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MIT
COMPUTER
VISION

6.819 / 6.869: Advances in Computer Vision

Instructors Bill Freeman, Phillip Isola
Lecture MW 9:30am - 11am (on Zoom!)



Toru Lin



Yen-Chen Lin



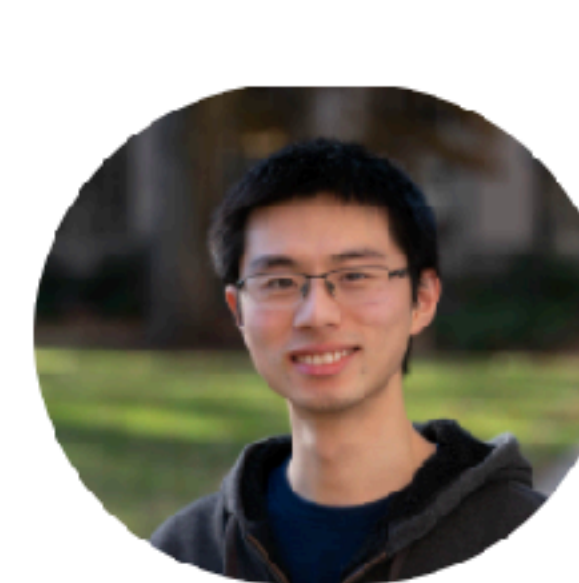
Steven Liu



Wei-Chiu Ma



Eric Qian



Clinton Wang



Shawn Wang

Tools we will use

- Math: Linear algebra, geometry, multivariate calculus, optimization, probabilistic inference, machine learning, deep nets
- Coding: Python, numpy, scipy, Pytorch
 - Tutorials will be announced

Assignments

- Problem sets (60%)
- Final project (40%)
- No exams or quizzes

Problem sets

<http://6.869.csail.mit.edu/fa19/policy.html>

- Weekly psets
- Out on Mon or Weds each week
- Usually due one week after
- Grades returned two weeks after due date [we will do our best to handle regrade requests if we made a mistake]
- The submission deadline will be 23:59 on the due date. Late submissions will be accepted up to 7 days late, but grade decays linearly to half credit over this period. You will also have a total of 3 free late days that will not be penalized. Details at: <http://6.869.csail.mit.edu/fa19/policy.html>
- Collaboration policy
 - Psets should be done individually, unless otherwise stated (a few will be group projects)
 - You can talk each other, get advice, ask questions on Piazza — but writing and coding should be done individually, and never shared (except when specified in group projects)
- No hard copies. Submissions will be made electronically.
- Some problem sets will have extra problems only for those taking the graduate version of the course.

Final project

<http://6.869.csail.mit.edu/fa19/project.html>

We will provide a list of ~10 projects to pick from. List will be made public around April 5th.

- Individually or pairs (recommended)
- Due on May 20th
- Presentations week of May 17th (3-5 minutes each)
- Everybody presents

Materials

<http://6.869.csail.mit.edu/sp21/materials.html>

- Office hours (zoom links and times listed on website)
- Use TA office hours for psets, Prof office hours for questions about lectures, projects; both can be used for general confusion
- Piazza: to ask questions to other students and TAs, send your questions using Piazza (avoid emails). Everybody is welcome to participate.
- Readings: We will be posting class work-in-progress notes for many of the lectures; the course materials link (above) lists other good resources, many of which are free online (Szeliski book, Deep learning text)

Course content



Lecture	Date	Topic
Week 1		
1	Wed 02/17/2021	Introduction. Simple Vision Systems
Week 2		
2	Mon 02/22/2021	Describing the Signal: pinhole, computational, and corner cameras.
3	Wed 02/24/2021	Geometry, Stereo, Intrinsic-Extrinsic Camera Parameters.
Week 3		
4	Mon 03/01/2021	Signal Processing
5	Wed 03/03/2021	Spatial Linear Filters
Week 4		
6	Mon 03/08/2021	Temporal Linear Filters
7	Wed 03/10/2021	Multi-Scale Pyramids

**cameras,
optics**

signals

Week 5		
8	Mon 03/15/2021	Introduction to Machine Learning
9	Wed 03/17/2021	Neural Networks
Week 6		
10	Wed 03/24/2021	Stochastic Gradient Descent, Back Propagation
Week 7		
11	Mon 03/29/2021	Spatial NNs, CNNs, visualization of weights
12	Wed 03/31/2021	Mechanisms of training and running networks
13	Mon 04/05/2021	Temporal NNs, RNNs, LSTMs, Attention
14	Wed 04/07/2021	Representation Learning

deep learning

Week 9		
15	Mon 04/12/2021	Scene Understanding
16	Wed 04/14/2021	Vision for Embodied Agents
Week 10		
17	Wed 04/21/2021	EHT and Image Priors
Week 11		
18	Mon 04/26/2021	Statistical Models for Images, Texture
19	Wed 04/28/2021	Image Synthesis: structured prediction, generative models, GANs, autoregressive models

applications

21	Wed 05/05/2021	Fairness / ethics in CV	Olga Russakovsky (Princeton)
Week 13			
22	Mon 05/10/2021	How to do research; How to write papers; How to give talks	Bill, Phillip
23	Wed 05/12/2021	Datasets, curation, biases and domain adaptation	Phillip
Week 14			
24	Mon 05/17/2021	Invited talk	Geoff Hinton (U. Toronto)
25	Wed 05/19/2021	Final Project Presentations	

**CV in
practice**