



HANDWRITTEN DIGIT RECOGNITION WITH DEEP NEURAL NETWORKS

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ABSTRACT:

The project entitled as “Handwritten Digit Recognition with Deep Neural Networks “, which has been developed using Pycharm framework. Here python 3.8 front ends and Mysql Server as the back end.

Currently, Handwritten Digit Recognition is a pivotal concern in computer vision. Machine Learning technology makes a machine efficient to perform pattern or text recognition. Handwriting patterns differ according to the speaker it is normally quite difficult to recognize. Handwritten digit recognition is the process to provide the ability to machines to recognize human handwritten digits. Main aim of the proposed system is develop automatically recognizing and detecting handwritten digit Recognition using CNN models. Proposed application MNIST data set collected from kaggle repository is the most popular dataset for enthusiasts of machine learning and deep learning. More than 1000 plus training images of handwritten digits from zero to nine So, 10 different classes are in the MNIST dataset. The images of handwritten digits are shown as a matrix of 28×28 where every cell consists of a grayscale pixel value. Our proposed system to build an interactive window we created a new GUI. User can draw digits on canvas, and by clicking a button, user can identify the digit. The Tkinter library is the part of Python standard library. Our predict digit () method takes the picture as input CNN will completely extract information from the capture image. Finally capture information maintain in test data database. Finally proposed system applies CNN which makes and then activates the trained model to predict the digit.

Keywords: Handwritten digit recognition, CNN (Convolution Neural Networks), Machine Learning, Forged handwritten signature

Introduction :

Handwritten Digit Recognition (HDR) is the process of converting images of handwritten digit into digital format. A lot of money is wasted on converting the information that is in paper to digital format. This problem can be solved by using HDR. The heart of our project lies within the ability to develop an efficient algorithm that can recognize the handwritten digits which are scanned and sent as input by the user. The goal of this paper is to observe the variation of different algorithms that can classify the handwritten digits using different hidden layers, various number of epochs and to make a comparison based on the accuracy.

This experiment is performed using the Modified National Institute of Standards and Technology (MNIST) dataset. Machine learning and deep learning are crucial to both computer science and artificial intelligence. Deep learning and machine learning may decrease human effort in identifying learning, producing predictions, and many other areas. In this article, classifiers including SVM, KNN, Random Forest, and convolution networks of neurons are assessed in terms of their performance, accuracy, timeliness, sensitivity, positive productivity, and specificity when various classifier parameters are used. The handwritten digits from the well-known MNIST dataset (0 to 9) are recorded.

Developers are experimenting with deep learning and machine learning methods to improve machine intelligence, developers are trying out with deep learning and machine learning methods. . For instance, sound and apparent categorization, object detection, image segmentation, and object identification. Handwritten digit recognition is a feature of computers to recognize human handwritten digits. It is challenging job for the machine because handwritten digits are inaccurate and can be produced with a wide range of tastes. A method that can be used for resolving this problem uses the image of a digit to figure out the digit that is present in the image. This approach is also referred to as handwritten digit recognition. For instance, sound and visual categorization, object detection, image segmentation, and object identification. Handwritten digit recognition is the ability of computers to recognise human handwritten digits.

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OVERVIEW OF PROPOSED SYSTEM ALGORITHM

A Convolution Neural Network is a Deep Learning algorithm which can take in an input image And passes to multiple layer consists of three layers' Input layer, Hidden layer and classification layer.

Finally CNN classify whether digit or Not decision effectively

Cnn is more flexibility and Easy to use

CNN Automatically detects the important features without any human supervision.

