Research Projects

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Motivation: Web and social media

- Study using

Computer Science

Economics

Social Sciences

Advanced: Social Network Analysis

Graphs:

- Basic graph theory. Graph travesal, Connectivity.
- Centrality (PageRank etc), Strong/Weak Ties, Homophily
- Community Detection, Positive and Negative Relationships

Web, Cascades, Voting, Influence:

- Structure of the Web
- Web search
- Information Cascades
- Voting
- Random Graphs, Small Worlds Phenomenon, Power laws
- Cascading and Influence

Advanced: Machine Learning on Graphs

Classical ML tasks in graphs using embeddings:

- Node classification

  >Predict a type of a given node

- Link prediction

  > Predict whether two nodes are linked

- Community detection

  >Identify densely linked clusters of nodes

- Network similarity

  >How similar are two (sub)networks

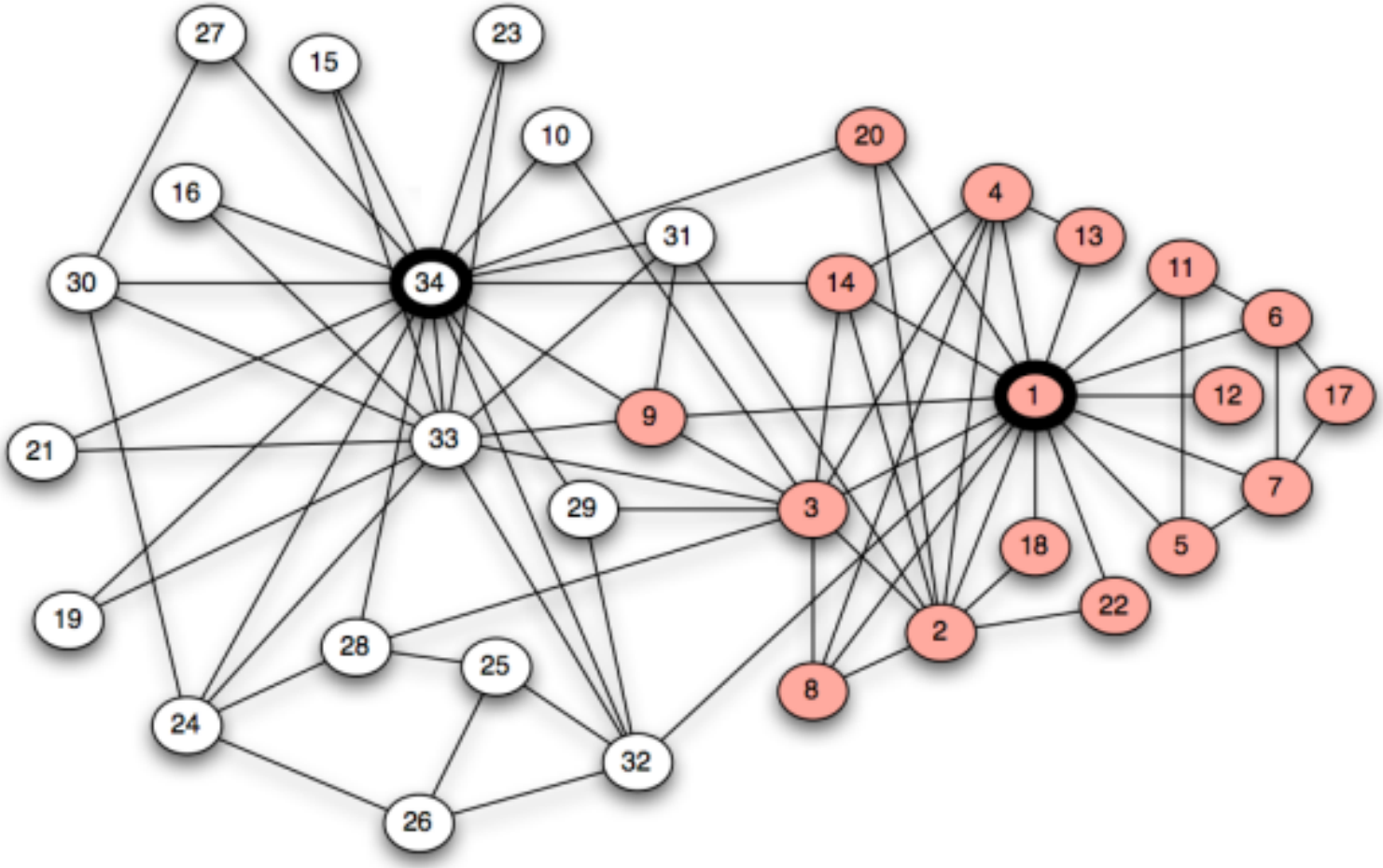
Networks are everywhere

- Modern society is “connected“ in different ways
  - Global communication
  - The Internet
  - Social networks
  - Financial systems
  - News and media
  - Smart city
  - Internet of Things
- Traditional “connections”
  - Roads
  - Brain

