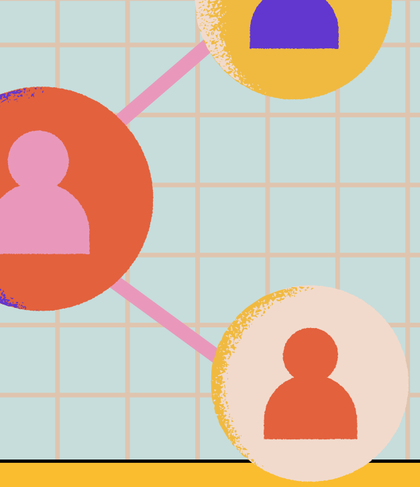
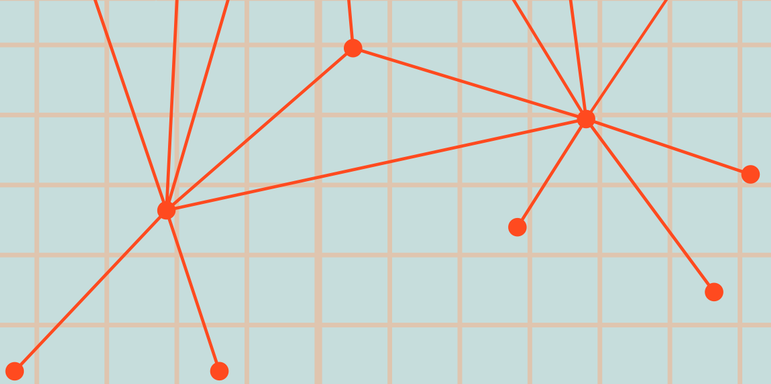


Project Presentation for
SGN Workshop, IMSc Chennai



How do we socialize?

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Mentored by:
Dr. V Sasidevan
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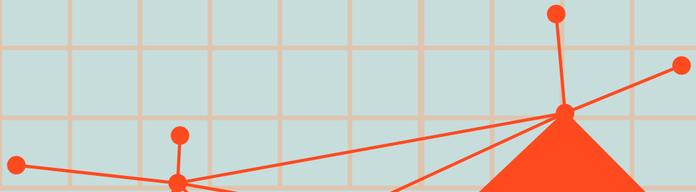


What we are trying to do

Our question began by observing the socialization and the formation of teams at the workshop.

An interesting dynamic appeared and prompted us to ask, “What goes into the formation of social groups?”

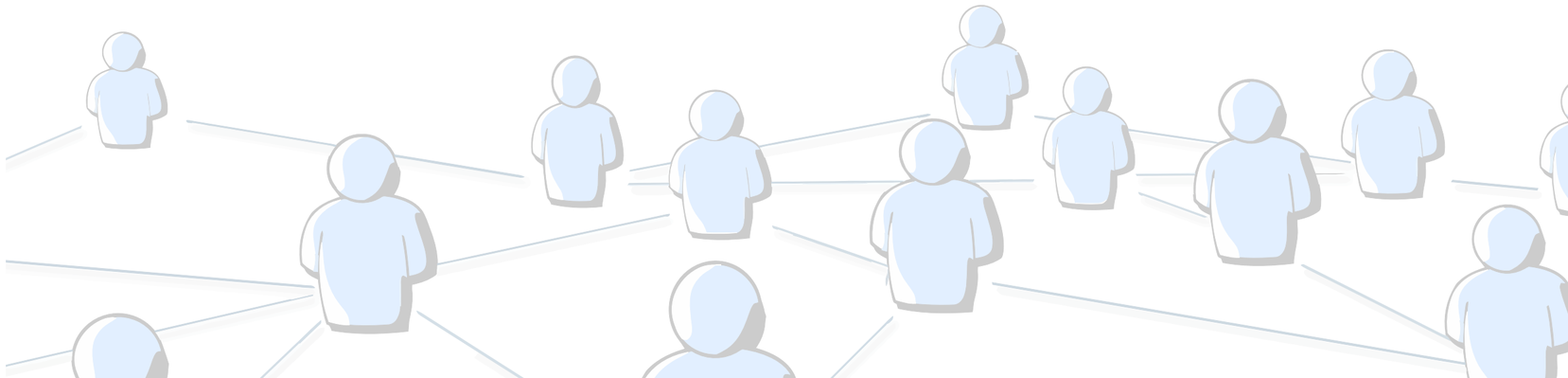
Our project is an attempt to understand, with a rudimentary simulation and some graph theory, how a group of people will behave and bond when we change some parameters of the situation.

