CSci 560 Neural Networks

Course Syllabus

Spring 2015

Instructor

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Class Meetings

Lectures and course materials will be distributed through our University's eCollege online course system.

01E 22569 T 1:50p - 4:30p Location: EDS135

Course Description

In this course the theory and practice of neural computation are introduced. Inspired from the interreaction of human neural cells, artificial neural networks are substantially used for many real-world problems: classification, time-series prediction, regression, pattern recognition. We start with the introduction of neural networks, and continue with Hebb and perceptron algorithms, which are fundamentals of classification in neural networks. This semester we also plan to take a look at Deep neural networks, once we have introduced basic feedforward networks with backpropagation learning. After that, as time permits, we will look at other more advanced neural network architectures. Autoassociative Nets and Iterative Autoassociative Nets are discussed with application on exemplary problems. Furthermore, having discussed the Kohonen self-organizing map, we briefly cover recurrent networks

of the Hopfield type nets. Average programming skills are expected. This course will use the Python programming language to build working models and classifier systems using the architectures we discuss.

Companion Textbooks / Readings

Most materials, work and readings will be assigned using freely available online textbooks and resources. We will be using the following new and freely available online book to begin with:

- Neural Networks and Deep Learning by Michael Nielson http://neuralnetworksanddeeplearning.co

Prerequisites

It is strongly encouraged that you have completed the Introduction to Computational Science (501) course, and/or have some familiarity with the Python programming language. Also students who have taken the AI and Machine Learning course will find the material covered in this course an extension of some of the concepts covered there.

Evaluation (Tentative)

Your grade for the course will be based on the following (approximate) percentages:

Two Exams	50% (25% each)
Labs / Programming Assignments (appx. 6-8)	45%
Quizzes and Participation	5%

Student's with Disabilities

The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you have a disability requiring an accommodation, please contact: Office of Student Disability Resources and Services, Texas A&M University-Commerce, Gee Library, Room 132, Phone (903) 886-5150, StudentDisabilityServices@tamuc.edu

Academic Ethics

"All students enrolled at the University shall follow the tenets of common decency and acceptable behavior conducive to a positive learning environment." (See Student's Guide Handbook, Policies and Procedures, Conduct). Ethics also includes the issue of plagiarism, and copying code for programming/lab assignments is just as serious as any other type of plagiarism. If you are caught sharing or using other people's work in this class, you will receive a 0 grade and a warning on the first instance. A subsequent instance will result in receiving an F grade for the course, and possible disciplinary proceedings.

Attendance Policy

Students are expected to follow all instructions and visit eCollege regularly many times weekly to complete the materials for this online course. If a student is unable to submit assignments by the due date for the assignment, they are expected to make alternative arrangements to assure that the assignment is turned in ON TIME, before the assignment is actually due. Any student wishing to withdraw from the course must do so officially as outlined in the class schedule. THE INSTRUCTOR CANNOT DROP OR WITHDRAW ANY STUDENT.

Course Requirement Deadlines

Credit will be given for ONLY those exam(s), program(s), and/or project(s) turned in no later than the deadline(s) as announced by the instructor of this class unless prior arrangement has been made with the instructor.

Course Schedule (Preliminary)

W	Date	Topic / Activity
1	1/20	How Neural Networks Learn, mathematical background
2	1/26	Simple perceptrons
3	2/2	Multi layer, feed forward networks
4	2/9	Multi layer feed forward networks
5	2/16	Backpropagation learning
6	2/23	Improving backpropagation
7	3/2	Regression with Neural networks
8	3/9	Classification with Neural Networks
	3/16	Spring Break
9	3/23	Recurrent Neural Networks
10	3/30	Deep learning systems
11	4/6	Hopfield netowrks and symmetrically connected networks
12	4/13	Hopfield networks and symmetrically connected networks
13	4/20	Kohonen Self-Organizing Maps
14	4/27	Kohonen Self-Organizing Maps
15	5/4	Review and discussion
	5/11	Finals Week

Student Learning Outcomes

1. Understand intiutively the mathematical and geometrical basis of how NN work and learn.

2. Be able to use multi-layer feed forward networks to classification and regression machine learning problems.

3. Be introduced to so called deep learning neural networks and their applications.

4. Look at some of the uses and advantages of recurrent neural networks.

5. Be familiar with other types of NN architectures and their uses.

Learning outcomes will be measured through mapping assignment and test questions to specific outcome items, as well as through exit surveys of student experiences with the outcome familarity.