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Springboard Capstone 2 Proposal: Identifying Handwriting Samples with Neural Networks

1. Background and Problem to be Solved

Image detection is a good entry point for learning about the use of neural networks, which I aim to learn more about in this project. Because image data is typically harder to work with than relational, or flat data is, more sophisticated forms of analysis are required. That said, massive computational power is not necessarily needed, as neural networks can perform the desired analysis. Simply put, the problem to be solved in my project is image detection (of handwritten digits, in this case) by using the branch of machine learning that deals with image detection.

2. Clients and Their Interest

Clients in this project cover a broad range of interests. Any organization that could benefit from automated recognition of handwritten digits. A few examples would be medical facilities (recognizing entries on forms completed by hand) and banks (for recognizing checks or other forms).

3. Data and Acquisition

Relevant data has been collected by the U.S. National Institute of Standards and Technology. The dataset I will use is a well-known subset called MNIST, which contains 70,000 images of handwritten digits. The data has been previously separated into training and test data, and each set comes with labels, too. I accessed it here: http://yann.lecun.com/exdb/mnist/.

While I will not have to do much data wrangling, I will need to write a brief program to read in the data before analysis. The images of course do not appear in a more familiar dataframe format, so I will write code to load the data. More specifically, my work will be to vectorize the images and confirm that the size (in pixels) of each is the same.

4. Approach

I will aim to solve this problem by first building a logistic-regression model, and perhaps a random forest as well. The logistic regression will serve as a baseline whose results can be compared to those of the neural networks. For the networks, I will first use a classical neural network (first with one hidden layer, and then with two hidden layers) with regularization. Time permitting, I will then try a deep neural network. I will assess results by comparing the

accuracy of each approach and also possibly by using a matrix that indicates pixel accuracy through shading (rather than numerical values) along the diagonal of the matrix.

5. Deliverables

My deliverables will include (1) all relevant software code (2) a paper discussing processes and results, and (3) a slide deck. These items will be stored on Github.