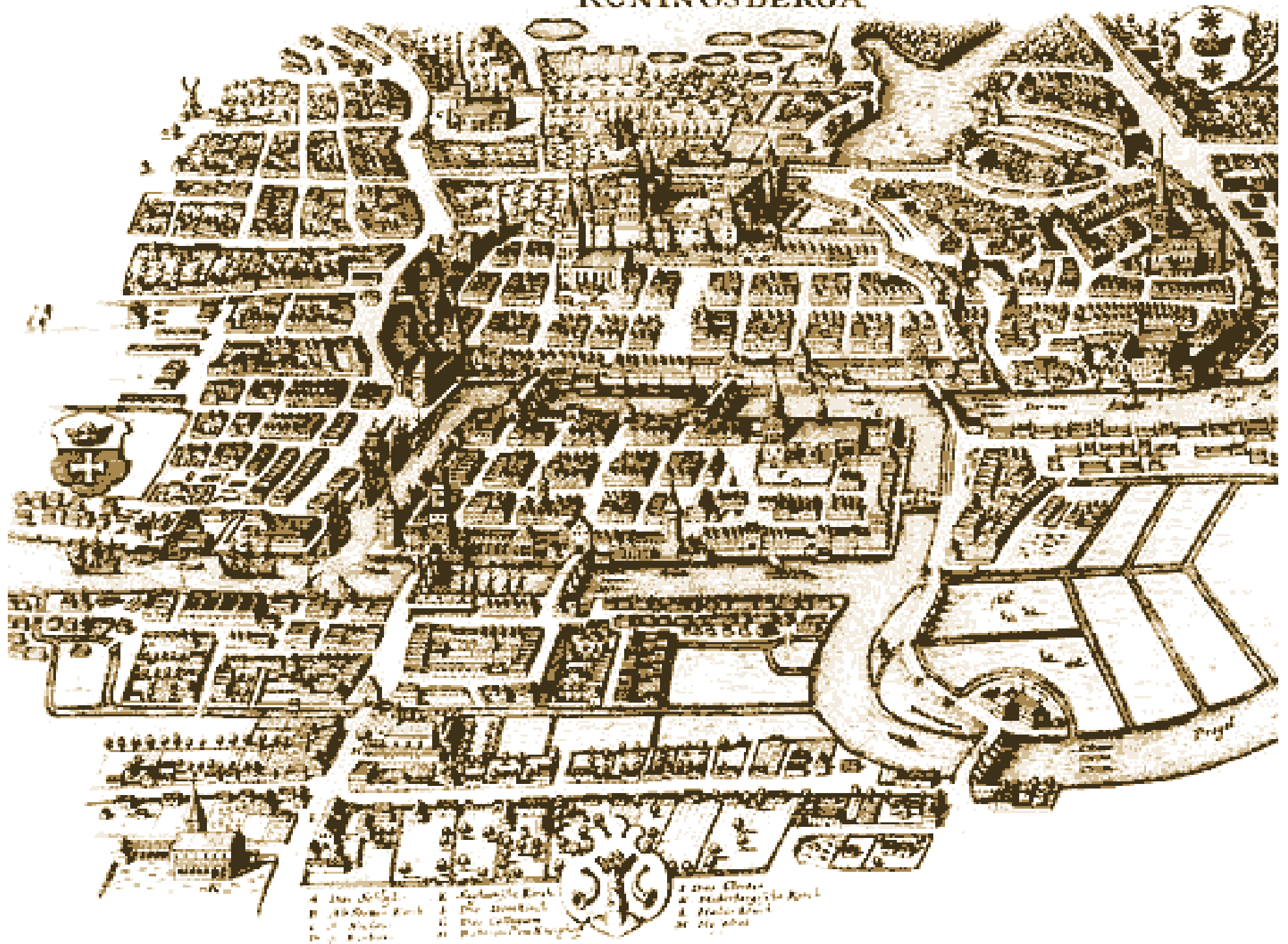
