Course: CES 514: Data Mining  
Lecture & Lab:

Instructor: Dr. Shahrad Jamshidi  
Office: -  
Phone: (970) 275-6125  
E-mail: sjamshidi@remi.ai

Office Hours: By Appointment / Online

Textbooks: None

Kaggle.com

Required Material: Laptop with python (preferably 3.6) installed

Prerequisites: Basic coding in python. Basic understanding of data retrieval and types

Grading Plan: 
Lab / Assignments 25%  
Projects 50% (25% each)  
Class Programming 15%  
Quiz 10%

Grading: 
95 - 100 A  
90 - 93 A-  
87 - 89 B+  
84 - 86 B  
80 - 83 B-  
74 - 76 C  
70 - 73 C-  
77 - 79 C+  
67 - 69 D+  
64 - 66 D  
60 - 63 D-  
< 60 F

Reminder:  
CES 514 is a 3 credit hour course requiring an average of 12 hours of study per week!

Note 1:  
• 15 points deduction / day for each late assignment / Incomplete programs are not accepted.  
• For each unexcused absence in the lab your final grade will be dropped by three points.
DISCLAIMER: This syllabus to give guidance in what may be covered during the semester and will be followed as closely as possible. However, the instructor reserves the right to modify, supplement and make changes as needs arise

<table>
<thead>
<tr>
<th>Course outline</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chapter 1 – Introduction</td>
</tr>
<tr>
<td>Chapter 2 – Classification vs Regression</td>
</tr>
<tr>
<td>Chapter 3 – Supervised Learning Methods</td>
</tr>
<tr>
<td>Chapter 4 – Cross validation and model selection criteria</td>
</tr>
<tr>
<td>Chapter 5 – Supervised Learning – Ensemble Methods</td>
</tr>
<tr>
<td>Chapter 6 – Unsupervised Learning Methods</td>
</tr>
<tr>
<td>Chapter 7 – Reinforcement Learning Methods</td>
</tr>
<tr>
<td>Chapter 8 – Tensorflow and Optimization</td>
</tr>
<tr>
<td>Chapter 9 – Computer Vision and Image Recognition</td>
</tr>
</tbody>
</table>

Packages

- Scikit-learn
- Scipy
- Pandas
- Numpy
- Tensorflow (and their relation to Keras, Pytorch, Theano)
POLICIES

CLASSROOM CONDUCTS: In order to create an appropriate environment for teaching and learning, students must show respect for their instructor and fellow students. Listed below are a few guidelines for classroom behavior. Students are expected to follow these rules to ensure that the learning environment is not compromised.

1 Class Participation: You are expected to be in class the entire class time. Please do not enter late or leave early. Rare exceptions may be made, particularly in emergency situations. Your participation in the class and lab and the discussions are very important and would help me understand how much you follow the material. As you go through the material before and after the class jot down your questions and ask me as I go through the slides.

2 Absences: Inform the instructor in advance, if you know you are going to miss a class. Also, take responsibility for getting missed assignments from other students. Your instructor is not responsible for re-teaching the material you missed due to an absence or being late.

3 Conversation: Do not carry on side conversations in class.

4 Sleep: Do not sleep in class.

5 Internet browsing: Please don’t browse internet for personal researching during class.

6 Attitude: You are expected to maintain a civil attitude in class. You may not use inappropriate or offensive commentary or body language toward the instructor or fellow students.

7 Cell phones: You may not use your cell phone during class. Please turn off your cell phone upon entering the classroom.

PLAGIARISM: All forms of cheating and plagiarism are serious offenses that can result in disciplinary penalties including expulsion from the university. This includes copying assignments from the Internet! Refer to the student handbook for details.

WITHDRAWAL: No student will be granted a withdrawal after the deadline unless under extreme circumstances. Policy regarding withdrawal is stated in the university catalog.

SPECIAL NEEDS: Any student who feels s/he may need an accommodation based on the impact of a disability should contact me privately to discuss your specific needs.
COURSE OBJECTIVES

At the conclusion of this course, the successful student will be able to:

1. Gain a solid understanding of machine learning methods and how they are processing data
2. Demonstrate a working knowledge of the necessary steps and methods used to correctly train, test and deploy a machine learning model
3. Develop and demonstrate a structured python language program to apply a machine learning method.
4. Be able to write a professional project report.
5. Be able to operate in team and work together towards a common goal.

ASSIGNMENTS

HOMEWORK: All students are required to complete homework assignments. Homework assignments require familiarity with different python packages such as pandas, tensorflow and scikit-learn. Homework assignments must be submitted in class. Late submissions will receive 15 deduction points for each late day, including weekends. All hardcopy submissions must be stapled and have a coversheet, otherwise they will not be accepted. Please avoid printing your homework when class starts! Unless specified in advance, no handwritten homework will be accepted.

PROJECTS: You are required to submit two coding projects, one implementing Image Recognition and one implementing Reinforcement Learning. All projects require prior approval from your instructor. Maximum of two people per group is allowed. Each must submit an abstract identifying its members (who is doing what), project idea, and objective of the project. The code for the project must be functional and run as intended. Here are some Project guidelines:

- Choose an appropriate project. You must check with your instructor to receive approval for your project.
- For each project you must use at least ONE of the following machine learning methods:
  - Image Recognition: CNN, Naive Bayes, Decision Trees
  - Reinforcement Learning: Q-learning, MCTS, CFR
- Each project must have the following functionalities:
  - Applying a supervised learning method with correct cross validation procedure
  - Performed hyperparameter optimization

If you are having trouble choosing a project, ask your supervisor or even look online, e.g. Kaggle.com, for project ideas.

PROJECT REPORTS: Each project must have a formal abstract. The abstract must briefly describe the scope of your paper and what you are discussing in the report. The abstract must be between 200-300 words. Each design project will be graded according to the following guidelines:

1. Working Prototype (20 points): The project’s code must be functional as intended and specified in the abstract. Projects must be coded in Python and you must be able to demonstrate its operation in the lab. Late projects will NOT be accepted.
2 **Flowchart (10 points):** Each project must be accompanied with a complete flowchart of the workflow.

3 **PowerPoint Presentation (20 points):** Minimum of 15 slides is required. The slides must include references and future works.

4 **Codes:** Submit all your code.

**QUIZZES:** There will be a quiz almost once a week. The quizzes will be based on practice/homework problems (but not exactly the same). No make-ups are allowed. If you are late to class or stepped outside and missed a quiz, there will be no make-up. You can drop your lowest quiz grade. Only ONE quiz can be dropped. Note that all quizzes are limited to no longer than 10-15 minutes.

**LABS:** Occasionally, each student must submit a single lab report. Please note that for each unexcused absence in the lab your final grade will be dropped by three points. All pre-labs must be typed, dated, and include student’s name and ID; you receive a zero otherwise. Pre-labs are ½ of the overall lab grades.
SOFTWARE

All students are expected to become skilled and comfortable with Python, namely the packages of pandas, tensorflow and scikit-learn.

GRADING SUMMARY

Each student’s final grade will be calculated according to the Grading Plan mentioned above. Please note the following:

1. All assignments must be submitted before the beginning of the class on Canvas.
2. Late assignments (hardcopy or softcopy), including lab, pre-lab, homework, etc., will receive 15 deduction points for each late day, including weekends.
3. There will be no curving (89.2 is still a B+).
4. There will be no make-ups.
5. Quizzes will be given at the beginning of each class.
6. Pay attention to the grading plan!
7. Incomplete projects do NOT receive grades!

Please make sure you speak to me before you decide on dropping the class!

I will be available, if you are willing to learn!