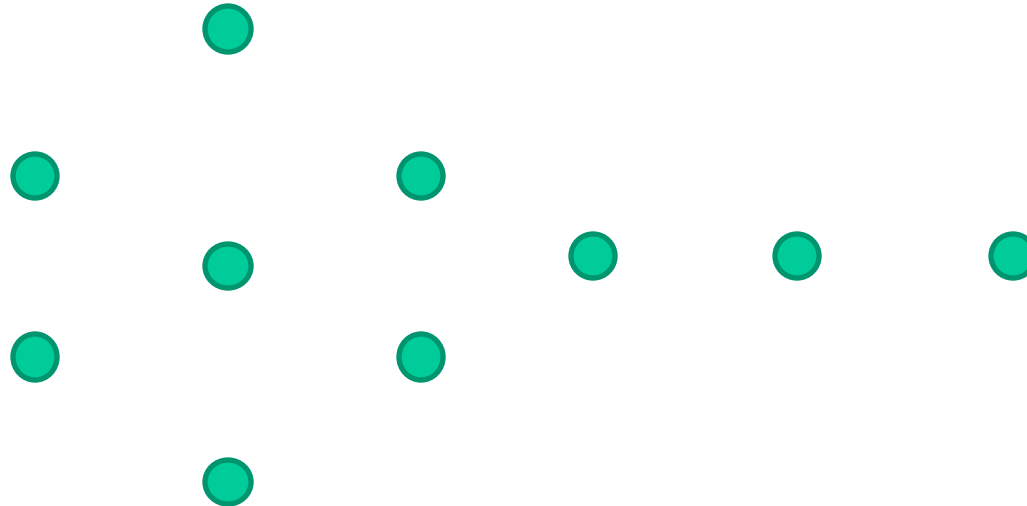Carlos J. Costa

NETWORK SCIENCE

Agenda

- Main concepts

- Measurements

- Tools

- Applications

- Challenges

Network Elements

- "vertex" and "edge" (Mathematics)

- "nodes" and "connections" (or links) (Computer Science)

- "Actors" (or "agents") and "relationships" (Sociology)

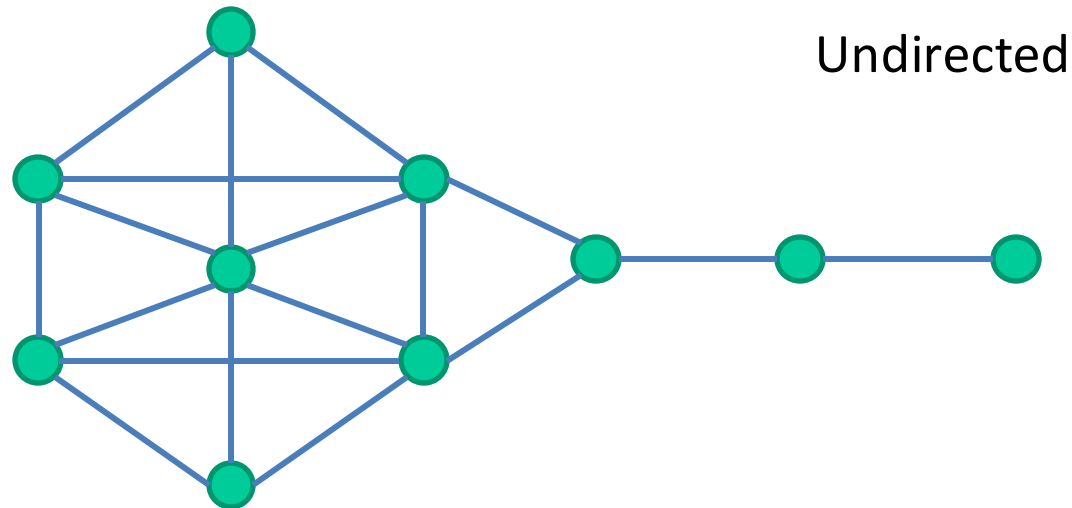- "site" and "bond" (Physics)

