assignment03

October 1, 2018

1 This script demonstrates K-means clustering

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1.0.3 Git : https://github.com/ppooiiuuyh/datamining_assignments/tree/master/assignment03

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In [ ]: import random
        import numpy as np
        import matplotlib.pyplot as plt
        import matplotlib.cm as cm
        import math
```

```
In [2]: def generatePointCluster(num_clusters, num_points):
            points = None
            for i in range(num_clusters):
                scale = random.random()*1+1
                x_pos = random.random()*6-5
                y_pos = random.random()*6-5

                #point[0] = x ; point[1] = y
                points_temp = np.random.rand(num_points,3)
                points_temp[:,0] = (points_temp[:,0] - np.mean(points_temp[:,0])) * scale + x_po
                points_temp[:,1] = (points_temp[:,1] - np.mean(points_temp[:,1])) * scale + y_po
                points_temp[:,2] = i

                points = points_temp if points is None else np.append(points,points_temp, axis=0
            return points
```

define computeDistance: $\sqrt{(p1.x - p2.x)^2 + (p1.y - p2.y)^2}$

```
In [3]: def computeDistance(p1,p2):
            #(p1.x - p2.x)**2 + (p1.y - p2.y)**2
            return math.sqrt((p1[0] - p2[0])**2 + (p1[1] - p2[1])**2)
```

```
In [9]: def initialiseLabel(points,num_clusters):
            perm = np.random.permutation(points.shape[0])
            points[:,2] = points[perm,2]
```

```
In [5]: def computeCentroid(points,num_clusters) :
            centroids = [[] for _ in range(num_clusters)]
            for i in range(len(points)):
                centroids[int(points[i][2])].append(points[i][0:2])
            centroids = [np.mean(centroids[i],axis=0) for i in range(len(centroids))]
            return centroids

In [6]: def assignLabel(points, num_clusters):
            centroids = computeCentroid(points,num_clusters)
            for i in range(len(points)):
                min = 9999
                for e,c in enumerate(centroids):
                    d = computeDistance(points[i],c)
                    if d <= min :
                        min = d
                        points[i,2] = e
```

define computeEnergy: $\frac{1}{NM}\sum_{c}^{C}\sum_{n}^{N} r_{cn}\sqrt{(p_{cn}.x - cent_c.x)^2 + (p_{cm}.y - cent_c.y)^2}$

```
In [7]: def computeEnergy(points,num_clusters):
            centroids = computeCentroid(points, num_clusters)
            dist = []
            for i in range(len(points)):
                dist.append( np.sqrt( ((centroids[int(points[i][2])]) - (points[i][0:2]))**2))
            return np.mean(dist)

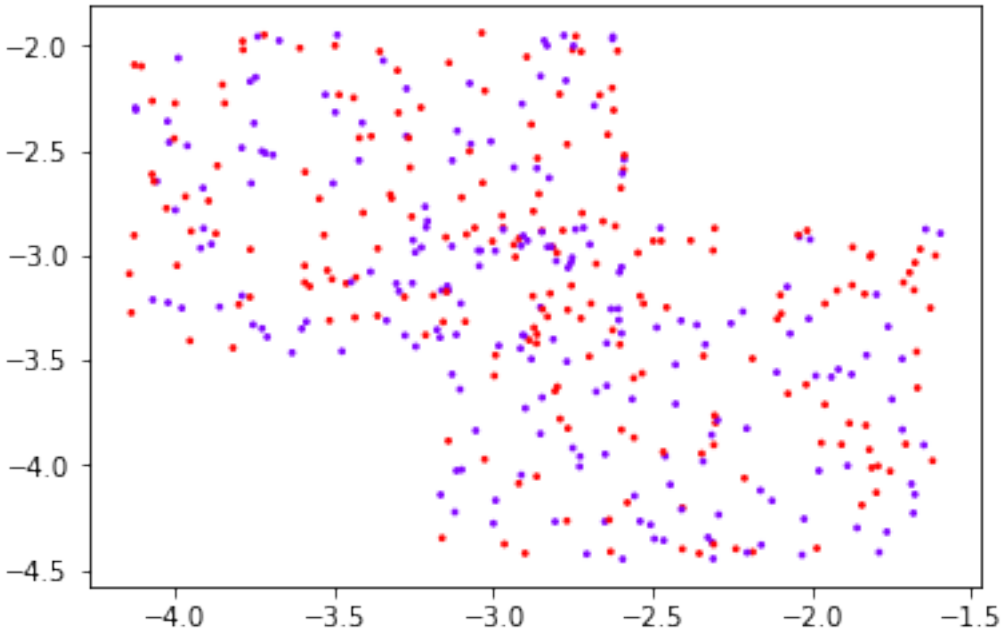
In [8]: def plot(points, num_clusters):
            colors = cm.rainbow(np.linspace(0, 1, num_clusters))
            plt.scatter(points[:,0], points[:, 1], s=3, c=colors[ points[:,2].astype(int) ])
            plt.show()

