

ECE and CS 4720-7720

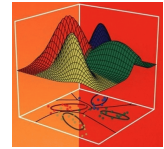
Machine Learning and Pattern Recognition

Prerequisite: CS2050 Algorithm Design and Programming
Stats 4710 Intro to Mathematical Statistics

G. DeSouza

Spring 2026

University of Missouri - Columbia
Electrical & Computer Engineering Department
Columbia, MO 65211



Description: This course provides foundation knowledge to the basic methods in machine learning and pattern recognition (MLPR). MLPR addresses the problem of programming computers to optimize certain performance criteria by using example data or expert knowledge and it has wide applications.

Outcomes and Objectives: Students will acquire fundamental knowledge regarding the problems that can *afflict* and/or *propel* a MLPR model (i.e. AI model). Through the study of the basic principles governing data in training, testing, and validation datasets; the stochastic interpretation of the nature of those data; and the algorithms developed to learn and draw possible inferences from those datasets; students will acquire insights on the success or failure of AI models, from simple multi-layer perceptrons to Large Language Models.

Course Texts:

Pattern Classification, 2nd edition by R. O. Duda, P. E. Hart, D. G. Stork
John Wiley and Sons, Inc., 2000
ISBN: 0-471-05669-3

Computer Manual in MATLAB to accompany Pattern Classification text by D.G. Stork and E. Yom-Tov
John Wiley and Sons, Inc., 2004
ISBN: 0-471-42977-5

References: Various other sources will be handed out and made available on the course website over the semester.

G. DeSouza's Office Hours: By appointment - EBW 325 (Walk-ins are welcome)
E-mail: DeSouzaG@missouri.edu

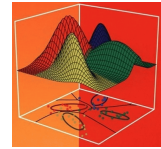
Ali Tousi's Office Hours: TBD - Naka 18
E-mail: stousi@mail.missouri.edu,

Course Format: Lectures will occur on Tuesdays and Thursdays. There will be a total of two exams: one mid-term and one final exam, plus one final project. Mini Project assignments will be each handed out and collected approximately every other week.

Lecture Notes and Assignments: Students should NOT count on availability of lecture notes. That is, students should take their own notes. Homework assignments will be made available in advance on the web at <http://vigir.missouri.edu/~gdesouza> (follow the link for ECE&CS7720).

Course Topics:

1. Introduction
2. Review of statistics & random variables
3. Statistical classifiers
4. K-nearest neighbor and Parzen window
5. Linear classifiers
6. Perceptron algorithm (linear)
7. Linear SVM
8. Regression methods (single and multi-variable)
9. Decision trees



10. Feature selection
11. Dimensionality reduction
12. Clustering
 - a. K-means
 - b. Hierarchical

Mini Projects: Mini Projects will be in the form of practical and theoretical questions and will be assigned at least once every two weeks. Students may be asked to come to office hours to explain their solutions for the MPs.

Course Policies: Cheating is strictly prohibited. Cheating violates any concept of honesty, integrity, and engineering ethics and it shall not be tolerated. Any evidence of copying or plagiarism, partial or in full, is considered cheating. All parts caught cheating shall: 1) receive a score of 0 in the assignment and a “F” in the course; 2) be turned over to the Department Chairman and the Academic Provost; and 3) face the appropriate penalties established by the University, including the possibility of being expelled.

Grade Construction

Graduate Students

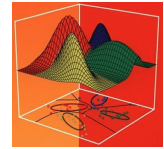
GRADE COMPONENT	POINTS: ECE-CS 7720
Exams	100 (midterm) & 100 (final)
Final Project	100 (Proposal+Presentation+Report)
Mini Projects	100
Total Points	400

Undergraduate Students

GRADE COMPONENT	POINTS: ECE-CS 4720
Exams	150 (midterm) & 150 (final)
Final Project	Optional (e.g. replace an exam)
Mini Projects	150
Total Points	450

Grad Scale:

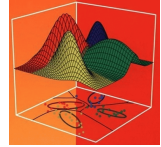
Undergrad students: A-to-F scale with +/- . Grad students: A, B, C, or F with +/- . Please, check https://en.wikipedia.org/wiki/Academic_grading_in_the_United_States and <https://catalog.missouri.edu/academicpolicies/grades/>, for more information on the grading system used in this class.



COURSE TIME SCHEDULE:

Spring 2026

	MP1	MP2	MP3	MP4	MP5	MP6	Final Project
Week 1							
Week 2	Assigned						
Week 3							
Week 4	Due	Assigned					
Week 5							
Week 6		Due	Assigned				
Week 7							
Mid-Term – Mar 10th							
Week 8			Due	Assigned			
Week 9							
Week 10	Spring Break						
Week 11				Due	Assigned		
Week 12							
Week 13					Due	Assigned	
Week 14							
Week 15						Due	
Week 16							Presentations
FINAL EXAM: TBA							



From the Office of the Provost:

Academic Dishonesty: According to University [policy](#), instructors are required to inform students of specific guidelines regarding cheating in their courses. Instructors are required by University policy to report incidents of cheating to the Office of the Provost. In compliance with this rule, all incidents of cheating by students in this course will be reported to the Office of the Provost for determination of possible disciplinary action.

Any student found to have cheated during *any assignment* will be given an “F” grade for the *class* and the evidence will be sent to the Provost's Office. Students submitting the same or similar solutions to a programming homework will be given a 0 for the assignment and the evidence will be sent to the Provost's Office for determination of possible disciplinary action. Second occurrences of cheating in a homework will lead to an “F” grade for the class.

Unless an assignment is specifically structured as a group project, duplicate homework written in collaboration with others is **not** acceptable. Although it is permissible to discuss the homework with others, these discussions should be of a general nature. All work at a detailed level must be done on your own. *Students submitting the same or similar solutions to the homework will be considered as having cheated.* No statements or actions made by anyone can alter this policy.

Statement on ADA:

Students with Disabilities:

If you anticipate barriers related to the format or requirements of this course, if you have emergency medical information to share with me, or if you need to make arrangements in case the building must be evacuated, please let me know as soon as possible.

If disability related accommodations are necessary (for example, a note taker, extended time on exams, captioning), please establish an accommodation plan with the Disability Center (disabilitycenter.missouri.edu, S5 Memorial Union, 573- 882-4696), and then notify me of your eligibility for reasonable accommodations. For other MU resources for persons with disabilities, visit ada.missouri.edu.

Other information:

For any other information not covered herein including use of AI, please check the University websites, such as: <https://provost.missouri.edu/faculty-affairs/syllabus-information/>