Deep Learning Computer Vision

Project. Group 1

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Task 1. Architecture

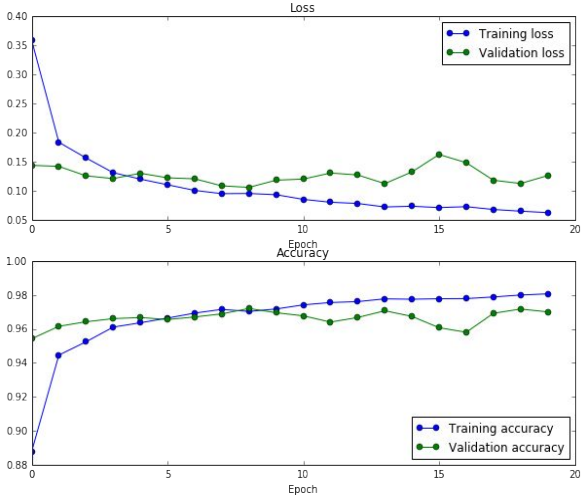
theano

TensorFlow

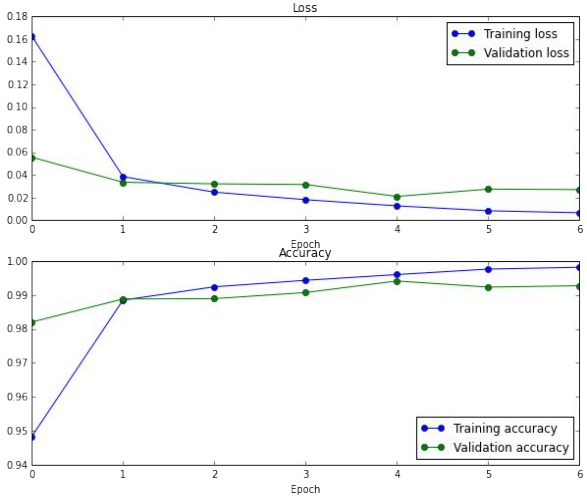
CPU Intel Core i5

Task 1. Architecture

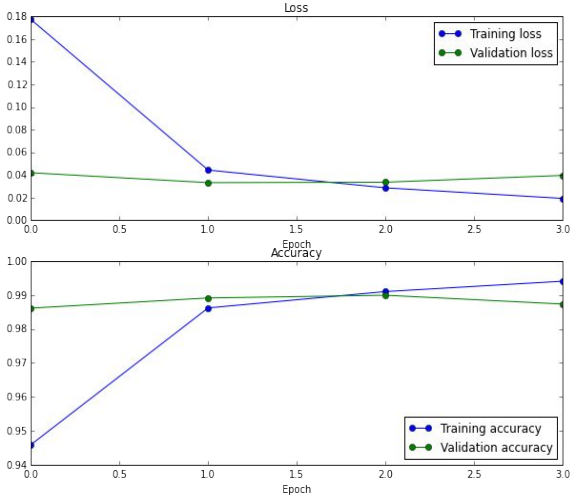
- Dense with relu (x2)
- Dense with softmax

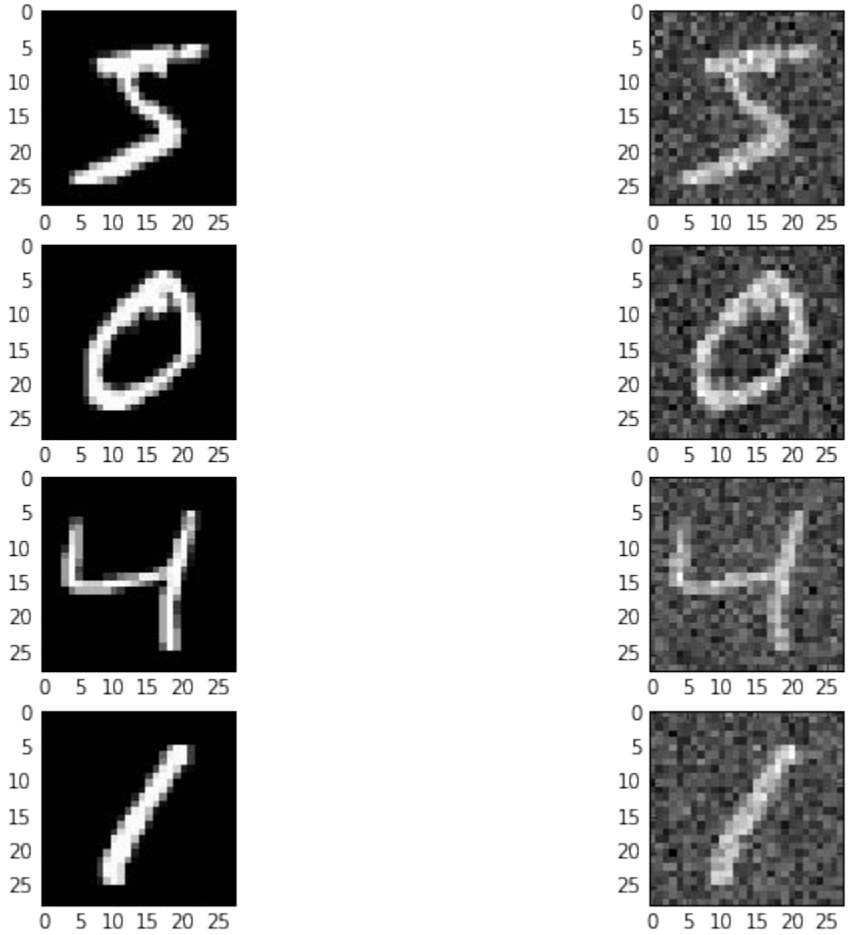


- Convolutional (x3)
- Dense with relu
- Dense with softmax



- Convolutional (x3)
- Dense with relu
- Dense with softmax
- Noise




0 5 10 15 20 25
0 5 10 15 20 25
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Task 2. Training

MNIST dataset

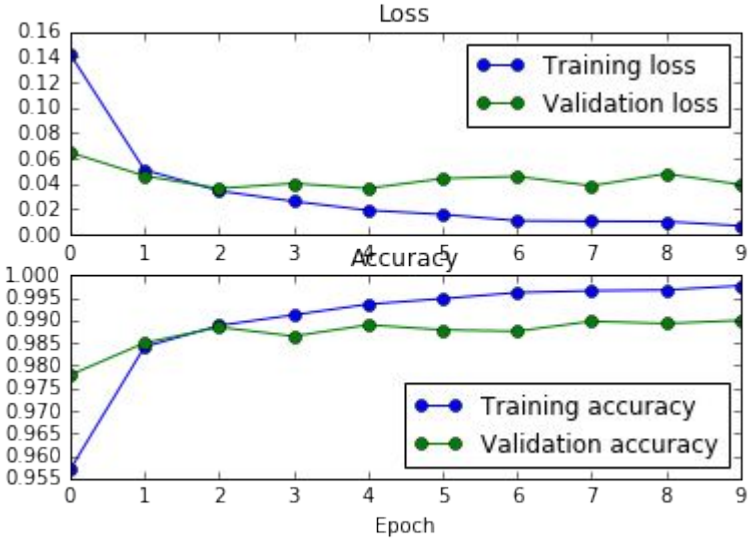
1 convolutional layer and
2 fully connected layers

