BIOST 523: Statistical Inference for Biometry II

Class Meeting Times:
MWF 10:30-11:20am (in HSE E214)
W 12:30-1:20pm (in HST 474A)

Office Hours:
Monday, 11:30 - 12:30 in F650.

Instructor: Noah Simon
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Course description

This is the second in a two-course sequence that introduces the theory of statistical inference that provides foundations to common biostatistical methods. It will also help students learn how to independently engage with statistical theory. Topics of the sequence include basic concepts of probability, parametric distributions, exact and asymptotic sampling distribution of statistics, maximum likelihood estimation, unbiased estimating equations, theory of hypothesis testing and Bayesian inference.

Learning Objectives

In this course there are 3 sets of objectives. I have somewhat arbitrarily organized these as objectives around Foundational Skills and Concepts, Applied Skills and Concepts, and Metacognitive Skills and Concepts. I view all of these as nearly equally important (potentially with Metacognitive being the most important).

Foundational Skills and Concepts

By the end of the course students should

1) Have a clear understanding of the underpinnings of parametric asymptotic statistics (with independently drawn observations)
2) Have facility with calculating/understanding the first order behaviour of parametric estimators/tests.
3) Intuitively understand the bias/variance tradeoff (and be able to identify how it comes up in standard non-parametric/high dimensional estimators).
4) Have a clear understanding of the theoretical underpinnings of Bayesian statistics in two contexts: 1) modeling with conjugate priors; and 2) formalizing a decision theoretic view of statistics.

Applied Skills and Concepts

In addition students should be able to

1) identify how these theory ideas map to standard statistical methods.
2) engage novel questions that they might encounter with those theoretical frameworks/ideas. This should allow them to i) give rough answers with little or no calculation; and ii) connect other theoretical ideas/questions to the content of this class.

**Metacognitive Skills and Concepts**

Students should also be able to

1) clearly articulate their thought processes (both written and verbally) when engaging with a question that involves either i) a theoretical calculation; or ii) mapping a methodologic question to a formal statistical theory question.

2) struggle with complex theoretical ideas; and should have practiced identifying their “zone of proximal development” (wherein there is an appropriate balance of problem difficulty and scaffolding for students to progress their understanding of statistics)

**Assessment**

The class will have many in-class exercises conducted in groups. Participation in these groups will be expected (and informally assessed).

The class will include homeworks due every other week. It will be in your best interest to attempt these homeworks alone first, but it is completely OK (and expected) that you work together in groups on these when you get stuck.

Students will also be expected to add an entry to a *dialogue journal* each week. This will be a roughly 1 page entry to help students synthesize the ideas they are learning in the class. I will provide feedback on these entries (to which the students will be expected to respond).

There will also be an interim individual oral assessment halfway through the course. This will be a 20-30 minute discussion with the instructor to assess the degree to which the student is meeting the learning objectives of the course.

Finally, there will be a summative written assessment (exam) at the end of the quarter. This will be a takehome assessment. It will be somewhat nontraditional- During the first few days, students will be expected to work alone on the assessment without outside aid, however there will be a period at the end where the students are permitted to talk with others in the class, and use other assistance (eg. textbooks, course-notes they find on the web, etc...). Students will be evaluated on the correctness of their solutions as well as their resourcefullness (for those that required outside aid), and the degree to which they were able to maintain their “zone of proximal development” (eg. *I was stuck here... and got a hint from a friend that I should use the delta method, after thinking through this, I realized that I needed to apply it in this way... is much better than I got stuck here, and looked at my friend’s solution and then finished mine*).

**Academic Integrity Statement**

Students at the University of Washington (UW) are expected to maintain the highest standards of academic conduct, professional honesty, and personal integrity. The UW School of Public Health (SPH) is committed to upholding standards of academic integrity consistent with the academic and professional communities of which it is a part. Plagiarism, cheating, and other misconduct are serious violations of the University of Washington Student Conduct Code (WAC 478-120). We expect you to know and follow the university’s policies on cheating and plagiarism, and the SPH Academic Integrity Policy. Any suspected cases of academic misconduct will be handled according to University of Washington regulations. For more information, see the University of Washington Community Standards and Student Conduct website.
UW Disability Statement – Access and Accomodations

Your experience in this class is important to me. If you have already established accommodations with Disability Resources for Students (DRS), please communicate your approved accommodations to me at your earliest convenience so we can discuss your needs in this course. If you have not yet established services through DRS, but have a temporary health condition or permanent disability that requires accommodations (conditions include but not limited to; mental health, attention-related, learning, vision, hearing, physical or health impacts), you are welcome to contact DRS at 206-543-8924 or uwdrs@uw.edu or disability.uw.edu. DRS offers resources and coordinates reasonable accommodations for students with disabilities and/or temporary health conditions. Reasonable accommodations are established through an interactive process between you, your instructor(s) and DRS. It is the policy and practice of the University of Washington to create inclusive and accessible learning environments consistent with federal and state law.

UW Inclusion Statement

The UW School of Public Health seeks to ensure all students are fully included in each course. We strive to overcome systemic racism by creating an environment that reflects community and mutual caring, while we ally with others in combating all forms of social oppression. This is a work in progress, as transformation is rarely a fully-completed project. In this course, we will look for opportunities to improve our performance as we seek to break down institutional racism. This can include course readings, class interactions, faculty performance, and/or the institutional environment. We encourage students to talk to your faculty member and/or the program director if you have concerns about classroom climate. DCinfo@uw.edu is a resource for students with classroom climate concerns.

Religious Accommodations

Washington state law requires that UW develop a policy for accommodation of student absences or significant hardship due to reasons of faith or conscience, or for organized religious activities. The UW’s policy, including more information about how to request an accommodation, is available at Religious Accommodations Policy (https://registrar.washington.edu/staffandfaculty/religious-accommodations-policy/). Accommodations must be requested within the first two weeks of this course using the Religious Accommodations Request form (https://registrar.washington.edu/students/religious-accommodations-request/).