



Neural Networks on Fashion-MNIST dataset

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1. Introduction

MNIST handwritten digit dataset

- Easily achieve high accuracy even with simple and shallow neural network.

MNIST fashion dataset developed by Zalando Research team

- Classification of 10 fashion products

- Well-defined dataset

Test different neural networks and compare the accuracy



Fashion- MNIST dataset

Train Image	48,000
Validation Image	12,000
Test Image	10,000
Optimizer	Adam optimizer
Performance Metric	Accuracy
Loss Function	Categorical Cross Entropy
Batch Size	512

Label Type	Label Type
0 'T-shirt/top'	5 'Sandal'
1 'Trouser'	6 'Shirt'
2 'Pullover'	7 'Sneaker'
3 'Dress'	8 'Bag'

2. Methods

Trained Networks

3 Layer Neural Network (3NN)

3 Layer Convolutional Network (3CNN)

3 Layer Convolutional Network with Augmented Data (3CNN_gen)

4 Layer Convolutional Network with Batch Normalization (4CNN_batchnorm)

4 Layer Convolutional Network with Batch Normalization and Augmented Data (4CNN_batchnorm_gen)

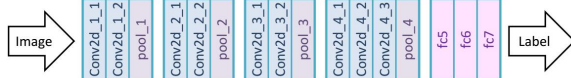
VGG-Like Neural Network (VGG-like)

VGG-Like Neural Network with Augmented Data (VGG-like_gen)

VGG-Like Neural Network with Batch Normalization (VGG-like_batchnorm)

VGG-Like Neural Network with Batch Normalization and Augmented Data (VGG-like_batchnorm_gen)

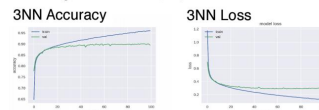
VGG-Like



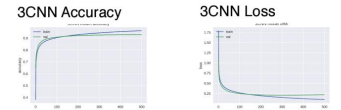
3. Results

Training dataset, Validation dataset

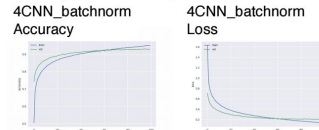
Learning rate = 0.0001, Epoch Size = 100



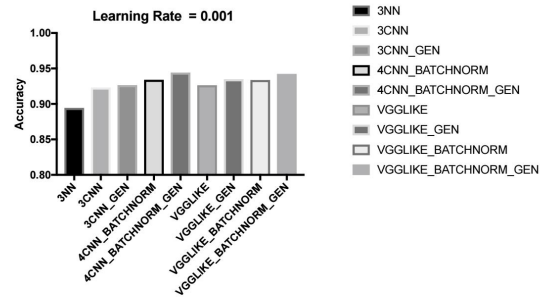
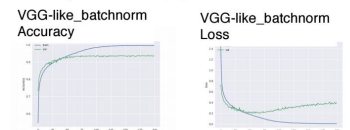
Learning rate = 0.0001, Epoch Size = 500



Learning rate = 0.00005, Epoch Size = 100



Learning rate = 0.00005, Epoch Size = 200



4. Discussion & Future

4CNN and VGG-like with batch normalization and augmented data perform the highest accuracy (94.4%). For future work, transfer learning would be interesting to apply on this dataset using autoencoders or confusing domains.

5. Reference

[1] <https://github.com/zalandoresearch/fashion-mnist>
 [2] H. Xiao, K. Rasul, and R. Vollgraf, "Fashion-mnist: a novel image dataset for benchmarking machine learning algorithms," arXiv preprint arXiv:1708.07747, 2017