6.036 Project 2

Kevin

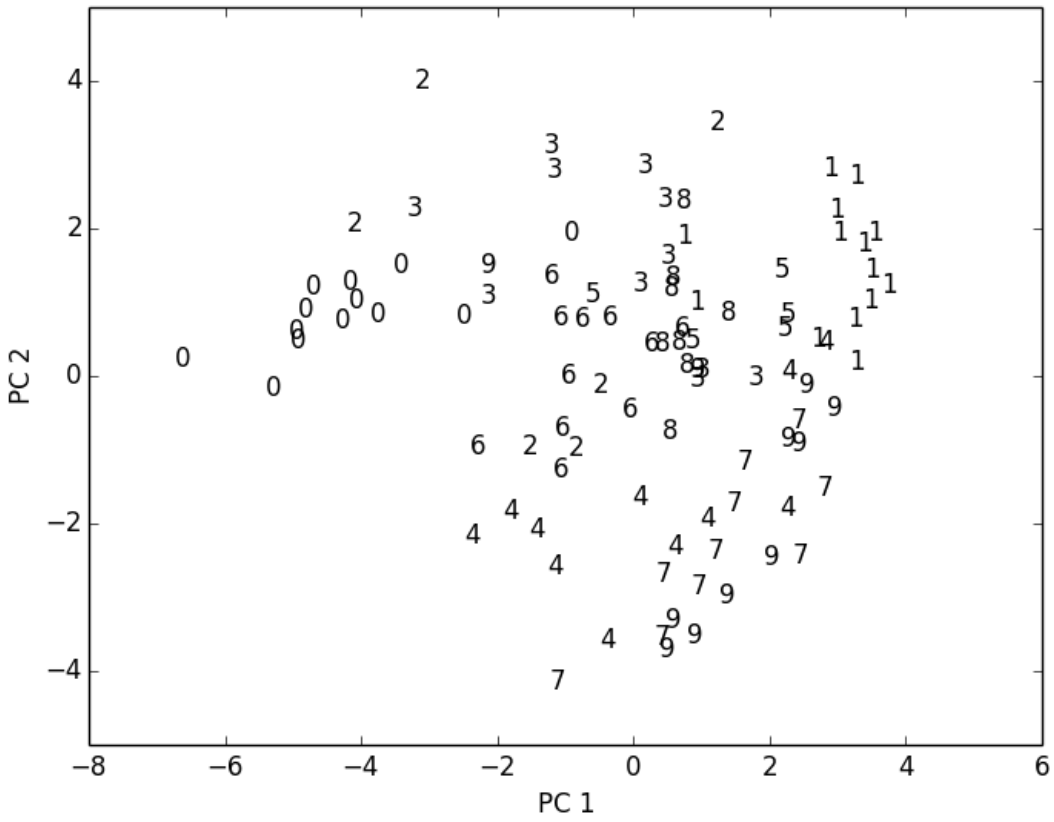
Due April 4th, 2016

I Multinomial/Softmax Regression and Gradient Descent

3. The error from the test set I got was 0.1004.

II Using manually crafted features

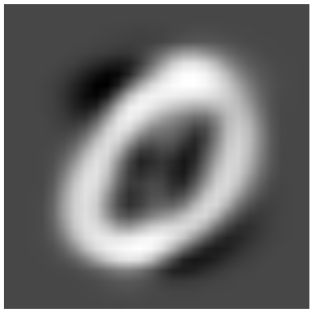
2. The error from PCA that I got was 0.1361.



3.

4.



5. The mapping for $[x_1, x_2]$ would be $[x_1^2, x_2^2, \sqrt{(2)} * x_1 * x_2, \sqrt{(2)} * x_1, \sqrt{(2)} * x_2, 1]$.

6. The error from Quadratic features that I got was 0.0368.

III Classification using deep neural networks

1b. The accuracy on test sets I got up to was .9816. The parameters I changed were the numclasses to 18, the learning rate to 0.55, the momentum to 0.8, and the batchsize to 40. Other things I tried was to raise the numclasses even more along with the batch size, but this actually hurt the accuracy instead of helping it out. This was the same for the learning rate.

2a. The code I used was :

```
model = Sequential()
model.add(Convolution2D(nb_filter=32,nb_row=3,nb_col=3,input_shape=(1, X_train.sha
model.add(Activation("relu"))
model.add(MaxPooling2D(pool_size=(2, 2)))
model.add(Convolution2D(nb_filter=64,nb_row=3,nb_col=3,input_shape=(1, X_train.sha
model.add(Activation("relu"))
model.add(MaxPooling2D(pool_size=(2, 2)))
model.add(Flatten())
model.add(Dense(output_dim=128, input_dim=784))
model.add(Dropout(0.5))
model.add(Dense(output_dim=10))
model.add(Activation("softmax"))
```