The Simulation

36 agents
d-max = 5
radius of influence assigned randomly from [1, 2, 3, 4, 5]

Conditions for connection:
1) agents must be in each other's radius of influence
2) the dot product of their interest vectors must be more than the larger of the two thresholds

No connections are broken

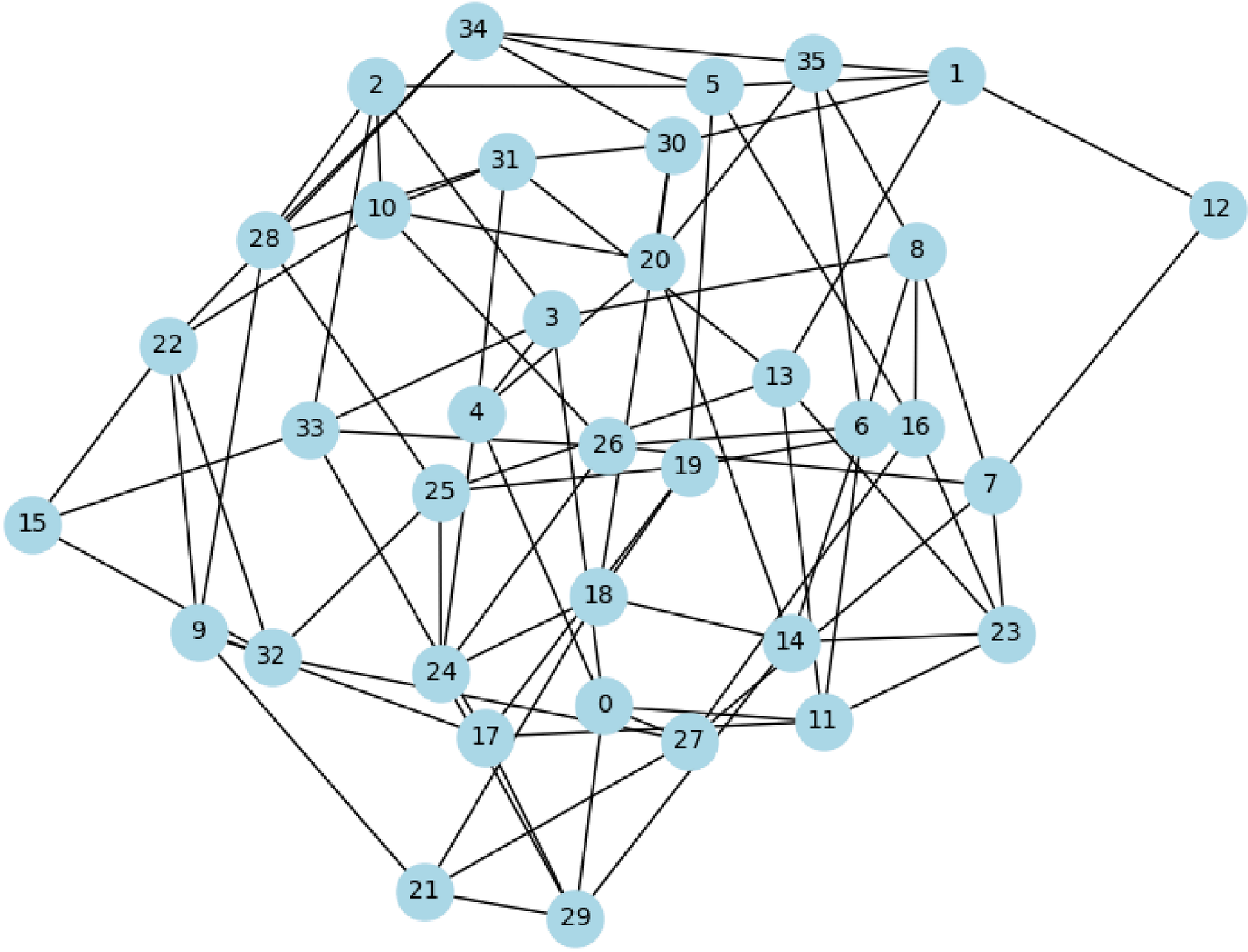


The Model

The model has 2 variable parameters:

