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28 November 2016, Article number 7760077, Pages 625-630  
5th International Conference on Informatics, Electronics and Vision, ICIEV 2016; Nabab Nawab  
Ali Chowdhury Senate Bhaban (Senate Auditorium), University of Dhaka Dhaka; Bangladesh; 13  
May 2016 through 14 May 2016; Category number CFP1644S-ART; Code 125063

### Convolutional neural network training with artificial pattern for Bangla handwritten numeral recognition (Conference Paper)

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#### Abstract

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Recognition of handwritten numerals has gained much interest in recent years due to its various application potentials. The progress of handwritten Bangla numeral is well behind Roman, Chinese and Arabic scripts although it is a major language in Indian subcontinent and is the first language of Bangladesh. Handwritten numeral classification is a high-dimensional complex task and existing methods use distinct feature extraction techniques and various classification tools in their recognition schemes. Recently, convolutional neural network (CNN) is found efficient for image classification with its distinct features. In this study, a CNN based method has been investigated for Bangla handwritten numeral recognition. A moderated pre-processing has been adopted to produce patterns from handwritten scan images. On the other hand, CNN has been trained with the patterns plus a number of artificial patterns. A simple rotation based approach is employed to generate artificial patterns. The proposed CNN with artificial pattern is shown to outperform other existing methods while tested on a popular Bangla benchmark handwritten dataset. © 2016 IEEE.

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Handwritten Bangla Numeral  
Recognition Using Ensembling of  
Convolutional Neural Network

Noor, R. , Islam, K.M. , Rahimi,  
M.J.  
(2019) 2018 21st International  
Conference of Computer and  
Information Technology, ICCIT  
2018

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**Publisher:** Institute of Electrical and Electronics Engineers Inc.

Bangla Handwritten Digit Recognition Using Deep CNN for Large and Unbiased Dataset

Shawon, A. , Jamil-Ur Rahman, M. , Mahmud, F.  
*(2018) 2018 International Conference on Bangla Speech and Language Processing, ICBSLP 2018*

Image Pre-processing on NumtaDB for Bengali Handwritten Digit Recognition

Paul, O.  
*(2018) 2018 International Conference on Bangla Speech and Language Processing, ICBSLP 2018*

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Akhand, M.A.H. , Ahmed, M. , Rahman, M.M.H.  
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