

Syllabus

COMP 388/488: Topics in CS: Network Science

Spring 2025



Last Updated: Feb 2. Moved Quiz 1 back by a week

1 Course Information

Course Name COMP 388/488: Topics in Computer Science: Network Science

Course Description Network science serves as a unifying framework to study intricate interconnected systems, encompassing living organisms, societies, power grids, and various techno-social systems. This course delves into the fundamental concepts and key applications of network science. Topics covered include the statistical properties and models of real-world networks, centrality measures, spreading phenomena, and community detection (clustering).

Modality Synchronous online

Course Duration Jan 13, 2025 – May 3, 2025

Lectures Mon 5:30 – 8:00 pm CT

Zoom Link <https://luc.zoom.us/j/81661665821>

Prerequisites (COMP 306 \vee COMP 379 \vee COMP 329) $((\text{COMP } 163 \vee \text{MATH } 201) \wedge (\text{COMP } 231 \vee \text{COMP } 251 \vee \text{COMP } 271))$ or instructor's permission

Helpful Links [Lecture Zoom Link](#) [Office Hours](#) [Gradescope \(DKB4W3\)](#) [Microsoft Teams](#) [Late Pass Form](#)

2 Instructor Information

Instructor Dr. Satyaki Sikdar

Campus Office Location 211 Doyle Center

Email ssikdar@luc.edu

Office Hours Online and in-person by appointment via [Calendly](#)

Contact Preference Microsoft Teams Email

3 Learning

Learning Outcomes

Identify and categorize various types of networks based on their origin (social, transportation, information, etc.) and characteristics (directed, attributed, temporal, multilayer, etc.)

Learn the pros and cons of different representations and storage formats of networks: adjacency lists, adjacency matrices, edge lists, GML, etc.

Understand the basics of network visualization and layout algorithms. Gain familiarity with Python plotting libraries such as matplotlib and Plotly.

Comprehend different network and node-level metrics including closeness, betweenness, and PageRank centralities. Predict structural characteristics based on centrality scores.

Get familiar with classical community detection algorithms such as Girvan-Newman, greedy and local optimization-based methods based on Modularity and Conductance, etc.

Get introduced to various network generative models including Erdős-Rényi models, Watts-Strogatz, preferential attachment, and configuration models.

Model the spread of epidemics over networks using the SI, SIS, SIRS models. (*COMP 488 only*)

Understand the steady state behavior and sensitivity to initial conditions of epidemic spread models. (*COMP 488 only*)

Activities

Problem Sets

Problem sets will be released on **Wednesdays at 1 pm** and due the following **Wednesday at 11:55 pm**. The **lowest-scoring** problem set will be dropped when calculating the final grade. Over the semester, 7-8 problem sets will be released. Problem sets may contain additional challenging questions for graduate students.

Quizzes

There will be 3 timed online quizzes administered on Sakai. There may be some overlap in content across quizzes. Each quiz will be worth 50 points and contain a mix of multiple-choice and short-answer questions. They will be closed book and closed internet, but you can use your class notes. You are expected to solve the problems on your own. Collaborating with other students or using other resources will be considered an Honor Code violation and treated appropriately. You will get *one* attempt to take the quiz during the nearly three-day window between Thursday and Saturday. The tentative dates are marked in **green** in the Schedule provided in the following section.

Final Exam

There will not be a final exam for this class. The final course project deliverables will be due at **11:55 pm** on the final exam date prescribed by the university.

Participation

After each lecture, you will be asked to write a brief reflection statement (4-5 sentences) covering the topics discussed. These will be administered on Sakai and will be due **24 hours** after the end of the lecture. These will be graded primarily for completion, and the **two lowest-scoring** assignments will be dropped while calculating the final grade.

Course Project

There will be a semester-long individual course project. There will be recurring checkpoints throughout the semester to track your progress. A final project report and a 10-15 min recorded presentation are due at the end of the semester during the week of final exams. More details will be posted on the course Sakai page. Graduate students are expected to produce more thoughtful and more challenging course projects.

Tentative Schedule

The schedule may be adjusted to fit the needs of the class. Please check Sakai for the most updated version.



Legend: Lectures Holidays Quizzes Misc. Events

4 Textbooks

1. Networks, Crowds, and Markets: Reasoning About a Highly Connected World

By David Easley and John Kleinberg

The book is freely available online and can be accessed using this [link](#).

2. Network Science

By Albert-László Barabási

The book is freely available online and can be accessed using this [link](#).

3. A First Course in Network Science (optional)

By Filippo Menczer, Santo Fortunato, and Clayton A. Davis

This book has a companion [GitHub](#) repository with helpful Jupyter notebooks.

5 Evaluation and Grading

Grade Distribution

Component	Weight
Problem Sets	35%
Quizzes	$3 \times 10\% = 30\%$
Course Project	25%
Participation	10%

Grading Scale

A	A-	B+	B	B-	C+	C	C-	D+	D	F
94+	90+	87+	84+	80+	77+	74+	70+	67+	60+	<60

6 *Policies*

General

Please be kind to yourself, your fellow students, and the course staff.

