CS 595: Assignment #6

Due on Thursday, October 30, 2014

Dr. Nelson 4:20pm

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Contents

Problem 1

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1.  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.

Useful sources include:

* Original paper
http://aris.ss.uci.edu/~lin/76.pdf

* 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
http://networkx.github.io/documentation/latest/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
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Problem 1 continued on next page...

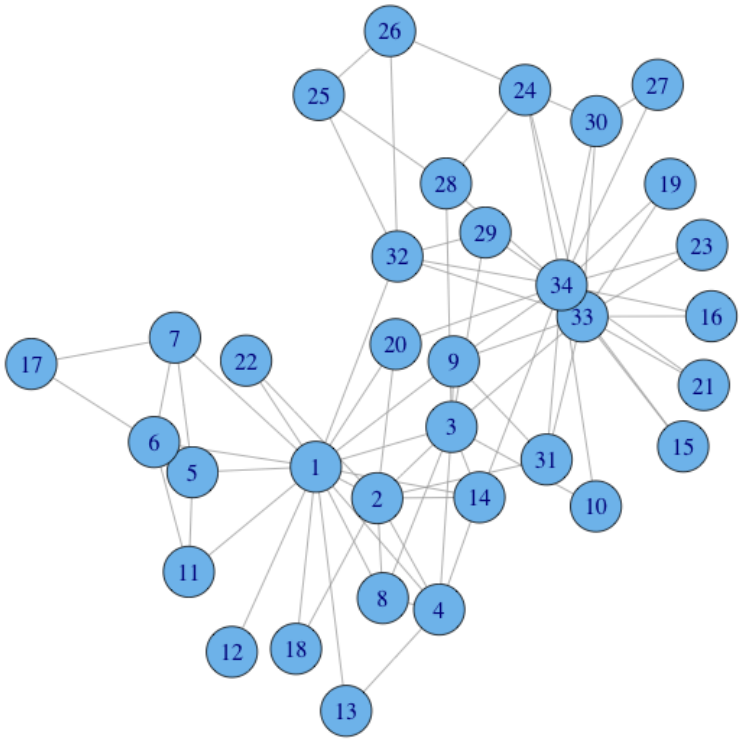

Figure 1: The Karate Club

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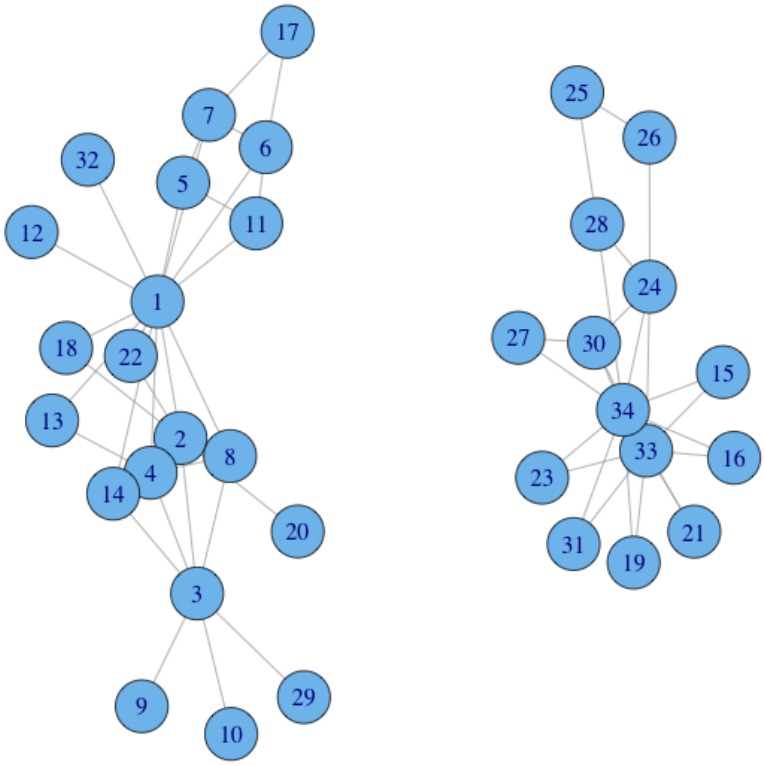

Figure 2: Karate Club Split

The mathematical model is a good representation of the members that followed Mr. Hi and John. The paper analysis mentioned the strengths of measuring relationships between the nodes mathematically.

