

Note: This version of the syllabus is uploaded at the beginning of the semester; hence, it is tentative.

CENG 5531 COURSE SYLLABUS

COURSE: CENG 5531-01 Machine Learning and Applications

SEMESTER: Fall 2018

CLASS LOCATION: UH-Clear Lake, **Delta 136**

CLASS MEETING TIMES: Wednesday 7:00pm-9:50pm

INSTRUCTOR: Unal "Zak" Sakoglu, PhD

MESSAGES: Phone: 281-283-3813

E-MAIL: *mylastname at uhcl dot edu*

FAX: 281-283-3870

OFFICE: Delta 111

URL: <http://sce.uhcl.edu/sakoglu>

Sr. Secretary: Ms. Kim Edwards: 281-283-3889

OFFICE HOURS OF INSTRUCTOR: **Mondays 2-4pm.**

Wednesdays 3:30pm-5:30pm.

Other days may be possible but by appointment only.

When you email me, put "CENG 5531" in the subject line. Feel free to just stop by during my office hours, the office hours are for you. But it wouldn't hurt if you could still email me in advance stating that you would stop by. Occasionally, I may have meetings that may overlap with the office hours. In those cases I will try to inform you in advance to my best ability, and there should be a notice on my office door.

Teaching Assistant (TA) Info: **Nidhi Patel**, PatelN8123@UHCL.edu,

TA Office Hours: **Mon & Thurs: 1-4pm, Tues:5-8pm, Fri: 1-6pm.** D205 (Delta Lab)

COURSE DESCRIPTION:

(Credit: 3, Lecture: 3)

Fundamentals of machine learning and pattern recognition. Topics covered include neural networks, Bayesian inference and non-parametric techniques.

COURSE PREREQUISITES: STAT 3334. (Basic probability & statistics.)

TEXTBOOK (required): *Introduction to Machine Learning, Author: Ethem Alpaydin, 2nd edition (or 3rd edition is also fine).*

Also recommended: "Pattern Recognition" by S. Theodoridis and K. Koutroumbas.

"Pattern Classification", by R. O. Duda, P. E. Hart, D. G. Stork.

METHODOLOGY: Lectures, project assignments, quizzes, tests. This course will be primarily delivered with in-class lectures. Some programming application assignments, will be included to reinforce the concepts. Numerous homework assignments will be assigned and graded. A term project will be assigned to apply and reinforce the information covered in the class. Pop-up quizzes may be utilized.

A **Blackboard Course Shell** will be set up and utilized to post HW/project assignments, course slides, notes, announcements, etc. So follow my announcements in the class about if/when the course shell will be created. You should login to the course shell daily.

Course Learning Outcomes:

1. Understand the key concepts in machine learning
2. Characterize the process to train and test machine learning algorithms and recognize ways to evaluate machine learning systems
3. Apply machine learning systems to perform various artificial intelligence tasks by using a programming language such as in Python, MATLAB, R or similar; experiment with the machine learning libraries of such languages
4. Conduct and communicate data analysis/classification research, i.e. propose a novel research idea on a dataset, design and execute classification experiments to support the proposed idea and write a report about the project and present it

Course Outline

Not all of the material in the textbook's chapters will be covered. So it is important that you follow the class.

Wk	Dates *,**	Subject (Ch. #'s from 3 rd Ed of textbook, Alpaydin)	Notes***
1	W Aug. 29	Introduction, the course, syllabus, website(s) for data. Probability and Random Variables Basics (App. A)	
2	W Sept. 5	Ch. 1 Introduction.	Start forming teams.
3	W Sept. 12	Ch. 2 Supervised Learning	Start selecting projects.
4	W Sept. 19	Ch. 3 Bayesian Decision Theory	Discussion of projects, and project selections.
5	W Sept. 26	Ch. 4 Parametric Methods	Project selections and teams finalized.
6	W Oct. 3	Ch. 5 Multivariate Methods Project Introduction Presentations	Project introductions presentation slides due noon of the class day.
7	W Oct 10	Ch. 6 Dimensionality Reduction	Verbal updates on project progress.

8	W Oct. 17	Ch. 7 Clustering Mid-term team project presentations #1.	Project presentation slides due noon of the class day.
9	W Oct. 24	Mid-term Exam/Test 1	Verbal updates on project progress.
10	W Oct. 31	Ch. 8 Nonparametric Methods and Ch. 9 Decision Trees	Verbal updates on project progress.
11	W Nov 7	Ch. 10 Linear Discrimination Mid-term Project Presentations #2	Project presentation slides due noon of the class day.
12	W Nov. 14	Ch. 11 Artificial Neural Networks / Multilayer Perceptrons	Verbal updates on project progress.
13	W Nov. 21	No class, happy thanksgiving!	Verbal updates on project progress.
14	W Nov. 28	Ch. 13 Kernel Machines / Support-Vector Machines	Verbal updates on project progress.
15	W Dec. 5	Any make-up classes, if necessary and if material is finished. Final term project presentations.	Project presentation slides due noon of the class day. Project reports due noon on Thursday December 6th.
16	W Dec. 12	Final Exam between 7pm - 9:50pm (All chapters covered, so, <u>comprehensive</u> , but more on the latest chapters) Final exam schedule: https://public.uhcl.edu/academics/resources/academic-calendar/final-exam-schedule	

* We will try to arrange for a make-ups for any missed dates if I have to travel for a conference, seminar talk, research talk, important meeting, etc.

