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BE CMPN B-4

https://github.com/chinmay0910/ML-Lab---VIT/blob/main/EXP%207/ML_Exp_7.ipynb

```
1  # Import necessary libraries
2  import pandas as pd
3  import networkx as nx
4  import numpy as np
5  import matplotlib.pyplot as plt
6  from sklearn.cluster import SpectralClustering
7  from sklearn.metrics import silhouette_score
8  from scipy.sparse import csr_matrix
9
10 # Load Facebook dataset (edges list)
11 url = 'https://snap.stanford.edu/data/facebook_combined.txt.gz'
12 df = pd.read_csv(url, sep=' ', header=None, names=['node1', 'node2'])
13
14 # Construct a graph
15 G = nx.from_pandas_edgelist(df, 'node1', 'node2')
16
17 # Visualize the graph (optional)
18 plt.figure(figsize=(8, 8))
19 nx.draw(G, node_size=50, node_color='blue', edge_color='gray', with_labels=False)
20 plt.show()
21
22 # Convert graph to adjacency matrix (sparse format)
23 adj_matrix = nx.adjacency_matrix(G)
24
25 # Ensure the matrix is in sparse format for Spectral Clustering
26 adj_matrix = csr_matrix(adj_matrix)
27
28
```
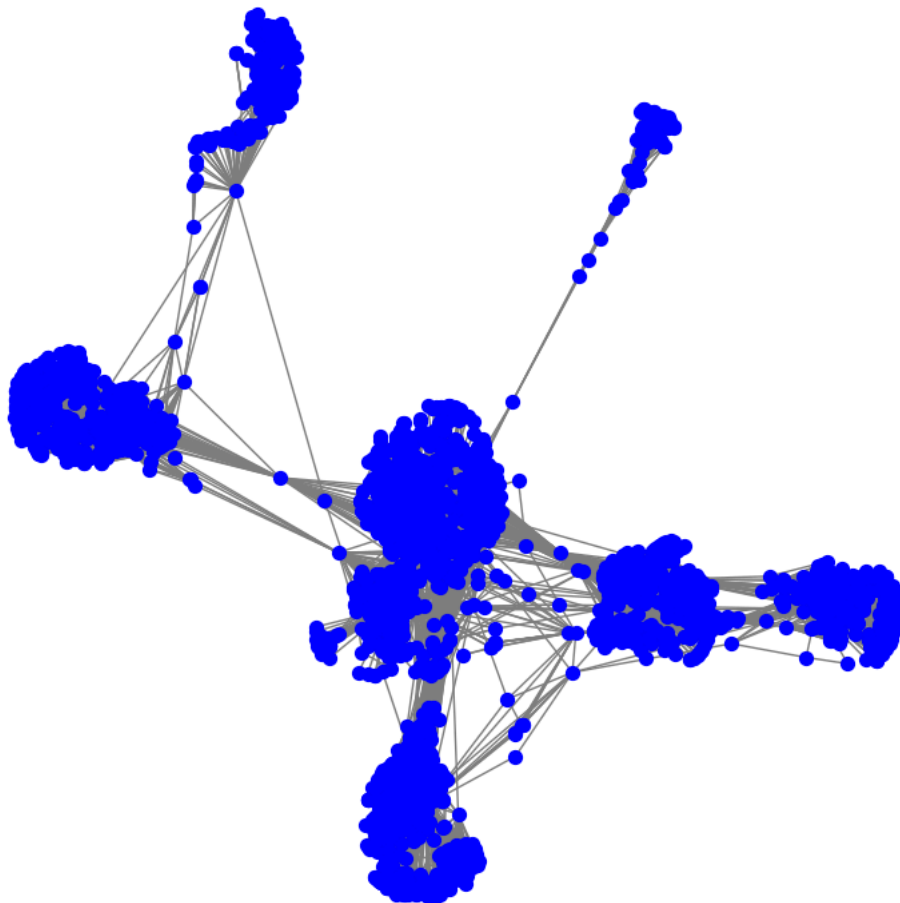
```
