GIS 4113: Introduction to Spatial Networks
Department of Geography
Fall 2025

Instructor	Dr. Yujie Hu
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Lab Website	https://geonavilab.geog.ufl.edu
Office Hours and Location	Wed. & Fri. 1:00 – 2:00 pm in TUR 3133
Class Meeting Time and Location	Fri. 9:35 am – 12:35 pm; TUR 3018

🕮 COURSE DESCRIPTION

It is often the case that real-world systems can be represented as networks of many interacting components. Examples include information (the World Wide Web, citation), social (friendship, classmates), physical (transportation, distribution), biological (food chain, brain) systems, and so forth. Many of these networks are essentially spatial, meaning each node can be associated with a location somewhere in the real world. Based on recent advances in network science and GIScience, this course teaches the fundamental concepts, models, and techniques for describing, visualizing, measuring, and analyzing networks. It also introduces their applications in geography, transportation, social science, etc. A series of labs using the popular network analysis package Gephi and GIS software ArcGIS are also designed to help students gain hands-on experience in visualizing and analyzing networks.

🕮 COURSE OBJECTIVES

After successful completion of this course students should be able to:

- Have a solid grasp of the vocabulary, central concepts, measures and techniques relating to networks;
- Conduct experiments within the Gephi and ArcGIS software environment;
- Apply their knowledge to visualize and analyze a real network data set of their choosing.

🕮 PREREQUISITES

Entry level knowledge of statistics (STA2023, GEO3162C/6160, or equivalent), or the consent of the instructor. Prior knowledge or experience with ArcGIS is preferred, but not required.

🕮 TEXTBOOKS

Recommended textbooks:

- Newman, M. (2010). *Networks: An Introduction*. Oxford University Press.
- Scott, J. (2017). *Social Network Analysis* (*4th ed.*). SAGE Publications.

🕮 EVALUATION

GRADE DISTRIBUTION

- **Participation (10%)**
  Students are encouraged to participate in class and contribute to our discussions. The most effective way for students to prepare for this portion of the evaluation is to come to class having read the assigned materials, such as slides from last lecture and readings. Note that their level of engagement with the class will be monitored by the instructor. This also includes the possibility of having occasional quizzes, where a portion of the participation

points will be specifically allocated for quizzes. The quizzes may be in a form of multiple choice, short answer, or short essay responses.

- **Homework assignments (40%)**
  Several homework assignments, including lab exercises, will be given to help students understand the concepts and methods discussed in class. They have one week to complete each assignment.
- **Mid-term exam (20%)**
  A close-book exam, covering all course contents by the day of the test, will be administered in class. The exam will comprise a mix of short answer, short essay responses, and math problems.
- **Final individual project (20%)**
  Each student will select a topic (**must be approved by instructor**) and complete an independent project utilizing skills they have acquired from the class. Each student needs to submit a report. Length is 1000 – 1500 words and must have proper references (a suggested format of the report will be provided). We will approach this in stages. The stages of report development will be graded and returned to the student to ensure progress: outline with details about data and methods – 5% and final report – 15%.
- **Final project presentation (10%)**
  Each student will prepare a 15-minute presentation (10-minute for presentation and 5-minute for Q&A) discussing their final project. Students will be provided with a rubric to guide their presentation. This usually takes place in the last two weeks of the class.

GRADING SCALE (&GPA EQUIVALENT)

A	A-	B+	B	B-	C+	C	C-	D+	D	D-	E
93+	92-90	89-87	86-83	82-80	79-77	76-73	72-70	69-67	66-63	62-60	59-
4.0	3.67	3.33	3.0	2.67	2.33	2.0	1.67	1.33	1.0	0.67	0

Note: A grade of C- is not a qualifying grade for major, minor, Gen Ed, or College Basic distribution credit. For further information on UF's Grading Policy, see: https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx#hgrades.

🕮 CLASSROOM POLICIES

- This course complies with all UF academic policies. For information on those polices and for resources for students, please see this link.
- Late submissions of the final project report will not be accepted. Late submissions of assignments can be accepted, but *10%* of the points will be deducted per day after the due date.

🕮 SUGGESTED COURSE SCHEDULE

Students should note that there may be changes to the class schedule.

Weeks	Lectures	Labs
1	Course overview; Intro to spatial networks	
2	Data for networks	Prepare and create networks
3	Concepts in networks	Visualize spatial networks
4	Concepts in networks	Compute network concepts

5	Concepts in networks	Create and analyze bipartite networks
6	Network measures	Measure network centrality
7	**Mid-term exam**	
8	Network measures	Measure network distances
9	**NO CLASS: Homecoming**	
10	Network measures	Prepare for final project
11	Network models	Prepare for final project
12	Network dynamics	Prepare for final project
13	Network dynamics	Prepare for final project
14	Final project presentation	
15	**NO CLASS: Thanksgiving**	
16	**NO CLASS: Reading Day**	