Computational Biology- CS 618- CRN 13250
Syllabus and Information

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General Information

Contact Your Instructor

Name: *Arash Rafiey*
Email: *arash.rafiey@indstate.edu*
Phone: *8122415469*
Office: *Root Hall A-140E*

Lecture, Exam, Office Hours

Lecture: *Tuesdays and Thursdays / 2:00pm – 3:15 pm, Root Hall 002*
Exam: TBA
Instructor Office Hours: *TTh 11:30pm – 12:30 pm, Root Hall A-140E*
Course website: All lectures and assignments will be posted on blackboard.

Prerequisites

CS 600, 558 for graduate students.

Recommended text

Much of the information required for the course is available online. Sources that can be used for the course include the following.

- Lecture slides and videos from a similar course at MIT - http://ocw.mit.edu/courses/biology/7-91j-foundations-of-computational-and-systems-biology-spring-2014/
- Lecture slides from a similar course at Brown - http://cs.brown.edu/courses/csci1810/
- Lecture slides and videos from a similar course at Stanford - http://cmgm.stanford.edu/biochem218/

Textbooks that align well with this course include *Understanding Bioinformatics* Marketa J. Zvelebil and Jeremy O. Baum and *An Introduction to Bioinformatics Algorithms* by Neil C. Jones and Pavel A. Pevzner.

Course Announcements

Announcements regarding the course will be made both during class and via email to your @sycamores.indstate.edu email address. You should regularly check this email account or have it forwarded to an account that you check regularly.

Classroom conduct

You may not use cell phones, iPods/music players, etc. during class. You should be civil and respectful to both the instructor and your classmates, and you should arrive to class a few minutes before the scheduled lecture so you are ready for lecture to begin on time. You may use your computer during class if you are using it to follow along with the examples that are being discussed. You may not check email, facebook, work on other courses, etc. during class.

Course Description

This course introduces students to computational problems that come from the field of biology. Problems are considered from many areas within biological systems - genetics, proteomics, systems modeling, etc. The course focuses on the core algorithms used to solve these problems, including tradeoffs between computational time versus memory, and how to handle intractable problems. Students gain experience analyzing problems and using tools to solve problems.

The official catalog description for the course is :

"This course is an introduction to computational biology. Topics covered in the course may include principles and methods used for sequence alignment, motif finding, structural modeling, structure prediction and network modeling, as well as currently emerging research areas. A focus is placed on the computational cost of solving problems - in terms of CPU time, memory, and disk space. Students study the core algorithms used to solve problems."

This course gives students exposure to analyzing biological systems using computational tools and to applying classic algorithms to the domain of biological systems.

Course Outline

1. Computational problems in genetics
    1. DNA/RNA/protein structure, copying mechanisms
    2. Gene sequencers - strengths, limitations, output formats
    3. Genetic analysis and computational problems
    4. Tools and techniques
2. Modeling biological systems
    1. Markov models
    2. Proteomics
    3. Bayesian networks
3. Other problems in computational biology

Grading and Assignments

The students of this course have the following responsibilities: read assigned readings before lecture, attend lecture, complete homework assignments, take in-class quizzes, take exams, and complete a project. The final grade consists of:

- **Project: 15%** of the final grade.
- **Homeworks and Quizzes: 30% total**. Most weeks there will be at least one homework assignment or quiz.
- **Exams: 45% total**. There will be 3 exams. The total exam grade will be calculated as

  max((.1 * exam1 + .15 * exam2 + .2 * exam3) / .45,

      (.15 * exam2 + .2 * exam3) / .35,

      exam3)

- **Class Attendance/Participation: 10% total**. Attendance will be taken at the beginning of each class. Half of your attendance/participation score will consist solely of whether you were present when attendance was taken each day - the total number of days present divided by the number of lectures in the semester. The other half of your attendance/participation grade will be assigned at the end of the semester based on how attentive you were in class throughout the semester.

Late Homeworks

All homework assignments will be given a preferred due date. Assignments can be turned in past the preferred due date, but any assignments turned in late will have their value multiplied by 80% (so the highest grade you can get on a late assignment is 80%). Each assignment will have a "final due date" past which no credit will be given.

