Spread of Misinformation in Social Media
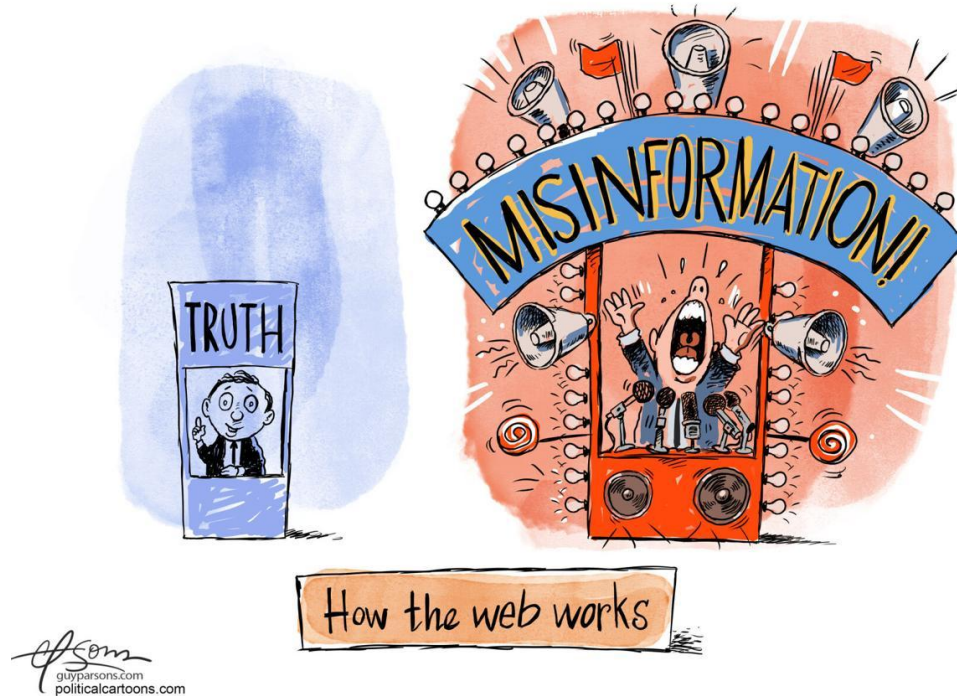
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Information Propagation in Social Networks

Examples: fake news, propaganda, marketing strategies, innovations etc.

Linear Threshold Model

- Two states : Active and Inactive
- Threshold dependent activation: Inactive node becomes active on crossing the threshold.
- State of a node is influenced only by the neighbouring nodes in real-time.

$$b_{v,w1} + b_{v,w4} + b_{v,w5} \geq \theta_v$$

○ *Inactive node*   ● *Active node*
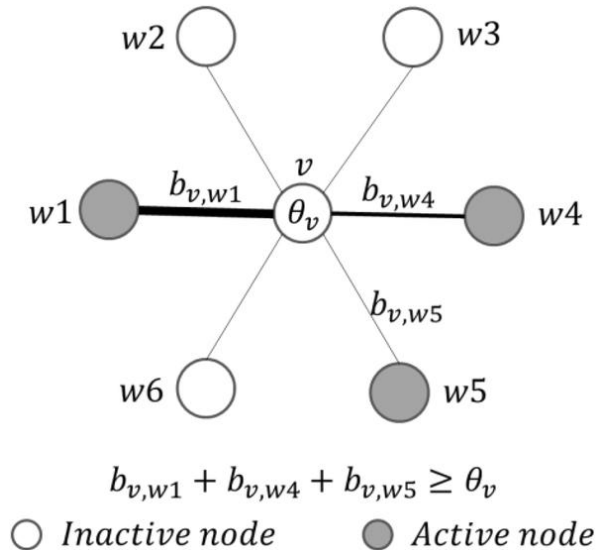
Aim

- Study the effect of faster propagation of misinformation on the network.
- Role of memory in the propagation of information across the network.

