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

CSCI 597: Special Topics: DSP & Machine Learning

Section 01B, Course Syllabus, Spring 2022

INSTRUCTOR INFORMATION

Instructor	Gerald L. Fudge, PhD
Office Location	AG/ET 217
Office Hours	Wednesday (9:00 am – 11:30 am) Thursday (2:00 pm – 4:30 pm)
Office Phone	Mobile: 214-662-5402 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
Communication Response Time	Typically, within 48 hours on weekdays for email

COURSE INFORMATION

Class Meeting Schedule	Meets 1/12/2022 through 5/13/2022
Class Meeting Dates	Tuesday 6:40 pm – 9:00 pm
Classroom	AG/ET 211
Textbook(s) Required	1. Machine Learning for Absolute Beginners: A Plain English Introduction (Third Edition), by Oliver Theobald. (ISBN-13: 979-8558098426; paperback recommended) 2. Machine Learning with PyTorch and Scikit-Learn, by Raschka, Liu, and Mirjalili. (978-1801819312; paperback recommended)
Software Required	Microsoft Office, Python/ML packages (available on school computers)
Optional Software	Student Matlab or Octave (Octave is not 100% compatible with Matlab; students are responsible for submitting Matlab compatible code)

The syllabus/schedule are subject to change

COURSE DESCRIPTION

This course will introduce Matlab-based signal processing for computer science graduate students and will also cover applied machine learning using Python tools, including Scikit-Learn and PyTorch. The course will include exercises using structured Matlab and object-oriented Python.

Prerequisites: Graduate standing in CSCI.

Student Learning Outcomes

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

- Be able to develop both structured and object-oriented code.
- Be able to develop code in both Matlab and Python.
- Understand and be able to apply signal processing concepts, including convolution, filtering, frequency domain processing using the Fast Fourier Transform, and principle component analysis.
- Understand how to select an appropriate machine learning (ML) algorithm.
- Be able to apply probability and statistical analysis in evaluating ML results and in selecting testing and training data to optimize use of available data and while avoiding selection bias.
- Demonstrate the ability to select the salient features via principle component analysis and similar methods to reduce the data dimensionality in a classifier.
- Be able to implement ML algorithms to solve real world problems using Python tools such as Skikit-Learn and PyTorch.

COURSE REQUIREMENTS

Minimal Technical Skills Needed

Programming skills are required, but not specifically in Matlab or Python (although that is helpful). Technical skills in linear algebra and statistics are helpful but not required.

Instructional Methods

The instructional methods in this course include lectures, class discussion and participation, projects using modeling tools such as Matlab and Python, homework assignments, and exams. This course will take a holistic approach as we integrate different knowledge fields in order to better prepare students for real-life situations that are more complex than standard textbook or classroom examples.

Student Responsibilities or Tips for Success in the Course

- **Attendance & Participation**: For optimum learning and grades, students need to attend class and participate in discussion, homework, project, and exams; note that in-person attendance is required and attendance & participation is a graded component. See the note at the bottom of the grading assessment table.
- **Homework:** The homework will consist primarily of computational coding assignments that will be due approximately once per week. These are designed to provide the coding experience that is required in order to develop competence in computational engineering. We will discuss selected homework solutions during class, including lessons learned, problems encountered, and innovative approaches. Late work may be penalized, including a grade of zero, unless student has an acceptable excuse proven by a doctor's note or other legal documentation.

- **Homework Collaboration:** Students must turn in their own work, but student collaboration to help work through solutions, debug code, fix style errors, etc., is strongly encouraged.
- **Submission of Assignments:** Students shall submit assignments in D2L. If problems are encountered using D2L, 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.
- **Soft-Copy Report Formats:** Students should submit reports in Word or PDF formats. APA or other standard formatting is required for all reports assigned during this class. Non-adherence to standard formatting will result in points deduction on the assignment.
- **Project:** The final project is currently planned to 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.
- **Exam**: The mid-term exam will be closed book & closed notes, and will include a combination of written response questions and writing pseudo-code. The use of a personal phone is strictly prohibited during exams. Makeup exam may be offered but an official permit for absence that fulfills University procedures must be provided to the instructor in timely manner.

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**
Homework	30
Participation and Attendance*	10
Midterm Exam	30
Final Project	30
Total*	**100**
* Regular in-person attendance is required. The maximum # of classes that can be missed is 3, otherwise the grade may revert to an "F." If classes are missed, the student is expected to read the missed lecture material and keep up with homework except in rare circumstances. I will try to be flexible to accommodate different situations, but the bottom line is that in-person attendance is expected for this class. If needed due to excessive excused absences, the instructor will arrange make-up sessions to cover missed material. These will primarily be in-person, although occasional zoom meetings may be used at the instructor's discretion in lieu of in-person make-up meetings.	

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

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.

The syllabus/schedule are subject to change

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.

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.
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
Website: Office of Student Disability Resources and Services
http://www.tamuc.edu/campusLife/campusServices/studentDisabilityResourcesAndServices/

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.

Department or Accrediting Agency Required Content

COURSE OUTLINE / CALENDAR

Week	Day	Unit / Topic	Notes
	Tues.		
1	8-30	Original image processing class (replaced with 597)	
2	9-6	Class 1: Introductions; Matlab; histogram	**9-5: Labor Day**
3	9-13	Euler's formula; noise; intro to Fourier Transform	**9-14: Census Day**
4	9-20	Fourier Transform	
5	9-27	Filtering & convolution; Fourier Analysis	
6	10-4	Spectrogram	
7	10-11	Linear Algebra & matrix math; least squares regression	
8	10-18	Intro to ML with Python; Clustering & Classification	
9	**10-25**	Review; Midterm Exam (through week 7)	**Midterm Exam**
10	11-1	Final Project Kickoff; linear regression with Python	
11	11-8	CNNs (or more on classification)	
12	11-15	Graph CNNs (aka Graph Signal Processing)	
13	11-22	Topics in ML & signal processing	**11-24,25: Holiday**
14	11-29	Topics in ML & signal processing	
15	**12-6**	Present your final projects	**Final Project**
16			

Notes:

1. Specific dates are subject to change
2. Topics in ML & signal processing can include Kalman filtering, practical image processing techniques, etc.