**Special Topics in Computing Science**

**CMPT 880 G100**

**Deep Learning and Unsupervised Feature Learning**

**Simon Fraser University**

**Spring 2014**

**Instructor: Oliver Schulte**

For course details such as scheduling, contact information, office hours etc., please see the course website <https://courses.cs.sfu.ca/2014sp-cmpt-880-g1/pages/> .

**Overview**

Machine learning has seen numerous successes, but applying learning algorithms often means spending a long time hand-engineering the input feature representation. This is true for many problems in vision, audio, NLP, robotics, and other areas. *Unsupervised feature learning* algorithms that automatically learn a good representation for the input address this problem. Since these algorithms mostly learn from unlabeled data, they have the potential to learn from vastly increased amounts of data (since unlabeled data is cheap), and thereby achieve vastly improved performance. The currently most popular unsupervised feature learning algorithms are extensions of neural net learning, collectively known as deep learning. In this course we will study deep learning and other unsupervised feature learning methods.

**Objectives**

* Learn the main theoretical ideas behind unsupervised feature learning.
* Ability to read research papers in this area.
* Become familiar with a set of computational tools for unsupervised feature learning.
* The course project should evaluate one or more feature learning tools on a realistic task.

The initial lectures will provide introduction to the necessary background. *The course is a seminar course, meaning that students are expected to give presentations.* A student presentation should feature a demo of a working system and explain the theory behind it.

**Prerequisites**

* Having passed CMPT 726 or equivalent. Consult with me on what is “equivalent”.

**Grading and Expectations**

More than half of the course consists of students giving seminars about the software and papers in the reading list, and all of us discussing these papers. You are expected to read papers and code from our reading/resources list and discuss them in class. The course is meant to be practical in that the students should learn to use and apply programs that actually carry out deep learning. Deep learning is still a young part of machine learning, and we want to evaluate its potential by applying deep learning techniques to real problems. Depending on the class size, presentations and projects can be done in pairs or groups.

**Presentations**

* Your demo presentation should introduce a piece of software; see http://deeplearning.net/software\_links/. The class should see a demo and you should explain the design and the theory behind the program. You should design a homework for the class to do so that they can run the program for themselves. Our goal is to build a repository of shared software that the students can use for projects.
* The project presentation should outline an idea for a project. The purpose is to give you feedback early.
* The final presentation of the project will show what you created and results.

**Projects**

Every student should carry out a course project. I will suggest course projects, but you are free to design your own. A typical course project applies deep learning to a dataset that is of interest to the student, for example one from their thesis research.

**Grading**

* Participation: 5%.
* Demo Presentation: 30%.
* Homeworks: 5%.
* Project Outline Presentation: 15%.
* Final Project, Project Presentation: 45%.