Assignment 7 (Due Monday March 19)

Deep learning exercise.

Create a simple data set of 10X10 images of letters that consist of horizontal and vertical aligned rectangles such as E, F, H, I, L, and T. Use gray scale 0-255. Images are black and white but using a scale allows you to modify the shade of a pixel.

Create a simple network with two convolution kernels followed by a fully connected layer. Decide to classify images by adding Softmax or to reconstruct images.

Select one of the following two problems.

1. If you classify
   a. What classification does a random image get? Try several random images.
   b. Reconstruct images using only the first two singular vectors. Is the reconstructed image still classified correctly?
   c. Try fooling the network by slightly modifying an image. Explain how you slightly modified the image and the resulting classification.

2. If you train the network to reproduce the image
   a. Explore what each kernel learns.
   b. Train the network twice using different starting random weights. Do the gates learn the same things?