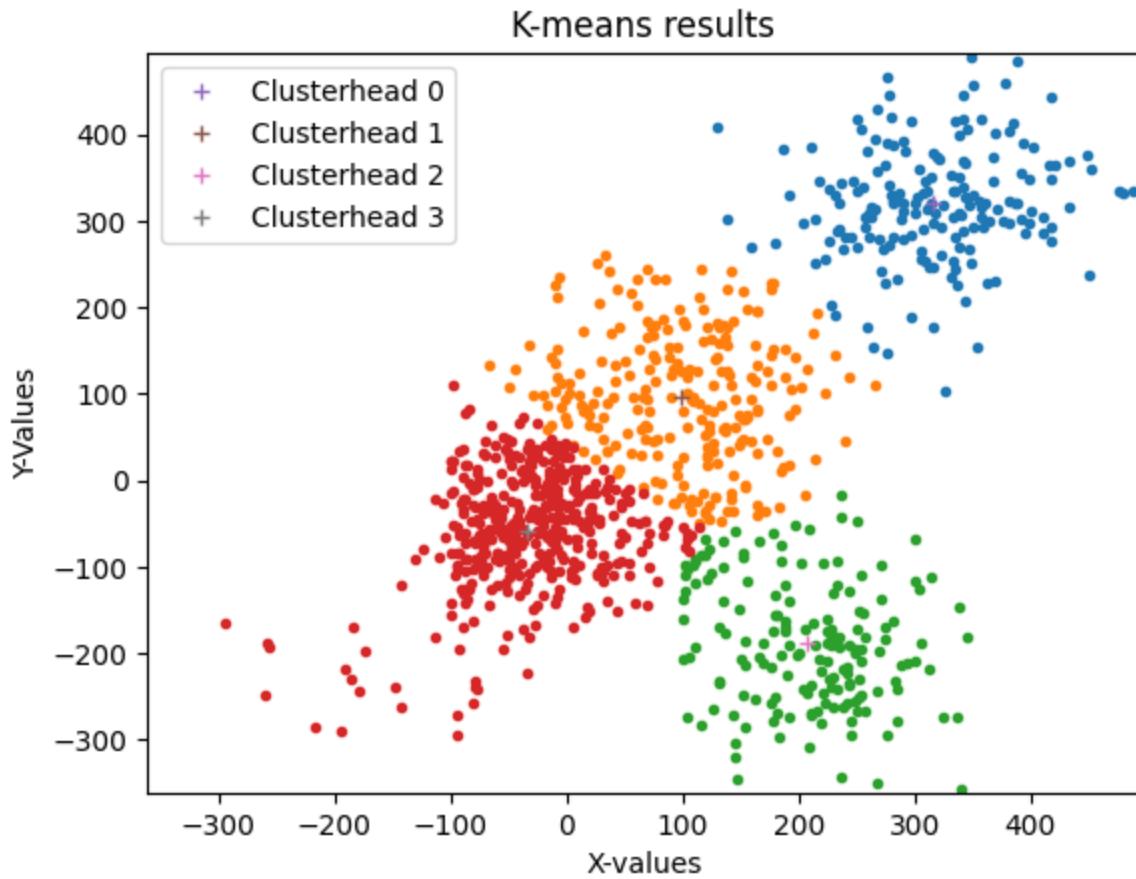
```
[[ 315.55315336  98.67606037  206.71775307 -34.60116935]
 [ 319.57321825  94.46603593 -188.84811979 -59.29555476]]
```

new cluster heads:

```
[[ 315.55315336  99.12350615  206.71775307 -34.20856951]
 [ 319.57321825  95.18943411 -188.84811979 -58.96784972]]
```

last heads:

```
[[ 315.55315336  98.67606037  206.71775307 -34.60116935]
 [ 319.57321825  94.46603593 -188.84811979 -59.29555476]]
```



distance between old and new heads: 0.99

new cluster heads:

```
[[ 315.55315336  99.12350615  206.71775307 -34.20856951]
 [ 319.57321825  95.18943411 -188.84811979 -58.96784972]]
```

last heads:

```
[[ 315.55315336  99.12350615  206.71775307 -34.20856951]
 [ 319.57321825  95.18943411 -188.84811979 -58.96784972]]
```

new cluster heads:

```
[[ 315.55315336  100.90109538  206.71775307 -34.20856951]
 [ 319.57321825  96.49297642 -188.84811979 -58.96784972]]
```

last heads:

```
[[ 315.55315336  99.12350615  206.71775307 -34.20856951]
 [ 319.57321825  95.18943411 -188.84811979 -58.96784972]]
```

new cluster heads:

```
[[ 315.55315336  100.90109538  206.71775307 -34.20856951]
 [ 319.57321825  96.49297642 -188.84811979 -58.96784972]]
```

last heads:

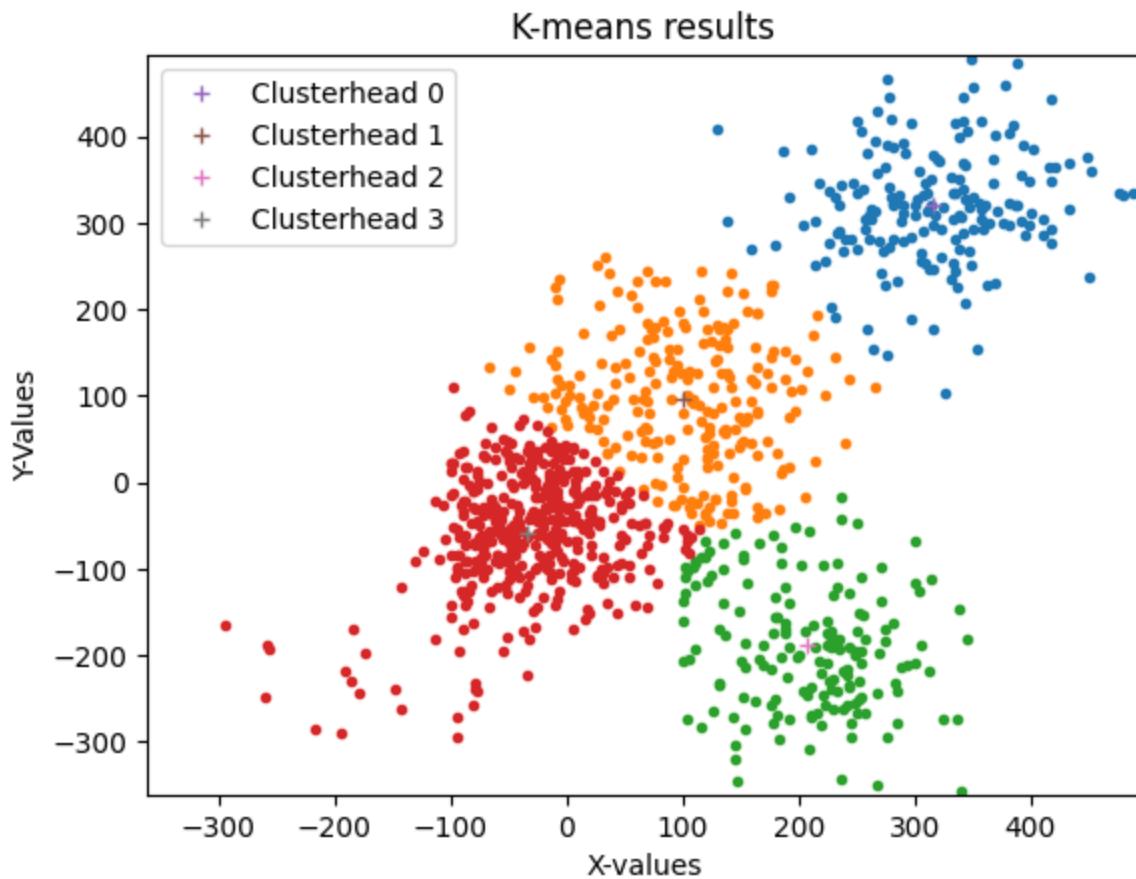
```
[[ 315.55315336  99.12350615  206.71775307 -34.20856951]
 [ 319.57321825  95.18943411 -188.84811979 -58.96784972]]
```

new cluster heads:

```
[[ 315.55315336  100.90109538  206.71775307 -33.61005811]
 [ 319.57321825  96.49297642 -188.84811979 -57.83629358]]
```

last heads:

```
[[ 315.55315336  99.12350615  206.71775307 -34.20856951]
 [ 319.57321825  95.18943411 -188.84811979 -58.96784972]]
```



distance between old and new heads: 6.50

new cluster heads:

```
[[ 315.55315336  100.90109538  206.71775307  -33.61005811]
 [ 319.57321825   96.49297642  -188.84811979  -57.83629358]]
```

last heads:

```
[[ 315.55315336  100.90109538  206.71775307  -33.61005811]
 [ 319.57321825   96.49297642  -188.84811979  -57.83629358]]
```

new cluster heads:

```
[[ 315.55315336  100.99630142  206.71775307  -33.61005811]
 [ 319.57321825   96.98791653  -188.84811979  -57.83629358]]
```

last heads:

```
[[ 315.55315336  100.90109538  206.71775307  -33.61005811]
 [ 319.57321825   96.49297642  -188.84811979  -57.83629358]]
```

new cluster heads:

```
[[ 315.55315336  100.99630142  206.71775307  -33.61005811]
 [ 319.57321825   96.98791653  -188.84811979  -57.83629358]]
```

last heads:

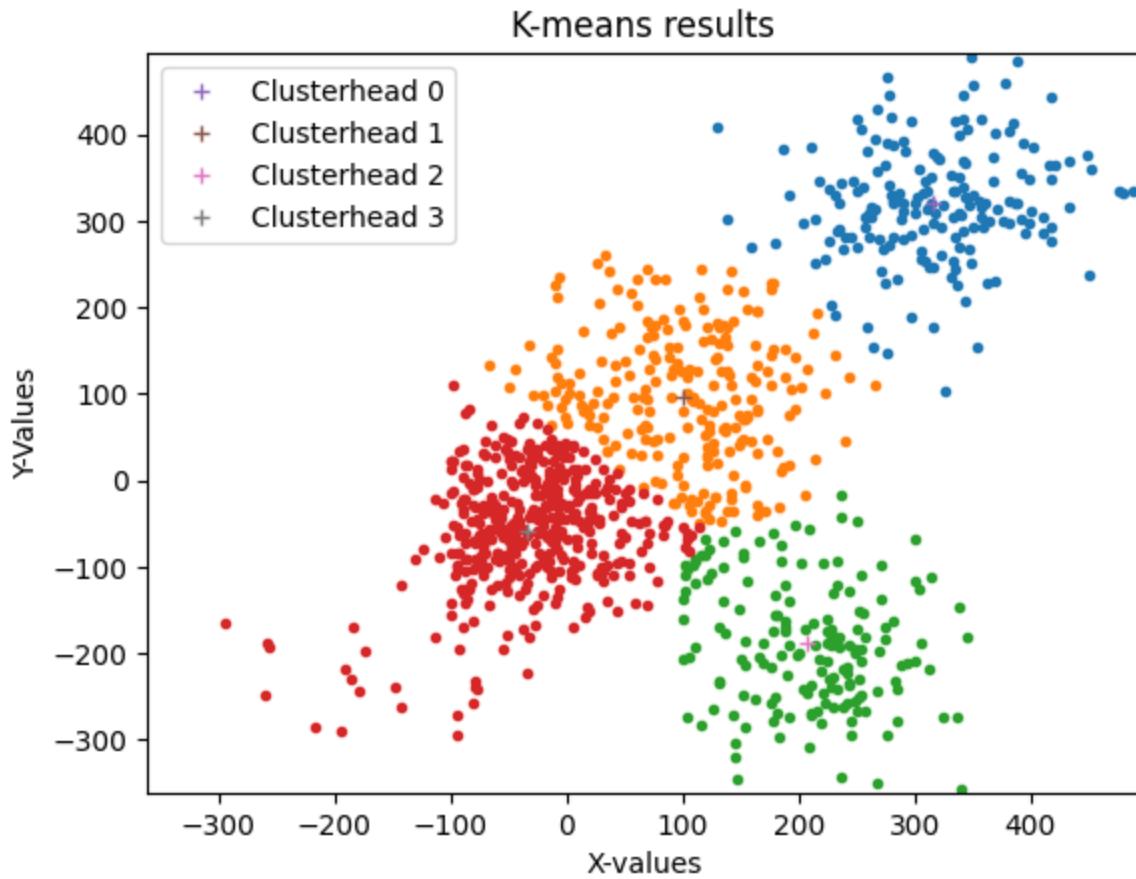
```
[[ 315.55315336  100.90109538  206.71775307  -33.61005811]
 [ 319.57321825   96.49297642  -188.84811979  -57.83629358]]
```

new cluster heads:

```
[[ 315.55315336  100.99630142  206.71775307  -33.33567741]
 [ 319.57321825   96.98791653  -188.84811979  -57.74553754]]
```

last heads:

```
[[ 315.55315336  100.90109538  206.71775307  -33.61005811]
 [ 319.57321825   96.49297642  -188.84811979  -57.83629358]]
```



distance between old and new heads: 0.34

new cluster heads:

```
[[ 315.55315336  100.99630142  206.71775307  -33.33567741]
 [ 319.57321825   96.98791653 -188.84811979  -57.74553754]]
```

last heads:

```
[[ 315.55315336  100.99630142  206.71775307  -33.33567741]
 [ 319.57321825   96.98791653 -188.84811979  -57.74553754]]
```

new cluster heads:

```
[[ 315.55315336  101.14734933  206.71775307  -33.33567741]
 [ 319.57321825   97.43332133 -188.84811979  -57.74553754]]
```

last heads:

```
[[ 315.55315336  100.99630142  206.71775307  -33.33567741]
 [ 319.57321825   96.98791653 -188.84811979  -57.74553754]]
```

new cluster heads:

```
[[ 315.55315336  101.14734933  206.71775307  -33.33567741]
 [ 319.57321825   97.43332133 -188.84811979  -57.74553754]]
```

last heads:

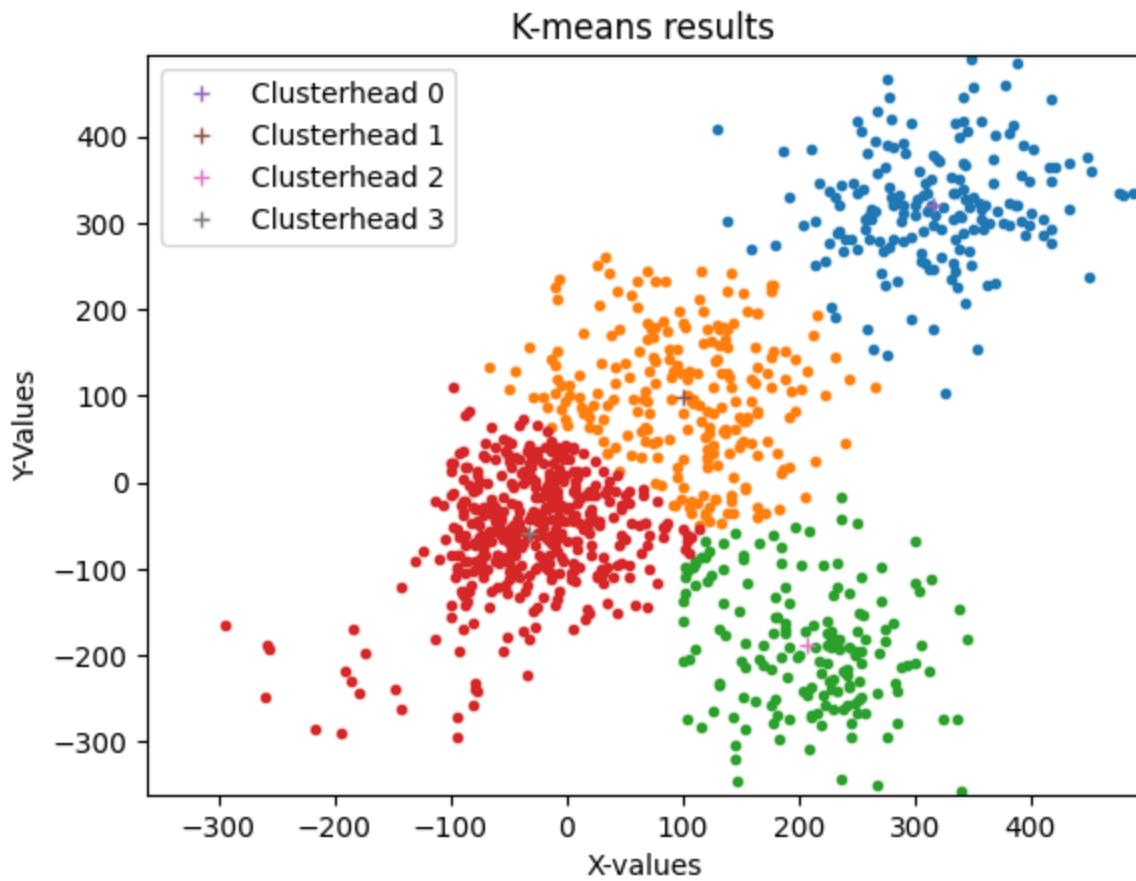
```
[[ 315.55315336  100.99630142  206.71775307  -33.33567741]
 [ 319.57321825   96.98791653 -188.84811979  -57.74553754]]
```

new cluster heads:

```
[[ 315.55315336  101.14734933  206.71775307  -33.0943946 ]
 [ 319.57321825   97.43332133 -188.84811979  -57.62422233]]
```

last heads:

```
[[ 315.55315336  100.99630142  206.71775307  -33.33567741]
 [ 319.57321825   96.98791653 -188.84811979  -57.74553754]]
```



distance between old and new heads: 0.29

new cluster heads:

```
[[ 315.55315336  101.14734933  206.71775307  -33.0943946 ]
 [ 319.57321825   97.43332133  -188.84811979  -57.62422233]]
```

last heads:

```
[[ 315.55315336  101.14734933  206.71775307  -33.0943946 ]
 [ 319.57321825   97.43332133  -188.84811979  -57.62422233]]
```

new cluster heads:

```
[[ 315.55315336  101.09532626  206.71775307  -33.0943946 ]
 [ 319.57321825   98.05763775  -188.84811979  -57.62422233]]
```

last heads:

```
[[ 315.55315336  101.14734933  206.71775307  -33.0943946 ]
 [ 319.57321825   97.43332133  -188.84811979  -57.62422233]]
```

new cluster heads:

```
[[ 315.55315336  101.09532626  206.71775307  -33.0943946 ]
 [ 319.57321825   98.05763775  -188.84811979  -57.62422233]]
```

last heads:

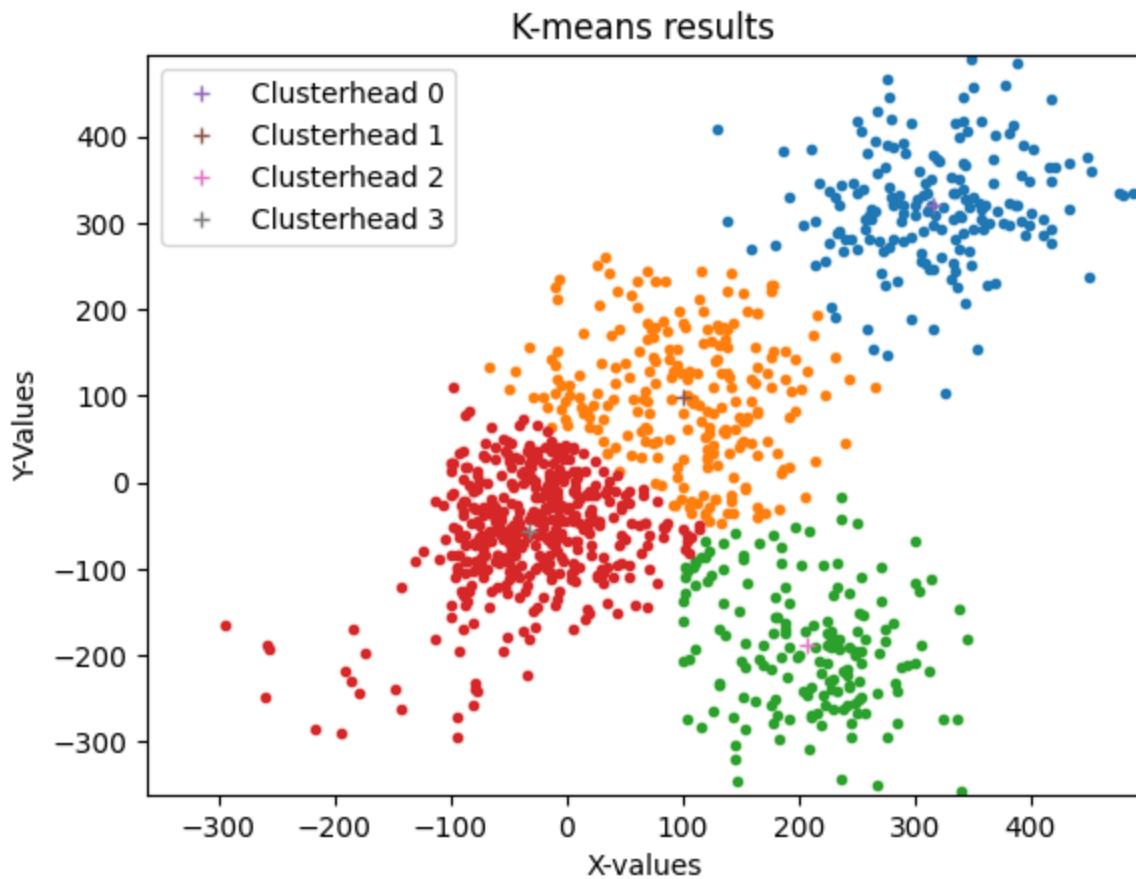
```
[[ 315.55315336  101.14734933  206.71775307  -33.0943946 ]
 [ 319.57321825   97.43332133  -188.84811979  -57.62422233]]
```

new cluster heads:

```
[[ 315.55315336  101.09532626  206.71775307  -32.73715761]
 [ 319.57321825   98.05763775  -188.84811979  -57.6038731 ]]
```

last heads:

```
[[ 315.55315336  101.14734933  206.71775307  -33.0943946 ]
 [ 319.57321825   97.43332133  -188.84811979  -57.62422233]]
```



distance between old and new heads: 0.52

new cluster heads:

```
[[ 315.55315336  101.09532626  206.71775307 -32.73715761]
 [ 319.57321825   98.05763775 -188.84811979 -57.6038731 ]]
```

last heads:

```
[[ 315.55315336  101.09532626  206.71775307 -32.73715761]
 [ 319.57321825   98.05763775 -188.84811979 -57.6038731 ]]
```

new cluster heads:

```
[[ 315.55315336  101.09532626  206.71775307 -32.73715761]
 [ 319.57321825   98.05763775 -188.84811979 -57.6038731 ]]
```

last heads:

```
[[ 315.55315336  101.09532626  206.71775307 -32.73715761]
 [ 319.57321825   98.05763775 -188.84811979 -57.6038731 ]]
```

new cluster heads:

```
[[ 315.55315336  101.09532626  206.71775307 -32.73715761]
 [ 319.57321825   98.05763775 -188.84811979 -57.6038731 ]]
```

last heads:

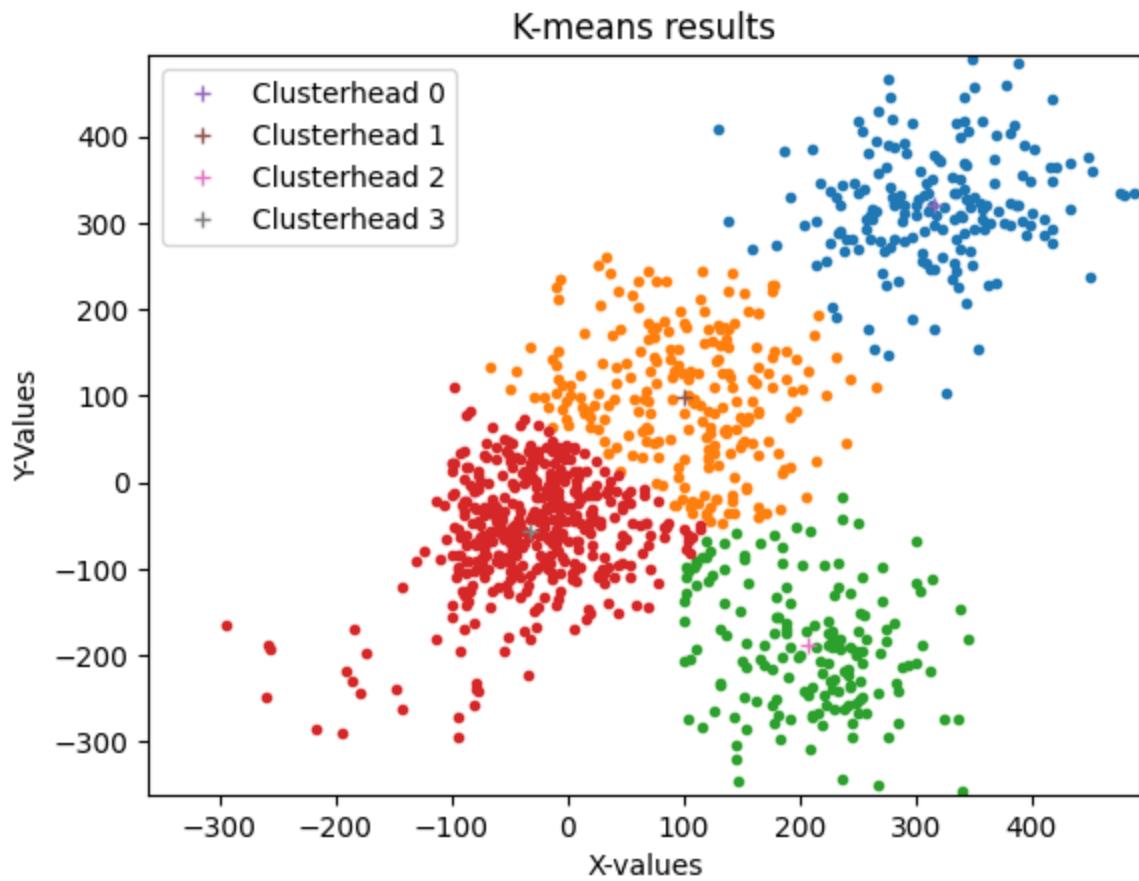
```
[[ 315.55315336  101.09532626  206.71775307 -32.73715761]
 [ 319.57321825   98.05763775 -188.84811979 -57.6038731 ]]
```

new cluster heads:

```
[[ 315.55315336  101.09532626  206.71775307 -32.73715761]
 [ 319.57321825   98.05763775 -188.84811979 -57.6038731 ]]
```

