CS 432

Assignment 5

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The purpose of this assignment was to examine the data presented in Zachary's Karate Club study to determine whether the outcome of the karate club's split into two factions could have been predicted analytically.

I began by plotting a graph of the social network which is part of the "networkx" Python library. I used the following script retrieved from:

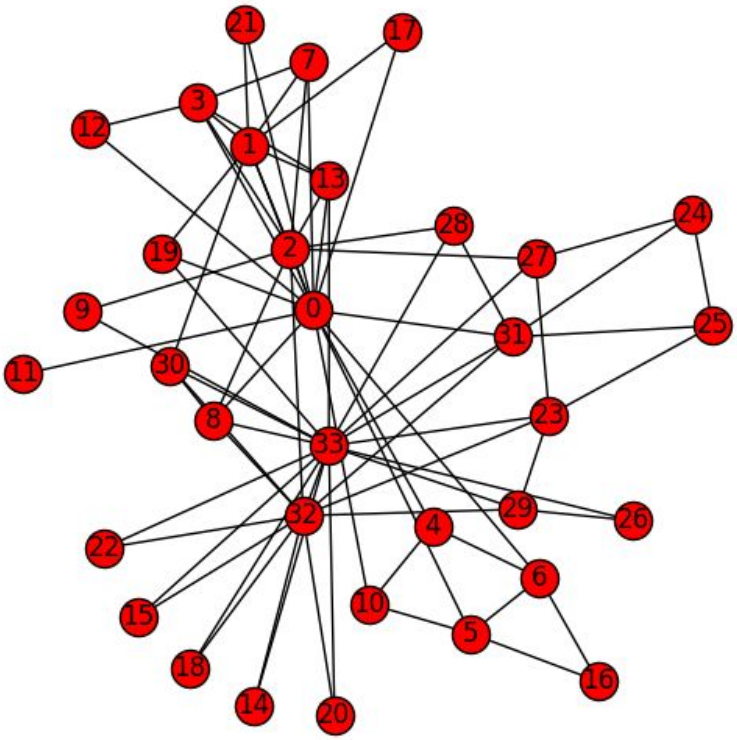
http://nbviewer.jupyter.org/url/courses.cit.cornell.edu/info6010/resources/11notes.ipynb
in order to display the graph and print the weight of each node to a file.

```
#http://networkx.github.io/documentation/latest/examples/graph/karate_club.html
#Zachary's Karate Club graph
#Data file from:
#http://vlado.fmf.uni-lj.si/pub/networks/data/Ucinet/UciData.htm
import networkx as nx
import matplotlib.pyplot as plt

f=open("kNodes.txt","a")
G=nx.karate_club_graph()
plt.figure(figsize=(8,8))
nx.draw_networkx(G)
plt.axis('off')
f.write("Node Degree")
for v in G:
    f.write('%s     %s' % (v,G.degree(v)))
plt.savefig("kClubGraph.pdf")
plt.show()


```

This script produced the following output:



This script also produced the following list of nodes and a weight depicting hoe many associations each node had.

Node	Degree
1	9
2	10
3	6
4	3
5	4
6	4
7	4
8	5
9	2
10	3
11	1
12	2
13	5
14	2
15	2
16	2
17	2
18	2
19	3
20	2
21	2
22	2
23	5
24	3
25	3
26	2
27	4
28	3
29	4
30	4
31	6
32	12
33	17

Next I wrote a script that display a weighted graph depicting the strength of the associations between club members.

