Portland State UNIVERSITY

Winter 2021 CS 510/610

Topic on probabilistic graphical models

Instructor:	Fang Song
Course Meeting Schedule:	T/R 12 – 13:15 via Zoom.
Email:	fsong@pdx.edu Stat email subject line with "w21-5610-pgm"
Course webpage:	https://fangsong.info/teaching/w21_5610_pgm/
Office hours:	F 10 – 11 am via Zoom.
Zoom links:	Course webpage under "Schedule" tab. Also check your "PSU Classes" calendar.

Course Description

Graphical models bring together graph theory and probability theory, and provide a flexible framework for modeling probabilistic distributions with complex dependencies. This course will cover the key formalisms and main techniques to construct them and to solve optimization and learning problems.

Course Objectives

Upon the successful completion of this class, students will be able to:

1. represent probability distributions in Bayesian networks.
2. represent probability distributions in undirected graphical models and their temporal extensions.
3. apply and analyze exact inference methods, such as variable elimination.
4. apply and analyze approximate inference methods such as MAP inference and Markov-Chain Monte Carlo methods.
5. estimate of the parameters and learn the structure of graphical models.

Course Prerequisites

This course is theory oriented. Students are expected to have basic knowledge of probability theory, statistics, algorithm design and analysis.

Readings

No required text. We will primarily follow lecture notes, and read research papers. The one below is recommended.

- [**DF**] Daphne Koller and Nir Friedman. Probabilistic Graphical Models: Principles and Techniques, MIT Press, 2009. Link.

Grading Policies

- Homework: 40%. Biweekly assignments.
- Quizzes: 15%. Biweekly.
- Project: 40%. You will form small groups and carry out some form of research related to this course.

- Participation: 5%.

Homework Policy

- You have a quota of 5 days in total for late submissions of homework or quizzes without penalty. You can use them at your will. Once the quota runs out, no late submissions will be accepted.
- Quizzes must be completed on your own. Collaboration on homework problems is highly encouraged, but you must write up solutions entirely on your own and clearly list who you discussed with for each problem. You must also clearly cite any other source you have referenced other than the text (a person, a book, a research paper, a webpage, etc.).
- All assignments must be submitted in PDF format. It is recommended to type-set your solutions using LaTeX, and you will get extra credit doing so.
- "I'll take 15%" option on homework problems. Your solutions should be as clear and concise as possible. Partial credit will only be given for answers that make significant progress towards correct solutions. If you realize you cannot solve a problem, you may write "I'll take 15%" instead of your answer, so you get 15% for this problem (or part of the problem). But if you do write an answer, you will get 0 if your solution is completely wrong. "I'll take 15%" option does not apply to problems of bonus credits.
- For each assignment, a random subset of problems will be graded.

Course Topics and Tentative Schedule

Check course webpage for details and updates

Week	Topic	Main Reading
1 - 2	Intro, review on basic probability, Bayesian networks, undirected graphical models.	DF 1 – 4
3 – 6	Exact inference, approximate inference, Markov Chain Monte Carlo, variational inference.	DF 9 – 13
7 – 8	Learning graphical models.	DF 16 - 20
9	Selected topics	
10	Project presentations	

PSU Policies & Resources

Academic Integrity

Academic integrity is a vital part of the educational experience at PSU. Please see the PSU Student Code of Conduct for the university's policy on academic dishonesty. A confirmed violation of that Code in this course may result in failure of the course.

Student Services

Disability Access Statement

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, https://www.pdx.edu/disability-resource-center/

Safe Campus Statement

Portland State University desires to create a safe campus for our students. As part of that mission, PSU requires all students to take the learning module entitled Creating a Safe Campus: Preventing Gender Discrimination, Sexual Harassment, Sexual Misconduct and Sexual Assault. If you or someone you know has been harassed or assaulted, you can find the appropriate resources on PSU's Enrollment Management & Student Affairs: Sexual Prevention & Response website at http://www.pdx.edu/sexual-assault

Title IX Reporting

As an instructor, one of my responsibilities is to help create a safe learning environment for my students and for the campus as a whole. Please be aware that as a faculty member, I have the responsibility to report any instances of sexual harassment, sexual violence and/or other forms of prohibited discrimination. If you would rather share information about sexual harassment, sexual violence or discrimination to a confidential employee who does not have this reporting responsibility, you can find a list of those individuals on PSU's Enrollment Management & Student Affairs: Sexual Prevention & Response website at http://www.pdx.edu/sexual-assault. For more information about Title IX please complete the required student module "Creating a Safe Campus: Preventing Gender Discrimination, Sexual Harassment, Sexual Misconduct and Sexual Assault" in the "My Courses" section of D2L.

Cultural Resource Centers

The Cultural Resource Centers (CRCs) create a student-centered inclusive environment that enriches the university experience. We honor diversity, explore social justice issues, celebrate cultural traditions, and foster student identities, success, and leadership. Our centers include the Multicultural Student Center, La Casa Latina Student Center, Native American Student & Community Center, Pan African Commons, Pacific Islander, Asian, Asian American Student Center and the Middle Eastern, North African, South Asian program. We provide student leadership, employment, and volunteer opportunities; student resources such as computer labs, event, lounge and study spaces; and extensive programming. All are welcome!

Recording Technology Notice

We will use technology for virtual meetings and recordings in this course. Our use of such technology is governed by FERPA, the Acceptable Use Policy and PSU's Student Code of Conduct. A record of all meetings and recordings is kept and stored by PSU, in accordance with the Acceptable Use Policy and FERPA. Your instructor will not share recordings of your class activities outside of course participants, which include your fellow students, TAs/GAs/Mentors, and any guest faculty or community-based learning partners that we may engage with. **You may not share recordings outside of this course. Doing so may result in disciplinary action.**