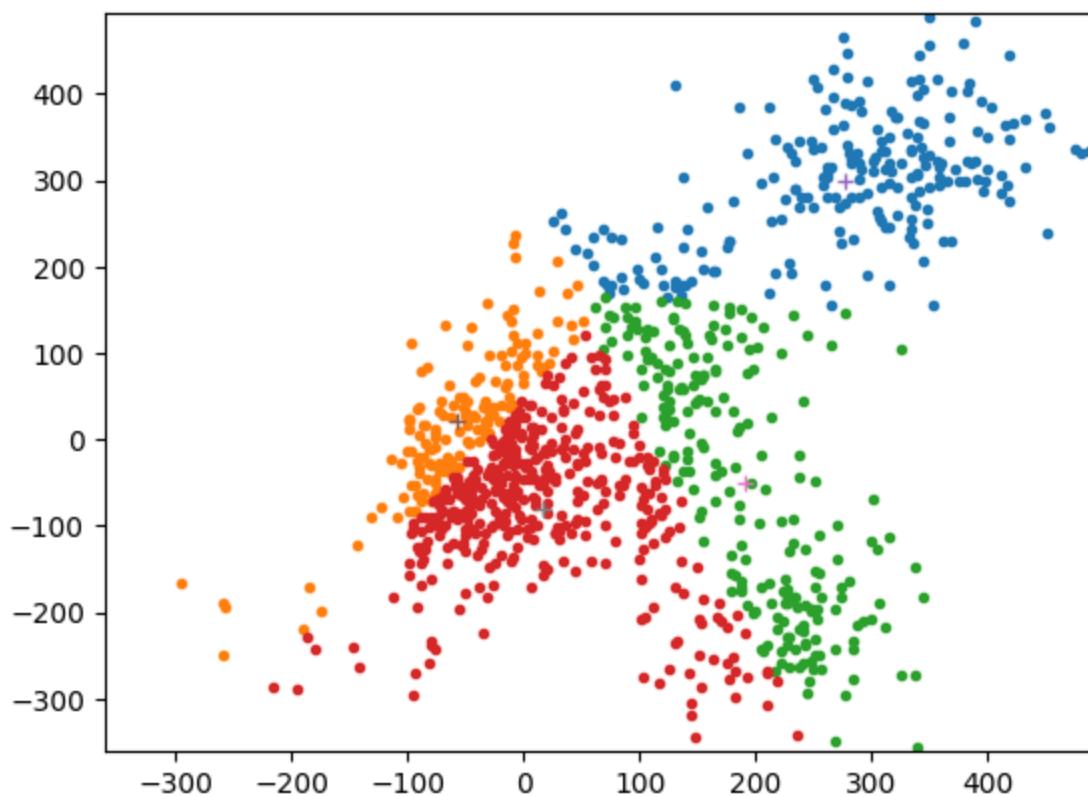
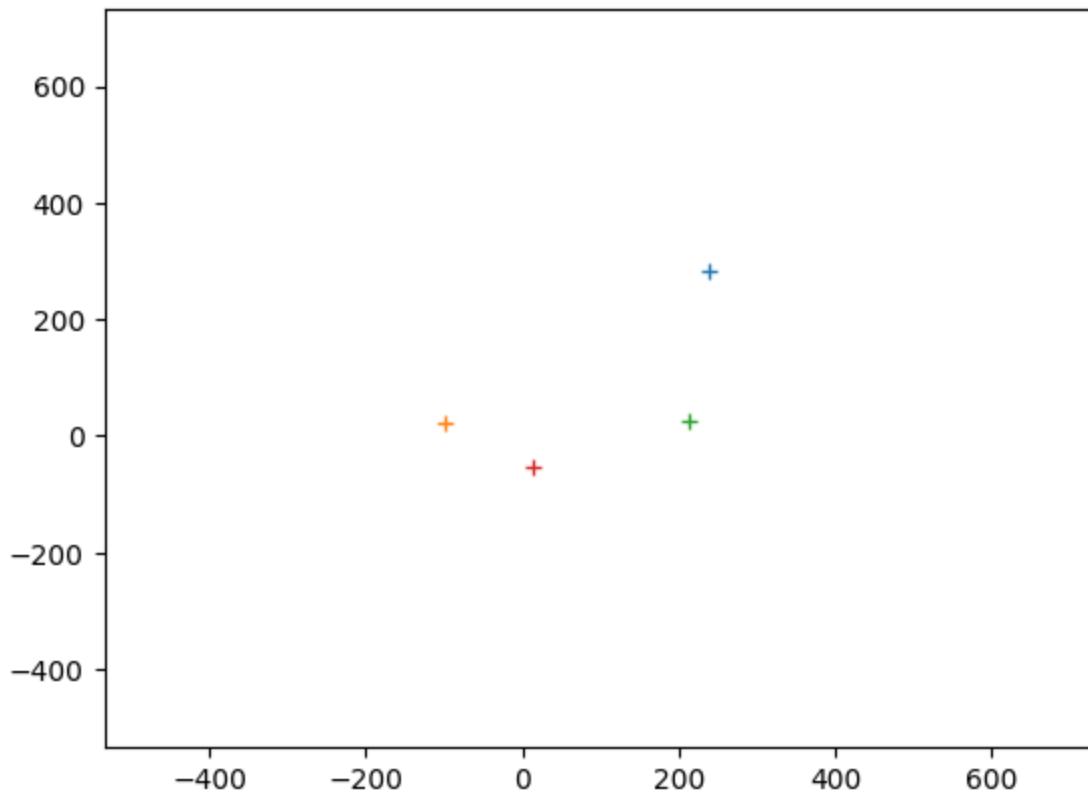
last heads:

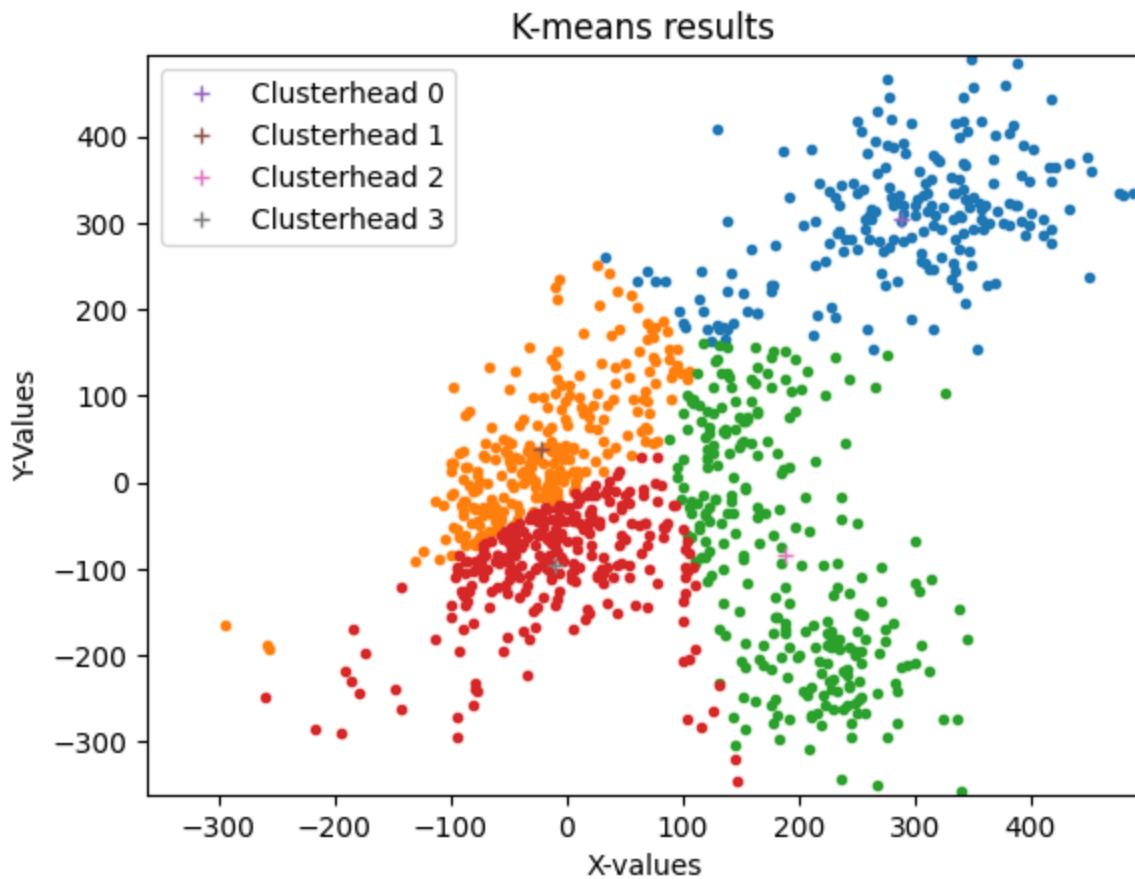
```
[[ 315.55315336  101.09532626  206.71775307 -32.73715761]
 [ 319.57321825   98.05763775 -188.84811979 -57.6038731 ]]
```



Finished try! Distance between old and new heads: 0.000000

new cluster heads:  
[[277.00988254 -99.1491229 214.19978658 14.03749444]  
[299.33266966 22.49143774 25.4824691 -53.65099893]]  
last heads:  
[[239.27696417 -99.1491229 214.19978658 14.03749444]  
[281.43120139 22.49143774 25.4824691 -53.65099893]]  
new cluster heads:  
[[277.00988254 -57.64384655 214.19978658 14.03749444]  
[299.33266966 21.20310866 25.4824691 -53.65099893]]  
last heads:  
[[239.27696417 -99.1491229 214.19978658 14.03749444]  
[281.43120139 22.49143774 25.4824691 -53.65099893]]  
new cluster heads:  
[[277.00988254 -57.64384655 191.04586949 14.03749444]  
[299.33266966 21.20310866 -51.31450209 -53.65099893]]  
last heads:  
[[239.27696417 -99.1491229 214.19978658 14.03749444]  
[281.43120139 22.49143774 25.4824691 -53.65099893]]  
distance between old and new heads: 10635.31  
new cluster heads:  
[[288.54841421 -57.64384655 191.04586949 16.6508247 ]  
[304.64527548 21.20310866 -51.31450209 -80.59575863]]  
last heads:  
[[277.00988254 -57.64384655 191.04586949 16.6508247 ]  
[299.33266966 21.20310866 -51.31450209 -80.59575863]]  
new cluster heads:  
[[288.54841421 -21.84157325 191.04586949 16.6508247 ]  
[304.64527548 38.28020339 -51.31450209 -80.59575863]]  
last heads:  
[[277.00988254 -57.64384655 191.04586949 16.6508247 ]  
[299.33266966 21.20310866 -51.31450209 -80.59575863]]  
new cluster heads:  
[[288.54841421 -21.84157325 187.86928636 16.6508247 ]  
[304.64527548 38.28020339 -84.33054243 -80.59575863]]  
last heads:  
[[277.00988254 -57.64384655 191.04586949 16.6508247 ]  
[299.33266966 21.20310866 -51.31450209 -80.59575863]]  
new cluster heads:  
[[288.54841421 -21.84157325 187.86928636 -9.34535601]  
[304.64527548 38.28020339 -84.33054243 -95.60167333]]  
last heads:  
[[277.00988254 -57.64384655 191.04586949 16.6508247 ]  
[299.33266966 21.20310866 -51.31450209 -80.59575863]]





distance between old and new heads: 3735.92

new cluster heads:

```
[[298.63252742 -21.84157325 187.86928636 -9.34535601]
 [309.80121902 38.28020339 -84.33054243 -95.60167333]]
```

last heads:

```
[[288.54841421 -21.84157325 187.86928636 -9.34535601]
 [304.64527548 38.28020339 -84.33054243 -95.60167333]]
```

new cluster heads:

```
[[298.63252742 14.73099419 187.86928636 -9.34535601]
 [309.80121902 61.9386948 -84.33054243 -95.60167333]]
```

last heads:

```
[[288.54841421 -21.84157325 187.86928636 -9.34535601]
 [304.64527548 38.28020339 -84.33054243 -95.60167333]]
```

new cluster heads:

```
[[ 298.63252742 14.73099419 188.79790109 -9.34535601]
 [ 309.80121902 61.9386948 -113.88526501 -95.60167333]]
```

last heads:

```
[[288.54841421 -21.84157325 187.86928636 -9.34535601]
 [304.64527548 38.28020339 -84.33054243 -95.60167333]]
```

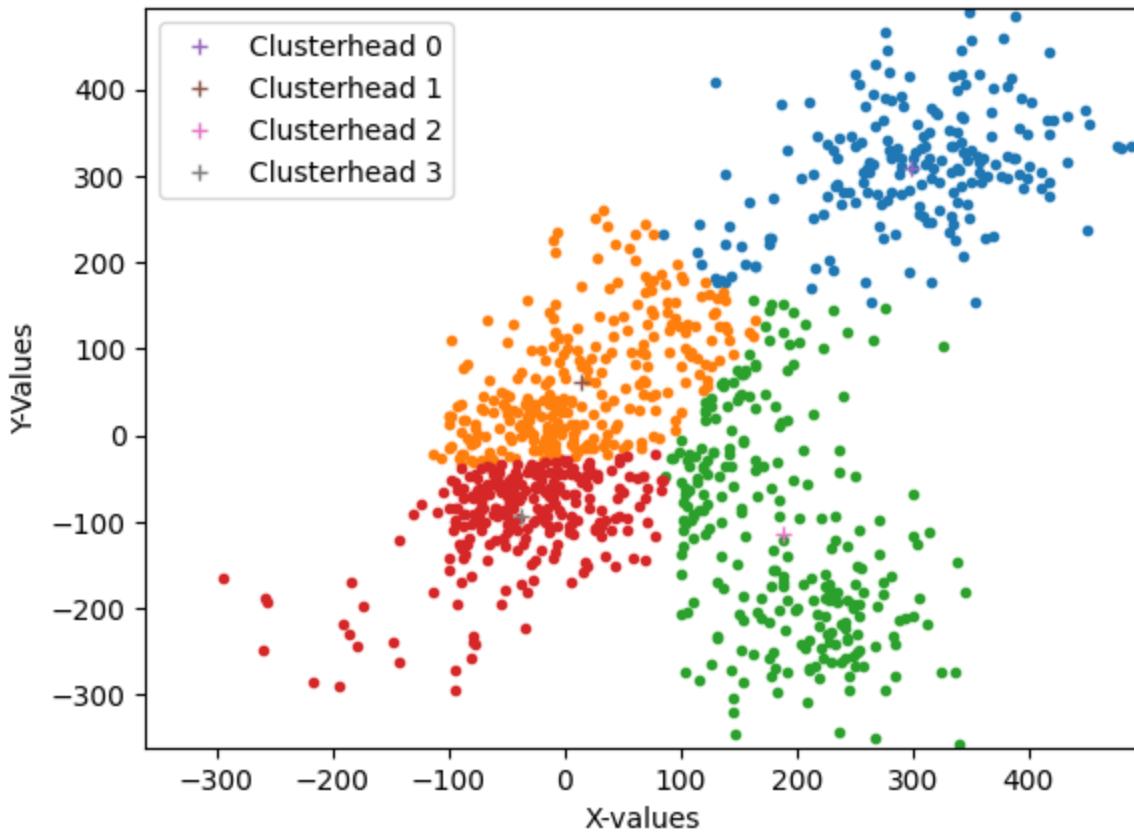
new cluster heads:

```
[[ 298.63252742 14.73099419 188.79790109 -37.93936892]
 [ 309.80121902 61.9386948 -113.88526501 -94.5637624 ]]
```

last heads:

```
[[288.54841421 -21.84157325 187.86928636 -9.34535601]
 [304.64527548 38.28020339 -84.33054243 -95.60167333]]
```

## K-means results



distance between old and new heads: 3718.59

new cluster heads:

```
[[ 306.08349795  14.73099419  188.79790109 -37.93936892]
 [ 314.81717795  61.9386948 -113.88526501 -94.5637624 ]]
```

last heads:

```
[[ 298.63252742  14.73099419  188.79790109 -37.93936892]
 [ 309.80121902  61.9386948 -113.88526501 -94.5637624 ]]
```

new cluster heads:

```
[[ 306.08349795  46.15668714  188.79790109 -37.93936892]
 [ 314.81717795  73.90438502 -113.88526501 -94.5637624 ]]
```

last heads:

```
[[ 298.63252742  14.73099419  188.79790109 -37.93936892]
 [ 309.80121902  61.9386948 -113.88526501 -94.5637624 ]]
```

new cluster heads:

```
[[ 306.08349795  46.15668714  194.14052004 -37.93936892]
 [ 314.81717795  73.90438502 -145.88941603 -94.5637624 ]]
```

last heads:

```
[[ 298.63252742  14.73099419  188.79790109 -37.93936892]
 [ 309.80121902  61.9386948 -113.88526501 -94.5637624 ]]
```

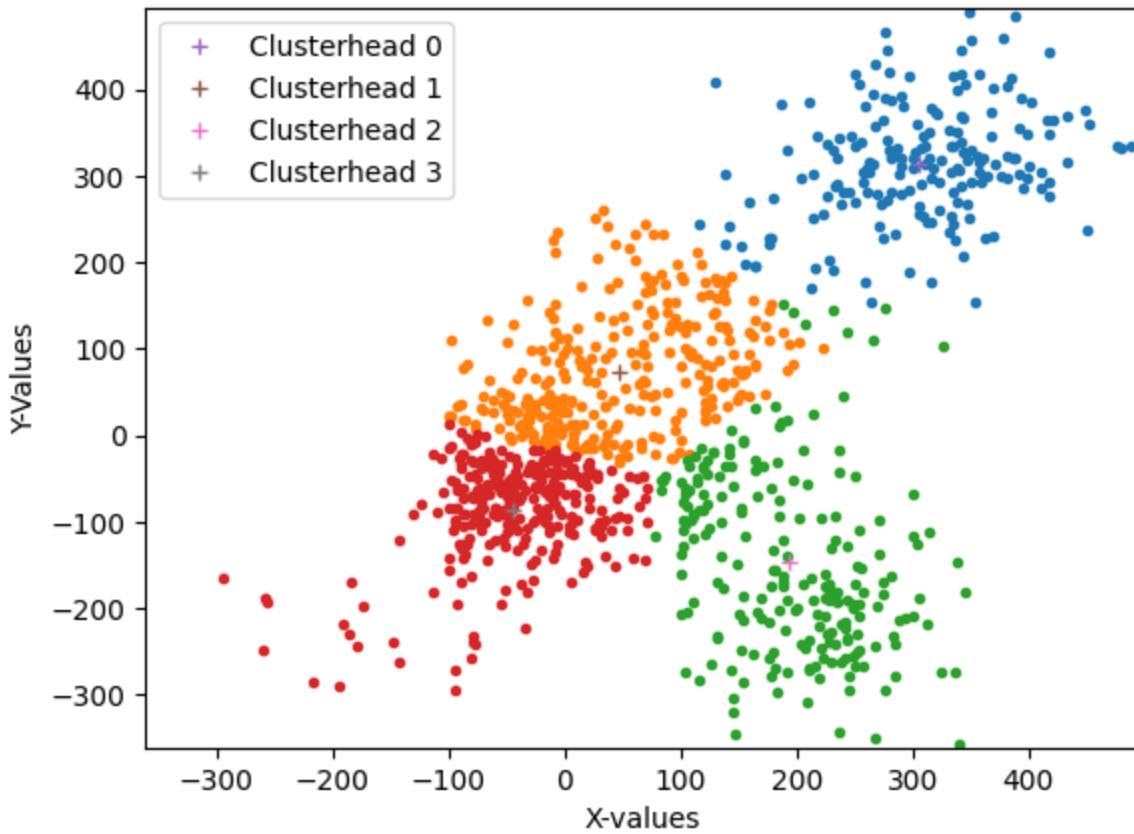
new cluster heads:

```
[[ 306.08349795  46.15668714  194.14052004 -44.02945127]
 [ 314.81717795  73.90438502 -145.88941603 -86.29581992]]
```

last heads:

```
[[ 298.63252742  14.73099419  188.79790109 -37.93936892]
 [ 309.80121902  61.9386948 -113.88526501 -94.5637624 ]]
```

## K-means results



distance between old and new heads: 2369.69

new cluster heads:

```
[[ 311.31754691  46.15668714  194.14052004 -44.02945127]
 [ 318.2185508   73.90438502 -145.88941603 -86.29581992]]
```

last heads:

```
[[ 306.08349795  46.15668714  194.14052004 -44.02945127]
 [ 314.81717795  73.90438502 -145.88941603 -86.29581992]]
```

new cluster heads:

```
[[ 311.31754691  66.99797922  194.14052004 -44.02945127]
 [ 318.2185508   79.8771508  -145.88941603 -86.29581992]]
```

last heads:

```
[[ 306.08349795  46.15668714  194.14052004 -44.02945127]
 [ 314.81717795  73.90438502 -145.88941603 -86.29581992]]
```

new cluster heads:

```
[[ 311.31754691  66.99797922  199.84285408 -44.02945127]
 [ 318.2185508   79.8771508  -165.64620609 -86.29581992]]
```

last heads:

```
[[ 306.08349795  46.15668714  194.14052004 -44.02945127]
 [ 314.81717795  73.90438502 -145.88941603 -86.29581992]]
```

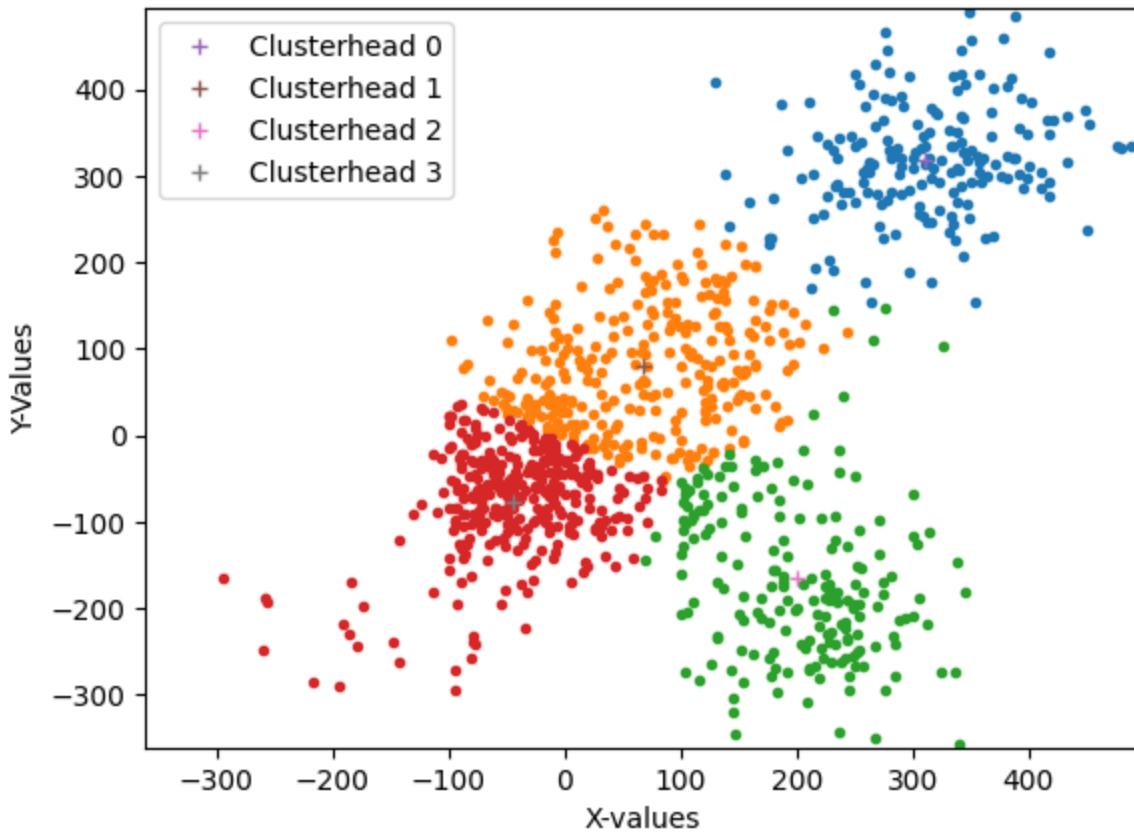
new cluster heads:

```
[[ 311.31754691  66.99797922  199.84285408 -43.71209576]
 [ 318.2185508   79.8771508  -165.64620609 -76.12654294]]
```

last heads:

```
[[ 306.08349795  46.15668714  194.14052004 -44.02945127]
 [ 314.81717795  73.90438502 -145.88941603 -86.29581992]]
```

## K-means results



distance between old and new heads: 1035.36

new cluster heads:

```
[[ 312.82566655  66.99797922  199.84285408 -43.71209576]
 [ 319.4690224   79.8771508  -165.64620609 -76.12654294]]
```

last heads:

```
[[ 311.31754691  66.99797922  199.84285408 -43.71209576]
 [ 318.2185508   79.8771508  -165.64620609 -76.12654294]]
```

new cluster heads:

```
[[ 312.82566655  80.45732539  199.84285408 -43.71209576]
 [ 319.4690224   84.93217207 -165.64620609 -76.12654294]]
```

last heads:

```
[[ 311.31754691  66.99797922  199.84285408 -43.71209576]
 [ 318.2185508   79.8771508  -165.64620609 -76.12654294]]
```

new cluster heads:

```
[[ 312.82566655  80.45732539  202.99850233 -43.71209576]
 [ 319.4690224   84.93217207 -176.76798607 -76.12654294]]
```

last heads:

```
[[ 311.31754691  66.99797922  199.84285408 -43.71209576]
 [ 318.2185508   79.8771508  -165.64620609 -76.12654294]]
```

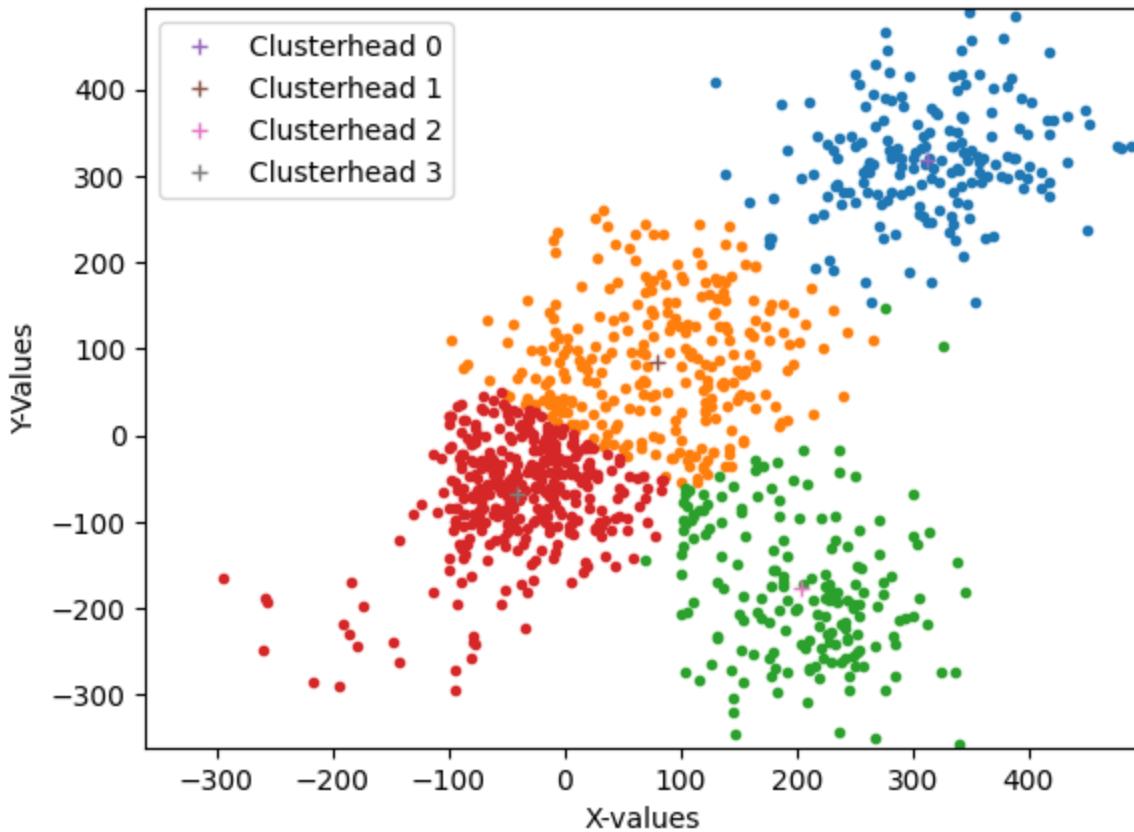
new cluster heads:

```
[[ 312.82566655  80.45732539  202.99850233 -40.65779306]
 [ 319.4690224   84.93217207 -176.76798607 -68.96437727]]
```

last heads:

```
[[ 311.31754691  66.99797922  199.84285408 -43.71209576]
 [ 318.2185508   79.8771508  -165.64620609 -76.12654294]]
```

## K-means results



distance between old and new heads: 404.82

new cluster heads:

```
[[ 313.59705513  80.45732539  202.99850233 -40.65779306]
 [ 320.01778272  84.93217207 -176.76798607 -68.96437727]]
```

last heads:

```
[[ 312.82566655  80.45732539  202.99850233 -40.65779306]
 [ 319.4690224   84.93217207 -176.76798607 -68.96437727]]
```

new cluster heads:

```
[[ 313.59705513  89.52436158  202.99850233 -40.65779306]
 [ 320.01778272  90.035456   -176.76798607 -68.96437727]]
```

last heads:

```
[[ 312.82566655  80.45732539  202.99850233 -40.65779306]
 [ 319.4690224   84.93217207 -176.76798607 -68.96437727]]
```

new cluster heads:

```
[[ 313.59705513  89.52436158  205.47768398 -40.65779306]
 [ 320.01778272  90.035456   -179.78413879 -68.96437727]]
```

last heads:

```
[[ 312.82566655  80.45732539  202.99850233 -40.65779306]
 [ 319.4690224   84.93217207 -176.76798607 -68.96437727]]
```

