

Fall 2013 CSS Graduate Course

CSS 899 – 001

Introduction to NetLogo

Wednesday: 7:20–8:20pm, Innovation Hall Room 333



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Office hours for Dr. Crooks: Room 374, Research Hall, Friday 1:00-3:00
or by appointment

Office hours for Mr. Scott: by appointment, schedule via e-mail

Class Web Site: <http://www.css.gmu.edu/groups/netlogo/>

Overview

This one credit hour offering will focus on NetLogo programming for beginners with applications to the social sciences. It will consist of 1 hour/week meetings in Innovation Hall 333, from 7:30-8:30 on Wednesday, directly following CSS 600. It is intended to provide a working knowledge of NetLogo coding techniques for model construction, output visualization, data analysis, and computational experimentation. It is open to all CSS students (Ph.D., Master's or Certificate) as well as students from other Departments and non-degree programs. CSS 600 and 605 students are encouraged to take this class but it is not required. It will cover material not dealt with in those courses. Advanced students are welcome to take 899 in order to gain a working knowledge of NetLogo. The course will be led by Professor Andrew Crooks, assisted by CSS Ph.D. student Steve Scott, whose book manuscript, "A Field Guide to NetLogo," will serve as the text.

As with CSS600, no particular computer science, programming, or advanced mathematics skills are necessary for this course, since it is specifically designed as an introductory survey. However, some background and "maturity" in computing and mathematics is desirable. The main requirements to take this course and perform well are:

- Interest in some area of real-world social investigation where computational approaches have been applied (e.g., the environment, financial markets, war and peace, origins of civilization, or other area of application).
- Curiosity about the nature and purpose of computational modeling in the various domains of the social sciences: Why do social simulations in the first place? What are they for? What can they tell us about the way in which various social processes operate? What are their main strengths and limitations?
- Basic skills in critical thinking and analytical reasoning (learning concepts, fundamental principles, and how to apply them to specific domains).
- Motivation to learn from case studies, research projects, and demonstrations.

Course Organization and Grading

Your grade for the class will reflect your attendance to the class, participate in the discussions (20% of final grade), and to demonstrate basic proficiency in NetLogo. Students are expected to develop a working NetLogo model on a topic of their interest (40% of final grade). In addition, students are expected to either (1) submit a 5 page paper describing their work in creating a NetLogo model, or (2) prepare at 15 minute presentation describing their work creating a NetLogo model (40% of final grade). (Note: In the event that many students elect to present their work, we may need to extend the scheduled class meeting time to allow for additional presentation time.) The model and the associated paper or presentation should

demonstrate that you have developed basic facility to write software using the features of the NetLogo language and environment, and should show some familiarity with good programming practices and Agent-Based Modeling principles.

Students should prepare a short abstract (preferably 300 words or less) of their proposed project by 02 Oct 2013. Submit abstracts in electronic form using PDF format. The abstract should provide at least a basic idea of what you want to do for the final paper/presentation. Changes in project format or subject area are OK after this date – the intent is to go on record making a first cut at your project plans. The abstract should indicate the problem area, the proposed modeling task to investigate the area, and the choice of paper or presentation format for the final deliverable.

For students electing to prepare a presentation, please generate sufficient slides to accurately describe your work, but be aware that you only have 15 minutes total for your presentation. You should also be prepared to run your model as part of your presentation, so budget your chart count accordingly. Please submit an electronic copy of your presentation materials by 8:30 pm on Dec 11th 2013, using PDF format. As University policy requires grades to be submitted within 48 hours of the scheduled final exam time, **no late presentation packages can be accepted.**

For students electing to prepare a paper instead of doing a presentation, final papers are due by 8:30 pm on Dec 11th, 2013. Papers should be submitted in electronic form, using PDF format. As University policy requires grades to be submitted within 48 hours of the scheduled final exam time, **no late papers can be accepted.**

The NetLogo model should be submitted in electronic form as a NetLogo file (.nlogo), by 8:30 pm on Dec 11th, 2013. Any additional files necessary for running the model must be included. As University policy requires grades to be submitted within 48 hours of the scheduled final exam time, **no late models can be accepted.**

Grading Scale (points = percentage)

95-100 = A+

88-94 = A

82-87 = A-

76-81 = B+

70-75 = B

64-69 = B

58-63 = C

<58 = F

Academic Honesty and Collaboration

The integrity of the University community is affected by the individual choices made

by each of us. GMU has an Honor Code with clear guidelines regarding academic integrity. Three fundamental and rather simple principles to follow at all times are that: (1) all work submitted be your own; (2) when using the work or ideas of others, including fellow students, give full credit through accurate citations; and (3) if you are uncertain about the ground rules on a particular assignment, ask for clarification. No grade is important enough to justify academic misconduct.

Plagiarism means using the exact words, opinions, or factual information from another person without giving the person credit. Writers give credit through accepted documentation styles, such as parenthetical citation, footnotes, or endnotes. Paraphrased material must also be cited, using MLA or APA format. A simple listing of books or articles is not sufficient. Plagiarism is the equivalent of intellectual robbery and cannot be tolerated in the academic setting. If you have any doubts about what constitutes plagiarism, please see me.

