CS 495 - Introduction to Web Science

Fall 2014

Assignment 6

by

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October 31, 2014

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Honor Pledge

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Signed: Eric Littley

Contents

1 Introduction

In this assignment we were tasked to prove or disprove if the the classic karate club split could have been predicted based on the weighted graph of social predictions. The assignment is based on a 1977 research study done by Wayne Zachary.[2] The actual results and data can be found in the research paper.

2 Design

The assignment was solved using a python interface to the ipython API. A tutoral on ipython actually included a section on the karate club problem.[1] The data from this tutorial was used to construct the graphs in the next section. Stack overflow was consulted for different betweenness methodologies. The Community Leading Eigenvector (CLE) method was chosen since it returned results similar to the study.

3 Graphs and Results

Below is a the predicted grouping of people after the split using the CLE algorithm. A graphical representation can be seen below that.

```
Group1: Mr Hi, Actor 2, Actor 3, Actor 4, Actor 5, Actor 6, Actor 7,
    Actor 8, Actor 11, Actor 12, Actor 13, Actor 14, Actor 17,
    Actor 18, Actor 20, Actor 22
Group2: Actor 9, Actor 10, Actor 15, Actor 16, Actor 19, Actor 21,
    Actor 23, Actor 24, Actor 25, Actor 26, Actor 27, Actor 28,
    Actor 29, Actor 30, Actor 31, Actor 32, Actor 33, John A
```

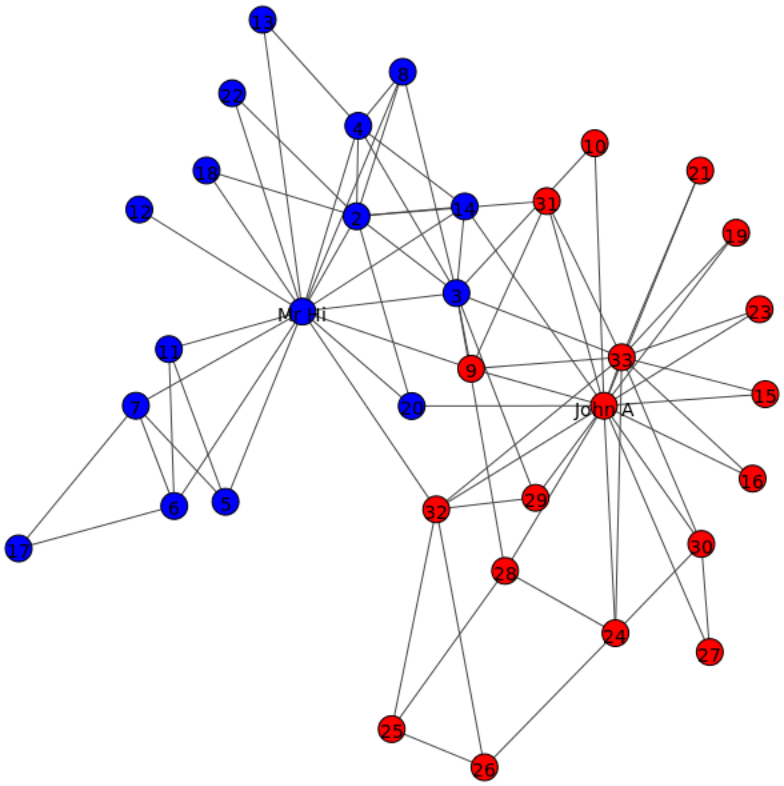

Figure 1: Community Leading Eigen Vector Two Groups

These results match the results in the research paper so there was about 3% error. The exact split was not predicted, but it came very close. On the next several pages I use the same CLE algorithm to try and predict how the groups would have split into groups if the number of split groups were 3, 4, and 5.