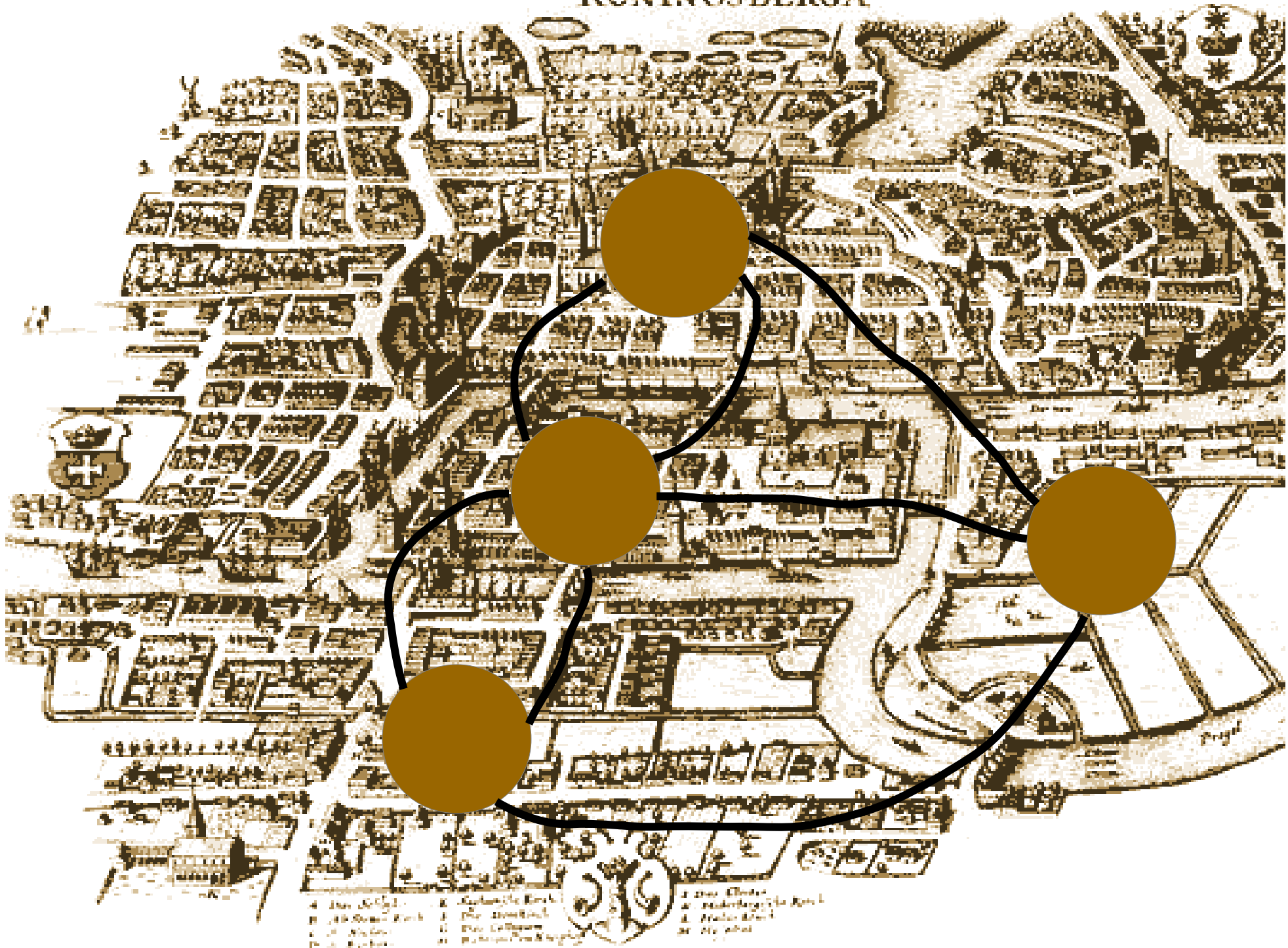


