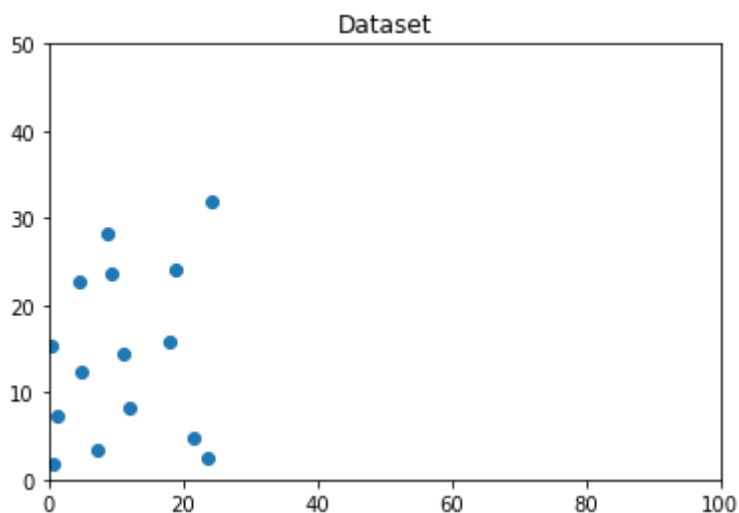


# k-Means algorithm

```
In [1]: import numpy as np
        from sklearn.cluster import KMeans
        import matplotlib.pyplot as plt
        from sklearn.mixture import GaussianMixture
        import pandas as pd
```

```
In [3]: X=pd.read_csv("program5.csv")
        x1 = X['V1'].values
        x2 = X['V2'].values
        X = np.array(list(zip(x1, x2))).reshape(len(x1), 2)
        plt.plot()
        plt.xlim([0, 100])
        plt.ylim([0, 50])
        plt.title('Dataset')
        plt.scatter(x1, x2)
        plt.show()
```



```
In [5]: gmm = GaussianMixture(n_components=3)
        gmm.fit(X)
        em_predictions = gmm.predict(X)
        print("\nEM predictions")
        print(em_predictions)
        print("mean:\n",gmm.means_)
        print('\n')
        print("Covariances\n",gmm.covariances_)
        print(X)

EM predictions
[2 2 0 2 1 2 1 0 1 2 0 0 2 2 1 0 2 1 0 1 2]
mean:
[[ 3.87004698 16.19467857]
 [14.03598519  0.7258207 ]
 [10.93962489  9.54606718]]

Covariances
[[[ 17.14601232 30.4406603 ]
  [ 30.4406603 76.55265727]]

 [ 99.34162937  5.04919157]
```

```

[ 5.04919157  9.32933094]]

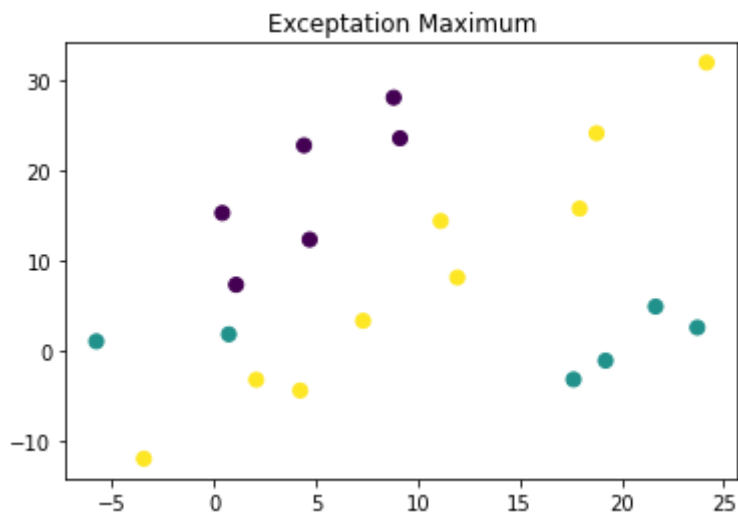
[[ 72.59138887 114.03114933]
 [114.03114933 188.03678761]]]
[[ 2.072345 -3.24169 ]
 [17.93671  15.78481 ]
 [ 1.083576  7.319176]
 [11.12067  14.40678 ]
 [23.71155  2.557729]
 [24.16993  32.02478 ]
 [21.66578  4.892855]
 [ 4.693684 12.34217 ]
 [19.21191  -1.12137 ]
 [ 4.230391 -4.44154 ]
 [ 9.12713  23.60572 ]
 [ 0.407503 15.29705 ]
 [ 7.314846  3.309312]
 [-3.4384  -12.0253 ]
 [17.63935  -3.21235 ]
 [ 4.415292 22.81555 ]
 [11.94122  8.122487]
 [ 0.725853  1.806819]
 [ 8.815273 28.1326 ]
 [-5.77359  1.0248 ]
 [18.76943  24.16946 ]]

```

```

In [6]: plt.title('Exception Maximum')
plt.scatter(X[:,0], X[:,1],c=em_predictions,s=50)
plt.show()

```



```

In [7]: import matplotlib.pyplot as plt1
kmeans = KMeans(n_clusters=3)
kmeans.fit(X)
print(kmeans.cluster_centers_)
print(kmeans.labels_)
plt.title('KMEANS')
plt1.scatter(X[:,0], X[:,1], c=kmeans.labels_, cmap='rainbow')
plt1.scatter(kmeans.cluster_centers_[ :,0] ,kmeans.cluster_centers_[ :,1],
color='black')

```

```

[[11.05062467 20.95321333]
 [18.833962   2.2478702 ]
 [ 0.88786014 -0.89263186]]
[2 0 2 0 1 0 1 0 1 2 0 0 2 2 1 0 1 2 0 2 0]

```

```

Out[7]: <matplotlib.collections.PathCollection at 0x1a2e020f9a0>

```

