NORTHERN ARIZONA UNIVERSITY
College of Engineering, Forestry & Natural Sciences
Department of Electrical Engineering & Computer Science

Syllabus for CS399

Bioinformatics II: Projects in Bioinformatics

General Information

- Spring 2012
- Tu/Th 8:00-9:15 (3 credit hours) in Engineering (building 69), Room 224
- Professor: Dr. Gregory Caporaso (gregcaporaso@gmail.com)
- Office location: Engineering (building 69), Room 265
- Office hours: Will be determined first week of class and posted on the course website.
- Course website: http://bit.ly/nau-bio399

Course Prerequisites

Bio/CS 299 or instructor consent.
This course assumes that you have some knowledge of basic molecular biology, as well as basic techniques in molecular biology (things like PCR, DNA sequencing, gel electrophoresis), as would be obtained in Bio/CS 299. You should also have a basic understanding of bioinformatics including concepts such as multiple sequence alignment, identification of homologous sequences, phylogenetic tree construction, and OTU picking. You should have working knowledge of the python programming language.

Course Description

This course will focus on many of the tools that are necessary to initiate, implement, and complete bioinformatics projects. The course will be project-oriented, and students will work on projects in interdisciplinary groups. Each group will be assigned one project based on "next-generation" sequencing data, and will work over the course of the semester on that project. This will involve running analyses, interpreting results, and presenting those results both in writing and through oral presentations; developing new software in python; and running parallel jobs on the Amazon Web Services cloud. Topics covered in the course will include microbial ecology and the QIIME software package, bioinformatics experimental design and record keeping, testing of software, development of command line interfaces, and high-performance computing topics such as interacting with remote Linux systems, cloud computing, and python generators. Groups (chosen by Dr. Caporaso) will be assigned projects, will give several (2-4) oral presentations on their projects over the course of the semester, and turn in written presentations of their study design and results several (2-4) times over the course of the semester.

Student Learning Expectations/Outcomes for this Course

After taking this course, students should be comfortable with developing, documenting and testing new python software, including command line interfaces, and working on remote Linux systems in a cloud environment. Students will have experience with software development tools that are used in real-world bioinformatics, and will understand how to initiate, perform, carry out and present a bioinformatics experiment.

Course Structure/Approach

This course will be focused on lectures, projects and student presentations of their projects. We will additionally have some scheduled in-class time for hands-on work, such as working on the Amazon Cloud. Homework

assignments and reading should be completed by the due date provided on the course schedule. There will be surprise quizzes throughout the semester – these will cover material that was recently presented, and should not be difficult if you are attending class and doing the readings. Quizzing on the homework and reading assignments due the same day is fair game.

Come to office hours! This course covers a lot of diverse material, and office hours are your chance to interact with me directly to ensure that you understand the concepts being covered in class. Coming to office hours is also a great way to boost your class participation score.

Course projects will be focused on using the PyCogent and QIIME bioinformatics software packages. These are widely used open-source packages. Contributions that you make to these software packages, in the form of new documentation or new features, can be applied as extra credit in the course. If you're interested in making a contribution, talk with me ahead of time and we will discuss whether it is a contribution worthy of extra credit, and if so how much it will be worth. Additionally, submitting bug reports or contributing to the QIIME forum (in the form of correctly answering questions) will count toward increasing your participation grade. If you submit bug reports or respond on the forum, forward that information to me by email.

Textbook and Required Materials
You are not required to purchase any textbooks for the course, but you may be interested in buying some of the recommended references. I will provide materials throughout the course that include sections of textbooks and primary literature.

Recommended References
A list of references is available on my teaching website here: http://bit.ly/bioi-nau
Particularly relevant to this course are *Molecular Biology of the Cell*, *Brock Microbiology*, and *Practical Programming: A Introduction to Computer Science Using Python*.

Course Schedule
http://bit.ly/nau-bio399-schedule
A tentative course schedule is provided at the link above. It is very likely that the schedule will change over the course of the semester as we identify certain areas that we'll need to spend additional time on. For that reason the outline is provided in a dynamic format. The spreadsheet at the above link will always be the definitive source for the outline, reading assignments, and homework assignments.

Assessment of Student Learning Outcomes
- You will be assessed primarily thorough graded material (see *Grading System*). A small portion of your assessment will be based on participation. This allows me to determine if you understand the material well enough to ask questions and engage in discussion in class and in office hours.
- I will strive to return all graded materials within seven days, and hopefully sooner. Under some circumstances I may need a little more time. Check with me at any time during the semester on your current participation score.

Grading System
- 5% Participation
- 10% Surprise quizzes; lowest quiz score will be dropped
- 20% Presentations
- 25% Graded homeworks and projects
- 20% Midterm exam
- 20% Final exam

Grading Scale

A: 90-100
B: 80-90
C: 70-80
D: 60-70
F: 0-59

Course Policy

- If you have a legitimate reason why you cannot make one of the exam times or why you won't be able to complete an assignment by the due date, talk with me early on and something can be arranged. Students who do not show up for exams without making prior arrangements will get a zero.
- Students are not graded on attendance, but there will be no make-ups of surprise quizzes so it is highly recommended that you plan to attend all lectures. If you have to miss a lecture and there is a quiz that day, it will count as your dropped quiz score.
- Plagiarism and cheating will not be tolerated. Any students found guilty of either will receive a failing grade in the class. We will discuss what counts as plagiarism of software on the first day of the course.
- No computers, cell phones, headphones, books or papers may be used during quizzes or exams. If a student is observed looking at or touching any of these items during a quiz or exam it will be considered cheating – this includes checking to see who just texted you! To be safe, I recommend turning off cell phones during exams.
- Computers may be used for course-related work during the class such note taking or working along with programming examples that are being done on the overhead. You may not however use computers for non-course-related work such as checking e-mail or Facebook. If I notice you doing this I will document it and count it against your participation grade in the course.
- On the first week of class you'll sign up for the course e-mail list. I expect you to check your e-mail at least once per day.

University Policies

The Safe Environment, Students with Disabilities, Institutional Review Board, Academic Integrity, Academic Contact Hour, Classroom Management and Professional Ethics and Code of Conduct policies are available at http://www4.nau.edu/avpaa/policy1.html. Students are responsible for reviewing and understanding these policies.