

CSci 574 Machine Learning

Course Syllabus

Fall 2017

Instructor

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Class Meetings

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

01W 83006 Web Based Class

Course Description

Study of computer algorithms that automatically acquire new knowledge and improve their own performance through experience. Theory and practical implementation of algorithms for machine learning. Topics include linear and logistic regression, artificial neural networks, Bayesian networks and learning, decision trees, kernel / support-vector machines, statistical learning methods, unsupervised learning, reinforcement learning, and other modern, emerging algorithms. Short programming assignments and/or projects with hands-on experiments with various learning algorithms will be given.

In this course we will start with an introduction to Python, which we will be using to implement various machine learning methods. We will implement various methods by hand, and use existing Python machine learning libraries, for assignments and lecture materials for this course.

Requirements and Objectives

1. Be able to formulate machine learning problems corresponding to different applications.
2. Understand a range of machine learning algorithms along with their strengths and weaknesses.
3. Understand the basic differences between supervised and unsupervised machine learning methods, and be able to apply each where appropriate.
4. Understand the basic theory underlying machine learning.
5. Be able to apply machine learning algorithms to solve problems of moderate complexity.
6. Be able to read current research papers and understand the issues raised by current research.

Companion Textbooks / Readings

- [CI] Programming Collective Intelligence by Toby Segaran, O'Reilly Media, 2007, ISBN: 0596529325
- [ML] Marsland. (2009). Machine Learning: An Algorithmic Perspective. By Marsland, CRC Press, 2009.
- [PY] How to Think Like a Computer Scientist: Learning with Python 2ed by Jeffrey Elkner, Allen B. Downey and Chris Meyers (Open Book Project) <http://www.greenteapress.com/thinkpython/>

Prerequisites

Background in basic programming (Undergraduate equivalent of CSci 151/152) and Data Structures (Undergraduate equivalent of CSci 270) or equivalent knowledge will be assumed for this course. You must have passed or received credit for CSci 515 (Fundamentals of Programming C/C++). We will be learning the Python programming language in this course, but previous knowledge of Python will not be assumed.

Evaluation (Tentative)

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

Two Exams (Midterm and Final)	50% (25% each)
Labs / Programming Assignments (appx. 4-5)	45%
Class Participation	5%

Letter grades will be assigned according to the following scale:

Final Average (%)	Letter Grade
90 - 100	A
80 - 89	B
70 - 79	C
60 - 69	D
Below 60	F

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.

Technology Requirements

This course is a web enhanced course, which means all assignments and handouts will be distributed and collected through our University's eCollege online course system.

- To fully participate in online courses you will need to use a current browser, such as Mozilla Firefox or Google Chrome.
- You will need regular access to a computer with a broadband internet connection. The minimum computer requirements are:
 - 512 MB of RAM, 1 GB or more preferred.
 - Broadband connection required by courses that are heavily video intensive.
 - Video display capable of high-color 16-bit display 1024 x 768 or higher resolution.
- You must have a:
 - Sound card, which is usually integrated into your desktop or laptop computer.
 - Speakers or headphones.

Access and Navigation

This course will be facilitated using Pearson LearningStudio, the learning management system used by Texas A&M University-Commerce. To get started with the course, go to myLeo and from the top menu ribbon select eCollege. Then on the upper left side of the screen click on the My Courses tab. <http://www.tamuc.edu/myleo.aspx>

You will need your campus-wide ID (CWID) and password to log into the course. If you do not know your CWID or have forgotten your password, contact the Center for IT Excellence (CITE) at 903.468.6000 or helpdesk@tamuc.edu.

Note: It is strongly recommended you perform a “Browser Test” prior to the start of your course. To launch a browser test login to Pearson LearningStudio, click on the My Courses tab, and then select the Browser Test link under Support Services.

Texas A&M University-Commerce provides students technical support for the use of Pearson LearningStudio. Technical assistance is available 24/7 (24 hours, 7 days a week). If you experience LearningStudio (eCollege) technical problems, contact the LearningStudio helpdesk at 1-866-656-5511 (toll free) or visit Pearson 24/7 Customer Support Site <http://247support.custhelp.com/>

Accessing Help from within Your Course: Click on the ‘Tech Support’ icon on the upper left side of the screen inside the course. Then you will be able to get assistance via online chat or by phone.

Note: Personal computer and internet connection problems do not excuse the requirement to complete all course work in a timely and satisfactory manner. Each student needs to have a backup method to deal with these inevitable problems. These methods might include the availability of a backup PC at home or work, the temporary use of a computer at a friend’s home, the local library, office service companies, Starbucks, a TAMUC campus open computer lab, etc.

myLeo Support: Your myLeo email address is required to send and receive all student correspondence. Please email helpdesk@tamuc.edu or call us at 903-468-6000 with any questions about setting up your myLeo email account. You may also access information at myLeo. <https://leo.tamuc.edu>

Nondiscrimination Notice

Texas A&M University-Commerce will comply in the classroom, and in on-line 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	Notebook	Test
1	8/28	Course Introduction, Set up Python	1a & 1b	
2	9/4	Introduction to Python Scientific Libraries	2a, 2b, 2c	
3	9/11	Linear Regression with One Variable		
4	9/18	Linear Regression with Multiple Variables		
5	9/25	Logistic Regression and Regularization		
6	10/2	K Nearest Neighbor		
7	10/9	Decision Trees and Ensembles		
8	10/16			Midterm
9	10/23	Support Vector Mechines (SVM) and Kernel Methods		
10	10/30	Unsupervised Learning and Dimensionality Reduction		
11	11/6	Principle Component Analysis (PCA)		
12	11/13	K-means and Hierarchical Clustering		
13	11/20	Anomaly Detection and Recommender Systems		
14	11/27	Large Scale Machine Learning		
15	12/4	Advice for Applying Machine Learning		
	12/11	Finals Week 12/12 - 12/16		Final

Student Learning Outcomes

1. Develop familiarity with high-level Python scripting language.
2. Learn basics of fundamental machine learning techniques, such as regression, clustering, k-nearest neighbor, kernel methods, etc.
3. Learn basic distinction between supervised and unsupervised machine learning methods.
4. Learn basic machine learning training and testing techniques, including cross validation and data optimization.

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.