Course Description

This is a 3-credit course.

Network science is a new and emerging scientific discipline that examines the interconnections among networks. The types of networks include, but are limited to, physical or engineered networks (e.g., power grid and transportation networks), information networks, biological networks (e.g., gene regulatory networks, protein networks, cell networks), semantic networks (e.g. word networks, concept networks), economic networks (e.g., stock markets), and social networks. This field of science seeks to discover common principles, algorithms and tools that govern network structures/topologies, network functionalities, and network behaviors. This course introduces various methodologies and technologies in network science and studies a multitude of applications of network science.

Course Prerequisites

- None

Required Textbook


Recommended Readings

- Alain Barrat, Marc Barthélemy, Alessandro Vespignani, "Dynamical Processes on Complex Networks", 1st
Course Information

Instructor:

Dr. Dapeng Oliver Wu
Office: NEB 431
Email: wu@ece.ufl.edu

TA:

Yun Zhu
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Course website: http://www.wu.ece.ufl.edu/courses/cnt6805f15

Meeting Time

Monday, Wednesday, Friday, period 9 (4:05 pm - 4:55 pm)

Meeting Room

LAR 310

Office Hours

- Dr. Wu: Monday, Wednesday, period 7 (1:55 pm - 2:45 pm), and by appointment via email.

Structure of the Course

The course consists of lectures, 3 homework assignments, and 1 project.

Course Outline

- Network Representations and Characteristics
- Network Partitioning and Clustering
- Network Visualization
- Community Formation and Detection
- Network Sampling of Events
- Learning of Network Topology
- Estimation of Network Dynamics
- Complex Network Robustness and Vulnerability
Course Objectives

Upon the completion of the course, the student should be able to

- understand the basics of network science
- conduct statistical analysis of network data
- know the fundamental techniques in network science
- acquire the basic skill of designing scheme for network partitioning, sampling, and estimation

Handouts

Please find handouts here.

Course Policies

- **Attendance:**
  - Perfect class attendance is not required, but regular attendance is expected.
  - It is the student's responsibility to independently obtain any missed material (including handouts) from lecture.
- **During lecture, cell phones should be turned off.**
- **No late submissions of your homework solution and project proposal/report, are allowed.**
- **Announcements:**
  - All students are responsible for announcements made in lecture, on the student access website, or via the class email list.
  - It is expected that you will check your email several times per week for possible course announcements.
- **Students with disabilities:**
  - Student requesting classroom accommodation must first register with the Dean of Students Office. The Dean of Students Office will provide documentation to the student who must then provide this documentation to the Instructor when requesting accommodation. For more information on classroom accommodation, please click here.

- **Intellectual Integrity**

All students admitted to the University of Florida have signed a statement of academic honesty committing them to be honest in all academic work and understanding that failure to comply with this commitment will result in disciplinary action. This statement is a reminder to uphold your obligation as a student at the University of Florida, and to be honest in all work submitted and exams taken in this class and all others. Refer to the academic honor code for more information.
Students are encouraged to discuss class material in order to better understand concepts. All homework answers must be the author's own work. However, students are encouraged to discuss homework to promote better understanding. What this means in practice is that students are welcome to discuss problems and solution approaches, and in fact can communally work solutions at a board. However, the material handed in must be prepared starting with a clean sheet of paper (and the author's recollection of any solution session), but not refer to any written notes or existing code from other students during the writing of the solution. In other words, writing the homework report shall be an exercise in demonstrating the student understands the materials on his/her own, whether or not help was provided in attaining that understanding.

All work submitted in this course must be your own and produced exclusively for this course. The use of sources (ideas, quotations, paraphrases) must be properly acknowledged and documented. For the copy of the UF Honor Code and consequences of academic dishonesty, please refer to http://www.dso.ufl.edu/scr/honorcodes/honorcode.php. Violations will be taken seriously and are noted on student disciplinary records. If you are in doubt regarding the requirements, please consult with the instructor before you complete any requirement of the course.

**Useful links:**

- UF Counseling Services –Resources are available on-campus for students having personal problems or lacking clear career and academic goals. The resources include:
  - UF Counseling & Wellness Center, 3190 Radio Rd, 392-1575, psychological and psychiatric services.
  - Career Resource Center, Reitz Union, 392-1601, career and job search services.

For university counseling services and mental health services, please visit [http://www.counsel.ufl.edu/](http://www.counsel.ufl.edu/).

- In order to graduate, graduate students must have an overall GPA and an upper-division GPA of 3.0 or better (B or better). Note: a B- average is equivalent to a GPA of 2.67, and therefore, it does not satisfy this graduation requirement. For more information on grades and grading policies, please visit: [http://www.registrar.ufl.edu/catalog/policies/regulationgrades.html](http://www.registrar.ufl.edu/catalog/policies/regulationgrades.html)

### Grading:

<table>
<thead>
<tr>
<th>Grades</th>
<th>Percentage</th>
<th>Dates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Homework</td>
<td>30%</td>
<td>See the <a href="http://www.wu.ece.ufl.edu/courses/cnt6805f15/index.htm">course calendar</a></td>
</tr>
<tr>
<td>Project proposal</td>
<td>10%</td>
<td>4pm, October 30</td>
</tr>
<tr>
<td>Project report</td>
<td>60%</td>
<td>4pm, December 16</td>
</tr>
</tbody>
</table>

The project report consists of

1. (50%) A written report for your project (You must obtain a similarity score for your written report from [Turnitin](http://www.wu.ece.ufl.edu/courses/cnt6805f15/index.htm); otherwise, your score will be reduced by 50% in this category of written report.)
2. (25%) Computer programs that you develop for your project
3. (10%) Powerpoint file of your presentation
4. (15%) Your presentation/demo video on YouTube

**Grading scale:**

Top 25% students will receive A. Average score will be at least B+.

**Homework:**

- Due dates of assignments are specified in the course calendar.
- **No late submissions** are allowed unless U.F. approved reasons are supplied and advance permission is granted by the instructor.
- If you wish to dispute a homework grade, you must return the assignment along with a succinct written argument within one week after the graded materials have been returned to the class. Simple arithmetic errors in adding up grade totals are an exception, and can normally be handled verbally on-the-spot during office hours of the TA. For all other disputes, the entire homework may be (non-maliciously) re-graded, which may result in increase or decrease of points.

**Class Project:**

The class project will be done individually (that is, teaming with other students is not allowed). Each project requires a proposal and a final report. The final report is expected to be in the format of a conference paper plus computer programs, a Powerpoint file, and a video. On Oct. 30, the project proposal (up to 2 pages) is due. On Dec. 16, the final report (up to 10 pages) is due. For details about the project, please read here.

Suggested topics for projects are listed here.

**Useful links**

- MATLAB Tutorial
- MATLAB Central
- Matlab Primer, Matlab Manuals
- Pajek: computer program for (large) network analysis and visualization. Pajek runs on Windows and is free for noncommercial use.
- Graph theory in Matlab:
  - Bioinformatics Toolbox has several functions related to graph theory, e.g., shortest-path, connected
components, max-flow. In addition, the documentation of the biograph object describes some functions for directed graphs.

- grTheory
- matlabBGL
- Matgraph