

A Novel Method for Handwritten Digit Recognition System

S. No	Paper name, Author & publication year	Proposed framework	Algorithm Used	Limitations & Future work
1	“Multi-Language Handwritten Digits Recognition based on Novel Structural Features” - Jaafar M. Alghazo et al. (2019)	The proposed approach has been evaluated on six prominent languages. 65 local structural characteristics are recovered in total, and multiple classifiers are utilized to assess number recognition.	AIRS, MLP, Logistic Regression, Random Forest	Fuzzy logic might be used in the future to eliminate misunderstanding between various digits.
2	“Improved Handwritten Digit Recognition Using Convolutional Neural Networks (CNN)” - Savita Ahlawat , Amit Choudhary et al. (2020)	The goal of the proposed work is to investigate different design alternatives, such as the number of layers, stride size, receptive field, kernel size for CNN-based handwritten digit recognition .In order to enhance the performance of handwritten digit recognition, several SGD optimization strategies were used. Uses pure CNN.	CNN, SGD	Ensemble CNN models can give higher accuracy than pure CNN models.
3	“An Effective and Improved CNN-ELM Classifier for Handwritten Digits Recognition and Classification” - Saqib Ali, Jianqiang Li et al. (2020)	The proposed model is a self-developed handwritten digit recognition system built on the symmetrical CNN-ELM method, which has high training precision and runs quickly. The findings show that the CNN-ELM-DL4J strategy surpasses the traditional CNN models in terms of accuracy and computing efficiency.	CNN-ELM	By expanding/changing the dataset images and/or further configuring the network with the right parameters, experimental results can be made more effective and efficient.
4	“Combination of Convolutional Neural Network Architecture and its Learning Method for Rotation-Invariant Handwritten Digit Recognition” - Kazuya Urazoe et al. (2020)	The proposed model introduced a multi-task learning (MTL) algorithm for rotation invariance. This letter describes how our past work may be applied to common CNN designs.	CNN	-
5	“Handwritten Digit Recognition of MNIST dataset using Deep Learning state-of-the-art Artificial Neural Network (ANN) and Convolutional Neural Network (CNN)	In this research, the two primary Deep Learning algorithms, Artificial Neural Network and Convolutional Neural Network, are compared in terms of feature extraction and classification phases of recognition. On the MNIST dataset, the algorithms were trained utilizing categorical cross-entropy loss and the ADAM optimizer.	ANN, CNN	The drawback of the CNN over the ANN is that it requires more time and CPU resources.

	” - Drishti Beohar et al. (2021)			
6	“An improved faster-RCNN model for handwritten character recognition” - Saleh Albahli et al. (2021)	Introduced an enhanced Faster-RCNN framework using DenseNet-41 for feature computation, which improves performance in identifying tiny objects while reducing training and testing time and complexity.	DenseNet-41, Deep learning, Faster-RCNN	Was tested over a simple dataset like MNIST dataset
7	“A Novel Handwritten Digit Classification System Based on Convolutional Neural Network Approach “ - Ali Abdullah Yahya et al. (2021)	The feature extraction task is carried out by the convolution layers, max-pooling layers, and batch normalization layers in the proposed CNN architecture. The feature mappings learnt from these layers are then used to categorize the picture score in the input layer.	CNN	There are about 1% of the values that occur outside the main diagonal, implying that the method still yields some mislabeled components. The primary reason for failure is that images vary in size and style, making categorisation even more difficult.
8	“Realtime Handwritten Digit Recognition Using Keras Sequential Model and Pygame” - K. Senthil Kumar et al. (2021)	In this research, CNN and Pygame are used to construct an expanded application of handwritten detection, — in other words, real-time validation of handwritten numbers. This project's classifier is a sequential model using a 4-layer CNN.	CNN	Various methods, such as a multilayer perceptron, can be used to improve the overall process.
9	“Handwritten Digit Recognition Using Deep Learning” - Gaganashree J. S.Padmashali et al. (2021)	When attempting to tackle this problem, other issues occur. Handwritten numerals do not always have the same size, thickness, direction, or location relative to the edge. The major purpose of this study is to improve the way of defining perceptual patterns characterization approach to include the handwritten digits.	CNN, ANN	It is difficult to determine which handwriting traits accurately describe each concerned class.
10	“Convolutional Vision Transformer for Handwritten Digit Recognition” Vanita Agrawal et al. (2022)	A deep learning method that uses attention processes to evaluate the significance of factors	CNN, ViT	To recognize digit strings, the model must be expanded.

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