STAT 410:001 CRN 44982 and STAT 510:001 CRN 44983
Introduction to Graphical Models

Fall 2015
TR 8:15–9:30, NH 385

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Prerequisites: This is a course designed for upper undergraduate or first year graduate students in Math/Stat or Engineering who have taken two quarters in prob/stat, e.g., Stat 451 & Stat 452 or Stat 461 & Stat 462. The students will need a basic knowledge of a high level programming language: Matlab, Python or R.

Textbook: There is no required textbook for this class. However, the following book is recommended to help mastering the material: Machine Learning, A Probabilistic Perspective, Kevin P. Murphy, ISBN: 978-0-262-01802-9.

Computer Software: The homework problems as well as the project will require the use of a high level programming language as Matlab, R or python.

Learning Goals: To provide an introduction to the theory and use of simple graphical models.

Learning objectives: Upon completion of this course the student should be able to:

1. Understand the problem of clustering, the K-means and soft K-means algorithm, the concept of mixture of models;
2. Understand the Expectation-Maximization (EM) algorithm;
3. Derive the EM “equations” for a clustering problem and implement the EM algorithm using a high level programming language;
4. Understand the concepts of Markov Random fields and Gibbls distribution;
5. Understand the Gibbs sampling algorithm and the belief propagation algorithm;
6. Apply these algorithms to an image segmentation problem;
7. Present a small project orally with the help of a poster;

D2L: All course handouts and some additional materials will be posted on D2L (Desire-to-Learn, the online platform). Please check the site regularly for updates.
Grading: will be based on attendance, four homework handouts, two midterm exam (Thursday, February 18th and Thursday March 10th), and a project poster presentation (Thursday March 17th, 8–12). The final grade will be computed as follows: attendance (10%), homework (20%), midterms (40%), project poster presentation (30%). This grade will be converted to a letter grade using the standard conversion chart, see [https://www.pdx.edu/registration/grading-system](https://www.pdx.edu/registration/grading-system).

Attendance: There will be 18 lectures during the winter trimester. 15 lectures attended provide 100% of the attendance grade, 10 lectures provide 50%. A student arriving at 8:30 or later cannot claim attendance for this lecture.

Homework: Four problem set will be assigned. Late homework will receive no credit. While you are encouraged to discuss problems with others, the homework assignment is individual work.

Exams: The midterm exams will be closed-book. However, a cheat-sheet of one page: front and back is allowed. A simple, not graphic calculator is allowed. Tests must be taken on the scheduled dates. Make-ups will not be allowed unless proper justification is presented.

Undergraduate versus Graduate students: It is PSU policy that undergraduate students and graduate students are graded differently. In this class, the grading system differ for the homework problems and the project. Special homework problems will be marked GR. These problems will count as bonus for undergraduate students. The project will also contain a Gr question.

Access and Inclusion for Students with Disabilities: PSU values diversity and inclusion; we are committed to fostering mutual respect and full participation for all students. My goal is to create a learning environment that is equitable, useable, inclusive, and welcoming. If any aspects of instruction or course design result in barriers to your inclusion or learning, please notify me. The Disability Resource Center (DRC) provides reasonable accommodations for students who encounter barriers in the learning environment.

If you have, or think you may have, a disability that may affect your work in this class and feel you need accommodations, contact the Disability Resource Center to schedule an appointment and initiate a conversation about reasonable accommodations. The DRC is located in 116 Smith Memorial Student Union, 503-725-4150, drc@pdx.edu, [http://www.pdx.edu/drc](http://www.pdx.edu/drc).

1. If you already have accommodations, please contact me to make sure that I have received a faculty notification letter and discuss your accommodations.
2. Students who need accommodations for tests and quizzes are expected to schedule their tests to overlap with the time the class is taking the test.
3. Please be aware that the accessible tables or chairs in the room should remain available for students who find that standard classroom seating is not useable.

A word on ethics: The strength of the university depends on academic and personal integrity. In this course, you must be honest and truthful. Ethical violations include cheating on exams, plagiarism, reuse of assignments, improper use of the Internet and electronic devices, unauthorized collaboration, alteration of graded assignments, forgery and falsification, lying, facilitating academic dishonesty, and unfair competition. Report any violations you witness to the instructors.