

Introduction to Machine Learning

Course Logistics

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Welcome to ECE 1508!

Happy to see you in ECE 1513

Introduction to Machine Learning

Instructor: Ali Bereyhi

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Where and When?

- *Tuesdays* at **5:00 PM till 7:00 PM** at **BA 1170**
- *Thursdays* at **5:00 PM till 7:00 PM** at **MC-252**

Tutorials: Saba Ale Ebrahim and Mohammadreza Safavi

- *Thursdays* at **6:00 PM till 7:00 PM** at **MC-252**

Teaching Team

- Saba Ale Ebrahim – *Tutorials* and *Office Hours*
 - PhD Candidate, ECE Department
 - saba.aleebrahim@mail.utoronto.ca
- Saeed Jafari – *Assignments* and *Project*
 - PhD Candidate, ECE Department
 - saeed.jafari@mail.utoronto.ca
- Mohammadreza Safavi – *Tutorials* and *Office Hours*
 - M.A.Sc. Student, ECE Department
 - mohammadreza.safavi@mail.utoronto.ca
- TBA – *Assignments* and *Project*
 - TBA
 - TBA

Quercus and Piazza

We got a *Quercus* page

- You have been automatically enrolled
- Also you got registered at the *Piazza* page

↳ *This is the easiest way to reach out*

The course has though its own page on *GitHub*

What Do We Learn?

We study *Machine Learning!* from *scratch*

You may wonder what do we learn in this course?

- **Part I: Learning Pattern from Data**
 - Clustering: *K-Means Clustering*
 - Dimensionality reduction: *Principal Component Analysis*
 - Learning data distribution: *Gaussian Mixture Model*

We also recap some notions and develop some intuitions in

- Linear Algebra
- Probability Theory

What Do We Learn?

We study *Machine Learning!* from *scratch*

You may wonder what do we learn in this course?

- **Part II: Supervised Learning**
 - Regression: *Linear Regression*
 - Classification: *Logistic Regression, Perceptron and Multiclass Classification*
 - Training via Stochastic Gradient Descent
 - Support Vector Machines
 - Overfitting and Underfitting: *Regularization*
 - Nonlinear Models and Representation: *Kernels and Neural Networks*

We also recap some notions and develop some intuitions in

- Functional Analysis and Optimization

What Do We Learn?

We study *Machine Learning!* from *scratch*

Don't we study Deep Neural Networks?

- Within **Part II**, we study *Neural Networks (NNs)*, specifically
 - Expressive Power of NNs: *Universal Approximation Theorem*
 - Multilayer Perceptrons (MLPs): *Feedforward NNs*
 - Training MLPs: *Backpropagation*
 - Convolutional NNs

Nonetheless, please note that

- This is *not* a course on *Deep Learning*, but *general ML*
- To study *Deep Learning*, you may consider taking

ECE1508: Applied Deep Learning

Checkout the course *syllabus at Course Page*

How Do We Get Trained?

There are three learning components in the course

- *Assignments*
 - ↳ We solve **five sets** of assignments
 - ↳ **No need to say** that they are the **best thing** to understand the course!
 - ↳ And, of course we do **some programming** as well!
 - ↳ Assignments will be solved in Tutorial **after the deadline**
 - ↳ You have **two weeks** time for each assignment
 - ↳ Submission by **deadline at 11:59 PM**
 - ↳ **No extension** will be made! Really Sorry! ☹️

Attention!

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

- 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 evaluate our **understanding** of **fundamental concepts**
 - ↳ Exam is on **February 24, 2026 at 5:00 - 8:00 PM**
- Final Project

How Do We Get Trained?

There are three learning components in the course

- Assignments
- Midterm Exam
- *Final Project*
 - ↳ You build groups of size three
 - ↳ Each group chooses a topic and submits the proposal by Week 10
 - ↳ Each group submits the final codes and paper by Week 14

Attention!

The projects of ECE1508 and ECE1513 cannot be the same! Any overlap between the projects should be discussed in advance!

Course Calendar

Week #	Date	Notes	Posted	Deadline
1	Jan 05 - Jan 09			
2	Jan 12 - Jan 16		Assignment 1	
3	Jan 19 - Jan 23			
4	Jan 26 - Jan 30		Assignment 2	Assignment 1
5	Feb 02 - Feb 06			
6	Feb 09 - Feb 13		Assignment 3	Assignment 2
7	Feb 16 - Feb 20	Reading Week-- No Lectures		
8	Feb 23 - Feb 27	Midterm Exam on Feb 24		
9	Mar 02 - Mar 06		Assignment 4	Assignment 3
10	Mar 09 - Mar 13			Project: Proposal Submission
11	Mar 16 - Mar 20		Assignment 5	Assignment 4
12	Mar 23 - Mar 27			
13	Mar 30 - Apr 03			Assignment 5
14	Apr 06 - Apr 10	Examination Time -- No Lectures	Project: Presentation	Project: Final Report and Source Codes

In Person Lectures!

The course is **in-person** and . . .

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

attendance
MATTERS

Recording might be available

- They are mainly for **recap** and **cannot be guaranteed**
- I **strongly** advise to **attend** the lectures
 - You don't want to miss my **performance** 😊
 - **ECE1513** is taught **on the board**

Programming in Python

We mainly use Python for programming

- ↳ Basic knowledge in Python is enough
 - ↳ *Don't run away* if you *don't have*, 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, PyTorch*
- ↳ Programming is *not* the *only major thing*!
 - ↳ *We get some hands-on experience with implementing*
 - ↳ *But, we are here to learn **Fundamentals of Machine Learning***

No Major Prerequisites

The course is *self-containing* meaning that

you will learn *all background* you need!

I 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

- CSC 311/2515 and ECE 421/1504

↳ These course are considered *exclusions*

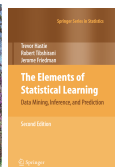
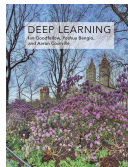
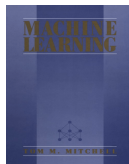
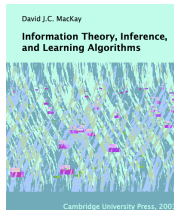
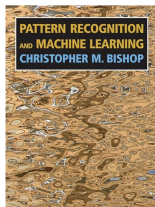
↳ We cover pretty much *the same things* in this course

- ECE 1508: Applied Deep Learning

↳ Totally fine (actually *suggested*) to have it before or with this course

↳ It focuses on *Deep Learning* not *general Machine Learning*

Textbooks



Materials are mostly collected from

- Bishop's textbook, which can be accessed online [at this link](#)
- MacKay's book that is available online [at this link](#)

Also some parts are taken from

- Mitchell's textbook that is available online [here](#)
- Goodfellow et al. that can be accessed online [at this link](#)
- *Elements of Statistical Learning (ESL)* by Hastie, Tibshirani and Friedman

Terms and Conditions!



The instructor keeps the right reserved for himself to modify online materials

- *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 notes

- *in form of mini-batches 😊*

Date and Signature

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? 😊