ECE1513H Introduction to Machine Learning
FALL 2023

Description: An Introduction to the basic theory, the fundamental algorithms, and the computational toolboxes of machine learning. The focus is on a balanced treatment of the practical and theoretical approaches, along with hands-on experience with relevant software packages.

ECE1513 Learning Outcomes

- **Supervised learning methods.**
- **Unsupervised learning methods.**
- **Application of these techniques to real-life problems.**

Textbook: C. M. Bishop**, *Pattern Recognition and Machine Learning***, Springer, ISBN-13: 978-0387-31073-2.

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https://www.ece.utoronto.ca/people/sejdic-e/

Course Website: The course will be administered via Quercus. Communications with the instructor and Teaching Assistants, announcements, on-line course notes, detailed course notes, assigned homework, homework solutions, evaluations (midterms and finals), and grades, and will be posted here. Please ensure that you always have access to the Quercus based ECE1513 page. **There is only one ECE1513 web page**.

Evaluation: There will **be two midterms and a final examination**. The composition of the final ECE1513 mark is as follows:

Final Examination	30%
Midterm Test 1 (Oct. 23rd)	10%
Midterm Test 2 (No. 20th)	10%
Assignments	25%
Project	25%
Total	100%

Note:

1. Petitions related to any evaluation must be submitted online through the Term-Work Petition system: http://uoft.me/termworkpetition
2. **Each midterm test will be 60 minutes long.**
3. **The final examination will be a 2 ½ hours long (150 minutes long) exam.**

Coverage

Date	Topic
Sep 11, 2023	Introduction to machine learning (Chapters 1 and 2), Tutorial #1
Sep 18, 2023	Linear models for regression (Chapter 3), Tutorial #2
Sep 25, 2023	Linear models for classification (Chapter 4), Tutorial #3
Oct 2, 2023	Neural networks (Chapter 5), Tutorial #4
Oct 16, 2023	Kernel methods (Chapter 6), Tutorial #5 *Assignment #1 due*
Oct 23, 2023	**Midterm exam #1** Sparse kernel machines (Chapter 7)
Oct 30, 2023	Graphical models (Chapter 8), Tutorial #6
Nov 6, 2023	Mixture models and EM (Chapter 9), Tutorial #7 *Assignment #2 due*
Nov 13, 2023	Approximate inferences (Chapter 10) and sampling methods (Chapter 11) Tutorial #8
Nov 20, 2023	**Midterm exam #2** Continuous latent variables (Chapter 12)
Nov 27, 2023	Sequential data (Chapter 13), Tutorial #9 Combining models (Chapter 14), Tutorial #10 *Assignment #3 due*
Dec 4, 2023	**Final exam**
Dec 8, 2023	**Project due**

Note: The lecturing schedule is provided for **information purposes only.** All specific details are **subject to change (with notice).**

Homework Problems / Readings

To do well in this course you must *keep up to date with the class schedule*. The best way to accomplish this is to *practice*, through the assigned homeworkand other exercise problems. **Homework problems are listed below, and their solutions will be posted one week after the tutorial session**. Thus, homework solutions will not be collected, but you are required to work out the problems when the pertinent material is covered and before you consult the solutions.

ECE1513 Homework Assignments
Tutorial #1:
1.1, 1.4, 1.8, 1.20, 1.31, 1.41, 2.1, 2.5, 2.14, 2.15, 2.28, 2.40, 2.60
Tutorial #2:
3.1, 3.4, 3.6, 3.11, 3.15, 3.18, 3.20, 3.23
Tutorial #3:
4.2, 4.7, 4.9, 4.10, 4.17, 4.19, 4.23, 4.25
Tutorial #4:
5.2, 5.9, 5.10, 5.25, 5.26, 5.34, 5.29

Tutorial #5:
6.1, 6.12, 6.14, 6.16, 6.17, 6.23, 6.25
Tutorial #6:
7.1, 7.4, 7.12, 7.15, 8.1, 8.5, 8.6, 8.12, 8.15, 8.18
Tutorial #7:
9.3, 9.5, 9.7, 9.8, 9.12, 9.19, 9.20, 9.25, 9.26
Tutorial #8:
10.1, 10.5, 10.10, 10.16, 10.20, 10.23, 11.1, 11.5, 11.15, 11.6
Tutorial #9:
12.1, 12.17, 12.25, 12.28, 12.29, 13.17, 13.22, 13.24, 13.27
Tutorial #10:
14.1, 14.3, 14.5, 14.9, 14.15, 14.17