CSci 5521 sec 001 -- Fall 2020 -- Course Syllabus (tentative)

Class Hours
Lecture: TTh 1-2:15pm - electronic only via Zoom/Canvas. Some activities will be semi-synchronous.
Seating is limited by available staff support, which has yet to be determined.

Textbook
Introduction to Machine Learning; by Ethem Alpaydin (3rd ed) 2014.
"https://na01.alma.exlibrisgroup.com/view/action/uresolver.do?operation=resolveService&package_service_id=2261997953790001701&institutionId=1701&customerId=1700"
(above link requires UofM login. Fourth edition also exists, but access available by purchase only)

Instructor: Prof. Daniel Boley,
Office: ZOOM: TBA
Phone: 612-625-3887 (lv message)
Office Hours: M 10-11 Th 2-3 (after class)
office hours are tentative during the first two weeks
To avoid my e-mail spam filter, please include the string "5521" in the subject line.

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Office Hours: M 4-5pm, T 4-5pm

Assignment Plan (not in order)
If the number of exams and/or assignments changes, the relative weights will be adjusted.

- Several "classroom" exercises and/or pop quizzes (up to once a week): up to 10% of final grade
- 3-4 assignments with short turn-around time (max 24 hours): 40% of final grade
- 4-6 longer assignments : 50% of final grade
- Final grade will be based on a weighted average of your scores, assuming you have reached a minimum threshold in each category.

General Information
Neural networks, non-parametric windowing, and Bayes statistical theory are three popular methods for recognizing and classifying patterns - the pr
Pattern Recognition. These are the basic machine learning algorithms applicable to high-dimensional numerical data. We introduce the fundamental cc
of these various approaches, including the classification phase and the learning phase. Part of the class will be devoted to methods for unsupervised l
and classification. We assume just some knowledge of elementary statistics, calculus, and elementary linear algebra at the upper division undergradua
A combination of written assignments and programming projects will be used to illustrate the concepts. Most if not all programming will be done in M
and/or python. For those familiar with one but not the other, side-by-side comparisons will be provided. material showing how to for those unfamiliar

TOPICS by week

1. Intro: What is Machine Learning (Chap 1)
   HW0 due Friday Sept 11 ##
2. Supervised Learning: Some basic concepts (Chap 2)
3. Bayes Decision Theory: Conditional Probability (Chap 3)
   . . . Discriminant Functions, Normal Dist. (Chap 3)
   HW1 due Friday September 25 ##
4. Estimating Unknown Probability Densities, (Chap 4)
   . . . Parametric Classification (Chap 4)
5. Multivariate Methods: estimation and classification (Chap 5)
   Take Home Exam 1, due Friday October 16. ##

6. . . . *continued*
7. Dimensionality Reduction: feature selection PCA (Chap 6)
8. Unsupervised Clustering: K-means EM (Chap 7)
   HW2, now due Friday October 30 ##
9. Support Vector Machines, (Linear and Kernel) (chap 13)
10. . . . *continued*
    HW3 due Friday November 13 ##
11. Linear Discriminant - the Perceptron (Chap 10)
    Take Home Exam 2, due November 17 ##
12. Multilayer Perceptrons (Chap 11)
    . . . *continued*
13. Decision trees; (Chap 9) random forests (bagging)
    HW4, due Wednesday December 2 ##
14. Review
    HW5 due Thursday December 10 ## 
15. *Take Home Exam 3, due Tuesday December 15*

Students will be expected to implement several of the algorithms on a digital computer, some in MATLAB and some in python. Exact details v forthcoming before the semester starts. Students should be familiar with basic programming techniques, as well as being able use the help syste MATLAB or python. Students should also be acquainted with the basic concepts in linear algebra and probability, though some of this will be reviewed during the course.

All items handed in to be graded must represent the individual effort of whoever's name(s) appears on the item. At a minimum, violators of this will fail the course and/or will have their names recorded at the appropriate University or Department office. Mutual discussion of each individ results in the homeworks is encouraged, as long as the results themselves represent individual efforts. Some assignments will be done by pairs students; such items should be handed in as a single item listing the names of all participants. To pass the course, you will have to achieve a pas grade on the exams alone, and do satisfactorily on the homeworks. After any graded item is first handed back, you have at most one week to about the way it was graded.

You should also be aware of the following University-wide policies:

- Student Conduct Code
- Makeup Work for Legitimate Absences
- Appropriate Student Use of Class Notes and Course Materials
- Sexual Harassment
- Equity, Diversity, Equal Opportunity, and Affirmative Action
- Disability Accommodations If you require special accomodation for examinations, you should notify the instructor in the first two weeks semester. Any special arrangements to take exams outside of class are to be arranged with the Disability Office.
- Mental Health and Stress Management

Late submissions: Homeworks will be accepted up to two working days after the due date with a deduction of 5% of the total grade per day, before the answers have been posted, which ever occurs first. Classroom exercises will be handed out during the posted class time on an irreg basis and should be submitted electronically through canvas within 24 hours. Students signing up for the class during the first two weeks of the semester must hand in missed classroom exercises during the day of their first attendance. These deadlines may be extended for excused abse a case-by-case basis, but only for a limited number of occurences.

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