



EE 497: Special Topics: Applied Machine Learning
Section 01E, Course Syllabus, Spring 2024
Rev 0, 11/1/2023

INSTRUCTOR INFORMATION

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| Instructor | Gerald L. Fudge, PhD |
| Office Location | AG/ET 217 |
| Office Hours | Wednesday (1:00 pm – 4:30 pm) Tuesday (3:00 pm – 4:30 pm) |
| Phone | Office: 903-468-8122 |
| Office Fax | 903-886-5960 (Inform instructor when fax is sent) |
| University Email Address | Gerald.Fudge@tamuc.edu |
| Preferred Form of Communication | Email or mobile |
| Communication Response Time | Typically, within 48 hours on weekdays for email |

COURSE INFORMATION

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|--|---|
| Class Meeting Schedule | See schedule at end of syllabus |
| Class Meeting Dates | Tuesday / Thursday 11:00 am – 12:15 pm |
| Classroom | AG/ET 118A |
| Textbook(s) Required | 1. Machine Learning with PyTorch and Scikit-Learn, by Raschka, Liu, and Mirjalili. (978-1801819312) |
| Software Required | Microsoft Office, Matlab, Python/ML packages (recommend start with standard Anaconda packages) |
| Optional Texts and/or Materials | 1. Machine Learning for Absolute Beginners: A Plain English Introduction (Third Edition), by Oliver Theobald. (ISBN-13: 979-8558098426) |

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COURSE DESCRIPTION

This course allows for studying emerging topics in electrical engineering that are not present in the curriculum. This class will focus on Machine Learning (ML) applications with real-world data, including data scrubbing, visualization, and exploratory analysis; data preprocessing steps such as normalization and principle component analysis; ML algorithms to perform clustering, prediction, and classification; and potential impacts of machine learning and artificial intelligence on society. This class will use Excel, Matlab, and Python on a variety of data sets. Application areas are not limited to engineering, and can include such diverse fields as wildlife, human health performance, climate, etc.

Prerequisites: Upper level standing with instructor's consent, MATH 2318 (may be taken as a co-requisite) and ENGR 213 (may be taken as a co-requisite).

Student Learning Outcomes

Upon successful completion of this course, students will achieve the following learning outcomes:

- Have a basic understanding of ML, including overall process and specific techniques
- Be able to acquire and prepare data for ML, including starting from Excel spreadsheets or CSV files
- Understand preprocessing steps such as principle component analysis, data normalization, etc.
- Know how to learn new ML techniques in a team environment
- Be able to select and use appropriate ML algorithms for clustering, prediction, or classification
- Understand how to partition data into training and validation
- Be able to generate reproduceable results with properly labeled figures, properly documented code, and properly written technical reports
- Understand potential impacts of ML / AI on society

COURSE REQUIREMENTS

Minimal Technical Skills Needed

Students should be proficient in Matlab and/or Python.

Instructional Methods

The instructional methods in this course include lectures, class discussion and participation, lab projects using modeling tools such as Matlab and Python, homework assignments, team seminar research and presentations, and exams.

Student Responsibilities or Tips for Success in the Course

- **Attendance & Participation:** This class will include a seminar-like component in which teams will be required to investigate and present specific ML techniques. Thus, class attendance & participation is critical for this course.
- **Seminar Presentations:** Each team will research an assigned ML topic and present to the class. These presentations form an integral component to the classroom experience.
- **Homework Assignments:** Working through example problems is a critical component to learning. Homework will be assigned on average two to three times per month.
- **Submission of Assignments:** Students shall submit assignments either in class or in the assigned drop boxes on D2L (directions will be provided in class). If problems are encountered using D2L,

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then email may be used as a backup with instructor permission. Late work is not accepted, unless student has an acceptable excuse proven by a doctor's note or any legal documentation.

- **Collaboration:** Collaboration is encouraged on homework, but students must turn in their own homework. Students are required to collaborate on team activities.
- **Exams:** The exams will be closed book & closed notes. The use of a personal phone is prohibited during exams. A makeup exam may be offered but an official permit for absence that fulfills University procedures must be provided to the instructor in timely manner.
- **Final Project:** The final project will be a team exercise, with approximately 2-4 students per team, and with individual participation forming a part of the individual project grade. The deliverables will include a report, live presentation / demonstration, and a summary of individual contributions to the project. The report should be in PDF (preferred) or Word format.
- **Use of Artificial Intelligence (AI) Tools:** Other than as directed by the instructor for the final project and specific homework assignments, AI tools, ChatBots, and other software that has the capacity to generate code, text, or suggest replacements for text beyond individual words is prohibited. Any use of such software must be documented. Any undocumented use of such software constitutes an instance of academic dishonesty (plagiarism).

GRADING

Final grades in this course will be based on the following scale:

| A | B | C | D | F |
|----------|---------|---------|---------|--------|
| 100 - 90 | 89 - 80 | 79 - 70 | 69 - 60 | 59 - 0 |

Overall grades will be based on a weighted average as shown below:

| Assessment Type | Percent |
|------------------------------|------------|
| Participation and Attendance | 10 |
| Seminar presentations | 15 |
| Homework | 25 |
| Final Project | 25 |
| Exams | 25 |
| Total | 100 |

Note: There may also be opportunities for bonus points; these will be discussed in class.

