Homework 10: Due Fri 10-19-2018
Total Points (30 pts)

1. (10 pts) Watch the video Deep Learning for Computer Vision by Andrej Karpath. (69 min).[1]

   (a) How do current methods for computer vision that use ConvNets (convolution neural networks) defer from previous methods.

   (b) Name three applications of ConvNets.

   (c) Name the four commonly used types of layers in ConvNets.

   (d) Generally speaking, do ConvNets have more or fewer parameters than feed-forward networks. Explain.

2. (20 pts) Train LeNet on `notMNIST_train_AB` and use `notMNIST_test_AB` to evaluate the accuracy of LeNet. Compare LeNet's accuracy rate to a baseline accuracy rate and also to a human accuracy rate.

   Note: `notMNIST_train_AB` contains 100,000 images. LeNet will take a long time to train on such a large dataset. Start by using a random sample of 100 or 1,000 images to debug your code. You should be able to drive the training error down to nearly zero. When you are satisfied your code is working properly, increase the number of images to 10,000 or 100,000 images. I used `gauss.csse.rose-hulman.edu`. My code used approximately 45 CPU cores and took 3 minutes to complete. JupyterHub makes it easy to use gauss through a web browser.

   Random Sample:

```
n = 1000
perm = np.random.permutation(len(X))[0:n]
X = X[perm]
P = P[perm]
print('X shape',X.shape)
print('P shape',P.shape)
```

   Accessing gauss using JupyterHub:

   1. First ssh into gauss using your Rose-Hulman login credentials. This will automatically create a home directory on gauss for you.
   2. Use a web browser to browse to https://gauss.csse.rose-hulman.edu:8000/hub/login and login.
   3. Use `upload` button (top right) to upload files to gauss.

   Path to notMNIST data on gauss: `/work/shibberu/MA490_DeepLearning/Data/notMNIST/`

[1] https://www.youtube.com/watch?v=u6aEYuemt0M