Overview

Machine Learning is the study of computer algorithms that improve automatically through experience. Machine learning algorithms play an important role in industrial applications and commercial data analysis. The goal of this course is to present students with both the theoretical justification for, and practical application of, machine learning algorithms. Students will gain hands-on experience with major machine learning tools and their applications to real-world data sets. This course will cover techniques in supervised and unsupervised learning, the graphical model formalism, and algorithms for combining models. This course is intended for graduate students who are interested in machine learning or who conduct research in fields which use machine learning, such as computer vision, natural language processing, data mining, bioinformatics, and robotics. No previous knowledge of pattern recognition or machine learning concepts is assumed, but students are expected to have, or obtain, background knowledge in mathematics and statistics.

Administrivia

Lectures: Monday / Wednesday / Friday 10:30-11:20 in B9201 / AQ3182 / B9201
Greg’s office hours: Friday 11:30-1 in ASB 9971
TAs: Jiawei He, Mehran Khodabandeh, Mengyao Zhai
TA office hours: Monday / Tuesday / Wednesday / Thursday / Friday 3:30-5:00 in TASC1 8002

Course website:
http://www.cs.sfu.ca/~mori/courses/cmpt726

Lecture Schedule (subject to change)

Sept. 7, 9, 12: Introduction (Ch. 1)
Sept. 14, 16, 19: Linear Models for Regression (Ch. 3)
Sept. 21, 23: Kernel Density Estimation, Nearest-neighbour (Ch. 2.5)
Sept. 26, 28, 30: Linear Models for Classification (Ch. 4)
Oct. 3, 5, 7: Support Vector Machines (Ch. 6.1-6.3, 7.1)
Oct. 12, 14, 17, 19, 21: Deep Learning (Neural Networks) (Ch. 5)
Oct. 24: Quiz 1
Oct. 26, 28, 31: Graphical Models (Ch. 8)
Nov. 2, 4, 7, 9, 14: Sequential Data (Ch. 13), Recurrent Neural Networks
Nov. 16, 18: Mixture Models and EM (Ch. 9)
Nov. 21, 23, 25: Boosting, Decision Trees (Ch. 14.3-14.5)
Nov. 28, 30: Continuous Latent Variables (Ch. 12)
Dec. 2: Quiz 2
Dec. 5: Poster Session **10:30am-12:30pm in TASC1 9204**

**Grading**

Evaluation will be based on individual programming and written assignments, two in-class quizzes, and a final project (in groups of up to 5).

- 30% Assignments
- 15% Quiz 1
- 15% Quiz 2
- 40% Final project

**Assignments**

There will be three assignments, worth 10% each. Assignment dates:

- A1: Regression (out Sept. 19, due Oct. 3)
- A2: Classification (out Oct. 7, due Oct. 21)
- A3: Deep learning / graphical models (out Oct. 31, due Nov. 14)
- FINAL PROJECT: poster session Dec. 5 at 10:30am, report due Dec. 9 11:59pm

All assignments are to be done individually.
Late policy

Students will be permitted 3 grace days to use at their discretion over the trimester. Late days are counted from the time an assignment is due, rounded up to the nearest whole day. For example, if an assignment is due on Friday at 3:30am, and is submitted on Saturday at 5pm, 2 grace days will be used.

IMPORTANT: Other than the 3 grace days, late assignments will not be accepted, and will receive zero marks. If you have extenuating medical circumstances, please consult SFU’s policies and discuss with the instructor.

IMPORTANT: Grace days may not be used for the final project.

Textbooks

REQUIRED:

- Pattern Recognition and Machine Learning, Christopher M. Bishop, Springer (2006)

REFERENCE:

- Deep Learning, Ian Goodfellow, Yoshua Bengio and Aaron Courville (http://www.deeplearningbook.org)
- The Elements of Statistical Learning, Trevor Hastie, Robert Tibshirani, and Jerome Friedman, Springer-Verlag (2001)
- Pattern Classification (2nd ed.), Richard O. Duda, Peter E. Hart, and David G. Stork, Wiley Interscience (2000)

Academic Honesty

Academic Honesty plays a key role in our efforts to maintain a high standard of academic excellence and integrity. Students are advised that ALL acts of intellectual dishonesty are subject to disciplinary action by the School; serious infractions are dealt with in accordance with the Code of Academic Integrity and Good Conduct (S 10.01) (http://www.sfu.ca/policies/gazette/student/s10-01.html). Students are encouraged to read the School’s policy information (http://www.cs.sfu.ca/undergrad/Policies/).