As in many classes, a number of projects in this class are designed to be completed within your study group. With collaborative work, names of all the participants should appear on the work. Collaborative projects may be divided up so that individual group members complete portions of the whole, provided that group members take sufficient steps to ensure that the pieces conceptually fit together in the end product.

Other projects are designed to be undertaken independently. In the latter case, you may discuss your ideas with others and conference with peers on drafts of the work; however, it is not appropriate to give your paper to someone else to revise. You are responsible for making certain that there is no question that the work you hand in is your own. If only your name appears on an assignment, your professor has the right to expect that you have done the work yourself, fully and independently.

Disability Statement

If you have a documented learning disability or other condition that may affect academic performance you should: 1) make sure this documentation is on file with the Office of Disability Services (SUB I, Rm. 222; 993-2474; <http://www.gmu.edu/student/drc/>) to determine the accommodations you need; and 2) talk with us to discuss your accommodation needs.

Reading Assignments

All readings are assigned as preparatory material to the weekly meeting. The reading material for this course consists mostly of required readings and optional recommended readings listed below and detailed for each meeting. The optional readings may or may not be discussed in class, depending on the time available, but is nonetheless included in the interest of depth and completeness.

The textbooks are available at the GMU bookstore in the Johnson Center. Articles and chapters are available online or are made available on the course website.

Required textbooks (relevant portions will be made available):

The textbook for this course is a draft manuscript prepared by your TA. The current plan is to distribute hard copies of the text in class, so no need to go to the bookstore.

Scott, Stephen, and Matthew Koehler (2011). *A Field Guide to NetLogo, Version 1.1*. Draft Manuscript.

We will be using NetLogo, which is available for free download for Windows, Mac, and Linux systems at: <http://ccl.northwestern.edu/netlogo>

Class website

The class website (<http://www.css.gmu.edu/groups/netlogo/>) contains all the supplementary material needed for the course. Material for each class including models is given in the assigned week. The *user name* and *password* for the site will be provided during the first class.

Please note that course handouts (lecture slides) will not be available until the day of the class, however core reading material and references will be provided beforehand. I do not expect you to read all the additional references; I provide them purely for a reference resource for topics covered in class.

You should check this website regularly for updates.

Course Outline:

Date	Topic	Readings	Models
28 Aug	Administrivia Universitatus Mandatorium et Necessarium Overview of NetLogo history and concepts Running a NetLogo model from the library A quick hands-on tour: Sea Turtle Migrations A brief overview of the NetLogo Environment (3 main panels and how to use them)	Field Guide: Ch 1, Getting Started	NetLogo Models Library: Social Science Segregation model Field Guide turtle migration model

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04 Sep	<p>Getting our feet (flippers?) wet Agent based modeling concepts, systems engineering of modeling, and the elements of coding style</p> <p>Programming in Netlogo (Agents, Data Structures)</p>	<p>Field Guide: Ch 2, Agent-Based Modeling Concepts</p> <p>Field Guide: Ch 3, Programming in Netlogo</p>	
11 Sep	<p>Going with the (control) Flow Programming in NetLogo (Interface Objects, Control Flow)</p>	Field Guide: Ch 3, Programming in NetLogo	
18 Sep	<p>Get with the Process (Procedure) Programming in NetLogo (Procedures, Input/Output)</p>	Field Guide: Ch 3, Programming in Netlogo	
25 Sep	<p>Welcome to my secret laboratory, Mr. Powers... How to use NetLogo Models for Research</p>	Field Guide: Ch 4, Using Models for Research	
02 Oct	<p>When Bad Things Happen to Good Models How to debug agent based models in the NetLogo environment</p>	Field Guide: Ch 5, So, Your Model Doesn't Work...	Project Abstracts Due!
9 Oct	<p>Biological Models (It's Alive!) Using NetLogo to model distributed biological systems</p>		<p>Netlogo models library</p> <p>Biology</p> <p><i>Virus</i></p> <p>Biology/Evolution</p> <p><i>Peppered Moths</i></p>
16 Oct	<p>Zombies (Yikes !) Using Netlogo to model pedestrian movement</p>		<p><i>Zombie attack model</i></p> <p><i>Escape from Krasnow model</i></p> <p><i>Steve's simple pedestrian egress model</i></p>
23 Oct	<p>Earth Science (Because Good Planets are Hard to Find) Using Netlogo to model natural processes</p>		<p>Netlogo Models Library</p> <p><i>Fire</i></p> <p><i>Grand Canyon</i></p>

Date	Topic	Readings	Models
30 Oct	Social Science I Using NetLogo to model macro level social properties		Netlogo Models Library Networks <i>Preferential Attachment</i> Social Science <i>Cooperation</i> <i>Rebellion</i>
6 Nov	Social Science II Using NetLogo to model emergent behavior, norms, and a bit of economics		Netlogo Models Library Social Science/Sugarscape <i>Sugarscape</i> <i>Voting</i> <i>Wealth Distribution</i>
13 Nov	Replication (Attack of the Clones) How to build a model to replicate published results		
20 Nov	Stats: All the kids are above average Some basic statistical tools and techniques to use when designing and executing an ABM modeling project. How many replications should you run, what kinds of inferential tests should you do, and how design of experiments can help		
27 Nov	No Class, Thanksgiving		
04 Dec	Student final project presentations		
11 Dec	Student final project presentations		Final paper or project deliverables due ! Final NetLogo model due !