Advantage

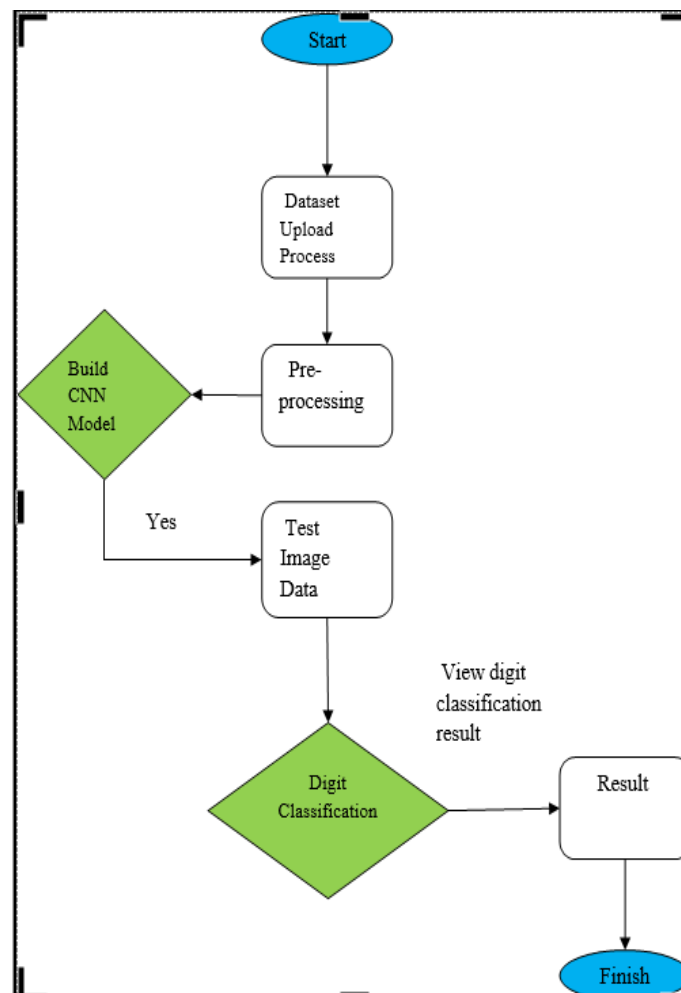
- Less Time consuming process
- Easy to enhance requiring modifications in future.
- High Detection Accuracy
- To minimize the data required for learning.
- CNN network appreciably increases the accuracy with low noise.

Convolutional Neural Networks

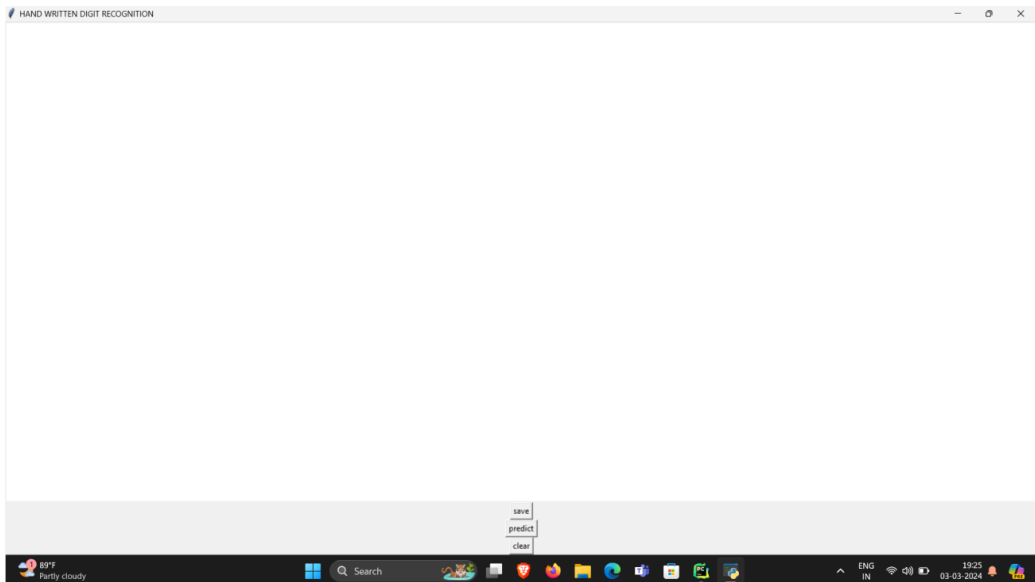
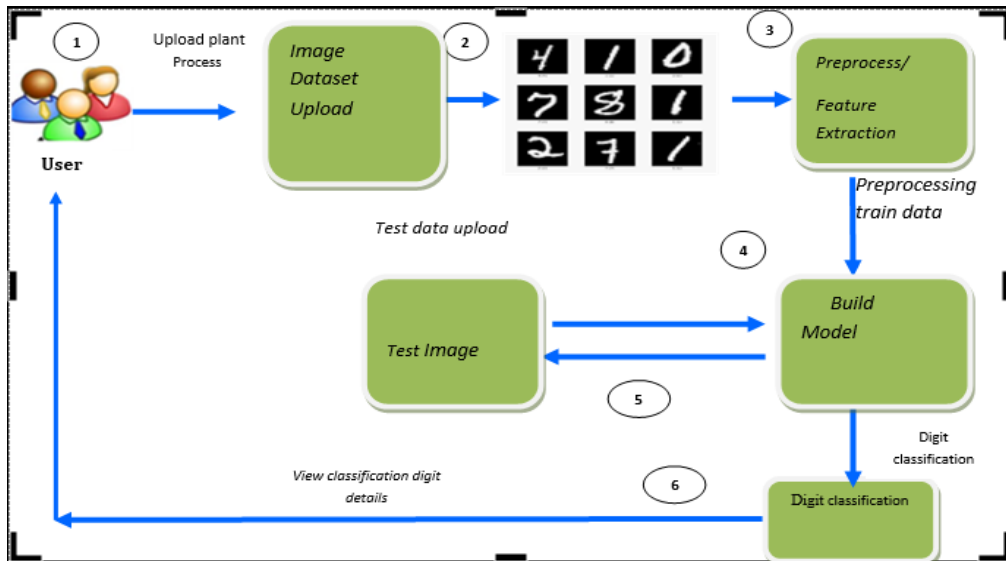
In 1995 A.D., Yann LeCun and Yoshua Bengio introduced the concept of CNNs. CNN is a feed-forward neural network which has the ability of extracting topological features from the input image. It extracts features from the image and those extracted features are inputted to a classifier which categorizes the image. CNNs are generally invariant to distortions and simple geometric transformations like translation, scaling, rotation and squeezing. CNNs combine 3 architectural ideas to ensure some degree of shift, scale, and distortion invariance: local receptive fields, shared weights, and spatial or temporal sub-sampling [3]. CNNs are usually trained like a standard ANN using back propagation.

