

Syllabus – STOR 655
Spring 2021 (January 19 – May 5)
TuTh 11:00am – 12:15pm
Phillips 0381

Instructor: Jan Hannig

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Office Hours: MW 2:00 – 3:00PM

Course home page on

and by appointment. Office hours will be
on zoom!

<https://hannig.cloudapps.unc.edu/STOR655>

<https://sakai.unc.edu/portal/site/stor655.sp21>

Zoom link for Office hours:

<https://unc.zoom.us/j/91787829144?pwd=bFQwUW9HUG85d2VaZkZvRVBFV1gwZz09>

Meeting ID: 917 8782 9144

Passcode: HanesHall

Zoom link for lectures (if needed)

<https://unc.zoom.us/j/99881628876?pwd=bEE3akgzcEFBYVhVZG1wblg5Y0N4UT09>

Meeting ID: 998 8162 8876

Passcode: HanesHall

Teaching Assistant: Hang Yu

E-mail: hangyu@live.unc.edu

TA zoom:

<https://unc.zoom.us/j/8021616239?pwd=ZFprUGR4L2JhbENnaUpKQy9CdXV5QT09>

TA Office Hour: F 3:00 – 4:00PM

Meeting ID: 802 161 6239

Passcode: 798043

Target Audience: First year Ph.D. students in the Department of Statistics and Operations Research who have successfully completed STOR654 and STOR634.

Required Text: Ferguson, *A course in large sample theory*, CRC Press, ISBN 041204371-8

Optional Texts: Casella and Berger: *Statistical Inference*, Duxbury 2/e,
Bickel and Doksum, *Mathematical Statistics, Vol 1*, 2/e, Prentice Hall
A. W. van der Vaart, *Asymptotic statistics*, Cambridge University Press
Mood, Graybill, Boas, *Introduction to the Theory of Statistics*

Course Objective This is a second theoretical course in mathematical statistics. We will continue where STPR654 has left off. The covered topics will include asymptotic statistics and additional topics.

Course Format: I am planning to give a traditional lecture, and anyone is welcome to attend in person. Lectures will also be available remotely via zoom if you are not comfortable with in person instruction.

Assessment: Your grade will be based on a midterm exam (40% of the grade), a final exam (40% of the grade) and weekly homework sets (20% of the grade). The instructor might also assign “extra credit problems” from time to time.

Important dates:

Final Exam: Friday, May 7, 12:00noon – 3:00 PM
(see the published university schedule)

Midterm exam: Tuesday, March 9

Homework: Homework sets will be usually assigned on Thursday and due in one week on gradescope. Late/missed homework will receive a grade of zero. Students are welcome to discuss the homework problems with other members of the class but should prepare their final answers on their own.

Course Outline:

1. Convergence in probability
 - a. Definition
 - b. Continuous and uniformly continuous functions
 - c. Closure properties of in-probability convergence[*]
 - d. Weak law of large numbers
2. Convergence in distribution
 - a. Definition (using expectations of bounded continuous functions)
 - b. Connections with convergence in probability
 - c. Continuous mapping theorem / Slutsky's theorem
 - d. The delta method
3. Basic asymptotic theory
 - a. Consistency of MLE
 - b. Asymptotic normality of MLE
 - c. Asymptotic efficiency of MLE
 - d. Asymptotic distributions of LR test statistics
 - e. χ^2 goodness of fit tests
4. Other / Special Topics (time permitting)
 - a. Projections and U-Statistics
 - b. Asymptotic properties of Bayesian Posterior
 - c. Bootstrap
 - d. Lower bounds

COVID-19 Each of us has a responsibility to know and act on these standards and policies in a way that maximizes a safe and healthy environment for us to teach, work, learn and live. To this end, we are developing a set of community standards and policies for our students, faculty, staff and visitors. We are all in this together, and we believe that

together, we can face the challenges presented by COVID-19 with resilience, determination and great support for our community.

See <https://carolinatogether.unc.edu/community-standards/> lines that we all need to follow to reduce the spread of COVID-19:

- Understand How COVID-19 Spreads
- Wash Your Hands Often
- Practice Physical Distancing
- Wear a Face Mask
- Maintain Clean, Safe Spaces
- Engage in Smaller Group and Virtual Settings
- Follow Immunization Recommendations
- Protect the community
- Provide Medical Return Clearance
- Regularly participate in asymptotic testing.

See the Carolina Together Roadmap at <https://carolinatogether.unc.edu/> for more information on the University's plans regarding COVID-19.

Delivery Method This course is classified as a hybrid course. More details on this delivery method can be found at <https://carolinatogether.unc.edu/> . Students participate either remotely or in-person sessions in the classroom.

Etiquette for Zoom These are my five expectations of you on Zoom:

- Have your camera turned on.
- Mute your microphone unless answering or asking a question.
- Communicate by unmuting yourself or using the chat feature.
- Be mindful of background noise when not muted.
- Limit your distractions and avoid multi-tasking.

UNC Attendance Policy No right or privilege exists that permits a student to be absent from any class meetings, even online classes, except for these university approved absences: authorized university activities, and disability/religious observance/pregnancy, as required by law and approved by Accessibility Resources and Service and/or the Equal Opportunity and Compliance Office (EOC). Significant health condition and/or personal/family emergency as approved by the Office of the Dean of Students, Gender Violence Service Coordinators, and/or the Equal Opportunity and Compliance Office (EOC).

Diversity Statement I value the perspectives of individuals from all backgrounds reflecting the diversity of our students. I broadly define diversity to include race, gender identity, national origin, ethnicity, religion, social class, age, sexual orientation, political background, and physical and learning ability. I strive to make this classroom an inclusive space for all students. Please let me know if there is anything I can do to improve, I appreciate suggestions.

Accessibility Resources UNC-Chapel Hill facilitates the implementation of reasonable accommodations for students with learning disabilities, physical disabilities, mental health struggles, chronic medical conditions, temporary disability, or pregnancy complications, all of which can impair student success. See the ARS website for contact and registration information: <https://ars.unc.edu/about-ars/contact-us>

Counseling and Psychological Services CAPS is strongly committed to addressing the mental health needs of a diverse student body through timely access to consultation and connection to clinically appropriate services, whether for short or long-term needs. Go to their website: <https://caps.unc.edu/> or visit their facilities on the third floor of the Campus Health Services building for a walk-in evaluation to learn more.

Title IX Any student who is impacted by discrimination, harassment, interpersonal (relationship) violence, sexual violence, sexual exploitation, or stalking is encouraged to seek resources on campus or in the community. Please contact the Director of Title IX Compliance (Adrienne Allison - Adrienne.allison@unc.edu), Report and Response Coordinators in the Equal Opportunity and Compliance Office (reportandresponse@unc.edu), Counseling and Psychological Services (confidential), or the Gender Violence Services Coordinators (gvsc@unc.edu; confidential) to discuss your specific needs. Additional resources are available at <https://safe.unc.edu>

Honor Code Statement Students are bound by UNC's honor code (<https://studentconduct.unc.edu/information/policies>) in taking exams and in written work, and the submission of said work signifies understanding and acceptance of those requirements. Plagiarism will not be tolerated. Please consult with me if you have any questions about the honor code.

Legal The instructor reserves the right to make any changes he considers academically advisable. It is your responsibility to attend classes and keep track of the proceedings.