CIFAR-10 dataset

1 convolutional layer and
2 fully connected layers

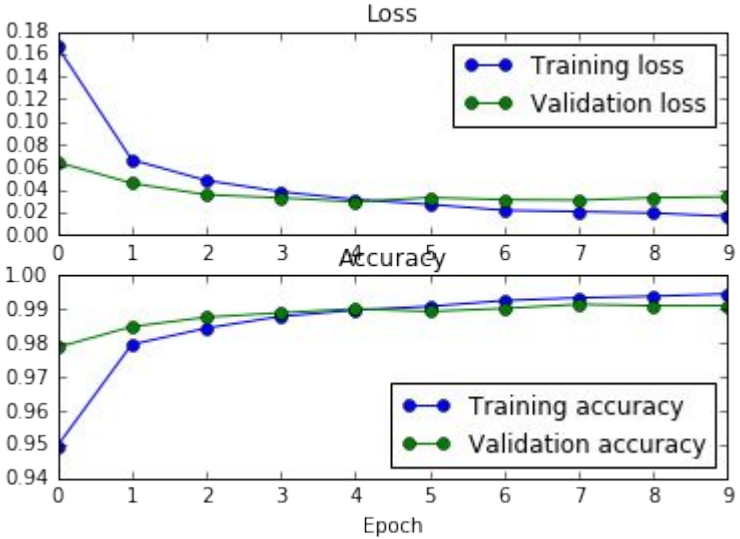
Training MNIST with drop out

Drop out: 0.2



Accuracy: 0.86
Loss: 0.04

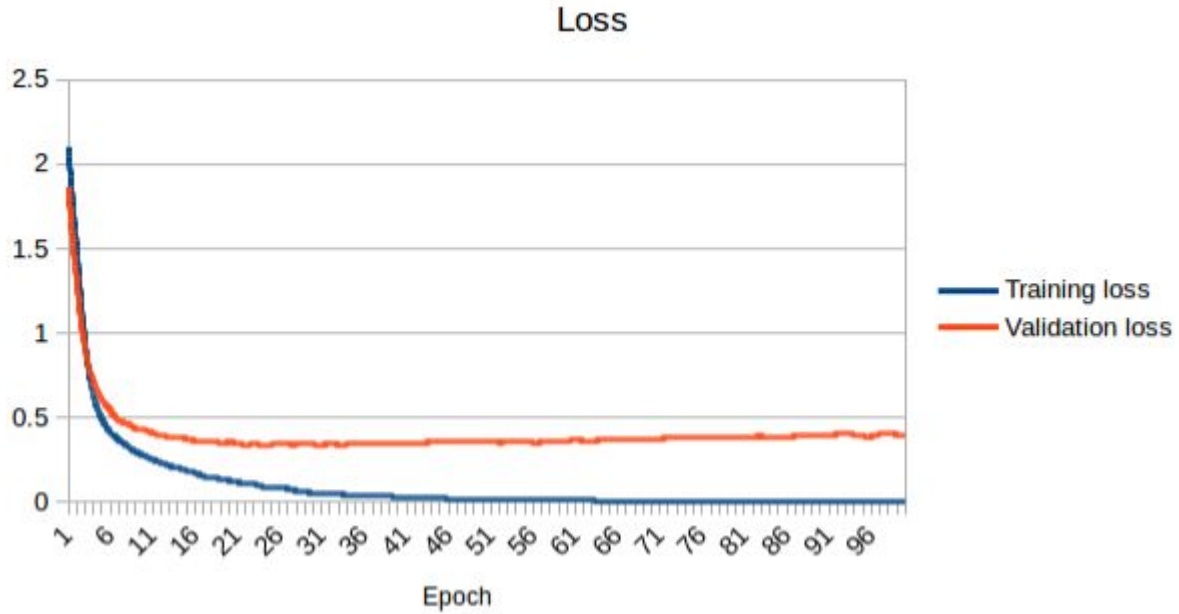
Drop out: 0.9



Accuracy: 0.99
Loss: 0.04

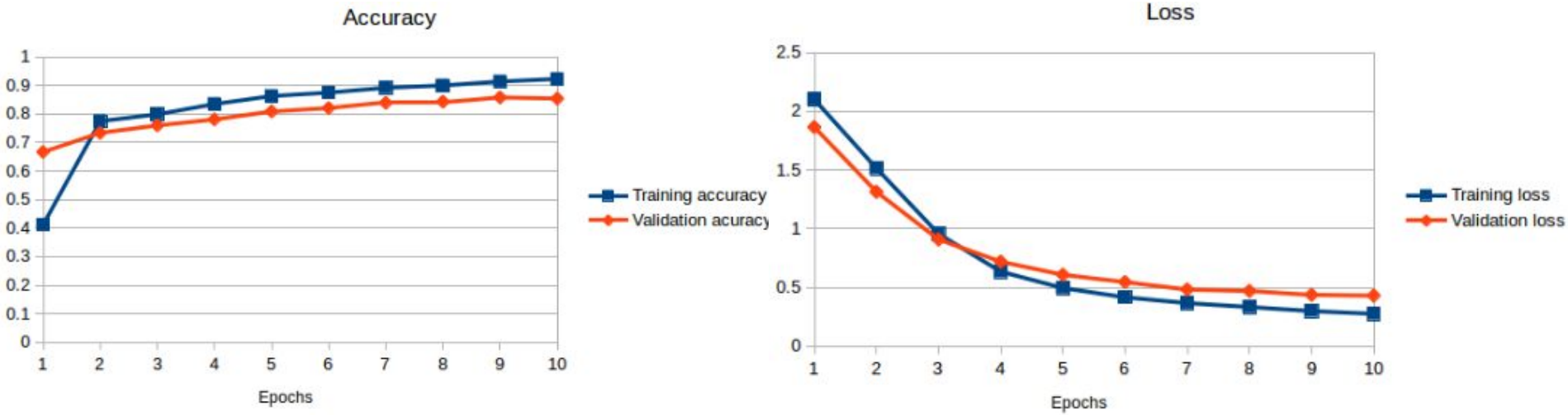
Training MNIST to overfit

MNIST database → 1 convolutional layer and 2 fully connected layers



Training MNIST with drop out

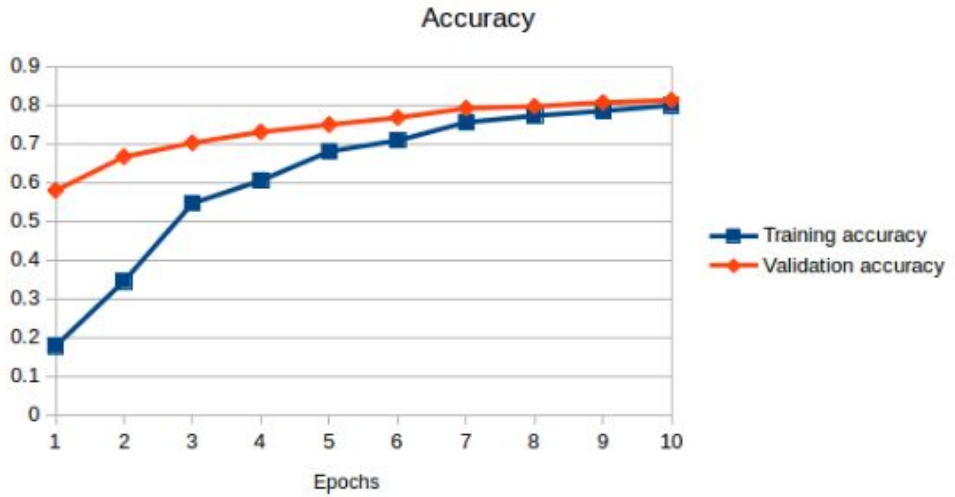
Drop out: 0.2

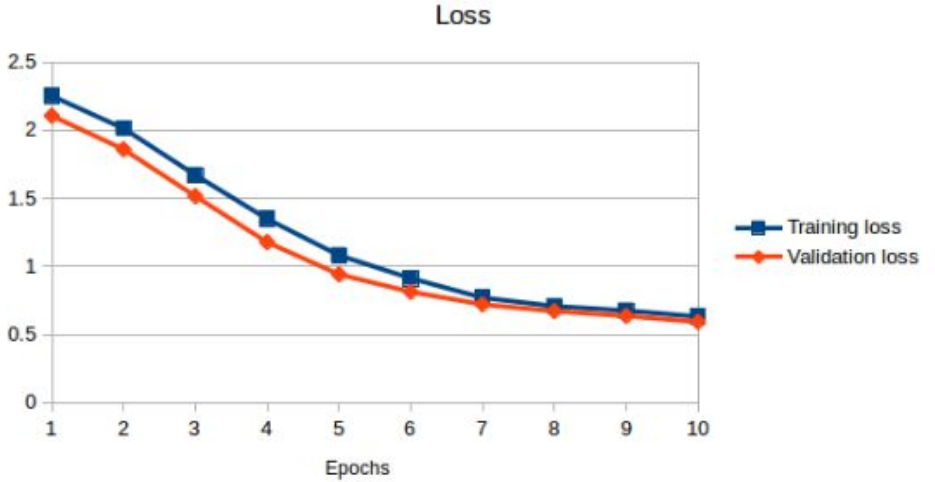