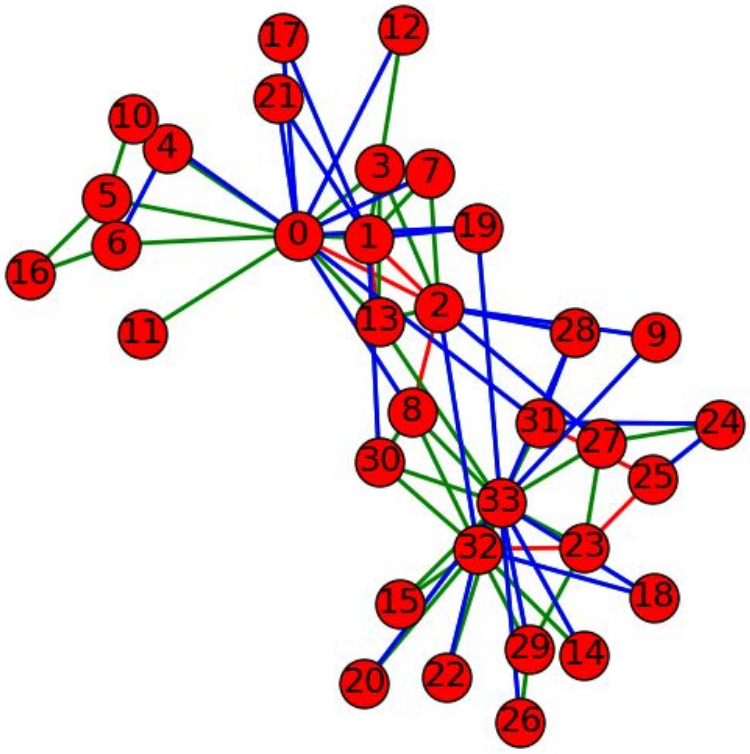
```
import networkx as nx
import matplotlib.pyplot as plt
import numpy as np
from StringIO import StringIO

edgeW = open("F:\Web_Science\cs532-s16\A5\Wedges.txt","a")
f = open("zachary2.txt","r")
g = nx.Graph()

d = np.genfromtxt(f, delimiter=' ')

for i in range(0,34):
    for j in range(0,34):
        if d[i][j]== 0:
            pass
        else:
            g.add_edge(i,j,weight=d[i][j])
esmall =[(u,v) for (u,v,d) in g.edges(data=True) if d['weight'] <=2.0]
emed =[(u,v) for (u,v,d) in g.edges(data=True) if d['weight'] <=4.0]
elarge =[(u,v) for (u,v,d) in g.edges(data=True) if d['weight'] >=5.0]
plt.figure(figsize=(8,8))
pos=nx.spring_layout(g)
nx.draw_networkx_nodes(g,pos,node_size=500)
nx.draw_networkx_edges(g,pos,edgelist=elarge,width=2,edge_color='r')
nx.draw_networkx_edges(g,pos,edgelist=emed,width=2,edge_color='g')
nx.draw_networkx_edges(g,pos,edgelist=esmall,width=2,edge_color='b')
labels={}
for i in range(0,34):
    labels[i] = i
nx.draw_networkx_labels(g,pos,labels,font_size=16)
plt.axis('off')
for line in nx.generate_edgelist(g):
    edgeW.write(line +'\n')
plt.savefig("F:\Web_Science\cs532-s16\A5\kEdges.png")
plt.show()
```

This script produced the following graph and list of edges and their weights.



```
0 1 {'weight': 4.0}
0 2 {'weight': 5.0}
0 3 {'weight': 3.0}
0 4 {'weight': 3.0}
0 5 {'weight': 3.0}
0 6 {'weight': 3.0}
0 7 {'weight': 2.0}
0 8 {'weight': 2.0}
0 10 {'weight': 2.0}
0 11 {'weight': 3.0}
0 12 {'weight': 1.0}
0 13 {'weight': 3.0}
0 17 {'weight': 2.0}
0 19 {'weight': 2.0}
0 21 {'weight': 2.0}
0 31 {'weight': 2.0}
1 2 {'weight': 6.0}
1 3 {'weight': 3.0}
1 7 {'weight': 4.0}
1 13 {'weight': 5.0}
1 17 {'weight': 1.0}
1 19 {'weight': 2.0}
1 21 {'weight': 2.0}
1 30 {'weight': 2.0}
2 3 {'weight': 3.0}
2 32 {'weight': 2.0}
2 7 {'weight': 4.0}
2 8 {'weight': 5.0}
2 9 {'weight': 1.0}
2 13 {'weight': 3.0}
2 27 {'weight': 2.0}
2 28 {'weight': 2.0}
3 7 {'weight': 3.0}
3 12 {'weight': 3.0}

```

From the data collected thus far I could not accurately predict the outcome of the split.