STAT 4500 A: Parametric Estimation

COURSE OUTLINE

Term: Fall 2019
Instructor: Dr. Natalia Stepanova
Office: 5229 HP
E-mail: nstep@math.carleton.ca
Website: http://culearn.carleton.ca/
Phone: 613-520-2600, ext. 1272
Office hours: Tuesday 12:15 pm – 1:15 pm, or by appointment
Lectures: Tuesday 10:05 am – 11:25 am Southam Hall 309
Thursday 10:05 am – 11:25 am Southam Hall 309

Grades: Final Exam (50%), Midterm Test (30%), Assignments (20%).
Text: Statistical Inference, 2nd ed., by George Casella, Roger L. Berger

One 80-minute midterm test will be held during regular lecture hours on Thursday, October 31. There are no make-up tests in this course. There will be four assignments. All assignments count towards the term mark. Due dates for Assignments 1 to 4 are tentatively scheduled for October 10, October 29, November 14, and November 28. Late assignments will not be accepted. In addition to assignments, there will be four problem sets. They will be given for your practice and will not be counted towards the term mark.

Important Notes:
- If you miss the midterm test you will receive a zero unless you provide me with a proper documented reason (e.g., medical), in which case the weight of the midterm test will be shifted to the final exam. The same rule applies to each assignment.
- Assignments and their solutions, problem sets and their solutions, and announcements will be posted on cuLearn. Students should check the course web page on cuLearn on a regular basis.
- Students wishing to see their final examination papers must make an appointment during the first three weeks of Winter Term 2020 to do this. Please note that I do not change your grade on the basis of your needs (such as scholarships, etc.).

The course topics below include selected sections of Chapters 5, 6, 7, 9, and 10 in the text.

COURSE TOPICS

1. Review of Probability: Some modes of convergence; relationships among the various modes of convergence; conditional expectation and its properties

2. Sufficiency and Related Theorems: Definition of a sufficient statistic and some basic results; minimal sufficient statistics; completeness and uniqueness: Rao-Blackwell theorem and Lehmann-Scheffé theorem

3. Criteria for Selecting an Estimator: Unbiased estimators and UMVU estimators; Fisher information; Cramér-Rao inequality; loss functions; admissible and inadmissible estimators; Bayes estimators; minimax estimators; relationships among the Bayes, admissible and minimax estimators
4. **Classical Methods of Estimation**: Method of moments estimators and their properties; least square estimators and their properties; maximum likelihood estimators and their properties; robust estimators

5. **Asymptotically Optimal Properties of Estimators**: Consistency, asymptotic efficiency, asymptotic normality

6. **Interval Estimation**: Definition of a confidence interval and some examples; construction of a confidence interval in the Bayesian case; construction of a confidence interval using asymptotically normal estimators; construction of a confidence interval via a given statistic; criteria for selecting interval estimators

**Objectives of the course**: the course is designed to present in depth the basic theories and methods of the classical Estimation Theory whose knowledge is required in various fields of modern Statistics. It is anticipated that through attending lectures and solving homework problems the students will acquire valuable skills in constructing efficient estimation procedures in univariate and multivariate settings.

**Academic Accommodation**
You may need special arrangements to meet your academic obligations during the term. For an accommodation request the processes are as follows:

**Pregnancy obligation**: write to me with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details visit the Equity Services website [http://www2.carleton.ca/equity/accommodation/](http://www2.carleton.ca/equity/accommodation/).

**Religious obligation**: write to me with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details visit the Equity Services website [http://www2.carleton.ca/equity/accommodation/](http://www2.carleton.ca/equity/accommodation/).

**Academic Accommodations for Students with Disabilities**: The Paul Menton Centre for Students with Disabilities (PMC) provides services to students with Learning Disabilities (LD), psychiatric/mental health disabilities, Attention Deficit Hyperactivity Disorder (ADHD), Autism Spectrum Disorders (ASD), chronic medical conditions, and impairments in mobility, hearing, and vision. If you have a disability requiring academic accommodations in this course, please contact PMC at 613-520-6608 or pmc@carleton.ca for a formal evaluation. If you are already registered with the PMC, contact your PMC coordinator to send me your Letter of Accommodation at the beginning of the term, and no later than two weeks before the first in-class scheduled test or exam requiring accommodation (if applicable). After requesting accommodation from PMC, meet with me to ensure accommodation arrangements are made. Please consult the PMC website for the deadline to request accommodations for the formally-scheduled exam (if applicable) at [http://www2.carleton.ca/pmc/new-and-current-students/dates-and-deadlines/](http://www2.carleton.ca/pmc/new-and-current-students/dates-and-deadlines/). You can visit the Equity Services website to view the policies and to obtain more detailed information on academic accommodation at [http://www2.carleton.ca/equity/](http://www2.carleton.ca/equity/).
**Academic Integrity:** The University states unequivocally that it demands academic integrity from all its members. Academic dishonesty, in whatever form, is ultimately destructive to the values of the University. Students who violate the principles of academic integrity through dishonest practices undermine the value of the Carleton degree. Dishonesty in scholarly activity cannot be tolerated. Any student who violates the standards of academic integrity will be subject to appropriate sanctions.

**Important dates:**

- **September 4, 2019:** Fall term begins. Fall and fall/winter classes begin.
- **September 17, 2019:** Last day of registration for fall term and fall/winter courses. Last day to change courses or sections (including auditing) for fall term and fall/winter courses.
- **September 30, 2019:** Last day to withdraw from fall term and fall/winter courses with a full fee adjustment. Withdrawals after this date will result in a permanent notation of WDN on the official transcript.
- **October 11, 2019:** December examination schedule (fall term final and fall/winter mid-terms) available online.
- **October 14, 2019:** Statutory holiday. University closed.
- **October 15, 2019:** Last day for receipt of applications for admission to an undergraduate degree program for the winter term from applicants whose documents originate from outside Canada or the United States.
- **October 21-25, 2019:** Fall break, no classes.
- **November 8, 2019:** Last day to request Formal Examination Accommodation Forms for December examinations to the Paul Menton Centre for Students with Disabilities. Note that it may not be possible to fulfil accommodation requests received after the specified deadlines.
- **November 15, 2019:** Last day for receipt of applications for admission to an undergraduate degree program for the winter term.
- **November 22, 2019:** Last day for summative tests or examinations - or for formative and/or practical tests or examinations totaling more than 15% of the final grade - before the official examination period (see examinations regulations in the Academic Regulations of the University section of the Undergraduate Calendar/General Regulations of the Graduate Calendar).
- **December 1, 2019:** Last day for receipt of applications from potential winter (February) graduates.
- **December 6, 2019:** Fall term ends. Last day of fall term classes. Classes follow a Monday schedule. Last day for academic withdrawal from fall term courses. Last day for handing in term work and the last day that can be specified by a course instructor as a due date for term work for fall term courses. Last day for receipt of applications for undergraduate degree program transfers for winter term.
- **December 7-8, 2019:** No classes or examinations take place.
- **December 9-21, 2019:** Final examinations in fall term courses and mid-term examinations in fall/winter courses may be held.
- **December 25 through January 1, 2020 (inclusive):** University closed.