



## Syllabus for CSE176-01: Introduction to Machine Learning

Fall 2015

Instructor: Miguel Carreira-Perpinan

<b>Designation:</b>	CSE 176 Introduction to Machine Learning
<b>Catalog Description:</b>	Survey of techniques for development and analysis of software that learns from experience. Specific topics: supervised learning (classification, regression); unsupervised learning (density estimation, clustering, dimensionality reduction); reinforcement learning; and others. Specific techniques: linear classifiers, mixture models, nonparametric methods, decision trees, neural networks, kernel machines, ensembles, graphical models, Bayesian methods, etc.
<b>Text Books and Other Required Materials:</b>	E. Alpaydin: "Introduction to Algorithms", 3rd ed. MIT Press, 2014. ISBN 978-0-26202-818-9.
<b>Course Objectives/ Student Learning Outcomes:</b>	<p>Students who successfully complete this course will have acquired a sufficient understanding of the basic concepts and methods of machine learning to make use of some elementary machine learning techniques in the design of computer systems. They will also come to possess insights concerning the relative strengths and weaknesses of various common machine learning methods. This course is intended to make the vast machine learning research literature accessible to diligent students. Finally, through the completion of individual term projects, students will gain experience in applying machine learning methods to problems of personal interest.</p> <p>Students will:</p> <ul style="list-style-type: none"><li>- Apply machine learning techniques in the design of computer systems.</li><li>- Explain the relative strengths and weaknesses of different machine learning methods.</li><li>- Demonstrate knowledge of the machine learning literature.</li><li>- Apply machine learning techniques to a selected problem.</li></ul>
<b>Program Learning Outcomes:</b>	<p>By the end of course through lectures, readings, homeworks, lab assignments and exams, students will demonstrate:</p> <ul style="list-style-type: none"><li>- The abilities (1) to apply knowledge of computing and mathematics to machine learning problems, models and algorithms; (2) to analyze a problem and identify the computing requirements appropriate for its solution; (3) to design, implement, and evaluate an algorithm to meet desired needs; and (4) to apply mathematical foundations, algorithmic principles, and computer science theory to the modeling and design of computer-based systems in a way that demonstrates comprehension of the trade-offs involved in design choices.</li><li>- An ability to apply design and development principles in the construction of software systems of varying complexity.</li><li>- An ability to function effectively as a member of a team in order to accomplish a common goal.</li><li>- Recognition of the need for and an ability to engage in continuing professional</li></ul>

development.

- An ability to use current techniques, skills, and tools necessary for computing practice.

**Prerequisites by Topic:** CSE31 Introduction to CSE II  
MATH24 Linear Algebra and Differential Equations  
MATH32 Probability and Statistics

Proficient level of programming skills and of the fundamentals of linear algebra, multivariate calculus and probability.

**Course Policies:**

**Academic Dishonesty Statement:**

- a. Each student in this course is expected to abide by the University of California, Merced's Academic Honesty Policy. Any work submitted by a student in this course for academic credit will be the student's own work.
- b. You are encouraged to study together and to discuss information and concepts covered in lecture and the sections with other students. You can give "consulting" help to or receive "consulting" help from such students. However, this permissible cooperation should never involve one student having possession of a copy of all or part of work done by someone else, in the form of an e mail, an e mail attachment file, a diskette, or a hard copy. Should copying occur, both the student who copied work from another student and the student who gave material to be copied will both automatically receive a zero for the assignment. Penalty for violation of this Policy can also be extended to include failure of the course and University disciplinary action.
- c. During examinations, you must do your own work. Talking or discussion is not permitted during the examinations, nor may you compare papers, copy from others, or collaborate in any way. Any collaborative behavior during the examinations will result in failure of the exam, and may lead to failure of the course and University disciplinary action.

**Disability Statement:**

Accommodations for Students with Disabilities: The University of California Merced is committed to ensuring equal academic opportunities and inclusion for students with disabilities based on the principles of independent living, accessible universal design and diversity. I am available to discuss appropriate academic accommodations that may be required for student with disabilities. Requests for academic accommodations are to be made during the first three weeks of the semester, except for unusual circumstances. Students are encouraged to register with Disability Services Center to verify their eligibility for appropriate accommodations.

**Topics:**

Supervised learning; Bayesian decision theory; Parametric methods; Multivariate methods; Dimensionality reduction; Clustering; Nonparametric methods; Decision trees; Linear discrimination; Multilayer perceptrons; Local models; Kernel machines; Graphical models; Hidden Markov models; Bayesian estimation; Combining multiple learners; Reinforcement learning; Design and analysis of machine learning experiments.

**Class/laboratory Schedule:**

see registrar website

**Midterm/Final Exam Schedule:**

**Course Calendar:**

**Professional Component:**

**Assessment/Grading Policy:**

Based on homeworks, lab assignments, exams and projects.

**Coordinator:** Miguel Carreira-Perpinan  
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