Evaluation of the proposed CNN model to classify the MNIST handwritten dataset

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Abstract

The automatic detection of handwritten digits from image data can be tricky as handwritten information varies from person to person. The main goal of this work is to propose a simple convolutional neural network (CNN) model to classify the MNIST handwritten dataset, which will produce test accuracy of over 98% and evaluate different optimizers.

1 Introduction

Convolutional neural networks (CNN) are a type of artificial neural network, mostly used in graphical analysis. In order to analyze image data, a labeled set of particular image classes is fed into a CNN model. MNIST is a database containing labeled images of handwritten digits. MNIST's training image set contains 60000 images, and the test image set contains 10000 images; each image is 28*28 pixels with a pixel value ranging from 0 to 255. Different combinations of CNN can produce different results in a single dataset. We have used two different CNN models and evaluated the Adam, SGD, and RMSprop optimizers. "Model 1" has an input layer followed by a one-dimensional convolutional layer, a max pooling layer, a flattening layer, a dense layer, and finally the output layer. 'Model 2' has an extra set of layers of one-dimensional convolutional layer and max pooling layer.

2 Literature Review

The capacity of computer programs to detect human handwritten digits is known as handwritten digit recognition. Because handwritten figures are not always accurate and can take many various forms and sizes, it is a difficult work for the machine. A solution to this issue is the handwritten digit recognition system, which uses an image of a digit to identify the digit that is contained in the image. To recognize handwritten numbers, a convolutional neural network model was developed using the PyTorch toolkit and the MNIST dataset.

The ability of a computer to recognize human handwritten integers from various sources, such as photographs, papers, touch screens, etc. and classify them into ten specified categories is known as handwritten digit recognition (0-9). The field of deep literacy has been the subject of limitless investigation with this content. Numerous tasks related to number recognition include processing bank checks, sorting postal mail, and number plate identification. We encounter many difficulties in handwritten number identification. due to the fact that different people write in various ways and because optical character recognition is not used.

3 Conclusion

The proposed "Model 1" provides the best test accuracy of 98.72 percent on RMSprop optimizer and the lowest test accuracy of 93.66% on SGD optimizer, while "Model 2" provides the best test accuracy of 98.79 percent and the lowest accuracy of 94.49% on SGD.

But the analysis shows a different rate of training and validation accuracy, thus indicating the model will not perform consistently in real-life data. The RMSprop optimizer of "Model 1" indicates a somewhat similar rate of training and validation

accuracy, which indicates the model will perform better in real-life data.

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