ECE 1508: Applied Deep Learning

Course Logistics

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Welcome to ECE 1508!

Happy to see you in ECE 1508

Applied Deep Learning

Instructor: Ali Bereyhi

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Where and When?

- *Tuesdays at 11:00 AM till 1:00 PM* at **SF 1101**
- *Fridays at 11:00 AM till 1:00 PM* at **MP-103**

Tutorials: There are tutorial sessions

- *TBA*

Teaching Team

- Jiaqi Wang – *Project Supervision and Assignments*
  - *PhD Candidate, ECE Department*
  - *jiaqiangela.wang@utoronto.ca*
- Navid Hassanzadeh – *Project Supervision and Assignments*
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- Cassie Li – *Tutorials and Office Hours*
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- Faeze Moradi– *Project Supervision and Assignments*
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Quercus and Piazza

We got a Quercus page

- You have been automatically enrolled
- Also you got registered at the Piazza page
  - ↳ You can login through the Quercus page
- We though use the Course Page to share the course materials

Please! Feel free to ask questions on Piazza!

What Do We Learn?

Simple: we are going to learn Deep Learning!

You may wonder how do we learn it? Well! in 3 steps

- *Step 1:* **Preliminaries of Machine Learning**
  - We try to get what is the problem in Machine Learning
  - We understand what Deep Learning is
  - We get to know Neural Networks and their Deep version
  - We understand why really Deep Neural Networks work

  By the end of this step, we know in theory
  - How Deep Learning works
  - What we need to learn if we want to build a Deep Learning model

  This motivates us to get to the next step!

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- *Step 2:* **Neural Networks: MLPs, CNNs and Sequence Models**
  - We now get to know the details of each architecture
  - How we can implement them
  - What kind of challenges we deal with when we implement them
  - What are the standard techniques to overcome these challenges

  This is the major part of the course. As we get over this part
  - You can consider yourself a mid-level expert in Deep Learning
  - You are able to build a suitable Deep Learning model for a given problem
  - You are able to implement what you need from scratch

  No worries! We all get there for sure! ☺

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You may wonder how do we learn it? Well! in 3 steps

- *Step 3:* **Advances in Deep Learning**
  - We study few selected advance topics in Deep Learning
  - We see how easily we follow the topics using what we learned in *Step 2*

  By the end of this part

  - You believe that you're mid-level expert in Deep Learning
  - You get to know how to train yourself for more advanced projects

Checkout the course syllabus

How Do We Get Trained?

There are three learning components in the course

- *Assignments*
  - ↳ We solve four sets of assignments
  - ↳ No need to say that they are the best thing to understand the course!
  - ↳ And, of course we do lots of programming in there!
  - ↳ Each assignment will be solved in Tutorial after the deadline
    - ↳ You have *two weeks* time for each assignment
    - ↳ Submission by deadline at 11:59 PM: full mark
    - ↳ Up to 2 days delay is allowed: each day deducts 10%

Attention!

Assignments make almost half of the course mark; so, they need effort! They are a part of the learning process, not supplementary!

  - ↳ *Feel free to get help, even from ChatGPT!*
- Midterm Exam
- Final Project

How Do We Get Trained?

There are three learning components in the course

- Assignments
- *Midterm Exam*
  - ↳ We will have one written exam in the middle of semester
    - ↳ Questions that can be solved by hand, so no programming in the exam
    - ↳ We just evaluate our understanding of fundamental concepts
    - ↳ Exam is on **October 24, 2025** at **11:00 AM**
- Final Project

How Do We Get Trained?

There are three learning components in the course

- Assignments
- Midterm Exam
- *Final Project*
  - ↳ The most interesting part of the course
  - ↳ We build groups of size three or four
    - ↳ Each group chooses a topic:

      some engineering problem solved by Deep Learning
    - ↳ Each group submits a proposal and a flyer by Week 5
    - ↳ Each group briefs us about the progress by Week 10
    - ↳ Each group accomplishes their project and submits final codes and paper
    - ↳ We meet all in a poster session where the groups present their projects