# KONINGSBERGA



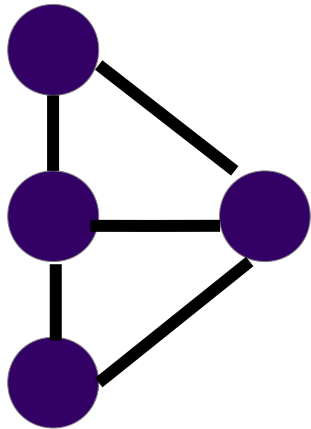
# KONINGSBERGA



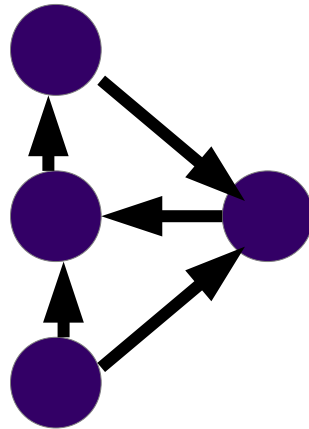
Representing a system as a Network can be useful for retrieving some of its properties.

# Networks

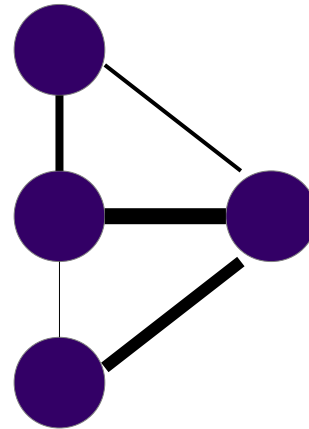
Graph



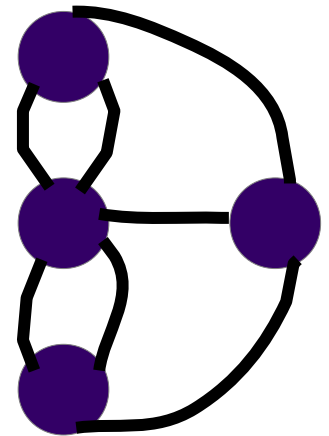
Directed Graph



Weighted Graph

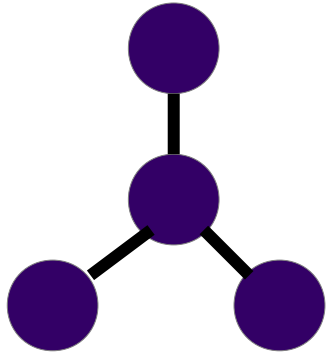


Multigraph

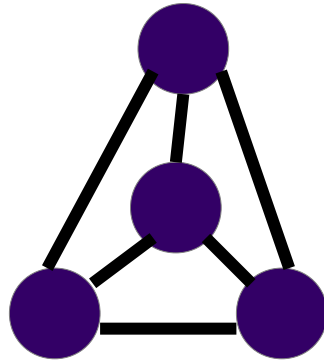


# Networks

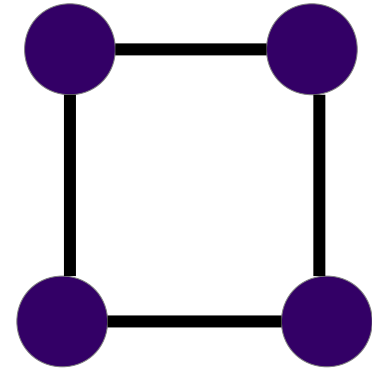
Star Graph



Clique

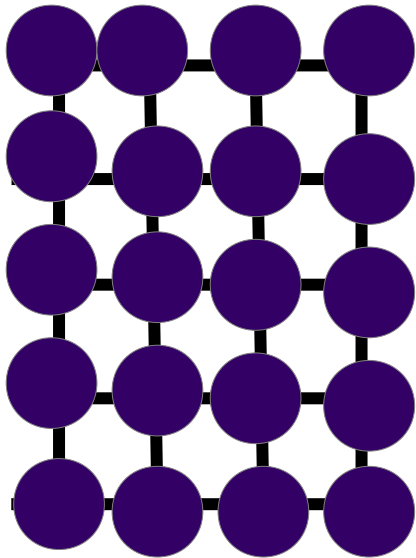


Cycle Graph

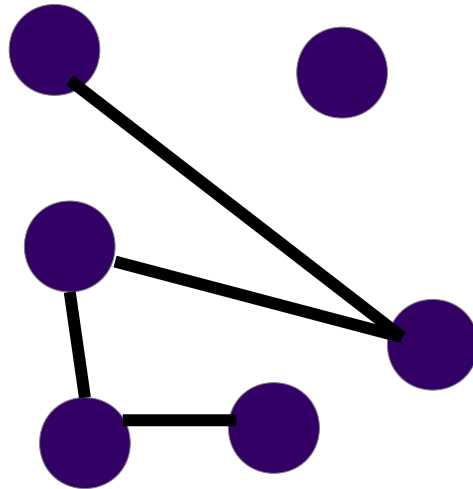


# Networks

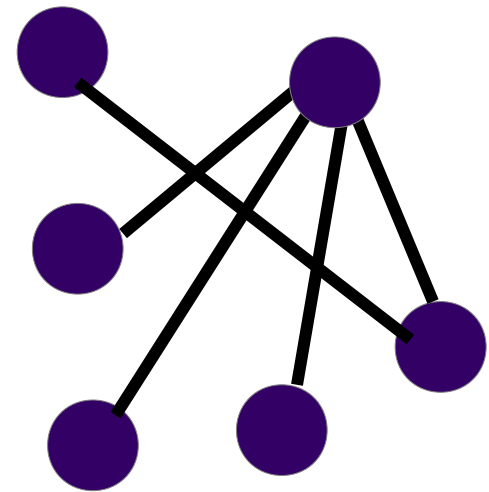
Regular



Random



Scale Free



# Networks

## Static Properties

### PBT Framework

- How robust is the system against failure?
