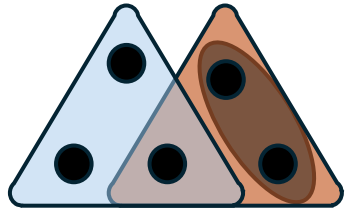


1. Theoretical background

- **Hypergraph** contains hyperedges that can connect an arbitrary number of nodes



Example of a hypergraph

- **SICP** is a spreading model where, at each time step, a node spreads through one of its hyperedges, infecting nodes with probability β
- **Diffusion Backbone** is a network where each hyperedge is assigned a weight equal to the average number of infections cause by that hyperedge

2. Approximating backbone weights

- Each node used once as the infection seed
- The average number of infections directly caused by a hyperedge is counted
- Repeated for 100 realizations to reduce randomness
- Computed with probability of infection $\beta = 0.3$, $\beta = 0.02$ and $T = 25$ time steps

3. Measured Properties

Based on 2 hypotheses:

- Early infected nodes cause larger backbone weights

- Degree
Number of unique neighbours
- Hyperdegree
Number of hyperedges
- Neighbourhood Coefficient
Degree / Hyperdegree
- Closeness Centrality
Average proximity to all other nodes

- Hyperedges important for shortest paths have larger backbone weights

- Betweenness Centrality
Frequency in shortest paths
- Shortest Detour
Length of alternative paths

Evaluation using Pearson and Kendall correlations between the properties and the backbone weights across six datasets

4. Results

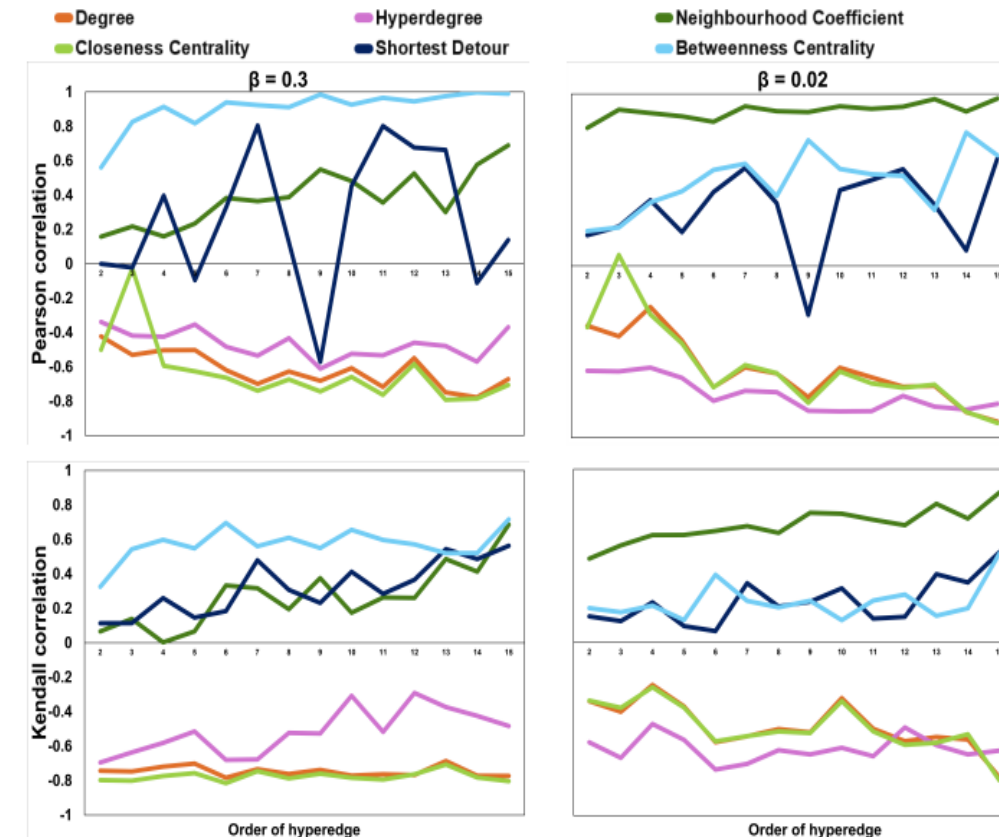
For the algebra dataset

Degree, Hyperdegree, and Closeness Centrality show (strong) negative correlations

Neighbourhood Coefficient shows positive correlations: moderate for $\beta = 0.3$ and strong for $\beta = 0.02$

Betweenness Centrality shows positive correlations, stronger for $\beta = 0.3$ than $\beta = 0.02$

Shortest Detour shows positive correlations. However, Pearson correlation highly fluctuates



5. Conclusions

- Correlations depend on the infection rate and the network structure
- Little support was found for first hypothesis: Degree, Hyperdegree, and Closeness Centrality generally showed strong negative correlations
- Neighbourhood Coefficient showed positive correlations for low infection rates
- Properties related to shortest path showed positive correlations with the backbone weights
- Global properties seem to perform better at a higher infection rate, while local seem to perform better at a lower infection rate