Introduction to Machine Learning

Course Logistics

Ali Bereyhi

`ali.bereyhi@utoronto.ca`

Department of Electrical and Computer Engineering
University of Toronto

Winter 2026

Welcome to ECE 1513!

Happy to see you in ECE 1513

Introduction to Machine Learning

Instructor: Ali Bereyhi
- *Office:* BA 7208 at Bahen Centre for Information Technology
- *Email:* ali.bereyhi@utoronto.ca

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: *Princapl 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
M**A**TTERS

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 gets 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
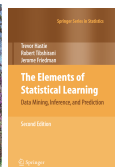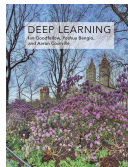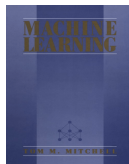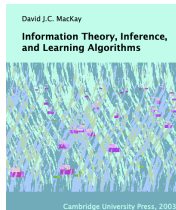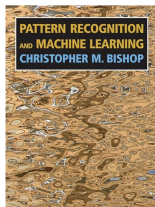   - ↪ *These course are considered *exclusions**
    - ↪ *We cover pretty much *the same things* in this course*
- ECE 1508: Applied Deep Learning
    - ↪ *Totally fine (actually *suggested*) to have it before or with this course*
    - ↪ *It focuses on *Deep Learning* not *general Machine Learning**

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? ☺