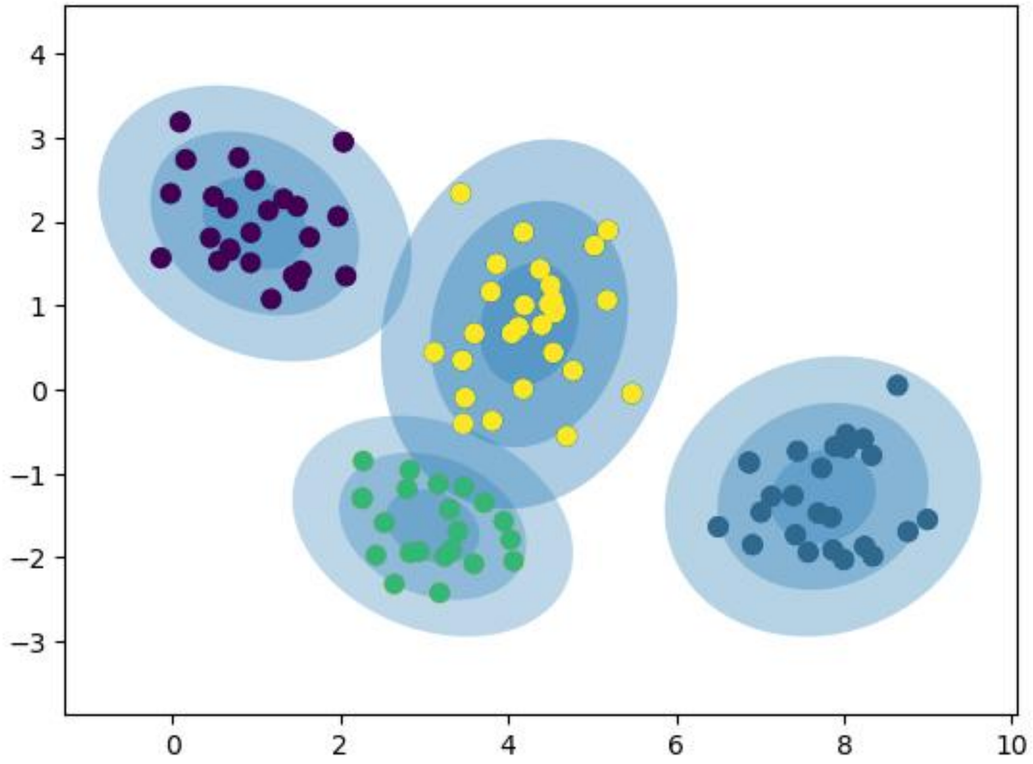
Experiment-11

AIM: Apply EM algorithm to cluster a set of data stored in a. CSV file. Use the same data set for clustering using k-Means algorithm. Compare the results of the set two algorithms and comment on the quality of clustering. You can add Java/Python ML library classes/API in the program.

```
import numpy as np

import matplotlib.pyplot as plt

from sklearn.datasets import make_blobs

from sklearn.mixture import GaussianMixture

from matplotlib.patches import Ellipse


X, y_true = make_blobs(n_samples=100, centers=4, cluster_std=0.60, random_state=0)

X = X[:, ::-1]

gmm = GaussianMixture(n_components=4).fit(X)

labels = gmm.predict(X)

plt.scatter(X[:, 0], X[:, 1], c=labels, s=40, cmap='viridis')

probs = gmm.predict_proba(X)

print(probs[:5].round(3))

size = 50 * probs.max(1) ** 2

plt.scatter(X[:, 0], X[:, 1], c=labels, cmap='viridis', s=size)


def draw_ellipse(position, covariance, ax=None, **kwargs):

    ax = ax or plt.gca()

    if covariance.shape == (2, 2):

        U, s, Vt = np.linalg.svd(covariance)
        angle = np.degrees(np.arctan2(U[1, 0], U[0, 0]))
        width, height = 2 * np.sqrt(s)
    else:
        angle = 0
        width, height = 2 * np.sqrt(covariance)

    for nsig in range(1, 4):
        ax.add_patch(Ellipse(position, nsig * width, nsig * height, angle, **kwargs))

def plot_gmm(gmm, X, label=True, ax=None):
    ax = ax or plt.gca()
    if label:
        labels = gmm.fit(X).predict(X)
        ax.scatter(X[:, 0], X[:, 1], c=labels, s=40, cmap='viridis', zorder=2)
    else:
        ax.scatter(X[:, 0], X[:, 1], s=40, zorder=2)
    ax.axis('equal')

    w_factor = 0.2 / gmm.weights_.max()
    for pos, covar, w in zip(gmm.means_, gmm.covariances_, gmm.weights_):
        draw_ellipse(pos, covar, alpha=w * w_factor)

gmm = GaussianMixture(n_components=4, random_state=42)
plot_gmm(gmm, X)
gmm = GaussianMixture(n_components=4, covariance_type='full', random_state=42)
plot_gmm(gmm, X)
plt.show()
```

Output:

```
[[0. 0. 1. 0.]
 [0. 1. 0. 0.]
 [0. 0. 1. 0.]
 [0. 0. 1. 0.]
 [0. 0. 1. 0.]]
```



4
3
2
1
0
−1
−2
−3
0
2
4
6
8
10