Introduction to Machine Learning
EEL 4930
Spring 2018

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Course Website: Canvas & GitHub
Lecture: Tuesdays and Thursdays, 1:55-3:50pm, Larsen 310

Course Description: This course will cover introductory topics in pattern recognition and machine learning. We will review some needed mathematical and statistical concepts throughout the course. The following is an approximate schedule of the course:

- **Week 1-3, Jan. 9-25: Introduction to Machine Learning and Evaluation of Methods**:

    - *What is Machine Learning?*
    - *Regression*
    - *Overfitting*
    - *Cross-Validation*
    - *Error and Accuracy Metrics*
    - *ROC curves*
    - *Introduction to Python*

- **Weeks 4-5, Jan. 30-Feb. 8: Introduction to Dimensionality Reduction**:

    - *Curse of Dimensionality* (Week 4)
    - *Principal Components Analysis* (Weeks 4-5)
    - *Multi-Dimensional Scaling, ISOMAP, Locally Linear Embedding* (Week 5)

- **Weeks 6-8, Feb. 13-Mar. 2: Introduction to Unsupervised Learning Methods**:

    - *Gaussian Mixture Models* (Week 6-7)
    - *K-Means, Fuzzy C-Means & Possibilistic C-Means Algorithm* (Week 7-8)
    - *Evoluationary & Genetic Algorithms* (Week 8)

- **Mid-Term Exam: March 13**

- **Weeks 9-12, Mar. 15-Apr. 6: Introduction to Supervised Learning Methods**:

    - *Linear Classifiers & Artifical Neural Networks*: Fisher Linear Discriminant, Neuron, Perceptron Convergence Theorem, Multi-layer Perceptrons, Back-Propogation, What is Deep Learning?, (Weeks 9-11)
    - *Nearest Neighbor Methods*, (Weeks 11-12)

- **Weeks 13-15: Project Competition**:

- *Completion of Project*: In Class Project Focus (Weeks 13-14)
- *Project Presentations*, (Weeks 14-15)

Required Textbook: C. Bishop, "Pattern Recognition and Machine Learning," Springer, 2006. ISBN 0387310738.

Laptop Requirement: A laptop with Python 3.5 and Git installed will be required during class for in class assignments. Please see: `https://www.eng.ufl.edu/students/resources/computer-requirements/`

Prerequisites: EEL 3135 Signals and Systems; Prior exposure to calculus, probability, statistics and linear algebra.

Evaluation and Grading:

Mid-Term Exam	20% of grade
Project	20% of grade
In Class and Homework Assignments	60% of grade

Homework and in class assignments will be weighted by the number of points each one is given (i.e., all homework and in class assignments are not weighted equally). **Late Assignments will not be accepted**. If you feel a graded assignment or exam needs to be re-graded, you must discuss this with the instructor within one week of grades being posted for that assignment/exam. After one week, items will not be considered for re-grading. The class will be graded on a curve.

Assignment Requirements: Requirements for all assignments in this class are listed below. For maximum credit, along with correct, substantial answers, I expect high quality professional looking code and documents. Complete your assignments with care and ensure that your submission illustrates that you understand the concepts the assignment is trying to emphasize.

- For all assignments that require submission of code, turn in clean, easy to read, easy to run, and well commented Python 3.5 code. Points will be taken off if code cannot be run and/or easily understood. For example, do not use one letter variable names, do not include "magic" numbers/parameters in your code that are unexplained, etc.

- Complete all assignments in the format assigned. For example, if a PDF document is requested and a Word DOC is submitted instead, you will lose points.

- Most assignments will be assigned (and will need to be submitted) via GitHub. Each assignment will have its own subfolder that will be pushed to your homework repositories. You should keep all files associated with an assignment within its subfolder. Be sure to pay attention and follow any required file naming convention for all assignments.

Attendance Requirements: As this course will have in class assignments, consistent attendence is very important. Requirements for class attendance and make-up exams, assignments, and other work in this course are consistent with university policies that can be found at: `https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx`.

Academic Dishonesty: UF students are bound by The Honor Pledge which states, We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code. On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: On my honor, I have neither given nor received unauthorized aid in doing this assignment. The Honor Code (`http://www.dso.ufl.edu/sccr/process/student-conduct-honor-code/`) specifies a number of behaviors that are in violation of this code and the possible sanctions. Furthermore, you are obligated to report any condition that facilitates academic misconduct to appropriate personnel. If you have any questions or concerns, please consult with the instructor.

Any student found to have cheated during on an exam or assignment will be given a grade of 0 for that exam or assignment and the evidence will be sent to the Provost's Office for the determination of any additional disciplinary action. Unless an assignment is specifically structured as a group project, duplicate assignments 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.

Accommodations: Students with disabilities requesting accommodations should first register with the Disability Resource Center (352-392-8565, `www.dso.ufl.edu/drc/`) by providing appropriate documentation. Once registered, students will receive an accommodation letter which must be presented to the instructor when requesting accommodation. Students with disabilities should follow this procedure as early as possible in the semester.

Online Course Evaluation: Students are expected to provide feedback on the quality of instruction in this course by completing online evaluations at `https://evaluations.ufl.edu`. Evaluations are typically open during the last

two or three weeks of the semester, but students will be given specific times when they are open. Summary results of these assessments are available to students at https://evaluations.ufl.edu/results/.