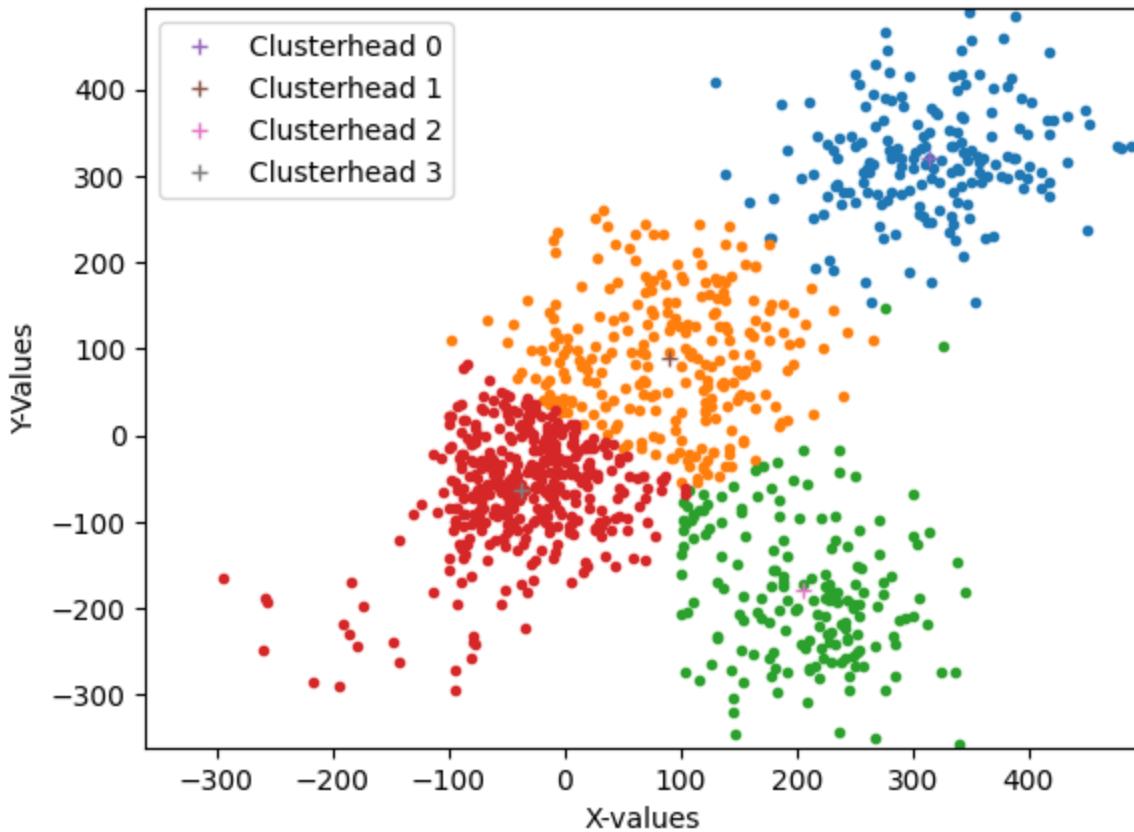
new cluster heads:

```
[[ 313.59705513  89.52436158  205.47768398 -37.7802357 ]
 [ 320.01778272  90.035456   -179.78413879 -63.53585328]]
```

last heads:

```
[[ 312.82566655  80.45732539  202.99850233 -40.65779306]
 [ 319.4690224   84.93217207 -176.76798607 -68.96437727]]
```

## K-means results



distance between old and new heads: 162.14

new cluster heads:

```
[[ 315.15135207  89.52436158  205.47768398 -37.7802357 ]
 [ 321.05558072  90.035456   -179.78413879 -63.53585328]]
```

last heads:

```
[[ 313.59705513  89.52436158  205.47768398 -37.7802357 ]
 [ 320.01778272  90.035456   -179.78413879 -63.53585328]]
```

new cluster heads:

```
[[ 315.15135207  94.95213988  205.47768398 -37.7802357 ]
 [ 321.05558072  93.76193307  -179.78413879 -63.53585328]]
```

last heads:

```
[[ 313.59705513  89.52436158  205.47768398 -37.7802357 ]
 [ 320.01778272  90.035456   -179.78413879 -63.53585328]]
```

new cluster heads:

```
[[ 315.15135207  94.95213988  206.63620921 -37.7802357 ]
 [ 321.05558072  93.76193307  -181.97842439 -63.53585328]]
```

last heads:

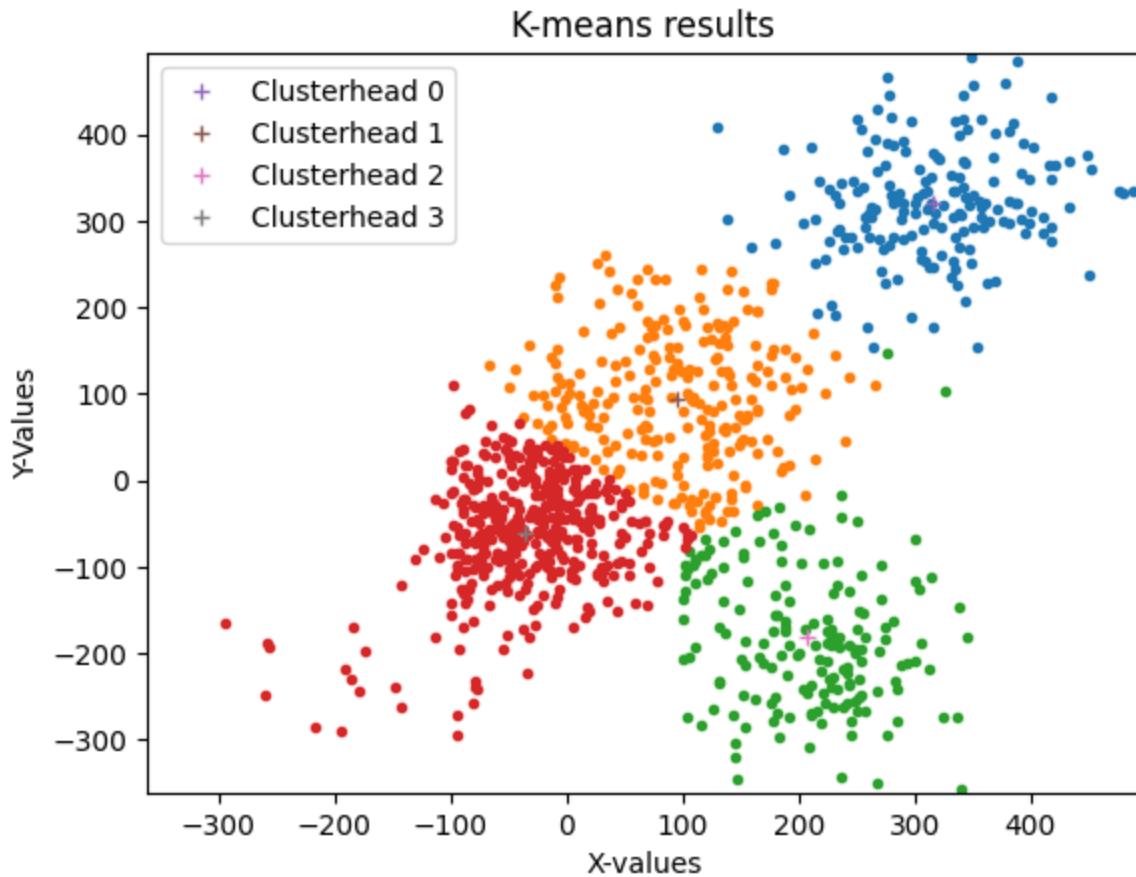
```
[[ 313.59705513  89.52436158  205.47768398 -37.7802357 ]
 [ 320.01778272  90.035456   -179.78413879 -63.53585328]]
```

new cluster heads:

```
[[ 315.15135207  94.95213988  206.63620921 -35.84900854]
 [ 321.05558072  93.76193307  -181.97842439 -60.79225346]]
```

last heads:

```
[[ 313.59705513  89.52436158  205.47768398 -37.7802357 ]
 [ 320.01778272  90.035456   -179.78413879 -63.53585328]]
```



distance between old and new heads: 64.25

new cluster heads:

```
[[ 315.71791866  94.95213988  206.63620921 -35.84900854]
 [ 321.78978529  93.76193307 -181.97842439 -60.79225346]]
```

last heads:

```
[[ 315.15135207  94.95213988  206.63620921 -35.84900854]
 [ 321.05558072  93.76193307 -181.97842439 -60.79225346]]
```

new cluster heads:

```
[[ 315.71791866  97.14995614  206.63620921 -35.84900854]
 [ 321.78978529  94.64971424 -181.97842439 -60.79225346]]
```

last heads:

```
[[ 315.15135207  94.95213988  206.63620921 -35.84900854]
 [ 321.05558072  93.76193307 -181.97842439 -60.79225346]]
```

new cluster heads:

```
[[ 315.71791866  97.14995614  206.84348251 -35.84900854]
 [ 321.78978529  94.64971424 -182.82314093 -60.79225346]]
```

last heads:

```
[[ 315.15135207  94.95213988  206.63620921 -35.84900854]
 [ 321.05558072  93.76193307 -181.97842439 -60.79225346]]
```

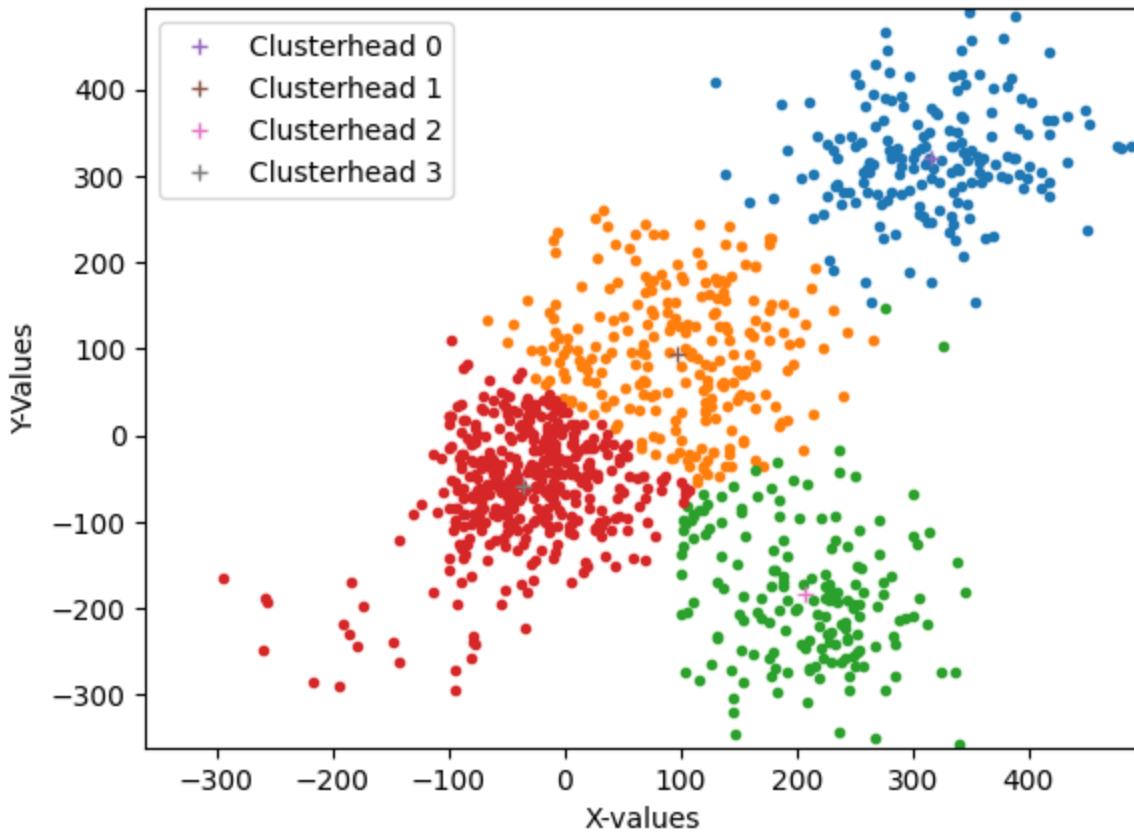
new cluster heads:

```
[[ 315.71791866  97.14995614  206.84348251 -35.39593368]
 [ 321.78978529  94.64971424 -182.82314093 -59.86036955]]
```

last heads:

```
[[ 315.15135207  94.95213988  206.63620921 -35.84900854]
 [ 321.05558072  93.76193307 -181.97842439 -60.79225346]]
```

## K-means results



distance between old and new heads: 8.31

new cluster heads:

```
[[ 315.71791866  97.14995614  206.84348251 -35.39593368]
 [ 321.78978529  94.64971424 -182.82314093 -59.86036955]]
```

last heads:

```
[[ 315.71791866  97.14995614  206.84348251 -35.39593368]
 [ 321.78978529  94.64971424 -182.82314093 -59.86036955]]
```

new cluster heads:

```
[[ 315.71791866  98.40569706  206.84348251 -35.39593368]
 [ 321.78978529  95.02095079 -182.82314093 -59.86036955]]
```

last heads:

```
[[ 315.71791866  97.14995614  206.84348251 -35.39593368]
 [ 321.78978529  94.64971424 -182.82314093 -59.86036955]]
```

new cluster heads:

```
[[ 315.71791866  98.40569706  207.57602107 -35.39593368]
 [ 321.78978529  95.02095079 -184.30508835 -59.86036955]]
```

last heads:

```
[[ 315.71791866  97.14995614  206.84348251 -35.39593368]
 [ 321.78978529  94.64971424 -182.82314093 -59.86036955]]
```

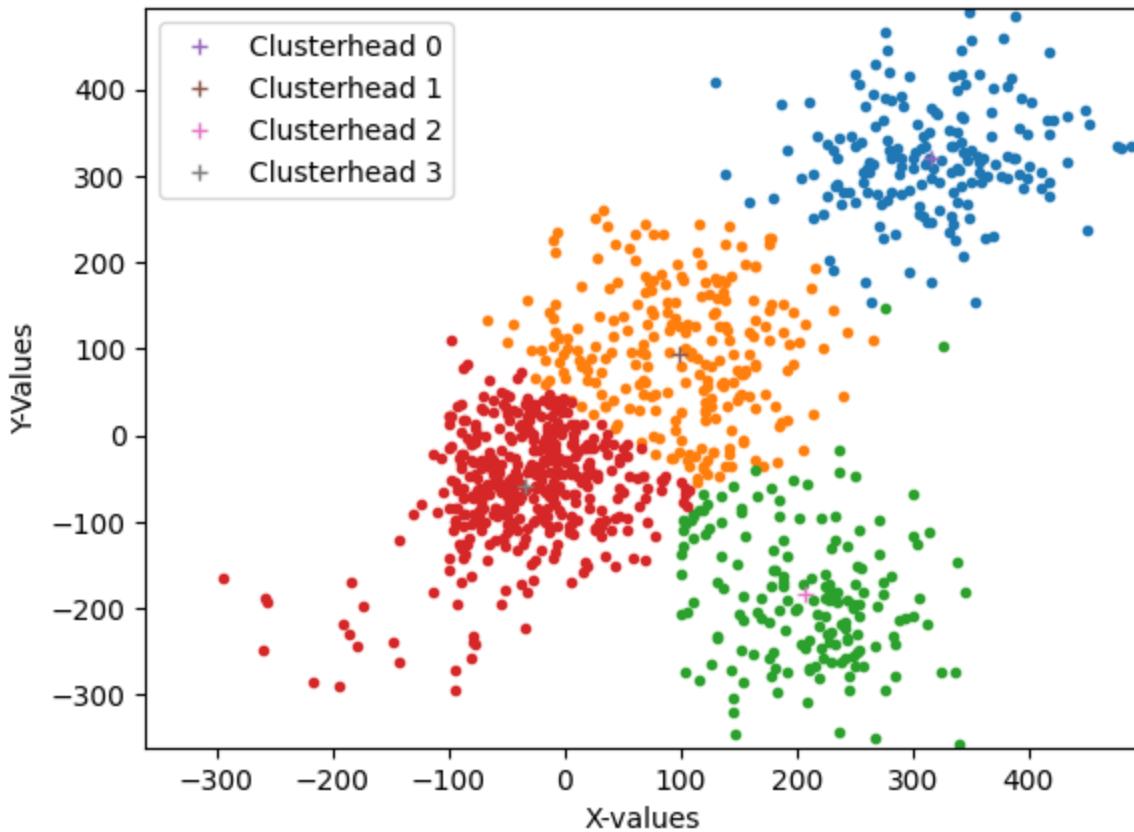
new cluster heads:

```
[[ 315.71791866  98.40569706  207.57602107 -34.60116935]
 [ 321.78978529  95.02095079 -184.30508835 -59.29555476]]
```

last heads:

```
[[ 315.71791866  97.14995614  206.84348251 -35.39593368]
 [ 321.78978529  94.64971424 -182.82314093 -59.86036955]]
```

## K-means results



distance between old and new heads: 5.40

new cluster heads:

```
[[ 315.71791866  98.40569706  207.57602107 -34.60116935]
 [ 321.78978529  95.02095079 -184.30508835 -59.29555476]]
```

last heads:

```
[[ 315.71791866  98.40569706  207.57602107 -34.60116935]
 [ 321.78978529  95.02095079 -184.30508835 -59.29555476]]
```

new cluster heads:

```
[[ 315.71791866  98.85275738  207.57602107 -34.60116935]
 [ 321.78978529  95.75192428 -184.30508835 -59.29555476]]
```

last heads:

```
[[ 315.71791866  98.40569706  207.57602107 -34.60116935]
 [ 321.78978529  95.02095079 -184.30508835 -59.29555476]]
```

new cluster heads:

```
[[ 315.71791866  98.85275738  207.57602107 -34.60116935]
 [ 321.78978529  95.75192428 -184.30508835 -59.29555476]]
```

last heads:

```
[[ 315.71791866  98.40569706  207.57602107 -34.60116935]
 [ 321.78978529  95.02095079 -184.30508835 -59.29555476]]
```

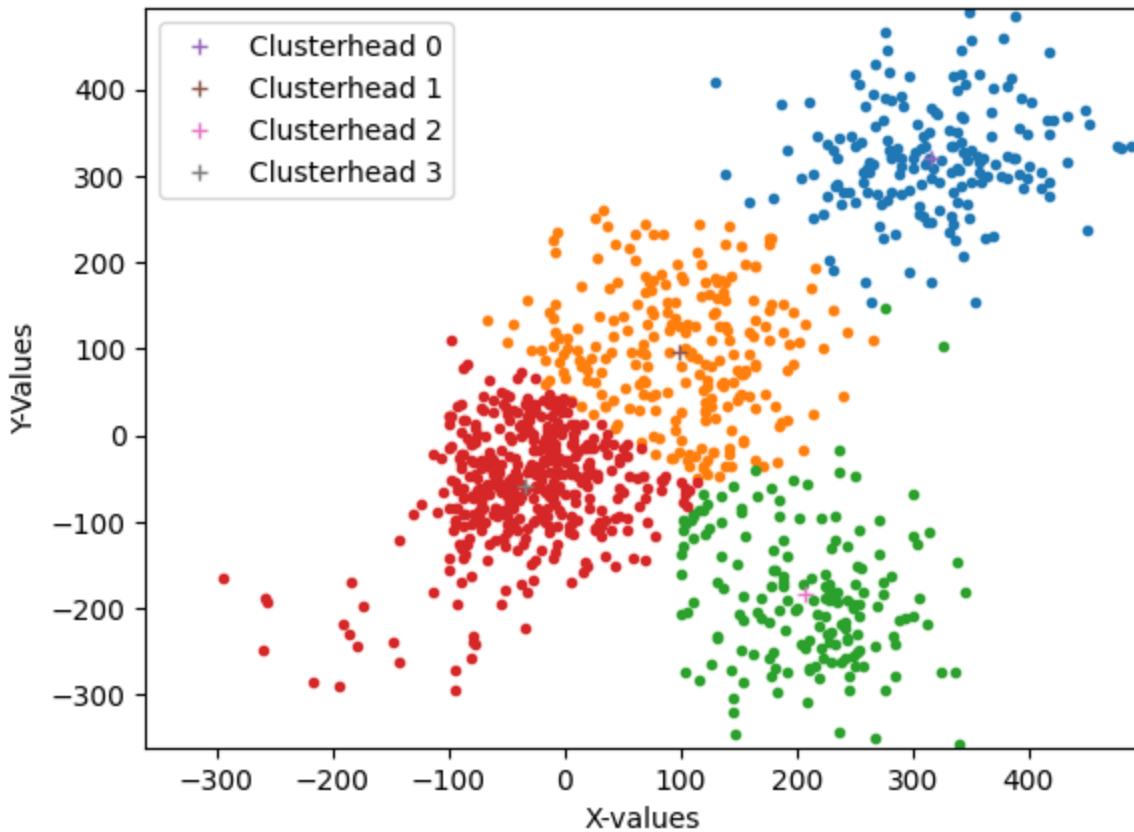
new cluster heads:

```
[[ 315.71791866  98.85275738  207.57602107 -34.20856951]
 [ 321.78978529  95.75192428 -184.30508835 -58.96784972]]
```

last heads:

```
[[ 315.71791866  98.40569706  207.57602107 -34.60116935]
 [ 321.78978529  95.02095079 -184.30508835 -59.29555476]]
```

## K-means results



distance between old and new heads: 1.00

new cluster heads:

```
[[ 315.71791866  98.85275738  207.57602107 -34.20856951]
 [ 321.78978529  95.75192428 -184.30508835 -58.96784972]]
```

last heads:

```
[[ 315.71791866  98.85275738  207.57602107 -34.20856951]
 [ 321.78978529  95.75192428 -184.30508835 -58.96784972]]
```

new cluster heads:

```
[[ 315.71791866 100.63213499  207.57602107 -34.20856951]
 [ 321.78978529  97.07283366 -184.30508835 -58.96784972]]
```

last heads:

```
[[ 315.71791866  98.85275738  207.57602107 -34.20856951]
 [ 321.78978529  95.75192428 -184.30508835 -58.96784972]]
```

new cluster heads:

```
[[ 315.71791866 100.63213499  207.57602107 -34.20856951]
 [ 321.78978529  97.07283366 -184.30508835 -58.96784972]]
```

last heads:

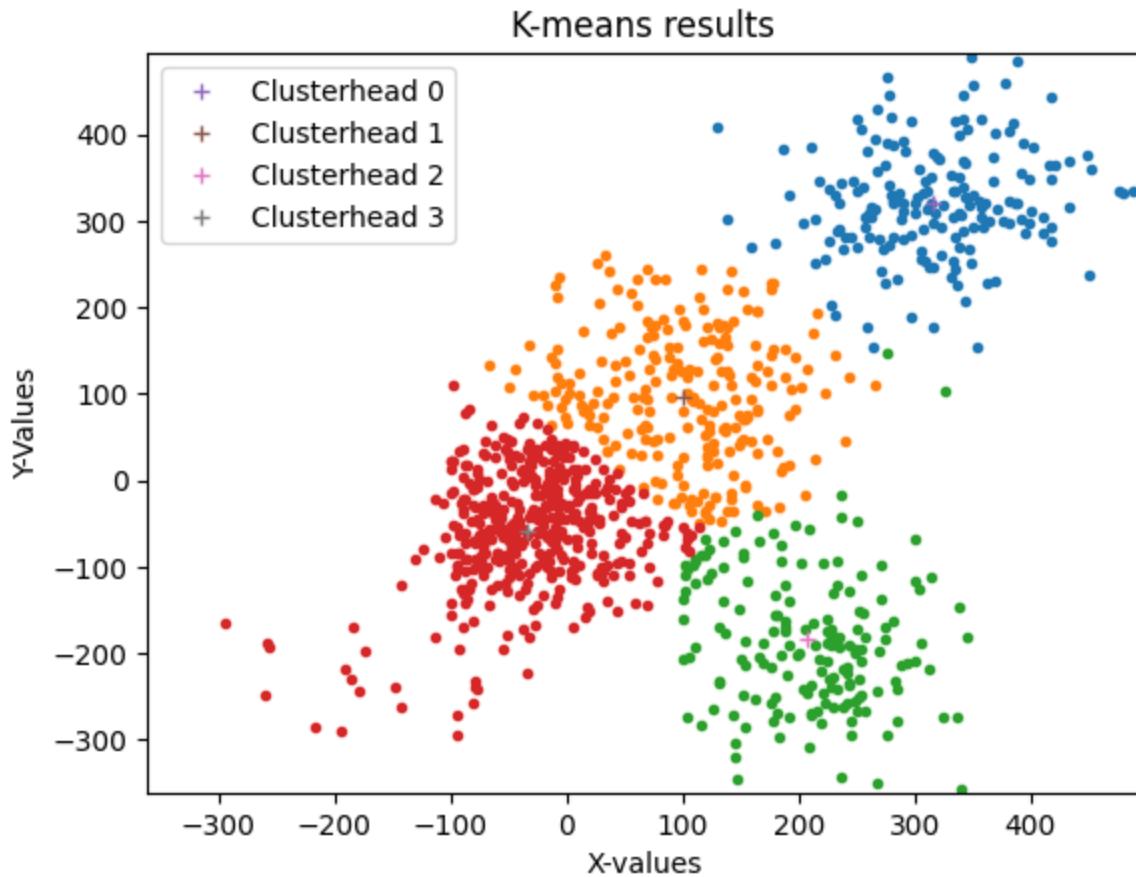
```
[[ 315.71791866  98.85275738  207.57602107 -34.20856951]
 [ 321.78978529  95.75192428 -184.30508835 -58.96784972]]
```

new cluster heads:

```
[[ 315.71791866 100.63213499  207.57602107 -33.61005811]
 [ 321.78978529  97.07283366 -184.30508835 -57.83629358]]
```

last heads:

```
[[ 315.71791866  98.85275738  207.57602107 -34.20856951]
 [ 321.78978529  95.75192428 -184.30508835 -58.96784972]]
```



distance between old and new heads: 6.55

new cluster heads:

```
[[ 316.01155491  100.63213499  207.57602107  -33.61005811]
 [ 322.75118193   97.07283366  -184.30508835  -57.83629358]]
```

last heads:

```
[[ 315.71791866  100.63213499  207.57602107  -33.61005811]
 [ 321.78978529   97.07283366  -184.30508835  -57.83629358]]
```

new cluster heads:

```
[[ 316.01155491  101.57099553  207.57602107  -33.61005811]
 [ 322.75118193   98.26145674  -184.30508835  -57.83629358]]
```

last heads:

```
[[ 315.71791866  100.63213499  207.57602107  -33.61005811]
 [ 321.78978529   97.07283366  -184.30508835  -57.83629358]]
```

new cluster heads:

```
[[ 316.01155491  101.57099553  207.57602107  -33.61005811]
 [ 322.75118193   98.26145674  -184.30508835  -57.83629358]]
```

last heads:

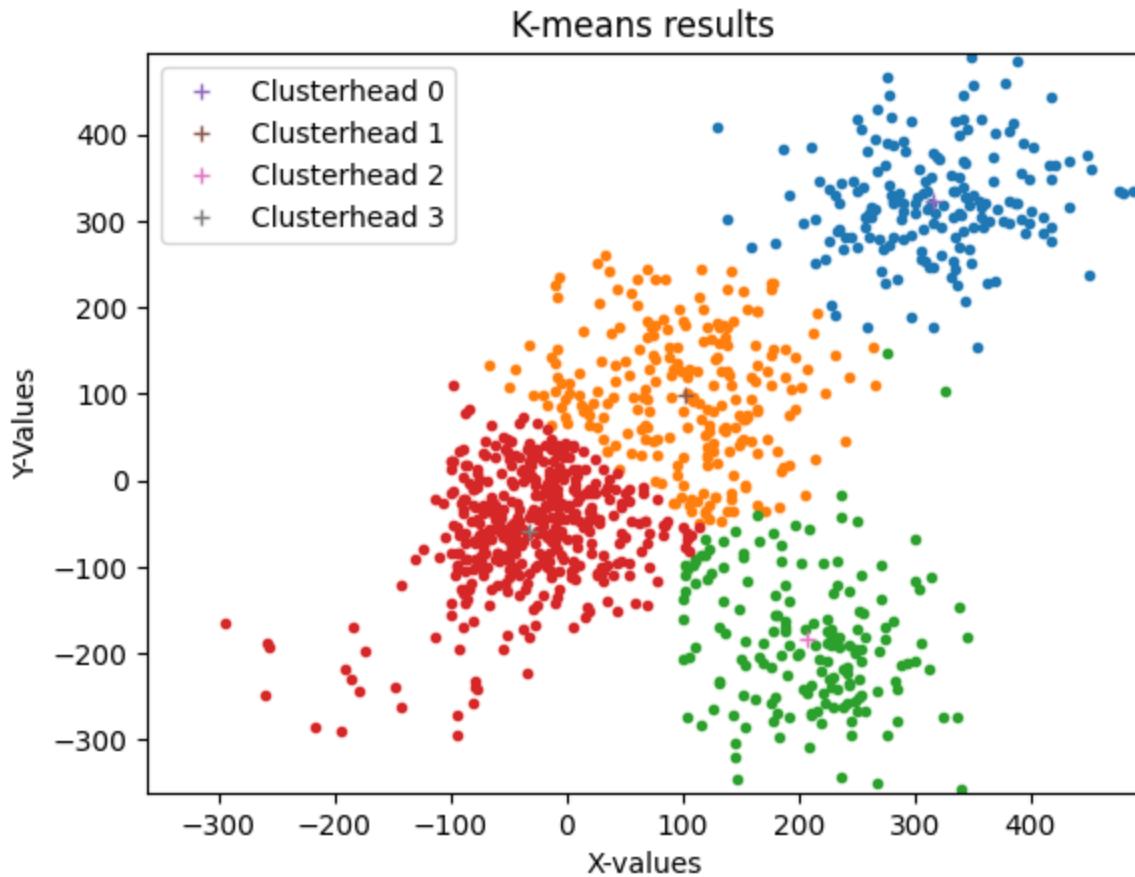
```
[[ 315.71791866  100.63213499  207.57602107  -33.61005811]
 [ 321.78978529   97.07283366  -184.30508835  -57.83629358]]
```

new cluster heads:

```
[[ 316.01155491  101.57099553  207.57602107  -33.0943946 ]
 [ 322.75118193   98.26145674  -184.30508835  -57.62422233]]
```

last heads:

```
[[ 315.71791866  100.63213499  207.57602107  -33.61005811]
 [ 321.78978529   97.07283366  -184.30508835  -57.83629358]]
```



distance between old and new heads: 3.62

new cluster heads:

```
[[ 316.01155491  101.57099553  207.57602107  -33.0943946 ]
 [ 322.75118193   98.26145674  -184.30508835  -57.62422233]]
```

last heads:

```
[[ 316.01155491  101.57099553  207.57602107  -33.0943946 ]
 [ 322.75118193   98.26145674  -184.30508835  -57.62422233]]
```

new cluster heads:

```
[[ 316.01155491  101.52077521  207.57602107  -33.0943946 ]
 [ 322.75118193   98.88929715  -184.30508835  -57.62422233]]
```

last heads:

```
[[ 316.01155491  101.57099553  207.57602107  -33.0943946 ]
 [ 322.75118193   98.26145674  -184.30508835  -57.62422233]]
```

new cluster heads:

```
[[ 316.01155491  101.52077521  207.57602107  -33.0943946 ]
 [ 322.75118193   98.88929715  -184.30508835  -57.62422233]]
```

last heads:

