CS-4981 Deep Learning In Signal Processing				
Draft Outline				
Week	Day 1	Lab	Day 2	Project Milestones
1	Course Introduction; DL Intro: classification/regression, loss functions: binary cross-entropy/MSE, deep networks, backpropagation	5%: Get a Rosie account; MATLAB Deep Learning Toolbox: Run "Get Started" Examples	DSP Intro: Signal types (audio, position/acceleration, image, video, …), Nyquist, sampling, quantization, LTI (linear, time-invariant) systems and difference equations, detection/ enhancement/ denoising	
2	DL: The training pipeline, optimization algorithms (SGD, ADAM), overfitting, confusion matrices (accuracy, precision, recall, etc.)	10%: Rosie / MATLAB Lab TBD	DSP: system response, convolution, as projection onto basis functions (linear algebra)	5%: Topic Selection, Identify 3+ References
3	DL: Fully connected layers (FC), activations (nonlinear), NN as robust function approximation, generalization, basic network structures	10%: Rosie / MATLAB Lab TBD	DSP: frequency content and response, Discrete Fourier Transform (DFT), FFT	
4	DL: Convolutional layers (conv1d, etc.); pooling layers	10%: Rosie / MATLAB Lab TBD	TBD / catch up	15% Background Paper: Summarize references, propose implementation approach (data source, outline work to be done)
5	DL: Layers for robustness: dropout, batchnorm; improved error measures (perceptual, …) and backprop.	Project work	DSP: spectrograms and windowing	
6	DL: Pruning and model quantization	Project work	DSP: inverting the spectrogram, perfect reconstruction	10% Preliminary results, updated work plan
7	DL: TBD: Autoencoders, data augmentation, transfer learning, or …	Project work	TBD	10% Presentation Draft: Slides and notes, mostly complete, final results may be pending
8				
9	Project Presentations			10% Presentation execution
10				15% Writeup of final results
11	Finals Week			
	https://msoe.dev/	Rosie guide		
	https://durant.io/	Professor's web site, schedule, course materials		
	https://d2l.ai/	Free deep learning textbook for more information for project, etc.		
	https://www.dspguide.com/	Free digital signal processing textbook for more information		