Networks

- Each such system can be represented as a **network**, that defines the **interactions** between the components

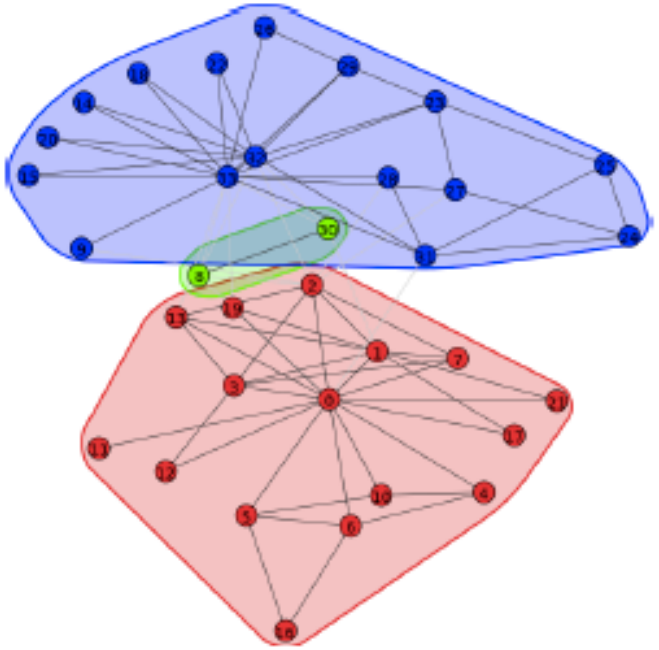
Networks: What is this? 34 person Karate club



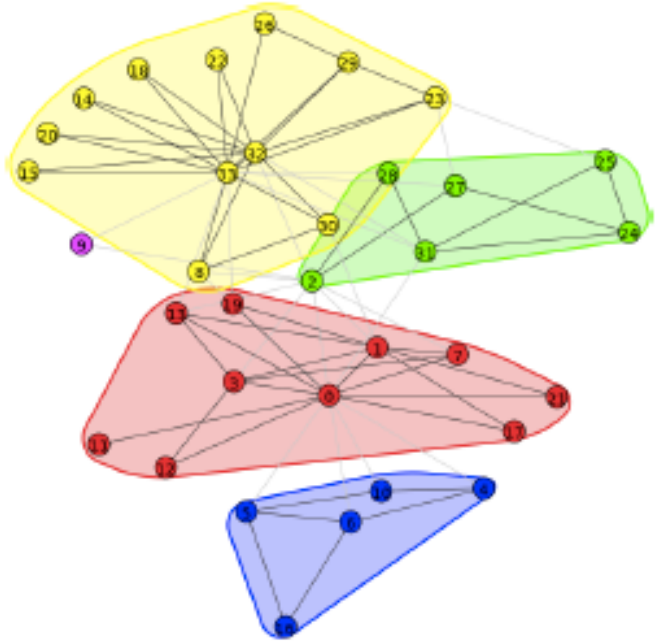
- The social network of friendships within a 34-person karate club provides clues to the fault lines that eventually split the club apart (Zachary, 1977) Adapted from Figure 1 (p. 456) in Zachary, Wayne W. "An Information Flow Model forConflict and Fission in Small Groups." *Journal of Anthropological Research* 33, no. 4 (1977): 452-473.