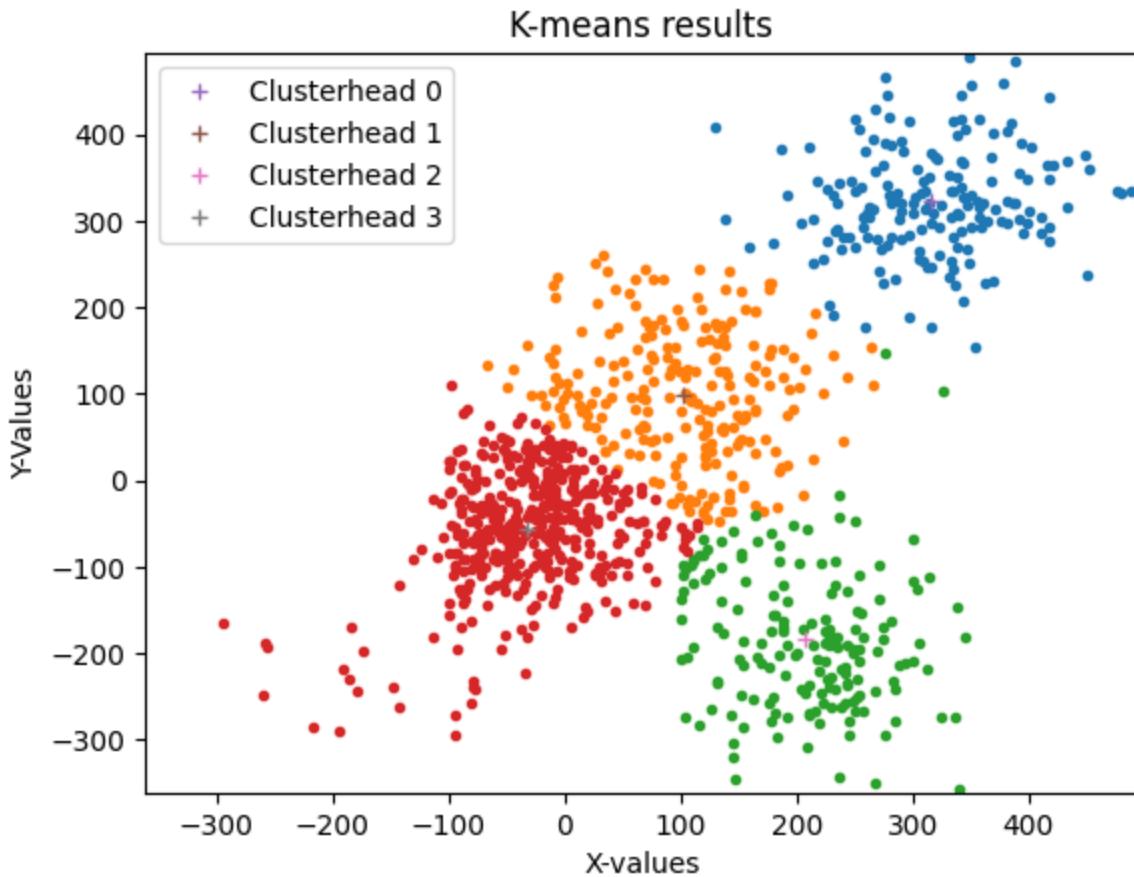
```
[[ 316.01155491  101.57099553  207.57602107  -33.0943946 ]
 [ 322.75118193   98.26145674  -184.30508835  -57.62422233]]
```

new cluster heads:

```
[[ 316.01155491  101.52077521  207.57602107  -32.73715761]
 [ 322.75118193   98.88929715  -184.30508835  -57.6038731 ]]
```

last heads:

```
[[ 316.01155491  101.57099553  207.57602107  -33.0943946 ]
 [ 322.75118193   98.26145674  -184.30508835  -57.62422233]]
```



distance between old and new heads: 0.52

new cluster heads:

```
[[ 316.01155491  101.52077521  207.57602107 -32.73715761]
 [ 322.75118193  98.88929715 -184.30508835 -57.6038731 ]]
```

last heads:

```
[[ 316.01155491  101.52077521  207.57602107 -32.73715761]
 [ 322.75118193  98.88929715 -184.30508835 -57.6038731 ]]
```

new cluster heads:

```
[[ 316.01155491  101.52077521  207.57602107 -32.73715761]
 [ 322.75118193  98.88929715 -184.30508835 -57.6038731 ]]
```

last heads:

```
[[ 316.01155491  101.52077521  207.57602107 -32.73715761]
 [ 322.75118193  98.88929715 -184.30508835 -57.6038731 ]]
```

new cluster heads:

```
[[ 316.01155491  101.52077521  207.57602107 -32.73715761]
 [ 322.75118193  98.88929715 -184.30508835 -57.6038731 ]]
```

last heads:

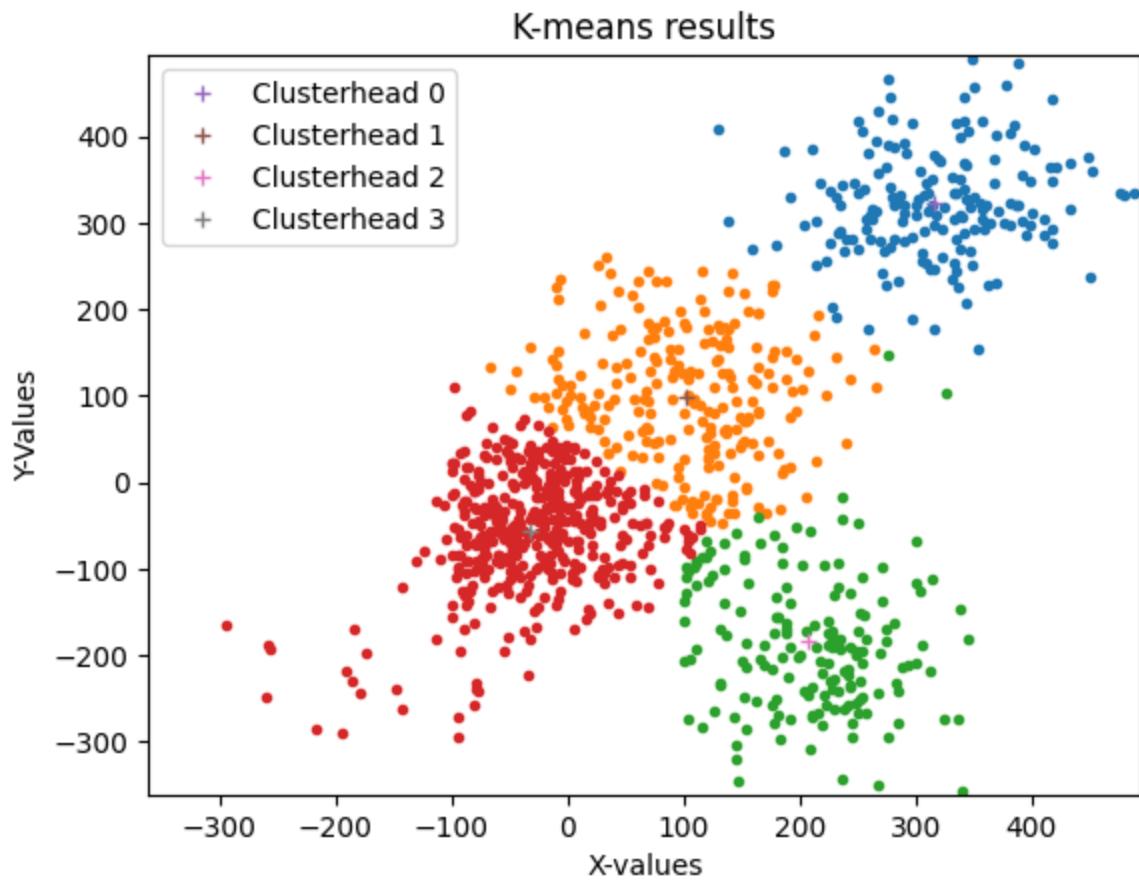
```
[[ 316.01155491  101.52077521  207.57602107 -32.73715761]
 [ 322.75118193  98.88929715 -184.30508835 -57.6038731 ]]
```

new cluster heads:

```
[[ 316.01155491  101.52077521  207.57602107 -32.73715761]
 [ 322.75118193  98.88929715 -184.30508835 -57.6038731 ]]
```

last heads:

```
[[ 316.01155491  101.52077521  207.57602107 -32.73715761]
 [ 322.75118193  98.88929715 -184.30508835 -57.6038731 ]]
```



Finished try! Distance between old and new heads: 0.000000

new cluster heads:

```
[[ 189.65517648 -19.3750543  100.85388337 187.50644046]
 [-162.68535287  39.83709276  26.80692478 118.92432258]]
```

last heads:

```
[[170.77792799 -19.3750543  100.85388337 187.50644046]
 [-35.84246445  39.83709276  26.80692478 118.92432258]]
```

new cluster heads:

```
[[ 189.65517648 -40.74817989  100.85388337 187.50644046]
 [-162.68535287 -35.49277226  26.80692478 118.92432258]]
```

last heads:

```
[[170.77792799 -19.3750543  100.85388337 187.50644046]
 [-35.84246445  39.83709276  26.80692478 118.92432258]]
```

new cluster heads:

```
[[ 189.65517648 -40.74817989   84.0900209 187.50644046]
 [-162.68535287 -35.49277226  10.56247242 118.92432258]]
```

last heads:

```
[[170.77792799 -19.3750543  100.85388337 187.50644046]
 [-35.84246445  39.83709276  26.80692478 118.92432258]]
```

new cluster heads:

```
[[ 189.65517648 -40.74817989   84.0900209 251.81667373]
 [-162.68535287 -35.49277226  10.56247242 261.58843783]]
```

last heads:

```
[[170.77792799 -19.3750543  100.85388337 187.50644046]
 [-35.84246445  39.83709276  26.80692478 118.92432258]]
```

distance between old and new heads: 47610.63

new cluster heads:

```
[[ 208.38569024 -40.74817989   84.0900209 251.81667373]
 [-193.18425709 -35.49277226  10.56247242 261.58843783]]
```

last heads:

```
[[ 189.65517648 -40.74817989   84.0900209 251.81667373]
 [-162.68535287 -35.49277226  10.56247242 261.58843783]]
```

new cluster heads:

```
[[ 208.38569024 -45.39413329   84.0900209 251.81667373]
 [-193.18425709 -56.92036804  10.56247242 261.58843783]]
```

last heads:

```
[[ 189.65517648 -40.74817989   84.0900209 251.81667373]
 [-162.68535287 -35.49277226  10.56247242 261.58843783]]
```

new cluster heads:

```
[[ 208.38569024 -45.39413329   90.45526543 251.81667373]
 [-193.18425709 -56.92036804  49.35632292 261.58843783]]
```

last heads:

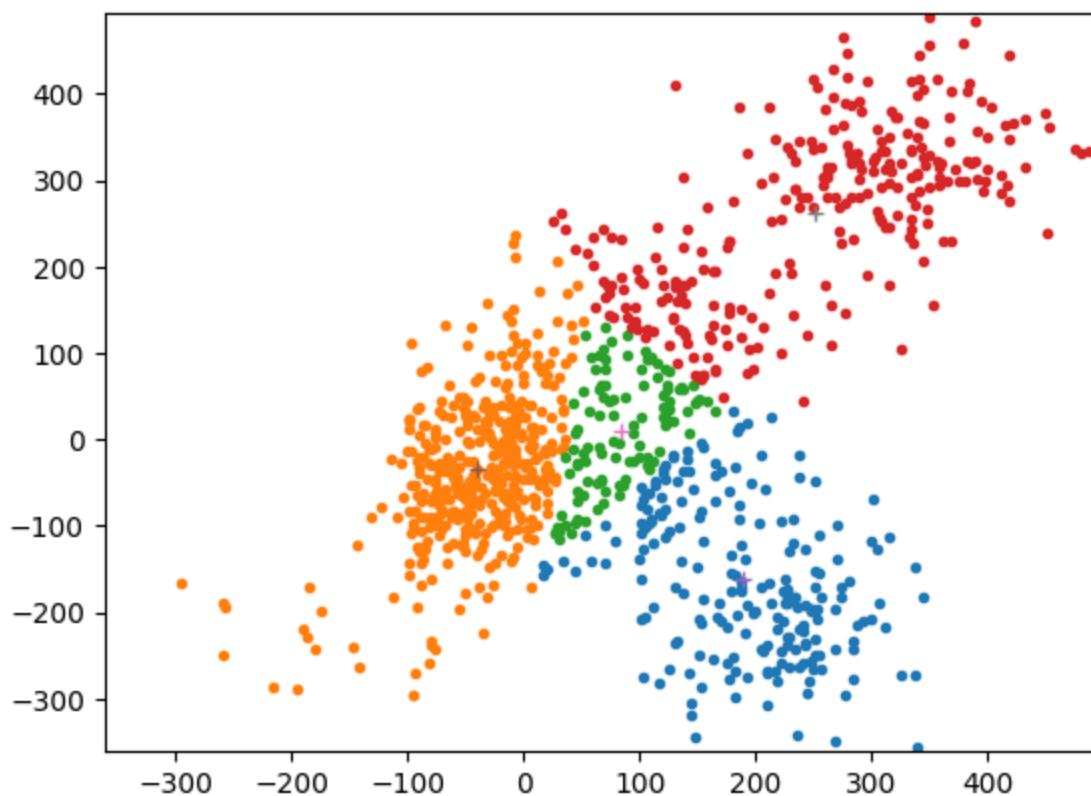
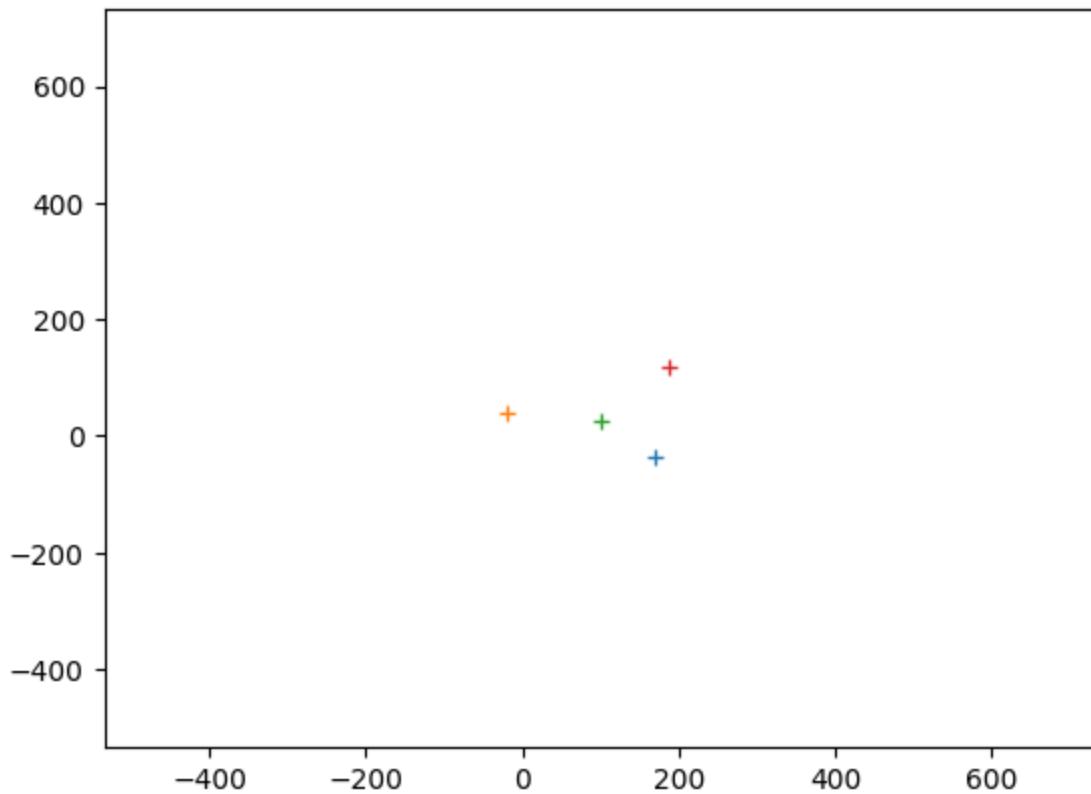
```
[[ 189.65517648 -40.74817989   84.0900209 251.81667373]
 [-162.68535287 -35.49277226  10.56247242 261.58843783]]
```

new cluster heads:

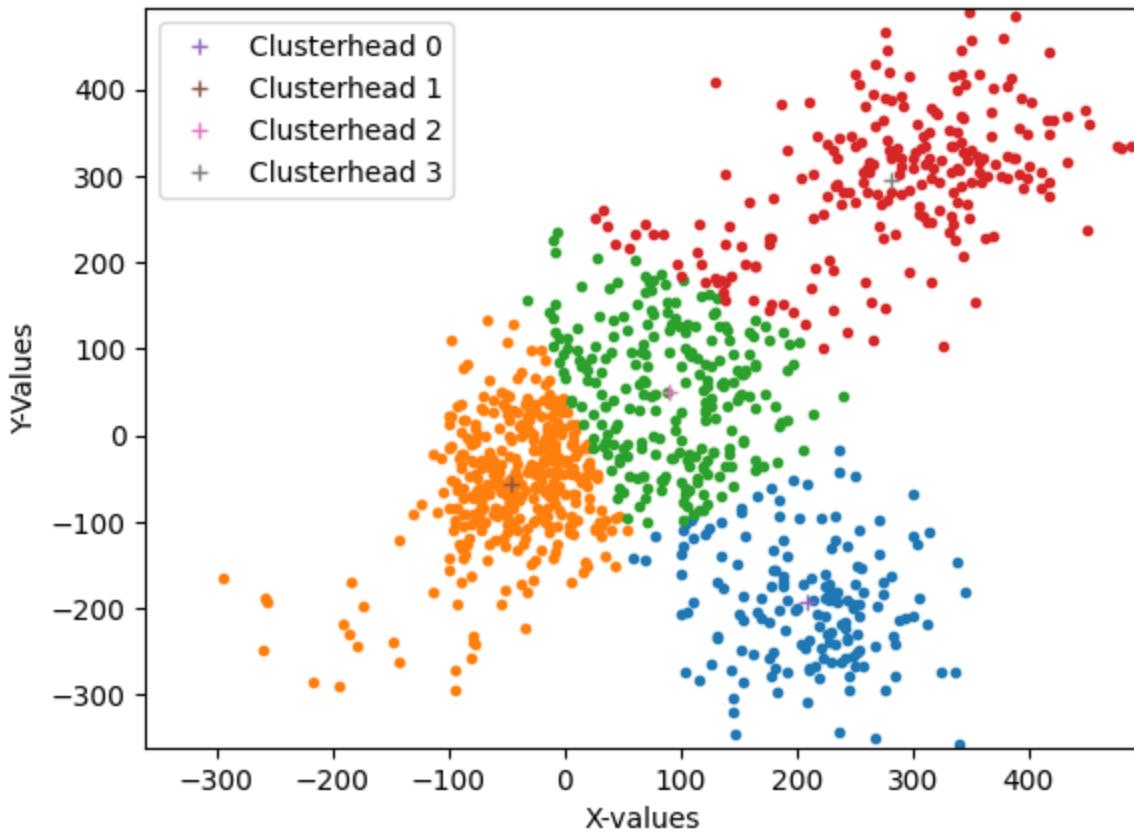
```
[[ 208.38569024 -45.39413329   90.45526543 281.36442462]
 [-193.18425709 -56.92036804  49.35632292 294.53283583]]
```

last heads:

```
[[ 189.65517648 -40.74817989   84.0900209 251.81667373]
 [-162.68535287 -35.49277226  10.56247242 261.58843783]]
```



## K-means results



distance between old and new heads: 5265.62

new cluster heads:

```
[[ 210.83625875 -45.39413329  90.45526543  281.36442462]
 [-195.40289429 -56.92036804  49.35632292  294.53283583]]
```

last heads:

```
[[ 208.38569024 -45.39413329  90.45526543  281.36442462]
 [-193.18425709 -56.92036804  49.35632292  294.53283583]]
```

new cluster heads:

```
[[ 210.83625875 -42.48963615  90.45526543  281.36442462]
 [-195.40289429 -63.03383105  49.35632292  294.53283583]]
```

last heads:

```
[[ 208.38569024 -45.39413329  90.45526543  281.36442462]
 [-193.18425709 -56.92036804  49.35632292  294.53283583]]
```

new cluster heads:

```
[[ 210.83625875 -42.48963615  90.44673821  281.36442462]
 [-195.40289429 -63.03383105  69.59013654  294.53283583]]
```

last heads:

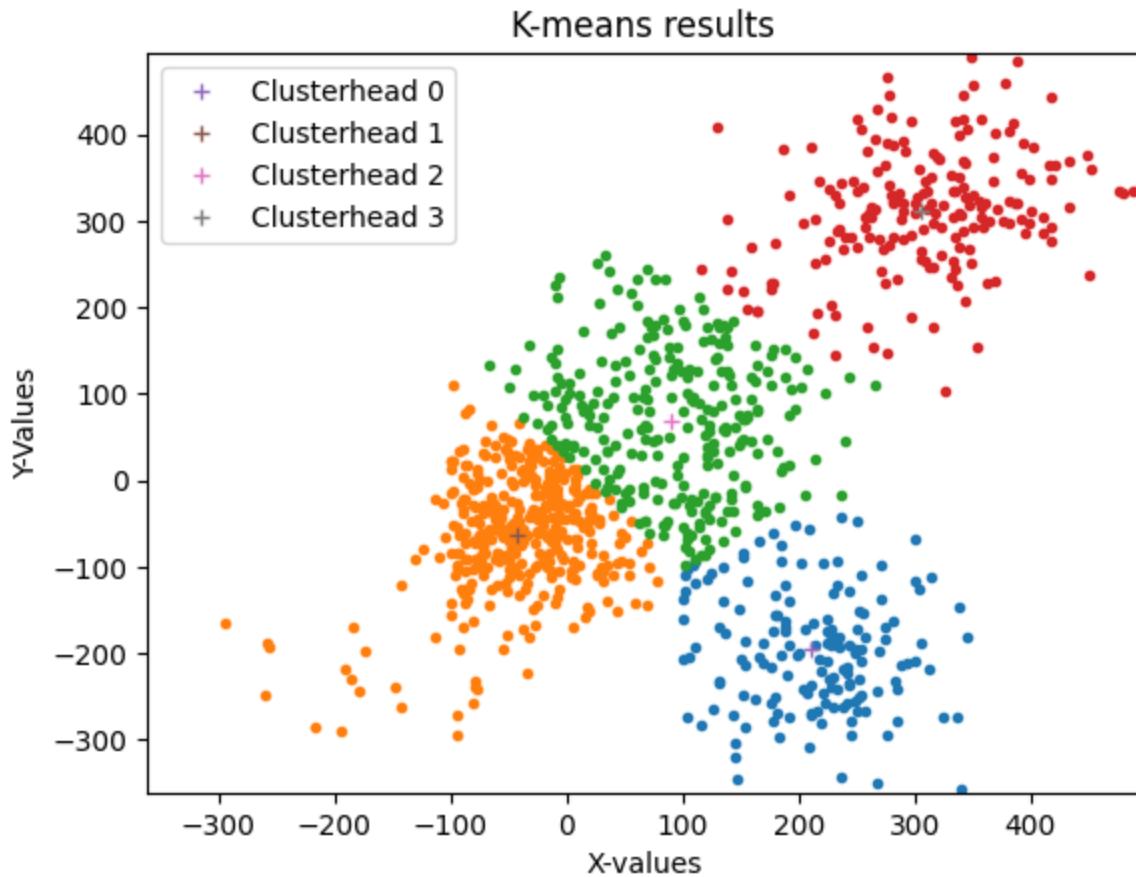
```
[[ 208.38569024 -45.39413329  90.45526543  281.36442462]
 [-193.18425709 -56.92036804  49.35632292  294.53283583]]
```

new cluster heads:

```
[[ 210.83625875 -42.48963615  90.44673821  305.64234944]
 [-195.40289429 -63.03383105  69.59013654  311.92677481]]
```

last heads:

```
[[ 208.38569024 -45.39413329  90.45526543  281.36442462]
 [-193.18425709 -56.92036804  49.35632292  294.53283583]]
```



distance between old and new heads: 1358.11

new cluster heads:

```
[[ 210.83625875 -42.48963615  90.44673821  305.64234944]
 [-195.40289429 -63.03383105  69.59013654  311.92677481]]
```

last heads:

```
[[ 210.83625875 -42.48963615  90.44673821  305.64234944]
 [-195.40289429 -63.03383105  69.59013654  311.92677481]]
```

new cluster heads:

```
[[ 210.83625875 -39.17081099  90.44673821  305.64234944]
 [-195.40289429 -62.37036728  69.59013654  311.92677481]]
```

last heads:

```
[[ 210.83625875 -42.48963615  90.44673821  305.64234944]
 [-195.40289429 -63.03383105  69.59013654  311.92677481]]
```

new cluster heads:

```
[[ 210.83625875 -39.17081099  93.95255499  305.64234944]
 [-195.40289429 -62.37036728  78.3399639   311.92677481]]
```

last heads:

```
[[ 210.83625875 -42.48963615  90.44673821  305.64234944]
 [-195.40289429 -63.03383105  69.59013654  311.92677481]]
```

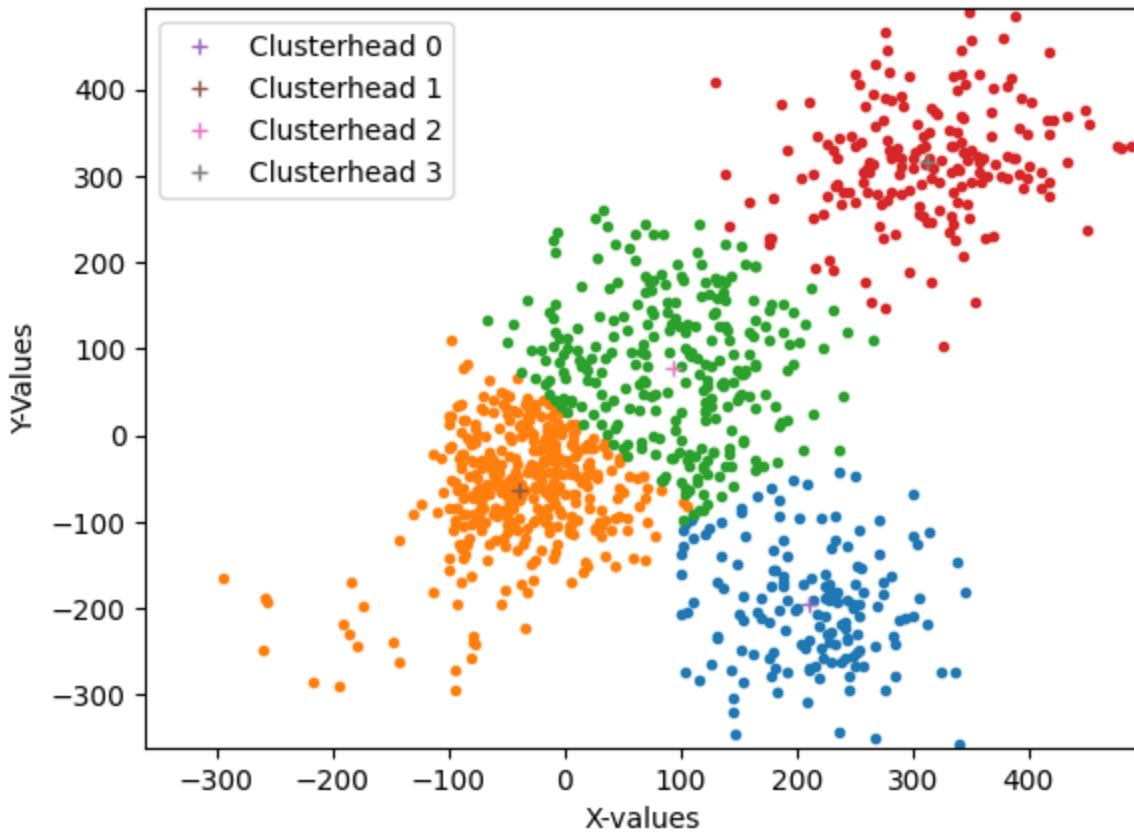
new cluster heads:

```
[[ 210.83625875 -39.17081099  93.95255499  311.75338858]
 [-195.40289429 -62.37036728  78.3399639   316.91681985]]
```

last heads:

```
[[ 210.83625875 -42.48963615  90.44673821  305.64234944]
 [-195.40289429 -63.03383105  69.59013654  311.92677481]]
```