- How efficient is the structure of the system to act as a trade unit?
- How clusterized is the system, are there communities?

### Game Theory

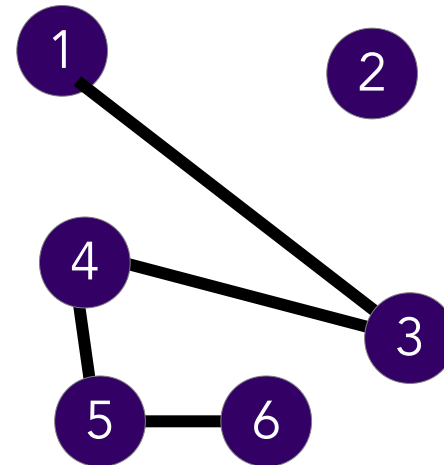
- Topology dependent phase diagram

# Networks

## Dynamics on Networks

Adjacency Matrix and Discrete Time

$$\begin{pmatrix} 0 & 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 1 & 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 & 0 & 1 \\ 0 & 0 & 0 & 0 & 1 & 0 \end{pmatrix}$$

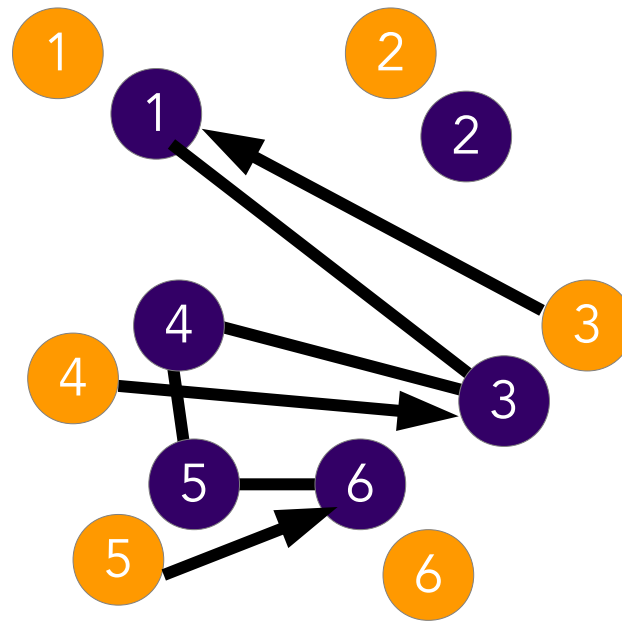




# Networks

## Dynamics on Networks

Beyond Markov: More complex time relations and memory



# Networks

## Dynamics on Networks

### Navigation

- Spatially weighted function
- Discretization of continuous space
- Movility Patterns