3.1 Three Groups

Group 1: Mr Hi, Actor 2, Actor 3, Actor 4, Actor 8, Actor 13, Actor 14, Actor 18, Actor 20, Actor 22

Group 2: Actor 9, Actor 10, Actor 15, Actor 16, Actor 19, Actor 21, Actor 23, Actor 24, Actor 25, Actor 26, Actor 27, Actor 28, Actor 29, Actor 30, Actor 31, Actor 32, Actor 33, John A

Group 3: Actor 5, Actor 6, Actor 7, Actor 11, Actor 12, Actor 17

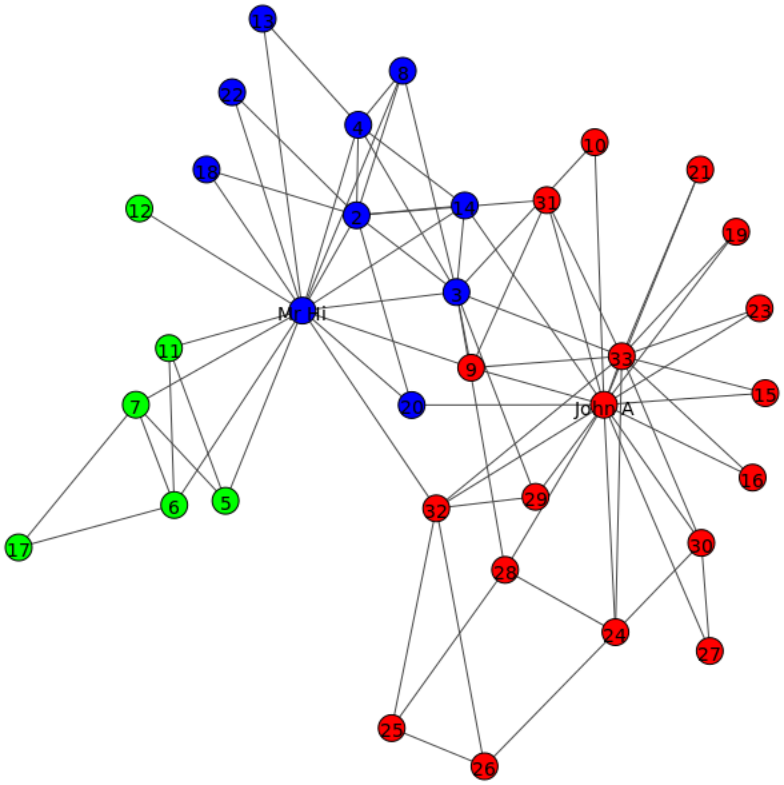

Figure 2: CLE Three Groups

3.2 Four Groups

Group 1: Mr Hi, Actor 2, Actor 3, Actor 4, Actor 8, Actor 13, Actor 14, Actor 18, Actor 20, Actor 22

Group 2: Actor 9, Actor 10, Actor 15, Actor 16, Actor 19, Actor 21, Actor 23, Actor 24, Actor 25, Actor 26, Actor 27, Actor 28, Actor 29, Actor 30, Actor 31, Actor 32, Actor 33, John A