Communities in Zachary's Karate Club

[AlgoCloud2018]



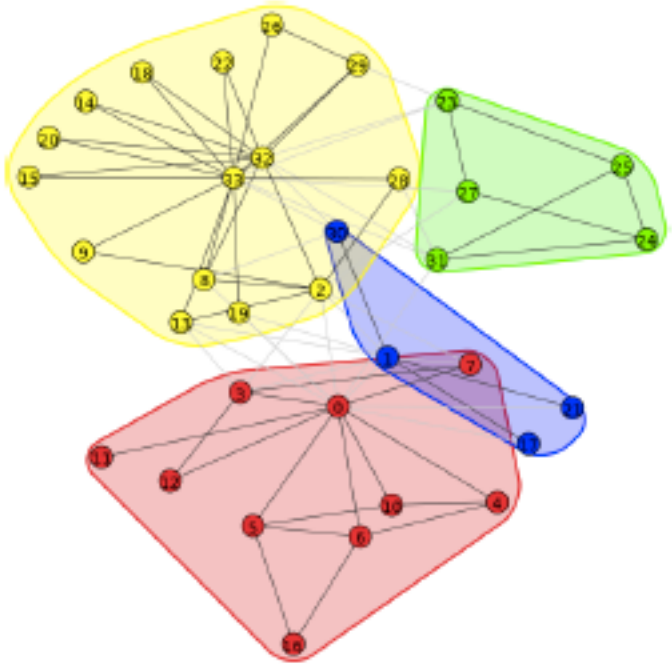
(a) Zachary's Karate Club (ST)



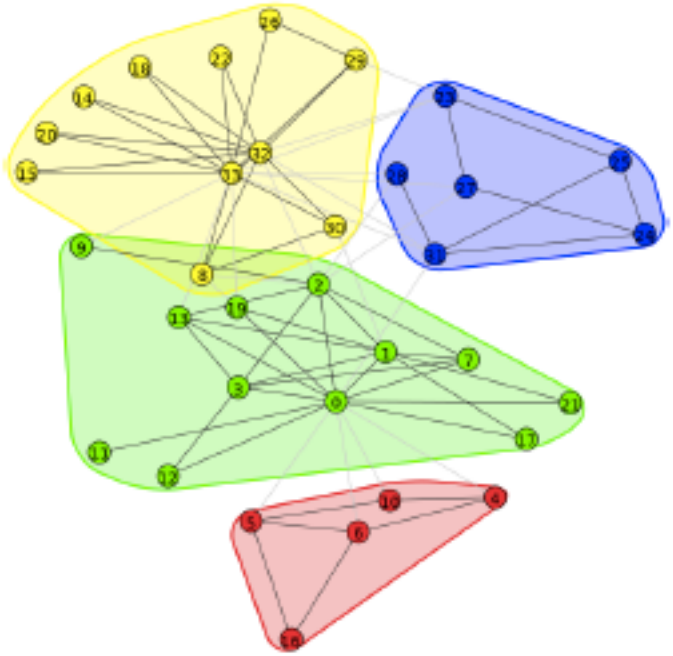
(b) Zachary's Karate Club (GN)

Communities in Zachary's Karate Club

[AlgoCloud2018] cont.

