ECOL496H/596H Complex systems and networks
Fall 2013

Instructor:
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Office Hours by appointment

Mondays and Wednesdays 3-3:50pm, Modern Languages Building 301. 2 credits.

Course description
In this course we will compare social networks of humans and animals with gene networks, food webs, robot groups, and other systems composed of multiple interacting units. How do such decentralized, self-organized groups function? What are similarities and differences? Can researchers of one system learn from the insights of other fields? We will also talk about some hands-on methods for analyzing such systems.

Objectives
The goal of this class is to help students think of their study system or discipline from a different angle, and to inspire them to use methods and theory developed in other fields. We will try to come up with a list of the questions that have been asked (and answered) using a network/complex system approach, and the benefits and drawbacks of using such an approach for these questions.

Expected learning outcomes
Students will become familiar with the terminology and methods used in networks, self-organization, and complex systems research. Students will practice reading and discussing current research in fields that are not directly related to their own. Students will get a brief overview on using R (a statistics/analysis software that is freely available) and how this can be used to perform network analyses, and of NetLogo (a free individual-based simulation software) and how this can be used to study complex systems.

Throughout we will discuss what types of questions are answered by understanding particular systems as 'complex systems' or as 'networks', and what other approaches to answering these questions exist (if any).

Student-led Discussions
Each student will lead at least one, perhaps two discussion sessions. All students are expected to read 'required readings', but for the sessions you are leading, you should also read the 'optional readings'. Give a short summary of the readings at the beginning of the class (no need for slides), then moderate the discussion. Give other students a chance to ask questions first, and make sure all students understand the gist of the main paper. Then have a couple of discussion questions ready, or allow the discussion to take its course, as required.

Written assignments
(1) Who's who
Each student will pick 3 faculty at the UA who are researching complex systems, networks, or self-organization, and assemble some material on them and their research, to be shared later with all students in class. Specifically, this should be an image of the faculty member, their website address, and answers to the questions (a) what is the theme of research in their group overall, and how does it relate to complex systems/networks/self-organization; and (b) what is one (or two) insights or results that this faculty member has published on these topics. The

answer to these two questions should be no more than 150 words; the whole assignment is due in the d2l dropbox by Nov 6th.
In preparing for this assignment, students should meet in person with the respective faculty if possible, but in any case should show them their draft text for approval. We will collate all student contributions to make a website with pages on the research groups on campus involved in complex system & network research, and you should tell the faculty this.

(2) Netlogo model
A goal of this course is for students to become familiar with individual-based (or agent-based) modeling. Depending on your familiarity with such methods, you should either write your own model in Netlogo, or modify an existing model (from the Netlogo library or community). Ideally, the model should relate to your own research or field of expertise. We will start this in class, so that you can ask questions of each other and the instructor. Your final model is due Oct 28th.

(3) R exercise
R is a statistics software you can use, among other things, to analyze network properties for a dataset of interactions. We will do this for a dataset of your choice in class (or start this analysis). For the assignment, you should write (in no more than a page) a short tutorial on what research question you wanted to answer, and how you answered it in R (including the complete code used). This should be uploaded to the d2l dropbox by Dec 4th. We will make these tutorials available to other students through the website.

(4) Wiki article
Every student in the class will write a new Wikipedia article or substantially revise an existing one (good candidates are ones marked as 'stubs' on Wikipedia, or ones that have a tag at the top, such as the one stating that references are missing). This should be on a topic relating to our class discussions, and should be referenced with appropriate literature. It should be in the recommended Wikipedia format. If you can include images that is ideal, but not required. You will have to generate an account on Wikipedia for yourself (this is not required for editing pages, but it is for this class). This will make it easier to track you edits and get feedback. Check the webpage http://en.wikipedia.org/wiki/Wikipedia:About first. Then read http://en.wikipedia.org/wiki/Wikipedia:Your_first_article. After that, you can find answers to lots of questions on the Wikipedia help pages http://en.wikipedia.org/wiki/Help:Contents. Remember that any article on Wikipedia, as soon as it is posted, is communally owned and edited – so you may see changes happening to it almost immediately, sometimes substantial ones. That is ok, and that is how Wikipedia improves all the time. This is also how science works: individuals contribute their own little elements, but the overall insights are shaped by a community which is constantly re-evaluating and revising the existing knowledge. Your grade will be based on the version you send to me and how you improved it from the community and my feedback.article is due November 27th 2013. The final draft is has to be uploaded to Wikipedia *and* sent to the instructor as separate file by December 11th 2013.

Grading
Final grade will be determined from the discussion sessions you led (20%), your participation in class (20%), and the written assignments (60% total; of this, 20% points for the 'who's who's, 10% points for the Netlogo model, 10% points for the R exercise, and 20% points for the Wiki article). There are no written exams.
A: 90-100%; B: 80-89%; C: 70-79%; D: 60-69%; E (fail): 0-59 %

Readings & Course website
You will be able to obtain readings and check the current class schedule at the course website on d2l. Before the semester starts, or if you are not yet enrolled, you will find general information at: http://socialinsectlab.arizona.edu/ecol596H

Policy on Expected Classroom Behavior
Enrollment in the course signifies that a student will participate to the best of his or her abilities in each class session. No electronic communication devices should be used during the class session. Each student is expected to attend every class session; however, all holidays or special events observed by organized religions will be honored for those students who show affiliation with that particular religion, and absences pre-approved by the UA Dean of Students (or Dean's designee) will be honored.

Policy Against Plagiarism
http://dos.web.arizona.edu/uapolicies

Policy Against Threatening Behavior
http://policy.web.arizona.edu/~policy/threaten.shtml.

Academic Integrity
Integrity is expected of every student in all academic work. The guiding principle of academic integrity is that a student's submitted work must be the student's own. This principle is furthered by the *Student Code of Conduct* and disciplinary procedures established by ABOR Policies 5-308 - 5-403, all provisions of which apply to all University of Arizona students. For further information, please see: http://w3.arizona.edu/~studpubs/policies/cacaint.htm.

Special Needs and Accommodations Statement
Students who need special accommodation or services should contact the SALT (Strategic Alternatives Learning Techniques), the Center for Learning Disabilities (SALT Center, Old Main, PO Box 210021, Tucson, Arizona 85721-0021, (520) 621-1242, FAX (520) 621-9448, TTY (520) 626-6072), http://www.salt.arizona.edu/, and/or the Disability Resources Center, 1540 E. 2nd Street, PO Box 210064, Tucson, Arizona 85721-0064, (520) 621-3268, FAX (520)621-9423, http://drc.arizona.edu/. The appropriate office must document the need for accommodations.