The problem had the following properties: Mr. Hi and John had different ideologies. There was a split and it was over time. Mr. Hi taught nights as a part-time instructor. Many supporters worked out on the weekends. Student teachers could interact with each other but not with their students. There was interaction at the university student bar. Open karate tournaments at the private studio and intercollegiate tournaments at the university. Both the open karate tournaments and the intercollegiate karate tournaments were both held on the night making it impossible to attend both.

Deterministic factors given a group that gains new members over an extended period of time allows a stronger confidence in reliable results.
The end result producing a 94% successful hits rate. As the powerpoint suggests, determining the edges, which are obtained from the above factors assists in the prediction. This is close to the papers results - 33 hits, 1 miss or 97% hits, 3% misses. So the model is close to representing reality.

Identifier	Model	Actual	Hit/Miss
1	Mr. Hi	Mr. Hi	Hit
2	Mr. Hi	Mr. Hi	Hit
3	Mr. Hi	Mr. Hi	Hit
4	Mr. Hi	Mr. Hi	Hit
5	Mr. Hi	Mr. Hi	Hit
6	Mr. Hi	Mr. Hi	Hit
7	Mr. Hi	Mr. Hi	Hit
8	Mr. Hi	Mr. Hi	Hit
9	Mr. Hi	Mr. Hi	Hit
10	Mr. Hi	John	Miss
11	Mr. Hi	Mr. Hi	Hit
12	Mr. Hi	Mr. Hi	Hit
13	Mr. Hi	Mr. Hi	Hit
14	Mr. Hi	Mr. Hi	Hit
15	John	John	Hit
16	John	John	Hit
17	Mr. Hi	Mr. Hi	Hit
18	Mr. Hi	Mr. Hi	Hit
19	John	John	Hit
20	Mr. Hi	Mr. Hi	Hit
21	John	John	Hit
22	Mr. Hi	Mr. Hi	Hit
23	John	John	Hit
24	John	John	Hit
25	John	John	Hit
26	John	John	Hit
27	John	John	Hit
28	John	John	Hit
29	John	John	Hit
30	John	John	Hit
31	John	John	Hit
32	Mr. Hi	John	Miss
33	John	John	Hit
34	John	John	Hit

Figure 3: Evaluation of Hit Miss Results

Problem 2

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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?
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References

[1] Zachary, Wayne. An Information Flow Model for Conflict and Fission in Small Groups. http://aris.ss.uci.edu/ lin/76.pdf

[2] Slides- http://www-personal.umich.edu/ ladamic/courses/networks/si614w06/ppt/lecture18.ppt

[3] http://clair.si.umich.edu/si767/papers/Week03/Community/CommunityDetection.pptx

[4] Code and Data- http://networkx.github.io/documentation/latest/examples/graph/karateclub.html

[5] http://nbviewer.ipython.org/url/courses.cit.cornell.edu/info6010/resources/11notes.ipynb

[6] Stack Overflow. What are the differences between community detection algorithms in igraph? http://stackoverflow.com/questions/9471906/what-are-the-differences-between-community-detection-algorithms-in-igraph/94789899478989

[7] http://stackoverflow.com/questions/5822265/are-there-implementations-of-algorithms-for-community-detection-in-graphs

[8] http://konect.uni-koblenz.de/networks/ucidata-zachary

[9] http://vlado.fmf.uni-lj.si/pub/networks/data/ucinet/ucidata.htmzachary

[10] http://igraph.org/r/