Spring 2021
Introduction to Network Science
Instructor: Jianxi Gao
Class room:
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Textbooks:
1. Network Science, Albert-László Barabási
2. Complex Networks: Structure, Robustness and Function, Reuven Cohen and Shlomo Havlin
3. Introduction to network of networks, Jianxi Gao, Amir Bashan, Shlomo Havlin

Course description
Networks are everywhere. This course is an interdisciplinary introduction to the emerging science of complex networks and their applications. Topics to be covered include the mathematics of networks, data analysis, network visualization, and applications to ecology, biology, sociology, technology, and other fields. Students will learn about the ongoing research in the field, and ultimately apply their knowledge to conduct their own analysis of a real network data set of their choosing as part of the final project.

Prerequisites

CSCI 2200

Course Content
- Introduction to network science
- Graph theory
- Random networks
- Scale-free networks
- The Barabasi-Albert Model
- Evolving Networks
- Degree Correlations
- Network Robustness
- Spreading Phenomena,
- Communities,
- Network control

Evaluation and grading
- 10% on the attendance (Random 10 times sign in)
- 30% on the written assignments
- 20% in-class quizzes
- 20% on the progress presentations
- 10% on the final project presentation

- 10% on the final project reports

The progress presentations will be graded 0 or 1 (progress made, and effectively communicated). To get an A you need 95%, A– you need 90%, B+ you need 85%, etc.

Student Learning Outcomes
1. Understand the structures and dynamics of networked systems;
2. Apply the knowledge of network science to real systems in different fields;
3. Build the computer programming skills for network analysis and network visualization;
4. Read, analyze, and critique published literature in the field of network science and dynamical systems

Course Assessment Measures
(1) Final project assignment: students will collect data representing a real complex networked system and analyze the structural or dynamical resilience of it using the computational tools introduced in class.
(2) Homework assignments.
(3) Contributions to in-class discussions.

Academic Integrity
Student-teacher relationships are built on trust. For example, students must trust that teachers have made appropriate decisions about the structure and content of the courses they teach, and teachers must trust that the assignments that students turn in are their own. Acts, which violate this trust, undermine the educational process. The Rensselaer Handbook of Student Rights and Responsibilities defines various forms of Academic Dishonesty and all students should make themselves familiar with these. In this class, all assignments that are turned in for a grade must represent the student's own work. Submission of any assignment that is in violation of this policy will result in a penalty of 0 points for assignment and failing of the course in case of repetition. If you have any question concerning this policy, please ask for clarification before preparing or submitting an assignment. The penalty for not adhering to these academic integrity rules is a failing grade for the assignment on the first offense, then failing the course and potential disciplinary actions by the Institute on any subsequent offenses.

Changes to syllabus and student responsibilities
The instructor reserves the right to modify this syllabus as deemed necessary any time during the semester. Emendations to the syllabus will be discussed with students during a class period. Students are responsible for information given in class. There may be also details about this course not covered in this syllabus.
Do not assume something just because it is not specified in the syllabus. If you are unsure about anything related to the rules guiding this course, consult with the instructor.