

COMP 5900F – Winter 2023

Surgical Data Science

Course Information

Classroom: Room location is posted on the public class schedule

Lectures: Mondays & Wednesdays, 10:00am – 11:30am

Course Website: <https://brightspace.carleton.ca/d2l/home/131328>

(University of Ottawa students, please see information here to access the course website: <https://gradstudents.carleton.ca/faculty-of-graduate-and-postdoctoral-affairs-access-to-brightspace/>)

Instructor

Matthew Holden

Contact: matthew.holden@carleton.ca

Office Hours: Mondays & Wednesdays 11:30am – 12:30pm (or by appointment)

Office Location: Herzberg Laboratories 5435

Course Calendar Description

Core concepts for modelling and analyzing data from image-guided surgeries and interventions. Emphasis on the underlying methods in surgical navigation, sensorization of the operating environment, modelling of surgical processes, and machine learning on surgical time series data.

Topics Covered

- Computer-assisted interventions
- Coordinate transformations and surgical navigation
- Introduction to medical imaging
- Representations for time series
- Alignment and comparison of time series
- Neural networks for time series
- Validation strategies for machine learning on surgical data

Prerequisites

Students are expected to have reasonable background in the topics list below. Please consult with the course instructor for more details.

- Linear algebra
- Introductory calculus
- Machine learning or artificial intelligence

Course Format

This course will be in-person. During class, we will have interactive activities such as: discussions, tutorials, demonstrations, examples, exercises, etc. Class attendance is very important as students will be responsible for all items discussed in class.

Communication

All announcements for the course will be made in class or through Brightspace. You are responsible for regularly monitoring these announcements.

Students are requested to ask questions or have discussions about the course or course material during the live classes, during instructor office hours, or on Brightspace. This way, other students may benefit from the discussion. You may not, however, post solutions to the assessments during the live classes or Brightspace. Questions or discussion about your individual situation may be asked by email.

Required Textbook(s) and Other Resources

There is no required textbook for this course. The course will use resources (e.g. journal articles, book chapters, conference proceedings) available through the Carleton Library. Information on accessing these resources will be provided in class or posted on Brightspace.

This course may use Poll Everywhere, Carleton University's tool for in-class polling. See here for details: <https://carleton.ca/edc/pollev/>.

Assessment Scheme

Students will be evaluated in this course according to the following scheme. All submitted work in this course is to be completed individually, unless otherwise specified by the instructor. Discussion of work with other students is permitted, but each student is expected to do the work individually. Details, due dates, and submission procedures for each component will be posted on Brightspace.

<i>Component</i>	<i>Weight</i>
Assignments (2)	20%
Participation	5%
Article summary presentations (2)	10%
Project (proposal + presentation + report)	50%
Student-led discussion	15%

Assignments

There will be two assignments in this course, each weighted equally. Each assignment will contain a theoretical part and an implementation part. Implementations may be written in Matlab, Python, or another language approved by the instructor.

Participation

Students may participate through either in-class discussion or through posting on Brightspace. To receive full participation marks, students must make at least ten contributions throughout the course (maximum one contribution per week will count).

Article Summary Presentation

Students will make two short presentations on an interesting problem in surgical data science, based on one or more articles in the literature.

Project

Students will complete a project where they address a research question in surgical data science. They may address the question by providing a practical solution, developing a theoretical solution, comparing/analyzing pre-existing solutions, or other related topics. Students must first submit a project proposal for approval by the instructor. Students will make a presentation on their project and write a report on their project.

Student-Led Discussion

Students will lead a class discussion on a topic in surgical data science. Students are encouraged to consult with the course instructor about their discussion beforehand.

Important Considerations

If you are unsure of the expectations regarding academic integrity (e.g. how to use and cite references, how much collaboration with classmates is appropriate), ask your instructor beforehand. Sharing assignment or quiz specifications or posting them online (to sites like Chegg, CourseHero, OneClass, etc.) is considered academic misconduct. You are never permitted to post, share, or upload course materials without explicit permission from your instructor.

For each assignment and the project, you will be given a 48-hour grace period. Assignments or projects submitted within this 48-hour grace period will be accepted without penalty. Late submissions beyond this will not be accepted. This will be strictly enforced. "Last-minute" requests for extensions or exceptions to these rules will not be granted (except for accommodations provided by university policy). Technical problems do not exempt you from this requirement. Consequently, you are advised to: (1) periodically upload your progress (e.g. upload your progress at least daily) and (2) attempt to submit your final submission well in advance of the due date and time.