## K-means results



distance between old and new heads: 162.55

new cluster heads:

```
[[ 210.83625875 -39.17081099  93.95255499  311.75338858]
 [-195.40289429 -62.37036728   78.3399639  316.91681985]]
```

last heads:

```
[[ 210.83625875 -39.17081099  93.95255499  311.75338858]
 [-195.40289429 -62.37036728   78.3399639  316.91681985]]
```

new cluster heads:

```
[[ 210.83625875 -36.71478595  93.95255499  311.75338858]
 [-195.40289429 -61.14452032   78.3399639  316.91681985]]
```

last heads:

```
[[ 210.83625875 -39.17081099  93.95255499  311.75338858]
 [-195.40289429 -62.37036728   78.3399639  316.91681985]]
```

new cluster heads:

```
[[ 210.83625875 -36.71478595  96.38624471  311.75338858]
 [-195.40289429 -61.14452032   83.60228426  316.91681985]]
```

last heads:

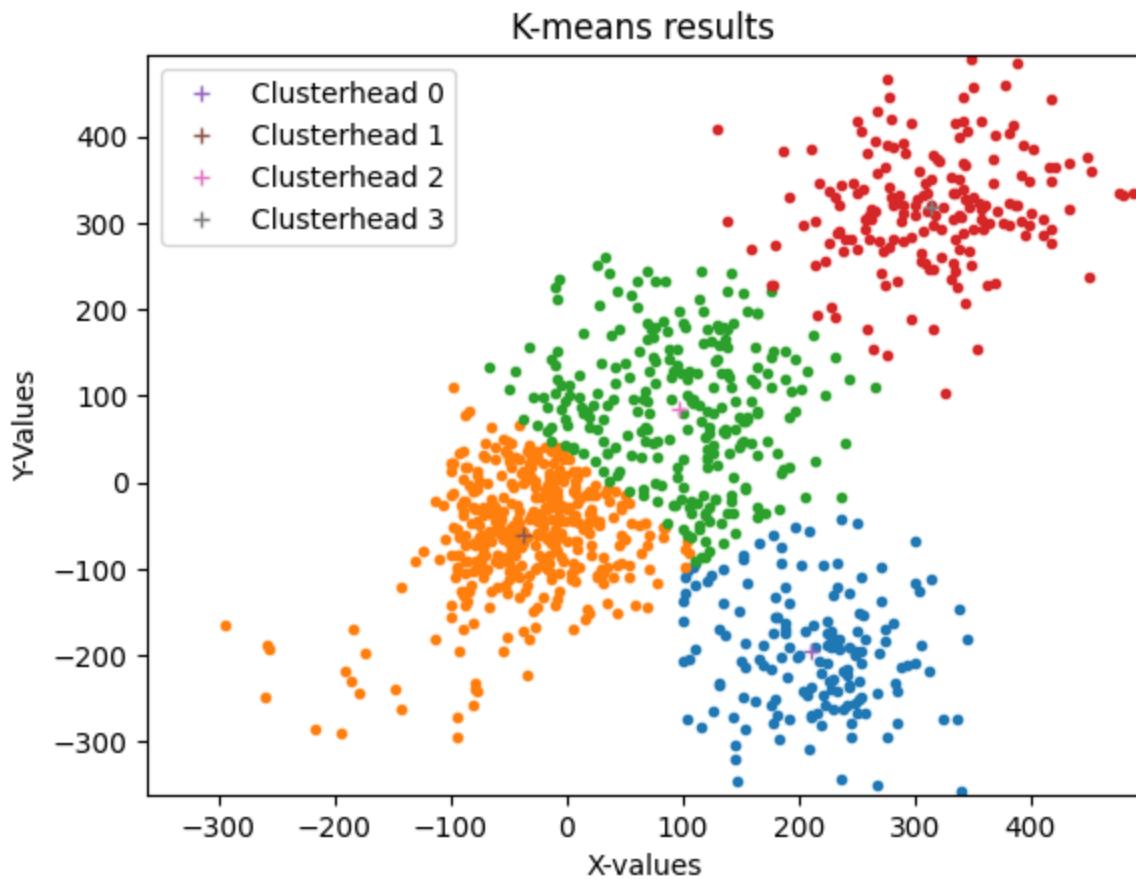
```
[[ 210.83625875 -39.17081099  93.95255499  311.75338858]
 [-195.40289429 -62.37036728   78.3399639  316.91681985]]
```

new cluster heads:

```
[[ 210.83625875 -36.71478595  96.38624471  313.45860106]
 [-195.40289429 -61.14452032   83.60228426  317.85784737]]
```

last heads:

```
[[ 210.83625875 -39.17081099  93.95255499  311.75338858]
 [-195.40289429 -62.37036728   78.3399639  316.91681985]]
```



distance between old and new heads: 44.94

new cluster heads:

```
[[ 210.83625875 -36.71478595  96.38624471  313.45860106]
 [-195.40289429 -61.14452032  83.60228426  317.85784737]]
```

last heads:

```
[[ 210.83625875 -36.71478595  96.38624471  313.45860106]
 [-195.40289429 -61.14452032  83.60228426  317.85784737]]
```

new cluster heads:

```
[[ 210.83625875 -35.43525295  96.38624471  313.45860106]
 [-195.40289429 -60.337195  83.60228426  317.85784737]]
```

last heads:

```
[[ 210.83625875 -36.71478595  96.38624471  313.45860106]
 [-195.40289429 -61.14452032  83.60228426  317.85784737]]
```

new cluster heads:

```
[[ 210.83625875 -35.43525295  97.53152068  313.45860106]
 [-195.40289429 -60.337195  85.74910975  317.85784737]]
```

last heads:

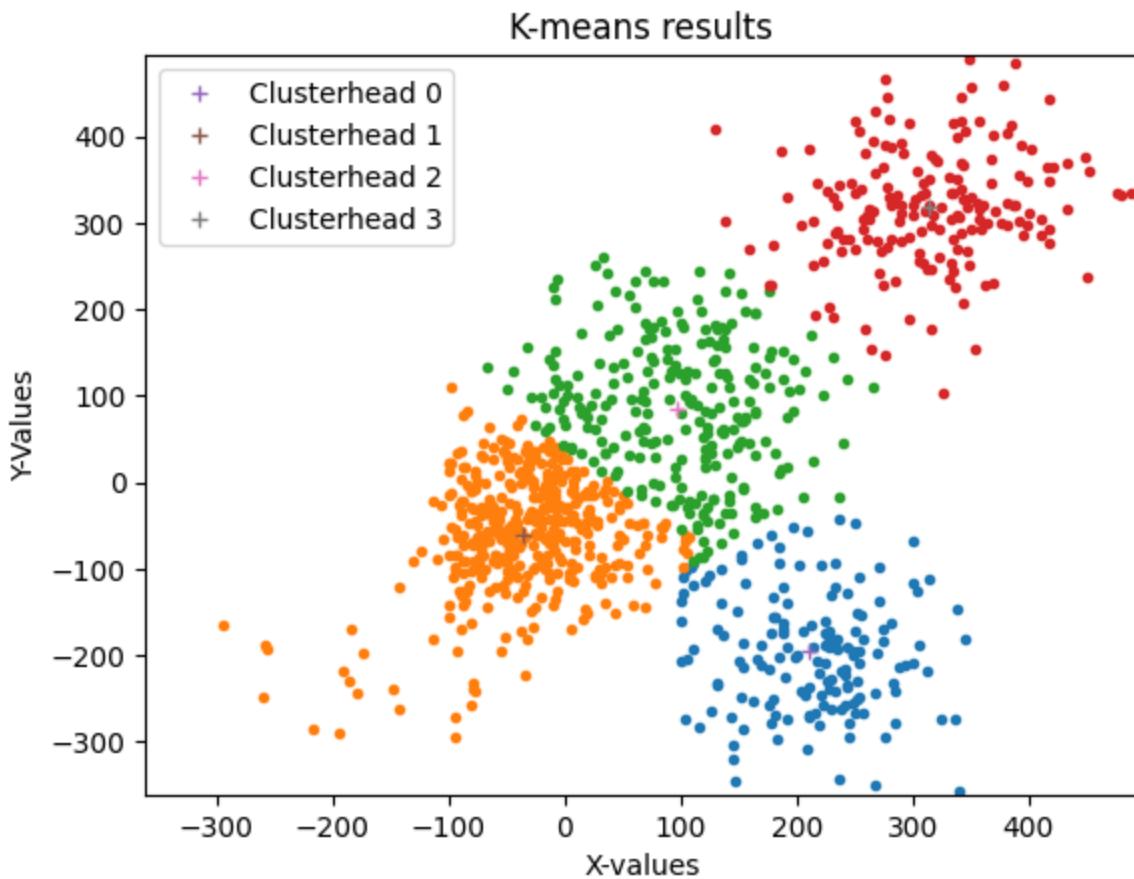
```
[[ 210.83625875 -36.71478595  96.38624471  313.45860106]
 [-195.40289429 -61.14452032  83.60228426  317.85784737]]
```

new cluster heads:

```
[[ 210.83625875 -35.43525295  97.53152068  313.45860106]
 [-195.40289429 -60.337195  85.74910975  317.85784737]]
```

last heads:

```
[[ 210.83625875 -36.71478595  96.38624471  313.45860106]
 [-195.40289429 -61.14452032  83.60228426  317.85784737]]
```



distance between old and new heads: 8.21

new cluster heads:

```
[[ 210.83625875 -35.43525295  97.53152068 313.45860106]
 [-195.40289429 -60.337195   85.74910975 317.85784737]]
```

last heads:

```
[[ 210.83625875 -35.43525295  97.53152068 313.45860106]
 [-195.40289429 -60.337195   85.74910975 317.85784737]]
```

new cluster heads:

```
[[ 210.83625875 -34.47901867  97.53152068 313.45860106]
 [-195.40289429 -60.21243015   85.74910975 317.85784737]]
```

last heads:

```
[[ 210.83625875 -35.43525295  97.53152068 313.45860106]
 [-195.40289429 -60.337195   85.74910975 317.85784737]]
```

new cluster heads:

```
[[ 210.83625875 -34.47901867  97.60392811 313.45860106]
 [-195.40289429 -60.21243015   87.28508803 317.85784737]]
```

last heads:

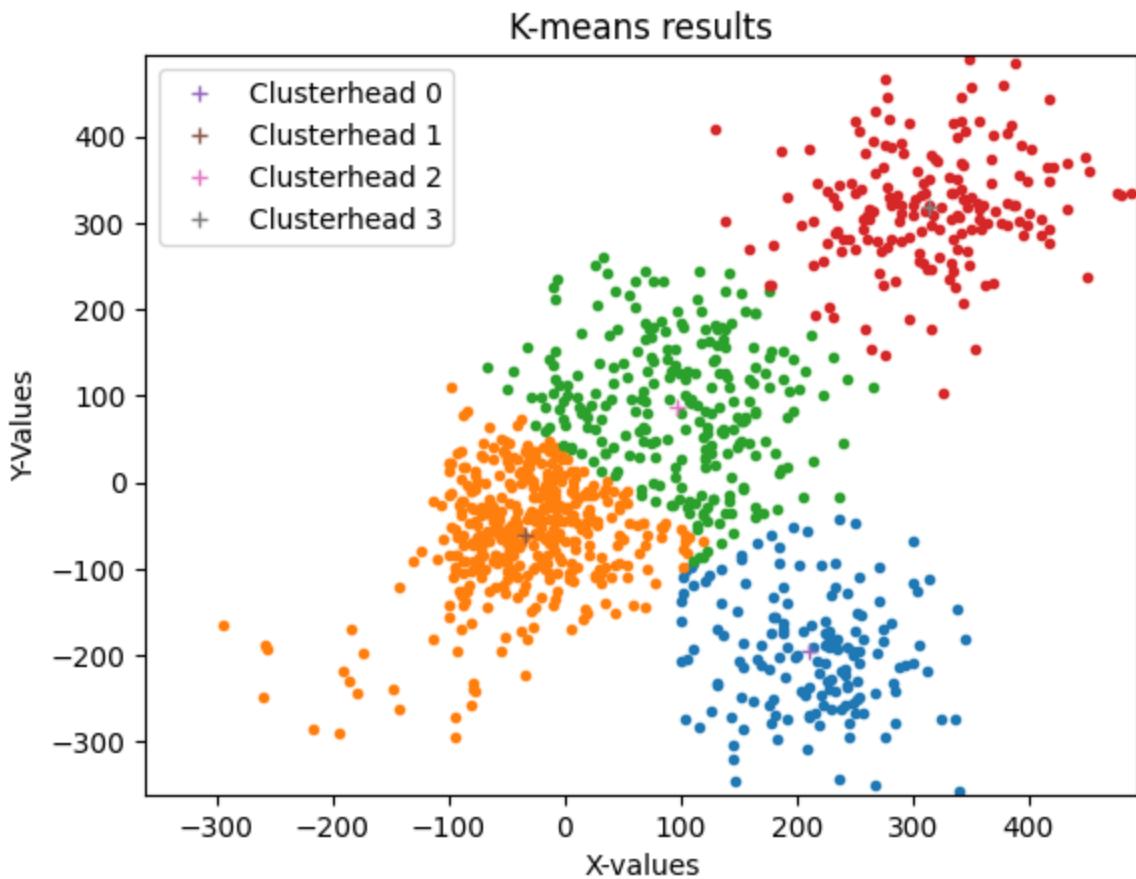
```
[[ 210.83625875 -35.43525295  97.53152068 313.45860106]
 [-195.40289429 -60.337195   85.74910975 317.85784737]]
```

new cluster heads:

```
[[ 210.83625875 -34.47901867  97.60392811 313.45860106]
 [-195.40289429 -60.21243015   87.28508803 317.85784737]]
```

last heads:

```
[[ 210.83625875 -35.43525295  97.53152068 313.45860106]
 [-195.40289429 -60.337195   85.74910975 317.85784737]]
```



distance between old and new heads: 3.29

new cluster heads:

```
[[ 210.83625875 -34.47901867  97.60392811  313.45860106]
 [-195.40289429 -60.21243015   87.28508803  317.85784737]]
```

last heads:

```
[[ 210.83625875 -34.47901867  97.60392811  313.45860106]
 [-195.40289429 -60.21243015   87.28508803  317.85784737]]
```

new cluster heads:

```
[[ 210.83625875 -34.47901867  97.60392811  313.45860106]
 [-195.40289429 -60.21243015   87.28508803  317.85784737]]
```

last heads:

```
[[ 210.83625875 -34.47901867  97.60392811  313.45860106]
 [-195.40289429 -60.21243015   87.28508803  317.85784737]]
```

new cluster heads:

```
[[ 210.83625875 -34.47901867  98.68528851  313.45860106]
 [-195.40289429 -60.21243015   88.80109441  317.85784737]]
```

last heads:

```
[[ 210.83625875 -34.47901867  97.60392811  313.45860106]
 [-195.40289429 -60.21243015   87.28508803  317.85784737]]
```

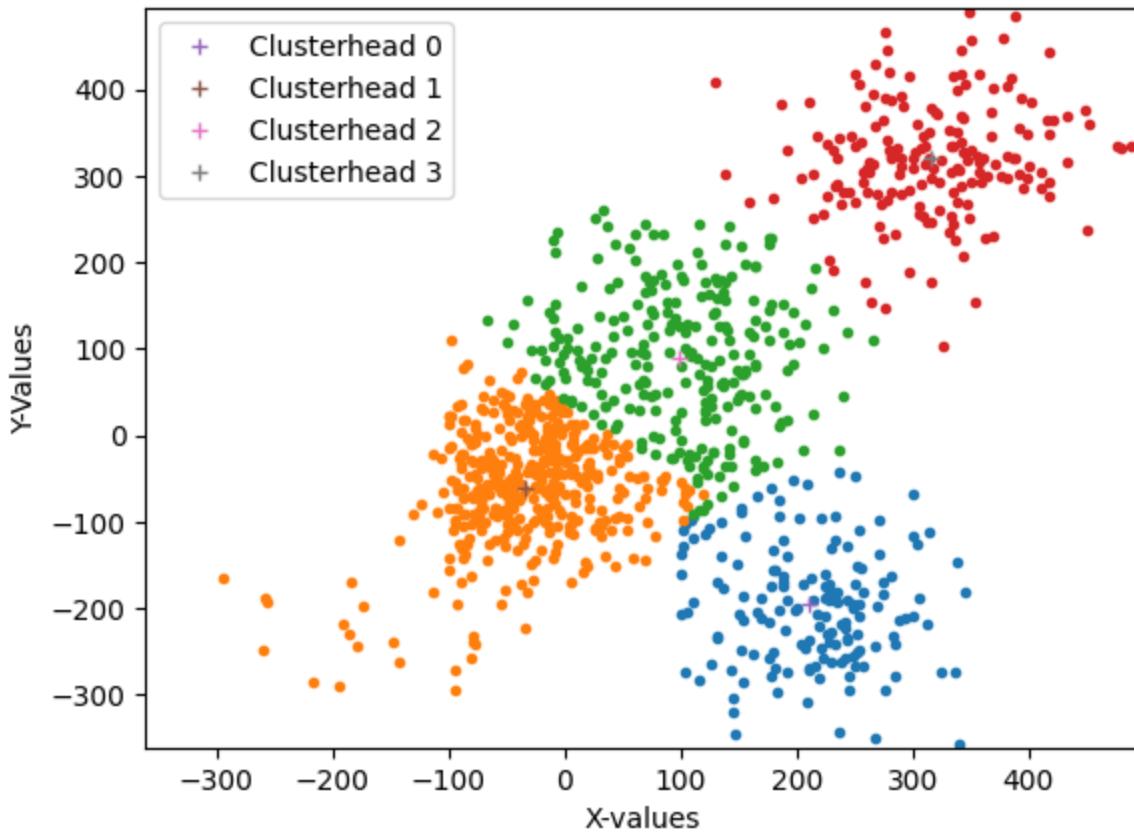
new cluster heads:

```
[[ 210.83625875 -34.47901867  98.68528851  315.55315336]
 [-195.40289429 -60.21243015   88.80109441  319.57321825]]
```

last heads:

```
[[ 210.83625875 -34.47901867  97.60392811  313.45860106]
 [-195.40289429 -60.21243015   87.28508803  317.85784737]]
```

## K-means results



distance between old and new heads: 10.80

new cluster heads:

```
[[ 210.83625875 -34.47901867  98.68528851  315.55315336]
 [-195.40289429 -60.21243015   88.80109441  319.57321825]]
```

last heads:

```
[[ 210.83625875 -34.47901867  98.68528851  315.55315336]
 [-195.40289429 -60.21243015   88.80109441  319.57321825]]
```

new cluster heads:

```
[[ 210.83625875 -34.23107345  98.68528851  315.55315336]
 [-195.40289429 -59.76871747   88.80109441  319.57321825]]
```

last heads:

```
[[ 210.83625875 -34.47901867  98.68528851  315.55315336]
 [-195.40289429 -60.21243015   88.80109441  319.57321825]]
```

new cluster heads:

```
[[ 210.83625875 -34.23107345  99.34336144  315.55315336]
 [-195.40289429 -59.76871747   89.27566913  319.57321825]]
```

last heads:

```
[[ 210.83625875 -34.47901867  98.68528851  315.55315336]
 [-195.40289429 -60.21243015   88.80109441  319.57321825]]
```

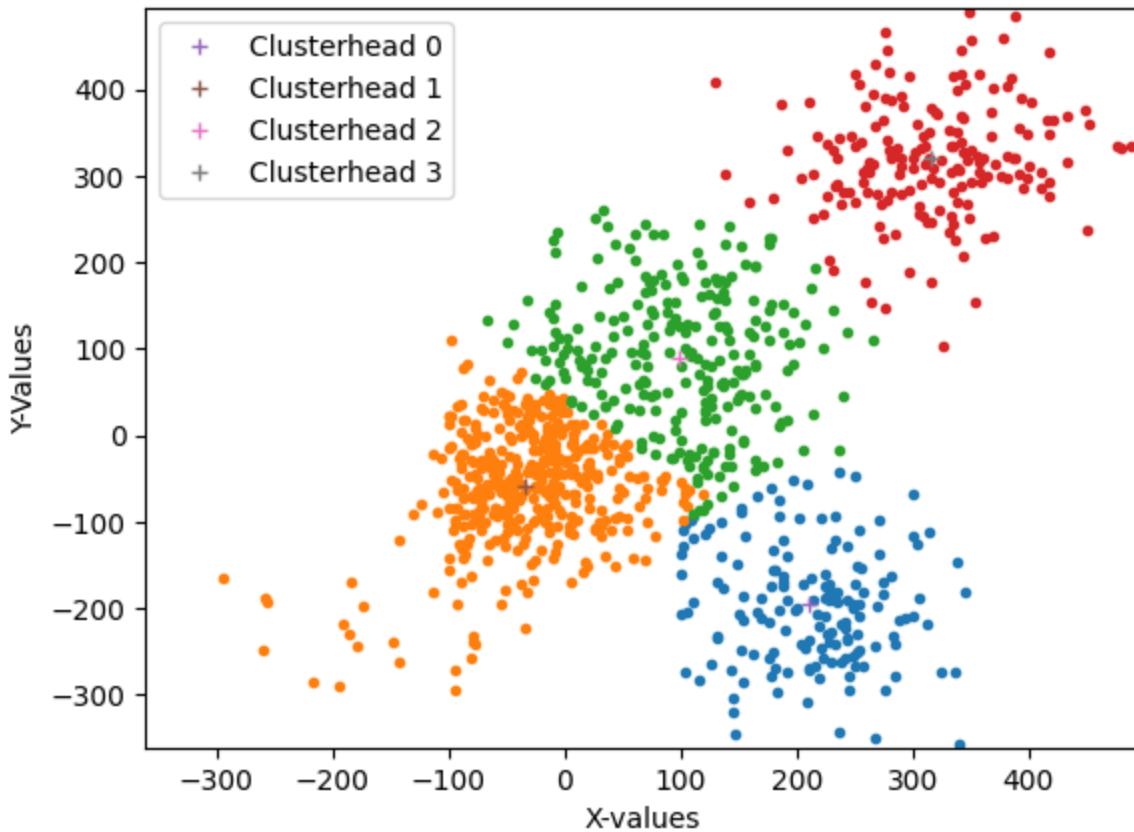
new cluster heads:

```
[[ 210.83625875 -34.23107345  99.34336144  315.55315336]
 [-195.40289429 -59.76871747   89.27566913  319.57321825]]
```

last heads:

```
[[ 210.83625875 -34.47901867  98.68528851  315.55315336]
 [-195.40289429 -60.21243015   88.80109441  319.57321825]]
```

## K-means results



distance between old and new heads: 0.92

new cluster heads:

```
[[ 210.83625875 -34.23107345  99.34336144  315.55315336]
 [-195.40289429 -59.76871747  89.27566913  319.57321825]]
```

last heads:

```
[[ 210.83625875 -34.23107345  99.34336144  315.55315336]
 [-195.40289429 -59.76871747  89.27566913  319.57321825]]
```

new cluster heads:

```
[[ 210.83625875 -34.10942159  99.34336144  315.55315336]
 [-195.40289429 -59.20957024  89.27566913  319.57321825]]
```

last heads:

```
[[ 210.83625875 -34.23107345  99.34336144  315.55315336]
 [-195.40289429 -59.76871747  89.27566913  319.57321825]]
```

new cluster heads:

```
[[ 210.83625875 -34.10942159  100.20941231  315.55315336]
 [-195.40289429 -59.20957024  89.56658812  319.57321825]]
```

last heads:

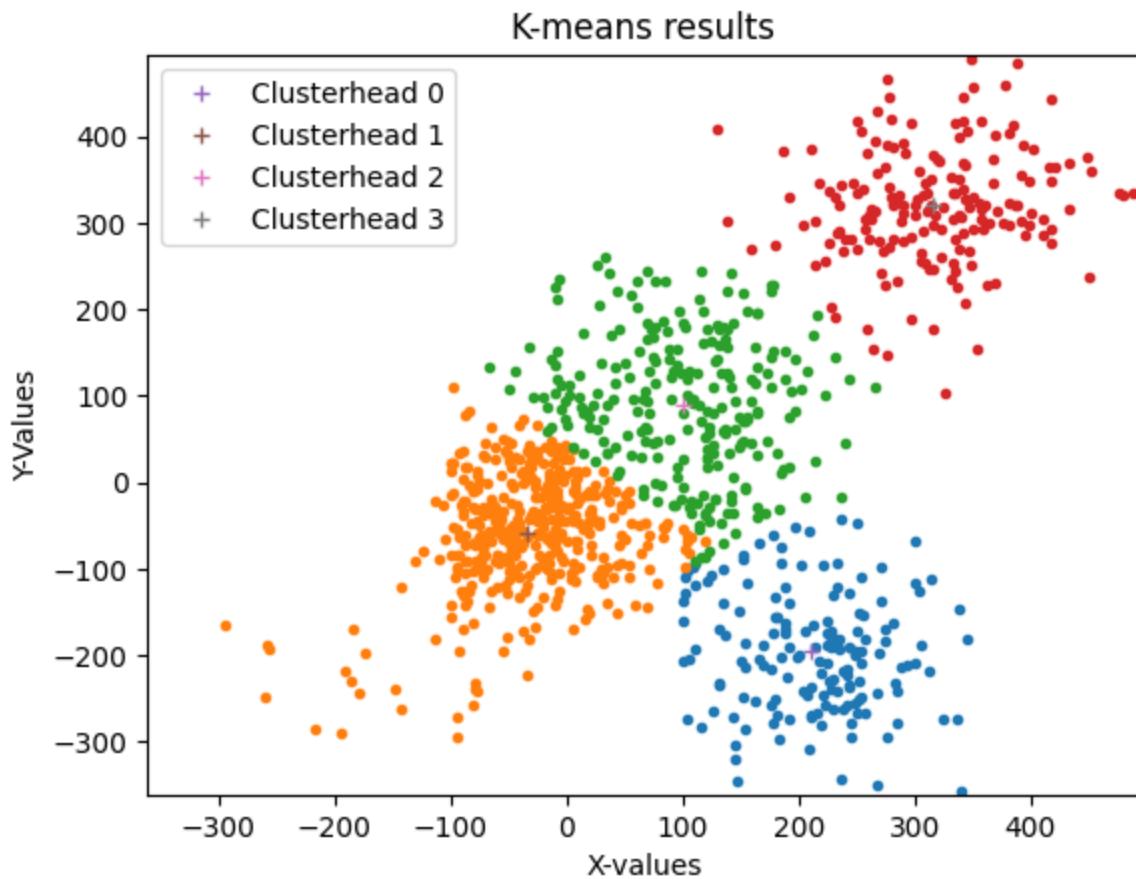
```
[[ 210.83625875 -34.23107345  99.34336144  315.55315336]
 [-195.40289429 -59.76871747  89.27566913  319.57321825]]
```

new cluster heads:

```
[[ 210.83625875 -34.10942159  100.20941231  315.55315336]
 [-195.40289429 -59.20957024  89.56658812  319.57321825]]
```

last heads:

```
[[ 210.83625875 -34.23107345  99.34336144  315.55315336]
 [-195.40289429 -59.76871747  89.27566913  319.57321825]]
```



distance between old and new heads: 1.16

new cluster heads:

```
[[ 210.83625875 -34.10942159 100.20941231 315.55315336]
 [-195.40289429 -59.20957024 89.56658812 319.57321825]]
```

last heads:

```
[[ 210.83625875 -34.10942159 100.20941231 315.55315336]
 [-195.40289429 -59.20957024 89.56658812 319.57321825]]
```

new cluster heads:

```
[[ 210.83625875 -34.06562443 100.20941231 315.55315336]
 [-195.40289429 -58.9144811 89.56658812 319.57321825]]
```

last heads:

```
[[ 210.83625875 -34.10942159 100.20941231 315.55315336]
 [-195.40289429 -59.20957024 89.56658812 319.57321825]]
```

new cluster heads:

```
[[ 210.83625875 -34.06562443 100.67422737 315.55315336]
 [-195.40289429 -58.9144811 89.68553328 319.57321825]]
```

last heads:

```
[[ 210.83625875 -34.10942159 100.20941231 315.55315336]
 [-195.40289429 -59.20957024 89.56658812 319.57321825]]
```

