SOCIAL NETWORK ANALYTICS

Introduction to Networks and Examples

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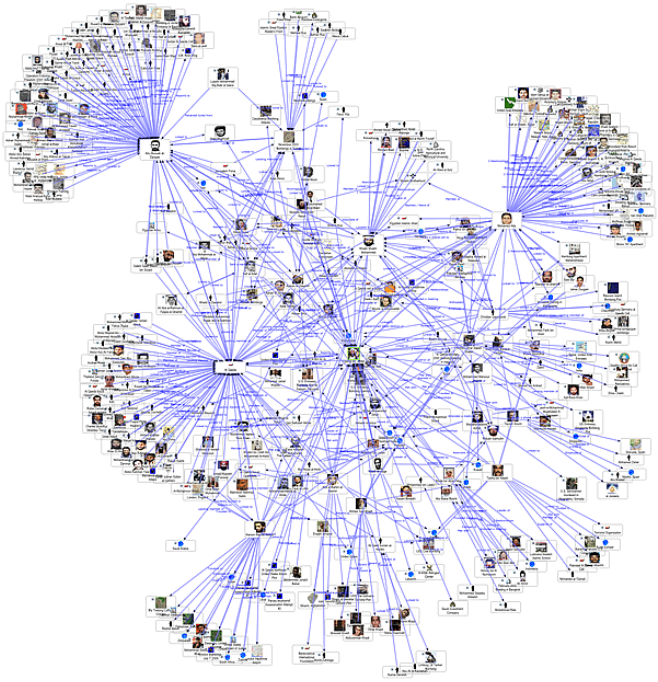
SOCIAL NETWORK ANALYTICS

Networks are everywhere

- Everything is connected



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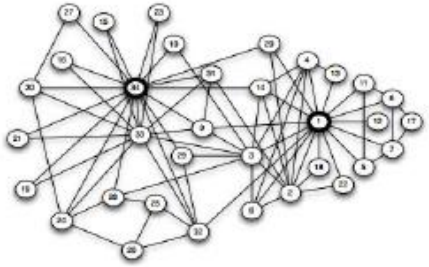
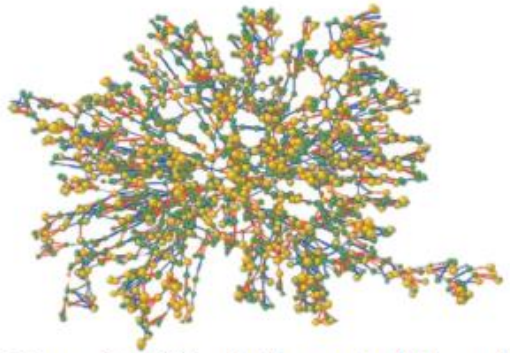
Networks: Social



Friendship network in a 34-person karate club
[Zachary 1977]

E-mail communication network
among 436 HP employees [Adamic & Adar 2005]



Network of friendship, marital tie, and
family tie among 2200 people
[Christakis & Fowler 2007]

Vertices (nodes) = persons, organizations/groups, companies, social events,…

Edges (links) = interactions/relations among the elements of the system

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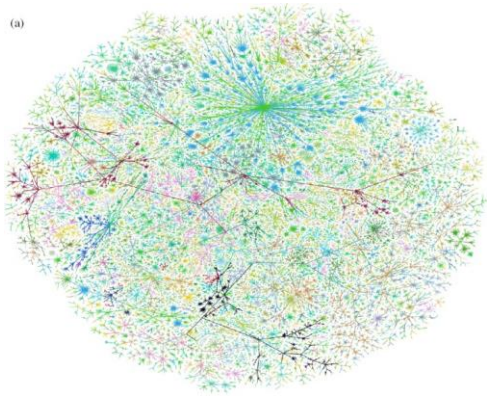
Networks: Technological

- Internet.
- Telephone-call network.
- Electric power grid network
- Network of airline routes, network of roads and network of railways.

