CS595 Assignment 6

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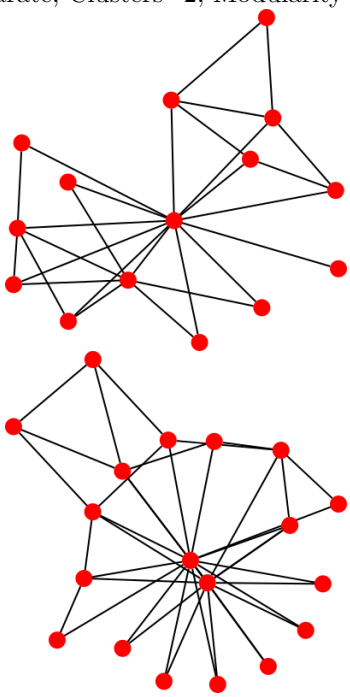
Q1. We know the result of the Karate Club (Zachary, 1977) split. Prove or disprove that the result of split could have been predicted by the weighted graph of social interactions. How well does the mathematical model represent reality?
Generously document your answer with all supporting equations, code, graphs, arguments, etc

Given the graph, the Girvan-Newman algorithm will iteratively remove the edge(s) with highest betweeness. Results are given below.

TODO describe hit success rate
TODO incorporate given weights
TODO explore modularity

See Appendix A for python program to produce graphs (svgs)
See Appendix B for bash script to produce merged pngs

Figure 1: Zachary Karate, Clusters=2, Modularity=0.3599605522682446



Q2. 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?

Figure 2: Zachary Karate, Clusters=3, Modularity=0.34878369493754113

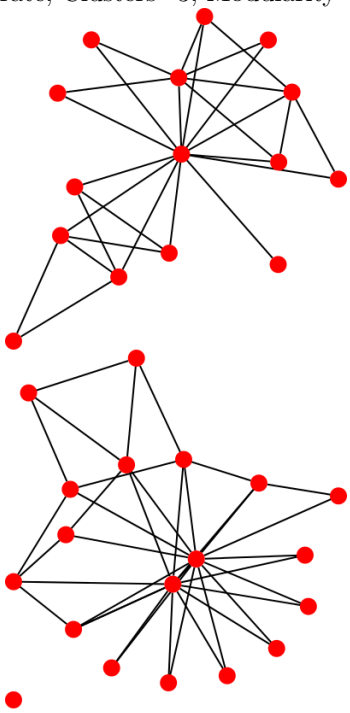


Figure 3: Zachary Karate, Clusters=4, Modularity=0.36324786324786335

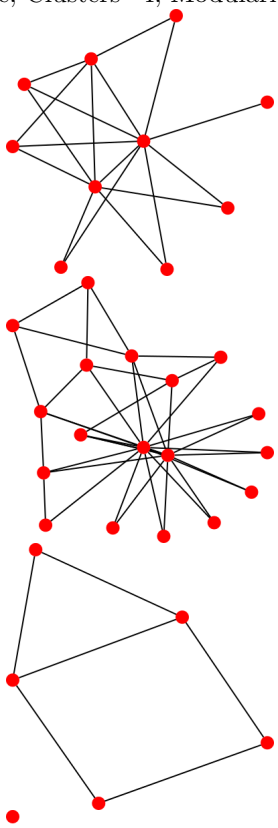
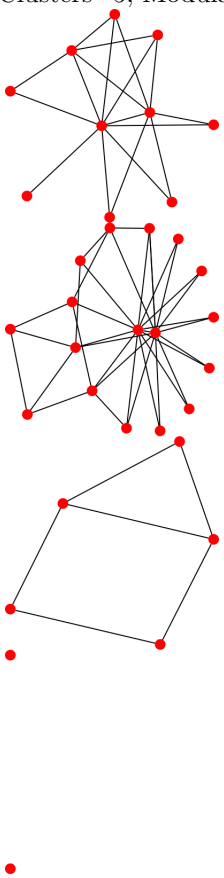


Figure 4: Zachary Karate, Clusters=5, Modularity=0.35174227481919795



Appendix A

```
#!/usr/bin/python3
import igraph
import sys

DEFAULT_FILE='karate.net'
if len(sys.argv) != 2:
        print('Pass the path to your graph file, defaulting to '+DEFAULT_FIL
        path=DEFAULT_FILE
else:
        path=sys.argv[1]

for x in range(2, 6):
    k = igraph.load(path)
    vertexDendrogram = k.community_edge_betweenness(clusters=x, directed=Fal
    vertexClustering = vertexDendrogram.as_clustering()
    print('Modularity: ' + str(vertexClustering.modularity))
    print(vertexClustering)
    i=0
    for subgraph in vertexClustering.subgraphs():
        subgraph.save(str(x)+'-karate-'+str(i)+'.svg', format="svg")
        i+=1
```

Appendix B

```
#!/bin/bash
for i in {2..5}; do
        convert $i*.svg -append $i-karate.png
        rm $i*.svg
done
```