UNIVERSITY OF GHANA

Social Networks and Graph Analysis – DSCD609

Network Analysis Report

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Network Analysis Report

1. Introduction

Understanding the structure of relationships within a research group or department is essential for analyzing collaboration patterns and identifying potential gaps in connectivity. This report presents a network analysis of a hypothetical research group using Python's NetworkX library. The network consists of six members, and the analysis includes computing key metrics such as the number of nodes and edges, degree distribution, and isolated nodes. A visualization of the network is also provided.

2. Methodology

The network was modeled as an undirected graph, where:

- Nodes represent individual members of the research group.
- Edges represent collaborative or relational ties between members.

The following steps were implemented:

1. Node Definition: Six members were included: Francis, Boakye, Mensah, Kofi, Dorothy, and Kusi.
2. Edge Construction: Five members (Francis, Boakye, Mensah, Kofi, Dorothy) were fully connected, forming a complete subgraph. Kusi was added as an isolated node.
3. Graph Creation: Using NetworkX, nodes and edges were added to the graph.
4. Metrics Computation:
   - Number of nodes and edges
   - Degree distribution
   - Identification of isolated nodes
5. Visualization: The graph was plotted using a spring layout for clarity.

3. Results

3.1 Number of Nodes and Edges

Nodes: 6
Edges: 10

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3.2 Degree Distribution

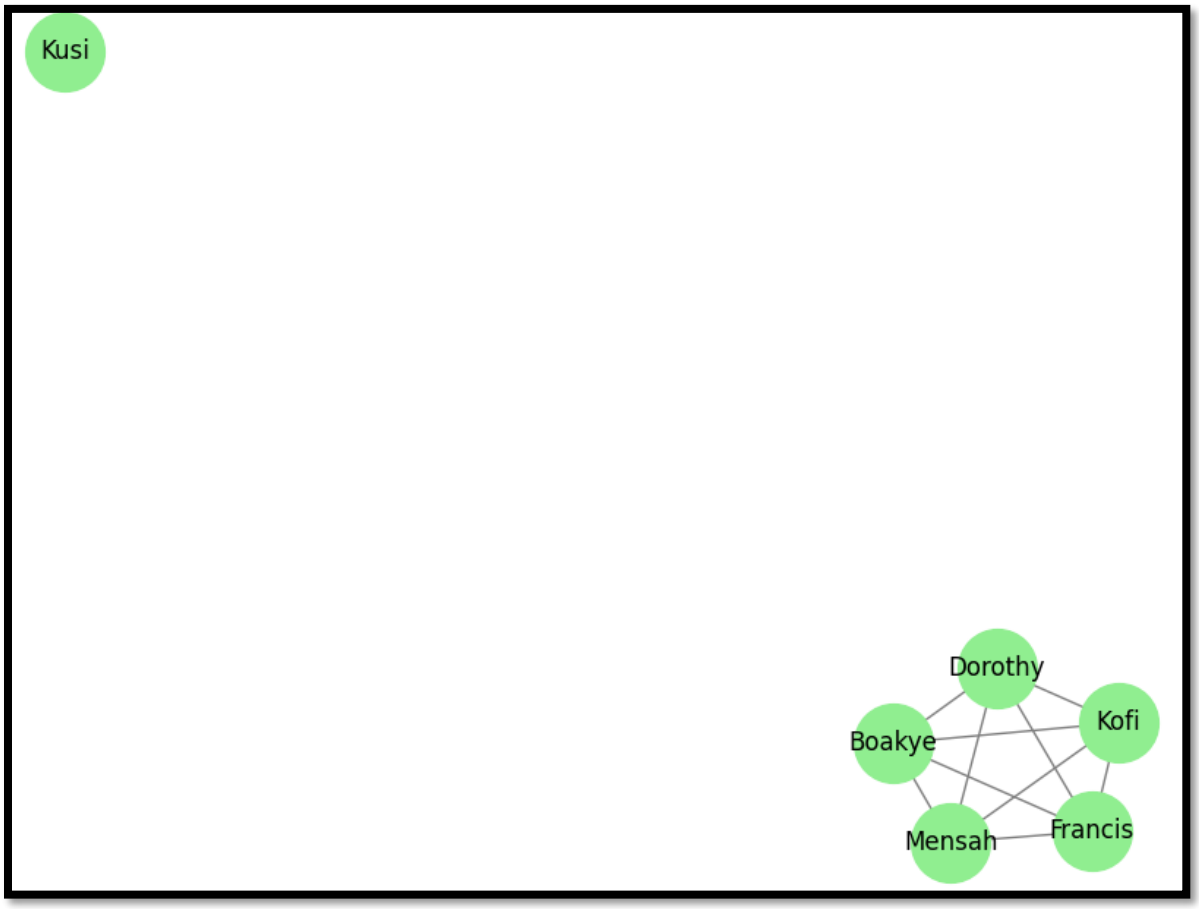
The degree of a node represents the number of connections it has:
Degree Distribution: {Francis: 4, Boakye: 4, Mensah: 4, Kofi: 4, Dorothy: 4, Kusi: 0}
Interpretation:
- Each of the five connected members has degree 4, indicating strong interconnectivity.
- Kusi has degree 0, making it an isolated node.

3.3 Isolated Nodes

Isolated Node: Kusi
This suggests that Kusi is not integrated into the collaborative network, which could indicate a lack of communication or involvement.

4. Visualization

The network visualization shows:



- A dense cluster of five interconnected nodes.
- One isolated node positioned away from the main group.

5. Interpretation and Insights

- The network exhibits a highly cohesive core of five members, which is beneficial for collaboration and information sharing.
- The presence of an isolated node (Kusi) highlights a potential issue: lack of engagement or exclusion from group activities.
- For optimal collaboration, efforts should be made to integrate isolated members into the network.

6. Conclusion

This analysis demonstrates how network modeling can reveal structural patterns within a research group. The strong connectivity among most members suggests effective collaboration, while the isolated node indicates an area for improvement.