Airline Network

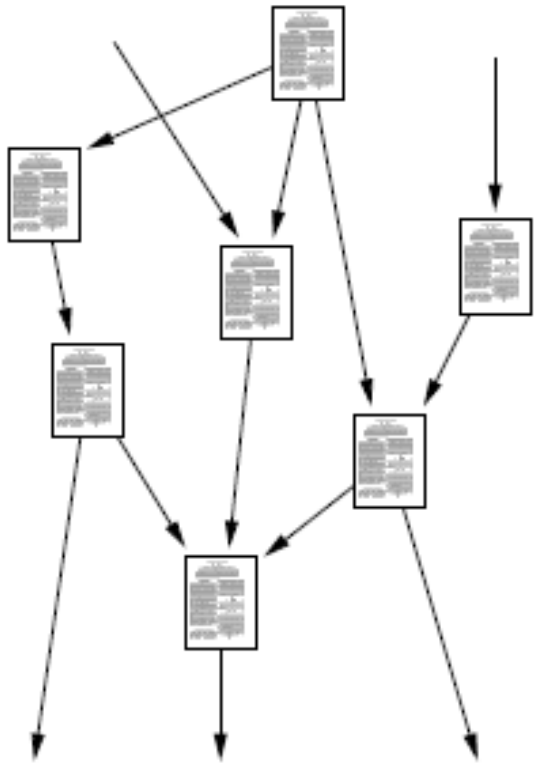


Graph of the Internet (Autonomous Systems)
Power-law degrees [Faloutsos-Faloutsos-Faloutsos, 1999]
Robustness [Doyle-Willinger, 2005]

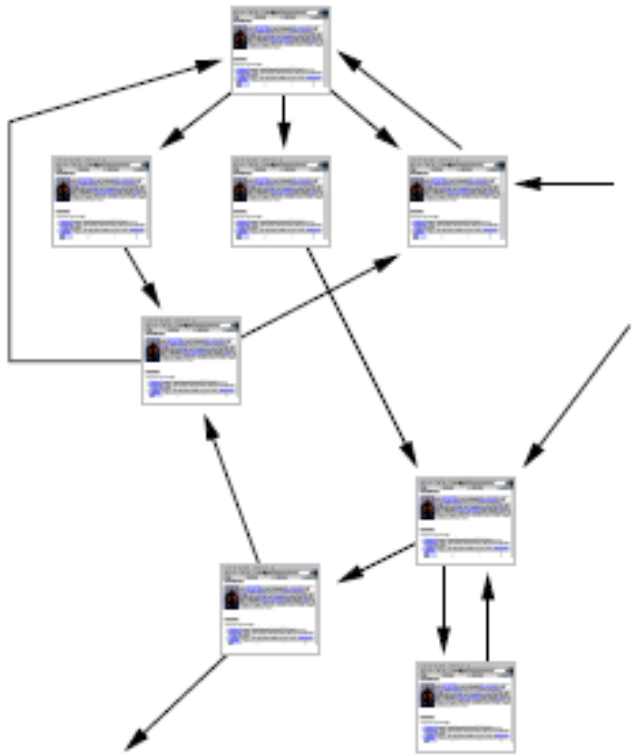
Railway/Metro Network

Networks: Information

Citation network and WWW [M. E. J. Newman]



citation network



World–Wide Web

Citation Network:

Vertices (nodes) = Published articles
Edges (links) = reference to a previously published article.

WWW:

Vertices (nodes) = web pages
Edges (links) = hyperlinks.

