

CMPT 728/420

Deep Learning

Simon Fraser University

Spring 2024

Instructor: Oliver Schulte

For course details such as scheduling, contact information, office hours etc., please see the course website at courses.cs.sfu.ca

Overview

Machine learning has become the main framework for building programs that perform intelligent tasks. In fields such as computer vision and natural language processing, many recent successes have been achieved using neural nets with several layers, so-called deep neural nets. This course is an introduction to deep neural nets, techniques for training them from data, and significant applications.

Textbook

Introduction to Deep Learning, Eugene Charniak, MIT Press.

Objectives

- Learn the main theoretical ideas behind deep learning.
 - When to use what model
 - Tips and tricks for training
- Ability to read (not write) research papers in this area.
- Become familiar with a set of computational tools for deep learning.

This is *not* a seminar course. Questions and interactions are welcome, but presentations are not required. Grading is based on quizzes, assignments, exams.

Prerequisites

You will find it difficult to succeed without a background in machine learning and the requisite mathematics (calculus, linear algebra, probability). The undergraduate section 420 therefore has machine learning as a prerequisite. For graduate students, our intro to machine learning course (CMPT 726) is

excellent preparation. I would advise you to take 726 first. There will be a background quiz to give you feedback on whether you are prepared.

Class Format. The classes are basically lecture classes. I will vary the lecture format for in-class exercises, polls, and brief discussions. I plan in-class surveys using mobile Canvas or Zoom polls; **you must be equipped to take part in these quizzes.**

Studying For This Class. The reading assignment for each week is given on the lecture schedule. You should read each assigned reading at least *twice*. It's a good idea to form study pairs for discussing (not copying) the readings, assignments, and other parts of the class.

Getting in Touch; E-mail

Face-to-face. The best occasion for discussing aspects of the course content is in my *office hour*. My office hour will have a public part for course content, and a private part with a Zoom waiting room, to discuss individual concerns.

There will be some time *at the end of class*. You can make an individual appointment with me or with the TA, as well.

Private Messages. I process email and private messages twice a week, so if you want a faster reply than that, please use the in-person avenues. E-mail is an inefficient way to carry on a discussion, and I won't have time to send you back more than a couple of sentences. You should first look at the course web page, course syllabus and the textbook for information.

When to send a Canvas message.

- For practical or organizational problems.
- To make a special appointment.
- **Please use the Canvas message function to send me a private message.** That way your message does not compete with the 100 or so emails I get each day.

When not to send email.

There are various types of information that you can get from the syllabus, the posted course schedule, in class, from me during my office hour, or from your fellow students. These are not appropriate for e-mail queries and I may not reply by e-mail but only in class. Examples include:

- When is my assignment/midterm/due date?
- What did we cover in class last week?
- Do I need to buy the textbook?

- What are you looking for in this assignment?

On-line support for assignments will be via the public discussion forum. **There will be no private email support for assignments.**

Grading and Expectations

Grading will be based on written assignments (4), quizzes, and 1 exam. The main component of the assignments will be applying neural networks to datasets. Assignments may also include a conceptual exercise part. Grading breakdown:

- Assignments/exercises 50%
- Quizzes 20%
- Final Exam 30%

Any written component may be supplemented with an oral examination. The mark for the written submission may be revised depending on the performance in the oral exam.

Assignments.

- I encourage you to work in groups. But each student should submit their own write-up (see instructions).

- I urge you to start working on the assignment as soon as it is given out. You will then get more out of the class that deals with the material on the assignment. Also, you can check your understanding against what we discuss in class: you will very likely catch mistakes that way.
- Submission details, grading criteria etc will be posted with the assignment.
- Late homework policy: You get four "late days". Turning in an assignment late costs one late day per day after the due date (rounded up). If you run out of late days, late submission costs 10% of the assignment grade per day. We will post solutions three days after the due date. No submissions will be accepted after that.

Quizzes. We will have regular quizzes to give you immediate feedback on how well you have followed the course material. The quizzes will cover both material from the lectures and from the text. I will run them as on-line quizzes using the Canvas system. The exact number of quizzes will depend on the class dynamics; roughly I'm planning for around 10 quizzes. I will discard the worst 2 quizzes for each student, to allow for absences, technical problems, etc. The average of the remaining quiz marks is your overall quiz mark.

Final Exam. The exam is cumulative over the course. It will have two components.

