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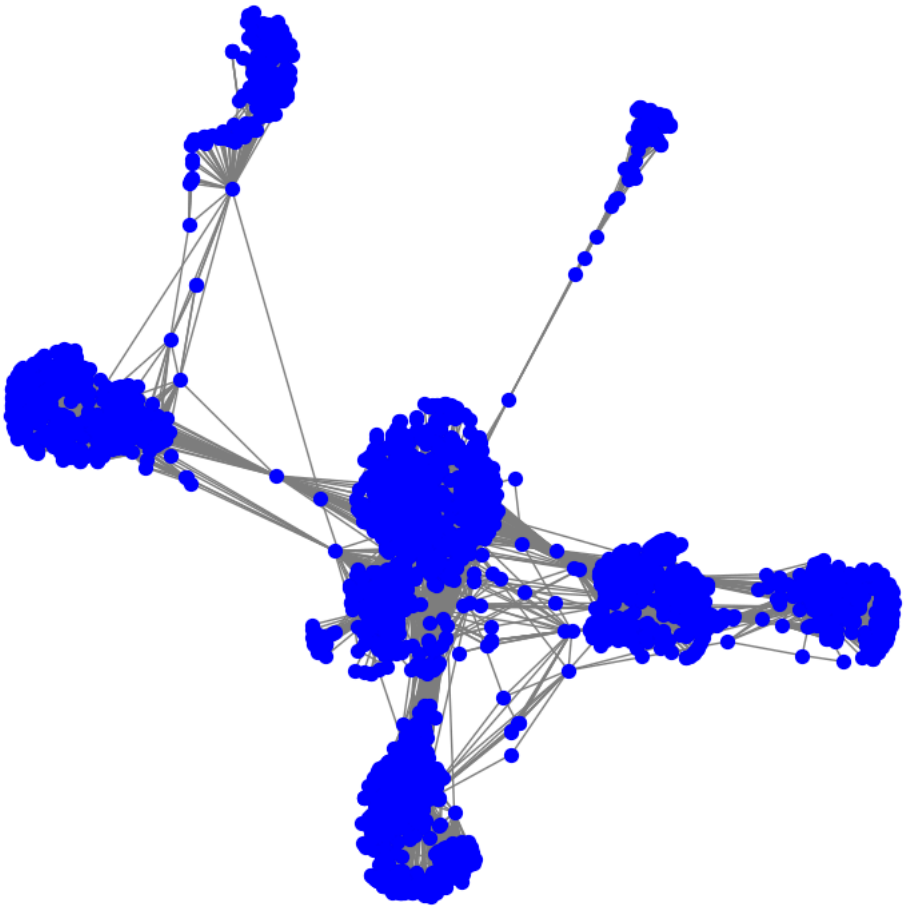
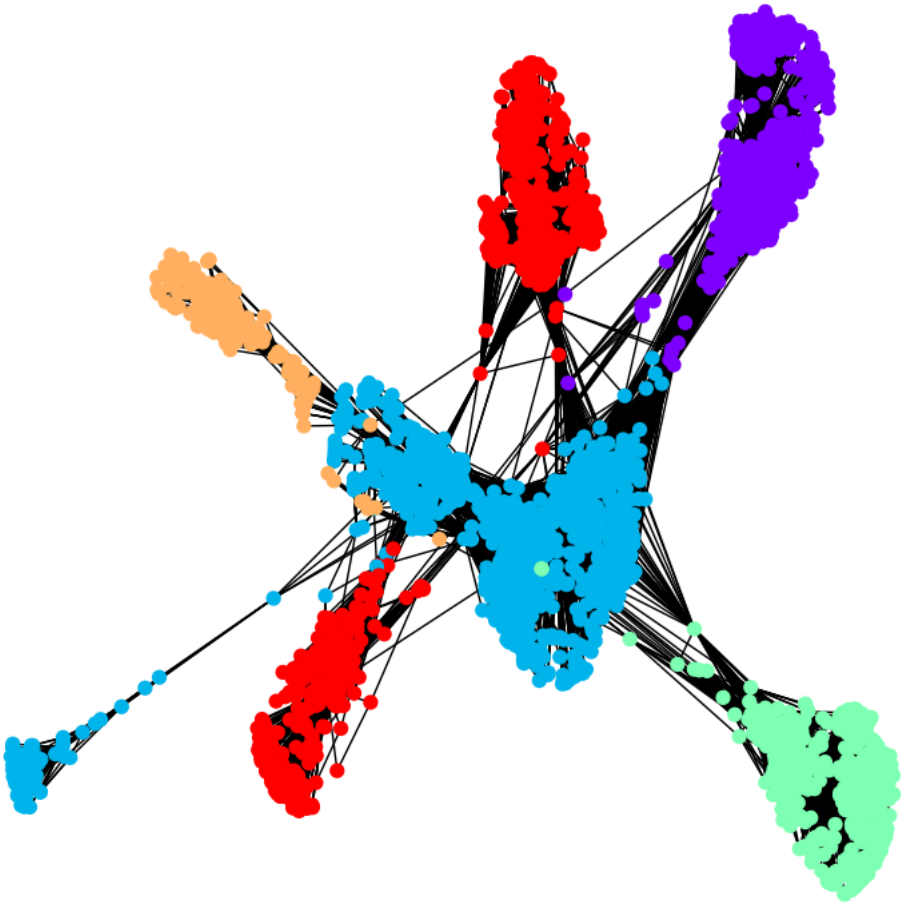
BE CMPN B-4

https://github.com/chinmay0910/ML-Lab---VIT/blob/main/EXP%207/ML_LAB_7.ipynb

```
# Import necessary libraries
import pandas as pd
import networkx as nx
import numpy as np
import matplotlib.pyplot as plt
from sklearn.cluster import SpectralClustering
from sklearn.metrics import silhouette_score
from scipy.sparse import csr_matrix

# Load Facebook dataset (edges list)
url = 'https://snap.stanford.edu/data/facebook_combined.txt.gz'
df = pd.read_csv(url, sep=' ', header=None, names=['node1', 'node2'])

# Construct a graph
G = nx.from_pandas_edgelist(df, 'node1', 'node2')

# Visualize the graph (optional)
plt.figure(figsize=(8, 8))
nx.draw(G, node_size=50, node_color='blue', edge_color='gray', with_labels=False)
plt.show()

# Convert graph to adjacency matrix (sparse format)
adj_matrix = nx.adjacency_matrix(G)

# Ensure the matrix is in sparse format for Spectral Clustering
adj_matrix = csr_matrix(adj_matrix)


```



```
# Define the number of clusters
n_clusters = 5  # Adjust as necessary

# Apply Spectral Clustering
sc = SpectralClustering(n_clusters=n_clusters, affinity='precomputed', assign_labels='kmeans')

# Fit the model
sc.fit(adj_matrix)

# Predict cluster labels
labels = sc.labels_

# Visualize clustering (optional for Facebook dataset)
pos = nx.spring_layout(G)
plt.figure(figsize=(8, 8))
nx.draw(G, pos, node_color=labels, node_size=50, cmap=plt.cm.rainbow, with_labels=False)
plt.show()

```



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

```

```
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.