



CS231n: Convolutional Neural Networks for Visual Recognition

(index.html)

Schedule and Syllabus

Unless otherwise specified the course lectures and meeting times are Tuesday and Thursday 12pm to 1:20pm in the NVIDIA Auditorium in the Huang Engineering Center. (map (<https://campus-map.stanford.edu/?id=04-080&lat=37.42787956&lng=-122.17429865&zoom=17&srch=nvidia%20auditorium>))

This is the syllabus for the **Spring 2017** iteration of the course. The syllabus for the Winter 2016 (<http://cs231n.stanford.edu/2016/syllabus>) and Winter 2015 (<http://cs231n.stanford.edu/2015/syllabus>) iterations of this course are still available.

Event Type	Date	Description	Course Materials
Lecture 1	Tuesday April 4	Course Introduction Computer vision overview Historical context Course logistics	[slides] (http://cs231n.stanford.edu/slides/2017/cs231n_2017)
Lecture 2	Thursday April 6	Image Classification The data-driven approach K-nearest neighbor Linear classification I	[slides] (http://cs231n.stanford.edu/slides/2017/cs231n_2017) [python/numpy tutorial] (http://cs231n.github.io/python-numpy-tutorial/) [image classification notes] (http://cs231n.github.io/image-classification-notes/) [linear classification notes] (http://cs231n.github.io/linear-classification-notes/)
Lecture 3	Tuesday April 11	Loss Functions and Optimization Linear classification II Higher-level representations, image features Optimization, stochastic gradient descent	[slides] (http://cs231n.stanford.edu/slides/2017/cs231n_2017) [linear classification notes] (http://cs231n.github.io/linear-classification-notes/) [optimization notes] (http://cs231n.github.io/optimization-notes/)
Lecture 4	Thursday April 13	Introduction to Neural Networks Backpropagation Multi-layer Perceptrons The neural viewpoint	[slides] (http://cs231n.stanford.edu/slides/2017/cs231n_2017) [backprop notes] (http://cs231n.github.io/optimization-backprop/) [linear backprop example] (http://cs231n.github.io/linear-backprop-example/) [derivatives notes] (http://cs231n.github.io/derivatives/) (optional) [Efficient BackProp] (http://yann.lecun.com/exdb/publis/papers/efficient-backprop.pdf) (optional) related: [1] (http://colah.github.io/posts/2015-08-Backpropagation/) (http://neuralnetworksanddeeplearning.com/chap2.html) (https://www.youtube.com/watch?v=q0pm3BrIUfo) (optional)
Lecture 5	Tuesday April 18	Convolutional Neural Networks History Convolution and pooling ConvNets outside vision	[slides] (http://cs231n.stanford.edu/slides/2017/cs231n_2017) ConvNet notes (http://cs231n.github.io/convolutional-net/)
Lecture 6	Thursday April 20	Training Neural Networks, part I Activation functions, initialization, dropout, batch normalization	[slides] (http://cs231n.stanford.edu/slides/2017/cs231n_2017) Neural Nets notes 1 (http://cs231n.github.io/neural-networks-notes-1/) Neural Nets notes 2 (http://cs231n.github.io/neural-networks-notes-2/) Neural Nets notes 3 (http://cs231n.github.io/neural-networks-notes-3/) tips/tricks: [1] (http://research.microsoft.com/pubs/192012.pdf), [2] (http://yann.lecun.com/exdb/publis/papers/efficient-backprop.pdf) (optional) [arxiv.org/pdf/1206.5533v2.pdf] (optional) Deep Learning [Nature] (http://www.nature.com/nature/journal/v521/n7553/full/) (optional)
A1 Due	Thursday	Assignment #1 due	[Assignment #1] (http://cs231n.github.io/assignments/)

	April 20	kNN, SVM, SoftMax, two-layer network	
Lecture 7	Tuesday April 25	Training Neural Networks, part II Update rules, ensembles, data augmentation, transfer learning	[slides] (http://cs231n.stanford.edu/slides/2017/cs231n_2017 Neural Nets notes 3 (http://cs231n.github.io/neural-net
Proposal due	Tuesday April 25	Couse Project Proposal due	[proposal description] (http://cs231n.stanford.edu/proj
Lecture 8	Thursday April 27	Deep Learning Software Caffe, Torch, Theano, TensorFlow, Keras, PyTorch, etc	[slides] (http://cs231n.stanford.edu/slides/2017/cs231n_2017
Lecture 9	Tuesday May 2	CNN Architectures AlexNet, VGG, GoogLeNet, ResNet, etc	[slides] (http://cs231n.stanford.edu/slides/2017/cs231n_2017 AlexNet (https://papers.nips.cc/paper/4824-imagenet-deep-convolutional-neural-networks.pdf), VGGNet (https://arxiv.org/abs/1409.1556), GoogLeNet (https://arxiv.org/abs/1409.4842), ResNet (https://arxiv.org/abs/1512.03385)
Lecture 10	Thursday May 4	Recurrent Neural Networks RNN, LSTM, GRU Language modeling Image captioning, visual question answering Soft attention	[slides] (http://cs231n.stanford.edu/slides/2017/cs231n_2017 DL book RNN chapter (http://www.deeplearningbook.org/contents/rnn.html) min-char-rnn (https://gist.github.com/karpathy/d4dee) char-rnn (https://github.com/karpathy/char-rnn), neura (https://github.com/karpathy/neuraltalk2)
A2 Due	Thursday May 4	Assignment #2 due Neural networks, ConvNets	[Assignment #2] (http://cs231n.github.io/assignments
Midterm	Tuesday May 9	In-class midterm Location: Various (https://piazza.com/class/j0vi72697xc49k?cid=1272) (not our usual classroom)	
Lecture 11	Thursday May 11	Detection and Segmentation Semantic segmentation Object detection Instance segmentation	[slides] (http://cs231n.stanford.edu/slides/2017/cs231n_2017
Lecture 12	Tuesday May 16	Visualizing and Understanding Feature visualization and inversion Adversarial examples DeepDream and style transfer	[slides] (http://cs231n.stanford.edu/slides/2017/cs231n_2017 DeepDream (https://github.com/google/deepdream) neural-style (https://github.com/jcjohnson/neural-style) fast-neural-style (https://github.com/jcjohnson/fast-ne
Milestone	Tuesday May 16	Course Project Milestone due	
Lecture 13	Thursday May 18	Generative Models PixelRNN/CNN Variational Autoencoders Generative Adversarial Networks	[slides] (http://cs231n.stanford.edu/slides/2017/cs231n_2017
Lecture 14	Tuesday May 23	Deep Reinforcement Learning Policy gradients, hard attention Q-Learning, Actor-Critic	[slides] (http://cs231n.stanford.edu/slides/2017/cs231n_2017
Lecture 15	Thursday May 25	Real-World Use Convolution algorithms, CPU / GPU Low-precision, model compression	[slides] (http://cs231n.stanford.edu/slides/2017/cs231n_2017
A3 Due	Friday May 26	Assignment #3 due	[Assignment #3] (http://cs231n.github.io/assignments
Guest Lecture	Tuesday May 30	Invited Talk: Ian Goodfellow	[slides] (http://cs231n.stanford.edu/slides/2017/cs231n_2017

Lecture 16	Thursday June 1	Student spotlight talks, conclusions	[slides]
Poster Due	Monday June 5	Poster PDF due	[poster description] (http://cs231n.stanford.edu/project)
Poster Presentation	Tuesday June 6		
Final Project Due	Monday June 12	Final course project due date	[reports]