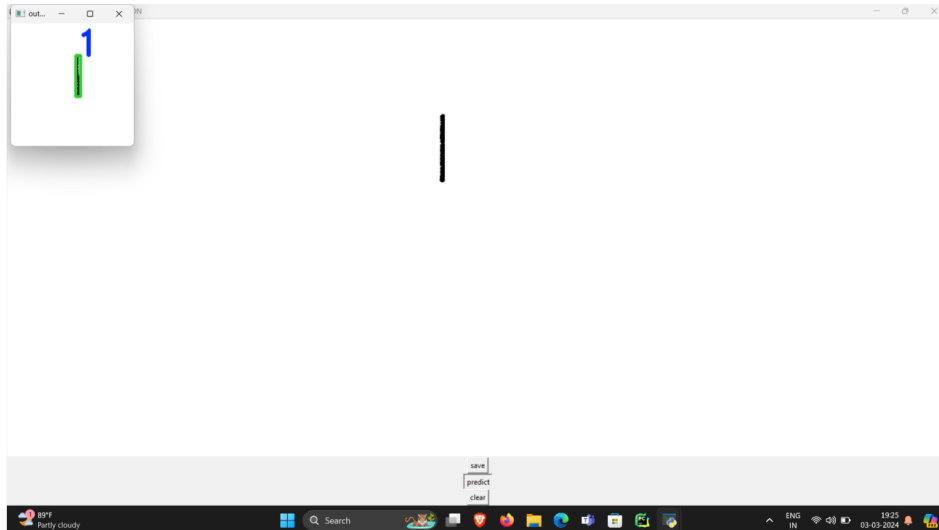
Neural networks (NNs) are widely used in pattern recognition due in large part to their ease of use and power. A straightforward method is to first extract a feature set of multiple samples from various signers that includes information about the

Flow Chat Diagram :



Architecture Diagram :





Conclusion :

Implementation is the stage of the project when the theoretical design is turned out into a working system. Thus it can be considered to be the most critical stage in achieving a successful new system and in giving the user, confidence that the new system will work and be effective. Proposed system successfully implements an user-friendly application this automatically recognizing and detecting handwritten digit Recognition using CNN models. Proposed application MNIST data set collected from kaggle and build model successfully . Our proposed system successfully build an interactive window we created a new GUI. User can draw digits on canvas, and by clicking a button, user can identify the digit. The Tkinter library is the part of Python standard library. Our predict digit () method takes the picture as input CNN will completely extract information from the capture image. Finally capture information maintain in test data database. Finally proposed system applies CNN which makes and then activates the trained model to predict the digit.

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