Computer Vision And Pattern Recognition[A]

Mid Project Report

Khalak Bin Khair

18-38697-3

Title:

Evaluation of proposed CNN model to classify the MNIST handwritten dataset

Abstract:

The automatic detection of handwritten digit from image data can be tricky as handwritten information depends on person to person. In this project our aim is to propose a simple Convolutional Neural Network(CNN) model to classify MNIST handwritten dataset and It will give output more than 98% where we evaluate different optimizer.

Introduction:

A convolutional neural network or CNN, is a deep learning neural network designed for processing structured arrays of data such as images. Convolutional neural networks are widely used in computer vision and have become the state of the art for many visual applications such as image classification. MNIST is a database of labelled images of handwritten digit image class where the train image set of MNIST consist of 6000 images and test image set of 10000 images each image consists 28*28 pixel. Every pixel value range is 0 to 255. In this project author used different types CNN model where ADAM, SGD, RMSprop exist. Every model has a input layer followed 2D Convolutional layer and max pooling layer and flatten layer, then after a danse layer and at the end output layer.

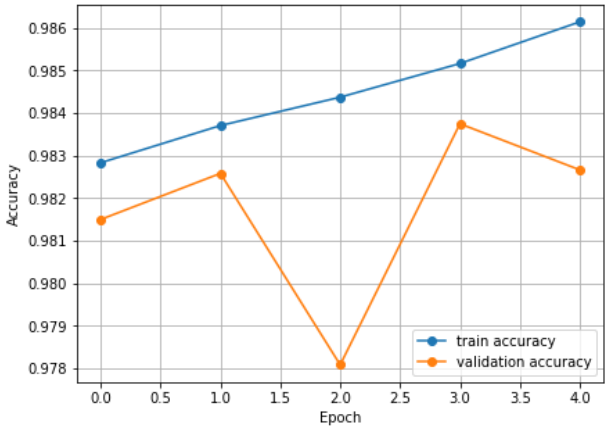
```
Model: "sequential_7"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
conv2d_18 (Conv2D)           (None, 24, 24, 32)        832
_________________________________________________________________
max_pooling2d_18 (MaxPooling (None, 12, 12, 32)        0
_________________________________________________________________
conv2d_19 (Conv2D)           (None, 10, 10, 64)        18496
_________________________________________________________________
max_pooling2d_19 (MaxPooling (None, 5, 5, 64)          0
_________________________________________________________________
flatten_7 (Flatten)          (None, 1600)              0
_________________________________________________________________
dense_14 (Dense)             (None, 64)                102464
_________________________________________________________________
dense_15 (Dense)             (None, 10)                650
=================================================================
Total params: 122,442
Trainable params: 122,442
Non-trainable params: 0
```

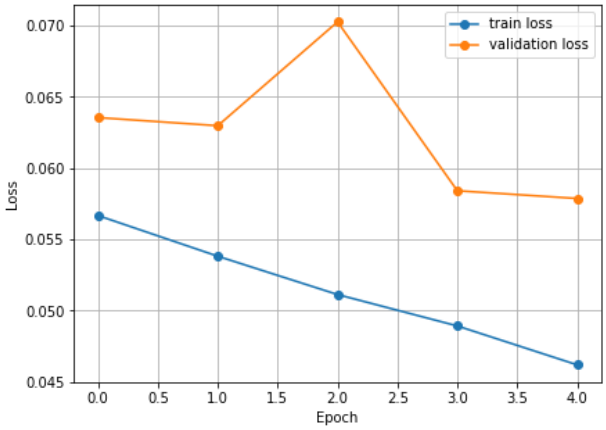
Fig1: Model 1

Results:

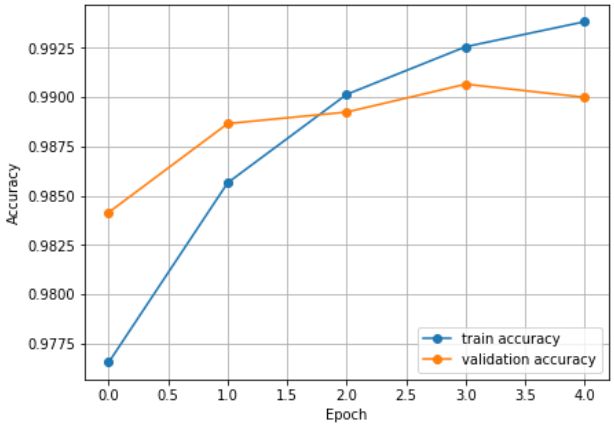
Result of the CNN ''Model 1'' for different optimizer are given below

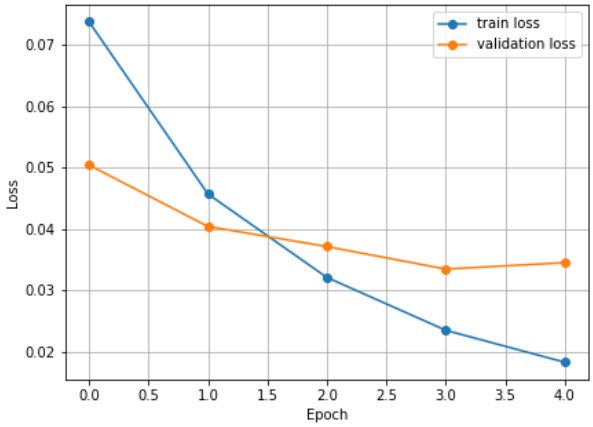
Optimizer	Train Accuracy	Validation Accuracy	Test Accuracy	Test Loss
SGD	98.28%	98.15%	98.61%	4.21%
Adam	97.66%	98.42%	99.14%	2.83%
RMSProp	99.54%	98.86%	99.12%	4.08%



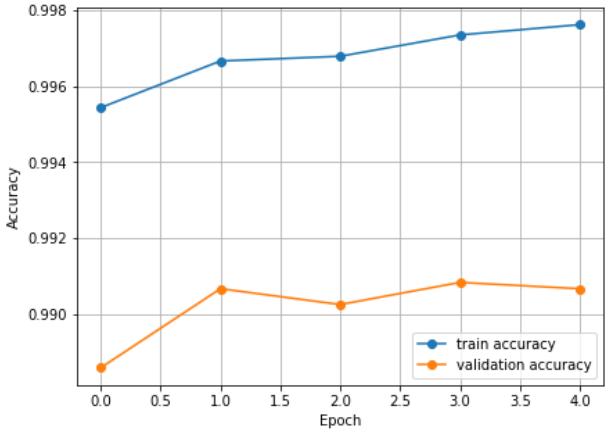


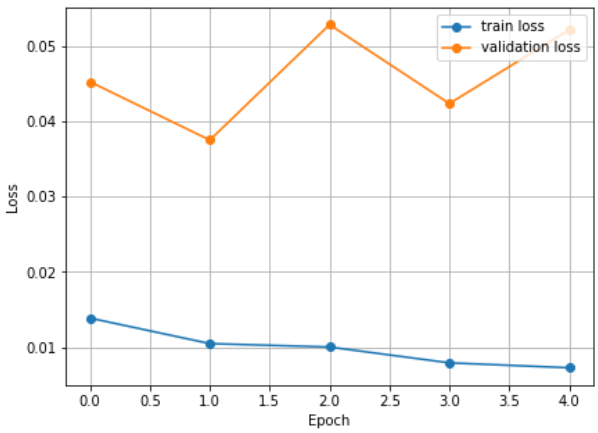
Model 1 Loss for SGD





Model 1 Loss for Adam





Model 1 Loss for RMSProp

Discussion:

Proposed Model 1 test accuracy is 99.14% on RMSProp optimizer and least accuracy is SGD optimizer 98.61%. Considering the graph analysis shows a different rate of Train and Validation accuracy, thus indicating the model will not perform consistent in real life data. The RMSprop optimizer of “Model 1” graph indicates somewhat similar rate of Train and Validation accuracy, thus indicates the model will perform better in real life data.