1. A synchronous multiple-choice/short-answer component. You must be available to take the exam at a fixed Vancouver time.
2. An asynchronous long-answer component. This will contain one or two questions that require a longer answer (long answer = up to 1 page).

Final Grades

Students must attain an overall passing grade on the exam in the course in order to get a C or higher. In other words, if you score less than 50% exam average, you get at most a D regardless of your score on the assignments. *This is the most common way for students to be assigned a D.*

I do not use a pre-determined set of cutoffs for converting percentage term marks to letter grades. The graduate and undergraduate sections will likely use different cutoffs because grade distributions differ significantly between graduate and undergraduate courses.

Excuses and Extensions

My main goal in considering special circumstances is to ensure *fair treatment* for all students. While you will understand the material better the more time you put into studying, I cannot evaluate your effort, only the results.

Valid reasons for an extension. The standard excuse for missing any part of the course requirements (assignment deadlines, exams, etc.) is a *certified medical problem*. You should discuss other reasons with me, preferably in advance. As a rule, I will require documentation of your problem, in the case of medical problems the standard SFU health care provider form (see course website) to be filled out by a physician. Documentation is necessary because otherwise some students abuse make-up options to gain an unfair advantage.

If you have a valid excuse:

- for an assignment or an on-line quiz, I will transfer the weight of what you have missed to the weight of the *exam*.
- for missing an exam, *it will be made up the day after*. You must be available for the exam day or the make-up day, otherwise you will receive 0 for the missed exam.

Invalid reasons for an extension.

Unforeseen circumstances such as breakdown of your car, printer, computer, internet. Outside commitments like work and travel plans.

I sympathize with these issues but they are not reasons for special treatment. If this worries you, I suggest you do your work ahead of the deadline and put in place alternative ways of getting it to class (e-mail, friends).

Grade Challenges

Valid reasons for making a grade change.

- There was a mistake adding up your points.
- The instructor/TA said the right answer was x. I put down x but got marked wrong.

If you wish to have a grade reconsidered, *write a brief note* stating your reasons. Typically, the note will outline what you take to be the requirements of a good answer, and point out where you believe that you met these requirements. Your note will show us that you have understood the issues involved, and in a class of this size, will help us keep track of our discussions and special circumstances.

Invalid reasons for making a grade change.

- I believe that the question was unclear.
- I disagree with your solution.
- I didn't know this would be on the exam.
- I spent a lot of time on this assignment/exam.
- I need a better grade to (stay in the program, stay in the university, get into business school, get a scholarship...).
- My term mark is close to a cut-off.

I sympathize with these issues but they are not sufficient reasons to consider a grade change. If you are not satisfied with your grade on a course component, or in the course, there is a procedure for appealing, starting with the Undergraduate/Graduate Chair of Computing Science.

Valid reasons for asking for a change of exam date.
Documented SFU commitments on the exam date.

Invalid reasons for asking for a change of exam date.
Other plans, e.g., travel, work, getting married.

Students With Special Needs

I advise students who require accommodations in this course due to a disability affecting mobility, vision, hearing, learning, or mental or physical health to discuss their needs with The Centre for Accessible Learning, 778-782-3112 (Phone) or <https://www.sfu.ca/students/disabilityaccess.html>.

Plagiarism

Plagiarism is a serious academic offence, and will not be tolerated in this course. SFU's Code of Academic Policy (<http://www.sfu.ca/policies/gazette/student/s10-01.html>) states that:

“Plagiarism is a form of academic dishonesty in which an individual submits or presents the work of another person as his or her own. Scholarship quite properly rests upon examining and referring to the thoughts and writings of others. However, when excerpts are used in paragraphs or essays, the author must be acknowledged using an accepted format for the underlying discipline. Footnotes, endnotes, references and bibliographies must be complete... Plagiarism exists when all or part of an essay is copied from an author, or composed by another person, and presented as original work. Plagiarism also exists when there is inadequate recognition

given to the author for phrases, sentences, or ideas of the author incorporated into an essay.

A draft paper, proposal, thesis or other assignment may be subject to penalty for academic dishonesty provided the instructor/supervisor has informed the student(s) before the work is submitted...

Penalties imposed by the University for academic dishonesty may include but are not limited to one or more of the following: a warning, a verbal or written reprimand, reassessment of work, failure on a particular assignment, failure in a course, denial of admission or readmission to the University, deregistration, forfeiture of University awards or financial assistance, suspension or permanent suspension from the University or revocation of a degree."