



ROB313 Introduction to learning from data

Syllabus and course information, Spring 2021

Objectives

This course provides an introduction machine learning, which is key to the design of intelligent systems and gaining actionable insights from datasets that arise in computational science and engineering. The course will cover the theoretical foundations of this topic as well as computational aspects of algorithms for unsupervised and supervised learning.

The major learning objectives are to gain insights into the process of learning from data, to develop an understanding of the fundamental ideas underpinning a variety of learning algorithms, to gain experience in applying learning algorithms to data, and to gain an understanding of how to evaluate the performance of learning algorithms.

Teaching team

Trefor Evans (Instructor)trefor.evans@mail.utoronto.ca
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Schedule & Delivery

Tuesday, 15:00 – 18:00 EST
Thursday, 15:00 – 17:00 EST

All course meetings will take place on zoom at the following link:

<https://utoronto.zoom.us/j/87687679136>

Meeting ID: 876 8767 9136

Passcode: rob313

Information on zoom licenses for students can be found [here](#). Although not required, you are strongly recommended to turn on your video during lectures.

If you require additional academic accommodations, please contact UofT Accessibility Services as soon as possible, <https://studentlife.utoronto.ca/as>

Pre-requisites

- Multivariable calculus, Linear algebra, Statistics
- Python will be used for programming assignments



Grading

- Grades will be based on 4 – 5 assignments (50%), a midterm exam (15%) and a final exam (35%)
- Important dates
 - Approximately 2 weeks to work on each assignment
 - Midterm exam: February 25
 - Final exam: to be announced
- Late policy: 10% of assignment grade per day
- Collaboration Policy: see [CollaborationPolicy.pdf](#) on the course webpage.

Reference materials

- Course webpage: <https://q.utoronto.ca>
- Recommended readings will be provided for each topic. Please take notes in class and ask questions!
- Recommended texts
 - Christopher Bishop, Pattern Recognition and Machine Learning, Springer, 2006. [Available online.](#)
 - Trevor Hastie, Robert Tibshirani and Jerome Friedman, The Elements of Statistical Learning, Springer, 2008. [Available online.](#)
 - David MacKay, Information Theory, Inference, and Learning Algorithms, Cambridge University Press, 2003. [Available online.](#)
 - Kevin P. Murphy, Machine learning: a probabilistic perspective, MIT Press, 2012.
- There are also lots of freely available, high-quality resources on this topic that will be posted on the course webpage throughout the semester.

Topics

- Fundamentals and Frequentist methods
 - Nearest neighbour methods for regression and classification
 - Linear regression and generalized linear models
 - Statistical perspectives on learning
 - Numerical optimization algorithms
 - Neural networks for regression and classification
- Probabilistic modelling and Bayesian methods
 - Introduction to Bayesian inference
 - Approximate Bayesian inference
 - Gaussian process regression
- Unsupervised learning: clustering, dimensionality reduction and density estimation
- Practical aspects of learning from data



Notice of video recording and sharing (Download permissible; re-use prohibited)

This course, including your participation, will be recorded on video and will be available to students in the course for viewing remotely and after each session.

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