

A NOVEL METHOD FOR HANDWRITTEN DIGITAL RECOGNITION SYSTEM

- DOMAIN : ARTIFICIAL INTELLIGENCE
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- **PAPER 01** :A novel method for Handwritten Digit Recognition with Neural Networks
- **PUBLICATION YEAR** : 2011
- **AUTHOR** : MALOTHU NAGU,MALOTHU NAGU

This paper Character recognition plays an important role in the modern world. It can solve more complex problems and makes humans' jobs easier. An example is handwritten character recognition. This is a system widely used in the world to recognize zip code or postal code for mail sorting. There are different techniques that can be used to recognize handwritten characters. Two techniques researched in this paper are Pattern Recognition and Artificial Neural Network (ANN). Both techniques are defined and different methods for each technique are also discussed. Bayesian Decision theory, Nearest Neighbor rule, and Linear Classification or Discrimination is types of methods for Pattern Recognition. Shape recognition, Chinese Character and Handwritten Digit recognition using Neural Network to recognize them. Neural Network is used to train and identify written digits. After training and testing, the accuracy rate reached 99%.This accuracy rate is very high

- **PAPER 02** :A novel handwritten character recognition system using gradient based features and run length count
- **PUBLICATION YEAR** : 2014
- **AUTHOR** : G RAJU,BINDU S MONI

In this paper, we propose a novel handwritten character recognition system using a combination of gradient-based features and run length count (GBF–RLC). The performance of the proposed method has been tested on Malayalam script, a South Indian language. The gradient of the image is the intensity at each point, giving the direction of the largest possible increase from light to dark and the rate of change in that direction. RLC is the count of a contiguous group of 1's encountered in a left to right/top to bottom scan of a character image or block of an image. Classification was carried out with a Simplified Quadratic Classifier (SQDF) and Multi Layer Perceptron (MLP). A database containing 19,800 isolated handwritten characters pertaining to 44 classes was used for the study. The feature vector is augmented by including aspect ratio, position of centroid and ratio of pixels on the vertical halves of a character image. The recognition accuracy of 99.78% was achieved with minimum computational and storage requirements

- **PAPER 03** :A Multi-language Handwritten Digit Recognition Dataset
- **PUBLICATION YEAR** : 2015
- **AUTHOR** :Weiwei JIANG

In this paper, we contribute a multi-language handwritten digit recognition dataset named MNIST-MIX, which is the largest dataset of the same type in terms of both languages and data samples. With the same data format as MNIST, MNIST-MIX can be seamlessly applied in existing studies for handwritten digit recognition. By introducing digits from 10 different languages, MNIST-MIX becomes a more challenging dataset and its imbalanced classification requires a better design of models. We also present the results of applying a LeNet model which is pre-trained on MNIST as the baseline.

- **PAPER 04** :Automatic Handwritten Digit Recognition
On Document Images Using Machine Learning Methods
- **PUBLICATION YEAR** : 2019
- **AUTHOR** :Akkireddy Challa

The main purpose of this thesis is to build an automatic handwritten digit recognition method for the recognition of connected handwritten digit strings. To accomplish the recognition task, first, the digits were segmented into individual digits. Then, a digit recognition module is employed to classify each segmented digit completing the handwritten digit string recognition task. In this study, different machine learning methods, which are SVM, ANN and CNN architectures are used to achieve high performance on the digit string recognition problem. In these methods, images of digit strings are trained with the SVM, ANN and CNN model with HOG feature vectors and Deep learning methods structure by sliding a fixed size window through the images labeling each sub-image as a part of a digit or not. After the completion of the segmentation, to achieve the complete recognition of handwritten digits.

- **PAPER 05** :A Novel method for hand written digital recognition using deep learning
- **PUBLICATION YEAR** : 2019
- **AUTHOR** : Rohini.M, D.Surendran

In this paper Handwritten digit recognition has recently been of very interest among the researchers because of the evolution of various Machine Learning, Deep Learning and Computer Vision algorithms. In this report, We compare the results of some of the most widely used Machine Learning Algorithms like CNN- convolutional neural networks and with Deep Learning algorithms like multilayer CNN using Keras with Theano and Tensorflow. MNIST is a dataset which is widely used for handwritten digit recognition. The dataset consist of 60,000 training images and 10,000 test images. The artificial neural networks can all most mimic the human brain and are a key ingredient in image processing field. For example Convolution Neural networks with back propagation for image processing. The applications where these handwritten digit recognition can be used are Banking sector where it can be used to maintain the security pin numbers, it can be also used for blind peoples by using sound output

- **PAPER 06** :A Novel Handwritten Digit Classification System Based on Convolutional Neural Network Approach
- **PUBLICATION YEAR** : 2021
- **AUTHOR** : Ali Abdullah Yahya , Jieqing Tan

This paper contains an enormous number of CNN classification algorithms that have been proposed in the literature. Nevertheless, in these algorithms, appropriate filter size selection, data preparation, limitations in datasets, and noise have not been taken into consideration. As a consequence, most of the algorithms have failed to make a noticeable improvement in classification accuracy. To address the shortcomings of these algorithms, our paper presents the following contributions: Firstly, after taking the domain knowledge into consideration, the size of the effective receptive field (ERF) is calculated. Calculating the size of the ERF helps us to select a typical filter size which leads to enhancing the classification accuracy of our CNN. Secondly, unnecessary data leads to misleading results and this, in turn, negatively affects classification accuracy. To guarantee the dataset is free from any redundant or irrelevant variables to the target variable, data preparation is applied before implementing the data classification mission. Thirdly, to decrease the errors of training and validation, and avoid the limitation of datasets, data augmentation has been proposed. Fourthly, to simulate the real-world natural influences that can affect image quality, we propose to add an additive white Gaussian noise with $\sigma = 0.5$ to the MNIST dataset. As a result, our CNN algorithm achieves state-of-the-art results in handwritten digit recognition, with a recognition accuracy of 99.98%, and 99.40% with 50% noise

