Advanced Topics in Machine Learning: Deep Generative Models (https://kuleshov.github.io/cornell-deep-generative-models-course/)

CS 6784 - Spring 2020

Detailed Syllabus

Week	Date	Lecture Topics	Coursework	Additional Readings
1	Jan 21 & 23	Introduction and Background (slides 1 (https://kuleshov.github.io/cornell-deep-generative-models-course/assets/slides/lecture1_2019.pdf), slides 2 (https://kuleshov.github.io/cornell-deep-generative-models-course/assets/slides/lecture2.pdf))		
2	Jan 28 & 30	Autoregressive Models (slides 3 (https://kuleshov.github.io/cornell-deep-generative-models-course/assets/slides/lecture3.pdf), slides 4 (https://kuleshov.github.io/cornell-deep-generative-models-course/assets/slides/lecture4.pdf))	HW 1 released	van den Oord et al. (2016a (https://arxiv.org/abs/1601.06759), 2016b (https://arxiv.org/abs/1609.03499)) Kalchbrenner et al. (2016 (https://arxiv.org/abs/1610.10099)) Vaswani et al. (2017 (https://arxiv.org/abs/1706.03762))
3	Feb 4 & 6	Variational Autoencoders (slides 5 (https://kuleshov.github.io/cornell-deep-generative-models-course/assets/slides/lecture5.pdf), slides 6 (https://kuleshov.github.io/cornell-deep-generative-models-course/assets/slides/lecture6.pdf))		Kingma et al. (2014 (https://arxiv.org/abs/1406.5298)) Gregor et al. (2015 (https://arxiv.org/abs/1502.04623)) Burda et al. (2016 (https://arxiv.org/abs/1509.00519)) Maddison et al. (2017 (https://arxiv.org/abs/1705.09279))
4	Feb 11 & 13	Normalizing Flow Models (slides 7 (https://kuleshov.github.io/cornell-deep-generative-models-course/assets/slides/lecture7.pdf), slides 8 (https://kuleshov.github.io/cornell-deep-generative-models-course/assets/slides/lecture8.pdf))	HW1 due (02/13), HW 2 released	Kingma and Dhariwal (2018 (https://papers.nips.cc/paper/8224-glow-generative-flow-with-invertible-1x1-convolutions.pdf)) Chen et al. (2018 (https://arxiv.org/abs/1806.07366)) Chen et al. (2019 (https://arxiv.org/abs/1906.02735)) Kumar et al. (2019 (https://arxiv.org/abs/1903.01434))
5	Feb 18 & 20	Generative Adversarial Networks (slides 9 (https://kuleshov.github.io/cornell-deep-generative-models-course/assets/slides/lecture9.pdf),		Dumoulin et al. (2016 (https://arxiv.org/abs/1606.00704)) Arjofsky et al. (2017 (https://arxiv.org/abs/1701.07875)) Zhu et al. (2017 (https://arxiv.org/abs/1703.10593))

		slides 10 (https://kuleshov.github.io/cornell-deep-generative-models-course/assets/slides/lecture10.pdf))		
		Project Proposal: Due Thursday, February 20, 2020.		
6	Feb 27	Energy-Based Models (slides 11 (https://kuleshov.github.io/cornell-deep-generative-models-course/assets/slides/lecture11.pdf))	HW 2 due (02/27)	
7	Mar 3 & 4	Combining Generative Model Variants Evaluating Generative Models (slides 12 (https://kuleshov.github.io/cornell-deep-generative-models-course/assets/slides/lecture12.pdf), slides 13 (https://kuleshov.github.io/cornell-deep-generative-models-course/assets/slides/lecture13.pdf))		
8	Mar 10 & 12	Discreteness in Generative Modeling (slides 14 (https://kuleshov.github.io/cornell-deep-generative-models-course/assets/slides/lecture14.pdf)) March 12: Postponed due to move to videoconferencing.	HW 3 released	
9	Mar 17 & 19	Student Presentations 3/17: Boyi Li and Junwen Bai: Uncertainty in DGMs 3/19: Yixin Shen and Youya Xia: Generative Models in RL		
10	Mar 24 & 26	Student Presentations 03/24: Evgenii Nikishin and Yicheng Bai: Noise Contrastive Estimation 03/26: Utkarsh Mall and Hubert Lin	HW 3 due (03/26)	
11	Mar 31 & Apr 2	Spring Break		
12	Apr 7 & 9	Student Presentations 04/07: Jack Wang and Joseph Kim 04/09: Dan Adler and Gengmo Qi		
		Project Progress Report: Due April 9, 2020.		
13	Apr 14 & 16	Student Presentations 04/14: Yong Huang and Yordanos Goshu: Combining GANs and variational inference 04/16: Kai Zhang, and Rui Qian		
14	Apr	Student Presentations		

	21 & 23	04/21: Guandao Yang and Wenqi Xian: Normalizing Flows 04/23: Shachi Deshpande, Alex Wang and Arman Mielke		
15	Apr 28 & 30	04/28: Joseph Kim and Zekun Hao: Wasserstein GANs 04/30: Guest Lecture		
16	May 5	Student Presentations 05/06: Kane Tian and Aaron Lou		
17	May 9-16	Exam Week (no lectures)		
		Final Project Reports: Due May 14, 2020.		

Additional Reading: Surveys and Tutorials

1. Tutorial on Deep Generative Models. (https://ermongroup.github.io/generative-models/) Aditya Grover and Stefano Ermon. International Joint Conference on Artificial Intelligence, July 2018.
2. Tutorial on Generative Adversarial Networks. (https://sites.google.com/view/cvpr2018tutorialongans/) Computer Vision and Pattern Recognition, June 2018.
3. Tutorial on Deep Generative Models. (https://www.youtube.com/watch?v=JrO5fSskISY) Shakir Mohamed and Danilo Rezende. Uncertainty in Artificial Intelligence, July 2017.
4. Tutorial on Generative Adversarial Networks. (https://www.youtube.com/watch?v=AJVyzd0rqdc) Ian Goodfellow. Neural Information Processing Systems, December 2016.
5. Learning deep generative models. (https://www.cs.cmu.edu/~rsalakhu/papers/annrev.pdf) Ruslan Salakhutdinov. Annual Review of Statistics and Its Application, Apr 2015.