**Use CNN to identify digits and letters**

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**Abstract:**

In lab 6 we learned how to use SVM to identify digits and letters. But we simply lumped the letters into a single class, and even remove those confusing letters such as o/O, i/I ,l/L to increase the accuracy. Since we what to identify all digits and letters in totally 36 classes, and SVM performed poorly, that is, spent a great deal of time (nearly 15 minutes) to obtain an accuracy around 82.82%, we want to use CNN to do the same problem and expect better result. So our data set is still **EMNIST[1]** and aim to gain an accuracy higher than 0.82 in shorter time.

**Milestones:**

In the program, we will use keras base on tensorflow as the model. In this model, we will try different ways to get better result.

1, extract the digits figures and letters figures and their respective lables from EMNIST[1] dataset.

2, stack digits and letters figures together and divide them into training data and testing data.

3, use suitable parameters and boundary condition to train the keras model with suitable layers.

4, fit the testing data using the model, try batch normalization[2], dropout[3], and data augmentation, evaluate their impact to the result.

5, draw a confusion matrix, base on the confusion matrix, determine what class weight5 we should use.

6, save the trained model and write another program to identify our own hand writing letters and digits.

**Reference:**

# EMNIST: an extension of MNIST to handwritten letters; https://arxiv.org/abs/1702.05373v1

1. Batch Normalization: Accelerating Deep Network Training by Reducing Internal Covariate Shift; https://arxiv.org/pdf/1502.03167v3.pdf
2. Dropout: A Simple Way to Prevent Neural Networks from Overfitting; http://jmlr.org/papers/volume15/srivastava14a.old/srivastava14a.pdf