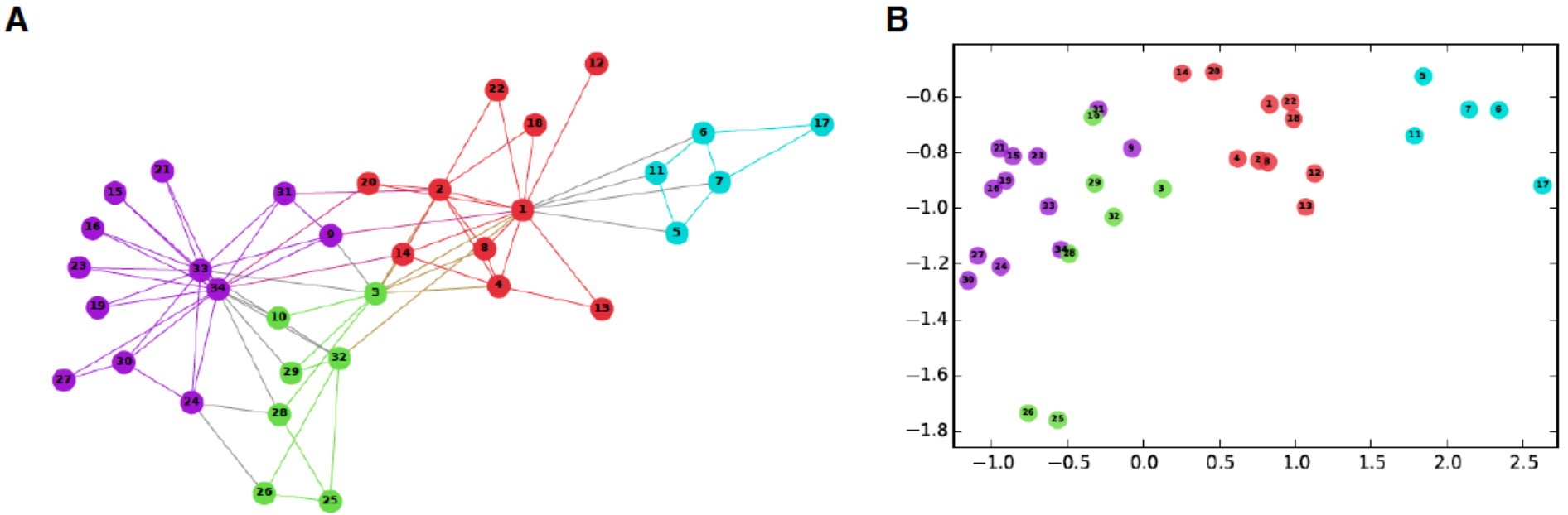


(a) Zachary's Karate Club (nover-Louvain)



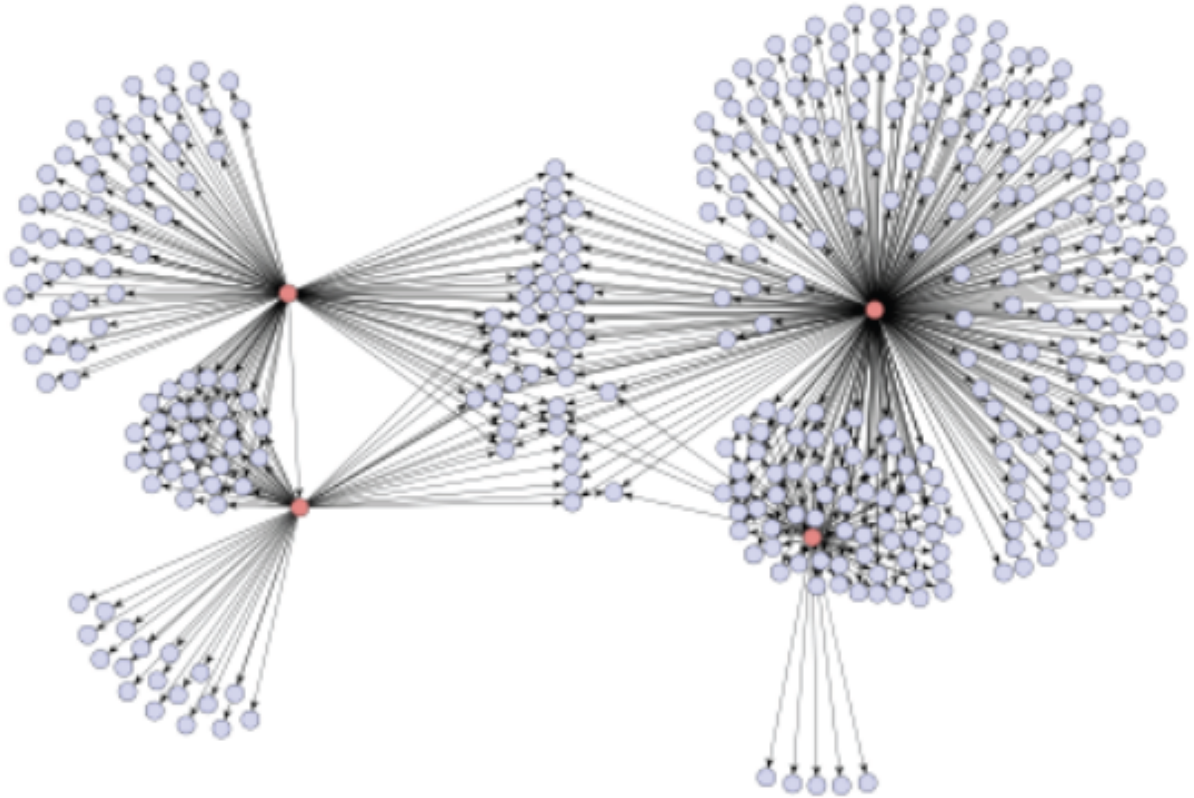
(b) Zachary's Karate Club (Louvain)

DeepWalk: Online Learning of Social Representations



deep learning (unsupervised feature learning) techniques, which have proven successful in natural language processing, into network analysis.
Image from: Perozzi et al. 2014. DeepWalk: Online Learning of Social Representations. *KDD.*

Networks: Influence



Here, e-mail recommendations for a Japanese graphic novel spread in a kind of informational or social contagion. (Leskovec et al. 2007)

When people are influenced by the behaviors of their neighbors in the network, the adoption of a new product or innovation can cascade through the network structure.