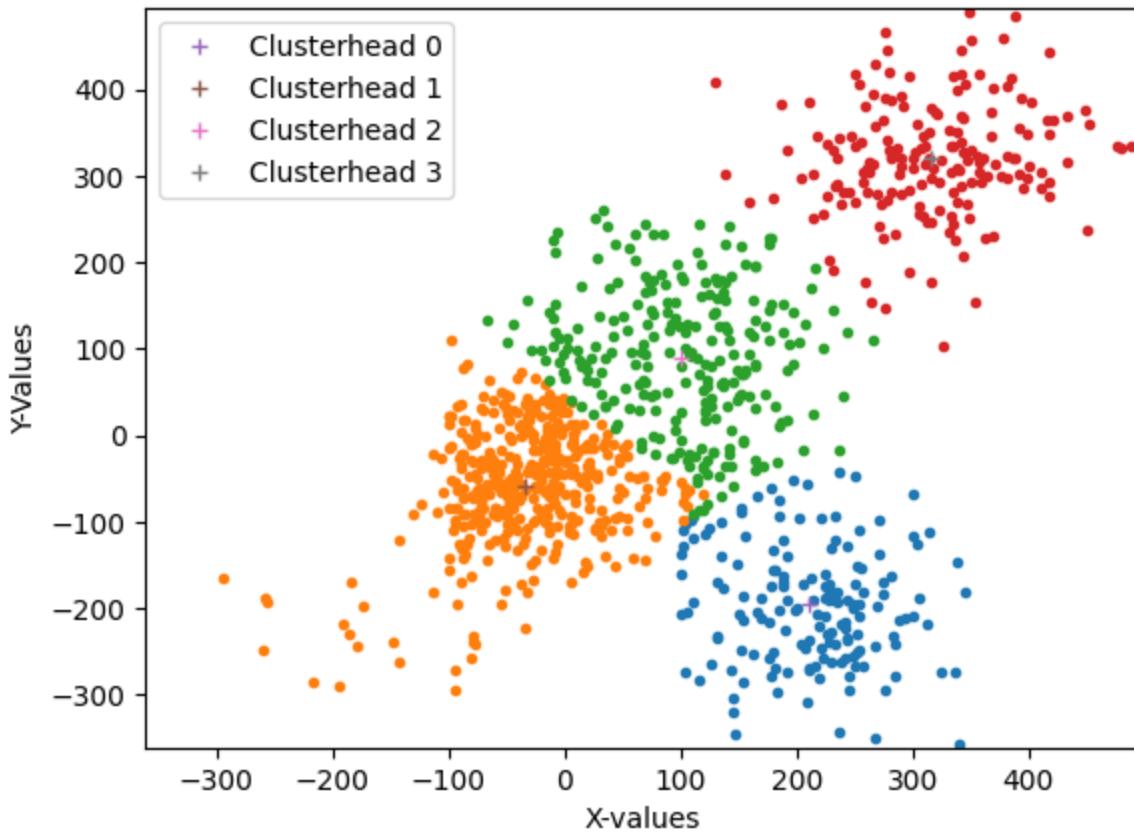
new cluster heads:

```
[[ 210.83625875 -34.06562443 100.67422737 315.55315336]
 [-195.40289429 -58.9144811 89.68553328 319.57321825]]
```

last heads:

```
[[ 210.83625875 -34.10942159 100.20941231 315.55315336]
 [-195.40289429 -59.20957024 89.56658812 319.57321825]]
```

## K-means results



distance between old and new heads: 0.32

new cluster heads:

```
[[ 210.83625875 -34.06562443  100.67422737  315.55315336]
 [-195.40289429 -58.9144811   89.68553328  319.57321825]]
```

last heads:

```
[[ 210.83625875 -34.06562443  100.67422737  315.55315336]
 [-195.40289429 -58.9144811   89.68553328  319.57321825]]
```

new cluster heads:

```
[[ 210.83625875 -34.06562443  100.67422737  315.55315336]
 [-195.40289429 -58.9144811   89.68553328  319.57321825]]
```

last heads:

```
[[ 210.83625875 -34.06562443  100.67422737  315.55315336]
 [-195.40289429 -58.9144811   89.68553328  319.57321825]]
```

new cluster heads:

```
[[ 210.83625875 -34.06562443  100.67422737  315.55315336]
 [-195.40289429 -58.9144811   89.68553328  319.57321825]]
```

last heads:

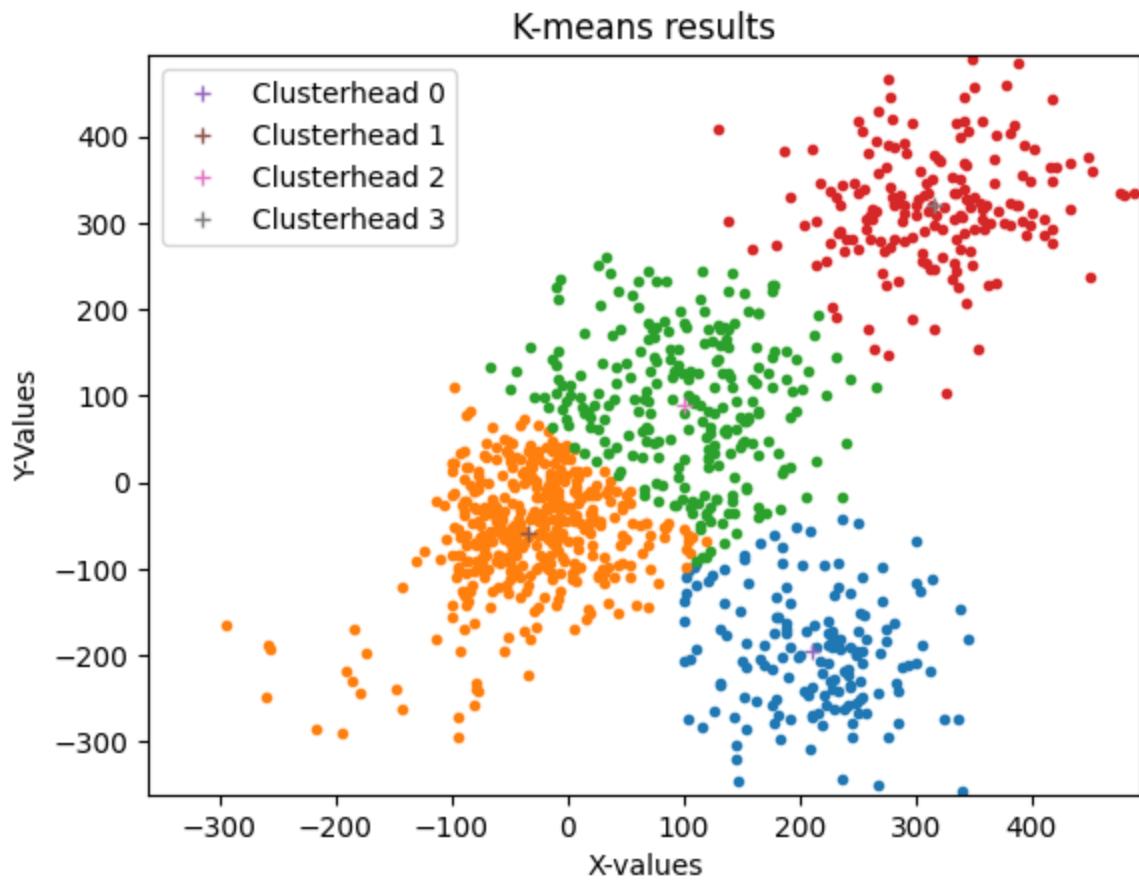
```
[[ 210.83625875 -34.06562443  100.67422737  315.55315336]
 [-195.40289429 -58.9144811   89.68553328  319.57321825]]
```

new cluster heads:

```
[[ 210.83625875 -34.06562443  100.67422737  315.55315336]
 [-195.40289429 -58.9144811   89.68553328  319.57321825]]
```

last heads:

```
[[ 210.83625875 -34.06562443  100.67422737  315.55315336]
 [-195.40289429 -58.9144811   89.68553328  319.57321825]]
```



Finished try! Distance between old and new heads: 0.000000

new cluster heads:

```
[[ 293.42442167 -32.72050317  137.85939455 -30.32848084]
 [ 305.93061568 -107.2623283   -36.53674129    7.1084424 ]]
```

last heads:

```
[[ 279.79367038 -32.72050317  137.85939455 -30.32848084]
 [ 331.01033424 -107.2623283   -36.53674129    7.1084424 ]]
```

new cluster heads:

```
[[ 293.42442167 -44.3501976   137.85939455 -30.32848084]
 [ 305.93061568 -117.53948474   -36.53674129    7.1084424 ]]
```

last heads:

```
[[ 279.79367038 -32.72050317  137.85939455 -30.32848084]
 [ 331.01033424 -107.2623283   -36.53674129    7.1084424 ]]
```

new cluster heads:

```
[[ 293.42442167 -44.3501976   171.41783497 -30.32848084]
 [ 305.93061568 -117.53948474   -75.45025027    7.1084424 ]]
```

last heads:

```
[[ 279.79367038 -32.72050317  137.85939455 -30.32848084]
 [ 331.01033424 -107.2623283   -36.53674129    7.1084424 ]]
```

new cluster heads:

```
[[ 293.42442167 -44.3501976   171.41783497 -9.84466265]
 [ 305.93061568 -117.53948474   -75.45025027  35.17800651 ]]
```

last heads:

```
[[ 279.79367038 -32.72050317  137.85939455 -30.32848084]
 [ 331.01033424 -107.2623283   -36.53674129    7.1084424 ]]
```

distance between old and new heads: 4903.58

new cluster heads:

```
[[ 301.13823089 -44.3501976   171.41783497 -9.84466265]
 [ 308.79635746 -117.53948474   -75.45025027  35.17800651 ]]
```

last heads:

```
[[ 293.42442167 -44.3501976   171.41783497 -9.84466265]
 [ 305.93061568 -117.53948474   -75.45025027  35.17800651 ]]
```

new cluster heads:

```
[[ 301.13823089 -51.84600928  171.41783497 -9.84466265]
 [ 308.79635746 -103.73357085   -75.45025027  35.17800651 ]]
```

last heads:

```
[[ 293.42442167 -44.3501976   171.41783497 -9.84466265]
 [ 305.93061568 -117.53948474   -75.45025027  35.17800651 ]]
```

new cluster heads:

```
[[ 301.13823089 -51.84600928  182.95561698 -9.84466265]
 [ 308.79635746 -103.73357085   -114.7478096  35.17800651 ]]
```

last heads:

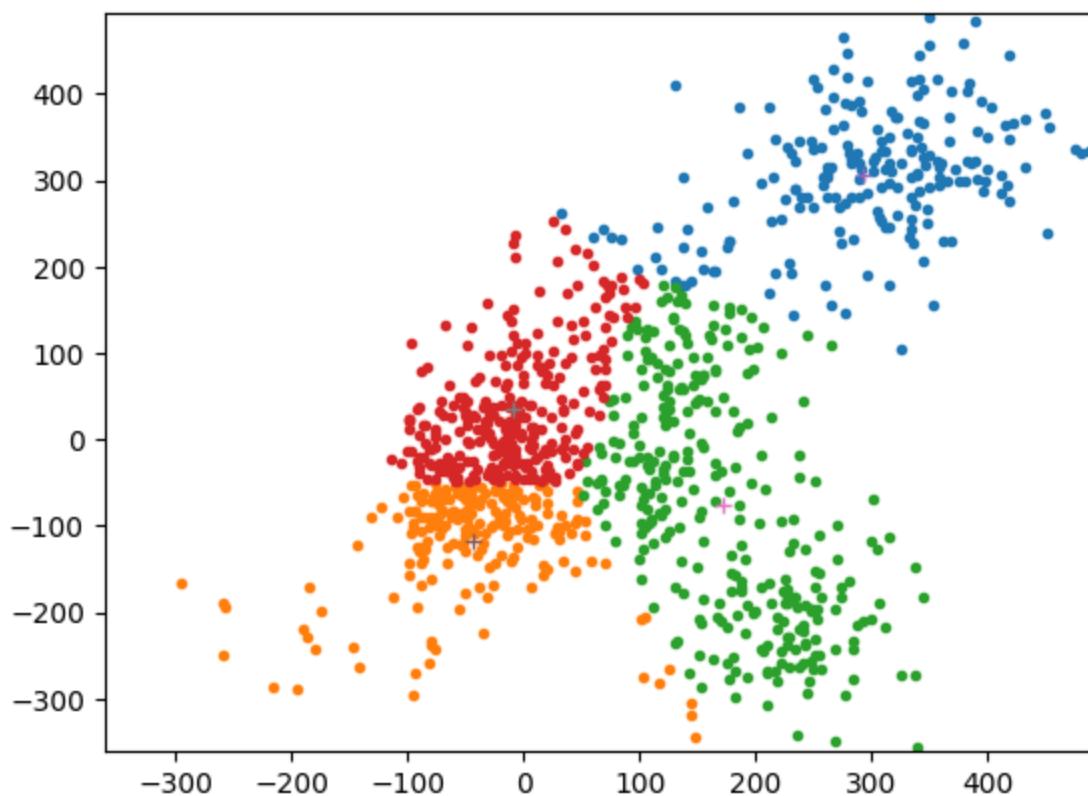
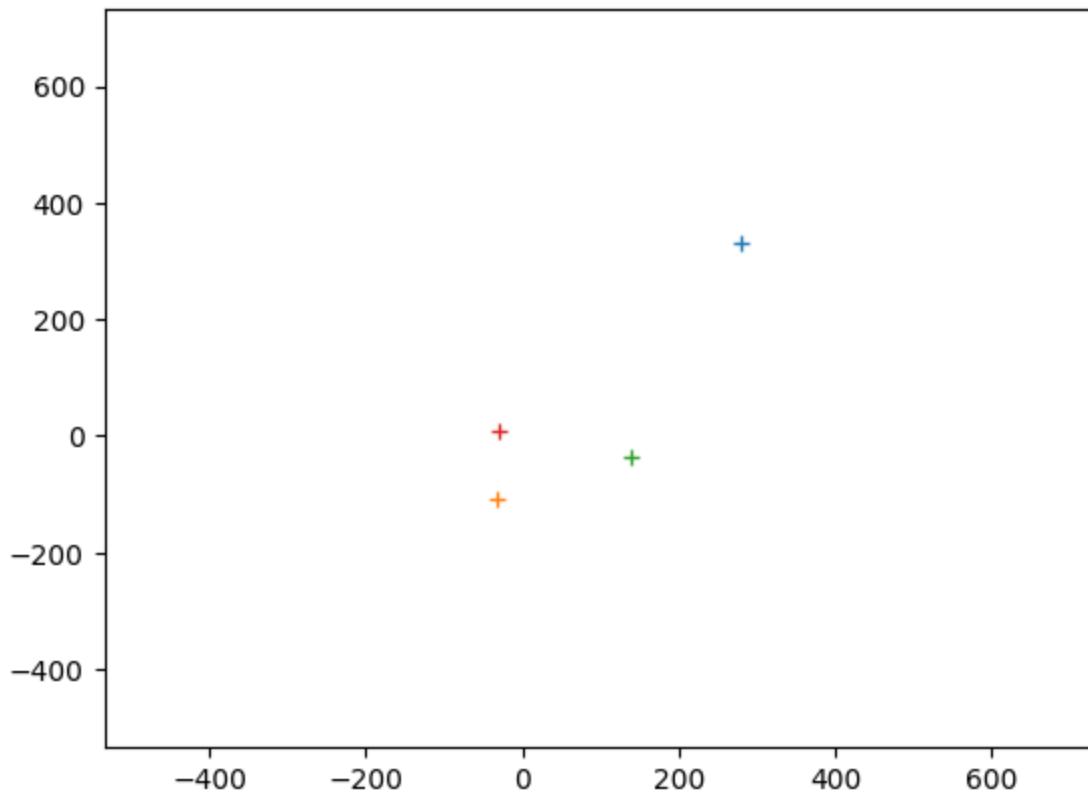
```
[[ 293.42442167 -44.3501976   171.41783497 -9.84466265]
 [ 305.93061568 -117.53948474   -75.45025027  35.17800651 ]]
```

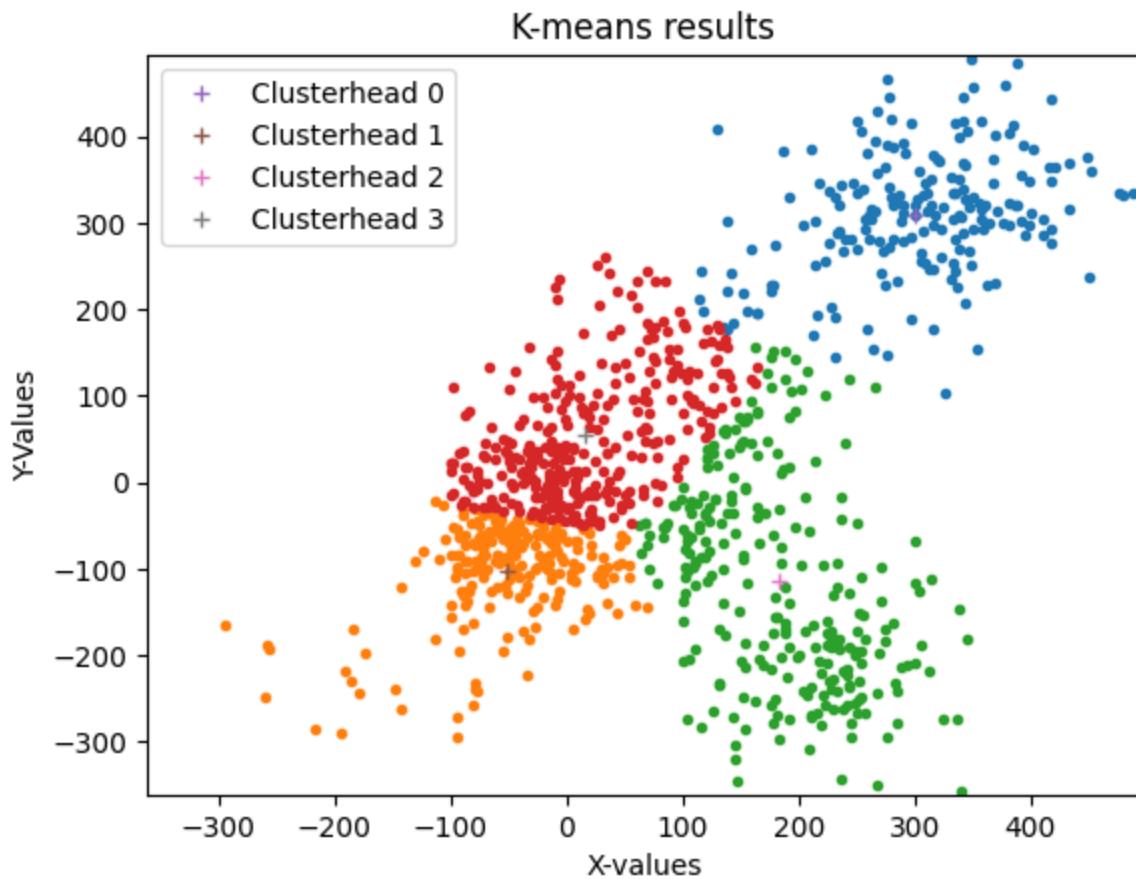
new cluster heads:

```
[[ 301.13823089 -51.84600928  182.95561698 16.38536248]
 [ 308.79635746 -103.73357085   -114.7478096  53.66958379 ]]
```

last heads:

```
[[ 293.42442167 -44.3501976   171.41783497 -9.84466265]
 [ 305.93061568 -117.53948474   -75.45025027  35.17800651 ]]
```





distance between old and new heads: 3021.88

new cluster heads:

```
[[ 305.64234944 -51.84600928 182.95561698 16.38536248]
 [ 311.92677481 -103.73357085 -114.7478096 53.66958379]]
```

last heads:

```
[[ 301.13823089 -51.84600928 182.95561698 16.38536248]
 [ 308.79635746 -103.73357085 -114.7478096 53.66958379]]
```

new cluster heads:

```
[[ 305.64234944 -49.85929139 182.95561698 16.38536248]
 [ 311.92677481 -91.45398462 -114.7478096 53.66958379]]
```

last heads:

```
[[ 301.13823089 -51.84600928 182.95561698 16.38536248]
 [ 308.79635746 -103.73357085 -114.7478096 53.66958379]]
```

new cluster heads:

```
[[ 305.64234944 -49.85929139 190.74321737 16.38536248]
 [ 311.92677481 -91.45398462 -148.73129555 53.66958379]]
```

last heads:

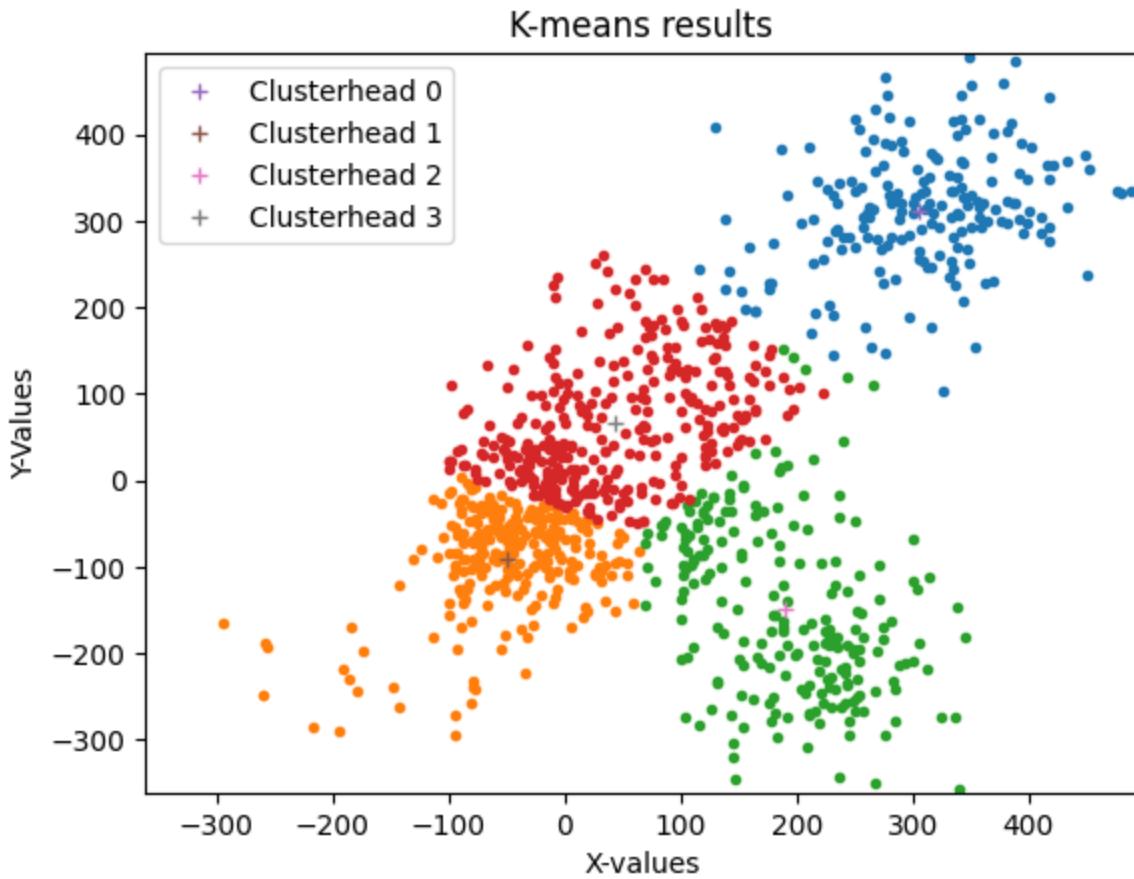
```
[[ 301.13823089 -51.84600928 182.95561698 16.38536248]
 [ 308.79635746 -103.73357085 -114.7478096 53.66958379]]
```

new cluster heads:

```
[[ 305.64234944 -49.85929139 190.74321737 42.97401858]
 [ 311.92677481 -91.45398462 -148.73129555 66.68321567]]
```

last heads:

```
[[ 301.13823089 -51.84600928 182.95561698 16.38536248]
 [ 308.79635746 -103.73357085 -114.7478096 53.66958379]]
```



distance between old and new heads: 2276.66

new cluster heads:

```
[[ 309.91981247 -49.85929139 190.74321737 42.97401858]
 [ 314.65179074 -91.45398462 -148.73129555 66.68321567]]
```

last heads:

```
[[ 305.64234944 -49.85929139 190.74321737 42.97401858]
 [ 311.92677481 -91.45398462 -148.73129555 66.68321567]]
```

new cluster heads:

```
[[ 309.91981247 -45.92572485 190.74321737 42.97401858]
 [ 314.65179074 -79.97860537 -148.73129555 66.68321567]]
```

last heads:

```
[[ 305.64234944 -49.85929139 190.74321737 42.97401858]
 [ 311.92677481 -91.45398462 -148.73129555 66.68321567]]
```

new cluster heads:

```
[[ 309.91981247 -45.92572485 199.35088612 42.97401858]
 [ 314.65179074 -79.97860537 -171.37028261 66.68321567]]
```

last heads:

```
[[ 305.64234944 -49.85929139 190.74321737 42.97401858]
 [ 311.92677481 -91.45398462 -148.73129555 66.68321567]]
```

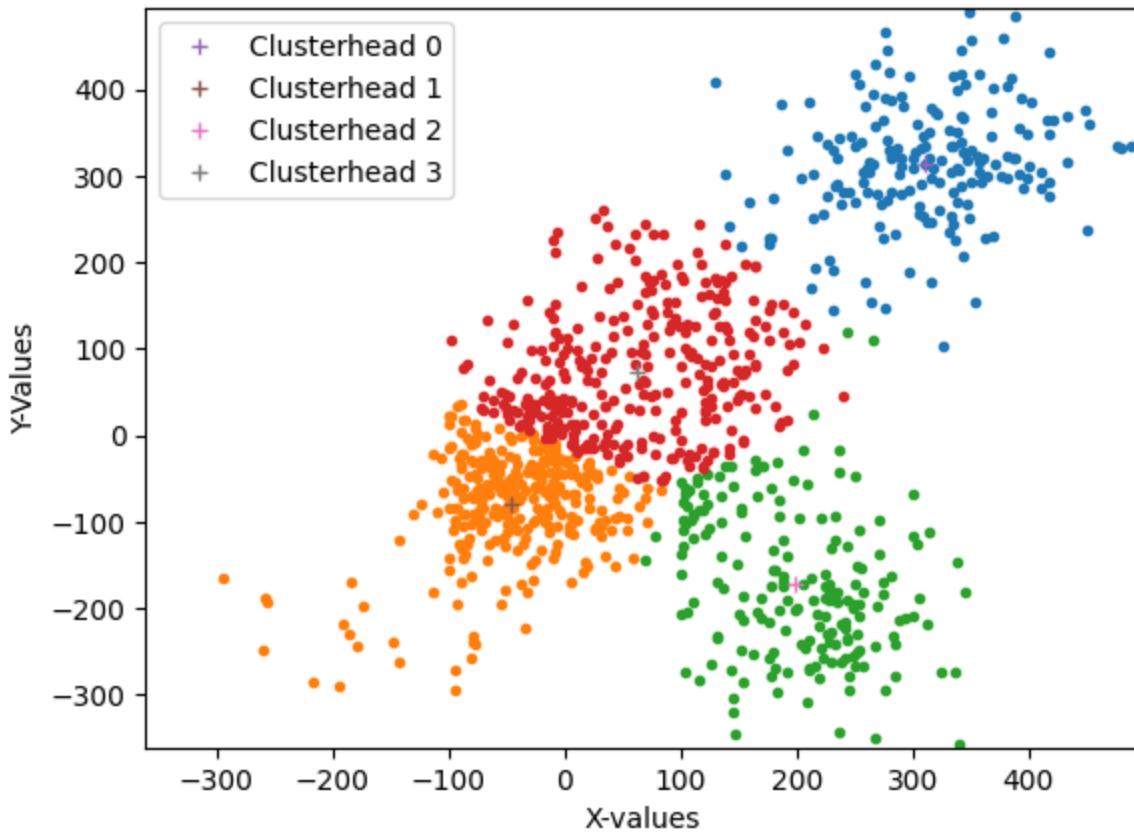
new cluster heads:

```
[[ 309.91981247 -45.92572485 199.35088612 63.23551253]
 [ 314.65179074 -79.97860537 -171.37028261 73.72090305]]
```

last heads:

```
[[ 305.64234944 -49.85929139 190.74321737 42.97401858]
 [ 311.92677481 -91.45398462 -148.73129555 66.68321567]]
```

