Syllabus in Spring 2019 for
CS 459 Topics in CS: Bioinformatics Programming

General Information

Contact Your Instructor

Name: Jeff Kinne
Email: jkinne@cs.indstate.edu
Phone: 812-237-2126 (but this is not the best way to get ahold of me)
Office: Root Hall A-140D

Lecture, Exam, Office Hours

Lecture: Tuesdays and Fridays 4-4:50pm in Root Hall A-017
Section and CRN: section 401, CRN 13975
Credit Hours: 1

Exam: no exam for this course

Instructor Office Hours: MWF 9am-noon (except the 4th Wednesday of the month). I am also normally around MWF afternoons. Tuesdays and Thursdays are mostly full of meetings.

GA Tutoring: See http://cs.indstate.edu/info/labs.html

Website: http://cs.indstate.edu/~jkinne/cs459-bd4isu-s2019

Prerequisites
Permission of instructor. Anyone interested in participating will be allowed to take the course.

Recommended and/or Required Text
None. We use all online sources.

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

The official description of this course from the catalog is

"Includes topics in computer science which are not usually present in a traditional computer science course. Designed to serve special needs and interests."

In this section of CS 459 we focus on R programming for biology. We may also do some python programming if time permits. The main focus of the course is providing the programming training needed for students participating in the BD4ISU (Biomedical big Data for ISU) program. No previous programming experience is assumed, so we start from the absolute basics and go from there.

Besides basic R programming, we have the following goals – write programs to use and analyze data from current biology faculty projects, understand different tools and algorithms available within R, and gain mastery over the most commonly used of these tools/algorithms.

Note that this section is a 1 credit course with 2 hours of lecture. We will sometimes cancel the Tuesday lecture so the class can attend biology department seminars. Also, students will receive an A in the course if they attend 80% of the lectures and complete all required assignments.

Course Outline and Learning Outcomes

- **Linux/unix basics**
  - Using the shell (aka terminal, aka command prompt)
  - Commonly used commands
  - Text files and text editors
  - *Outcomes – Proficient at navigating in linux, using the most commonly used programs to manage files, and performing basic operations on text data.*
- **R programming basics**
  - Concepts – data types, data structures, functions, control structures (loops, conditionals)
  - Concepts – vectors, arrays, matrices, and data frames
  - Concepts – input/output, debugging
  - Basics of plotting – histogram, lines, bar chart, box plot
  - *Outcomes – Can explain these concepts and write R programs from scratch that use them.*
- **Basics of statistics**
  - Terms and basic definitions
  - Basic statistics in R
  - *Outcomes – Can explain these concepts and write R programs from scratch that use them.*
- **Basics of regression and fitting**
  - Terms and basic definitions
  - Basic regression/fitting in R

    - *Outcomes – Can explain these concepts and write R programs from scratch that use them.*
- **Basics of machine learning**
    - Basic understanding of key algorithms – decision tree, random forest, hierarchical clustering, k-means, neural network, possibly some others.
    - R libraries to use these algorithms
    - *Outcomes – Can explain these concepts and write R programs from scratch that use them.*
- **Biology case study – differential gene expression**
    - Experimental design, what the input data means, what the goal is
    - R libraries and code to perform differential gene expression analysis
    - *Outcomes – Can explain these concepts and write R programs from scratch that use them.*
- **Biology case study – TBD**
- **Biology case study – TBD**

Expected Amount of Work

You will attend lecture 2 hours per week. Assignments will require another roughly 2-5 hours per week to complete required assignments.

Note - your classes should be more important than your part-time job.

Grading and Assignments

This course is graded pass/fail. To pass you must attend 80% of the lectures and complete check-point assignments. For assignments you may work with others but must understand the code, be able to explain, and be able to make changes/improvements to the code.

CS Course Policies

Note that this course follows all standard CS course policies. In particular check the CS course policies related to - cheating/plagiarism, attendance, missing exams. See http://cs.indstate.edu/info/policies.html for details.

Late Homeworks

Late homework is accepted for full credit in this course.

Start Homeworks Early

We 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 we mean that spending two hours on 3 consecutive days may be more productive than trying to spend 6 hours at once on the assignment.

Blackboard

The course has a blackboard site. Click here 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 (go to the course in blackboard, then click “My Tools”, and then “My Grades”). All course content, schedule, etc. is kept in this google doc (which you are currently viewing).

Academic Integrity

Follow the standard CS course policies in terms of what is and is not allowed on assignments: http://cs.indstate.edu/info/policies.html

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

Special Needs / Student Disabilities

Standard language included in the syllabi for ISU courses.

Indiana State University recognizes that students with disabilities may have special needs that must be met to give them equal access to college programs and facilities. If you need course adaptations or accommodations because of a disability, please contact us as soon as possible in a confidential setting either after class or in my office. All conversations regarding your disability will be kept in strict confidence. Indiana State University's Student Support Services (SSS) office coordinates services for students with disabilities: documentation of a disability needs to be on file in that office before any accommodations can be provided. Student Support Services is located on the lower level of Normal Hall in the Center for Student Success and can be contacted at 812-237-2700, or you can visit the ISU website under A-Z, Disability Student Services and submit a Contact Form. Appointments to discuss accommodations with SSS staff members are encouraged.

Once a faculty member is notified by Student Support Services that a student is qualified to receive academic accommodations, a faculty member is obligated to provide or allow a reasonable classroom accommodation under ADA.

Disclosures Regarding Sexual Misconduct

Standard language included in the syllabi for ISU courses.

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