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Networks: Organizations

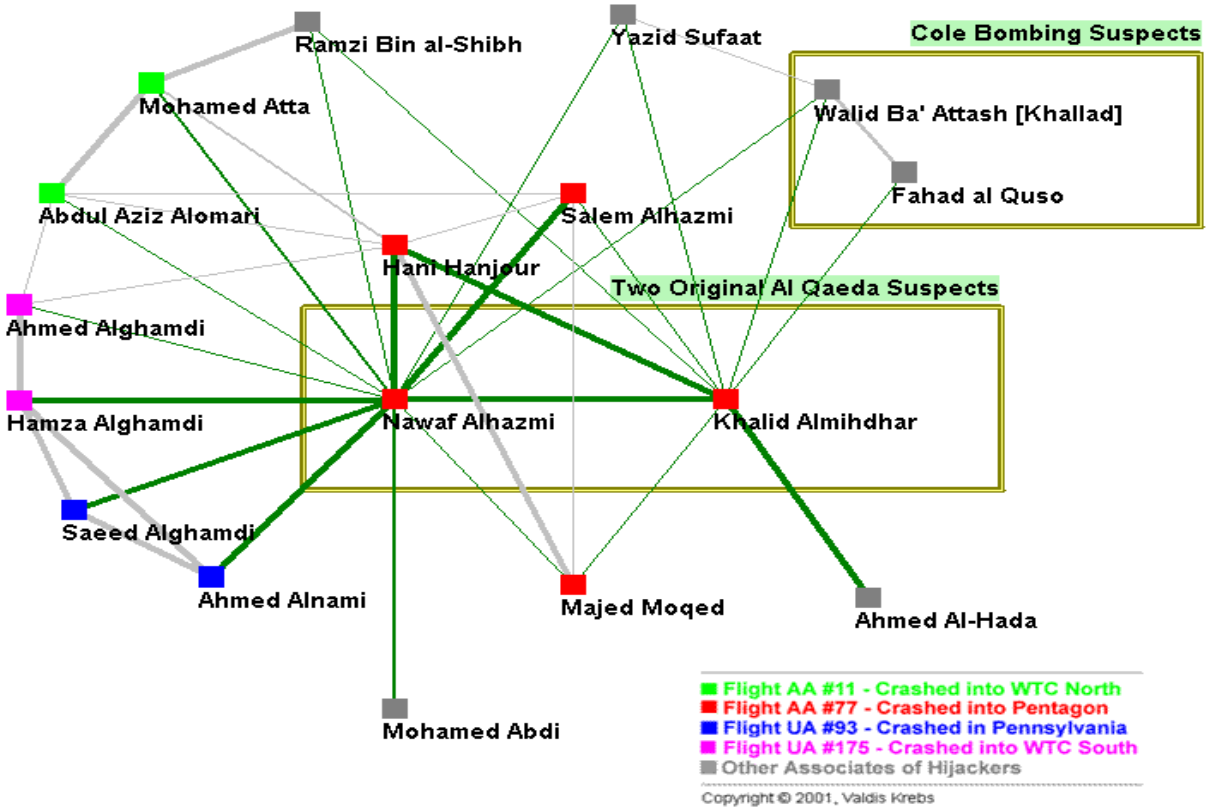

Figure 2 - All nodes within 1 step [direct link] of original suspects

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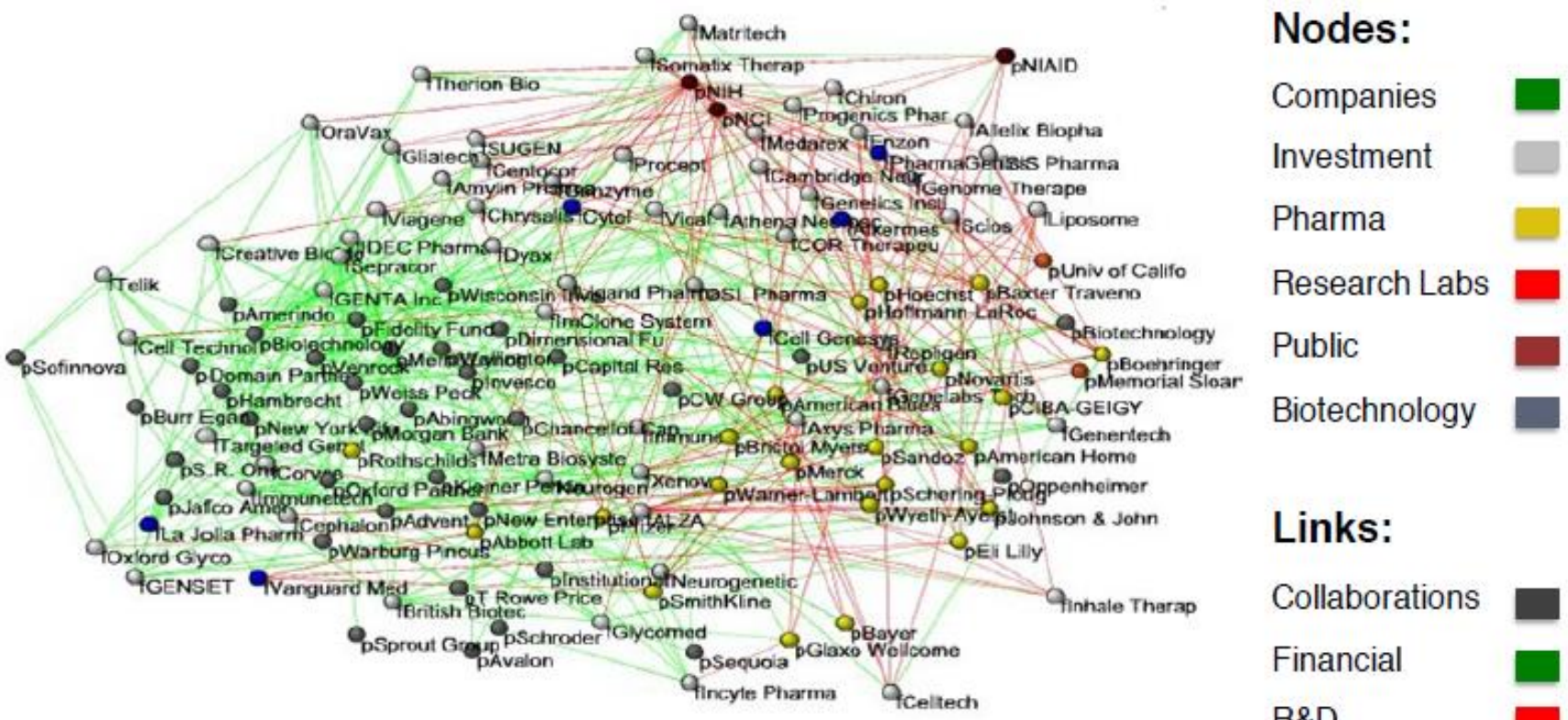
Networks: Economy



