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VISION

# 6.819 / 6.869: Advances in Computer Vision

**Instructors** Bill Freeman, Phillip Isola  
**Lecture TR** 1pm - 2:30pm, 26-100



Manel Baradad



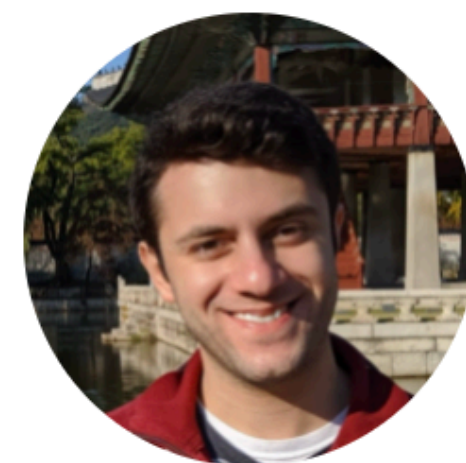
Wei Liao



Shuang Li



Lucy Chai



Alex Andonian



Prafull Sharma



Ching-Yao  
Chuang



Geeticka  
Chauhan



Joseph Suarez

# 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/sp22/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/sp22/project.html>

We will provide a list of ~10 projects to pick from.

- Individually or pairs (recommended)
- Due on May 10th
- Presentations during final week (3-5 minutes each)
- Everybody presents

# Materials

<http://6.869.csail.mit.edu/sp22/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 work-in-progress class 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	Tue 02/01/2022	Introduction. Simple Vision Systems
2	Thu 02/03/2022	Describing the Signal: pinhole, computational, and corner cameras.
Week 2		
3	Tue 02/08/2022	Geometry, Stereo, Intrinsic-Extrinsic Camera Parameters.
4	Thu 02/10/2022	Signal Processing
Week 3		
5	Tue 02/15/2022	Spatial Linear Filters
6	Thu 02/17/2022	Temporal Linear Filters
Week 4		
7	Tue 02/22/2022	No Class
8	Thu 02/24/2022	Multi-Scale Pyramids

**cameras,  
optics**

**signals**



Week 5		
9	Tue 03/01/2022	Introduction to Machine Learning
10	Thu 03/03/2022	Neural Networks
Week 6		
11	Tue 03/08/2022	Stochastic Gradient Descent, Back Propagation
12	Thu 03/10/2022	Spatial NNs, CNNs, visualization of weights
Week 7		
13	Tue 03/15/2022	Mechanisms of training and running networks
14	Thu 03/17/2022	Temporal NNs, RNNs, LSTMs, Attention
Week 8		
15	Tue 03/29/2022	Representation Learning

**deep learning**

16	Thu 03/31/2022	Scene Understanding
Week 9		
17	Tue 04/05/2022	Vision for Embodied Agents
18	Thu 04/07/2022	EHT and Image Priors
TUT	Fri 04/08/2022	AWS Tutorial
Week 10		
19	Tue 04/12/2022	Statistical Models for Images, Texture
20	Thu 04/14/2022	Image Synthesis: structured prediction, generative models, GANs, autoregressive models

**applications**

22	Thu 04/21/2022	Fairness / ethics in CV
Week 12		
23	Tue 04/26/2022	How to do research; How to write papers; How to give talks
24	Thu 04/28/2022	Datasets, curation, biases and domain adaptation
Week 13		
25	Tue 05/03/2022	Invited talk
26	Thu 05/05/2022	Final Project Presentations
Week 14		
	Tue 05/10/2022	Final Project Presentations

## CV in practice