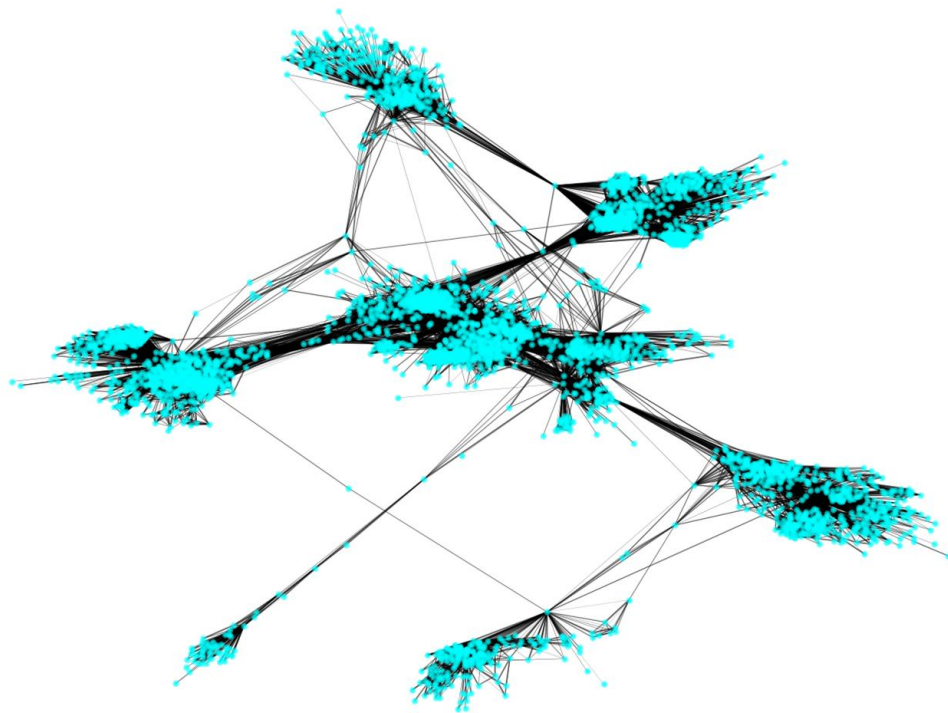# Our Modified Linear Threshold Model

- Three states:

$$w_i(t) = \begin{cases} -1, & \text{truth} \\ +1, & \text{misinformation} \\ 0, & \text{passive} \end{cases}$$

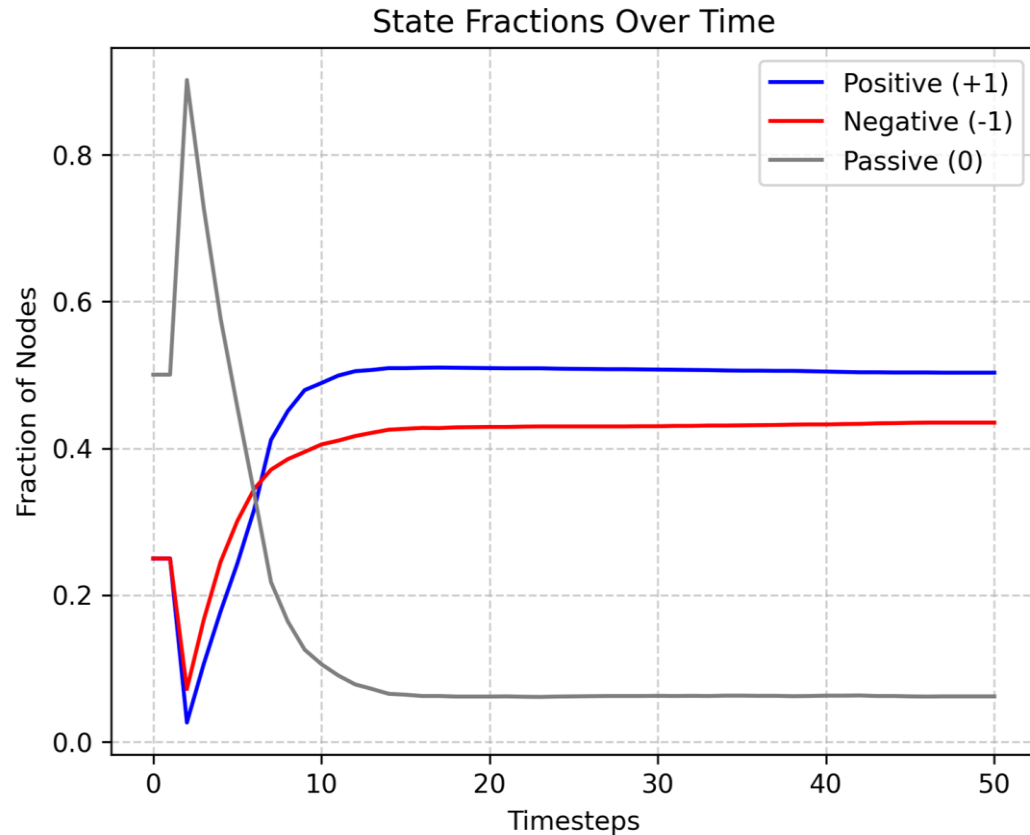$$\sum_{t=T-s}^{T} \left(\sum_{i \in active} b_{v,w_i} w_i(t) \right) > \Theta_v$$

