COMP 5900A - Summer 2022
Surgical Data Science

Course Information
Classroom: Room location is posted on the public class schedule
Lectures: Tuesdays & Thursdays, 6:00pm – 9:00pm
Course Website: https://brightspace.carleton.ca/d2l/home/111220

Instructor: Matthew Holden
Contact: matthew.holden@carleton.ca
Office Hours: Tuesdays & Thursdays 4:30pm – 5:30pm (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
- Deployment of sensors in the surgical environment
- Representations for surgical time series
- Alignment and comparison of surgical time series
- Neural networks for surgical data
- 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.

Component	Weight
Assignments	20%
Participation	10%
Article summary presentation	5%
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 two contributions per week will count).

Article Summary Presentation

Students will make a short presentation 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 small 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.

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 [Equity Services](#).

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.