Course : DSCD609 – Social Networking & Graph Analysis
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Date : 13th November 2025

Assignment 1:

1. Introduction

Networks provide a powerful way to model social relationships, interactions, and structural patterns within groups. This assignment required the construction and analysis of a directed graph representing members of a research group or department. Using Python's NetworkX library, a graph was created to visualize the relationships among five members: Elton, Asana, Harry, Isaac, and Samuel.

The objective of the task was to compute the number of nodes, number of edges, degree distribution, and identify any isolated nodes, as well as to produce a visualization of the resulting network as required in the assignment brief . The complete Python code used for the analysis is provided in the attached script .

2. Methodology

2.1 Tools and Libraries

- Jupyter
- NetworkX – for graph creation, computation of metrics, and visualization
- Matplotlib (implicitly through NetworkX's drawing functions)

2.2 Graph Construction

A directed graph (DiGraph) was constructed. The dataset was defined as a list of directed edges representing communication or relational links between group members.

- Each person in the group is connected to every other person, including reciprocal edges. For example:
- Elton → Asana, Harry, Isaac, Samuel
- Asana → Elton, Harry, Isaac, Samuel
- …and so on for all members

This results in a highly connected directed social network.

2.3 Visualization

The graph was visualized using networkx.draw(), with:

1

- Node size: 2020
- Node color: blue
- Label color: white

This allows for clear visibility of nodes and directional connections.

3. Results

3.1 Number of Nodes

The graph contains 5 unique nodes:

- Elton
- Asana
- Harry
- Isaac
- Samuel

This matches the number of members defined in the dataset.

3.2 Number of Edges

The script computed 20 directed edges in total.

Since each person is connected to the other four members, and all relationships are reciprocated, this results in a fully connected directed network:

$$
5 \text{ nodes} \times 4 \text{ outgoing edges per node} = 20 \text{ total edges}
$$

3.3 Degree of Each Node

In a directed graph, the degree is the sum of in-degree + out-degree.

From the output generated:

- All nodes have a degree of 8
  - 4 outgoing edges (to others)
  - 4 incoming edges (from others)

This symmetry confirms a uniformly connected structure.

3.4 Degree Distribution

The degree distribution is:

[
[8, 8, 8, 8, 8]
]

Since all nodes share identical structural properties, the distribution is uniform, representing a regular directed graph.

3.5 Isolated Nodes

There are no isolated nodes in the graph. An isolated node would have degree 0 (no connections), which does not occur in this dataset.

5. Visualization

A full visualization of the network was generated using NetworkX as required. This visualization clearly displays the five nodes and their directed edges.