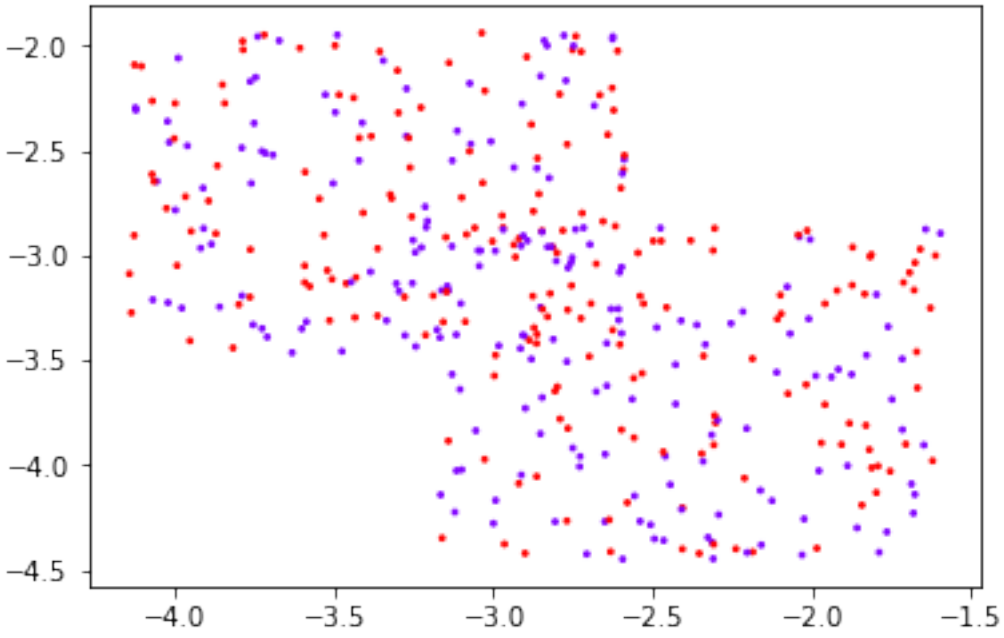
In [10]: num_clusters = 2

         points = generatePointCluster(num_clusters,200)

         energies = []
         initialiseLabel(points,num_clusters)
         energies.append(computeEnergy(points, num_clusters))
         plot(points, num_clusters)