1  # Define the number of clusters
2  n_clusters = 5  # Adjust as necessary
3
4  # Apply Spectral Clustering
5  sc = SpectralClustering(n_clusters=n_clusters, affinity='precomputed', assign_labels='kmeans')
6
7  # Fit the model
8  sc.fit(adj_matrix)
9
10 # Predict cluster labels
11 labels = sc.labels_
12
13 # Visualize clustering (optional for Facebook dataset)
14 pos = nx.spring_layout(G)
15 plt.figure(figsize=(8, 8))
16 nx.draw(G, pos, node_color=labels, node_size=50, cmap=plt.cm.rainbow, with_labels=False)
17 plt.show()
18
```
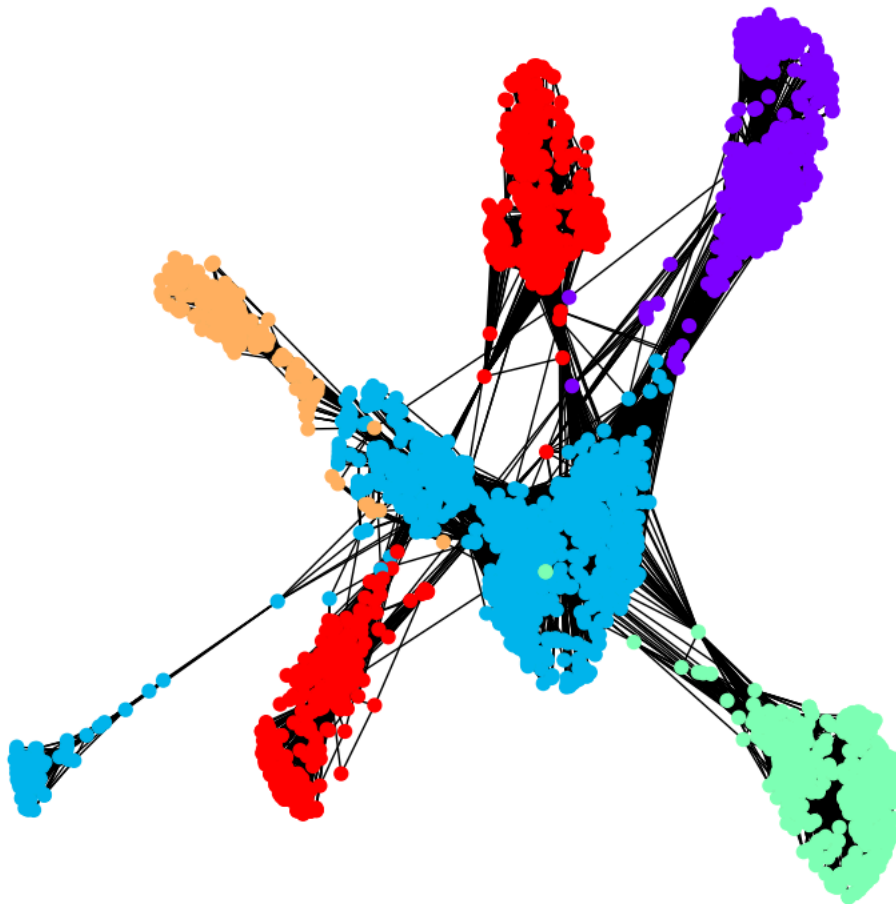


```
1  # Compute Silhouette Score
2  silhouette_avg = silhouette_score(adj_matrix, labels, metric='precomputed')
3  print(f'Silhouette Score: {silhouette_avg}')
4
```

Silhouette Score: -1.0

The characteristics of each cluster and any patterns or trends identified:

The social dynamics (for Facebook) or organizational structure and communication patterns (for Enron). Larger, tightly connected clusters often represent closer-knit groups, while smaller or less-connected clusters might indicate less frequent interactions or outliers.