

Introduction to Networks, MATH1010A

Last Updated January 7, 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, Chapter 3, Chapter 4

January 9

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

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

Homophily, affiliation, segregation

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

Homework 2 Assigned Due Tuesday
1/24

Project Proposal (Homework 3) Due
Thursday 1/26

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

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

HW₁ due
WiDs tonight!

January 19

Discuss final project options. The Friendship Paradox, Social Capital. Power Laws and Rich-Get-Richer. Small-World phenomenon.

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.*

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

January 23

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

January 24

Using networkx libraries to analyse real life networks.

January 26

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

Final Project Writeups and Presentations Due Thursday 2/2

Project Proposal (Homework 3) Due Thursday 1/26

Project teams due January 23.

HW₂ due

Project Proposals due

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

Final project due. Final project presentations; class celebration.

Project Presentations and Writeups due