- "Dot" and "arcs" (or ties)

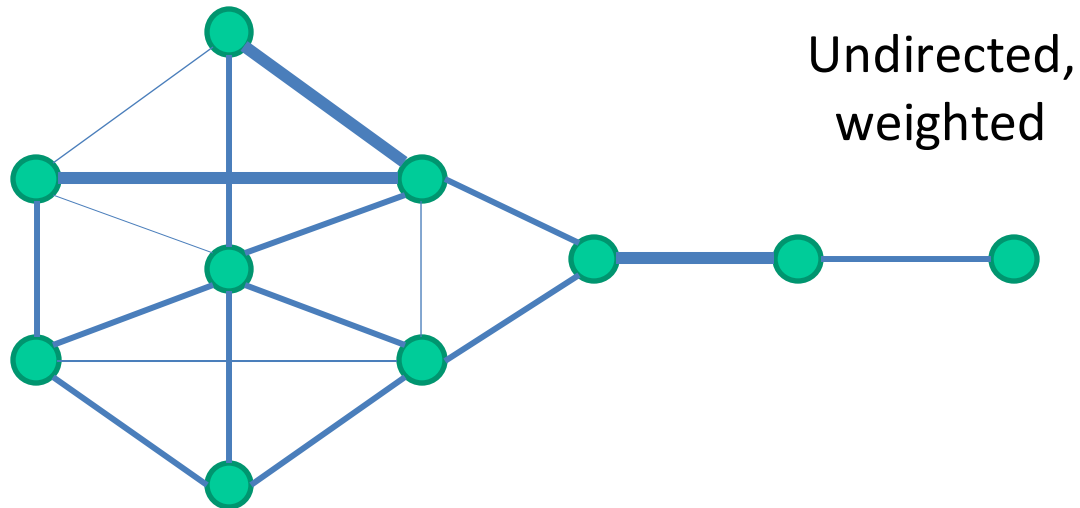# Network Elements

- Vertex, nodes and actors

Network Elements

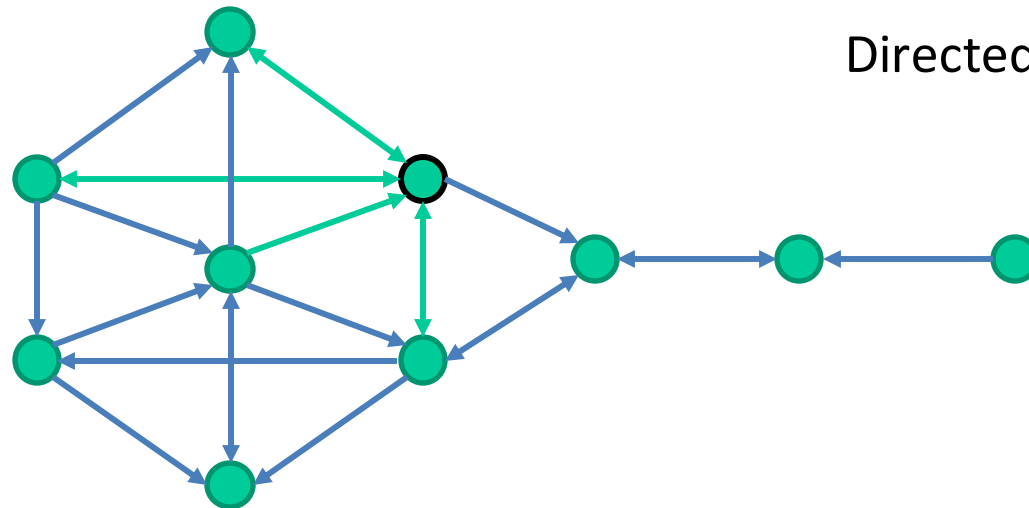- Edges, arcs, links and relationships

Undirected

Network Elements

- Edges, arcs, links and relationships

Undirected, weighted

Network Elements

- Edges, arcs, links and relationships