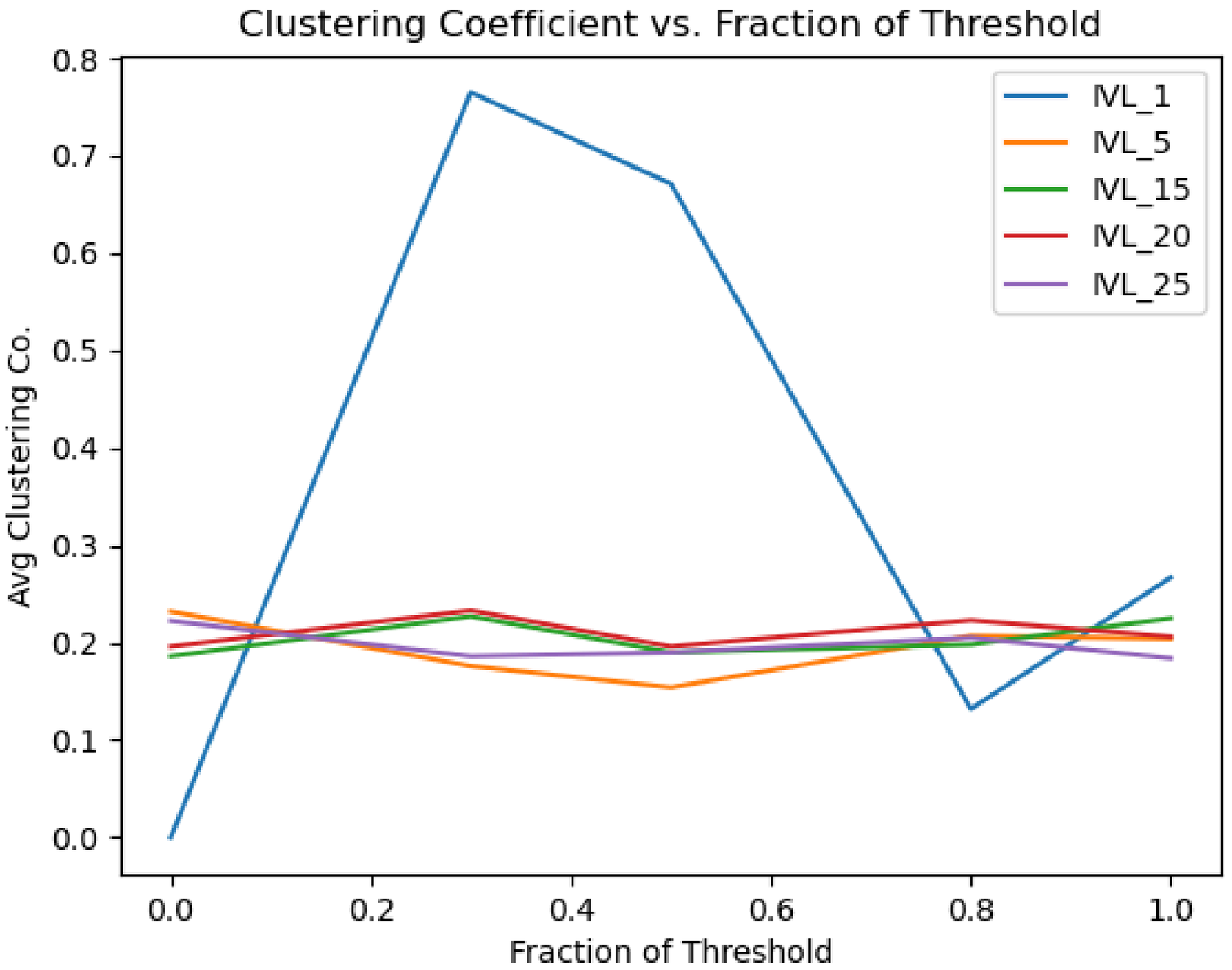
- **Interest vector:** every person is assigned an interest vector that emulates their interests. This is a proxy for topics over which people may connect, like music, dance, books, etc. Every interest vector is of the same size (n × 1). Each index of the vectors corresponds to the same "interest" and holds one of two values, i.e., 0 or 1, which stand for "interested" or "not interested".

