Iowa State University – BCB 568 Syllabus – Spring 2015

Instructor: Karin S. Dorman
Office: Snedecor 2411; Science II 534
Phone: (515)294-1457; (515)294-6078
Email: kdorman@iastate.edu
Office Hrs: Contact me.
TA: Ruolin Liu
 TA Office Hrs: M 3:00 - 5:00
Howe Hall 2624
Lecture: TR 9:30 - 10:50
Location: MBB 1424
Webpage: Blackboard
Textbook: None required.
Final Exam: Tuesday, May 3, 9:45 - 11:45 in MBB 1424

Course Description


Prequisites. STAT 430 or equivalent introduction to probability and statistical notation and thinking.

Course Goals

Learning Outcomes.

• Comprehend and critique bioinformatics articles that include statistical models and arguments.
• Formulate models to answer basic bioinformatics questions.
• Recognize and account for uncertainty and noise in biological sequence data.
• Recognize and account for dependence in biological sequence data.
• Use a model and standard statistical tools to perform inference: estimate model unknowns, answer scientific questions about the model, assess confidence in results, etc.

Learning Objectives (examples).

• Given a manuscript with a probability or statistical model, read, comprehend, correct, and explain the model to colleagues.
• Given sequence data containing multiple instances with variation of an unknown short motif, formulate a model, write a likelihood equation, and use it to find the motif and its occurrences.
• Given next generation sequencing (NGS) data aligned to a reference genome, identify the sequencing errors, the sequence variants, and assess confidence in each conclusion.
• Given NGS data aligned to a reference genome, test thousands of genes for differential expression and produce a list of genes such that at least 90% are really differentially expressed.

Course Information

Textbook: There is no required textbook for this class. You will be given all materials needed for this class. Nevertheless, you may find the following books useful references:
Primary literature: We will read and build the knowledge to comprehend primary articles with statistical models from the bioinformatics literature. Some will be current publications, others will be seminal work, foundational to modern statistical bioinformatics.

Class Participation: You will be expected to actively participate during every lecture. In addition, you must make three presentations to the class throughout the semester. In the presentation, you will teach your colleagues some foundational statistical or statistical bioinformatics model/method. Your ability to teach will be assessed by a quiz given to the class one lecture after your presentation. You will know the quiz material before your presentation, but you will not be allowed to simply provide solutions to the quiz. You must teach your colleagues the knowledge they need to be able to succeed on the quiz. Your presentation grade will depend partially on your delivery and partially on your colleague’s performance on the quiz.

Absence: Please let the instructor know if you must be absent. The instructor will work with you if illness or other serious issues interrupt your work or take you away during critical times, but you must keep her informed of your status.

Homework: Individual practice (homework) is an essential part of learning. I (and perhaps you) will assign problems to accompany the lecture material. After enough problems have been issued, a due date will be announced and one random problem will be graded. Complete solutions will be posted on the course website as a learning and study aid. You should keep up with homework by doing the problems as assigned.

Midterm: The midterm exam will be given during regular class time. If you have a conflict, you must let me know before the exam. Failure to do so will result in a 0 for the exam.

Final Exam: The final exam is cumulative with special emphasis on the material covered in the second part of the course. The time for the exam is posted above. Do not make plans for the end of the semester that prevent you from attending the final exam.

Grading: Letter grades including plus/minus will be given based on performance on homeworks (30%), quizzes/exams (40%), and presentations (30%). The specific grading scale is not determined until after all grades have been calculated. You will get periodic feedback about your projected grade based on completed work.

Computer Programming: Your bioinformatics skills list should ultimately include a few different programming languages (some of C, C++, Java, Python, Perl, R, and more). I do not enforce use of a particular language in this class, though we will sometimes rely on R for statistical analysis. Although all writeups for this class should be independently prepared, you are invited to team up and share code for all programming assignments.

Course Policies

Academic Dishonesty: The class will follow Iowa State University’s policy on academic dishonesty. Anyone suspected of academic dishonesty will be reported to the Dean of Students Office. [http://www.dso.iastate.edu/ja/academic/misconduct.html]
**Disability Accommodation:** Iowa State University complies with the Americans with Disabilities Act and Sect 504 of the Rehabilitation Act. If you have a disability and anticipate needing accommodations in this course, please contact (instructor name) to set up a meeting within the first two weeks of the semester or as soon as you become aware of your need. Before meeting with (instructor name), you will need to obtain a SAAR form with recommendations for accommodations from the Disability Resources Office, located in Room 1076 on the main floor of the Student Services Building. Their telephone number is 515-294-7220 or email disabilityresources@iastate.edu. Retroactive requests for accommodations will not be honored.

**Dead Week:** This class follows the Iowa State University Dead Week policy as noted in section 10.6.4 of the Faculty Handbook [http://www.provost.iastate.edu/resources/faculty-handbook](http://www.provost.iastate.edu/resources/faculty-handbook).

**Harassment and Discrimination:** Iowa State University strives to maintain our campus as a place of work and study for faculty, staff, and students that is free of all forms of prohibited discrimination and harassment based upon race, ethnicity, sex (including sexual assault), pregnancy, color, religion, national origin, physical or mental disability, age, marital status, sexual orientation, gender identity, genetic information, or status as a U.S. veteran. Any student who has concerns about such behavior should contact his/her instructor, Student Assistance at 515-294-1020 or email dso-sas@iastate.edu or the Office of Equal Opportunity and Compliance at 515-294-7612.

**Religious Accommodation:** If an academic or work requirement conflicts with your religious practices and/or observances, you may request reasonable accommodations. Your request must be in writing, and your instructor or supervisor will review the request. You or your instructor may also seek assistance from the Dean of Students Office or the Office of Equal Opportunity and Compliance.

**Contact Information:** If you are experiencing, or have experienced, a problem with any of the above issues, email academicissues@iastate.edu.

January 14, 2016