One important aspect of a Jesuit education is learning to respect the rights and opinions of others. Please respect others by (1) allowing all classmates the right to voice their opinions without fear of ridicule and (2) not using profanity or making objectionable (gendered, racial or ethnic) comments, especially comments directed at a classmate.

Class rosters are provided to each instructor with the student's legal name. I will gladly honor your request to address you by an alternate name and/or gender pronoun.

Life happens, and problems may come up which may interfere with your life and work. If you feel the need to sort something out related to this class, please contact Prof. Sikdar. If you have a problem with Prof. Sikdar, please contact the department chair, Prof. George Thiruvathukal.

I am committed to the principle of universal learning. This means that our classroom, virtual spaces, practices, and interactions are as inclusive as possible. Mutual respect, civility, and the ability to listen and observe others are crucial to universal learning. Active, thoughtful, and respectful participation in all aspects of the course will make our time together as productive and engaging as possible.

Attendance

The class will be conducted synchronously online over Zoom. You are expected to attend all weekly lectures.

At Loyola, faculty members will make efforts to accommodate students if the observance of a major religious holiday interferes with a student's academic work. If you are unable to attend a class, participate in a test or quiz, be present for a presentation, or complete an assignment on a specific day because of the observance of a religious holiday, you will be excused and provided the opportunity to make up the work. You will continue to be responsible for all assigned work and should notify the professor in advance through Loyola email of the religious observance(s) that conflict with your classes.

Academic Integrity

Academic integrity is the pursuit of scholarly activity in an open, honest, and responsible manner. Academic integrity is a guiding principle for all academic activity at Loyola University Chicago, and we expect all members of the University community to act under this principle. Failing to meet the following academic integrity standards seriously violates personal honesty and the academic ideals that bind the University into a learning community. These standards apply to both individual and group assignments. Individuals working in a group may be held responsible if one of the group members has violated one or more of these standards.

1. Students may not plagiarize.
2. Students may not submit the same work for credit for more than one assignment (known as self-plagiarism).
3. Students may not fabricate data.
4. Students may not collude or cheat.
5. Students may not facilitate academic misconduct.

Read through Loyola's full statement on Academic Integrity [here](#).

These policies fully apply to this course. The penalty for task-wise academic misconduct is losing all the task's points. Multiple events of misconduct will be reported through the proper channels.

Using Generative AI Tools

Academic integrity is a guiding principle for academia. You may not to submit others' work without attribution, fabricate information, or facilitate misconduct of others.

In this course, students may use AI tools for activities such as brainstorming and proofreading but must **never** submit AI-generated content as their own work, without attribution. Any use of AI must be disclosed and properly cited to maintain academic integrity and support the development of individual writing skills, otherwise sanctions will result. Remember, use it but cite it!

Late Work

Life often gets in the way of study. To accommodate that, you have **2 Late Passes** with no questions asked. To use a Late Pass, you must follow these guidelines. *No late work will be accepted without late passes.*

Notify Prof. Sikdar before the assignment is due. Any time before the deadline is fine. The notification must be made via the **late pass submission form**. Your request will be approved as long as you have late passes remaining. Thus, you do not need to wait for a response.

Turn in the assignment within **3 calendar days** of the original due date. Please include a note that it is being submitted late with a Late Pass.

You may only use one Late Pass per assignment.

Late Passes will not be applied automatically or retroactively to a past assignment.

Grade Change and Regrade Requests

Any requests for a grade change on an assignment or a quiz must be made within **seven days** when the grades are published. Any clerical errors while grading will be happily corrected.

All change requests for problem sets must be made on Gradescope.

Attendance

The class will be conducted online. You are expected to attend all weekly lectures and actively participate in the in-class activities. You are also *strongly encouraged* to have your webcams on during the lectures.

At Loyola, faculty members will make efforts to accommodate students if the observance of a major religious holiday interferes with a student's academic work. If you are unable to attend a class, participate in a test or quiz, be present for a presentation, or complete an assignment on a specific day because of the observance of a religious holiday, you will be excused and provided the opportunity to make up the work. You will continue to be responsible for all assigned work and should notify the professor in advance through Loyola email of the religious observance(s) that conflict with your classes.

Class Recording Notification

This course will be recorded using Zoom. This system allows us to automatically record and distribute lectures to you in a secure environment. You can watch these recordings on your computer, tablet, or smartphone. In Sakai, look for the links to the lecture videos on the course schedule. Because we will be recording the lectures, your questions and

comments may be recorded. Except for faculty and staff who require access, no content will be shared with individuals outside your course without your explicit permission. Loyola University Chicago and your instructor jointly copyright these recordings. Posting them to other websites (including YouTube, Facebook, Snapchat, etc.) or elsewhere without express written permission may result in disciplinary action and possibly civil prosecution.

