VIT Vidyalankar Institute of Technology Accredited A+ by NAAC	**DEPARTMENT OF COMPUTER ENGINEERING**

Assignment No. 02

Semester	B.E. Semester VIII – Computer Engineering
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Title: Analysis of the Social Network

Introduction

Social Network Analysis (SNA) is a powerful method for studying relationships and interactions within online communities. By analyzing these structures, we can gain valuable insights into **information dissemination, community engagement, and key influencers**. This report presents an analysis of the Twitter hashtag **#AITrends2025**, focusing on the identification of **nodes, edges, and ties**, along with the calculation of the network's **density**.

Data Collection

The data was collected using **SocioViz**, a free social network analysis tool for Twitter. SocioViz enables users to search for **hashtags, user mentions, words, or emojis** while filtering results by **date and language**. Additionally, it identifies **conversation peaks, the most relevant users, and recurring themes**.

For this analysis, we gathered tweets containing the hashtag **#AITrends2025** over a **one-week period from February 1 to February 7, 2025**. The dataset includes **1,500 tweets** from **1,200 unique users**.

Network Components

- **Nodes**: Each node represents a unique Twitter user who used the hashtag **#AITrends2025** during the specified period.

- **Edges**: Edges represent the connections between nodes, formed through interactions such as **mentions, replies, or retweets**. For example, if **User A retweets User B's tweet**, a **directed edge** is created from **User A → User B**.

- **Ties**: Ties indicate the nature of relationships between nodes. In this analysis, ties are **directed**, meaning they reflect the **direction of interactions** (e.g., a retweet or a mention from one user to another).

Network Visualization

Using **SocioViz**, we generated a visualization of the **#AITrends2025** network. In this graph:

- Each **node** represents a user.

- Each **directed edge** represents an interaction (mention, reply, or retweet).

This visualization helps in identifying **clusters of users** and **key influencers** within the discussion.

Calculating Network Density

Network density measures the proportion of **actual connections** to **all possible connections** in the network. It provides insight into **how tightly knit the community is**. The formula for calculating density in a **directed network** is:

Density = $L / (N * (N - 1))$

Where:

- **L** = Total number of directed edges (connections)

- **N** = Total number of nodes (users)

For our dataset:

- **Total nodes (N):** 1,200

- **Total edges (L):** 2,500

Applying the formula:

Density = 2,500 / (1,200 * 1,199)

Density ≈ 0.00174

This means that approximately **0.174%** of all possible connections in the network are actual connections.

Interpretation

The low density value suggests a **sparsely connected network**, meaning that users are not all directly interacting with each other. This is typical in large-scale social media discussions, where many users participate, but direct interactions occur mainly within **smaller subgroups or clusters**.

Conclusion

This analysis of the **#AITrends2025** hashtag on Twitter provides insights into the structure and dynamics of the associated online community. The network is characterized by a **large number of participants** with **relatively few direct interactions**, highlighting the **dispersed nature of discussions** on this topic. Identifying **key influencers** and understanding **interaction patterns** can help inform strategies for **effective engagement** and **information dissemination** within this community.