Nodes:

- Companies
- Investment
- Pharma
- Research Labs
- Public
- Biotechnology

Links:

- Collaborations
- Financial
- R&D

Bio-tech companies

[Powell-White-Koput, 2002]

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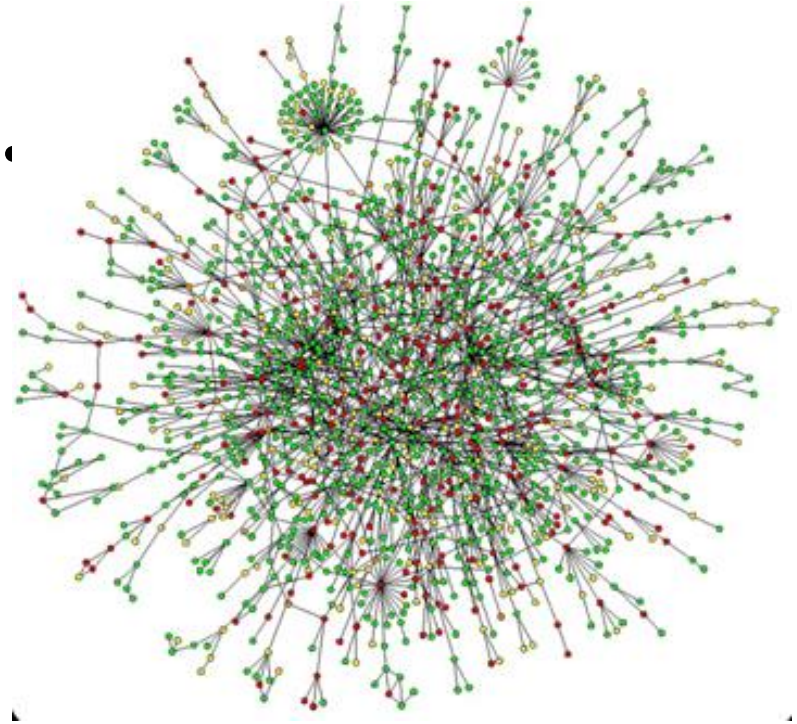
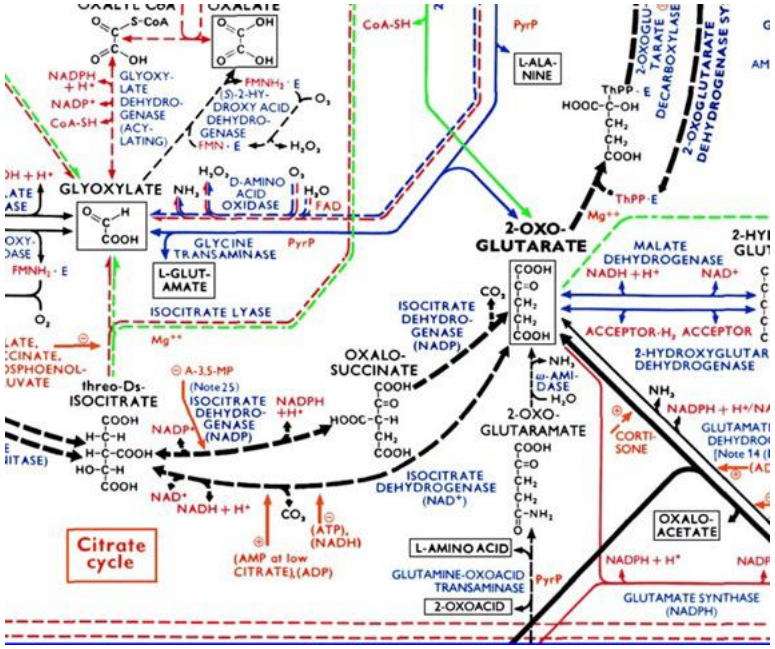
Networks: Biology





