Computer Vision to Identify Digits

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# Which Domain?

The data will be from the classification domain of data science problems.

1. https://www.kaggle.com/learn/deep-learning The Kaggle course on deep learning, teaching participants how to use Computer Vision and deep learning to complete classification problems.
2. https://hackernoon.com/latest-deep-learning-ocr-with-keras-and-supervisely-in-15-minutes-34aecd630ed8 This is a short overview of how to use Keras to build a convolutional neural network to recognize text.
3. https://www.cs.virginia.edu/dwu4/papers/HonorThesis.pdf Thesis written by a student which gives an overview to the background and history as well as related work of text recognition
4. https://towardsdatascience.com/build-a-handwritten-text-recognition-system-using-tensorflow-2326a3487cd5 A tutorial on how to build a network to detect handwritten text.
5. https://arxiv.org/pdf/1312.4569.pdf explanation of how dropout works in handwritten text recognition. This was briefly referenced within the Kaggle deep learning course, and it provides more information and context to what dropout does and how it affects the results.
6. http://openaccess.thecvf.com/content\_cvpr\_2016/papers/Poznanski\_CNN-N-Gram\_for\_Handwriting\_CVPR\_2016\_paper.pdf Overview of the landscape and use of N-Grams with convolutional neural network to evaluate the N-Gram as part of common parlance
7. https://arxiv.org/pdf/1408.5882.pdf Overview of CNN's. CNNs were originally created for postal code identification, and this goes into detail of using them on full sentences
8. https://www.tensorflow.org/tutorials/keras/basic\_classification The Google sponsored classification tutorial on image classification
9. https://www.digitalocean.com/community/tutorials/how-to-build-a-neural-network-to-recognize-handwritten-digits-with-tensorflow Perhaps the most important resource in the list. This is a tutorial on how to deploy this on a remote server.
10. https://niektemme.com/2016/02/21/tensorflow-handwriting/ Another great tutorial on how to create your own neural network to complete text recognition.

# Which Data?

I will be looking at the Modified National Institute of Standards and Technology (MINST) dataset for hand written images.

https://www.kaggle.com/c/digit-recognizer

# Research Questions? Benefits? Why analyze these data?

The research question being asked here is how efficiently can a computer recognize hand written text. The benefits can be wide and far reaching. The ability to classify and recognize hand written text accurately can in some instances remove thousands of man hours of work. The ability to intelligently capture and recognize text within business documents can remove process latency. Character recognition can automatically extract value and understanding from documents which arrive from almost any channel in any format.

# What Method?

Keras model with a CNN.

# Potential Issues?

I am unfamiliar with the functions to vectorize images and process them. I am also unfamiliar with writing my own code for neural networks, and I had to take the Kaggle tutorial to understand the challenges and where I need to investigate further.

# Concluding Remarks

CNN Networks are great tools for classification and computer vision. I will be working through training and creating a repeatable process in which I can apply to my own situations as they arise at work.