Privacy Statement

Assuring privacy among faculty and students engaged in online and face-to-face instructional activities helps promote open and robust conversations and mitigates concerns that comments made within the context of the class will be shared beyond the classroom. As such, recordings of instructional activities occurring in online or face-to-face classes may be used solely for internal class purposes by the faculty member and students registered for the course, and only during the period in which the course is offered. Students will be informed of such recordings by a statement in the syllabus for the course in which they will be recorded. Instructors who wish to make subsequent use of recordings that include student activity may do so only with informed written consent of the students involved or if all student activity is removed from the recording. Recordings, including student activity initiated by the instructor, may be retained by the instructor only for individual use.

Intellectual Property

All lectures, notes, PowerPoint slides, and other instructional materials in this course are the intellectual property of the professor. As a result, they may not be distributed or shared in any manner, either on paper or virtually, without my written permission. Lectures may not be recorded without my written consent; when consent is given, those recordings may be used for review only and may not be distributed. Recognizing that your work, too, is your intellectual property, I will not share or distribute your work in any form without your written permission.

Statement of Intent

By remaining in this course, students are agreeing to accept this syllabus as a contract and to abide by the guidelines outlined in the document. Students will be consulted should there be a necessary change to the syllabus.

Notice of Reporting Obligations for Responsible Campus Partners

As an instructor, I am a Responsible Campus Partner (“RCP”) under Loyola’s [Comprehensive Policy and Procedures for Addressing Discrimination, Sexual Misconduct, and Retaliation](#) (available at luc.edu/equity). While my goal is for you to be able to engage fully and authentically with our course material through class discussions and written work, I also want to be transparent that as a RCP I am required to report certain disclosures of sexual misconduct (including sexual assault, sexual harassment, intimate partner and/or domestic violence, and/or stalking) to the [Office for Equity & Compliance](#) (“OEC”). As the University’s [Title IX](#) office, the OEC coordinates the University’s response to reports and complaints of sexual misconduct (as well as discrimination of any kind) to ensure students’ rights are protected.

As an instructor, I also have an obligation under Illinois law to report disclosures of or suspected instances of child abuse or neglect (luc.edu/hr/legal-notices/mandatedreportingofchildabuseandneglect/).

The University maintains such reporting requirements to ensure that any student who experiences sexual/gender-based violence receives accurate information about available resources and support. Such reports will **not** generate a report to law enforcement (no student will ever be forced to file a report with the police). Additionally, the University’s resources and support are available to all students even if a student chooses that they do not want any other action taken. If you have any questions about this policy, you are encouraged to contact the OEC at equity@luc.edu or 773-508-7766.

If you ever wish to speak with a confidential resource regarding gender-based violence, I encourage you to call **The Line** at 773-494-3810. The Line is staffed by confidential advocates from 8:30 am - 5 pm M-F and 24 hours on the weekend when school is in session. Advocates can provide support, talk through your options (medical, legal, LUC reporting, safety planning, etc.), and connect you with resources as needed – without generating a report or record with the OEC. More information about The Line can be found at luc.edu/wellness.

Student Accommodations

Loyola University provides reasonable accommodations for students with disabilities. Any student requesting accommodations related to a disability or other condition is required to register with Student Accessibility Center (SAC), located in Sullivan Center, Suite 117. Professors receive the accommodation notification from SAC via Accommodate. Students are encouraged to meet with their professor individually in order to discuss their accommodations. All information will remain confidential. Please note that in this class, software may be used to record class lectures in order to provide equal access to students with disabilities. Students approved for this accommodation use recordings for their personal study only and recordings may not be shared with other people or used in any way against the faculty member, other lecturers, or students whose classroom comments are recorded as part of the class activity. Recordings are deleted at the end of the semester. For more information about registering with SAC or questions about accommodations, please contact SAC at 773-508-3700 or SAC@luc.edu.

Mental Health

In a given year, 5-20% of US residents will contract influenza (this rate varies greatly depending on the vaccine's effectiveness and virulence of the seasonal strain). In contrast, around 7% of US residents experience a major depressive episode each year. In other words, depression is as common as the flu, yet one can sometimes be socially stigmatized, and the other is not. From my point of view as your professor, if you are having mental health issues that are interfering with your ability to function (in my course or otherwise), that is an entirely valid medical reason to ask for short term extensions or accommodations, just as you might for a physical illness or injury. So, if your situation is hard or you feel hopeless, do not hesitate to reach out, and I will try to work with you to minimize the impact mental health difficulties have on your performance in my class.

During the semester, if you find that health problems, life stressors or emotional difficulties are interfering with your academic or personal success, and you are therefore finding it difficult to cope or to complete your academic work, please consider contacting the Wellness Center. Healthcare services, crisis intervention, time-limited individual counseling, and group therapies are free of charge, and strictly confidential, having nothing to do with your educational records.

You can make an appointment **online**. You may also call 773-508-2530 for counseling appointments or 773-508-8883 to speak with a nurse about medical concerns. More information is available at the **Wellness Center**. If your medical or mental health condition requires ongoing academic accommodations, please register with **Student Accessibility Services** and provide me with a copy of your accommodation letter.