## K-means results



distance between old and new heads: 1219.55

new cluster heads:

```
[[ 311.20627524 -45.92572485 199.35088612 63.23551253]
 [ 316.11368797 -79.97860537 -171.37028261 73.72090305]]
```

last heads:

```
[[ 309.91981247 -45.92572485 199.35088612 63.23551253]
 [ 314.65179074 -79.97860537 -171.37028261 73.72090305]]
```

new cluster heads:

```
[[ 311.20627524 -41.88121774 199.35088612 63.23551253]
 [ 316.11368797 -71.14447832 -171.37028261 73.72090305]]
```

last heads:

```
[[ 309.91981247 -45.92572485 199.35088612 63.23551253]
 [ 314.65179074 -79.97860537 -171.37028261 73.72090305]]
```

new cluster heads:

```
[[ 311.20627524 -41.88121774 203.41208367 63.23551253]
 [ 316.11368797 -71.14447832 -181.86442837 73.72090305]]
```

last heads:

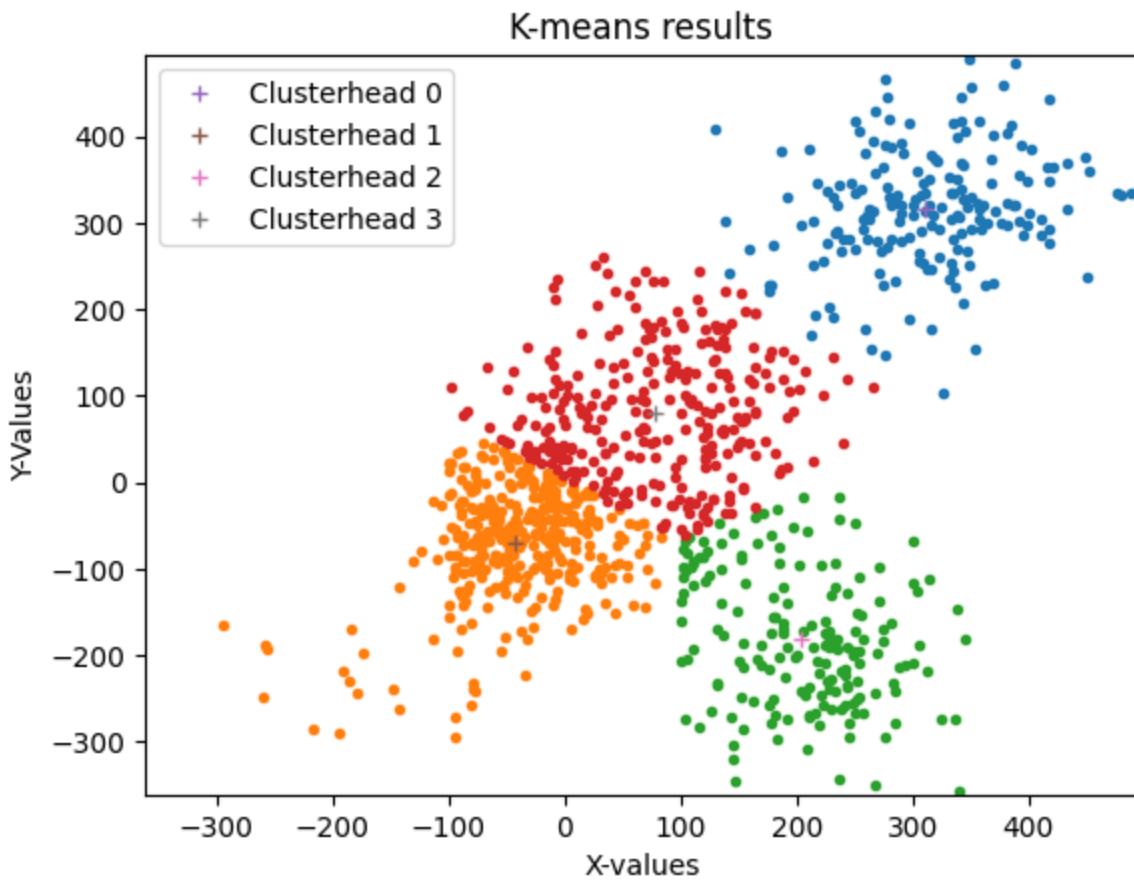
```
[[ 309.91981247 -45.92572485 199.35088612 63.23551253]
 [ 314.65179074 -79.97860537 -171.37028261 73.72090305]]
```

new cluster heads:

```
[[ 311.20627524 -41.88121774 203.41208367 77.79522027]
 [ 316.11368797 -71.14447832 -181.86442837 80.16615817]]
```

last heads:

```
[[ 309.91981247 -45.92572485 199.35088612 63.23551253]
 [ 314.65179074 -79.97860537 -171.37028261 73.72090305]]
```



distance between old and new heads: 478.34

new cluster heads:

```
[[ 312.69650105 -41.88121774  203.41208367  77.79522027]
 [ 317.32708405 -71.14447832 -181.86442837  80.16615817]]
```

last heads:

```
[[ 311.20627524 -41.88121774  203.41208367  77.79522027]
 [ 316.11368797 -71.14447832 -181.86442837  80.16615817]]
```

new cluster heads:

```
[[ 312.69650105 -38.73668665  203.41208367  77.79522027]
 [ 317.32708405 -64.3633112   -181.86442837  80.16615817]]
```

last heads:

```
[[ 311.20627524 -41.88121774  203.41208367  77.79522027]
 [ 316.11368797 -71.14447832 -181.86442837  80.16615817]]
```

new cluster heads:

```
[[ 312.69650105 -38.73668665  205.74064384  77.79522027]
 [ 317.32708405 -64.3633112   -186.43070517  80.16615817]]
```

last heads:

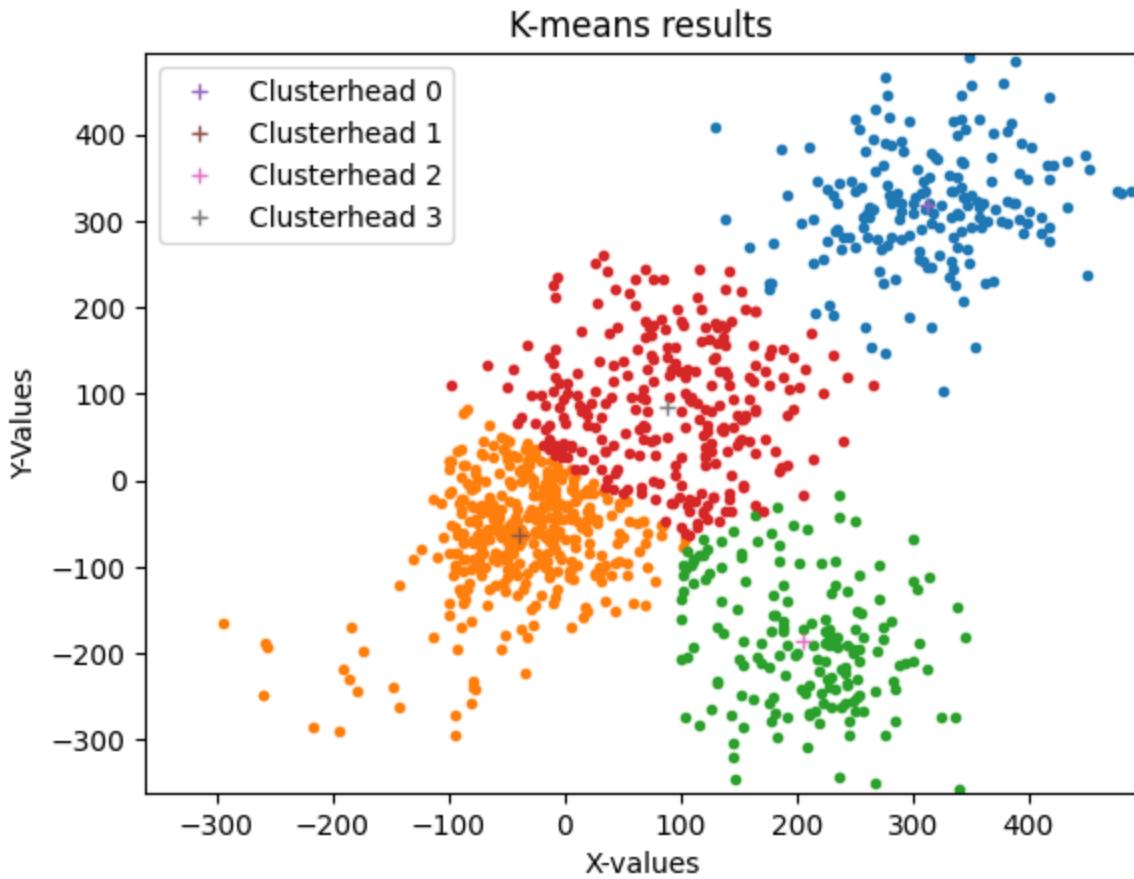
```
[[ 311.20627524 -41.88121774  203.41208367  77.79522027]
 [ 316.11368797 -71.14447832 -181.86442837  80.16615817]]
```

new cluster heads:

```
[[ 312.69650105 -38.73668665  205.74064384  89.00273602]
 [ 317.32708405 -64.3633112   -186.43070517  85.71658813]]
```

last heads:

```
[[ 311.20627524 -41.88121774  203.41208367  77.79522027]
 [ 316.11368797 -71.14447832 -181.86442837  80.16615817]]
```



distance between old and new heads: 242.25

new cluster heads:

```
[[ 313.45860106 -38.73668665 205.74064384 89.00273602]
 [ 317.85784737 -64.3633112 -186.43070517 85.71658813]]
```

last heads:

```
[[ 312.69650105 -38.73668665 205.74064384 89.00273602]
 [ 317.32708405 -64.3633112 -186.43070517 85.71658813]]
```

new cluster heads:

```
[[ 313.45860106 -35.91907573 205.74064384 89.00273602]
 [ 317.85784737 -61.05178858 -186.43070517 85.71658813]]
```

last heads:

```
[[ 312.69650105 -38.73668665 205.74064384 89.00273602]
 [ 317.32708405 -64.3633112 -186.43070517 85.71658813]]
```

new cluster heads:

```
[[ 313.45860106 -35.91907573 206.12051503 89.00273602]
 [ 317.85784737 -61.05178858 -188.20968992 85.71658813]]
```

last heads:

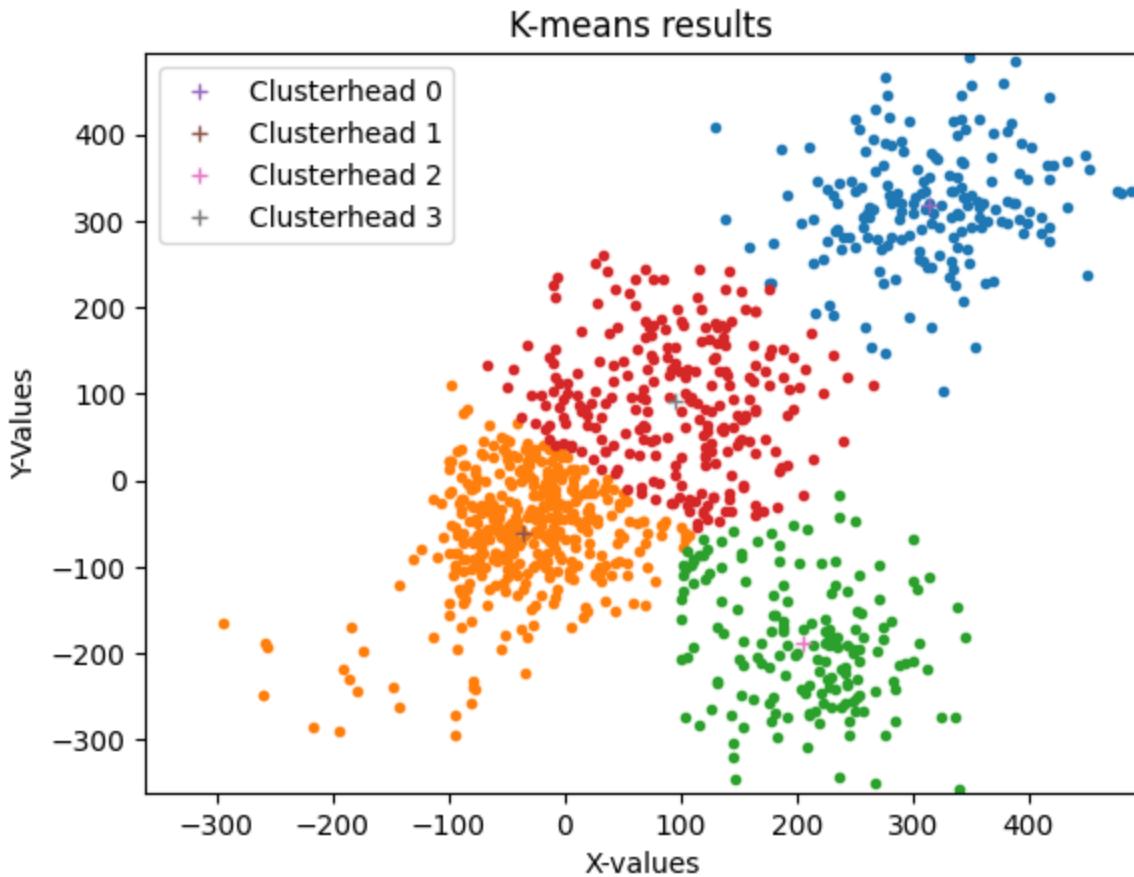
```
[[ 312.69650105 -38.73668665 205.74064384 89.00273602]
 [ 317.32708405 -64.3633112 -186.43070517 85.71658813]]
```

new cluster heads:

```
[[ 313.45860106 -35.91907573 206.12051503 94.81640436]
 [ 317.85784737 -61.05178858 -188.20968992 90.91282725]]
```

last heads:

```
[[ 312.69650105 -38.73668665 205.74064384 89.00273602]
 [ 317.32708405 -64.3633112 -186.43070517 85.71658813]]
```



distance between old and new heads: 83.88

new cluster heads:

```
[[ 315.55315336 -35.91907573 206.12051503 94.81640436]
 [ 319.57321825 -61.05178858 -188.20968992 90.91282725]]
```

last heads:

```
[[ 313.45860106 -35.91907573 206.12051503 94.81640436]
 [ 317.85784737 -61.05178858 -188.20968992 90.91282725]]
```

new cluster heads:

```
[[ 315.55315336 -35.20286847 206.12051503 94.81640436]
 [ 319.57321825 -60.43706828 -188.20968992 90.91282725]]
```

last heads:

```
[[ 313.45860106 -35.91907573 206.12051503 94.81640436]
 [ 317.85784737 -61.05178858 -188.20968992 90.91282725]]
```

new cluster heads:

```
[[ 315.55315336 -35.20286847 206.71775307 94.81640436]
 [ 319.57321825 -60.43706828 -188.84811979 90.91282725]]
```

last heads:

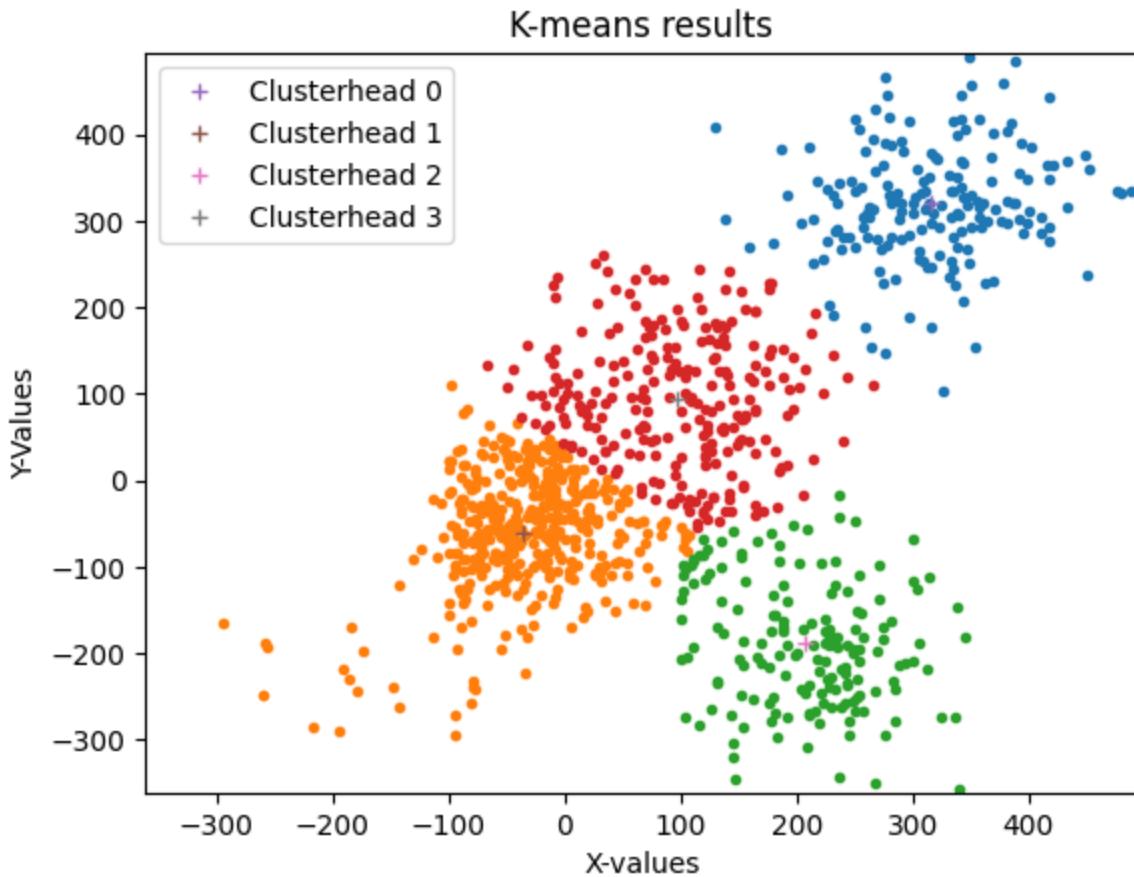
```
[[ 313.45860106 -35.91907573 206.12051503 94.81640436]
 [ 317.85784737 -61.05178858 -188.20968992 90.91282725]]
```

new cluster heads:

```
[[ 315.55315336 -35.20286847 206.71775307 96.96120039]
 [ 319.57321825 -60.43706828 -188.84811979 93.19439549]]
```

last heads:

```
[[ 313.45860106 -35.91907573 206.12051503 94.81640436]
 [ 317.85784737 -61.05178858 -188.20968992 90.91282725]]
```



distance between old and new heads: 18.79

new cluster heads:

```
[[ 315.55315336 -35.20286847  206.71775307  96.96120039]
 [ 319.57321825 -60.43706828 -188.84811979  93.19439549]]
```

last heads:

```
[[ 315.55315336 -35.20286847  206.71775307  96.96120039]
 [ 319.57321825 -60.43706828 -188.84811979  93.19439549]]
```

new cluster heads:

```
[[ 315.55315336 -34.70174277  206.71775307  96.96120039]
 [ 319.57321825 -59.54156131 -188.84811979  93.19439549]]
```

last heads:

```
[[ 315.55315336 -35.20286847  206.71775307  96.96120039]
 [ 319.57321825 -60.43706828 -188.84811979  93.19439549]]
```

new cluster heads:

```
[[ 315.55315336 -34.70174277  206.71775307  96.96120039]
 [ 319.57321825 -59.54156131 -188.84811979  93.19439549]]
```

last heads:

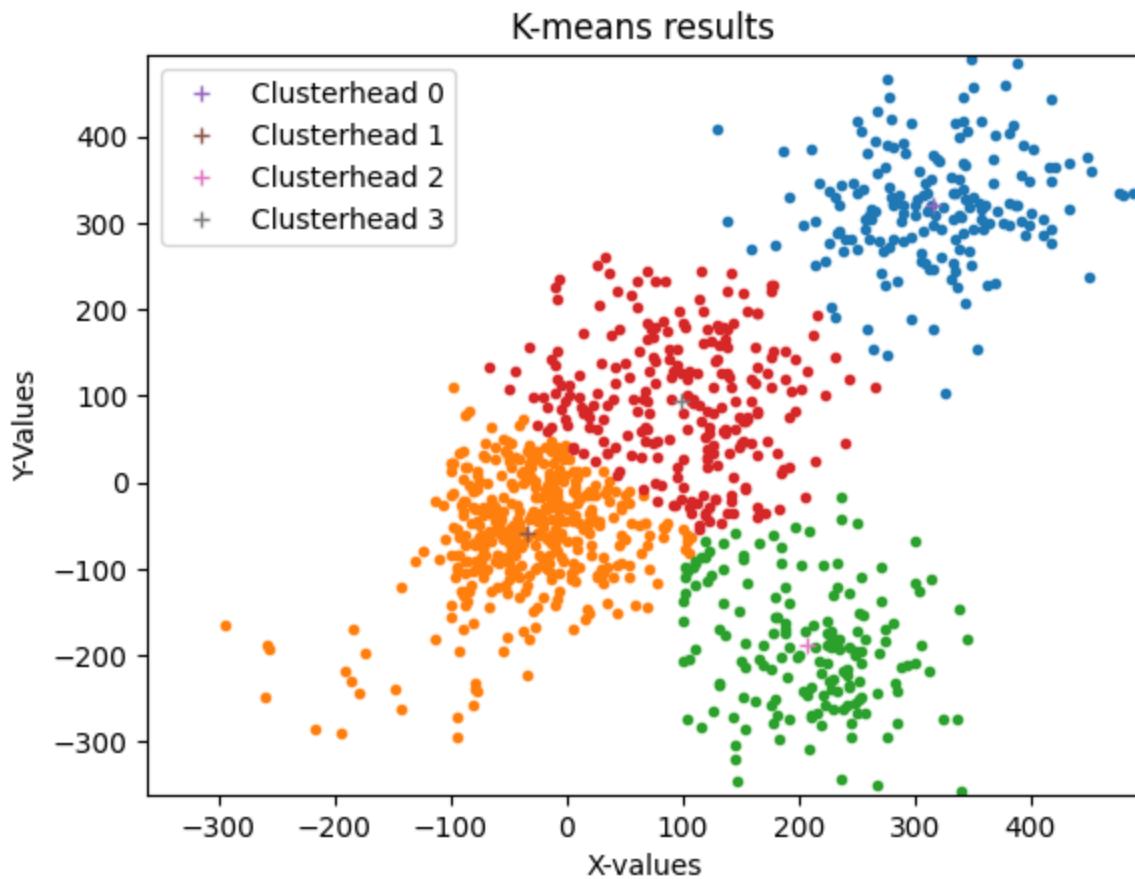
```
[[ 315.55315336 -35.20286847  206.71775307  96.96120039]
 [ 319.57321825 -60.43706828 -188.84811979  93.19439549]]
```

new cluster heads:

```
[[ 315.55315336 -34.70174277  206.71775307  98.2974082 ]
 [ 319.57321825 -59.54156131 -188.84811979  94.23999945]]
```

last heads:

```
[[ 315.55315336 -35.20286847  206.71775307  96.96120039]
 [ 319.57321825 -60.43706828 -188.84811979  93.19439549]]
```



distance between old and new heads: 3.93

new cluster heads:

```
[[ 315.55315336 -34.70174277 206.71775307 98.2974082 ]
 [ 319.57321825 -59.54156131 -188.84811979 94.23999945]]
```

last heads:

```
[[ 315.55315336 -34.70174277 206.71775307 98.2974082 ]
 [ 319.57321825 -59.54156131 -188.84811979 94.23999945]]
```

new cluster heads:

```
[[ 315.55315336 -34.57744006 206.71775307 98.2974082 ]
 [ 319.57321825 -58.98215264 -188.84811979 94.23999945]]
```

last heads:

```
[[ 315.55315336 -34.70174277 206.71775307 98.2974082 ]
 [ 319.57321825 -59.54156131 -188.84811979 94.23999945]]
```

new cluster heads:

```
[[ 315.55315336 -34.57744006 206.71775307 98.2974082 ]
 [ 319.57321825 -58.98215264 -188.84811979 94.23999945]]
```

last heads:

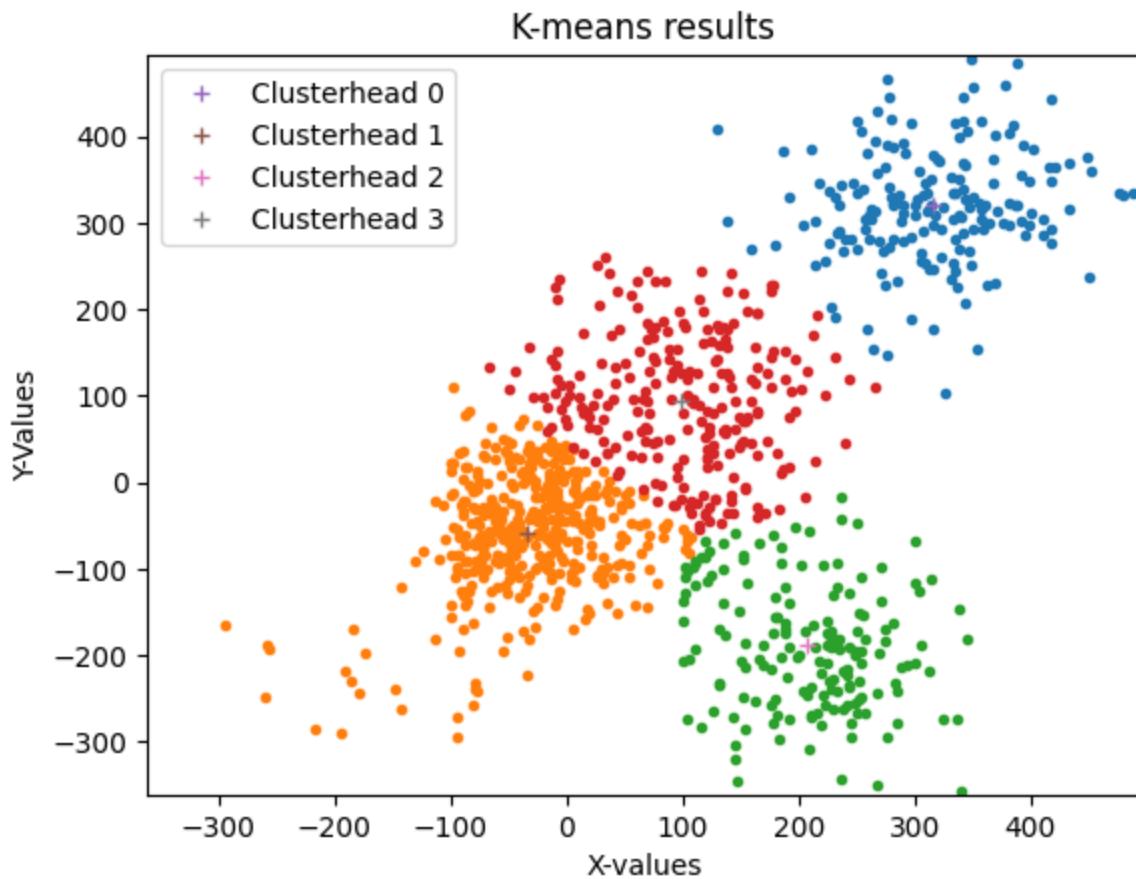
```
[[ 315.55315336 -34.70174277 206.71775307 98.2974082 ]
 [ 319.57321825 -59.54156131 -188.84811979 94.23999945]]
```

new cluster heads:

```
[[ 315.55315336 -34.57744006 206.71775307 99.1832808 ]
 [ 319.57321825 -58.98215264 -188.84811979 94.581148 ]]
```

last heads:

```
[[ 315.55315336 -34.70174277 206.71775307 98.2974082 ]
 [ 319.57321825 -59.54156131 -188.84811979 94.23999945]]
```



distance between old and new heads: 1.23

new cluster heads:

```
[[ 315.55315336 -34.57744006 206.71775307 99.1832808 ]
 [ 319.57321825 -58.98215264 -188.84811979 94.581148 ]]
```

last heads:

```
[[ 315.55315336 -34.57744006 206.71775307 99.1832808 ]
 [ 319.57321825 -58.98215264 -188.84811979 94.581148 ]]
```

new cluster heads:

```
[[ 315.55315336 -33.8019241 206.71775307 99.1832808 ]
 [ 319.57321825 -57.99789305 -188.84811979 94.581148 ]]
```

last heads:

```
[[ 315.55315336 -34.57744006 206.71775307 99.1832808 ]
 [ 319.57321825 -58.98215264 -188.84811979 94.581148 ]]
```

new cluster heads:

```
[[ 315.55315336 -33.8019241 206.71775307 99.1832808 ]
 [ 319.57321825 -57.99789305 -188.84811979 94.581148 ]]
```

last heads:

