(http://vision.stanford.edu/) (http://stanford.edu/)

CS231n: Convolutional Neural Networks for Visual Recognition

(index.html)

Schedule and Syllabus

(The syllabus for the (previous) Winter 2015 class offering has been moved here (syllabus_winter2015.html).)
Unless otherwise specified the course lectures and meeting times are Monday, Wednesday 3:00-4:20, Bishop Auditorium in Lathrop Building (map (http://campus-map.stanford.edu/?id=&lat=37.4292007889&lng=-122.167299117&zoom=16&srch=Bishop%20Auditorium))

Update: The class has ended! There are many people to thank for making this class run smoothly: Andrej Karpathy (https://twitter.com/karpathy) for the class notes and lectures, Justin Johnson (http://cs.stanford.edu/people/jcjohns/) the assignments and lectures, Fei-Fei Li (https://twitter.com/drfeifei) for maintaining order, the entire TA team (https://twitter.com/cs231n/status/707760595030781952) for their hard work on grading, office hours, and class logistics, and our wonderful students for their valuable feedback! The final course projects were posted here (http://cs231n.stanford.edu/reports2016.html). You can find the raw lecture slides (Google Presentations) here (https://drive.google.com/open?id=0B62MBK9B2knSY3ZmeHktSEhJNXM) and feel free to use material from any of the slides. Stay in touch on Twitter (https://twitter.com/cs231n) or Reddit r/cs231n (https://www.reddit.com/r/cs231n), and we'll see you again next year!
Update2: We had to take down the links to YouTube videos. Sorry about that. We're working on bringing them back, stay tuned.

Event Type	Date	Description	Course Materials
Lecture	Jan 4	Intro to Computer Vision, historical context.	[slides] (slides/winter1516_lecture1.pdf)
Lecture	Jan 6	Image classification and the data-driven approach k-nearest neighbor Linear classification I	[slides] (slides/winter1516_lecture2.pdf) [video] [python/numpy tutorial] (http://cs231n.github.io/python-numpy-tutorial) [image classification notes] (http://cs231n.github.io/classification) [linear classification notes] (http://cs231n.github.io/linear-classify)
Lecture	Jan 11	Linear classification II Higher-level representations, image features Optimization, stochastic gradient descent	[slides] (slides/winter1516_lecture3.pdf) [video] [linear classification notes] (http://cs231n.github.io/linear-classify) [optimization notes] (http://cs231n.github.io/optimization-1)

Lecture	Jan 13	Backpropagation Introduction to neural networks	[slides] (slides/winter1516_lecture4.pdf) [video] [backprop notes] (http://cs231n.github.io/optimization-2) [Efficient BackProp] (http://yann.lecun.com/exdb/publis/pdf/lecun-98b.pdf) (optional) related: [1] (http://colah.github.io/posts/2015-08-Backprop/), [2] (http://neuralnetworksanddeeplearning.com/chap2.html), [3] (https://www.youtube.com/watch?v=q0pm3BrIUFo) (optional)
Lecture	Jan 18	Holiday; No class.	
A1 Due	Jan 20	Assignment #1 (kNN/SVM/Softmax/2-Layer Net) Due date	[Assignment #1] (http://cs231n.github.io/assignments2016/assignment1/)
Lecture	Jan 20	Training Neural Networks Part 1 activation functions, weight initialization, gradient flow, batch normalization babysitting the learning process, hyperparameter optimization	[slides] (slides/winter1516_lecture5.pdf) [video] Neural Nets notes 1 (http://cs231n.github.io/neural-networks-1/) Neural Nets notes 2 (http://cs231n.github.io/neural-networks-2/) Neural Nets notes 3 (http://cs231n.github.io/neural-networks-3/) tips/tricks: [1] (http://research.microsoft.com/pubs/192769/tricks-2012.pdf), [2] (http://yann.lecun.com/exdb/publis/pdf/lecun-98b.pdf), [3] (http://arxiv.org/pdf/1206.5533v2.pdf) (optional) Deep Learning [Nature] (http://www.nature.com/nature/journal/v521/n7553/full/nature14539.html) (optional)
Lecture	Jan 25	Training Neural Networks Part 2: parameter updates, ensembles, dropout Convolutional Neural Networks: intro	[slides] (slides/winter1516_lecture6.pdf) [video] Neural Nets notes 3 (http://cs231n.github.io/neural-networks-3/)
Lecture	Jan 27	Convolutional Neural Networks: architectures, convolution / pooling layers Case study of ImageNet challenge winning ConvNets	[slides] (slides/winter1516_lecture7.pdf) [video] ConvNet notes (http://cs231n.github.io/convolutional-networks/)
Proposal due	Jan 30	Couse Project Proposal due	[proposal description] (http://cs231n.stanford.edu/project.html)
Lecture	Feb 1	ConvNets for spatial localization Object detection	[slides] (slides/winter1516_lecture8.pdf) [video]

Lecture	Feb 3	Understanding and visualizing Convolutional Neural Networks Backprop into image: Visualizations, deep dream, artistic style transfer Adversarial fooling examples	[slides] (slides/winter1516_lecture9.pdf) [video]
A2 Due	Feb 5	Assignment #2 (Neural Nets) Due date	[Assignment #2] (http://cs231n.github.io/assignments2016/assignment2/)
Lecture	Feb 8	Recurrent Neural Networks (RNN), Long Short Term Memory (LSTM) RNN language models Image captioning	[slides] (slides/winter1516_lecture10.pdf) [video] DL book RNN chapter (http://www.deeplearningbook.org/contents/rnn.html) (optional) min-char-rnn (https://gist.github.com/karpathy/d4dee566867f8291f086), char-rnn (https://github.com/karpathy/char-rnn), neuraltalk2 (https://github.com/karpathy/neuraltalk2)
Midterm	Feb 10	In-class midterm	
Lecture	Feb 15	Holiday; No class.	
Milestone	**Feb 17**	Course Project Milestone	
Lecture	Feb 17	Training ConvNets in practice Data augmentation, transfer learning Distributed training, CPU/GPU bottlenecks Efficient convolutions	[slides] (slides/winter1516_lecture11.pdf) [video]
Lecture	Feb 22	Overview of Caffe/Torch/Theano/TensorFlow	[slides] (slides/winter1516_lecture12.pdf) [video]
A3 Due	Feb 24	Assignment #3 (ConvNets) Due date	[Assignment #3] (http://cs231n.github.io/assignments2016/assignment3/)
Lecture	Feb 24	Segmentation Soft attention models Spatial transformer networks	[slides] (slides/winter1516_lecture13.pdf) [video]
Lecture	Feb 29	ConvNets for videos Unsupervised learning	[slides] (slides/winter1516_lecture14.pdf) [video]

Lecture	Mar 2	Invited Talk: Jeff Dean (https://en.wikipedia.org/wiki/Jeff_Dean_(computer_scientist)) [video]	
Lecture	Mar 7	Student spotlight talks, conclusions	[slides] (slides/winter1516_lecture15.pdf)
Poster Presentation	Mar 9		
Final Project Due	**Mar 13**	Final course project due date	[reports] (http://cs231n.stanford.edu/reports2016.html)