# CS 432/532 Web Science · Spring 2019 · Assignment #5 · Due: 11:59pm March 24

## 1 (10 points):

We know the result of the Karate Club (Zachary, 1977) split. Prove or disprove that the result of split could have been predicted by the weighted graph of social interactions. How well does the mathematical model represent reality?
Generously document your answer with all supporting equations, code, graphs, arguments, etc.

Clues:

1. Draw original Karate club graph (two connected components) after split (Week 6, slide 98).

2. Run multiple iterations of graph partitioning algorithm (e.g., Girvan-Newman Algorithm) on experimental Karate club graph until the graph splits into two connected components.

3. Compare the connected components of the experimental graph (in 2.) with the original connected components of the split Karate club graph (in 1.). Are they similar?

[sources]

## 2 (10x points):

Use D3.js's force-directed graph layout to draw the Karate Club Graph before split. Color the nodes according to the factions they belong to (John A or Mr. Hi). After a button is clicked, split the graph based on the original graph split. Include a link to the HTML/JavaScript files in your report and all necessary screenshots.
[sources]

## 3 (3x points):

We know the group split in two different groups. Suppose the disagreements in the group were more nuanced -- what would the clubs look like if they split into groups of 3, 4, and 5?

## Sources (1)

- Original paper
  - http://aris.ss.uci.edu/~lin/76.pdf
- Week 6 Slides:
  - https://docs.google.com/presentation/d/1ihf6N8bHgzM5VLAyHkmF_i5JGUBVpCSdsvYpk8XgHwo/edit?usp=sharing
- Slides
  - http://www-personal.umich.edu/~ladamic/courses/networks/si614w06/ppt/lecture18.ppt
  - http://clair.si.umich.edu/si767/papers/Week03/Community/CommunityDetection.pptx
- Code and data
  - https://networkx.github.io/documentation/networkx-1.10/reference/generated/networkx.generators.social.karate_club_graph.html
  - https://networkx.github.io/documentation/networkx-1.9/examples/graph/karate_club.html
  - http://nbviewer.ipython.org/url/courses.cit.cornell.edu/info6010/resources/11notes.ipynb
  - http://stackoverflow.com/questions/9471906/what-are-the-differences-between-community-detection-algorithms-in-igraph/9478989#9478989
  - http://stackoverflow.com/questions/5822265/are-there-implementations-of-algorithms-for-community-detection-in-graphs
  - http://konect.uni-koblenz.de/networks/ucidata-zachary
  - http://vlado.fmf.uni-lj.si/pub/networks/data/ucinet/ucidata.htm#zachary
  - https://snap.stanford.edu/snappy/doc/reference/CommunityGirvanNewman.html
  - http://igraph.org/python/doc/igraph-pysrc.html#Graph.community_edge_betweenness

## Sources (2):

- https://bl.ocks.org/mbostock/4062045
- https://d3js.org/