

FALL 2020 - STAT 830 G100

STATISTICAL THEORY I (4)

Class Number: 3818 Delivery Method: In Person

Overview

COURSE TIMES + LOCATION:

Th 2:30 PM – 4:20 PM
REMOTE LEARNING, Burnaby

Tu 2:30 PM – 4:20 PM
REMOTE LEARNING, Burnaby

EXAM TIME + LOCATION:**INSTRUCTOR:**

Lockhart, Richard
lockhart@sfu.ca
778-782-6591
Office: SC-K10561

PREREQUISITES:

STAT 450 or permission of the instructor.

Description

CALENDAR DESCRIPTION:

The statistical theory that supports modern statistical methodologies. Distribution theory, methods for construction of tests, estimators, and confidence intervals with special attention to likelihood and Bayesian methods. Properties of the procedures including large sample theory will be considered. Consistency and asymptotic normality for maximum likelihood and related methods (e.g., estimating equations, quasi-likelihood), as well as hypothesis testing and p-values. Additional topics may include: nonparametric models, the bootstrap, causal inference, and simulation. Students with credit for STAT 801 may not take this course for further credit.

COURSE DETAILS:**Course Outline:**

We will be discussing how to develop and evaluate statistical methods: we survey various general statistical techniques: prediction, forecasting, point and interval estimation, and hypothesis testing; we discuss how to assess how well a specific technique works in repeated sampling terms: forecast standard error, standard error of estimation, coverage probabilities, error rates; we consider optimality theory; throughout we examine trade-offs: bias versus variability, type I versus type II error rates, interval coverage versus precision or length, mechanistic versus empirical models, and others. The vision is that we use the techniques of probability to discuss inference in the face of uncertainty. I will start with inference and fill in background in probability as needed. Our focus is chapters 6 through 11 of the Larry Wasserman's text All of Statistics but I don't think you really need the text.

1. Probability: random variable, expectation, inequalities, and convergence
2. Inference: Parametric and nonparametric models, empirical distribution function, bootstrap, maximum likelihood and related methods, properties of MLEs and related methods, hypothesis testing and p-values, simulation, selected topics.

Course Details:

- **Lecture:** I will lecture for about 1 hour 40 minutes Tuesdays and Thursdays at 2:30 PM = 1430h Pacific Time on-line using either Zoom or Blackboard Collaborate Ultra through Canvas at SFU. The lectures will be recorded so that students in other time zones can watch at their convenience. I hope to have an audience of at least some students whom I can see so that I can gauge student reaction and field questions. Since the lectures are

being recorded, we will have to take care if you do not want to be included in the recording.

- **Tutorial:** the course has no tutorial but I will hold virtual zoom office hours which will feel like tutorials. These will not be one on one; instead students will be able to join a group conversation. Scheduling will not be clear until the course starts.
- **Quizzes:** These are currently scheduled to be synchronous one hour long conducted through Zoom on 24 Sept, 22 Oct and 12Nov. This detail will be discussed when the course starts.
- **Project:** Instead of a final exam students will either write a short paper explaining a theoretical concept not covered in the lectures or submit a video of themselves making a short presentation on such a topic.
- **Expectations:** I want to interact with students. Students in distant time zones will need to work out arrangements with me to discuss the course material through zoom if they are not able to participate synchronously in lectures. You should use my web pages. That is where there is lots and lots of course material. Some of it may show up in Canvas but most will not.

Grading

Assignments	50
Quizzes	30
Presentation or project: recorded or delivered on-line or submitted electronically—see course details.	20

NOTES:

Above grading is subject to change.

REQUIREMENTS:

Students will need high-speed internet access, a working camera and microphone. They will need to download and install R and I will encourage the use of RStudio. You should also install a working TeX version or be prepared to use something like Overleaf. These are all available on most computing platforms and are free in general for students.

Materials

REQUIRED READING:

Textbook:

All Of Statistics: A Concise Course in Statistical Inference by Larry Wasserman. Publisher: Springer.

eBook: ISBN 978-0-387-21736-9

Softcover: ISBN 978-1-4419-2322-6

Harcover: ISBN 978-0-387-40272-7

RECOMMENDED READING:

I won't be requiring this text but the notes follow it and refer to it from time to time. Because we will be on-line this year I intend to do my best to provide notes of my own which do not rely on Larry's book. Here is a list of texts which are available in the library and which cover many of the ideas I want to touch on.

Polansky, Alan M. Introduction to Statistical Limit Theory. (2011).

Abramovich, Felix and Ritov, Ya'acov. Statistical Theory: A Concise Introduction. (2013).

Silvey, S. D. Statistical Inference. (1975).

DasGupta, Anirban. Asymptotic Theory of Statistics and Probability. (2008).

GRADUATE STUDIES NOTES:

Important dates and deadlines for graduate students are found here: http://www.sfu.ca/dean-gradstudies/current/important_dates/guidelines.html. The deadline to drop a course with a 100% refund is the end of week 2. The deadline to drop with no notation on your transcript is the end of week 3.

REGISTRAR NOTES:

ACADEMIC INTEGRITY: YOUR WORK, YOUR SUCCESS

SFU's Academic Integrity web site <http://www.sfu.ca/students/academicintegrity.html> is filled with information on what is meant by academic dishonesty, where you can find resources to help with your studies and the consequences of cheating. Check out the site for more information and videos that help explain the issues in plain English.

Each student is responsible for his or her conduct as it affects the University community. Academic dishonesty, in whatever form, is ultimately destructive of the values of the University. Furthermore, it is unfair and discouraging to the majority of students who pursue their studies honestly. Scholarly integrity is required of all members of the University. <http://www.sfu.ca/policies/gazette/student/s10-01.html>

TEACHING AT SFU IN FALL 2020

Teaching at SFU in fall 2020 will be conducted primarily through remote methods. There will be in-person course components in a few exceptional cases where this is fundamental to the educational goals of the course. Such course components will be clearly identified at registration, as will course components that will be "live" (synchronous) vs. at your own pace (asynchronous). Enrollment acknowledges that remote study may entail different modes of learning, interaction with your instructor, and ways of getting feedback on your work than may be the case for in-person classes. To ensure you can access all course materials, we recommend you have access to a computer with a microphone and camera, and the internet. In some cases your instructor may use Zoom or other means requiring a camera and microphone to invigilate exams; this will be confirmed in the first week of class.

Students with hidden or visible disabilities who believe they may need class or exam accommodations, including in the current context of remote learning, are encouraged to register with the [SFU Centre for Accessible Learning](mailto:caladmin@sfu.ca) (caladmin@sfu.ca or 778-782-3112).

MODIFIED BY:

Department, Statistics Actuarial (stat) on 2020-06-19 10:08 AM