

CSci 560 Neural Networks and Deep Learning

Course Syllabus

Spring 2018

Instructor

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Class Meetings

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

01E TR 9:30a - 10:45a Location: JOUR104

Course Description

In this course the theory and practice of neural computation for machine learning are introduced. Artificial neural networks are used for many real-world problems: classification, time-series prediction, regression, pattern recognition. The class starts with an introduction to feed forward neural networks. More complicated multi-layered "deep" networks are then covered. Basic backpropagation, gradient descent and modern regularization techniques are implemented in assignments. The class will look at modern deep learning techniques: convolutional neural networks, deep belief networks and deep recurrent neural models such as LSTM nets. Readings and current results from the literature on neural network research will be discussed. Prerequisites: CSci 574

Companion Textbooks / Readings

Most materials, work and readings will be assigned using freely available online textbooks and resources. We will be using the following as textbooks for the course:

- Deep Learning with Python by François Challet
 - <https://www.manning.com/books/deep-learning-with-python>
- Neural Networks and Deep Learning by Michael Nielson
 - <http://neuralnetworksanddeeplearning.com>

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.

Nondiscrimination Notice

Texas A&M University-Commerce will comply in the classroom, and in online courses, with all federal and state laws prohibiting discrimination and related retaliation on the basis of race, color, religion, sex, national origin, disability, age, genetic information or veteran status. Further, an environment free from discrimination on the basis of sexual orientation, gender identity, or gender expression will be maintained.

Campus Concealed Carry Statement

Texas Senate Bill - 11 (Government Code 411.2031, et al.) authorizes the carrying of a concealed handgun in Texas A&M University-Commerce buildings only by persons who have been issued and are in possession of a Texas License to Carry a Handgun. Qualified law enforcement officers or those who are otherwise authorized to carry a concealed handgun in the State of Texas are also permitted to do so. Pursuant to Penal Code (PC) 46.035 and A&M-Commerce Rule 34.06.02.R1, license holders may not carry a concealed handgun in restricted locations.

For a list of locations, please refer to the Carrying Concealed Handguns On Campus document and/or consult your event organizer.

Web url: <http://www.tamuc.edu/aboutUs/policiesProceduresStandardsStatements/rulesProcedures/34SafetyOfEmployeesAndStudents/34.06.02.R1.pdf>

Pursuant to PC 46.035, the open carrying of handguns is prohibited on all A&M- Commerce campuses. Report violations to the University Police Department at 903- 886-5868 or 9-1

Course Schedule (Preliminary)

W	Date	Topic / Activity
1	2/1	How Neural Networks Learn, Python intro
2	2/5	Simple models of Neurons and Introduction to Learning
3	2/12	Machine Learning 101, 102. Assignment 01
4	2/19	Perceptrons, Multi layer feed forward networks
5	2/26	Backpropagation learning
6	3/5	Improving backpropagation
7	3/12	Regression with Neural networks
8	3/19	Classification with Neural Networks
	3/19	Spring Break
9	3/26	Recurrent Neural Networks
10	4/2	Deep learning systems
11	4/9	Hopfield networks and symmetrically connected networks
12	4/16	Hopfield networks and symmetrically connected networks
13	4/23	Kohonen Self-Organizing Maps
14	4/30	Kohonen Self-Organizing Maps
15	5/7	Review and discussion
	5/7	Finals Week

Student Learning Outcomes

1. Understand intuitively 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 familiarity.