



EMORY

ROLLINS
SCHOOL OF
PUBLIC
HEALTH

DEPARTMENT: BIOS
COURSE NUMBER: 711 **SECTION NUMBER:**
CREDIT HOURS: 4 **SEMESTER:** Spring 2019
COURSE TITLE: Statistical Inference II

INSTRUCTOR NAME: Eugene Huang

INSTRUCTOR CONTACT INFORMATION

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SCHOOL ADDRESS OR MAILBOX LOCATION: GCR 340

OFFICE HOURS by appointment

Teaching Assistant(s): Ying Cui

COURSE DESCRIPTION

This is a required course for the BIOS doctoral degree. It may also be interest to graduate students in other fields with adequate preparation. Prerequisites are BIOS 512, BIOS 511, and BIOS 710, or their equivalents.

The course examines the fundamental role of the likelihood function in statistical inference, likelihood-based estimation and testing, Bayesian inference, asymptotic theory, and estimating functions. Topics covered include marginal, conditional, profile, and other approximate likelihoods; Wald, score, and likelihood ratio tests; and consistency/asymptotic normality of likelihood and estimating function-based estimators. Computation-based methods, including jackknife and bootstrap, will also be discussed.

MPH/MSPH FOUNDATIONAL COMPETENCIES:

- B_{MPH5} : Explain fundamental concepts of probability and inference used in statistical methodology.
- B_{MSPH1} : Apply concepts in probability and statistical theory to define performance and extend basic statistical analysis techniques.

CONCENTRATION COMPETENCIES:

- B_{PhD2} : Develop and assess new statistical theory as needed.
- B_{PhD3} : Develop and assess new statistical methods to address a broad range of complex biomedical or public health problems.

EVALUATION

Weekly homework (40%)

In-class midterm I (20%)

In-class midterm II (20%)

In-class final (20%)

Cut points for letter grades:

- A: ≥ 90
- A-: 85 - 89
- B+: 80 - 84
- B: 75 - 79
- B-: 70 - 74
- C: 60 - 69
- F: < 60

COURSE STRUCTURE

The class typically meets twice a week. Each week has a homework assignment. There are three exams, two midterms and one final. All these tests are in-class, closed book, and closed notes.

Homework assignments and the three exams may cover a variety of questions concerning:

- Basic statistical concepts such as sufficient statistics; marginal, conditional, and profile likelihood.

Competency addressed: Explain fundamental concepts of probability and inference used in statistical methodology.

- Efficiency and robustness of various M-estimators; computation-based methods including jackknife and bootstrap.

Competency addressed: Apply concepts in probability and statistical theory to define performance and extend basic statistical analysis techniques.

- Likelihood-based inference, asymptotic theory, and M-estimation theory.

Competency addressed: Develop and assess new statistical theory as needed.

- Sampling techniques and study designs.

Competency addressed: Develop and assess new statistical methods to address a broad range of complex biomedical or public health problems.

COURSE POLICIES

Textbook: Boos, D and Stefanski, LA (2013). *Essential Statistical Inference: Theory and Methods*, Springer.

Students are expected to attend lectures and ask questions. For homework assignments, you may discuss general issues and approaches with fellow students. But your work must be your own. If you use any references, you must cite and credit your sources.

As the instructor of this course I endeavor to provide an inclusive learning environment. However, if you experience barriers to learning in this course, do not hesitate to discuss them with me and the Office for Equity and Inclusion, 404-727-9877.

RSPH POLICIES

Accessibility and Accommodations

Accessibility Services works with students who have disabilities to provide reasonable accommodations. In order to receive consideration for reasonable accommodations, you must contact the Office of Accessibility Services (OAS). It is the responsibility of the student to register with OAS. Please note that accommodations are not retroactive and that disability accommodations are not provided until an accommodation letter has been processed.

Students who registered with OAS and have a letter outlining their academic accommodations are strongly encouraged to coordinate a meeting time with me to discuss a protocol to implement the accommodations as needed throughout the semester. This meeting should occur as early in the semester as possible.

Contact Accessibility Services for more information at (404) 727-9877 or accessibility@emory.edu. Additional information is available at the OAS website at <http://equityandinclusion.emory.edu/access/students/index.html>

Honor Code

You are bound by Emory University's Student Honor and Conduct Code. RSPH requires that all material submitted by a student fulfilling his or her academic course of study must be the original work of the student. Violations of academic honor include any action by a student indicating dishonesty or a lack of integrity in academic ethics. *Academic dishonesty refers to cheating, plagiarizing, assisting other students without authorization, lying, tampering, or stealing in performing any academic work, and will not be tolerated under any circumstances.*

The RSPH Honor Code states: "Plagiarism is the act of presenting as one's own work the expression, words, or ideas of another person whether published or unpublished (including the work of another student). A writer's work should be regarded as his/her own property."

(http://www.sph.emory.edu/cms/current_students/enrollment_services/honor_code.html)

COURSE CALENDAR AND OUTLINE

1. Likelihood construction and estimation
2. Likelihood-based tests
3. Bayesian inference
4. Topics in large sample theory
5. Asymptotics of likelihood-based methods
6. Theory of M-estimation (estimating function)
7. Computation-based methods: Jackknife, Bootstrap

Weekly home works are typically assigned on Wednesdays and due in a week.