Influence Detection And Spread Estimation in Social Networks
Madhura Kaple S17

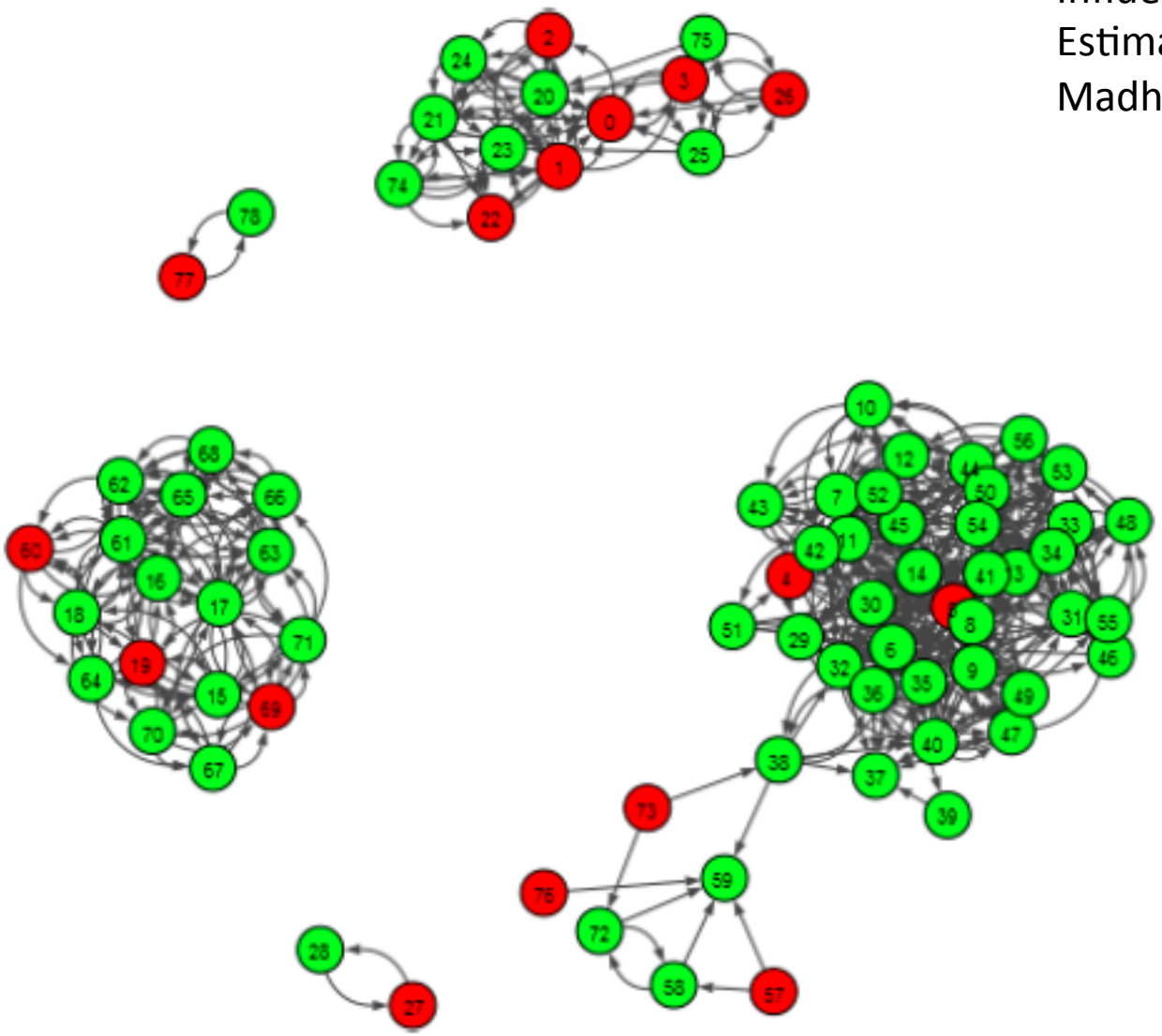


Figure 22: YouTube Social Network: Output Greedy algorithm