

CSE674: Advanced Machine Learning

Spring 2022

Instructor: Mingchen Gao

Syllabus

The first wave of Artificial Intelligence, known as knowledge-based systems, was based on pre-programmed logic. The second wave, which is based on deep learning, has made spectacular advances for sensing and perception. The next advance will be based on probabilistic reasoning— so as to take uncertainty into account as well as to address current limitations of deep learning, e.g., provide explanations of decisions, ethical AI, etc. Probabilistic graphical models are graphical representations of probability distributions. Such models are versatile in representing complex probability distributions encountered in many scientific and engineering applications. They have become essential to designing systems exhibiting advanced artificial intelligence, such as generative models for deep learning.

The course covers theory, principles, and algorithms associated with probabilistic graphical models (PGM). Both directed graphical models (Bayesian networks) and undirected graphical models (Markov networks) will be discussed regarding their representation, inference, and learning.

Prerequisite courses are introductory knowledge about machine learning (CSE4/574 or CSE4/555).

Readings

- “Probabilistic Graphical Models” by Daphne Koller and Nir Friedman, MIT Press 2009
- MURPHY: Kevin Murphy, Machine Learning: A Probabilistic Perspective, MIT Press, 2012.
- “Deep Learning”, by Goodfellow, et.al, MIT Press 2016

Grading Scheme

- Grading Scheme
 - 10 Short weekly quizzes using Gradiance – 20%
 - Self Designed Group Project
 - * Up to three students
 - * Can be used for the MS project
 - * Project Proposal – 20%
 - * Project Report – 20%
 - * Project Presentation – 10%
 - Final Exam (open book/notes) – 30%
- All components will be individually curved

	A	[92.5, 100]	B-	[72.5, 77.5]
– Final grade (<i>Tentative</i>):	A-	[87.5, 92.5]	C+	[67.5, 72.5]
	B+	[82.5, 87.5]	C	[62.5, 67.5]
	B	[77.5, 82.5]	C-	[57.5, 62.5]

- Gradiance quizzes
 - Will be released every Monday at 9.00 AM EST
 - Due next Sunday at 11.59 PM EST
 - Gradiance 0 will not be evaluated (warm up)

Accessibility Services and Special Needs

If you have a disability and may require some type of instructional and/or examination accommodation, please inform me early in the semester so that we can coordinate the accommodations you may need. If you have not already done so, please contact the Office of Accessibility Services; 25 Capen Hall; email: stu-accessibility@buffalo.edu Phone: 716-645-2608 (voice); 716-645-2616 (TTY); and on the web at <http://www.student-affairs.buffalo.edu/ods/>. All information and documentation is confidential.

The University at Buffalo and the School of Engineering and Applied Sciences are committed to ensuring equal opportunity for persons with special needs to participate in and benefit from all of its programs, services and activities.

Academic Integrity

This course will operate with a zero-tolerance policy regarding cheating and other forms of academic dishonesty. Any act of academic dishonesty will subject the student to penalty, including the high probability of failure of the course (i.e., assignment of a grade of F). It is expected that you will behave in an honorable and respectful way as you learn and share ideas. Therefore, recycled papers, work submitted to other courses, and major assistance in preparation of assignments without identifying and acknowledging such assistance are not acceptable. All work for this course must be original for this course. Please familiar yourself with the CSE Departments' and University at Buffalo's Academic Integrity Policy and Procedure outlined at <http://www.cse.buffalo.edu/shared/policies/academic.php>.