Dropout: A Simple Way to Prevent Neural Networks from Overfitting
Nitish Srivastava, Geoffrey Hinton, Alex Krizhevsky, Ilya Sutskever, Ruslan Salakhutdinov
Journal of Machine Learning Research 15 (2014) 1929-1958

Training MNIST with drop out

Drop out: 0.9





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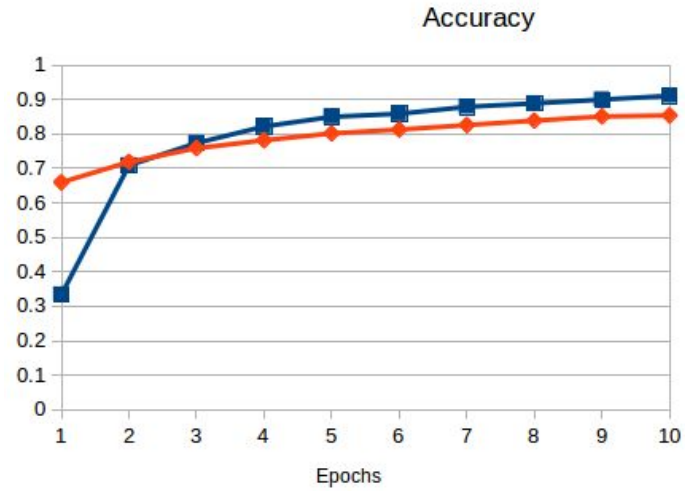
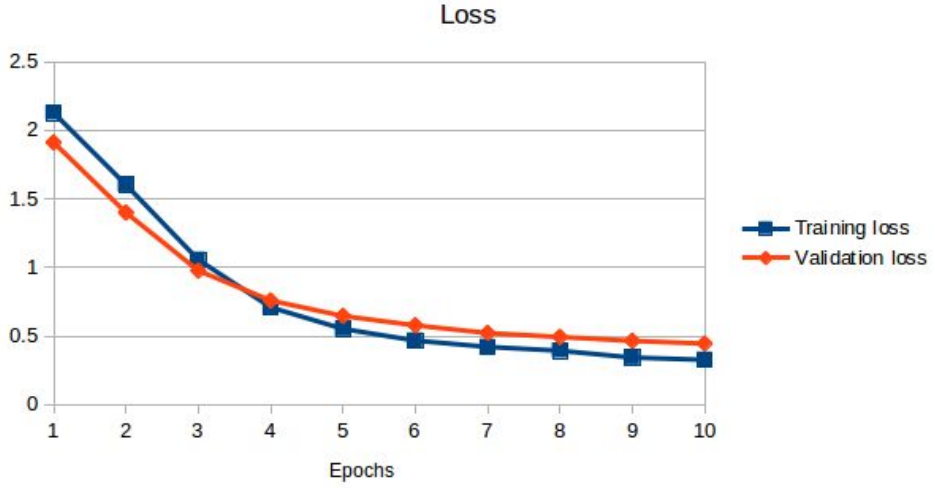
Training MNIST with drop out

Drop out: 0.5





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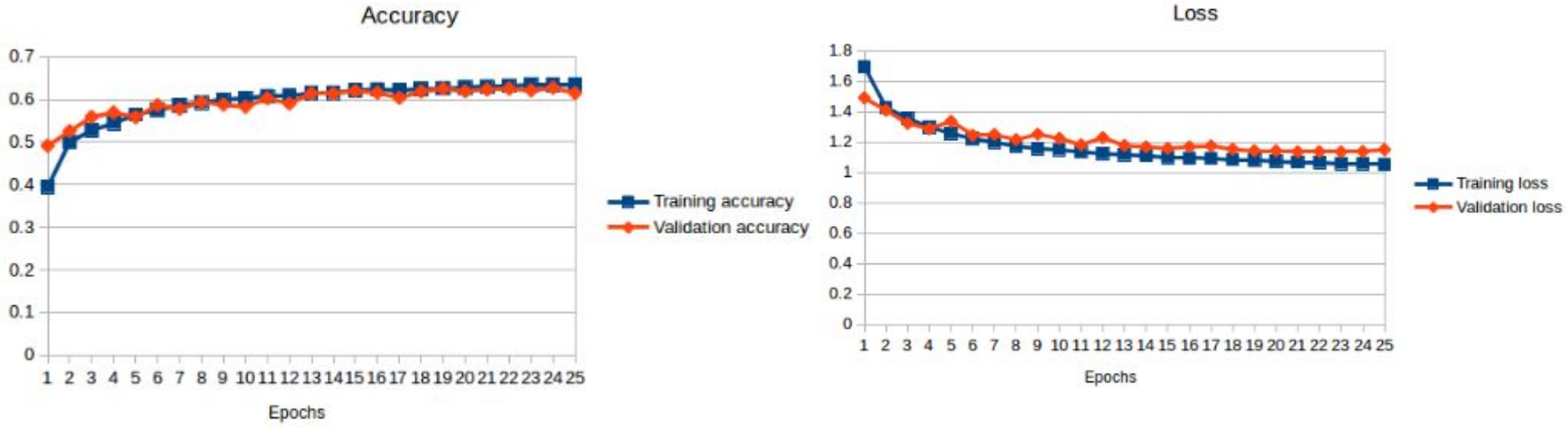
Training CIFAR-10 with drop out

