

# ECE1510/CSC2535: Advanced Inference Algorithms and Machine Learning University of Toronto

## 1 Course objectives

Machine learning algorithms and more broadly inference algorithms are used to solve many of the most important problems in science and engineering. These algorithms adapt to the data at hand and are tolerant of noisy, uncertain observations characteristic of real-world applications. Examples include image classification, document retrieval, speech recognition, data visualization, data compression, data protection, DNA sequence analysis and the prediction of gene expression. ECE1510/ECE2535 examines advanced concepts in machine learning, such as graphical models, variational methods, MCMC, loopy belief propagation, and expectation propagation. Students should have taken an introductory machine learning course before taking this course.

## 2 Instructor

*Professor:* Brendan J. Frey, BA 4136, [frey@psi.utoronto.ca](mailto:frey@psi.utoronto.ca), <http://www.psi.toronto.edu>

## 3 Computing

This course is about algorithms. You will need to write your own programs, debug them, and use them to conduct various experiments, plot curves, classify images, etc. Your course project will also require programming. You are strongly encouraged to use MATLAB.

## 4 Resources

The main reference for this course is Chris Bishop's book [Pattern Recognition and Machine Learning](#). It will also be helpful for you to have a copy of certain sections of Kevin Murphy's book, [Machine Learning: A Probabilistic Perspective](#). It hasn't been published yet, but sections will be made available to you for a nominal fee. [Wikipedia](#) and the [Kahn Academy](#) are also good sources of information.

## 5 Workload

The project is worth 60% of your grade in total and the aim is to produce a final report that could be submitted to a leading conference, such as NIPS, ICML, CVPR, ICCV, ECCV or ISMB. Your project proposal and my feedback on it is very important, since it will determine the overall success of your project. So, while it is worth only 10%, you should put a lot of time and thought into it.

Assignment, due Feb 10	10%
Project proposal, 2 pages, due Feb 24	10%
Project initial results, 8 pages, due March 7	10%
Draft of project report, 8 pages, due April 6	15%
Final project report, 8 pages, due May 4	25%
Final exam, Apr 18	30%