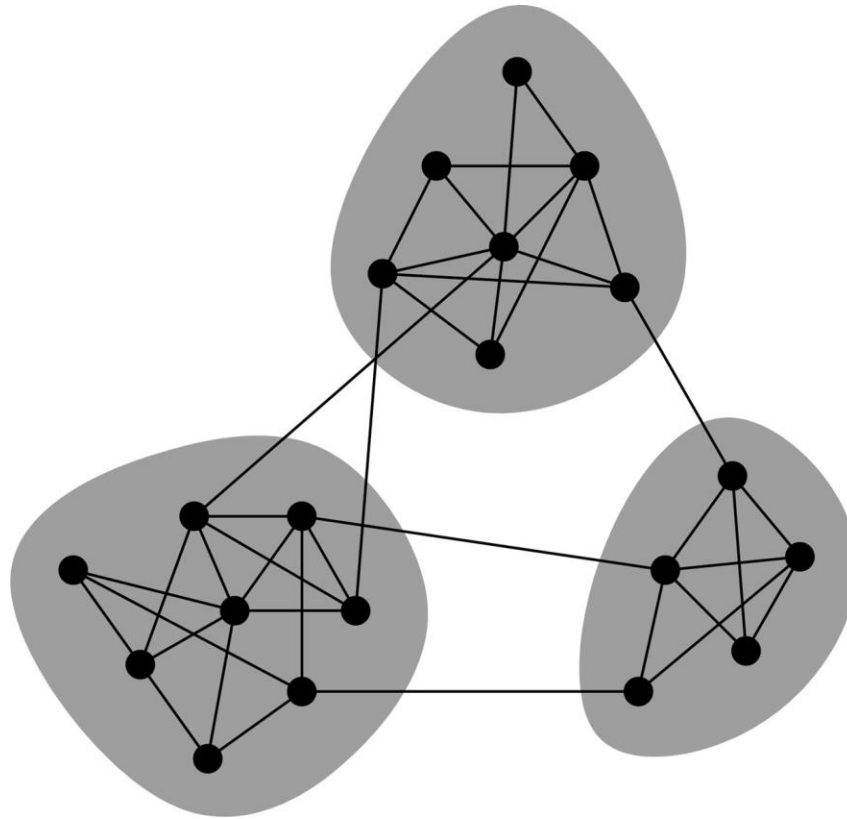

Directed

Measurement

- Node Degree

- Diameter

- Density

- Degree Centrality

- In-degree centrality

- Out-degree centrality

- Betweenness centrality

- Closeness centrality

Node Degree

- number of connections it has to other nodes

- degree distribution is the probability distribution of these degrees over the whole network.

