

CSE 575: Statistical Machine Learning

General Course Information

- Instructor: Dr. Jingrui He
- Office: BY 410
- Office Hours: F 1:30pm-3:30pm
- Email: jingrui.he@asu.edu
- Meeting Times: F 9am-11:45am
- Location: Tempe PSH 152
- TA: Dawei Zhou (dawei.zhou@asu.edu), Jun Wu (junwu6@asu.edu)
- TA office hours:
 - Time: M/T 9am-10am (Jun Wu), W/Th 3:30pm-4:30pm (Dawei Zhou)
 - Location: BY 221
- Prerequisite: Basics of linear algebra, probability, algorithm design and analysis, proficient programming in one of the following languages (Matlab, Python, C++ or Java). We will have a screen-quiz in the first class, which can be used as a reference on whether you have sufficient prerequisite for this class.
- Course Textbook: Pattern Recognition and Machine Learning, Christopher M. Bishop, 2006.
- Reference book: The Elements of Statistical Learning: Data Mining, Inference, and Prediction (2nd Edition). Trevor Hastie, Robert Tibshirani and Jerome Friedman. Springer-Verlag, 2009. (http://web.stanford.edu/~hastie/local.ftp/Springer/OLD/ESLII_print4.pdf)

Catalog Description

Probability distributions, MLE, regression, classification, decision tree, boosting, kernel methods, clustering, mixture models, graphical models, dimensionality reduction, and advanced topics, such as deep learning.

Objective

An in-depth understanding of machine learning and statistical pattern recognition techniques and their applications.

Additional Reference Books

- Semi-Supervised Learning. Olivier Chapelle, Bernhard Schölkopf, and Alexander Zien. The MIT Press, 2006. (http://enpub.fulton.asu.edu/cseml/Spring07/ssl_book/ssl_toc.pdf)

- Kernel Methods for Pattern Analysis. John Shawe-Taylor and Nello Cristianini. Cambridge University Press, 2004. (<http://read.pudn.com/downloads167/ebook/769401/Kernel%20Methods%20for%20Pattern%20Analysis.pdf>)
- Pattern Classification (2nd edition). Richard Duda, Peter Hart, and David Stork. Wiley, 2000.
- Machine Learning. Tom Mitchell. McGraw Hill, 1997.
- Introduction to Data Mining. Pang-Ning Tan, Michael Steinbach, and Vipin Kumar. Addison Wesley, 2005.
- Data Mining: Theories, Algorithms, and Examples. Nong Ye. CRC Press, 2013.

Grading

- Project (1): 30%. Six to eight students form a group to carry out a research project. It can be an implementation and a comparative study of existing methods, a review of a specific topic, or the development of a new idea. Each team will give a short presentation at the end of the semester.
- Homework (3): 15%. There are 3 homework assignments in total, with equal weights. Each student should finish **independently**.
- Exams (3): 50%. There will be 3 exams: 2 midterms (10% each) and 1 final (30%).
- Class participation: 5%. Students are required to attend the lectures and participate in the class discussion.

Class Project

- **Project proposal (10%): due on 2/22**
It should contain the following information:
 - (1) Project title
 - (2) Team members: please specify the role of each member
 - (3) Description of the problem you try to address
 - (4) Preliminary plan (milestones)
 - (5) Paper list
- **Group presentation (5%): 4/26**
- **Final project report (15%): due on 4/26**
It should have the following format:
 - (1) Introduction, including a summary of the problem, previous work, methods, and results
 - (2) Problem description, including a detailed description of the problem you try to address

- (3) Methodology, including a detailed description of methods used
- (4) Results, including a detailed description of your observations from the experiments
- (5) Conclusions and future work, including a brief summary of the main contributions of the project and the lessons you learn from the project, as well as a list of some potential future work

Tentative Class Schedule: Subject to Change

Week	Topic	Homework	Exam
1	Introduction	HW1 out	Screen-Quiz
2	Probability Basics, MLE		
3	Linear Regression, Bias-Variance Tradeoff		
4	Naive Bayes, Logistic Regression		
5	Overfitting	HW1 due, HW2 out	Midterm 1
6	Decision Tree		
7	Boosting, Instance-based Learning		
8	Support Vector Machines		
9	Spring Break	HW2 due, HW3 out	Midterm 2
10	Bayes Networks, GMM, EM		
11	Dimensionality Reduction		
12	Graphical Models		
13	Bayes Networks	HW3 due	
14	Hidden Markov Models		
15	Advanced Topics		
16	Group Presentation		

ASU Policies on Academic Integrity

Violations of the University Academic Integrity policy will not be tolerated. Penalties include reduced or 0 credit for submitted work, a failing grade in the class, a note on your official transcript that shows you were punished for cheating, suspension, expulsion and revocation of already awarded degrees. The university requires that should I implement any of these penalties, I must report the matter to the Dean's office. The university academic integrity policy can be found at <http://provost.asu.edu/academicintegrity>.

Sexual Discrimination

Title IX is a federal law that provides that no person be excluded on the basis of sex from participation in, be denied benefits of, or be subjected to discrimination under any education program or activity. Both Title IX and university policy make clear that sexual violence and harassment based on sex is prohibited. An individual who believes they have been subjected to sexual violence or harassed on the basis of sex can seek support, including counseling and academic support, from the university. If you or someone you know has been harassed on the basis of sex or sexually assaulted, you can find information and resources at <http://sexualviolenceprevention.asu.edu/faqs/students>.

As a mandated reporter, I am obligated to report any information I become aware of regarding alleged acts of sexual discrimination, including sexual violence and dating violence. ASU Counseling Services, <https://eoss.asu.edu/counseling>, is available if you wish discuss any concerns confidentially and privately.