# 2022W-T2 AISC2003 - Advanced Analytics 01 (M07 Group 1)

# Application Exercise 4

# Task : Execute the DBSCAN Algorithm in the dataset provided within code snippets of a provided articles.

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In [35]:

```
import numpy as np
import pandas as pd
from sklearn.cluster import DBSCAN
from sklearn import metrics
from sklearn.datasets import make_blobs
from sklearn.preprocessing import StandardScaler
from sklearn.datasets import make_circles

```

In [21]:

```
# Generate sample data
centers = [[1, 1], [-1, -1], [1, -1]]
X, labels_true = make_blobs(n_samples=500, centers=centers, cluster_std=0.4,random_sta
```

In [22]:

```
X = StandardScaler().fit_transform(X)# normalize the data points
```

In [23]:

```
# Compute DBSCAN Algorithm to find out existing clusters
db = DBSCAN(eps=0.3, min_samples=10).fit(X)
core_samples_mask = np.zeros_like(db.labels_, dtype=bool)
core_samples_mask[db.core_sample_indices_] = True
labels = db.labels_

```

In [24]:

```
# Number of clusters in labels, ignoring noise if present.
n_clusters_ = len(set(labels)) - (1 if -1 in labels else 0)
n_noise_ = list(labels).count(-1)
```

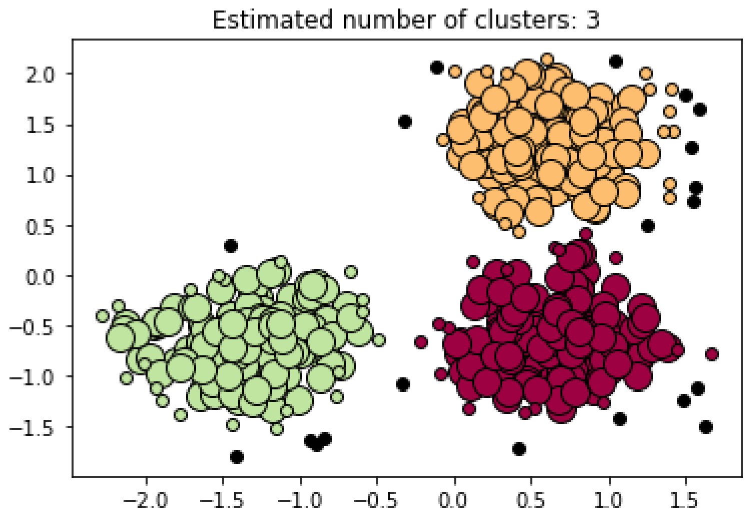
In [25]:

```
print('Estimated number of clusters: %d' % n_clusters_)
print('Estimated number of noise points: %d' % n_noise_)
print("Homogeneity: %0.3f" % metrics.homogeneity_score(labels_true, labels))
print("Completeness: %0.3f" % metrics.completeness_score(labels_true, labels))
print("V-measure: %0.3f" % metrics.v_measure_score(labels_true, labels))
print("Adjusted Rand Index: %0.3f"% metrics.adjusted_rand_score(labels_true, labels))
print("Adjusted Mutual Information: %0.3f"% metrics.adjusted_mutual_info_score(labels_
print("Silhouette Coefficient: %0.3f"% metrics.silhouette_score(X, labels))
```

```
Estimated number of clusters: 3
Estimated number of noise points: 20
Homogeneity: 0.939
Completeness: 0.844
V-measure: 0.889
Adjusted Rand Index: 0.927
Adjusted Mutual Information: 0.843
Silhouette Coefficient: 0.605


c:\python37\lib\site-packages\sklearn\metrics\cluster\supervised.py:746: Fut
ureWarning: The behavior of AMI will change in version 0.22. To match the be
havior of 'v_measure_score', AMI will use average_method='arithmetic' by def
ault.
  FutureWarning)
```

In [26]:

```python
# Plot result
import matplotlib.pyplot as plt
%matplotlib inline

# Black removed and is used for noise instead.
unique_labels = set(labels)
colors = [plt.cm.Spectral(each)
          for each in np.linspace(0, 1, len(unique_labels))]
for k, col in zip(unique_labels, colors):
    if k == -1:
        # Black used for noise.
        col = [0, 0, 0, 1]

    class_member_mask = (labels == k)

    xy = X[class_member_mask & core_samples_mask]
    plt.plot(xy[:, 0], xy[:, 1], 'o', markerfacecolor=tuple(col),markeredgecolor='k', 

    xy = X[class_member_mask & ~core_samples_mask]
    plt.plot(xy[:, 0], xy[:, 1], 'o', markerfacecolor=tuple(col),markeredgecolor='k', 

plt.title('Estimated number of clusters: %d' % n_clusters_)
plt.show()
```