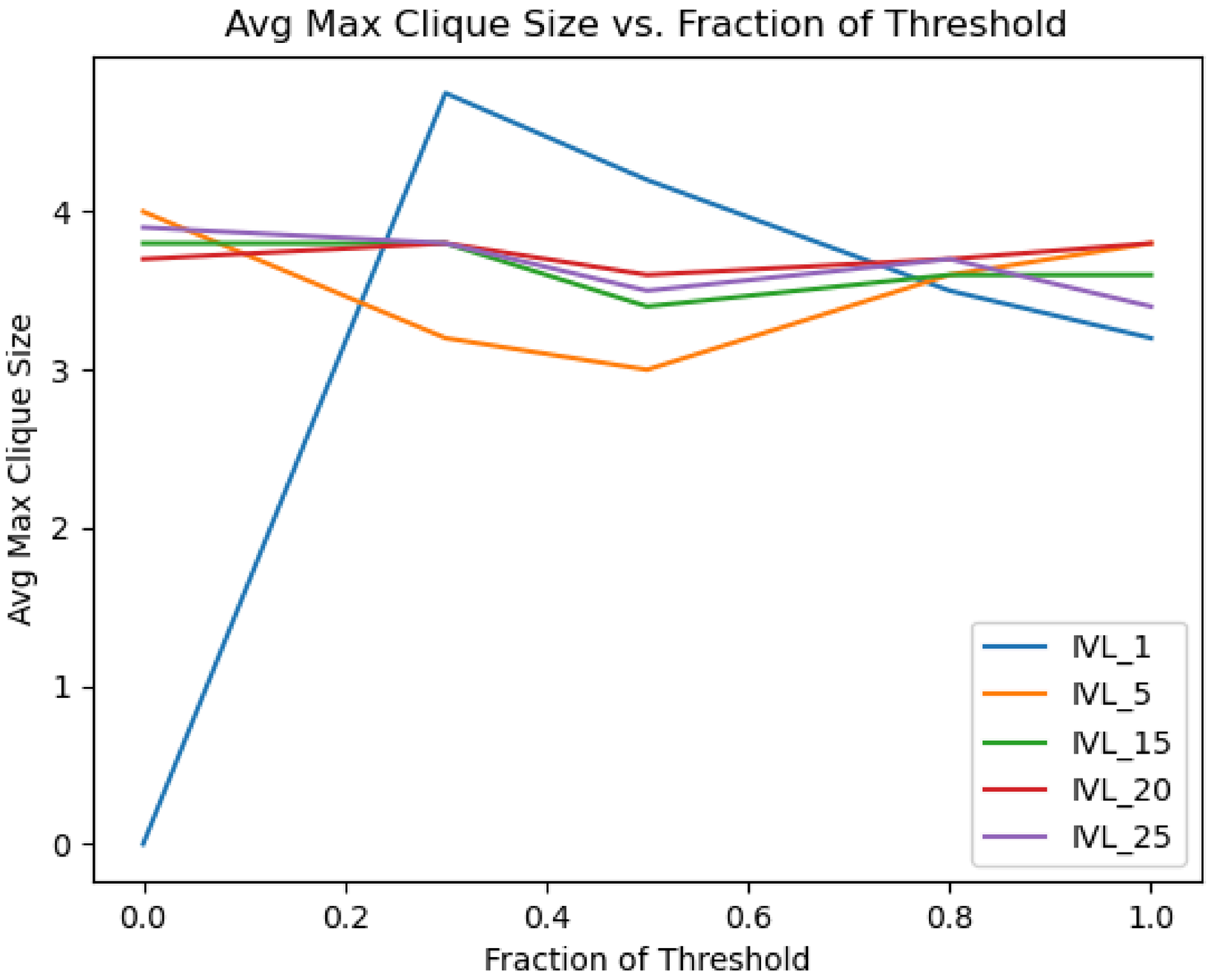
- **Fraction of threshold:** A threshold is a randomly assigned number to an agent that is either 1 or 2. The threshold is the number of matching interests that an agent requires in order to connect with another agent. Only if the **number of matching interests between two agents ≥ the threshold of the agents**, a connection is possible. For this model, we will see if varying the ratio of agents with threshold 1 to threshold 2 can affect the clustering.