** Other important dates: Sept 12 is census day; Nov 12 is last day to drop/withdraw. However visit <https://public.uhcl.edu/academics/resources/academic-calendar/> to double-check on UHCL's academic calendar for the most up-to-date important dates as some dates might change after the submission of this syllabus.

*** HWs' quantity, scheduling, due dates may change. All dates tentative. I will do my best to stick to the above plan. Individual HW deadlines will be stated on each HW's instructions.

ATTENDANCE POLICY: Attendance in class is expected and you should understand that classroom participation is an important element in the learning process. Students are encouraged to ask questions and make comments and participate in the class discussions. An absence from class does not excuse students from tests and assignment deadlines. **The instructor would appreciate an email message from students who are not going to attend class for whatever reason.**

GRADING POLICY: The grading policy of this course will follow the grading system as outlined in the current Catalog of the University of Houston-Clear Lake. In an effort to fairly assign letter grades according to the student's final average, usually there will not be a curve. Instead the following grading policy will hold:

A : 93-100%	C : 73-76.99%
A-: 90-92.99%	C-: 70-72.99%
B+: 87-89.99%	D+: 67-69.99%
B : 83-86.99%	D : 63-66.99%
B-: 80-82.99%	D-: 60-62.99%
C+: 77-79.99%	F : 0-59.99%

After I announce the grades of an assignment, HW, quiz, exam, etc. you have one week to see/review your graded paper (during my office hours, or appointment via email, based on my availability). *I will give you usually 7-11 days for the assignments to be completed by you and then it takes them about another 7-10 days to be graded and another couple of days for the grades to be announced, and if you do not see your graded paper within a week, it has already been 4 weeks since the assignment, and we all will almost forget about the questions. So it is important that you review your paper promptly within one week of announcement of grades for maximize your learning in an efficient manner.*

FINAL AVERAGES: Final averages will be determined by the following assignments and weighting*:

Attendance, Participance, pop-quizzes	10%
HW Assignments (includes programming)	15%
Test 1 (Midterm Test)	15%
Final Exam/Test	20%
Project (midterm and final presentations, and final report)	40%

*I may change these weights if I see it as necessary for some reason such as the students are disproportionately underperforming in any of the above assignments/items. In that case I will notify you of the new weights promptly.

Honesty Policy: Every student is expected to follow the honesty policy as described in the catalog. The first honesty violation will result in a grade of 0 on the assignment or test. The second honesty violation will result in a grade of F for the course. Students must remember the honesty pledge on all exams, as a reminder of the honesty code. Note that copying solutions verbatim or almost verbatim from a solutions manual or from instructions solutions, or from other or previous students are all considered cheating. You have to provide your own solutions. Academic Honesty Code is available at www.uhcl.edu website.

American Disabilities Act (ADA)

If you will require special academic accommodations, please contact the UHCL [Disability Services Office](#) at 281-283-2627.

The University of Houston System complies with Section 504 of the Rehabilitation Act of 1973 and the Americans with Disabilities Act of 1990, pertaining to the provision of reasonable academic adjustments/auxiliary aids for students with a disability. In accordance with Section 504 and ADA guidelines, each University within the System strives to provide reasonable academic adjustments/auxiliary aids to students who request and require them.

If you believe that you have a disability requiring an academic adjustments/auxiliary aid, please contact your University's student disability services center.

Drop Rule Limitation

Students who entered college for the first time in Fall 2007 or later should be aware of the course drop limitation imposed by the Texas Legislature. Dropping this or any other course between the first day of class and the census date for the semester/session does not affect your 6 drop rule count. Dropping a course between the census date and the last day to drop a class for the semester/session will count as one of your 6 permitted drops. You should take this into consideration before dropping this or any other course. Visit www.uhcl.edu/records for more information on the 6 drop rule and the census date information for the semester/session.

HOMEWORK/ASSIGNMENT RULES

First read all instructions on the HW and follow them carefully, especially follow the specific deadline stated on the HW, HW size limit, etc. For project reports, I will upload a template/sample report.

A. -10 POINTS FOR EACH DAY LATE. There will be a final deadline after which the HW will not be accepted (We have to start grading all the HWs at some point and give you timely feedback.

B. For all Problems do these: (Points will be deduced if violated)

1. Briefly describe the problem to be solved before attempting the solution.

2. Show all work.

3. Turn in problems in order.

4. Make the results clear (Circle answers, explain results, etc.)

5. When an explanation of the results is requested, the numerical solution will not be sufficient.

6. If you copy/paste hand-written notes, make sure it is legible and make sure you crop unnecessary parts of the images and zoom-in properly. To avoid huge file sizes, use/save png or jpg format when you copy/paste, do not use bmp.

C. For Programming Problems, do these (points will be deduced if violated)

1. Write the equations/problems to be solved

2. Describe the solution method (flowchart, description, etc)

3. Comment the programming code

4. Turn in the code and the results (Plots, etc.), in order.

Be Neat – if I cannot read the solution – no credit!!