Start Homeworks Early

I suggest attempting a homework assignment the day it is given, or the day after, so that if you have a problem you can ask early. If you continue to have problems in trying to complete the assignment, you will have time to ask again. Many of the homework assignments require thought and problem solving, which takes "time on the calendar" not just "time on the clock". By that I mean that spending an hour on 3 consecutive days is likely to be more productive than trying to spend 3 hours at once on the assignment.

Expected Amount of Work

My expectation is that an average student will spend about 4 hours OUTSIDE of class each week (that is in addition to class time) WORKING PRODUCTIVELY/EFFICIENTLY (not just staring at the

computer) to complete their coursework for this class. Some students may spend less time than this, and some students will spend more.

Grade Cutoffs

Homework assignments and exams are designed so that a standard cutoff for grades will be close to what you deserve. After the first exam I will create a grade in Blackboard called "Letter Grade" that is what your letter grade would be if the semester ended today. Initially, I will assign the following grades: 93-100 A, 90-93 A-, 87-90 B+, 83-87 B, 80-83 B-, 77-80 C+, 73-77 C, 70-73 C-, 67-70 D+, 63-67 D, 60-63 D-, 0-60 F

My goal is that the different grades have the following rough meaning.

A+/A

You understand everything and probably could teach the course yourself.

B+/A-

You understand nearly everything, and should be all set to use this knowledge in other courses or in a job.

C/C+/B-/B

Some things you understand very well and others you don't (more towards the former for a B and more towards the latter for a C).

D-/D+/C-

You did put some effort in, and understand many things at a high level, but you haven't mastered the details well enough to be able to use this knowledge in the future.

F

Normally, students that get an F simply stopped doing the required work at some point.

Blackboard

The course has a blackboard site. Click https://blackboard.indstate.edu/ to go to blackboard. You should see this course listed under your courses for the current term. The blackboard site is only used for giving you your grades. All course content, schedule, etc. will be posted on the course website.

Academic Integrity

Please follow these guidelines to avoid problems with academic misconduct in this course:

- **Homework:** You may discuss the homework assignments, but should solve and finish them on your own.

- **Note on sources:** if you use some other source, the web or whatever, you better cite it! Not doing so is plagiarism.

- **Exams:** No cheating during exams. The exams will be closed-book, closed-notes, no computer, and no calculator.

If cheating is observed, you will at the least receive a 0 for the assignment (and may receive an F for the course), and I will file a Notification of Academic Integrity Violation Report with Student Judicial Programs, as required by the university's policy on Academic Integrity. A student who is caught cheating twice (whether in a single course or different courses) is likely to be brought before the All-University Court hearing panel, which can impose sanctions up to and including suspension/expulsion. See the http://www.indstate.edu/sjp/docs/code.pdf and http://www.indstate.edu/academicintegrity/ for more information.

Please ask the instructor if you have doubts about what is considered cheating in this course.

Disclosures Regarding Sexual Misconduct

Indiana State University fosters a campus free of sexual misconduct including sexual harassment, sexual violence, intimate partner violence, and stalking and/or any form of sex or gender discrimination. If you disclose a potential violation of the sexual misconduct policy I will need to notify the Title IX Coordinator. Students who have experienced sexual misconduct are encouraged to contact confidential resources listed below. To make a report or the Title IX Coordinator, visit the Equal Opportunity and Title IX website: http://www.indstate.edu/equalopportunity-titleix/titleix.

The ISU Student Counseling Center – HMSU 7th Floor | 812-237-3939 | www.indstate.edu/cns

The ISU Victim Advocate – Trista Gibbons, trista.gibbons@indstate.edu
                                    HMSU 7th Floor | 812-237-3939 (office) | 812-230-3803 (cell)

Campus Ministries - United Campus Ministries | 812-232-0186
                                    http://www2.indstate.edu/sao/campusinistries.htm
                                    www.unitedcampusministries.org | ucmminister2@gmail.com
                                    321 N 7th St., Terre Haute, IN 47807

For more information on your rights and available resources

http://www.indstate.edu/equalopportunity-titleix/titleix