

Graph representation using Python and NetworkX

Tools :

You can use the libraries of Python. Install the following modules for Python3 as pandas, matplotlib, networkx and all what you need during the project.

Download data file to use the datasets available at moodle3.unistra.fr or using this link :

https://drive.google.com/drive/folders/1-Gpktj7kg0g-4-4byV8biTpUdkOLVTNr?usp=share_link

Part 1:

1. Read the dataset file from the CSV files
2. Describe each attribute in the dataset in the simplest way.
3. Describe the relations between the attributes.
4. Use statistical tools to represent the data using charts and other tools.

Part 2:

5. Using your experience from the lab session and the lab networkx, present the data in a graph format using:
 - a. First representation uses "IP" as a node and an event as edges.
 - b. Second representation uses event (row) as a node.
 - c. Third representation uses any attribute that you decide as a node.
6. Automate the process of representation using graphs to let users decide which attribute as node and which attribute as edges.

Part 3:

7. Using the plot of the graph to visualize it
8. Create a function to find anyone's path from a given origin to a given destiny (not supposed to be optimal) - you could get inspiration from Depth First Search (DFS) algorithm: https://en.wikipedia.org/wiki/Depth-first_search
9. Create a function to evaluate how many packets were sent using a path between IPs. Verify this by comparing your results to different implementations of the path function.

Part 4:

10. Use colors to the plot to represent differences between protocols.
11. Automate the coloring so the user can choose the attribute and then the representation color based on the difference between values.

If you have questions about the tasks please contact nigar.alishzada@ufaz.az and amhaz@unistra.fr and take an appointment to ask questions personally or via google meet.

Part 5:

12. Using the graphs tools give the values or the matrices of values for :

- Degree Connectivity
- Closeness Centrality
- Betweenness Centrality
- Network Density
- Network Diameter
- Network Average Path Length

Important: Use one or more notebooks via colab to represent all the codes the descriptions and to comment on the results you will have.

1. SUBMISSION

Deadline of submission: **Friday 22 December**

To be submitted:

- 1- Report on 10 pages maximum
- 2- Codes in Python

Sure: If you submit a notebook ipynb your point will be on 20, and report + code will be considered submitted.

- 3- The presentation that you will present to Mrs. Nigar Alishzada

To be considered:

- A) Good description of the project
- B) A good description of the data
- C) A good representation of the data in a network well defined based on your needs or your subject (+code)
- D) Good Analyse of the complexity of your graph representation.
- E) If you can do a better representation after the analyze (you can do a second representation after the analysis process)
- F) Good Final Analysis of the graph representation (+code)
- G) Good proposition of using one or more algorithms that solves your problem (EXAMPLE application: the maximum flow algorithm)
- H) Final conclusion about your project and perspectives of your project.

Codes should be well described by comments (without comments, you lose 1/4 of the full grade)

2. PRESENTATION

The presentation of your project will be **AS VIDEO of 10 minutes maximum or presentation in front of Mrs. Nigar.**

During the presentation, a few slides convinced us that you have prepared a good project, and mainly all members of the group understand the project and participate in one or many steps described above. IF we realize that one of the members didn't work or does not understand the tasks penalty points can affect even the report grade.

If you have questions about the tasks please contact nigar.alishzada@ufaz.az and amhaz@unistra.fr and take an appointment to ask questions personally or via google meet.