Lecture	Date	Part 1	Part 2
1	1/13/17	Logistics	1. Introduction to Image Representations, 2. Intensity based representation - Sampling and Quantization, 3. Transform domain representations – Fourier Representation, 4. Histogram representations, 5. Image gradients – a. edge maps, b. image gradient operators
2	1/20/17	1. Image representations – pixels, edges, histograms 2. Gradient histograms a. Histogram of oriented gradients b. Case study: Deformable part-based models 3. Decision making in the feature space a. Bayesian decision making b. Hyper-Planar decision making 4. Introducing migration towards neural computer vision	1. Introduction to supervised learning (motivation through a dataset) 2. Linear models (linear regression) 3. Least squares and analytic solution 4. Maximum likelihood interpretation of Least squares
3	1/27/17	1. Basis function expansion – overfitting 2. L1, L2 regularization – introduction 3. Geometry of regularizations (L1 and L2) 4. Cross validation 5. Generalization Gap	1. Gradient descent (optimization) 2. Non-convex error surfaces 3. Stochastic, batch and online gradient descent 4. Second order gradient decent a. Hessians b. Newton's method c. AdaGrad d. RMSProp 5. Momentum a. Polyak Momentum b. Nesterov's accelerated gradient
	Mini project 1: Implement linear regression. Posted on 1/20/17 Due on 2/3/17		
4	2/3/17	1. Introduction Artificial Neural Networks a. Linear regression as a neuron 2. The perceptron a. Rosenblatt perceptron b. The Perceptron algorithm 3. The logistic neuron a. Sigmoid activated neuron b. Multi-class extension through softmax.	1. Intro to Multi-layer neural networks a. Intro to MLNN b. XOR problem and solution 2. Backprop algorithm 3. Beyond backprop a. Batch normalization b. New activations i. ReLU, pReLU and leaky ReLU ii. Maxout networks
	Mini project 2: Implement MLNN and backprop algorithm. Posted on 2/1/17 Due on 2/10/17 Extended to 2/14/17		

	Project Proposal is Posted. Due on 2/17/17 Resubmission allowed until 2/24/2017.		
5	2/10/2017	Midterm 1	Practical session: Introduction to Yann toolbox.
	Mini project 3: Momentum, second order gradient descent and the yann toolbox. Posted 2/10/2017, Due on 2/17/2017		
6	2/17/17	1. Introduction to the convpool layer 2. Sparsely connected neurons 3. Weight sharing 4. Convolution operation 5. Pooling operation 6. The convolutional neural network	1. LeNet 2. AlexNet 3. Dropouts and ensemble learning (will repeat next class)
	Mini project 4: Convolutional neural network and the SVHN dataset, with memory and time constraints. Posted 2/17/2017, Due on 2/24/2017 Extended to 3/3/17		
	Pool of papers for paper discussions will be announced. Will be posted on 2/24/2017, Bidding starts on 3/3/2017		
7	2/24/17	1. Dropouts 2. Continuing CNN case studies: a. Googlenet and inception module b. VGG-19 c. Residual net and passing gradients through (guest lecture by Mr. Parag Chandakkar)	1. Generality of neural image features 2. Dark-knowledge distillation.
	Mini project 5: Pre-trained networks and generality – Posted on 2/23/2017. Due on 3/17/2017		
	Project proposal acceptance will be announced on 3/5/2017.		
8	3/3/17	1. Mentee networks and fitnets 2. Networks that generate images I - Autoencoders	1. Networks that generate images II – Generative adversarial networks
	Mini project 6a: Denoising Autoencoders. Announced on 3/3/2017, will be due on 3/24/2017 Mini project 6b: Generative Adversarial Networks. Announced on 3/3/2017, will be due on 3/24/2017		
9	3/17/17	Midterm 2	Paper presentation and discussion
10-15	Paper presentations		
14-15	Project is due, and “interviews” with the TA/instructors for the project.		