ECE 532 Fall 2015 Project/Lab Proposal

Tentative Title: Deep Learning for Classification

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Brief Overview of Topic and Motivation:

Our team is interested in exploring a machine learning topic which can be applied to the problem of image classification. Due to the ubiquity of image data in everyday life - from object recognition to medical imaging, we are motivated to research techniques that are used to learn image data. In our initial investigations, we discovered that deep learning neural networks are being used to solve the most complex classification processes, processes like Computer Vision and Speech recognition where we seek to identify intuitive classifications of the data without fully understanding what features define those classifications. We believe that our project will largely focus on image classification. Given a dataset of images, we will attempt to use a deep learning network to separate the images into two categories e.g. motorcycle and not motorcycle.

Core Concepts:

What concepts and tools may be involved in your project/lab?

We seek to design an image classification exercise which uses deep learning methods such as: convolutional neural networks, the perceptron algorithm, support vector machines, and back propagation.

From what we have covered so far, our study of least-squares classification applies to this project. In particular, the Fisher Iris homework problem motivates this project topic in that we would like to explore classification algorithms that improve upon least-squares. Additionally the bank note forgery example we examined in class provides an additional motivation where real world accuracy is crucial.

Related Papers, Datasets, or Resources:

List any that you have found so far (titles, urls, etc).

- Deep Learning (Course Number 11-785) at Carnegie Mellon: http://deeplearning.cs.cmu.edu/
- “The Perceptron: A Probabilistic Model for Information Storage and Organization in the Brain” http://deeplearning.cs.cmu.edu/pdfs/Rosenblatt.perceptron.pdf
- “ImageNet Classification with Deep Convolutional Neural Networks” http://arxiv.org/pdf/1311.2901v3.pdf

- “Dropout: A Simple Way to Prevent Neural Networks from Overfitting” http://www.cs.toronto.edu/~hinton/absps/JMLRdropout.pdf
- “Visualizing and Understanding Convolutional Networks” http://arxiv.org/pdf/1311.2901v3.pdf
- “Qualcomm’s Scene-detecting Smartphone System is Almost Here” (IEEE Spectrum) http://spectrum.ieee.org/computing/software/qualcomms-scenedetecting-smartphone-system-is-almost-here
- Deep Learning: Intelligence from Big Data Panel at Stanford https://youtu.be/czLI3oLDe8M

Real-world datasets are highly desirable, so please try to find some that are a good fit for your project (not necessary at this stage, but hopefully you will have a good dataset for your final project).

The following data sets are appropriate for our image classification problem: MNIST Database (handwritten numbers), Fisher’s iris data set, and many more image classification data sets are available at http://deeplearning.net/datasets/.