Read the post on Quercus for more details

Course Calendar

Week #	Date	Notes	Posted	Deadline
1	*Sep 01 - Sep 05*			
2	*Sep 08 - Sep 12*		Assignment 1: *Basics*	
3	*Sep 15 - Sep 19*			
4	*Sep 22 - Sep 26*		Assignment 2: *FNNs*	Assignment 1: *Basics*
5	*Sep 29 - Oct 03*			**Project:** *Flyer and Proposal*
6	*Oct 06 - Oct 10*			Assignment 2: *FNNs*
7	*Oct 13 - Oct 17*		Assignment 3: *CNNs*	
8	*Oct 20 - Oct 24*	***Midterm Exam -- Oct 24***		
9	*Oct 27 - Oct 31*	***Reading Week-- No Lectures***		
10	*Nov 03 - Nov 07*			**Project:** *Progress Briefing*
11	*Nov 10 - Nov 14*		Assignment 4: *Sequence Models*	Assignment 3: *CNNs*
12	*Nov 17 - Nov 21*			
13	*Nov 24 - Nov 28*			Assignment 4: *Sequence Models*
14	*Dec 01 - Dec 05*	***Last Lecture on Dec 2***		
15	*Dec 08 - Dec 12*	***Examination Time -- No Lectures***		**Project: *Final Submission and Poster Session***

- *You could check it out here*

In Person Lectures!

The course is in-person and · · ·

· · · by Regulations the attendance is mandatory in in-person courses!

Recording is uploaded after each lecture

- *They are mainly for recap and/or following **some** missed lectures*
- *I strongly advise to attend the lectures*
  - *You don't want to miss my performance* ☺
  - *Board and I are not captured in videos, it's only the slides and my voice*

Lots of Programming in *Python*

We are going to do lots of programming in Python

- ↳ Some basic knowledge in Python is needed
  - ↳ Don't run away if you haven't, *you only need a bit of more efforts*
- ↳ We just need basics, we will learn all packages that we need
  - ↳ *Matplotlib*, *NumPy*, *Scikit-Learn*, *Pandas*
  - ↳ But our main toolkit in Python will be *PyTorch* that we learn in detail
- ↳ Don't mistake! We do not learn *based on PyTorch*!
  - ↳ We learn to implement pretty much everything from scratch
  - ↳ But, we need to know *PyTorch* as well, since it is the professional toolkit

No Major Prerequisites

The course is self-containing meaning that

you will learn all background you need!

We assume that we all have some basic math in mind

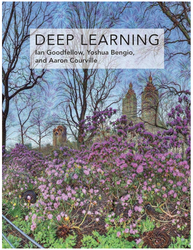
↳ linear algebra, calculus, and probability theory

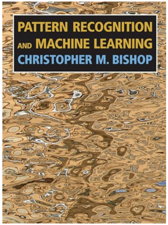
But we review whatever we need from these topics whenever needed!

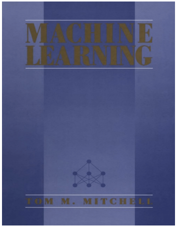
There are some other related courses, the most important one is

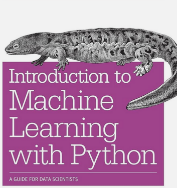
- ECE 1513: Introduction to Machine Learning
  - ↳ Totally fine (actually suggested) if *you had it before or have it right now*
  - ↳ It's focusing on the general Machine Learning not Deep Learning
  - ↳ We are going to study Deep Learning and Neural Networks
    - ↳ *So, the two courses can be seen as complements*
    - ↳ *You could also have only one of them*

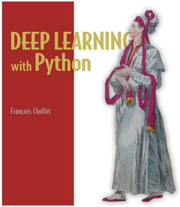
Textbooks







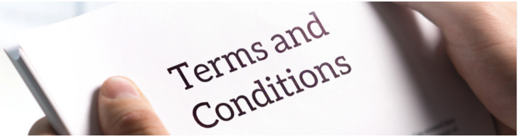

Introduction to Machine Learning with Python
A GUIDE FOR DATA SCIENTISTS



All materials are provided in the course. It's however good to know some texts!

- Goodfellow et al., can be accessed online at this link
- Mitchell's textbook is available online here
- For *PyTorch* the best resource is its own tutorials

Terms and Conditions!



The instructor keeps the right reserved for himself to modify the slides

- *last minute before the lecture* ☺
- *after the lecture has been given*
    - *Typically happens due to typos*

The instructor keeps the right reserved for himself to deliver the lecture-notes

- *in form of mini-batches* ☺

Date and Signature ....

Introducing Glum

Glum does not buy my words! e.g.,

+ *Well! We know Python, you think you can teach us Deep Learning!*
– Sure! Let's try!

So, please excuse me if I explain things sometimes in too much detail! I need to convince Glum!

No such thing as a stupid question!

Did you know that we got a Wikipedia page on this?

- ↳ Trust me! Your question will never sound stupid!
- ↳ If you don’t ask; then, I need to ask!
  - ↳ Interaction is the best tool to avoid getting bored!

Any Questions? ☺