Group 3: Actor 5, Actor 6, Actor 7, Actor 11, Actor 17

Group 4: Actor 12

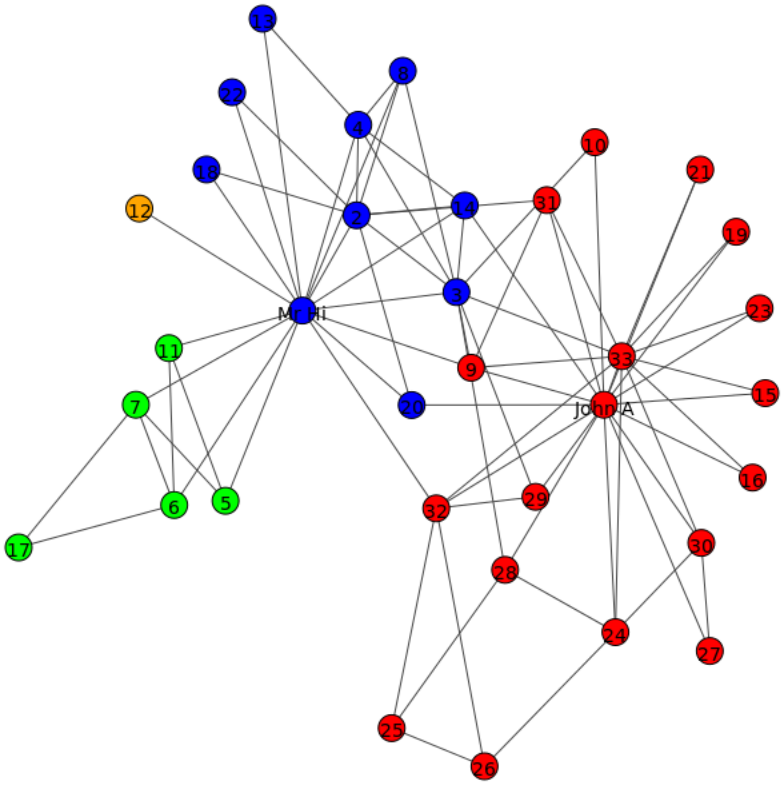

Figure 3: CLE Four Groups

3.3 Five Groups

Group 1: Mr Hi, Actor 2, Actor 3, Actor 4, Actor 8, Actor 13, Actor 14, Actor 18, Actor 20, Actor 22

Group 2: Actor 9, Actor 10, Actor 15, Actor 16, Actor 19, Actor 21, Actor 23, Actor 27, Actor 30, Actor 31, Actor 33, John A

Group 3: Actor 5, Actor 6, Actor 7, Actor 11, Actor 17

Group 4: Actor 12

Group 5: Actor 24, Actor 25, Actor 26, Actor 28, Actor 29, Actor 32

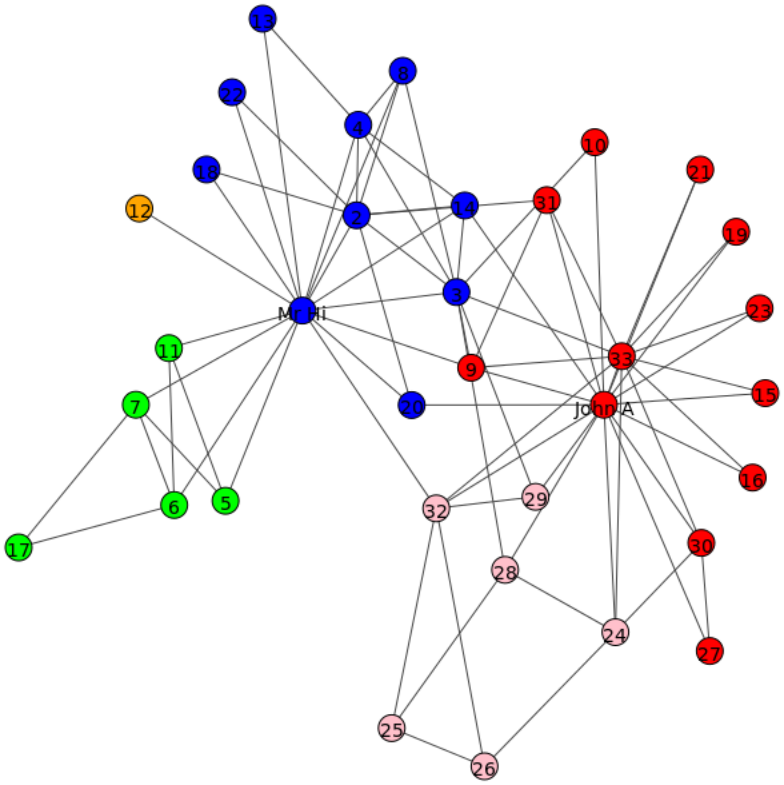

Figure 4: CLE Five Groups

References

[1] T. Nepusz and P.P. Setany, *python-igraph*, pdf (2014), available at `http://igraph.org/python/doc/python-igraph.pdf`.

[2] W.W. Zachary, *An information flow model for conflict and fission in small groups*, Journal of Anthropological Research **33** (1977), 452–473.