CMPT 726 - G100 Machine Learning

Instructor(s): Mo Chen

Calendar Objective/Description:
Machine Learning

Instructor's Objectives:
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 in the course 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, neural networks / deep 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 that 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.

Prerequisites:
see go.sfu.ca

Topics:
- Graphical models: directed and undirected graphs
- Inference algorithms: junction tree, belief propagation, variational inference, Markov Chain Monte Carlo, Gibbs sampling
- Temporal models and algorithms: hidden Markov Models, Kalman filtering, particle filtering
- Classification: nearest neighbour, support vector machines, decision trees, naive Bayes, Fisher's linear discriminant
- Regression: linear regression, logistic regression, regularization
- Unsupervised learning: spectral clustering, kmeans
- Expectation-maximization
- Deep learning

Grading:
The course grade will be based on homework assignments, a project, and exam.

Required Books:
Pattern Recognition and Machine Learning, Christopher M. Bishop, Springer, 2006, 9780387310732

Reference Books:
The Elements of Statistical Learning, Trevor Hastie, Robert Tibshirani, and Jerome Friedman, Springer-Verlag, 2009, 9780387848570