Network Overview

Modularity

Network Overview

Connected Components
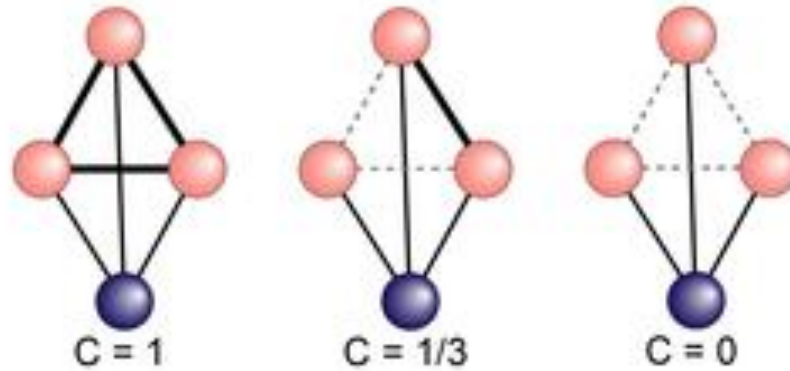

assortative   disassortative

Node Overview

- Clustering Coefficient

- Centrality

- Closeness Centrality

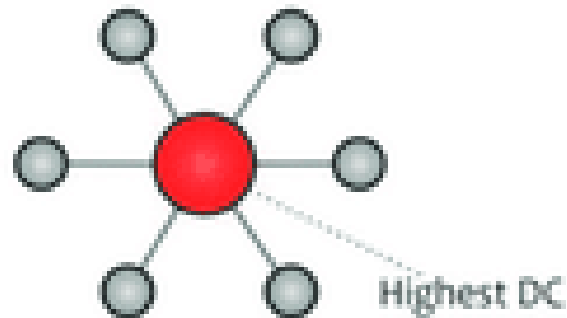- Betweenness Centrality

- Eigenvector Centrality

Node Overview

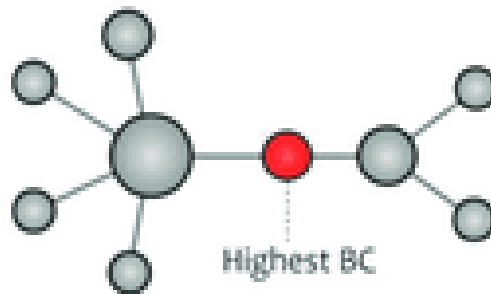Clustering Coefficient

Node Overview

Degree centrality

Highest DC

Centrality refers to indicators which identify the most
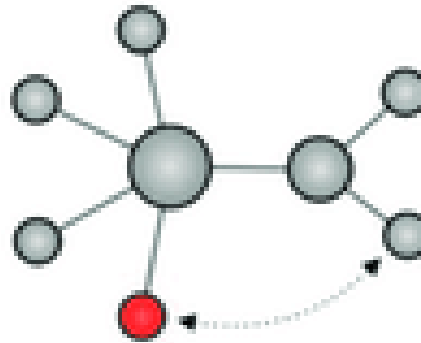important vertices within a graph

Node Overview

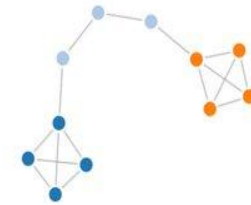Betweenness centrality

Highest BC

number of times a node acts as a bridge

Node Overview

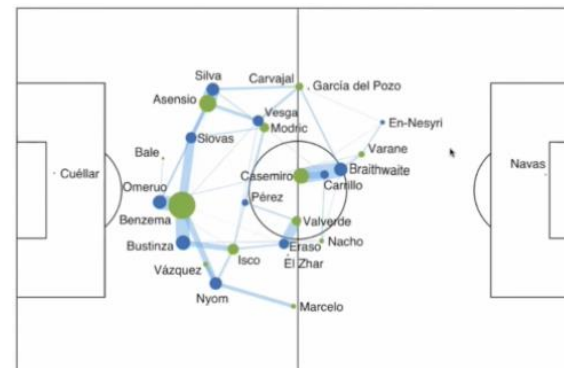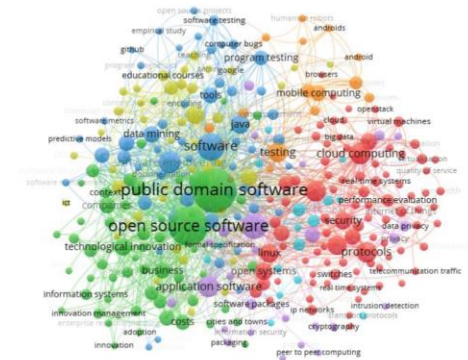a node is connected to many nodes who themselves
have high scores.

Tools

Applications

- Crime study

- Gang and organized crime

- Research collaboration

- Papers citations

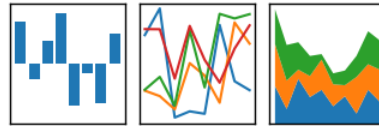- Social media study

- Team sports

Challenges

- Internal information

- Secrecy

- GDPR

- Conceptual Complexity

- Main value is obtained by integrate with other approaches

- ...

Python