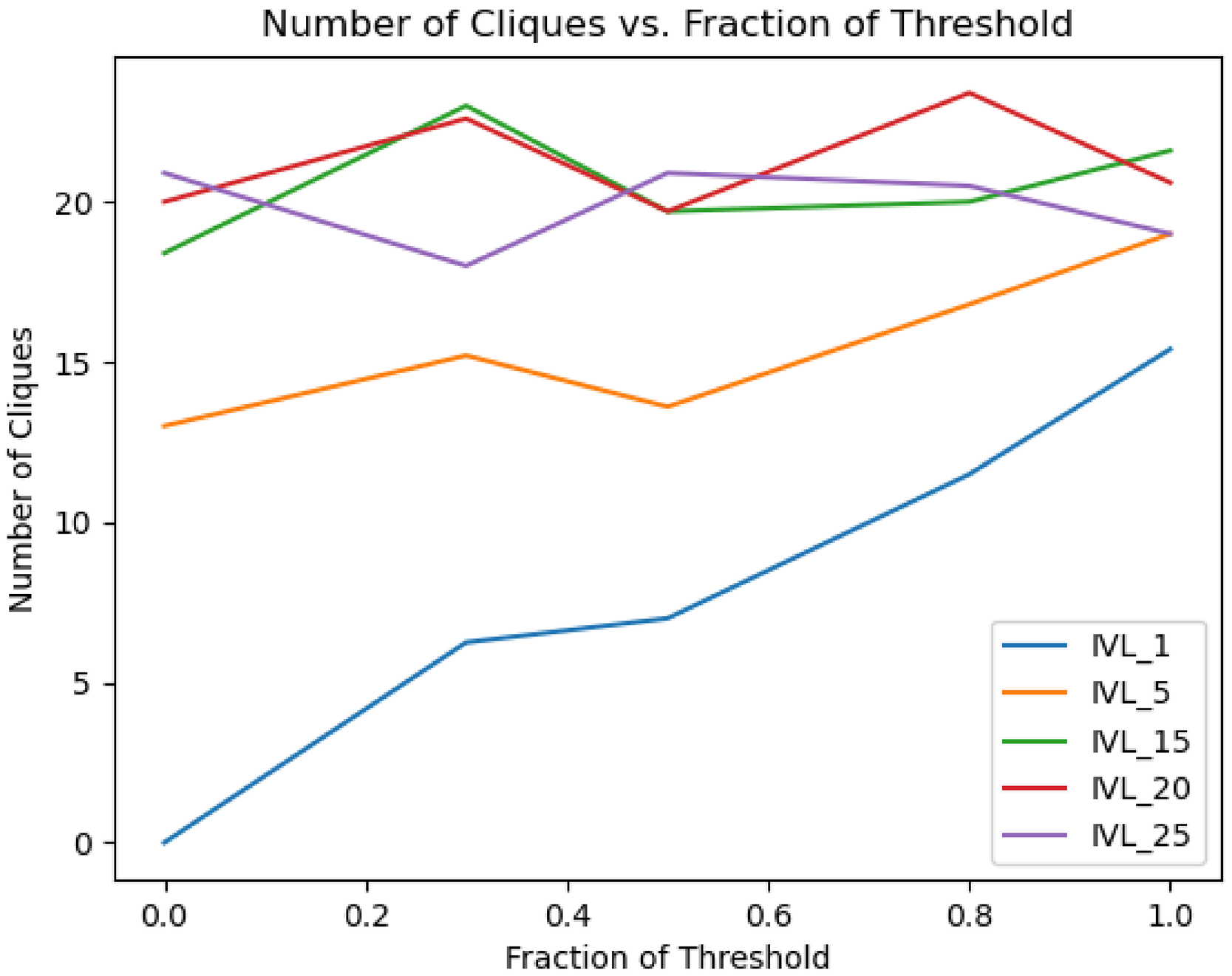

34
35
1
2
5
30
31
12
10
28
20
8
3
22
13
4
33
6
16
26
19
7
25
15
18
9
14
23
32
24
0
11
17
27
21
29

The Question

Does the extent of formation of clusters in a network change when we change
a) the number of interests in the interest vector
and b) the ratio of agents with threshold 1 to agents with threshold 2?


Clustering Coefficient vs. Fraction of Threshold
Avg Clustering Co.
Fraction of Threshold
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.0
0.2
0.4
0.6
0.8
1.0
ML_1
ML_5
ML_15
ML_20
ML_25


Avg Max Clique Size vs. Fraction of Threshold
Avg Max Clique Size
Fraction of Threshold
0
1
2
3
4
0.0
0.2
0.4
0.6
0.8
1.0
ML_1
ML_5
ML_15
ML_20
ML_25


Number of Cliques vs. Fraction of Threshold
Number of Cliques
0
5
10
15
20
0.0
0.2
0.4
0.6
0.8
1.0
Fraction of Threshold
IVL_1
IVL_5
IVL_15
IVL_20
IVL_25

Analysing simulation data

- The different Interest vector length (1, 5, 15, 20, 25) have distinct trends in how the average maximum clique size changes with the fraction of threshold; IVL plays a role in influencing the network structure and the formation of cliques.

- Generally, over most IVL values, as the fraction of threshold increases, the average maximum clique size tends to slightly decrease. This is likely because higher thresholds lead to more stringent conditions for nodes to be connected, resulting in smaller and less densely connected cliques.

Analysing simulation data

IVL-Specific Trends:

IVL 1: Shows a sharp decrease in average maximum clique size as the threshold increases.
IVL 5: Exhibits a more gradual decrease compared to IVL 1.
IVL 15 and IVL 20: Display a more stable trend with a less pronounced decrease as the threshold increases.
IVL 25: Shows a slight increase in average maximum clique size initially and then a gradual decrease.

Analysing simulation data

Some intuitive interpretations:

IVL as a network density determiner - The IVL might be acting as a parameter that controls the overall density or connectivity of the network. Higher IVL values could lead to denser networks, resulting in larger cliques being more prevalent, even at higher thresholds.

Effect of threshold fraction on clique formation - The threshold acts as a filter, removing weaker connections. As the threshold increases, the network becomes sparser, and larger cliques are less likely to form.

Limitations of the Model

- Technical limitation with the conditions of connection
- Oversimplification of reality
- Limited memory and static characteristics

Thank you