         for i in range(5):
             plot(points,num_clusters)
             assignLabel(points,num_clusters)
             energies.append(computeEnergy(points,num_clusters))
             print(energies)
         plt.plot(range(len(energies)),energies)
         plt.show()
```



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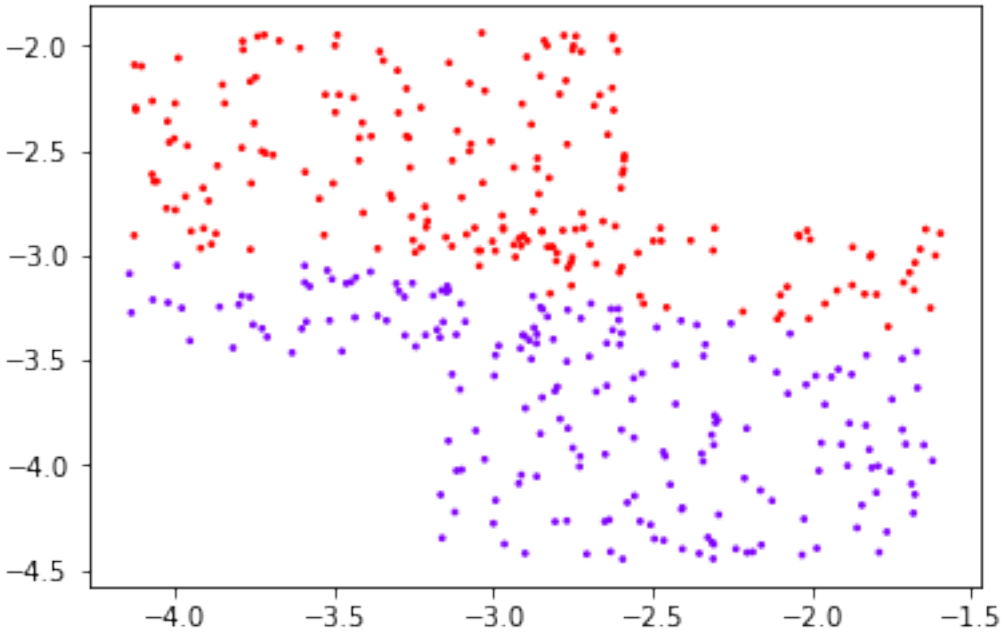


