Introduction to Networks, MATH1010A

Last Updated January 17, 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: Chapter 18, Chapter 20, *Friends You Can Count On. Super optional: Chetty et al. 2022, Social capital I*

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. Small-World phenomenon.

Week Four

Final Project Writeups and Presentations Due Thursday 2/2

Project Proposal (Homework 3) Due Thursday 1/26

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.*

Reading: *Chapter 13, Chapter 14, Chapter 16, Chapter 19, Chapter 21*

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

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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.