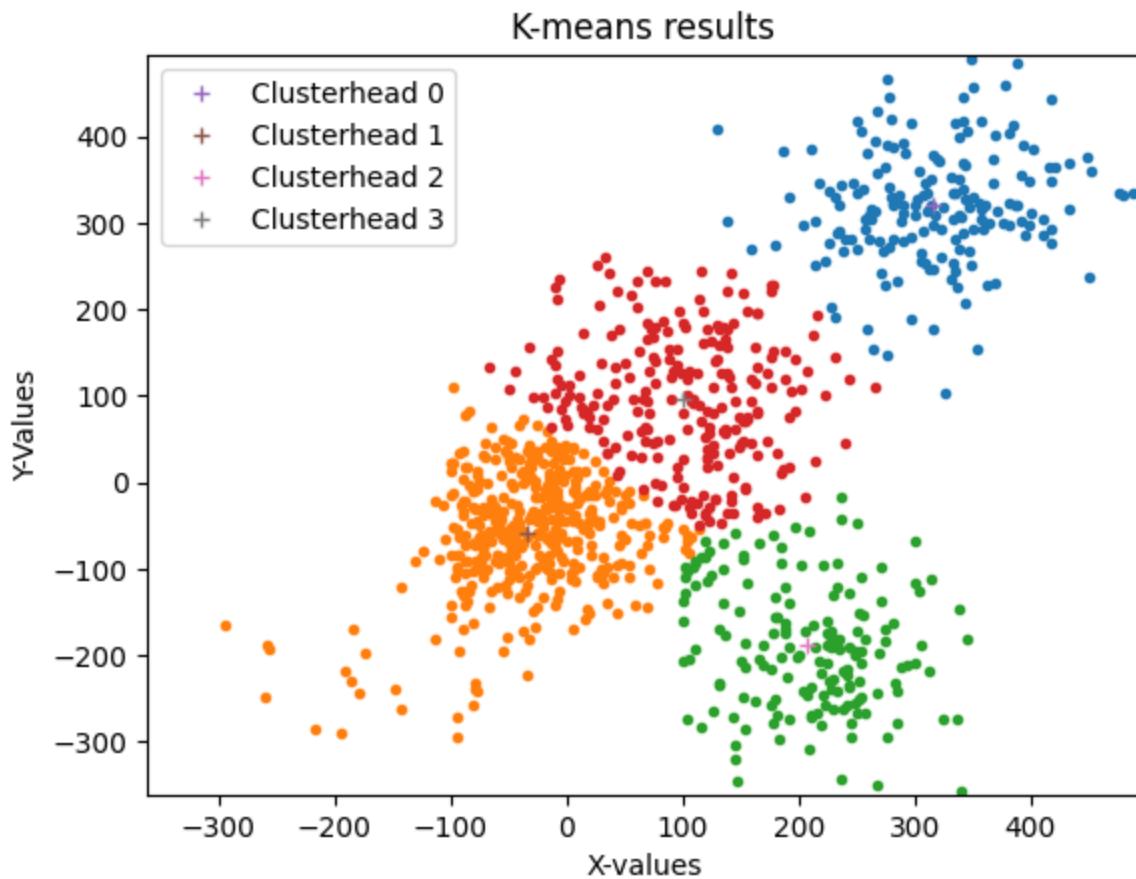
```
[[ 315.55315336 -34.57744006 206.71775307 99.1832808 ]
 [ 319.57321825 -58.98215264 -188.84811979 94.581148 ]]
```

new cluster heads:

```
[[ 315.55315336 -33.8019241 206.71775307 100.66421856]
 [ 319.57321825 -57.99789305 -188.84811979 96.12176352]]
```

last heads:

```
[[ 315.55315336 -34.57744006 206.71775307 99.1832808 ]
 [ 319.57321825 -58.98215264 -188.84811979 94.581148 ]]
```



distance between old and new heads: 6.14

new cluster heads:

```
[[ 315.55315336 -33.8019241  206.71775307 100.66421856]
 [ 319.57321825 -57.99789305 -188.84811979  96.12176352]]
```

last heads:

```
[[ 315.55315336 -33.8019241  206.71775307 100.66421856]
 [ 319.57321825 -57.99789305 -188.84811979  96.12176352]]
```

new cluster heads:

```
[[ 315.55315336 -33.33567741  206.71775307 100.66421856]
 [ 319.57321825 -57.74553754 -188.84811979  96.12176352]]
```

last heads:

```
[[ 315.55315336 -33.8019241  206.71775307 100.66421856]
 [ 319.57321825 -57.99789305 -188.84811979  96.12176352]]
```

new cluster heads:

```
[[ 315.55315336 -33.33567741  206.71775307 100.66421856]
 [ 319.57321825 -57.74553754 -188.84811979  96.12176352]]
```

last heads:

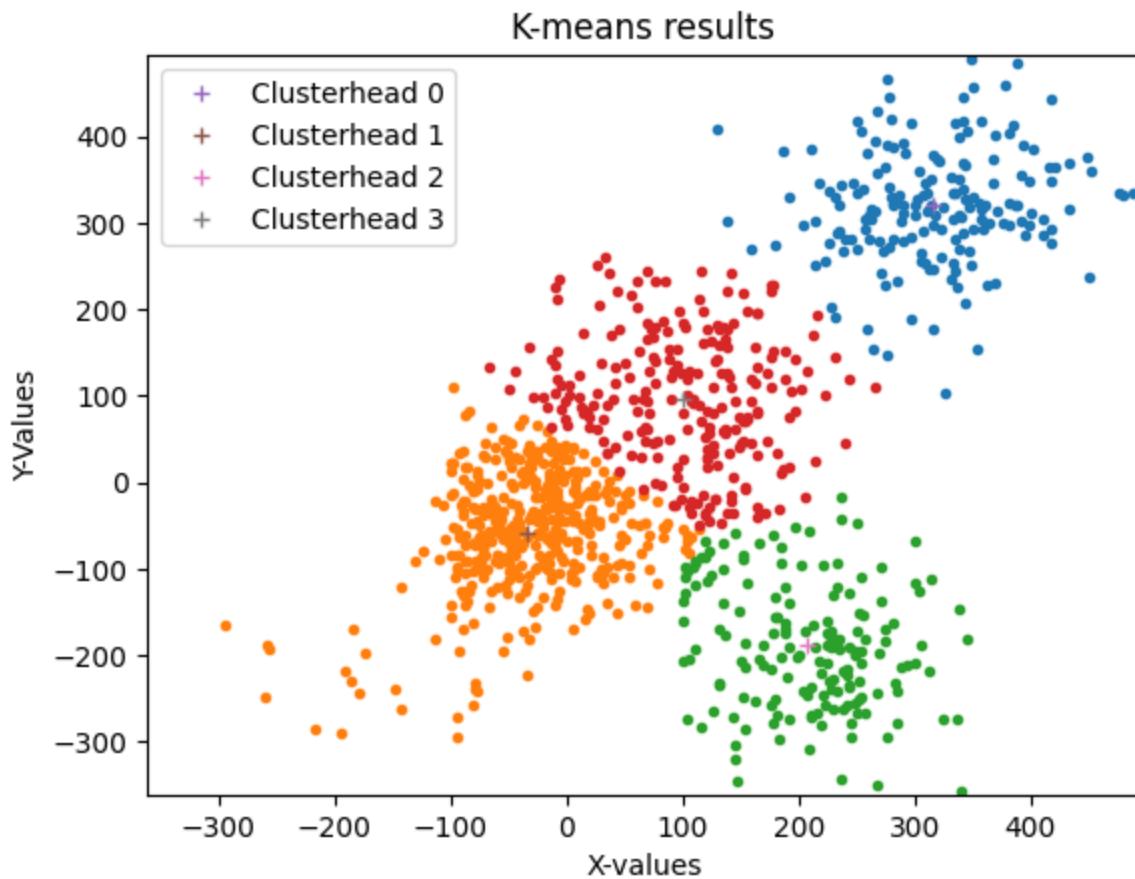
```
[[ 315.55315336 -33.8019241  206.71775307 100.66421856]
 [ 319.57321825 -57.99789305 -188.84811979  96.12176352]]
```

new cluster heads:

```
[[ 315.55315336 -33.33567741  206.71775307 100.99630142]
 [ 319.57321825 -57.74553754 -188.84811979  96.98791653]]
```

last heads:

```
[[ 315.55315336 -33.8019241  206.71775307 100.66421856]
 [ 319.57321825 -57.99789305 -188.84811979  96.12176352]]
```



distance between old and new heads: 1.14

new cluster heads:

```
[[ 315.55315336 -33.33567741  206.71775307 100.99630142]
 [ 319.57321825 -57.74553754 -188.84811979  96.98791653]]
```

last heads:

```
[[ 315.55315336 -33.33567741  206.71775307 100.99630142]
 [ 319.57321825 -57.74553754 -188.84811979  96.98791653]]
```

new cluster heads:

```
[[ 315.55315336 -33.0943946   206.71775307 100.99630142]
 [ 319.57321825 -57.62422233 -188.84811979  96.98791653]]
```

last heads:

```
[[ 315.55315336 -33.33567741  206.71775307 100.99630142]
 [ 319.57321825 -57.74553754 -188.84811979  96.98791653]]
```

new cluster heads:

```
[[ 315.55315336 -33.0943946   206.71775307 100.99630142]
 [ 319.57321825 -57.62422233 -188.84811979  96.98791653]]
```

last heads:

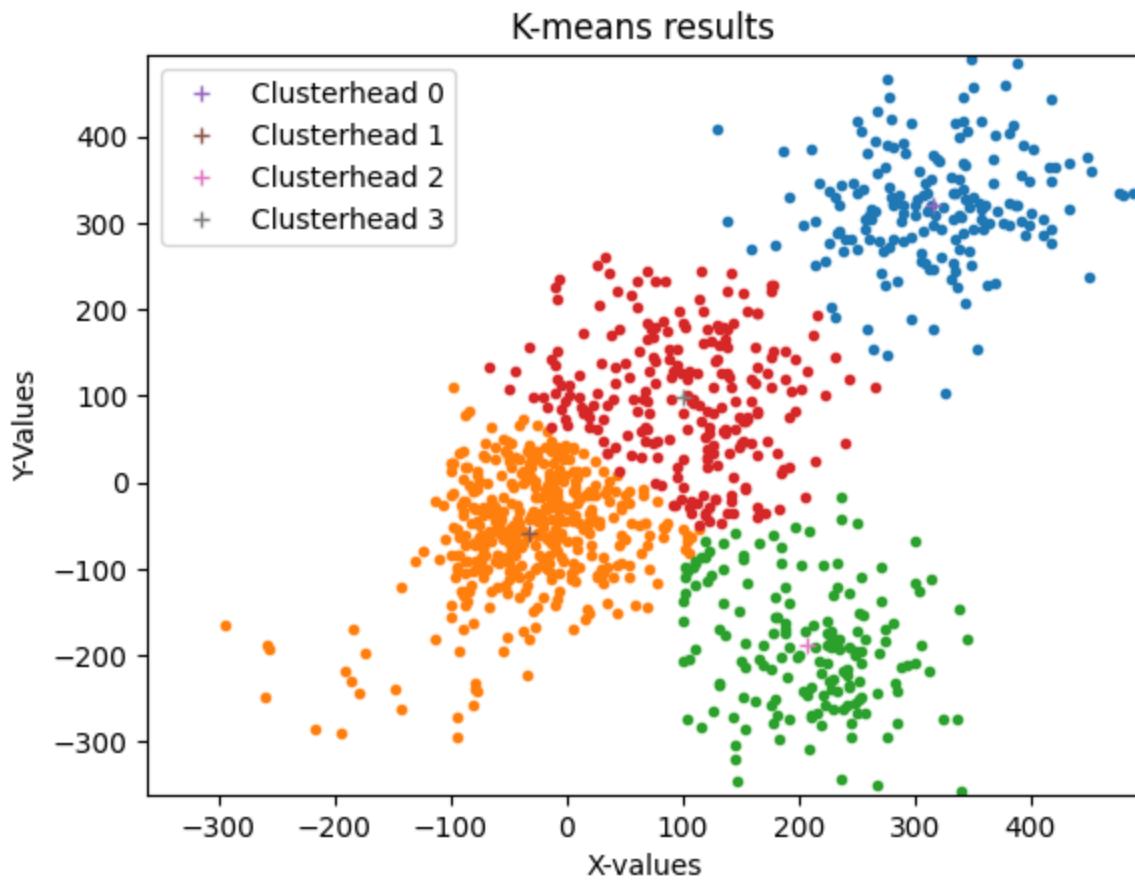
```
[[ 315.55315336 -33.33567741  206.71775307 100.99630142]
 [ 319.57321825 -57.74553754 -188.84811979  96.98791653]]
```

new cluster heads:

```
[[ 315.55315336 -33.0943946   206.71775307 101.14734933]
 [ 319.57321825 -57.62422233 -188.84811979  97.43332133]]
```

last heads:

```
[[ 315.55315336 -33.33567741  206.71775307 100.99630142]
 [ 319.57321825 -57.74553754 -188.84811979  96.98791653]]
```



distance between old and new heads: 0.29

new cluster heads:

```
[[ 315.55315336 -33.0943946  206.71775307 101.14734933]
 [ 319.57321825 -57.62422233 -188.84811979  97.43332133]]
```

last heads:

```
[[ 315.55315336 -33.0943946  206.71775307 101.14734933]
 [ 319.57321825 -57.62422233 -188.84811979  97.43332133]]
```

new cluster heads:

```
[[ 315.55315336 -32.73715761  206.71775307 101.14734933]
 [ 319.57321825 -57.6038731  -188.84811979  97.43332133]]
```

last heads:

```
[[ 315.55315336 -33.0943946  206.71775307 101.14734933]
 [ 319.57321825 -57.62422233 -188.84811979  97.43332133]]
```

new cluster heads:

```
[[ 315.55315336 -32.73715761  206.71775307 101.14734933]
 [ 319.57321825 -57.6038731  -188.84811979  97.43332133]]
```

last heads:

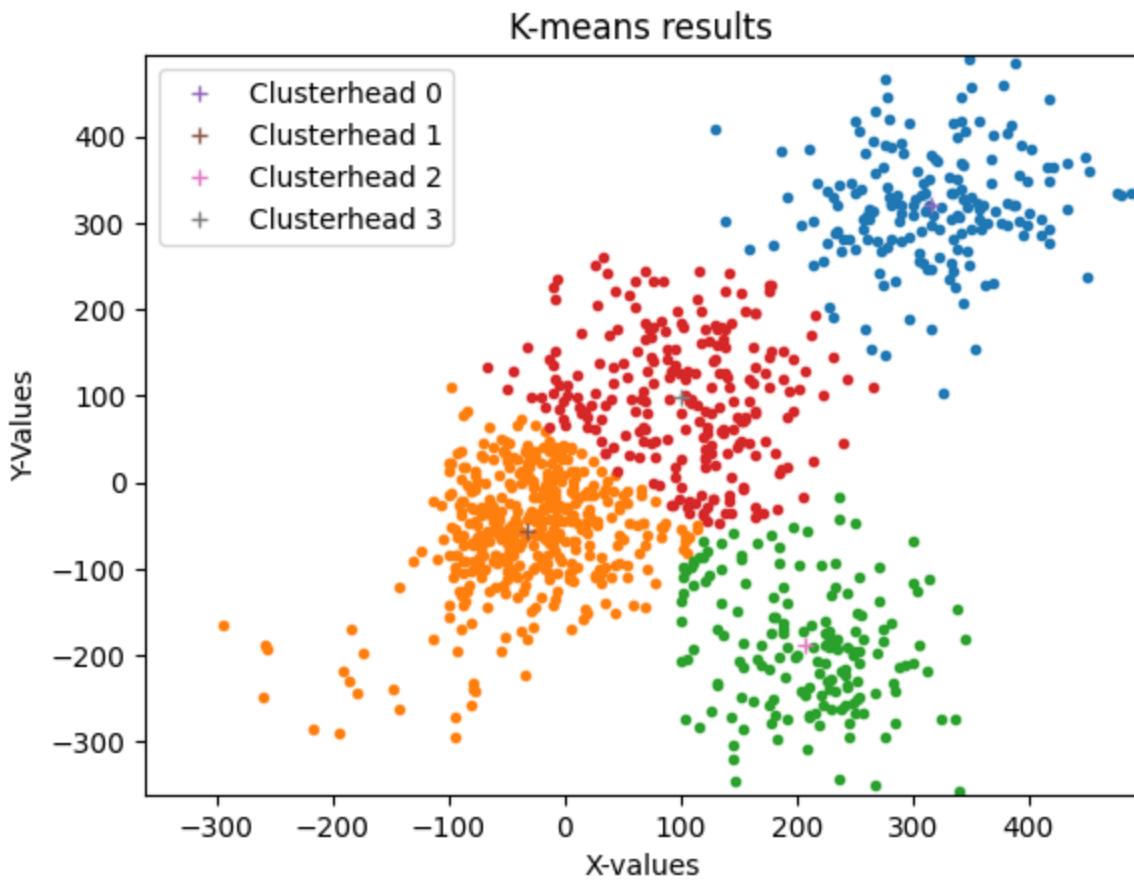
```
[[ 315.55315336 -33.0943946  206.71775307 101.14734933]
 [ 319.57321825 -57.62422233 -188.84811979  97.43332133]]
```

new cluster heads:

```
[[ 315.55315336 -32.73715761  206.71775307 101.09532626]
 [ 319.57321825 -57.6038731  -188.84811979  98.05763775]]
```

last heads:

```
[[ 315.55315336 -33.0943946  206.71775307 101.14734933]
 [ 319.57321825 -57.62422233 -188.84811979  97.43332133]]
```



distance between old and new heads: 0.52

new cluster heads:

```
[[ 315.55315336 -32.73715761  206.71775307 101.09532626]
 [ 319.57321825 -57.6038731 -188.84811979  98.05763775]]
```

last heads:

```
[[ 315.55315336 -32.73715761  206.71775307 101.09532626]
 [ 319.57321825 -57.6038731 -188.84811979  98.05763775]]
```

new cluster heads:

```
[[ 315.55315336 -32.73715761  206.71775307 101.09532626]
 [ 319.57321825 -57.6038731 -188.84811979  98.05763775]]
```

last heads:

```
[[ 315.55315336 -32.73715761  206.71775307 101.09532626]
 [ 319.57321825 -57.6038731 -188.84811979  98.05763775]]
```

new cluster heads:

```
[[ 315.55315336 -32.73715761  206.71775307 101.09532626]
 [ 319.57321825 -57.6038731 -188.84811979  98.05763775]]
```

last heads:

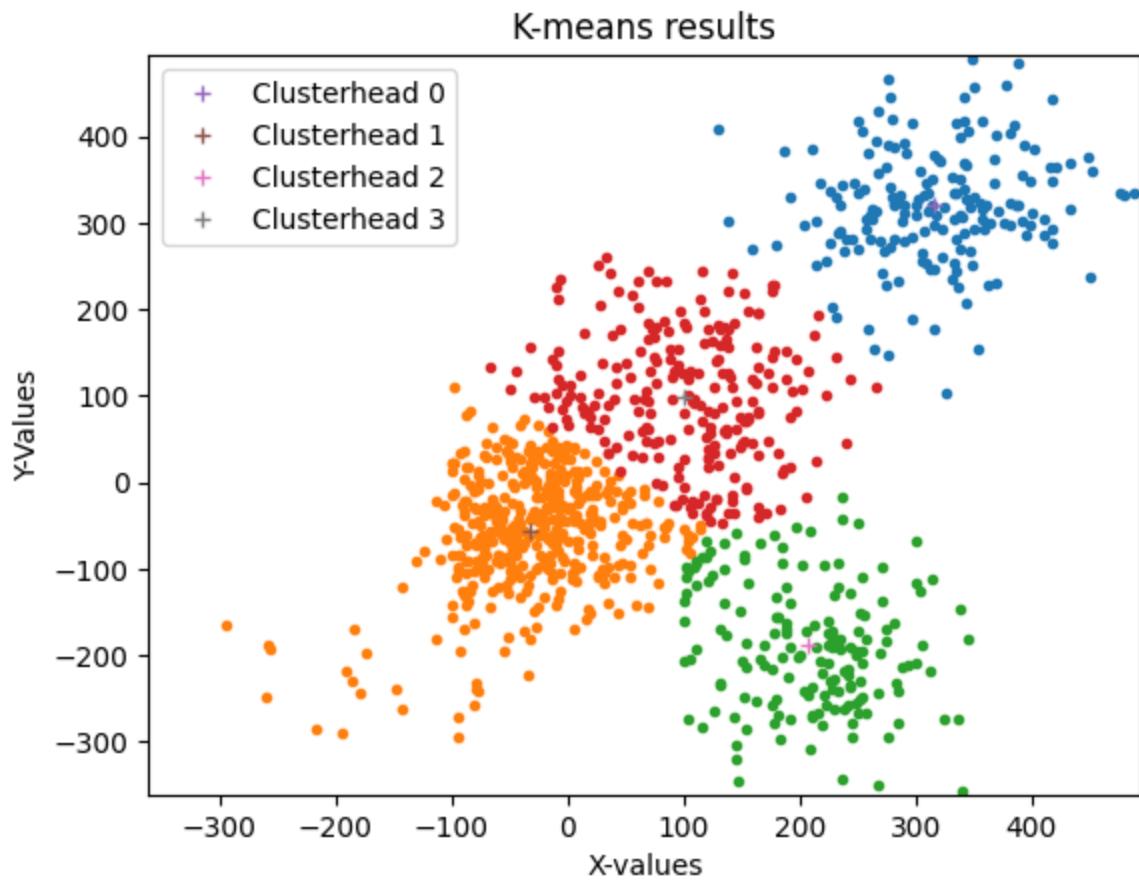
```
[[ 315.55315336 -32.73715761  206.71775307 101.09532626]
 [ 319.57321825 -57.6038731 -188.84811979  98.05763775]]
```

new cluster heads:

```
[[ 315.55315336 -32.73715761  206.71775307 101.09532626]
 [ 319.57321825 -57.6038731 -188.84811979  98.05763775]]
```

last heads:

```
[[ 315.55315336 -32.73715761  206.71775307 101.09532626]
 [ 319.57321825 -57.6038731 -188.84811979  98.05763775]]
```



Finished try! Distance between old and new heads: 0.000000

Fewest number of iterations was 15 on try 1  
distance between old and new heads: 67840.06  
error was 0.5  
distance between old and new heads: 7136.16  
error was 0.5625  
distance between old and new heads: 962.56  
error was 0.5625  
distance between old and new heads: 266.99  
error was 0.5625  
distance between old and new heads: 111.59  
error was 0.5625  
distance between old and new heads: 67.30  
error was 0.5625  
distance between old and new heads: 61.83  
error was 0.5625  
distance between old and new heads: 55.33  
error was 0.5  
distance between old and new heads: 41.63  
error was 0.5  
distance between old and new heads: 23.34  
error was 0.5  
distance between old and new heads: 4.87  
error was 0.5  
distance between old and new heads: 7.87  
error was 0.5  
distance between old and new heads: 13.31  
error was 0.5  
distance between old and new heads: 35.28  
error was 0.5  
distance between old and new heads: 42.51  
error was 0.5  
distance between old and new heads: 70.02  
error was 0.5  
distance between old and new heads: 61.20  
error was 0.5  
distance between old and new heads: 30.36  
error was 0.5  
distance between old and new heads: 20.77  
error was 0.5  
distance between old and new heads: 1.71  
error was 0.5

Finished try! Distance between old and new heads: 0.000000

distance between old and new heads: 85238.59  
error was 0.5  
distance between old and new heads: 1297.10  
error was 0.5  
distance between old and new heads: 43.29  
error was 0.5  
distance between old and new heads: 6.78  
error was 0.5  
distance between old and new heads: 3.04  
error was 0.5

Finished try! Distance between old and new heads: 0.000000

```
distance between old and new heads: 72757.83
error was 0.375
distance between old and new heads: 1551.89
error was 0.3125
distance between old and new heads: 337.64
error was 0.3125
distance between old and new heads: 285.70
error was 0.3125
distance between old and new heads: 347.92
error was 0.375
distance between old and new heads: 533.17
error was 0.375
distance between old and new heads: 639.64
error was 0.375
distance between old and new heads: 994.31
error was 0.375
distance between old and new heads: 527.00
error was 0.375
distance between old and new heads: 264.23
error was 0.375
distance between old and new heads: 58.36
error was 0.375
distance between old and new heads: 16.18
error was 0.375
distance between old and new heads: 13.04
error was 0.4375
distance between old and new heads: 7.15
error was 0.4375
distance between old and new heads: 9.15
error was 0.4375
distance between old and new heads: 4.09
error was 0.4375
distance between old and new heads: 5.53
error was 0.4375
distance between old and new heads: 5.14
error was 0.4375
Finished try! Distance between old and new heads: 0.000000

distance between old and new heads: 162928.67
error was 0.375
distance between old and new heads: 13153.27
error was 0.4375
distance between old and new heads: 6041.26
error was 0.5
distance between old and new heads: 2970.79
error was 0.5
distance between old and new heads: 372.49
error was 0.5
distance between old and new heads: 26.90
error was 0.5
distance between old and new heads: 12.49
error was 0.5
distance between old and new heads: 3.71
error was 0.5
Finished try! Distance between old and new heads: 0.000000
```

```
distance between old and new heads: 136443.94
error was 0.5
distance between old and new heads: 13580.04
error was 0.5
distance between old and new heads: 1379.15
error was 0.5
distance between old and new heads: 245.15
error was 0.5
distance between old and new heads: 41.72
error was 0.5
distance between old and new heads: 18.24
error was 0.5
distance between old and new heads: 6.24
error was 0.5
distance between old and new heads: 1.53
error was 0.5
distance between old and new heads: 0.82
error was 0.5
Finished try! Distance between old and new heads: 0.000000
```

```
distance between old and new heads: 54866.44
error was 0.5625
distance between old and new heads: 2515.13
error was 0.5625
distance between old and new heads: 304.87
error was 0.5625
distance between old and new heads: 288.07
error was 0.5625
distance between old and new heads: 137.74
error was 0.5625
distance between old and new heads: 103.80
error was 0.5625
distance between old and new heads: 80.00
error was 0.5625
distance between old and new heads: 67.51
error was 0.5
distance between old and new heads: 42.37
error was 0.5
distance between old and new heads: 23.36
error was 0.5
distance between old and new heads: 5.98
error was 0.5
distance between old and new heads: 7.87
error was 0.5
distance between old and new heads: 13.31
error was 0.5
distance between old and new heads: 35.28
error was 0.5
distance between old and new heads: 42.51
error was 0.5
distance between old and new heads: 70.02
error was 0.5
distance between old and new heads: 61.20
error was 0.5
distance between old and new heads: 30.36
```

```
error was 0.5
distance between old and new heads: 20.77
error was 0.5
distance between old and new heads: 1.71
error was 0.5
Finished try! Distance between old and new heads: 0.000000

distance between old and new heads: 159758.99
error was 0.5
distance between old and new heads: 15143.92
error was 0.5
distance between old and new heads: 3582.17
error was 0.5
distance between old and new heads: 1805.06
error was 0.4375
distance between old and new heads: 927.50
error was 0.4375
distance between old and new heads: 554.22
error was 0.4375
distance between old and new heads: 267.47
error was 0.375
distance between old and new heads: 157.30
error was 0.375
distance between old and new heads: 15.01
error was 0.375
distance between old and new heads: 27.97
error was 0.375
distance between old and new heads: 41.91
error was 0.375
distance between old and new heads: 41.97
error was 0.375
distance between old and new heads: 27.23
error was 0.375
distance between old and new heads: 19.02
error was 0.375
distance between old and new heads: 26.18
error was 0.375
distance between old and new heads: 64.84
error was 0.375
distance between old and new heads: 24.53
error was 0.375
distance between old and new heads: 16.48
error was 0.375
distance between old and new heads: 13.03
error was 0.4375
distance between old and new heads: 55.54
error was 0.4375
distance between old and new heads: 24.54
error was 0.4375
distance between old and new heads: 28.54
error was 0.4375
distance between old and new heads: 9.02
error was 0.4375
distance between old and new heads: 1.50
error was 0.4375
distance between old and new heads: 0.88
```

```
error was 0.4375
distance between old and new heads: 1.39
error was 0.4375
Finished try! Distance between old and new heads: 0.000000

distance between old and new heads: 27759.41
error was 0.5
distance between old and new heads: 2320.69
error was 0.5
distance between old and new heads: 484.10
error was 0.5
distance between old and new heads: 9.00
error was 0.5
distance between old and new heads: 1.60
error was 0.5
distance between old and new heads: 6.73
error was 0.5
Finished try! Distance between old and new heads: 0.000000

distance between old and new heads: 36096.63
error was 0.3125
distance between old and new heads: 11952.19
error was 0.375
distance between old and new heads: 6954.05
error was 0.4375
distance between old and new heads: 2101.64
error was 0.4375
distance between old and new heads: 382.28
error was 0.4375
distance between old and new heads: 82.64
error was 0.4375
distance between old and new heads: 41.14
error was 0.375
distance between old and new heads: 78.95
error was 0.375
distance between old and new heads: 23.86
error was 0.4375
distance between old and new heads: 12.13
error was 0.4375
Finished try! Distance between old and new heads: 0.000000

distance between old and new heads: 34724.11
error was 0.4375
distance between old and new heads: 35.14
error was 0.4375
distance between old and new heads: 3.00
error was 0.4375
distance between old and new heads: 1.56
error was 0.4375
distance between old and new heads: 6.15
error was 0.4375
distance between old and new heads: 7.92
error was 0.4375
Finished try! Distance between old and new heads: 0.000000
```

Fewest number of iterations was 7 on try 1

Lowest error was 0.4375 on try 1

<Figure size 640x480 with 0 Axes>