- Two thresholds: Positive and Negative
- **Memory**: Accounts for states at previous timestamps also (sliding window)
- Data: Facebook Network (~ 4000 nodes)

The Facebook Network

Dataset statistics	
Nodes	4039
Edges	88234
Nodes in largest WCC	4039 (1.000)
Edges in largest WCC	88234 (1.000)
Nodes in largest SCC	4039 (1.000)
Edges in largest SCC	88234 (1.000)
Average clustering coefficient	0.6055
Number of triangles	1612010
Fraction of closed triangles	0.2647
Diameter (longest shortest path)	8
90-percentile effective diameter	4.7

J. McAuley and J. Leskovec. Learning to Discover Social Circles in Ego Networks. NIPS, 2012.

Results: Equal rates | initial fractions - 25,25,50 | s=5

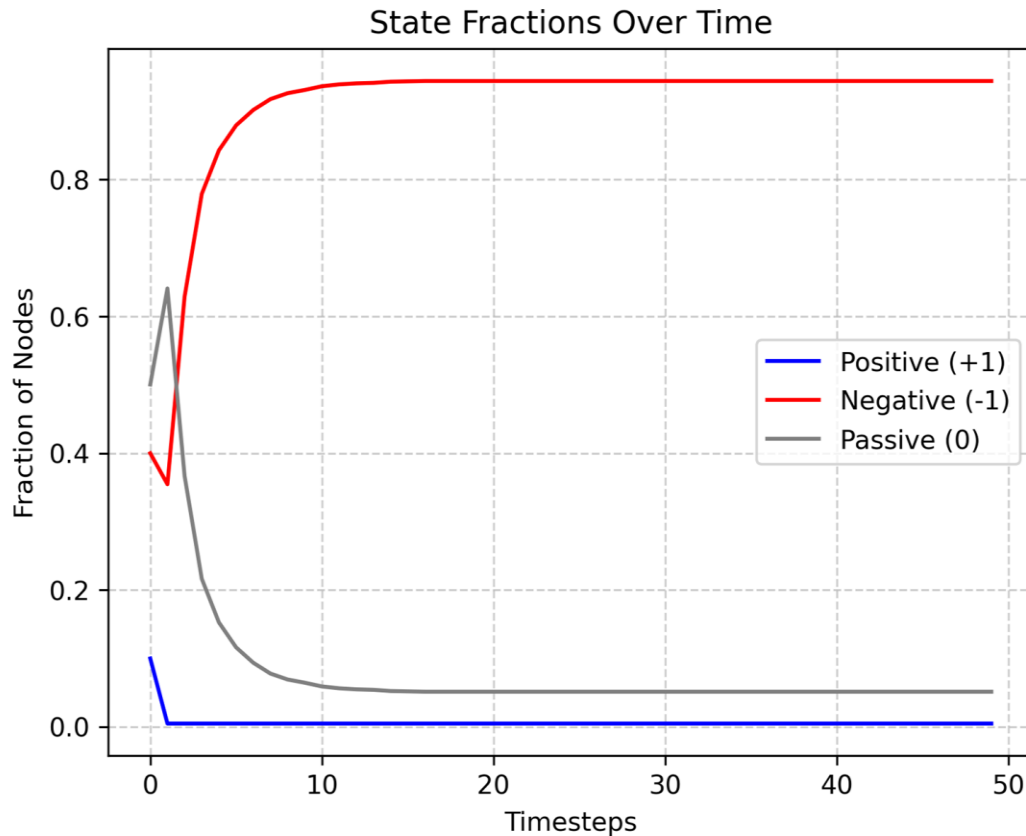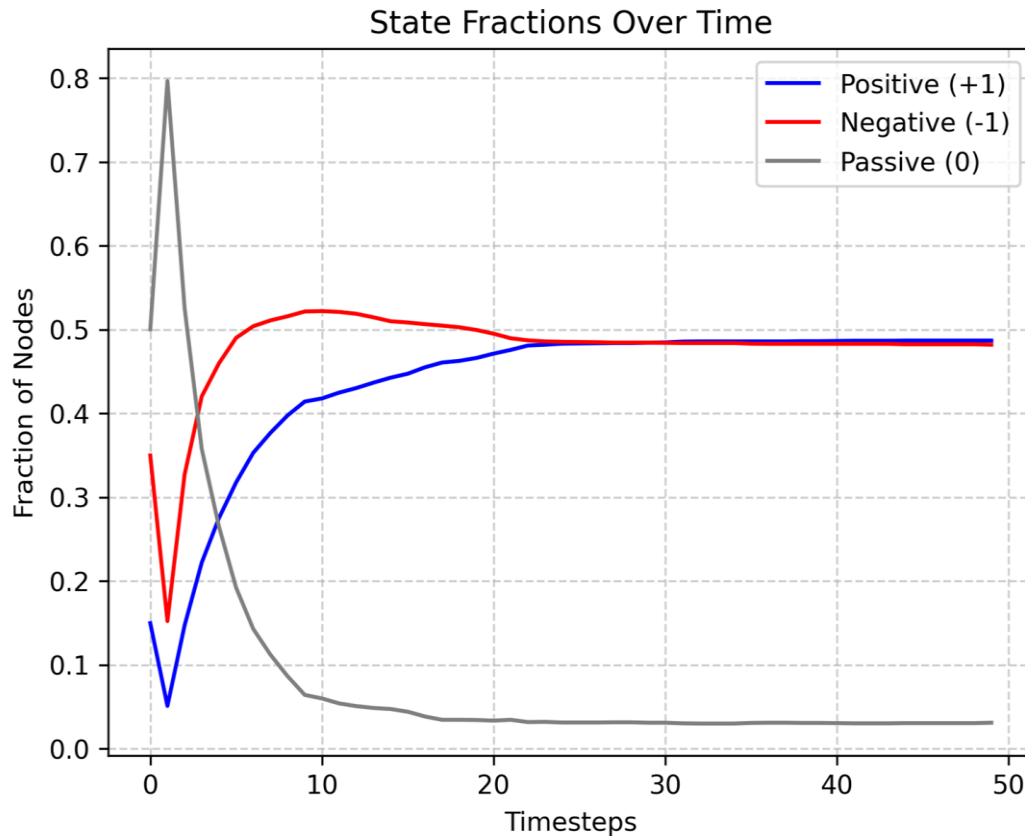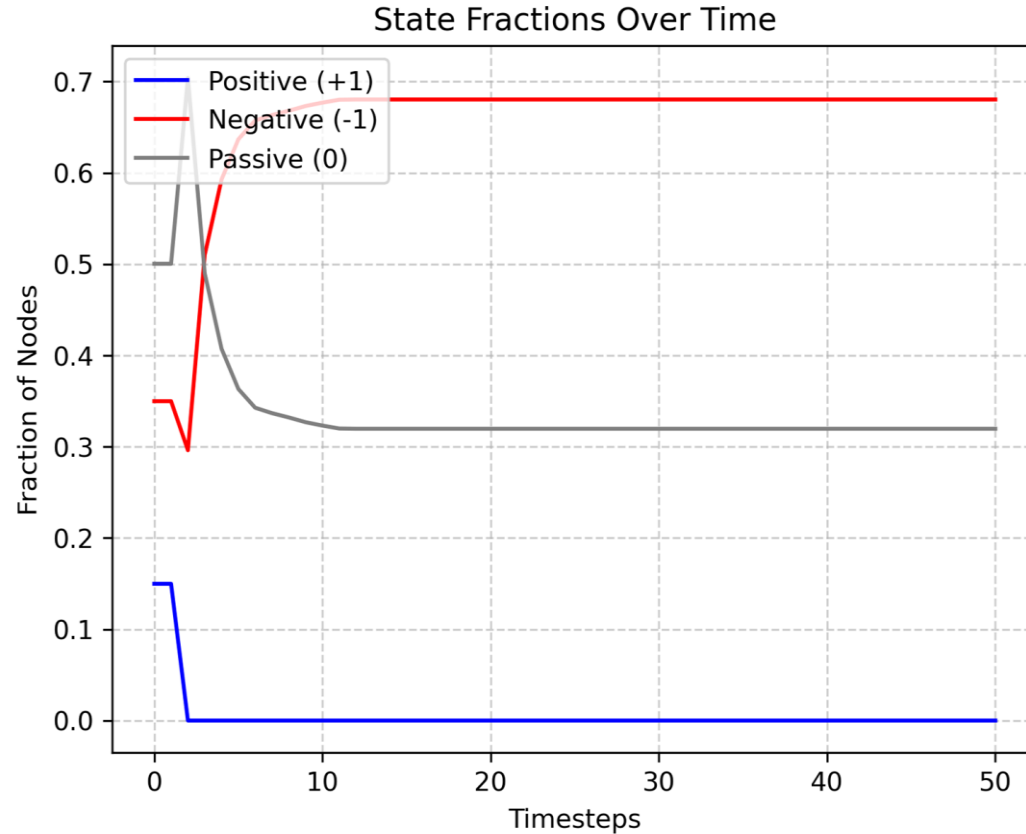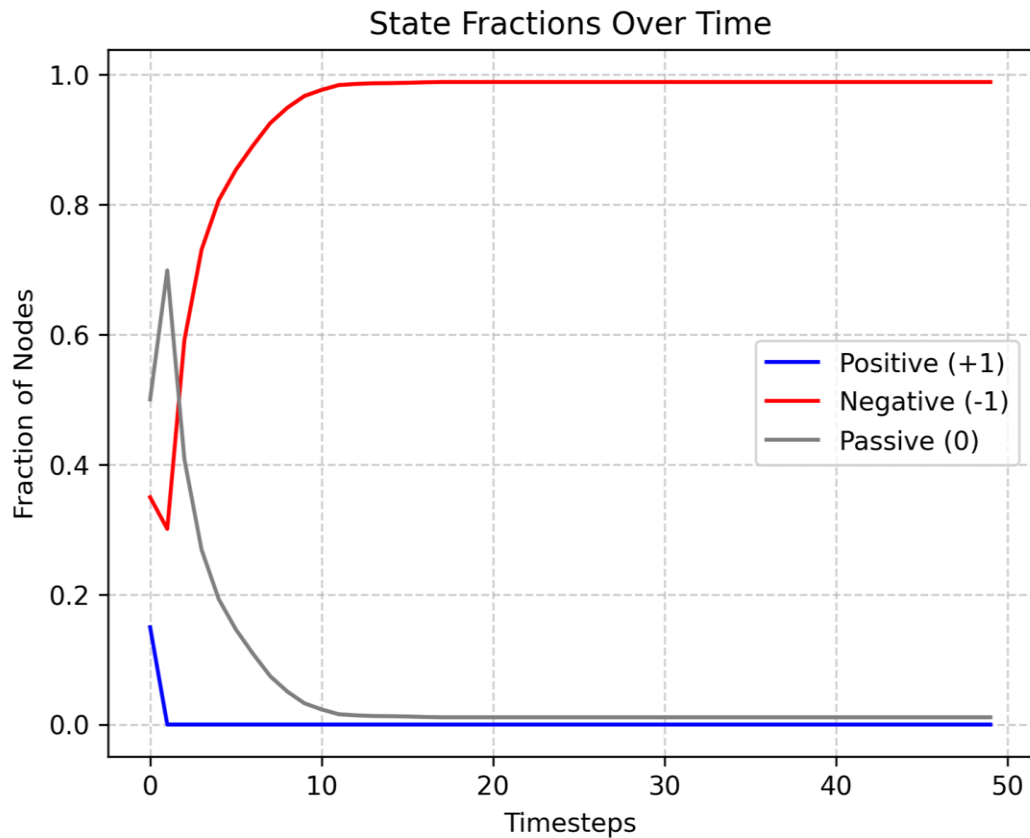State Fractions Over Time