Drop out: 0.5



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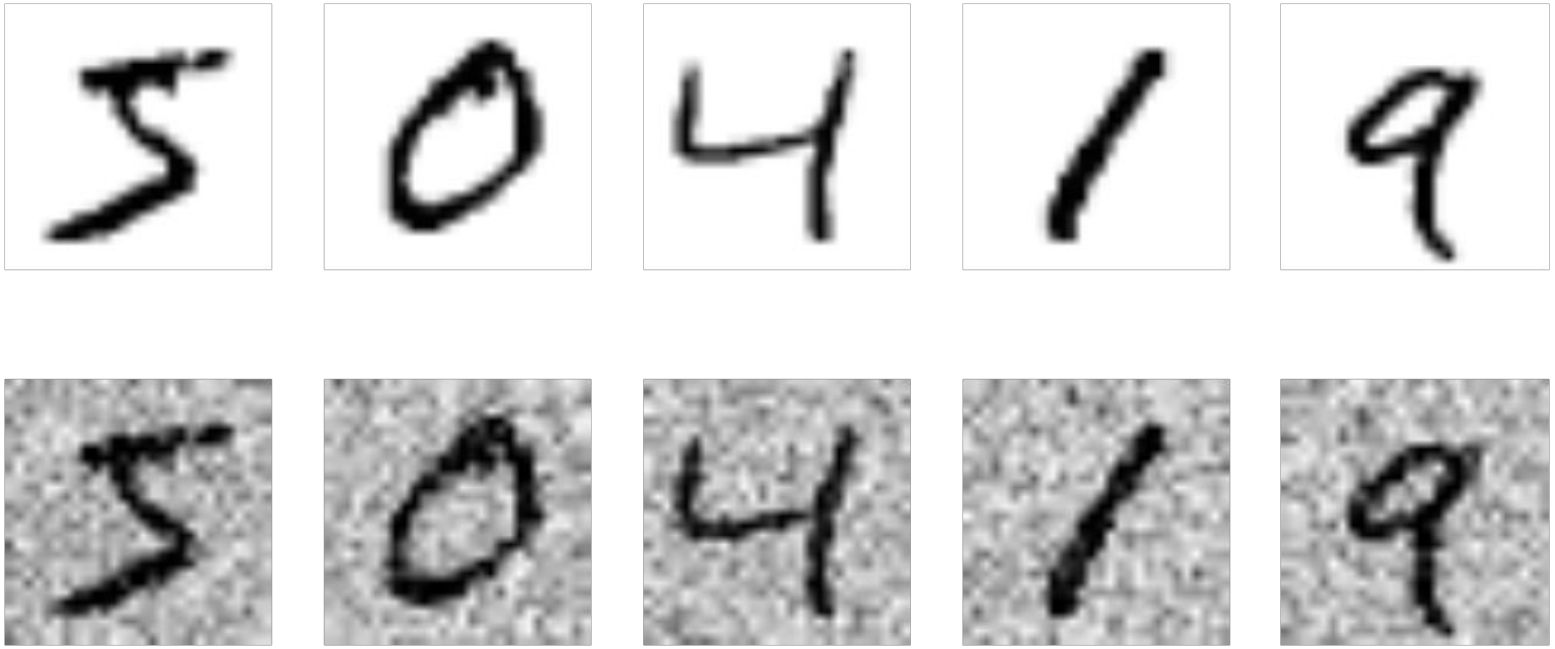
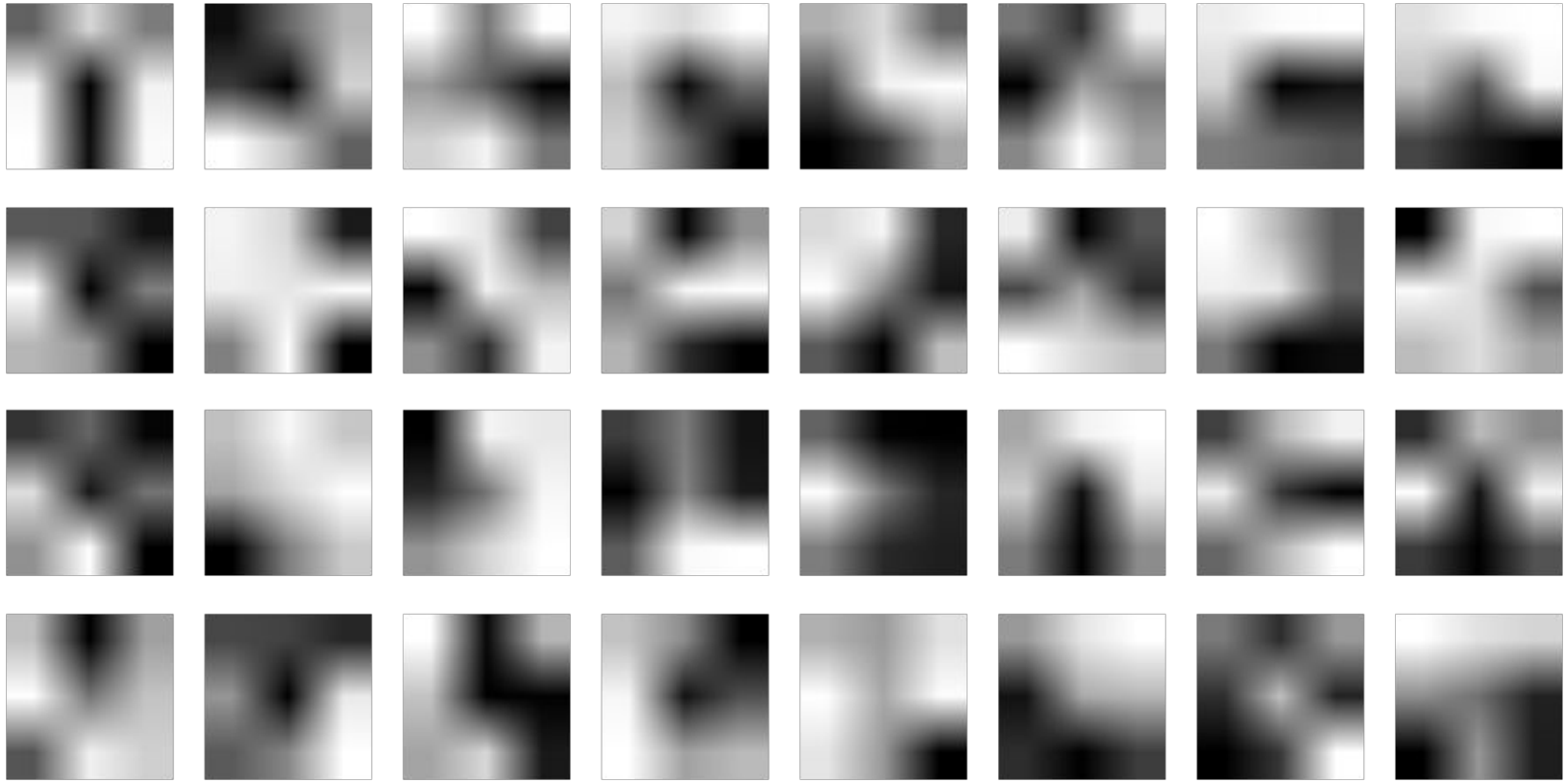
Task 3. Training MNIST with noise



