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CSCI 4220-E01

Programming Assignment 02

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Contents

1 Questions

Question 1.

- Download the data-set karate.zip

- The file "karate.gml" contains the network of friendships between the 34 members of a karate club at a US university (studied by Wayne Zachary in 1977).

1. Implement a python script to implement Girvan Newman's Community detection algorithm (based on edge betweenness). Implement the algorithm on Karate club dataset until you divide the network into two communities.

2. Your Python script should print the communities with the set of nodes.
   For example: community 1: [n1, n2, n3,.....], Community 2: [n10, n13, n30......]

3. Submit your python script in Canvas (save your file as: yourLastname_yourfirstname_hw1_problem2.py)

4. Please capture a screenshot of your output and submit in Canvas.(save your file as:
   yourLastname_yourfirstnam_hw1_problem2.png)

2 Code

Code available here

```
0 # ##   Libraries

2 # import networkx as nx
  # from networkx.algorithms.community.centrality import girvan_newman
4 # import pandas as pd
  # import numpy as np
6 # import matplotlib.pyplot as plt
  # import time
8 # import pprint

10 # ##   load graph and establish format
  # karate_graph = nx.karate_club_graph()
12 # karate_layout = nx.spring_layout(karate_graph)

14 # ## display info
  # print(nx.info(karate_graph))
16
  # ## using the built in karate club graph
18 # karate_graph = nx.karate_club_graph()

20 # ##   Girvan Newman Algo
  # communities = girvan_newman(karate_graph)
22
  # ## List of nodes
24 # node_groups = []

26 # for comm in next(communities):
  #      node_groups.append(list(comm))
28
  # this_dict = dict()
30 # this_dict["Community 0: "] = node_groups[0]
  # this_dict["Community 1: "] = node_groups[1]
32
  # ## sloppy way to zip a title to each sub−list
34 # for dic in this_dict:
  #      print(dic, this_dict[dic])
36
  # ## List of colors
38 # color_map = []
  # for node in karate_graph:
40 #      if node in node_groups[0]:
  #          color_map.append('mediumvioletred')
42 #      else:
  #          color_map.append('cornflowerblue')
44
  # ## Draw, display, and save graph
```

```python
46 # nx.draw(karate_graph , node_color=color_map , with_labels = True)
   # plt.show()
48 # plt.savefig("gNewman.png")

50 ## without built in karate club graph

52
   import networkx as nx
54 from networkx.algorithms.community.centrality import girvan_newman

56 import matplotlib.pyplot as plt

58 karate_graph = nx.read_gml('karate.gml', label = 'id')

60 ##  Girvan Newman Algo
   communities = girvan_newman(karate_graph)
62
   ## List of nodes
64 node_groups = []

66 for comm in next(communities):
       node_groups.append(list(comm))
68
   this_dict = dict()
70 this_dict["Community 0: "] = node_groups[0]
   this_dict["Community 1: "] = node_groups[1]
72
   ## display info
74 ## print(nx.info(karate_graph)) deprecated function
   print('Graph with ', len(karate_graph.nodes()), 'nodes and ',  len(karate_graph
       .edges()),'edges.')
76
   ## lazy way to zip a title to each sub-list
78 for dic in this_dict:
       print(dic , this_dict[dic])
80
   ## List of colors
82 color_map = []
   for node in karate_graph:
84     if node in node_groups[0]:
           color_map.append('mediumvioletred')
86     else:
           color_map.append('cornflowerblue')
88
   nx.draw_networkx(karate_graph , node_color=color_map , with_labels = True)
90 plt.show()
   plt.savefig("gNewmanOut.png")
```

3   Output

3.1   cli output

```
PowerShell                    ×      bk@x1: ~/dev/4220/csci-4220,  ×    +   ∨

bk@x1:~/dev/4220/csci-4220/pa-02$ python3 allenBrice-pa-02.py
Graph with  34 nodes and  78 edges.
Community 0:  [1, 2, 4, 5, 6, 7, 8, 11, 12, 13, 14, 17, 18, 20, 22]
Community 1:  [3, 9, 10, 15, 16, 19, 21, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34]
bk@x1:~/dev/4220/csci-4220/pa-02$ |
```

3.2   Graph