Results: 2x Positive | initial fractions - 25,25,50 | s=5
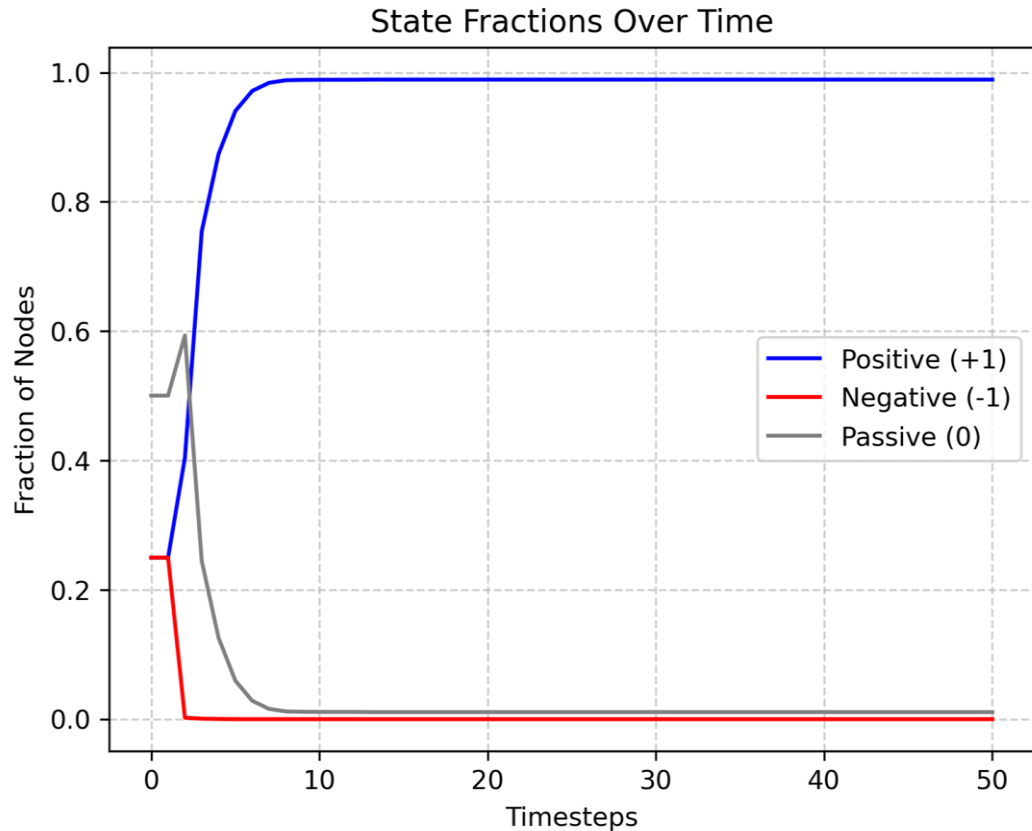
Results: 2x Positive | initial fractions -10,40,50 | s=5