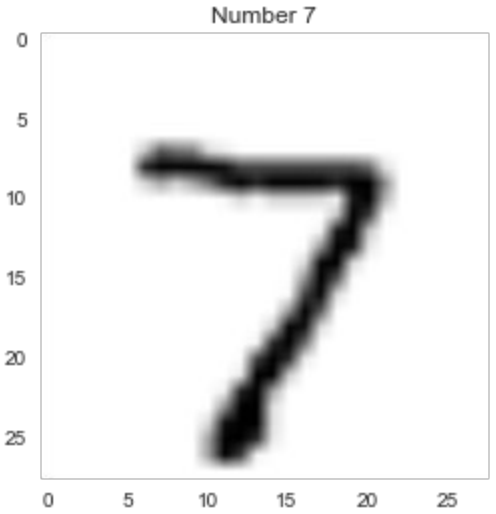
softmax
fc
pool2
conv2
pool1
conv1b
conv1a

Gaussian Noise (mean 0, std 0.2)

Filter visualization

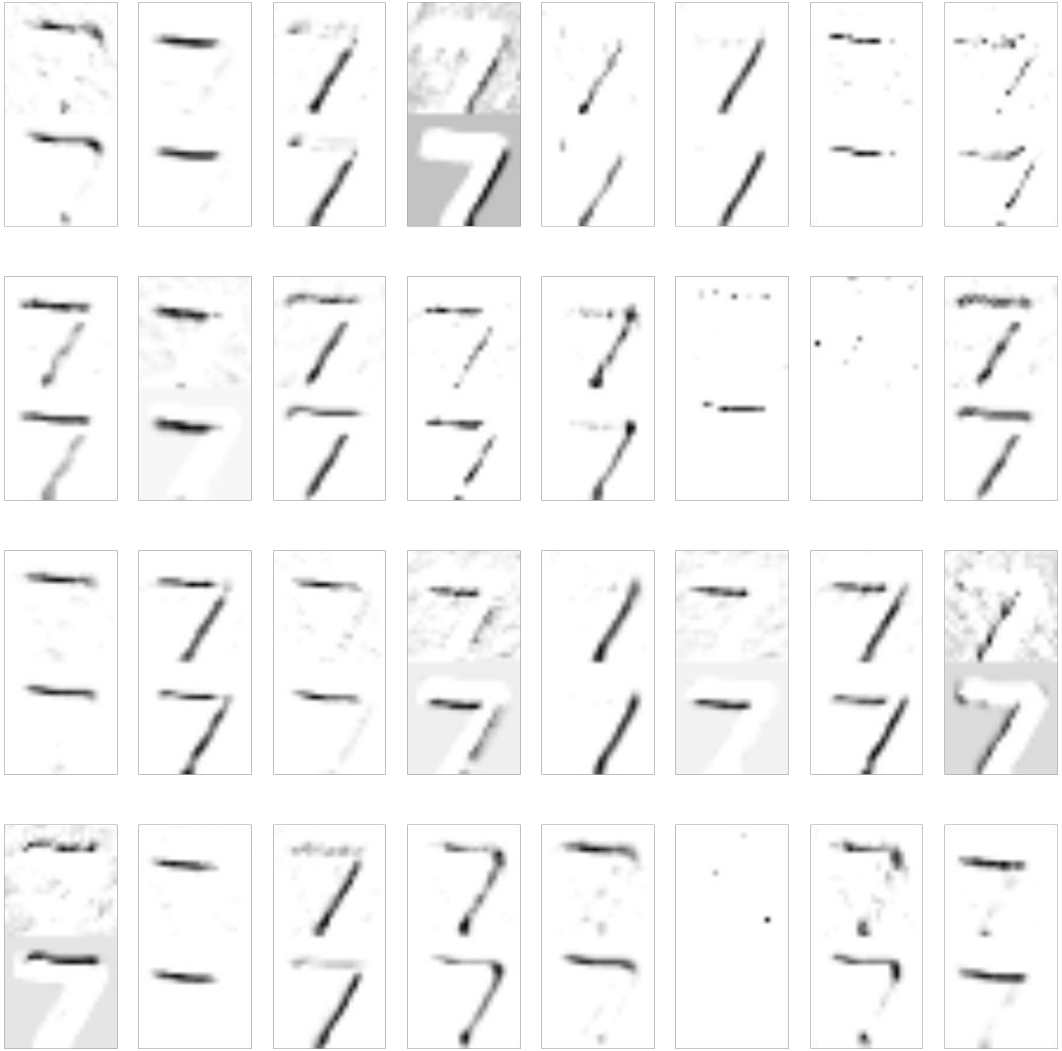


Convolutional Output Visualization

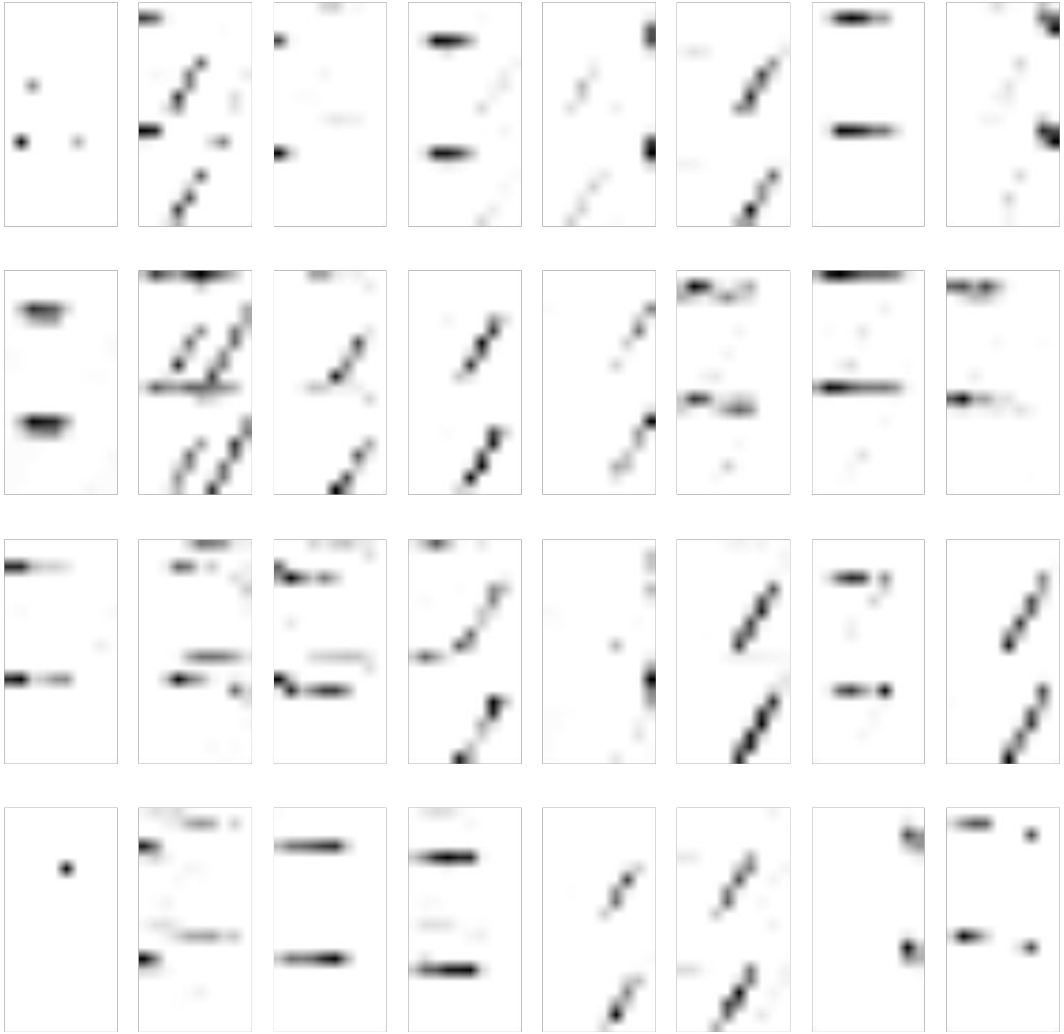


Conv1a Output

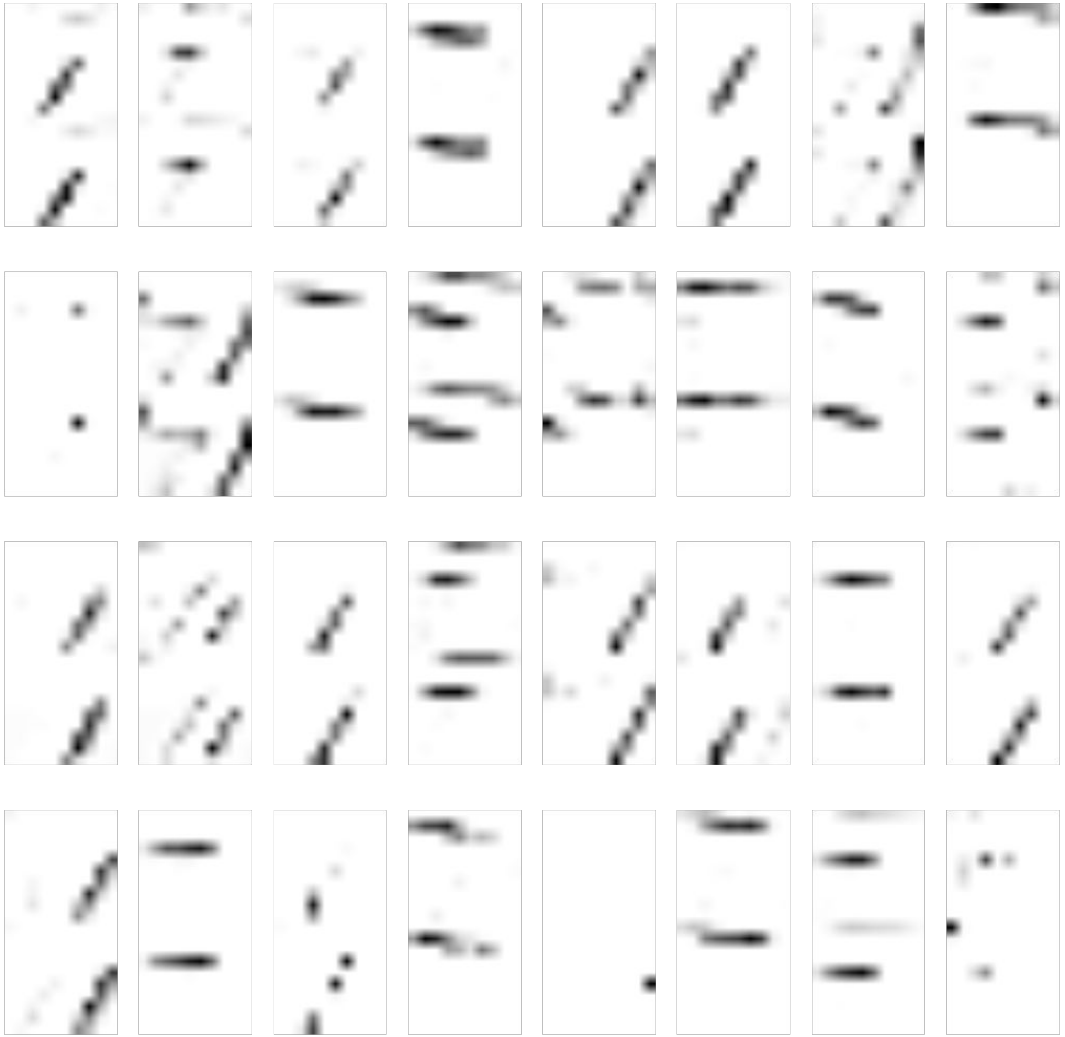
Conv1b Output



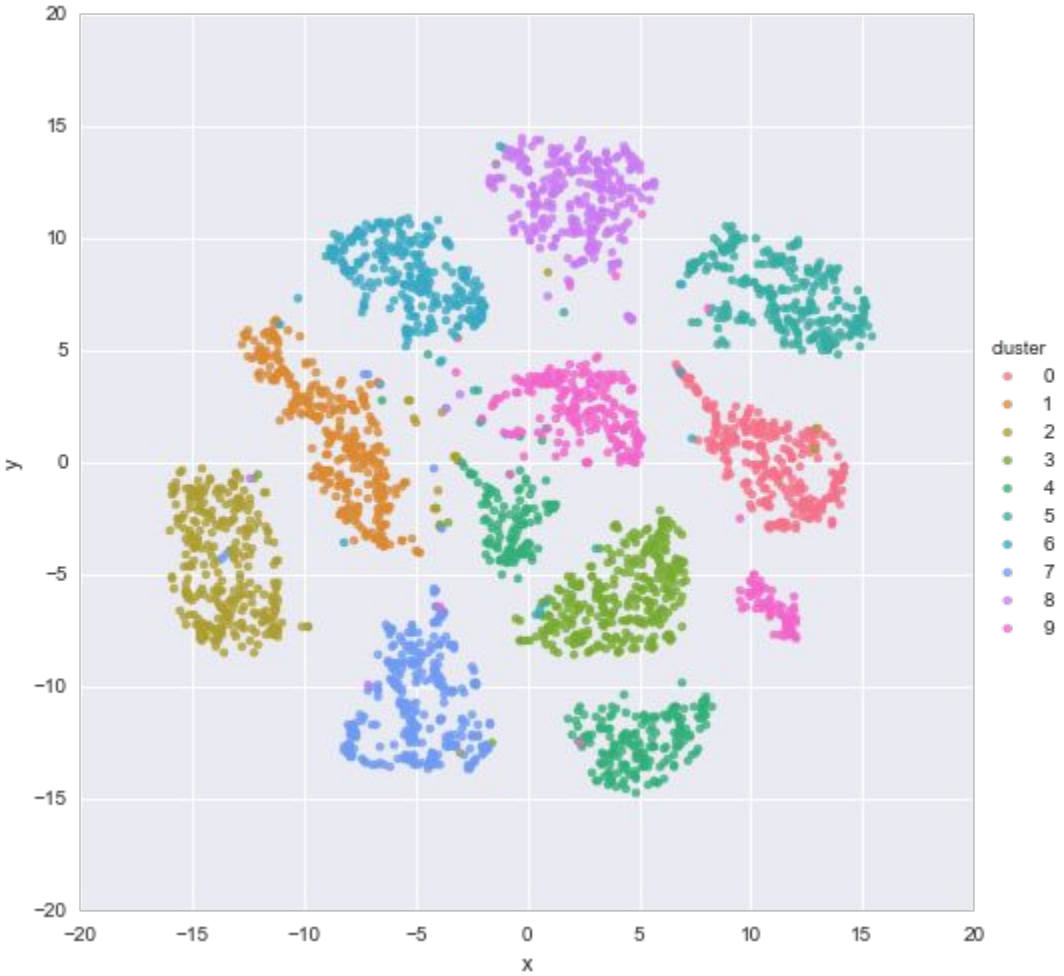