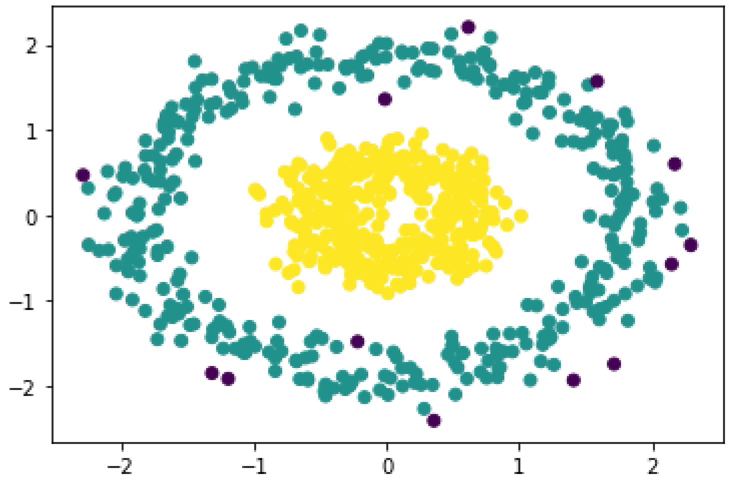


# apply DBSCAN to cluster non-spherical data

In [32]:

```
X, y = make_circles(n_samples=750, factor=0.3, noise=0.1)
X = StandardScaler().fit_transform(X)
y_pred = DBSCAN(eps=0.3, min_samples=10).fit_predict(X)

plt.scatter(X[:,0], X[:,1], c=y_pred)
print('Number of clusters: {}'.format(len(set(y_pred[np.where(y_pred != -1)]))))
print('Homogeneity: {}'.format(metrics.homogeneity_score(y, y_pred)))
print('Completeness: {}'.format(metrics.completeness_score(y, y_pred)))
print("V-measure: %0.3f" % metrics.v_measure_score(labels_true, labels))
print("Adjusted Rand Index: %0.3f"
      % metrics.adjusted_rand_score(labels_true, labels))
print("Adjusted Mutual Information: %0.3f"
      % metrics.adjusted_mutual_info_score(labels_true, labels))
# print("Silhouette Coefficient: %0.3f" % metrics.silhouette_score(X, labels))

```

```
Number of clusters: 2
Homogeneity: 1.0
Completeness: 0.9020059344930758
V-measure: 0.889
Adjusted Rand Index: 0.927
Adjusted Mutual Information: 0.843

c:\python37\lib\site-packages\sklearn\metrics\cluster\supervised.py:746: Fut
ureWarning: The behavior of AMI will change in version 0.22. To match the be
havior of 'v_measure_score', AMI will use average_method='arithmetic' by def
ault.
  FutureWarning)
```



# Test out DBSCAN, on a dataset consisting of annual customer data for a wholesale distributor.

In [38]:

```
data = pd.read_csv(r"./Wholesale customers data.csv")
#Drop non-continuous variables
data.drop(["Channel", "Region"], axis = 1, inplace = True)
```

In [39]:

```
data = data[["Grocery", "Milk"]]
data = data.to_numpy().astype("float32", copy = False)
```

In [42]:

```
#normalize each attribute by scaling it to 0 mean and unit variance
stscaler = StandardScaler().fit(data)
data = stscaler.transform(data)
print(data)
```

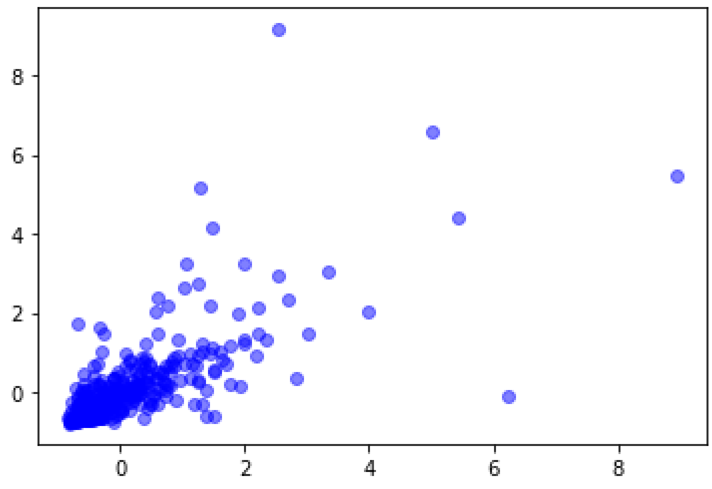
```
 [-5.62797725e-01 -5.01393497e-01]
 [ 3.32448781e-01 -2.96564043e-01]
 [-5.07595420e-01 -1.97676167e-01]
 [-5.33616364e-01 -6.07470810e-01]
 [-6.58716410e-02 -1.37041226e-01]
 [-5.99353433e-01 -5.17807007e-01]
 [ 3.30763191e-01 -4.14089076e-02]
 [-2.65821993e-01 -1.94556251e-01]
 [ 4.76775408e-01  6.45651519e-01]
 [ 9.22607720e-01  1.34736216e+00]
 [-7.42626607e-01 -7.10970759e-01]
 [-3.36510420e-01 -1.98625714e-01]
 [-2.10198268e-01 -3.70492548e-01]
 [ 7.38459587e-01  2.38569930e-01]
 [ 1.69048858e+00  7.18766153e-01]
 [ 2.65447497e-01  1.66947439e-01]
 [ 1.43059528e+00  2.20398355e+00]
 [ 1.47526288e+00  1.12218535e+00]
 [ 5.01663780e+00  6.57390499e+00]

 [ 3.07270616e-01  4.82548587e-02]
```

In [46]:

```
plt.scatter(data[:,0:1],data[:,1:], c=['blue'], alpha=0.5)
```

Out[46]:

```
<matplotlib.collections.PathCollection at 0x24734016d48>
```



In [48]:

```
dbsc = DBSCAN(eps = .5, min_samples = 15).fit(data)
labels = dbsc.labels_
core_samples = np.zeros_like(labels, dtype = bool)
core_samples[dbsc.core_sample_indices_] = True
```

In [50]:

```
labels = dbsc.labels_
# Number of clusters in labels, ignoring noise if present.
n_clusters_ = len(set(labels)) - (1 if -1 in labels else 0)
n_noise_ = list(labels).count(-1)
```

In [53]:

```
print('Estimated number of clusters: %d' % n_clusters_)
print('Estimated number of noise points: %d' % n_noise_)

```

```
Estimated number of clusters: 1
Estimated number of noise points: 36
```