For each assignment, you will be submitting one or more files that contain source code. They must be provided in the specified format. Assignments that are in the incorrect format will be penalized and may receive a mark of zero. If any of the source code files you submit does not run, it may receive a mark of zero. Furthermore, you are expected to demonstrate good programming practices, and your code may be penalized if it is poorly written. You are also expected to do the necessary preparatory work (i.e. devising an algorithm) before you start coding. You may be asked to present either pseudocode or a flowchart before you will receive any assistance from the instructor or a teaching assistant.

Graduate Academic Advisors

The Graduate Advisors for the School of Computer Science are available in Room 5302 HP; or by email at grad.scs@carleton.ca. The graduate advisors can assist with understanding your academic audit and the remaining courses required to meet graduation requirements.

University Policies

For information about Carleton's academic year, including registration and withdrawal dates, see [Carleton's Academic Calendar](#).

Pregnancy Obligation. Please contact 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 [Equity Services](#).

Religious Obligation. Please contact 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 <https://carleton.ca/equity/focus/discrimination-harassment/religious-spiritual-observances/>.

Academic Accommodations for Students with Disabilities If you have a documented disability requiring academic accommodations in this course, please contact the Paul Menton Centre for Students with Disabilities (PMC) at 613-520-6608 or pmc@carleton.ca for a formal evaluation or contact your PMC coordinator to send your instructor your Letter of Accommodation at the beginning of the term. You must also contact the PMC 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 your instructor as soon as possible to ensure accommodation arrangements are made. For more details, visit the [Paul Menton Centre](#) website.

Survivors of Sexual Violence. As a community, Carleton University is committed to maintaining a positive learning, working and living environment where sexual violence will not be tolerated, and survivors are supported through academic accommodations as per Carleton's Sexual Violence Policy. For more information about the services available at the university and to obtain information about sexual violence and/or support, visit: carleton.ca/sexual-violence-support

Accommodation for Student Activities. Carleton University recognizes the substantial benefits, both to the individual student and for the university, that result from a student participating in activities beyond the classroom experience. Reasonable accommodation must be provided to students who compete or perform at the national or international level. Please contact 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, see [the policy](#).

Student Academic Integrity Policy. Every student should be familiar with the Carleton University student academic integrity policy. A student found in violation of academic integrity standards

may be awarded penalties which range from a reprimand to receiving a grade of *F* in the course or even being expelled from the program or University. Examples of punishable offences include: plagiarism and unauthorized co-operation or collaboration. Information on this policy may be found [here](#).

Plagiarism. As defined by Senate, "plagiarism is presenting, whether intentional or not, the ideas, expression of ideas or work of others as one's own". Such reported offences will be reviewed by the office of the dean.

Unauthorized Co-operation or Collaboration. Senate policy states that "to ensure fairness and equity in assessment of term work, students shall not co-operate or collaborate in the completion of an academic assignment, in whole or in part, when the instructor has indicated that the assignment is to be completed on an individual basis". Please refer to the course outline statement or the instructor concerning this issue.

COVID Information

It is important to remember that COVID is still present in Ottawa. The situation can change at any time and the risks of new variants and outbreaks are very real. There are a number of actions you can take to lower your risk and the risk you pose to those around you including being vaccinated, wearing a mask, staying home when you're sick, washing your hands and maintaining proper respiratory and cough etiquette.

Feeling sick? Remaining vigilant and not attending work or school when sick or with symptoms is critically important. If you feel ill or exhibit COVID-19 symptoms do not come to class or campus. If you feel ill or exhibit symptoms while on campus or in class, please leave campus immediately. In all situations, you must follow Carleton's symptom reporting protocols.

Masks. Carleton has paused the COVID-19 Mask policy, but continues to strongly recommend masking when indoors, particularly if physical distancing cannot be maintained. It may become necessary to quickly reinstate the mask requirement if pandemic circumstances were to change.

Vaccines. While proof of vaccination is no longer required as of May 1 to attend campus or in-person activity, it may become necessary for the University to bring back proof of vaccination requirements on short notice if the situation and public health advice changes. Students are strongly encouraged to get a full course of vaccination, including booster doses as soon as they are eligible, and submit their booster dose information in cuScreen as soon as possible. Please note that Carleton cannot guarantee that it will be able to offer virtual or hybrid learning options for those who are unable to attend the campus.

All members of the Carleton community are required to follow requirements and guidelines regarding health and safety which may change from time to time. For the most recent information about Carleton's COVID-19 website and review the Frequently Asked Questions (FAQs). Should you have additional questions after reviewing, please contact covidinfo@carleton.ca.

Doctor's note or medical certificate. in effect for Winter 2023 term. In place of a doctor's note or medical certificate, students are advised to complete the [self-declaration form](#) available on the Registrar's Office website to request academic accommodation for missed course work including exams and assignments. Students should also discuss with the course instructor the required accommodations arising from the COVID-19 situation.