Conv2 Output



Conv2 Output



t-SNE



Task 5. Neural network for correcting rotation angle

softmax

fc

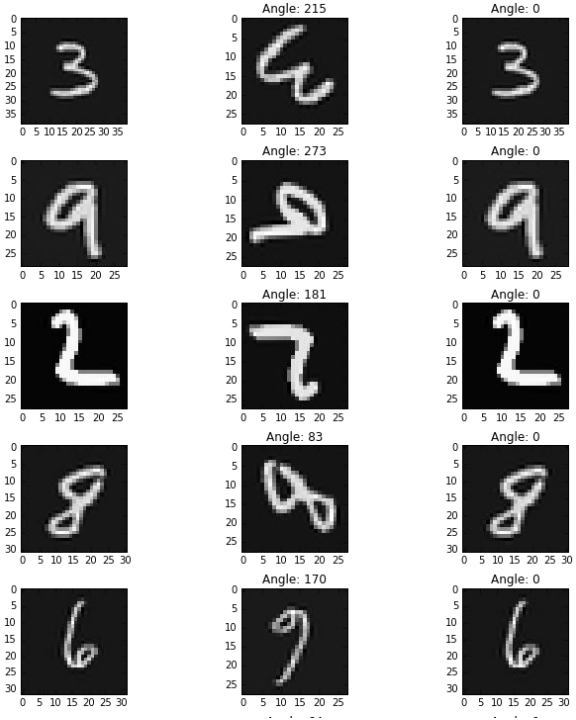
dropout

fc

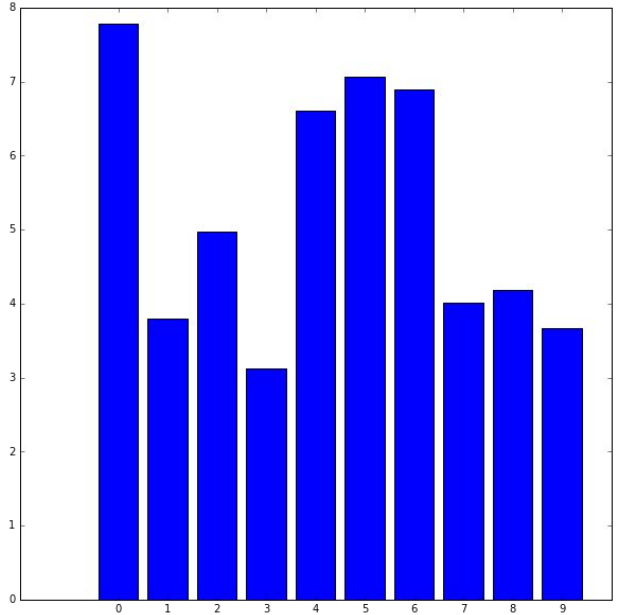
dropout

pool

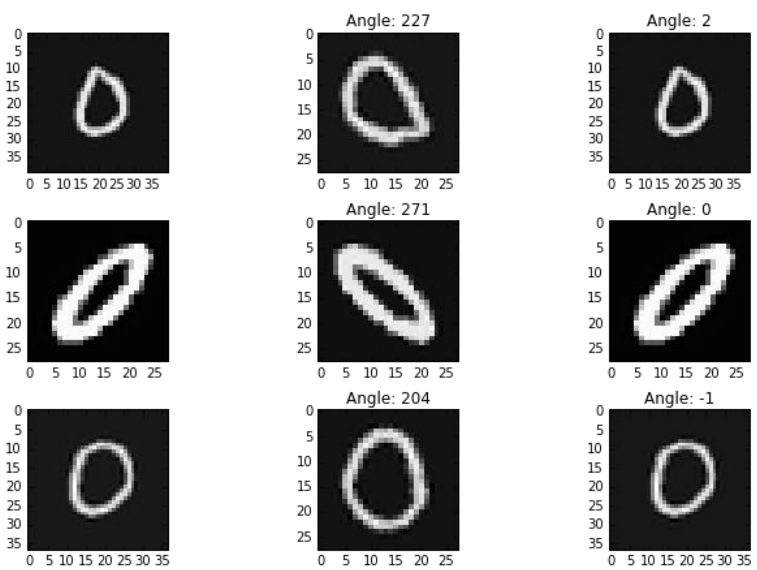
conv

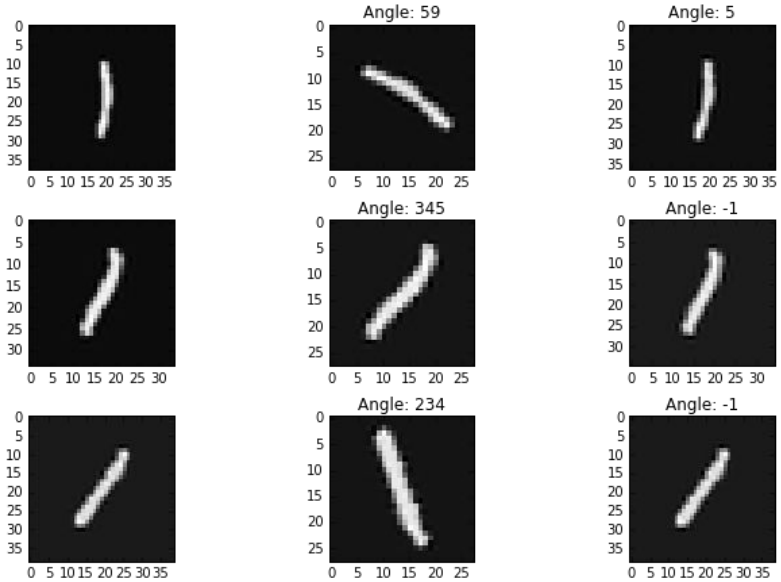


Average angle error ~ 5 degrees