Results: 2x Positive | initial fractions - 15,35,50 | s=5
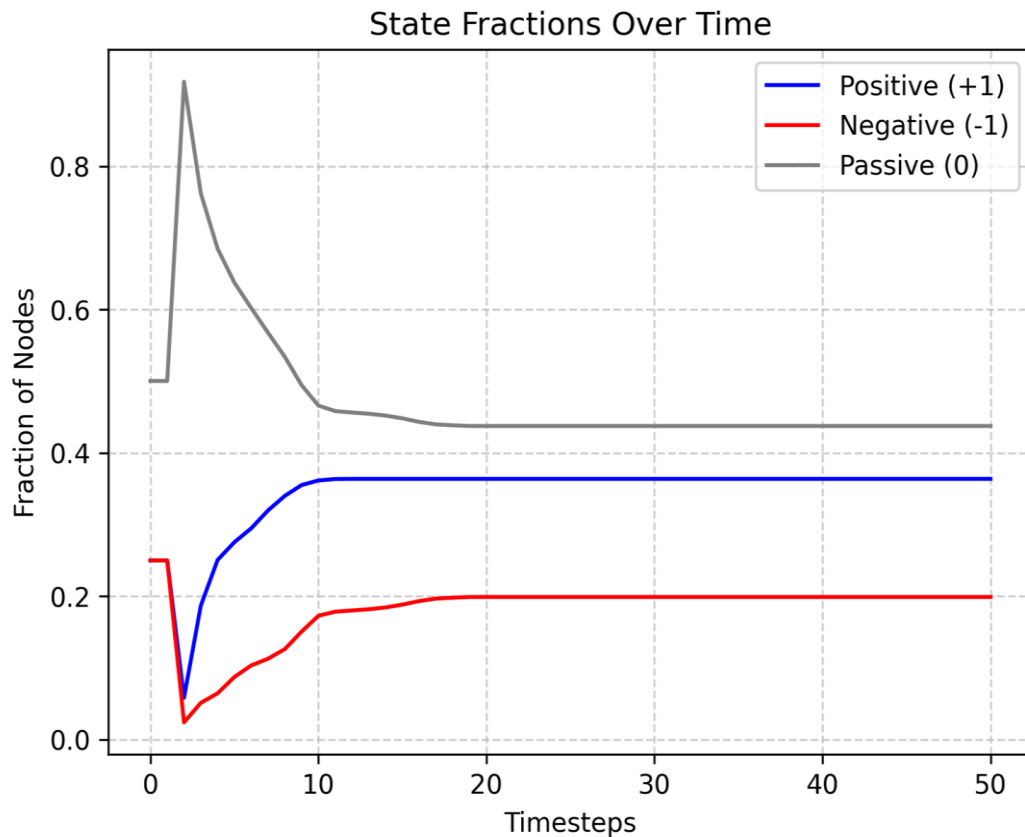

