

# ECE 1508: Applied Deep Learning

## Course Logistics

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# Welcome to ECE 1508!

Happy to see you in ECE 1508

## *Special Topics in Communications: Applied Deep Learning*

**Instructor:** Ali Bereyhi

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**Where and When?**

- **Tuesdays at 2:00 PM till 4:00 PM** at **MS 3153**
- **Thursdays at 2:00 PM till 4:00 PM** at **PB-B150**

**Tutorials:** Xiaocan (Bruce) Li

- **Tuesdays at 4:00 PM till 5:00 PM** at **MS 3153**

# Teaching Team

- Jiaqi Wang – *Project Supervision and Assignments*
  - PhD Candidate, ECE Department
  - [jiaqiangela.wang@utoronto.ca](mailto:jiaqiangela.wang@utoronto.ca)
- Navid Hassanzadeh – *Project Supervision and Assignments*
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- Xiaocan (Bruce) Li – *Tutorials and Office Hours*
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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
- All course materials will be shared on [Quercus](#)

**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!*

# 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 2: Neural Networks: FNNs, CNNs and RNNs**

- 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! ☺

# 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 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 at Quercus](#)

# 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 February 27, 2025 at 2:00 - 5:00 PM
- 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**
    - ↳ 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 8**
    - ↳ 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	Jan 06 - Jan 10			
2	Jan 13 - Jan 17		Assignment 1: Basics	
3	Jan 20 - Jan 24			
4	Jan 27 - Jan 31		Assignment 2: FNNs	Assignment 1: Basics
5	Feb 03 - Feb 07			Project: Flyer and Proposal
6	Feb 10 - Feb 14			Assignment 2: FNNs
7	Feb 17 - Feb 21	Reading Week-- No Lectures		
8	Feb 28 - Feb 28	Midterm Exam -- Feb 27	Assignment 3: CNNs	
9	Mar 03 - Mar 07			Project: Progress Briefing
10	Mar 10 - Mar 14		Assignment 4: RNNs	Assignment 3: CNNs
11	Mar 17 - Mar 21			
12	Mar 24 - Mar 28			Assignment 4: RNNs
13	Mar 31 - Apr 04			
14	Apr 07 - Apr 11	Examination Time -- No Lectures		Project: Final Submission and Poster Session

- You could check it out [here](#)
- Also, follow the [course board](#) on Quercus for updates

# 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

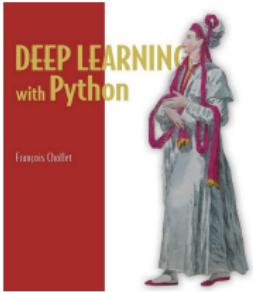
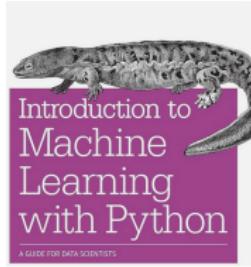
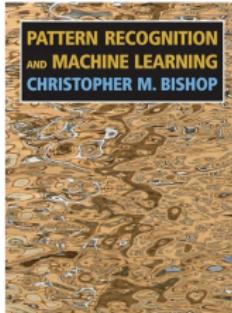
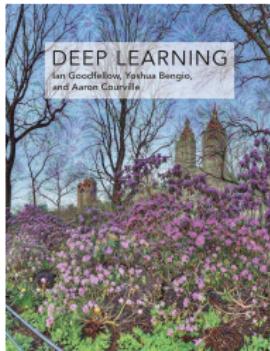
But we review **whatever we need** from these topics **whenever needed!**

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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



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? ☺