Literature Survey

Paper 1

Hybrid CNN-SVM Classifier for Handwritten Digit Recognition —2020

Savita Ahlawata, Amit Choudharyb

https://reader.elsevier.com/reader/sd/pii/S1877050920307754?token=255634CBFA4B29759D50EF7B36744C6A9188E2C8753392E7248C6B789632042A5517FDD577C664653923CB4293189277&originRegion=eu-west-1&originCreation=20220919085416

The aim of this paper is to develop a hybrid model of a powerful Convolutional Neural Networks (CNN) and Support Vector Machine (SVM) for recognition of handwritten digit from MNIST dataset. The proposed hybrid model combines the key properties of both the classifiers. In the proposed hybrid model, CNN works as an automatic feature extractor and SVM works as a binary classifier. The MNIST dataset of handwritten digits is used for training and testing the algorithm adopted in the proposed model. The MNIST dataset consists of handwritten digits images which are diverse and highly distorted. The receptive field of CNN helps in automatically extracting the most distinguishable features from these handwritten digits. The experimental results demonstrate the effectiveness of the proposed framework by achieving a recognition accuracy of 99.28% over MNIST handwritten digits dataset.

Paper 2

Deep capsule network for recognition and separation of fully overlapping handwritten digits –2021

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https://www.sciencedirect.com/science/article/pii/S0045790621000513

The recognition and separation of fully overlapping handwritten digits is an effective means to test the recognition ability of the network. It is also the basis of separating overlapping complex handwritten characters. This paper constructs a deep capsule network, FOD_DCNet, for the

recognition and separation of fully overlapping handwritten digits. Firstly, we used small sized convolution kernels to extract features, which is conducive to extracting fine-grained features while reducing training parameter; secondly, we expanded the capsules dimension to express the extracted features to avoid the loss and omission of features; thirdly, we proposed "series dual dynamic routing collocation" to optimize the routing classification function. Compared with CapsNet, our FOD_DCNet reduces the number of iterations of each route, and increases the classification efficiency. The classification accuracy of FOD_DCNet can reach 93.53%, which is 5.43% higher than CapsNet and its parameter amount is only 55.61% of CapsNet.

Highlight:
Recognizing fully overlapped handwritten digits.

•The dynamic routing algorithm between capsules is improved.

•Feature extraction using small convolution kernel.

•It has higher performance and lower parameters than capsnet.

Paper 3
Hierarchical Convolutional Neural Network for Handwritten Digits Recognition–2019
Zufar Kayumov, Dmitrii Tumakov, Sergey Mosin
https://www.sciencedirect.com/science/article/pii/S1877050920311881

The application of a combination of convolutional neural networks for the recognition of handwritten digits is considered. Recognition is carried out by two sets of the networks following each other. The first neural network selects two digits with maximum activation functions. Depending on the winners, the next network is activated, which selects one digit from two. The proposed algorithm is tested on the data from MNIST. The minimal handwriting recognition error was estimated with this approach.

Paper 4

A Comparative Study on Handwriting Digit Recognition Using Neural Networks-2017

Mahmoud Abu Ghosh, Ashraf Yunis Maghari

https://www.researchgate.net/publication/321121793_A_Comparative_Study_on_Handwriting_Digit_Recognition_Using_Neural_Networks

The handwritten digit recognition problem becomes one of the most famous problems in machine learning and computer vision applications. Many machine learning techniques have been employed to solve the handwritten digit recognition problem. This paper focuses on Neural Network (NN) approaches. The most three famous NN approaches are deep neural network (DNN), deep belief network (DBN) and convolutional neural network (CNN). In this paper, the three NN approaches are compared and evaluated in terms of many factors such as accuracy and performance. Recognition accuracy rate and performance, however, is not the only criterion in the evaluation process, but there are interesting criteria such as execution time. Random and standard dataset of handwritten digit have been used for conducting the experiments. The results show that among the three NN approaches, DNN is the most accurate algorithm; it has 98.08% accuracy rate. However, the execution time of DNN is comparable with the other two algorithms. On the other hand, each algorithm has an error rate of 1-2% because of the similarity in digit shapes, specially, with the digits (1,7), (3,5), (3,8), (8,5) and (6,9).