COURSE OUTLINE – SURGICAL DATA SCIENCE

Carleton University School of Computer Science
COMP 5900Z / CSI 5139 IZ0
Selected Topics in Computer Science - Surgical Data Science
Area Code: Applications
Winter 2020

Class Schedule

Classroom: Southam Hall 311 (subject to change)
Class Times: Mondays & Wednesdays 10:00am – 11:30am
Course Website: https://culearn.carleton.ca/moodle/course/view.php?id=137360

Instructor

Matthew Holden
matthew.holden@carleton.ca
Herzberg Laboratories 5435
Office hours:
Mondays 11:30am – 12:30pm
Wednesdays 11:30am – 12:30pm
Thursdays 10:00am – 12:00noon
(see http://people.scs.carleton.ca/~matthewholden for updates)

Course 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

- Coordinate transformations and registration for surgical navigation
- Deployment of sensors in the surgical environment
- Representations for surgical time series
- Alignment and comparison of surgical time series
- Recurrent neural networks for surgical data
- Validation and augmentation 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.

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

Course Objectives

This course is intended to provide students with the following learning outcomes:

- Use coordinate transformations for surgical navigation
- Understand requirements for deploying sensors in the surgical environment
- Align, compare, and represent multiple surgical time series
- Solve classification or regression problems on time series for surgery

Textbook(s)

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 cuLearn.

Online and Other Resources

Notes for the course will be posted on the course webpage periodically. This course will use Poll Everywhere, Carleton University's tool for in-class polling. See here for details: https://carleton.ca/edc/pollev/.

Evaluation

Students will be evaluated in this course according to the following measures.

Component	*Weight*
Assignments	20%
Participation	10%
Problem presentations	5%
Project (proposal + presentation + report)	50%
Student-led discussion	15%

Assignments

There will be two assignments in this course, each weighted equally. Assignment content and due dates will be announced in class and will be posted on cuLearn. Assignments are to be submitted electronically through cuLearn. It is your responsibility to ensure that your assignment is submitted properly and that all the files for the assignment are included. Copying of assignments is NOT allowed. Discussion of assignment work with others is acceptable but students are expected to do the work themselves. Please keep a backup copy of all your assignment work.

Participation

Students may participate through either in-class discussion or through posting on cuLearn. To receive full participation marks, students must make a contribution each week of class (best 10 weeks will count).

Problem Presentations

Students will make a short presentation on an interesting problem to the class in surgical data science, based on an article in the literature.

Project

Students will complete a project where they address a problem in surgical data science. They may address the problem 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 present on their project to the class and write a report on their project. Specifications for the proposal, presentation, and report and due dates will be announced in class and posted on cuLearn. Students may choose to do their project related to their "problem presentation".

Student-led Discussion

Students will lead a class discussion on one or more papers that addresses a problem in surgical data science. Students are encouraged to discuss their discussion with the course instructor beforehand.

Important Dates

Due dates for course work will be announced in class and posted on cuLearn. Please consult the Carleton University calendar for information on sessional dates.

Attendance

Class attendance is very important as students will be responsible for all items discussed in class.

University Policies

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. Some examples of offences are: plagiarism and unauthorized co-operation or collaboration. Information on this policy may be found in the Undergraduate Calendar.

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 of Science.

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.

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). Requests made within two weeks will be reviewed on a case-by-case basis. After requesting accommodation from PMC, meet with me to ensure accommodation arrangements are made. Please consult the PMC website (www.carleton.ca/pmc) for the deadline to request accommodations for the formally-scheduled exam (if applicable).

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/.

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/.

Medical Certificate

The following is a link to the official medical certificate accepted by Carleton University for the deferral of final examinations or assignments in undergraduate courses. To access the form, please go to http://www.carleton.ca/registrar/forms.