## Handwritten Isolated Bangla Compound Character Recognition a new benchmark using a novel deep learning approach

Advantage:

This work has the advantage of presenting a novel deep-learning method for the recognition of isolated compound characters in handwritten Bangla and of reporting a new benchmark for recognition accuracy on the CMATERdb 3.1.3.3 dataset. The suggested method uses supervised layerwise training of Deep Convolutional Neural Networks (DCNN) and accelerates convergence through the use of the RM-SProp algorithm. The supervised layerwise trained DCNNs beat normal DCNNs of similar architecture and traditional shallow learning models like Support Vector Machines by reaching an error rate of 9.67% and a recognition accuracy of 90.33%, which is an improvement of over 10%.

Limitations: The research presents a new benchmark of recognition accuracy on the CMATERdb 3.1.3.3 dataset employing a cutting-edge deep learning method for the identification of isolated compound characters in handwritten Bangla. To obtain faster convergence, the method uses supervised layerwise training of Deep Convolutional Neural Networks (DCNN) and adds the RM-SProp algorithm to the training process. By obtaining an error rate of 9.67% and a recognition accuracy of 90.33%, which represents an improvement of almost 10%, the supervised layerwise trained DCNNs beat conventional DCNNs of similar architecture as well as typical shallow learning models like Support Vector Machines. The report does not, however, address any specific drawbacks of the suggested method.

## Handwritten Numeral Databases of Indian Scripts and Multistage Recognition of Mixed Numerals

Advantage:

The main advantage of this paper is the development of two databases for handwritten numerals of the two most popular Indian scripts, along with a multistage cascaded recognition scheme using wavelet-based multiresolution representations and multilayer perceptron (MLP) classifiers. The proposed scheme has been extended to the situation when the script of a document is not known a priori or the numerals written on a document belong to different scripts. This scheme has potential applications in recognizing handwritten numerals in mixed scripts, which are frequently found in Indian postal mail and tabular form documents.

Limitations:

The limitations of this paper are not explicitly mentioned in the given text information. However, based on the information provided, it can be inferred that the proposed recognition scheme may not apply to handwritten numerals of other scripts or languages. Additionally, the recognition accuracy of the proposed scheme may vary depending on the quality of the input samples and the complexity of the numerals. Further research may be required to address these limitations.

## Improving Handwritten Chinese Text Recognition Using Neural Network Language Models and Convolutional Neural Network Shape Models

Advantage:

The benefit of this paper is that it proposes a novel method for improving Chinese handwriting recognition by evaluating the effects of two types of character-level neural network language models (feedforward and recurrent) and combining them with back-off n-gram language models to create hybrid language models. Experimental results on the Chinese handwriting database CASIA-HWDB demonstrate that neural network language models enhance recognition performance, with hybrid recurrent neural network language models outperforming other language models. This paper also presents a new standard for evaluating language models on a large corpus. Overall, the proposed method has the potential to enhance the precision of Chinese handwritten text recognition.

Limitation:

 it is important to note that the experimental results are based on a small text corpus and a single handwriting database. Therefore, the generalizability of the proposed approach to other datasets and languages needs to be further investigated.

## Recognition of Handwritten Digit using Convolutional Neural Network (CNN)

Advantage:

The advantage of this paper is that it proposes a model using Convolutional Neural Network and MNIST dataset to recognize handwritten digits with better accuracy. The paper also demonstrates how MatConvNet can be used to implement the model with CPU training and less training time. The model can be extended to recognize letters and a person's handwriting. Through this work, the authors aim to learn and practically apply the concepts of Convolutional Neural Networks.

Limitation:

One limitation of this paper is that it only focuses on recognizing handwritten digits and does not extend to recognizing letters or a person's handwriting. Additionally, the paper only uses the MNIST dataset, which may not be representative of real-world scenarios. Another limitation is that the paper only considers images of fixed size (28\*28 pixels) and does not explore the performance of the model on images of different sizes.

## Segmentation-Free Bangla Offline Handwriting Recognition using Sequential Detection of Characters and Diacritics with a Faster R-CNN

Advantage:

The advantage of this paper is that it presents an entirely segmentation-free approach for offline handwriting recognition of Bangla script using sequential detection of characters and diacritics with a Faster R-CNN. This approach detects characters and associated diacritics separately with different networks named C-Net and D-Net, which were prepared with transfer learning from VGG-16. The F1 scores for the C-Net and D-Net networks are 89.6% and 93.2% respectively. Afterward, both of these detection modules were fused into a word recognition unit with a CER (Character Error Rate) of 11.2% and a WER (Word Error Rate) of 24.4%. A spell checker further minimized the errors to 8.9% and 21.5% respectively. This same method is likely to be equally effective on several other Abugida scripts similar to Bangla.

Limitation:

One of the major limitations of this paper is the high number of false positives for the diacritic ' ' (AA-kar) which becomes a vertical line in most cases and can be falsely detected inside any other characters/diacritics which include such a straight line. Another limitation is the challenge of dealing with the complicated nature of the Bangla script while overcoming the limitation of data.