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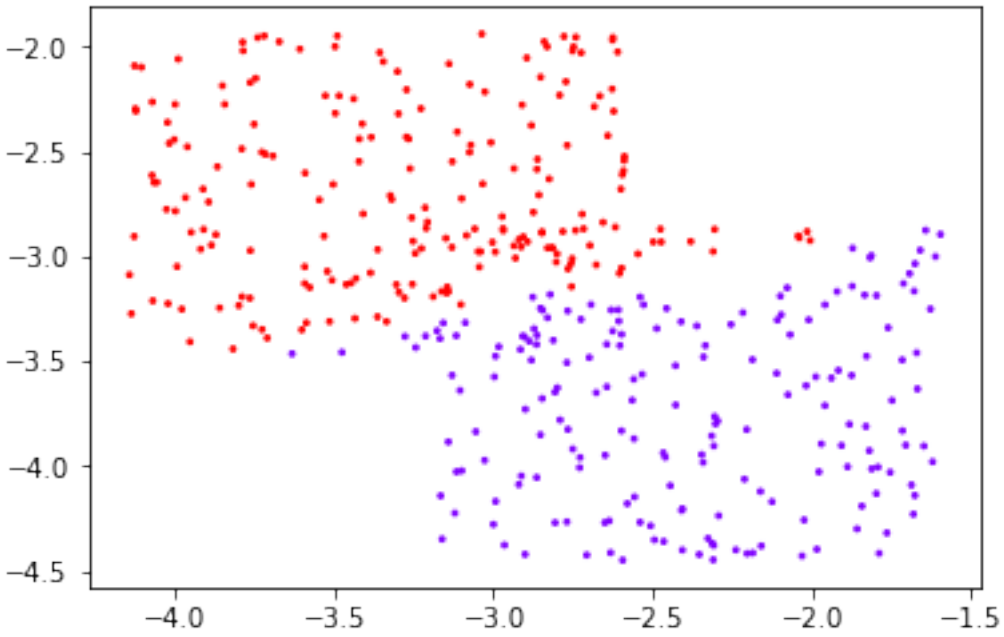

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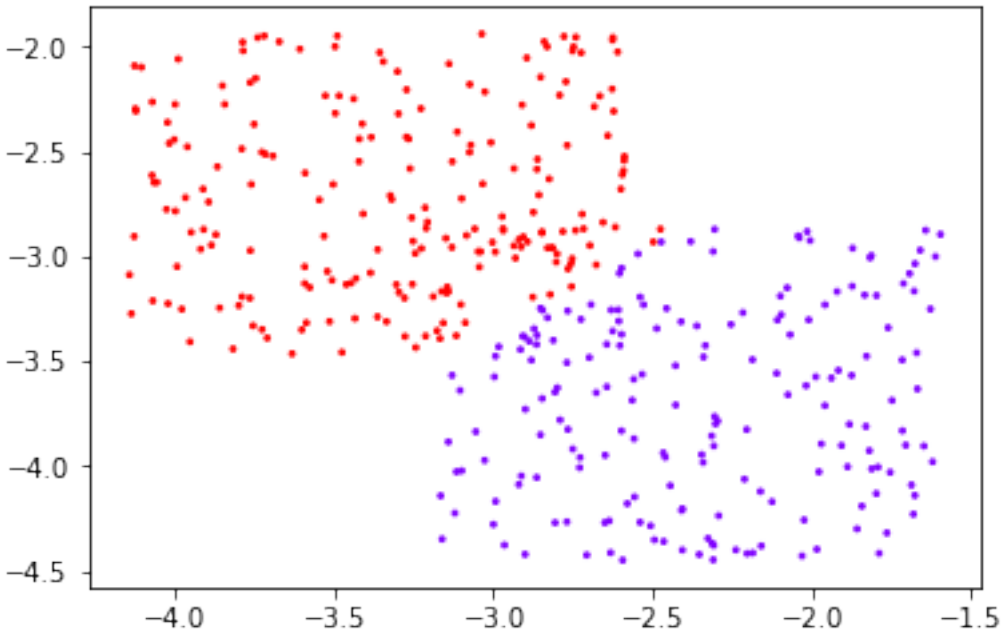

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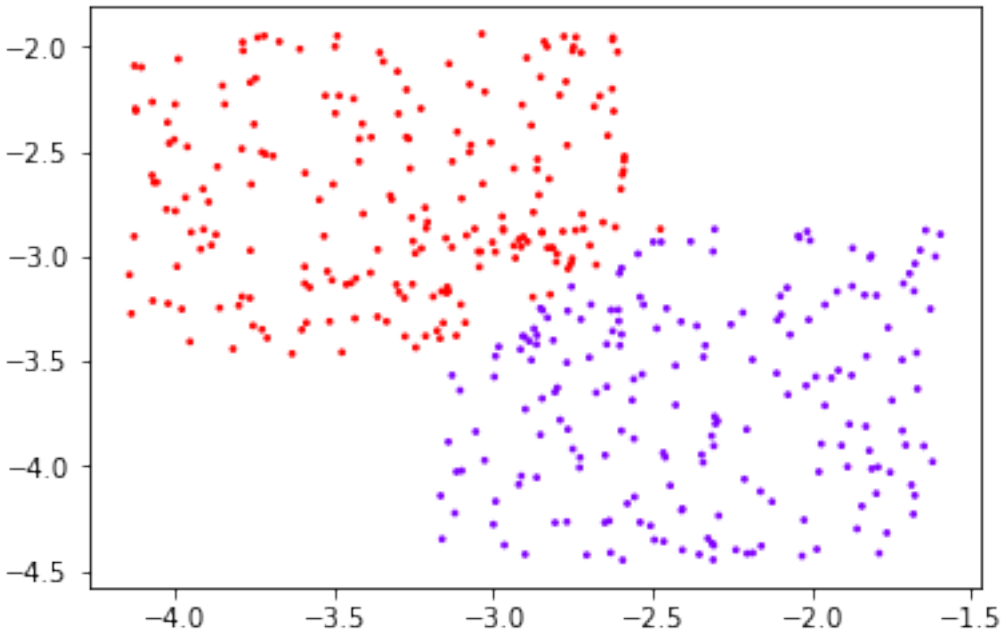

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[0.5264581846501964, 0.43207207144639476, 0.3918730846655572, 0.38348643196200316, 0.38348892830
```