TECHNOLOGY REQUIREMENTS

LMS

All course sections offered by Texas A&M University-Commerce have a corresponding course shell in the myLeo Online Learning Management System (LMS). Below are technical requirements

LMS Requirements:

<https://community.brightspace.com/s/article/Brightspace-Platform-Requirements>

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LMS Browser Support:

https://documentation.brightspace.com/EN/brightspace/requirements/all/browser_support.htm

ACCESS AND NAVIGATION

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: 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.

COMMUNICATION AND SUPPORT

If you have any questions or are having difficulties with the course material, please contact your instructor.

Technical Support

If you are having technical difficulty with any part of Brightspace, please contact Brightspace Technical Support at 1-877-325-7778. Other support options can be found here:

<https://community.brightspace.com/support/s/contactsupport>

Interaction with Instructor Statement

Use email and office hours as presented under instructor information. In addition, the instructor will provide mobile contact information.

COURSE AND UNIVERSITY PROCEDURES/POLICIES

Course Specific Procedures/Policies

As described above, student attendance and participation are required for this class.

Syllabus Change Policy

The syllabus is a guide. Circumstances and events, such as student progress, may make it necessary for the instructor to modify the syllabus during the semester. Any changes made to the syllabus will be announced in advance.

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University Specific Procedures

Student Conduct

All students enrolled at the University shall follow the tenets of common decency and acceptable behavior conducive to a positive learning environment. The Code of Student Conduct is described in detail in the [Student Guidebook](#).

<http://www.tamuc.edu/Admissions/oneStopShop/undergraduateAdmissions/studentGuidebook.aspx>

Students should also consult the Rules of Netiquette for more information regarding how to interact with students in an online forum: <https://www.britannica.com/topic/netiquette>

TAMUC Attendance

For more information about the attendance policy please visit the [Attendance](#) webpage and [Procedure 13.99.99.R0.01](#), and

- <http://www.tamuc.edu/admissions/registrar/generalInformation/attendance.aspx>
- <http://www.tamuc.edu/aboutUs/policiesProceduresStandardsStatements/rulesProcedures/13students/academic/13.99.99.R0.01.pdf>

Academic Integrity

Students at Texas A&M University-Commerce are expected to maintain high standards of integrity and honesty in all of their scholastic work. For more details and the definition of academic dishonesty see the following procedures:

- [Undergraduate Academic Dishonesty 13.99.99.R0.03](#)
- [Undergraduate Student Academic Dishonesty Form](#)
- <http://www.tamuc.edu/aboutUs/policiesProceduresStandardsStatements/rulesProcedures/documents/13.99.99.R0.03UndergraduateStudentAcademicDishonestyForm.pdf>
- [Graduate Student Academic Dishonesty Form](#)
- <http://www.tamuc.edu/academics/graduateschool/faculty/GraduateStudentAcademicDishonestyFormold.pdf>
- <http://www.tamuc.edu/aboutUs/policiesProceduresStandardsStatements/rulesProcedures/13students/undergraduates/13.99.99.R0.03UndergraduateAcademicDishonesty.pdf>

Students with Disabilities-- ADA Statement

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

Velma K. Waters Library Rm 162

Phone (903) 886-5150 or (903) 886-5835

Fax (903) 468-8148

Email: studentdisabilityservices@tamuc.edu

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Website: [Office of Student Disability Resources and Services](#)

<http://www.tamuc.edu/campusLife/campusServices/studentDisabilityResourcesAndServices/>

The Counseling Center at A&M-Commerce, located in the Halladay Building, Room 203, offers counseling services, educational programming, and connection to community resources for students. Students have 24/7 access to the Counseling Center's crisis assessment services by calling 903-886-5145. For more information regarding Counseling Center events and confidential services, please visit www.tamuc.edu/counsel

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 9-1-1.

COURSE OUTLINE / CALENDAR

| Wk. | Days | | Unit / Topic | Notes |
|-----|-------|-------|--|------------------------|
| | Tues. | Thur. | | |
| 1 | | 1-11 | W1: Intro to ML & Anaconda package | |
| 2 | 1-16 | 1-18 | W2: ML end-to-end process, project kick-off | |
| 3 | 1-23 | 1-25 | W3: Classifier overview, perceptron, logistic regression | Census day 1/26 |
| 4 | 1-30 | 2-1 | W4: SVM, Bayes classifiers | |
| 5 | 2-6 | 2-8 | W5: Decision tree | |
| 6 | 2-13 | 2-15 | W6: Random forest, bagging & boosting | |
| 7 | 2-20 | 2-22 | W7: Stochastic gradient descent classifier | |
| 8 | 2-27 | 2-29 | W8: Clustering – supervised & unsupervised | |
| 9 | 3-5 | 3-7 | W9: Review, exam | Midterm exam |
| 10 | 3-12 | 3-14 | W10: Spring Break, no class | |
| 11 | 3-19 | 3-21 | W11: Dimensionality reduction, PCA, LDA | Project kickoff |
| 12 | 3-26 | 3-28 | W12: t-distributed stochastic neighbor embedding | |
| 13 | 4-2 | 4-4 | W13: PyTorch package, MLP | |
| 14 | 4-9 | 4-11 | W14: Convolutional neural network | |
| 15 | 4-16 | 4-18 | W15: Recurrent neural networks; sentiment analysis | |
| 16 | 4-23 | 4-25 | W16: Reinforcement learning | |
| 17 | 4-30 | 5-2 | W17: Project presentations | Projects due! |
| | | | | Final exam |

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