Protein-protein interaction (PPI) networks:

Nodes: Proteins

Edges: ‘Physical’ interactions(binding)

Metabolic networks:

Nodes: Metabolites and enzymes

Edges: Chemical reactions

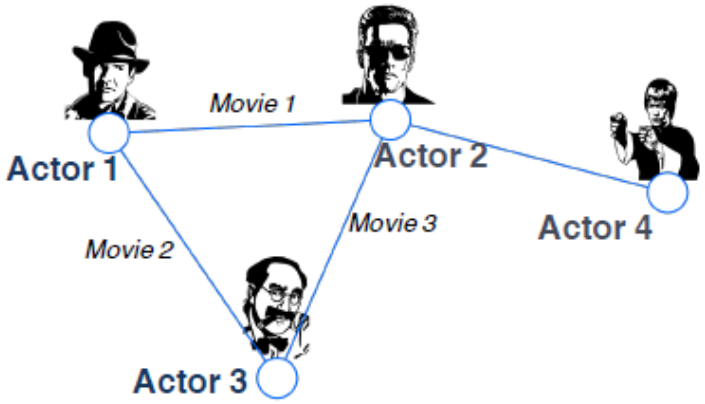
Networks and Complex Systems

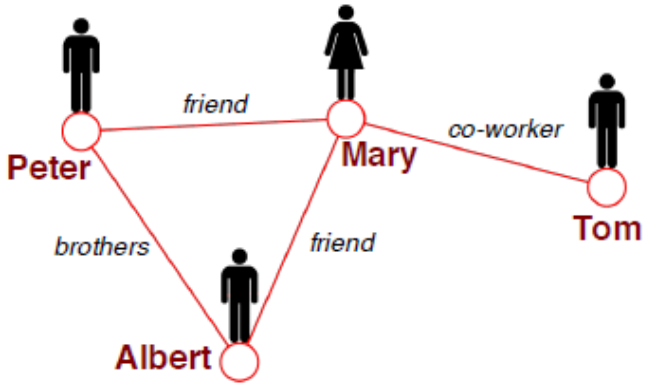
- **Complex systems are around us:**
  - **Society** is a collection of six billion individuals
  - **Communication systems** link electronic devices
  - **Information** and **knowledge** is organized and linked
  - Interactions between thousands of **genes** regulate life
  - Our **thoughts** are hidden in the connections between billions of neurons in our brain

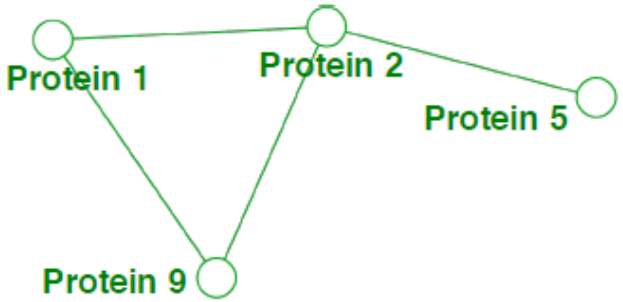
What do these systems have in common?
How can we represent them?

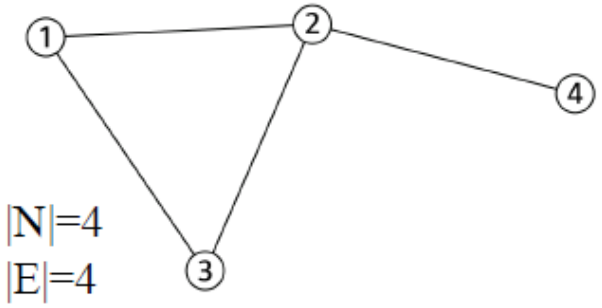
Networks representation

- **Graph is a mathematical representation of a network**









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- Wikipedia – Current Literature

THANK YOU

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