ECE and CS 4720-7720
Machine Learning and Pattern Recognition

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

G. DeSouza
January 2022

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.

Instructor: Prof. Guilherme N. DeSouza
TA: N/A

Course Texts:
Pattern Classification, 2nd edition by R. O. Duda, P. E. Hart, D. G. Stork
John Wiley and Sons, Inc., 2000
Computer Manual in MATLAB to accompany Pattern Classification text by D.G. Stork and E. Yom-Tov
John Wiley and Sons, Inc., 2004

References: Various others will be handed out over the semester.

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

TA Office Hours: TBD
Email: TBD@mail.missouri.edu
Office Hours: TBD
Office Location: TBD

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. Homework and Mini Project assignments will be 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

**Homework:** Homework will be in the form of theoretical questions and will be assigned at least once every two weeks.

**Mini Projects:** Homework will be in the form of practical questions and will also be assigned at least once every two weeks.

**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**

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<tr>
<th>GRADE COMPONENT</th>
<th>POINTS: ECE-CS 7720</th>
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<tbody>
<tr>
<td>Exams</td>
<td>100 (midterm) &amp; 100 (final)</td>
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<tr>
<td>Final Project</td>
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<td>Mini Projects</td>
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**Undergraduate Students**

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<td>Exams</td>
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<td>Final Project</td>
<td>Optional (e.g. replace an exam)</td>
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<td>Mini Projects</td>
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**Mid-Term – Mar 10**

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**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.