## Dynamics of Networks

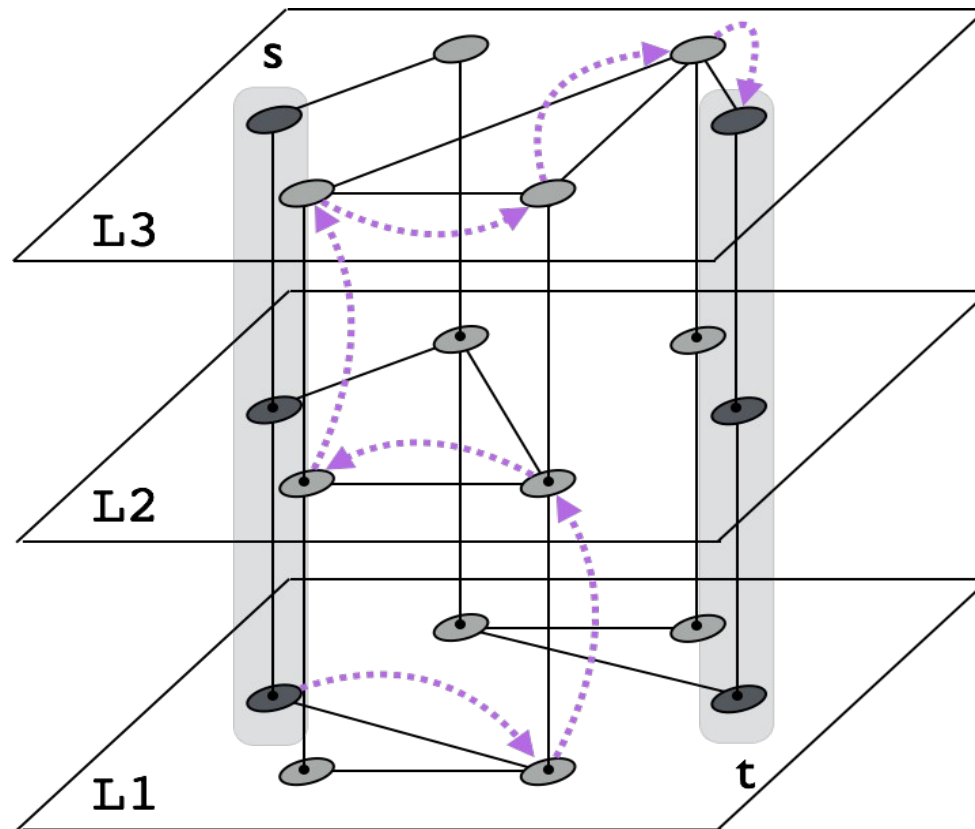
### Prediction of future scenarios

- How does the network dynamics affect the topology?

# Networks

## Generalizations

### Multilayer Networks

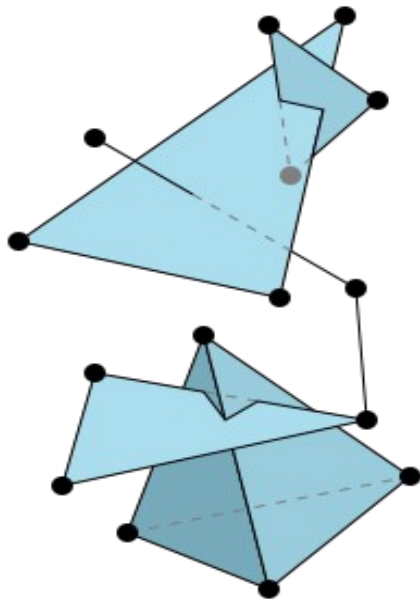


# Networks

## Generalizations

### Beyond Dyadic Interactions

Simplicial Complex



Hypergraph

