Math 499
Special Topics - Mathematics of Machine Learning
Spring 2016

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.

e-mail: guillermo.reyes@usc.edu

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

- Perioidic 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 Standardshttps://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/.

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- Support Systems.

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http://sait.usc.edu/academicsupport/centerprograms/dsp/home¿ndex.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.