State Fractions Over Time

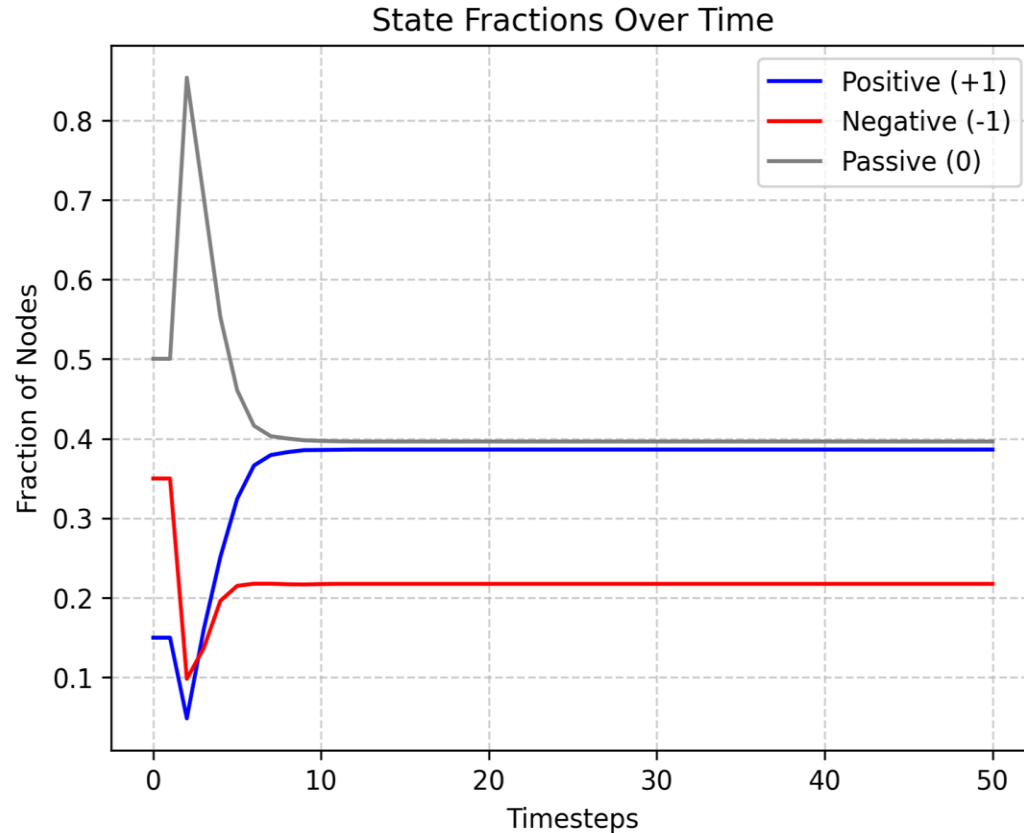# Results: 2x Positive | initial fractions - 15,35,50 | s=1

