PROJECT

First, please select **one** of the following alternative projects to conduct computer simulations.

1. Investigate a network or a set of networks that contains at least one hundred nodes. You can formulate a network by collecting data by your own. You must clearly explain how the network is formulated and the rationale that you constructed such a graph (the notations of nodes and edges).
(1) Perform <u>some</u> computer simulations (by using whatever computer software or programming language) on the formulated graphs to analyze the network properties (such as node-degree distribution, average shortest path-length, clustering coefficient, etc.) and dynamical behaviors (such as robustness against intentional attack and random attack, etc.).

(2) Calculate the node <u>coreness</u> in the formulated graphs;

(3) Draw necessary figures and/or tables to demonstrate your simulation results and to support your observations;

(4) To have <u>extra bonus</u>, you can develop a small system (including friendly interfaces, or graphic demonstrations) to show the layout of the networks you constructed.

2. With the spread of COVID-19, it poses big crisis for human beings. Read any recently developed papers that are related to complex network field and COVID-19, work on the selected paper that may include the following:
(1) highlight the features of the paper you have read, understand the techniques that authors used, repeat its revealed partial or full results by your own using any computer software or programming language. Draw necessary figures and/or tables to demonstrate your simulation results and to support your observations.

(2) to have extra bonus, you can propose your own model by changing one or more technical steps in the original model you have chosen above, such as initial condition, parameter settings, or else. Explain your rationale for making the change. Perform <u>some</u> computer simulations (by using whatever computer software or programming language), to a certain network size and step size that are large enough to show <u>some</u> basic features (whatever features you can observe) of your new model. Compare your model with the original model, draw necessary figures and/or tables to demonstrate your simulation results and to support your observations.

(3) or you can collect the COVID-19 data by yourself, propose a model for any purpose, such as COVID-19 control, analyzing the spreading dynamics, offering policy suggestions, etc. Perform some computer simulations and draw necessary figures and/or tables to demonstrate your simulation results and to support your observations.

Second, write a **Report** to summarize your project that you have selected.
The report should be written in such a way that a reader can understand what you have done and how to do it. That is, all detailed information should be provided and described clearly, so that anyone who wants to verify your model and simulations can reproduce them easily. The report does not have to be long (generally, a typed report has 10-20 pages including figures; no need to go beyond 20 pages unless it is necessary).

Third, prepare a **PPT** to demonstrate your basic modeling methods (or algorithms), observations, and discussions.

Organization format: one - two students per team. This project is conducted in a team work. You can use some software tools to manage your project process.

This project is due before the last class

Submit the <u>hard </u>copy of your Report to TA (Chao Ouyang and Minglong Dong); Wrap the soft copy of your report, the PPT and your source codes in only one file (named by your name + student ID) in .zip format (including a readme.txt file for explanations to the program settings if necessary), and submit it through <u>HITSZ-OJ (please contact TA to obtain the link).</u>