Task 5. Neural network for correcting rotation angle

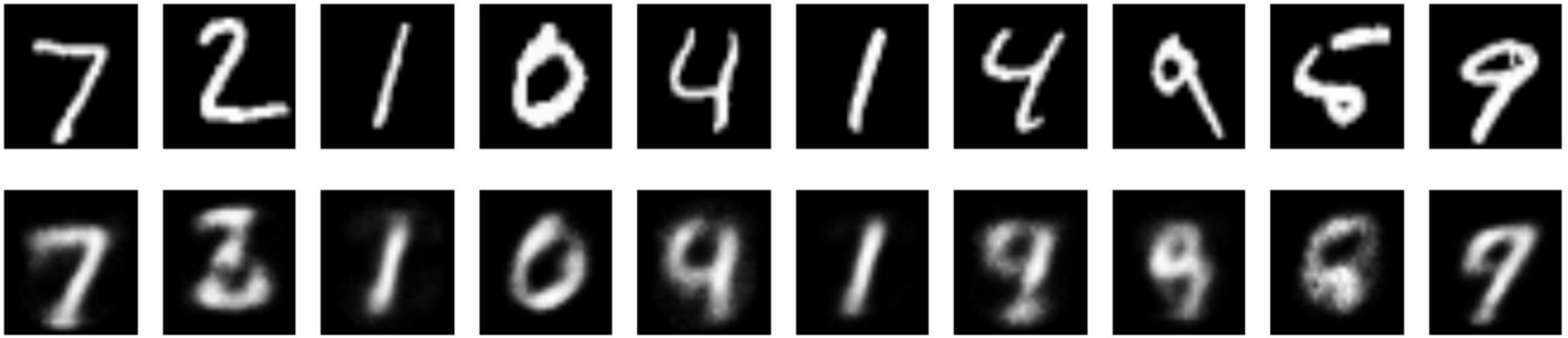




Task 5: Experimenting with Autoencoders

Fully connected Autoencoder to test the accuracy of unsupervised learning using K-means algorithm.
Architecture Encoder[128,64,32],Decoder[64,128,734].

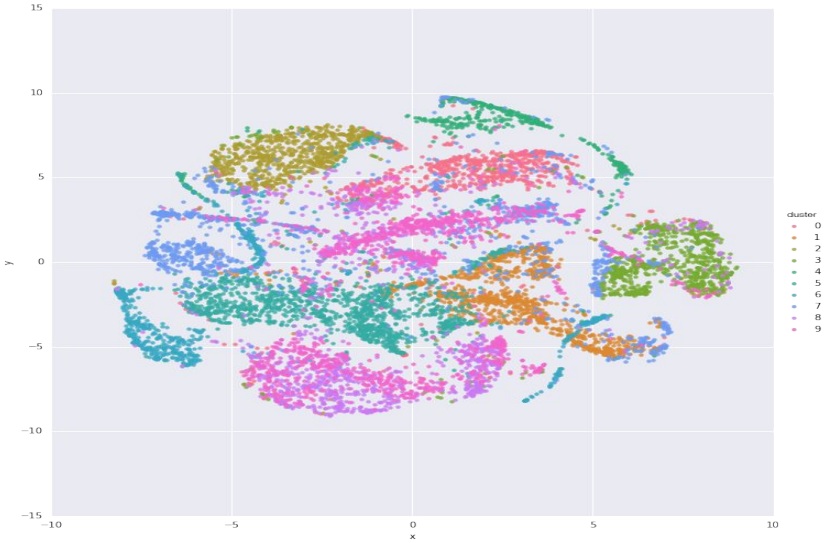
Output of the Autoencoder with Mnist:



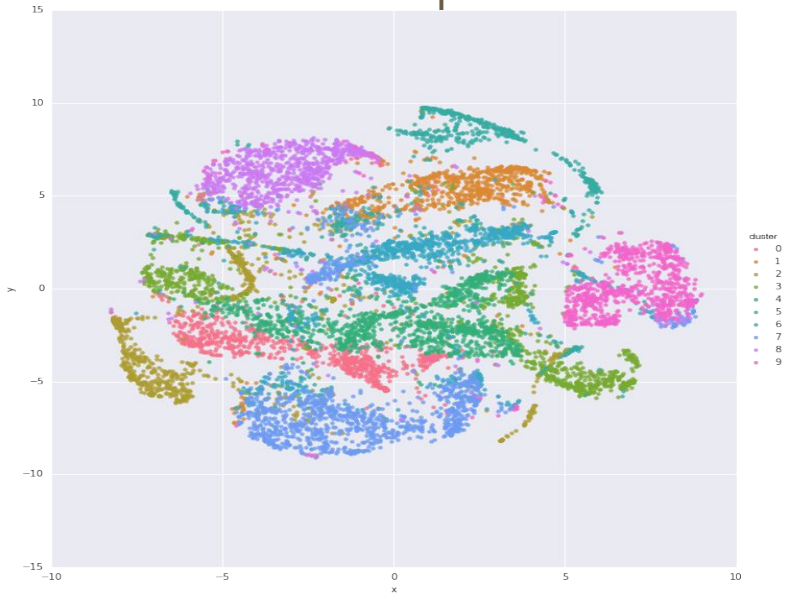
Task 5: Experimenting with Autoencoders

Representing the Data after clustering with K-means with different inputs:

Kmeans encoded input

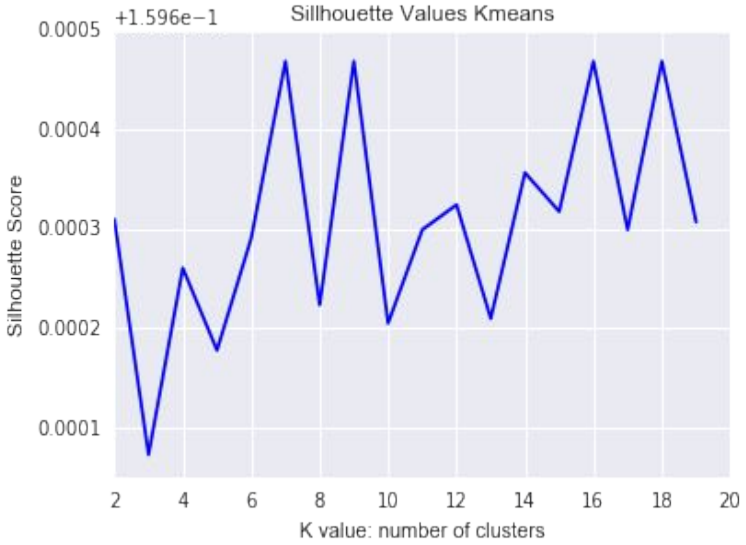


Kmeans raw input

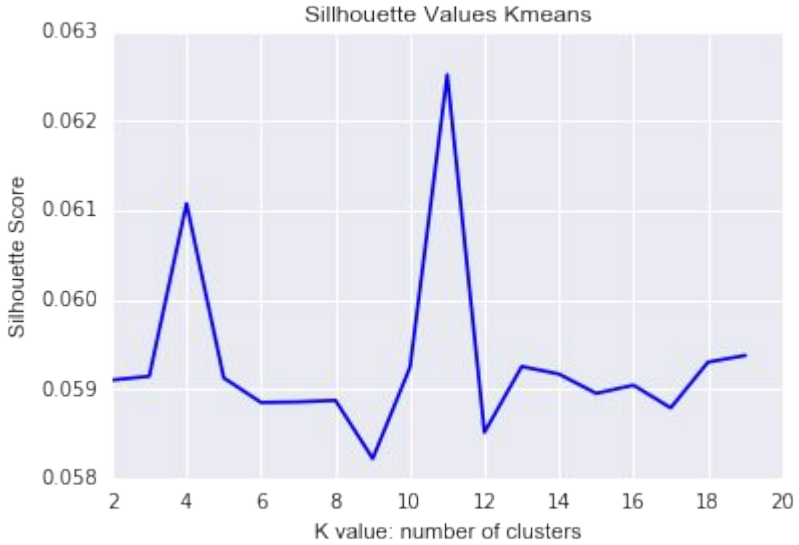


Task 5: Experimenting with Autoencoders

Encoded input



Raw Input




Thank
you