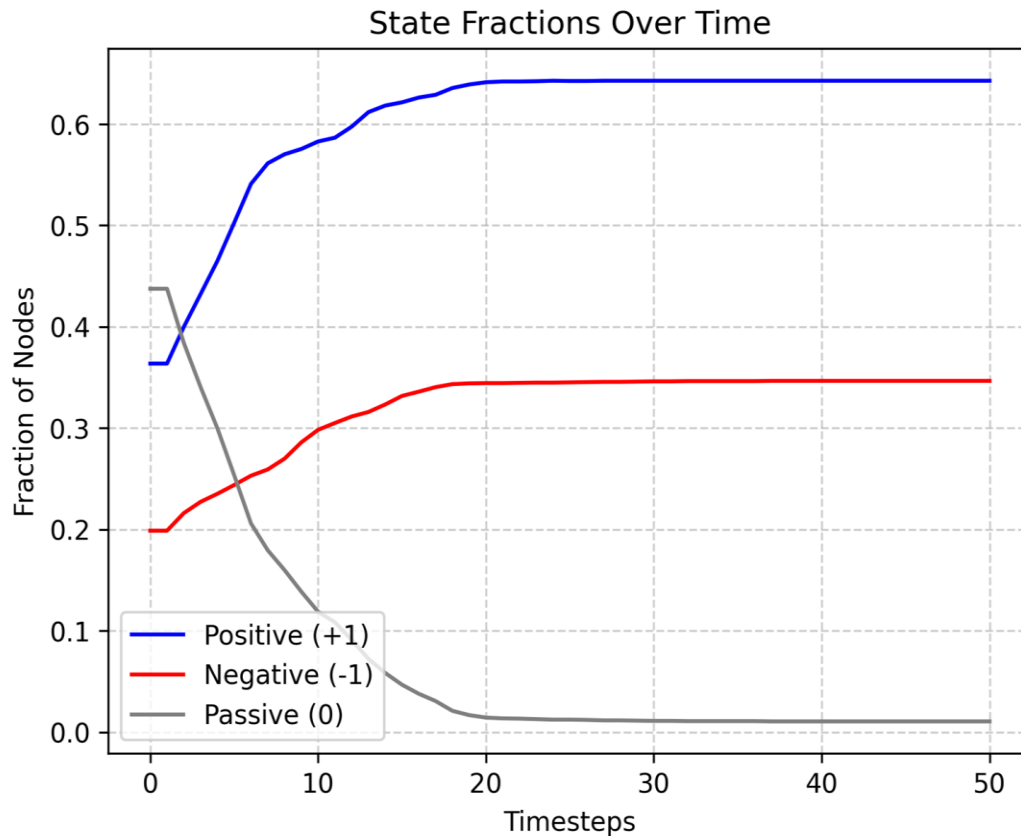# Results: 2x positive | initial fractions - 15,35,50 | s=10

Results: Equal rates | initial fractions - 25, 25, 50 | s=1

Results: 2x Positive | initial fractions - 15, 35, 50 | s=1

Results: 2x Positive | initial fractions - 15, 35, 50 | s=10

State Fractions Over Time

Conclusions

- Modular network results in different subgroups emerging.

- Memory and accumulation plays a role in persistence. On the other hand, lesser memory results in increased proportions of passive states.

THANK YOU