

STAT 4506 A/STAT 5516 W
Nonparametric Statistics
COURSE OUTLINE

Term:	Winter 2021	Email:	nstep@math.carleton.ca
Instructor:	Dr. Natalia Stepanova	Website:	http://culearn.carleton.ca/
Office Hour:	Tuesdays, 11:30 am - 12:30 pm, or by appointment. Office hours will be run synchronously via Zoom and start on the week of January 18th.		
Lectures:	Lectures will be delivered asynchronously through posting lecture notes and videos on cuLearn on a weekly basis, every Monday, starting the week of January 11th. The introductory lecture on January 12th will be delivered synchronously via Zoom and starts at 11:35 am.		
Grades:	Assignments: 30%, Take-home Test: 30%, Final Exam: 40%		
References:	There is no required textbook for the courses. The following books are recommended as references: Nonparametric Estimation and Spline Smoothing, 2nd ed., by R. Eubank; All of Nonparametric Statistics, by L. Wasserman; Nonparametric and Semiparametric Models, by W. Härdle et al.		

Assignments, test, and final exam policies:

- There will be three to four assignments with specific due dates. For the assignments, statistical software R will be used. Handouts with R codes of important functions will be provided on a regular basis. All assignments count towards the term mark. Late assignments will not be accepted.
- There will be one take-home test with a specific due date. You will be given one week to complete and submit your test paper.
- Three-hour open-book final exam will be scheduled by Carleton University. Open-book refers to class materials only (lecture notes, references, etc.). Exam question paper will be available on cuLearn during the scheduled exam hours.
- Assignments, take-home test, and final exam submissions will be handled electronically (i.e., via cuLearn). For each assignment, take-home test, and final exam you will be submitting exactly one (1) pdf-file created using Microsoft Office, Google Docs, or LaTeX.
- In normal circumstances, students with illness during the span of time a test or exam is offered might be granted an exemption only if they provide a copy of the Carleton University Medical Certificate https://carleton.ca/registrar/wp-content/uploads/med_cert.pdf that has been completed and signed by a physician covering the period in question. It is understood during the current COVID-19 situation, a medical note by a physician may be difficult to obtain. The Registrar's Office's self-declaration form for academic accommodations <https://carleton.ca/registrar/wp-content/uploads/self-declaration.pdf> can be used for any short-term medical issue. If you miss test or assignment, you may elect to submit the self-declaration form instead of obtaining a medical note, in which case the instructor might consider shifting the weight of the test or assignment to the final exam.

Important Notes:

- Assignments, handouts, and announcements will be posted on cuLearn. Students should check the course web page on cuLearn on a regular basis.
- **All materials created for this course** (including lecture notes, assignments, posted solutions, etc.) **remain the intellectual property of the instructor.** These materials are intended for the personal and non-transferable use of students registered in the current offering of the course. **Posting, reproducing, or redistributing any course materials**, in part or in whole, without the written consent of the instructor, **is strictly prohibited.**

COURSE TOPICS

Introduction: examples of nonparametric models and problems; parametric techniques versus nonparametric techniques.

Nonparametric Density Estimation: motivation and derivation of the kernel estimator; statistical properties; smoothing parameter selection; choosing the kernel function; multivariate density estimators.

Nonparametric Regression: 1. Kernel estimators: form of the estimator; consistency; selecting the kernel function; selecting the bandwidth; large-sample properties. 2. Local polynomial regression: form of the estimator; large-sample properties. 3. Orthogonal series estimators: some function space theory; form of the estimator; consistency and efficiency of the estimator. 4. Smoothing splines: form of the estimator; smoothing parameter selection; large-sample properties.

Elements of High-Dimensional Statistics: Multiple testing and false discovery; higher criticism and related developments; estimation and variable selection in sparse high-dimensional models.

Objectives of the course: Nonparametric methods are best suited for inference in situations where there is little or no prior information available about the data, and therefore are useful for practitioners. The STAT 4506/STAT 5516 students are anticipated to acquire and be able to use in practice the basic ideas, concepts, and methods of Modern Nonparametric Statistics.

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 your instructor 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/>.

Religious obligation: write to your instructor 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/>.

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/>. 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/>.

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:

- January 11, 2021: Winter term classes begin.
- January 25, 2021: Last day for registration for winter term courses. Last day to change courses or sections for winter and fall term courses.
- January 31, 2021: Last day to withdraw from winter term courses with a full fee adjustment. Withdrawals after this date will result in a permanent notation of WDN on the official transcript.
- February 12, 2021: April examination schedule available online.
- February 15, 2021: Statutory holiday. University closed.
- February 16–19, 2021: Winter break, no classes.
- March 19, 2021: Last day to request Formal Exam Accommodation Forms for April examinations to the Paul Menton Centre for Students with Disabilities.
- April 2, 2021: Statutory holiday. University closed.
- April 14, 2019: Last day of winter term classes. Last day for academic withdrawal from winter term courses.
- April 16–27, 2021: Final examinations in winter term courses may be held.