Introduction to Networks, MATH1010A
Last Updated January 19, 2023

Course Agenda

[1] Mondays and Thursdays will consist of lectures with a 15 minute break in the middle. Tuesdays will be "Computer Lab" days. **Please bring your laptops on Computer Lab Tuesdays.** We will go over a topic together and then will have an in-class activity to practice new skills.

[1] This schedule is tentative and depends on our pace week-to-week.

Week One

Weekly Goals: *Getting to know each other, assessing your expectations and hopes for the class, networks in the wild, introduction to graphs.*

    Reading: Chapter 1, Chapter 2.1, 2.2, `Graph_Types.pdf`

January 5

    Introduction to {me; you; the course}. Introduction to graph theory.

Homework 0 Assigned Due Tuesday 1/10

Week Two

Weekly Goals: *Graph theory vocabulary and concepts, learn about different types of ties in social networks. Introduce the concepts of homophily, bipartite networks, and affiliation networks.*

    Reading: Chapter 2.3, Chapter 3.1, 3.2, 3.3, 3.4, 3.5, 3.6A, Chapter 4.1, 4.2, `Adj_mats.pdf`, `Centrality_measures.pdf`

January 9

    Finish introduction to graph theory, adjacency matrices, Strong and Weak Ties.

January 10

    Class is asynchronous today with an optional in-person component from 3-4pm in our classroom. Introduction to python; set up jupyter notebooks; make a GitHub repository. **Important: There is still a quiz today. It will be online and you must complete it by 11:59pm today, 1/10.**

January 12

    Betweenness and Graph Partitioning. Centrality measures. Homophily.

Homework 1 Assigned Due Tuesday 1/17

HW0 due

Week Three

Weekly Goals: *Discuss the Friendship paradox and a modern example of social network science. Introduce some of the more well-known phenomena*

Homework 2 Assigned Due Tuesday 1/24

Project Proposal (Homework 3) Due Thursday 1/26

in network science: Power laws, rich-get-richer, and the small-world or six degrees of separation.

Reading: 4.3, 4.4, Chapter 18 Friends You Can Count On.

January 16

No class in observation of Martin Luther King Jr. Day.

January 17

HW1 due
WiDs tonight!

Adjacency matrices and numpy. Importing network data. Using `networkx` to visualize networks.

January 19

Discuss final project options. Affiliation networks. The Friendship Paradox, Social Capital. Power Laws and Rich-Get-Richer.

Week Four

Weekly Goals: *Form project groups. Decide what you'd like to do for your final project. Learn about the web as a network and how search engines work. Introduction to information cascades, how news (or germs) travel through a network.*

Final Project Writeups and Presentations Due Thursday 2/2

Project Proposal (Homework 3) Due Thursday 1/26

Reading: Chapter 13, Chapter 14, Chapter 16, Chapter 19, Chapter 21, Super optional: Chetty et al. 2022, Social capital I

January 23

Project teams due January 23.

The structure of the web. Link analysis and web search. Page Rank and Page Rank activity.

January 24

HW2 due

Using `networkx` libraries to analyse real life networks.

January 26

Project Proposals due

Information Cascades and activity. Bayes' rule. Diffusion through a network. Epidemics

Week Five

Weekly Goals: *Introduction to some more advanced applications of network science. Work on and finish final projects and presentations. Celebrate our time together.*

Reading: None

January 30

Example final project content and presentation. Modern applications of network science.

February 1

In-class final project workday.

February 2

Project Presentations and Writeups due

Final project due. Final project presentations; class celebration.