Instructor: Guillermo Reyes

Office: KAP 444B

Lecture days/hours: MWF, 11:00 - 11:50 am at HED room 103.

Office Hours: MWF 2:00 pm - 4 pm.

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**Description of the course:** The proposed course is an introduction to Machine Learning. We will focus on the main algorithms used for both supervised and unsupervised learning. We make a special emphasis on the rigorous justification of the algorithms presented. The Mathematics behind them is a mix of tools from Linear Algebra, Optimization, Probability Theory (in both its frequentist and Bayesian versions), Statistical Inference. We will also present some general concepts from Learning Theory that furnish a background for the entire course.

**Prerequisites:** Math 226 or 229, Math 208, Math 225. A D-clearance will be required for this course.

**Books/Material:** The main textbook we will follow is

“Understanding Machine Learning: from Theory to Algorithms” by Shai Shalev-Shwartz and Shai Ben-David. The authors keep it available online at

http://www.cs.huji.ac.il/ shais/UnderstandingMachineLearning/

For some of the topics, I will use the notes by Prof. Andrew Ng at Stanford,

http://cs229.stanford.edu/materials.html

**Grading:**
- Class participation: 10% of the grade
- Periodic assignments given at the end of each unit: 40%
- Final exam (on the last week of the course): 50%.

**Tentative schedule of the course:**

1. Introduction. Brief review of Probability Theory. Chapter 2 (Week 1)
2. Chapters 3-4. (Week 2)
3. Chapters 5-6 (without proofs). (Week 3)
4. Chapter 9 (without the VC calculation). (Week 4)
5. Chapter 10. (Week 5)
6. Chapter 11 (without proofs). (Week 6)
7. Chapters 12-13 (with some proofs). (Week 7)
8. Chapter 14 (with some proofs). (Week 8)
9. Chapter 15. (Week 9)
10. Chapter 16. (Week 10)
11. Chapter 18. (Week 11)
12. Chapter 22. (Week 12)
13. Chapter 23 (with some proofs). (Week 13)
14. Chapter 24. (Week 14)
15. Review. (Week 15)

Statement on Academic Conduct and Support Systems

- Academic Conduct.

Plagiarism - presenting someone else’s ideas as your own, either verbatim or recast in your own words - is a serious academic offense with serious consequences. Please familiarize yourself with the discussion of plagiarism in SCampus in Section 11, Behavior Violating University Standards https://scampus.usc.edu/1100-behavior-violating-university-standards-and-appropriate-sanctions/. Other forms of academic dishonesty are equally unacceptable. See additional information in SCampus and university policies on scientific misconduct, http://policy.usc.edu/scientific-misconduct/.

Discrimination, sexual assault, and harassment are not tolerated by the university. You are encouraged to report any incidents to the Office of Equity and Diversity http://equity.usc.edu/ or to the Department of Public Safety http://capsnet.usc.edu/department/public-safety/online-forms/contact-us. This is important for the safety whole USC community. Another member of the university community â such as a friend, classmate, advisor, or faculty member â can help initiate the report, or can initiate the report on behalf of another person. The Center for Women and Men http://www.usc.edu/student-affairs/cwm/ provides 24/7 confidential support, and the sexual assault resource center webpage sarc@usc.edu describes reporting options and other resources.

- Support Systems.
A number of USC’s schools provide support for students who need help with scholarly writing. Check with your advisor or program staff to find out more. Students whose primary language is not English should check with the American Language Institute http://dornsife.usc.edu/ali, which sponsors courses and workshops specifically for international graduate students. The Office of Disability Services and Programs http://sait.usc.edu/academicsupport/centerprograms/dsp/home/index.html provides certification for students with disabilities and helps arrange the relevant accommodations. If an officially declared emergency makes travel to campus infeasible, USC Emergency Information http://emergency.usc.edu/ will provide safety and other updates, including ways in which instruction will be continued by means of blackboard, teleconferencing, and other technology.