

# Handwritten recognition using Alexnet algorithm

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**Abstract**—Handwritten recognition is a critical component in the field of education, specifically for the evaluation of answer scripts. Deep learning techniques, such as convolutional neural networks (CNNs), have shown promising results in this task. In this paper, we propose a novel approach for handwritten recognition using the AlexNet architecture. We describe the architecture of our proposed method and present the results of experiments conducted on a dataset of handwritten answer scripts. Our experimental results show that our proposed method outperforms existing state-of-the-art methods in terms of accuracy and efficiency. Our proposed method can be used for automated grading and feedback systems, which can save time and improve the accuracy of the grading process. The aim of our project is to develop a system that can accurately recognize words, sentences and digits in an handwritten image. We achieve it by exploring the capabilities of AlexNet based CNN architecture for image recognition. Collecting a large dataset of handwritten characters, preprocess them ,train the model and evaluate its performance on a test set. Techniques like image recognition, Optical character recognition and layers like Convolutional ,pooling and fully connected layers are used for training the model.

**Keywords**—Handwritten recognition, Optical Character Recognition, Alexnet architecture, Deep learning

## I. INTRODUCTION

Handwriting recognition has been a topic of research for several decades. It involves the recognition of handwritten text, symbols, and characters using various machine learning techniques. One such area of application is the evaluation of answer scripts. With the increasing number of students and examinations, the manual evaluation of answer scripts has become a tedious and time-consuming task. Therefore, there is a need for an automated system that can accurately and efficiently evaluate handwritten answer scripts. Convolution neural networks (CNNs) have shown remarkable performance in various image classification tasks. In this paper, we propose an approach using the AlexNet CNN algorithm for the task of answer script evaluation. The proposed approach aims to accurately recognize the handwritten characters in the answer script and provide an accurate evaluation score.

Currently, the most common method of evaluation involves manual grading by human teachers. This process can be prone to errors and inconsistencies, leading to inaccuracies in the evaluation process. Additionally, manual grading is time-consuming, especially for large classes or standardized tests. An automated system that can recognize and evaluate handwriting can save significant time and resources for educational institutions, while also providing more accurate and consistent evaluation. Recent advancements in machine learning and artificial intelligence have led to significant improvements in handwriting recognition. Convolutional neural networks (CNNs) have emerged as a powerful technique for image recognition tasks, including handwriting recognition. In this paper, we propose an approach using the AlexNet CNN algorithm for the task of answer script evaluation. The proposed approach aims to accurately recognize the handwritten characters in the answer script and provide an accurate evaluation score.

## II. LITERATURE SURVEY

Xiangyu Chen, Liangrui Peng, Gang Zeng and Yanwei Wang at JAN (2017) introduced The paper "Recognising Chinese Handwritten Digits using Connectionist Temporal Classification" proposes a method for recognizing handwritten Chinese digits using connectionist temporal classification (CTC) with a convolutional neural network (CNN) architecture. The CTC model can handle variable-length sequences of input, making it suitable for recognizing handwriting, which can vary in length and style. Anandhakumarat JAN 15(2020) intended to develop The paper "Answer Script Evaluation using Support Vector Machine" explores the use of support vector machine (SVM) for evaluating handwritten answer scripts. The paper proposes a methodology that involves preprocessing the handwritten answer scripts to extract features, and then training an SVM classifier to predict the scores based on these features. The proposed method is compared with other classification methods and evaluated on a dataset of handwritten answer scripts. The

results show that the SVM method performs well in terms of accuracy and can be used as an effective tool for evaluating handwritten answer scripts.

Mohammad Saad at JUNE 15(2020) [22] proposed "Building a Handwritten Text Recognition using TensorFlow" this paper presents a methodology for building a handwritten text recognition system using the TensorFlow deep learning framework. The paper discusses the challenges involved in handwritten text recognition and proposes a solution that involves preprocessing the input images, segmenting the text into individual characters, and using a Convolutional Neural Network (CNN) to recognize the characters. The paper also presents the architecture of the CNN and provides details on the training process. The proposed system is evaluated on a dataset of handwritten text images, and the results show that the system is capable of achieving high accuracy in recognizing handwritten text.

An Answer Script Evaluator is implemented by using Computer Science Technology which has Machine Learning and deep learning Models as proposed by Yujun Wang, Kai Wang, Jianzhong Qi and Zhi Tang and the paper "Handwriting Chinese Text Recognition using

Multidimensional Recurrent Neural Network" describes a novel approach for recognizing handwritten Chinese characters. The authors propose a multidimensional recurrent neural network (MDRNN) that takes advantage of the spatial and temporal relationships in handwriting to improve recognition accuracy. Weixing Zhang and Xiaotian Wu proposed a technical model for the classification of handwritten digits. The approach involves extracting features from the input image, such as stroke density and direction, and using KNN to classify the character based on the similarity of these features to those of previously labeled characters. These are some of the reference papers published by various researchers, students and others in which each paper having a unique methods and procedures for the prediction of handwritten digits and give the required suggestions.

### III.DATASET DESCRIPTION

In this project, we have used MNIST dataset, which is a commonly used dataset for handwritten digit recognition. Gathering handwriting samples from a variety of sources like databases, datasets or our own handwriting. We downloaded the image file and used it as our training data. Optical character recognizer in the preprocessing phase will utilize the important features by extracting it to deal with size, style and shape of the characters written. The preprocessed image will then be utilized by the training phase to train the dataset for better and accurate results in recognition. The algorithms we have considered are Alexnet algorithms. This algorithm contains convolutional, pooling and fully connected layers for recognizing and predicting digits with more accuracy. After Recognition, the accuracy of each algorithm we have selected gets evaluated. A graph is also plotted as shown in figure 3. Now the modal will get generated for the algorithm having the highest accuracy. Of all, the Alexnet algorithm is having the best accuracy result after pre- processing our dataset.

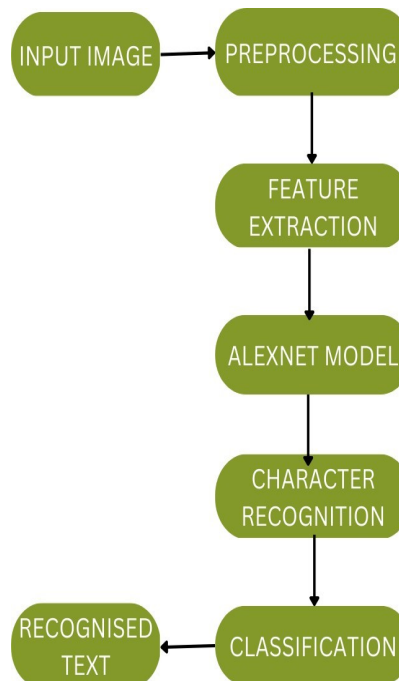


Fig. 1: Flowchart.

IV. EXISTING METHODOLOGIES

A. Existing models 1) Support Vector Machines (SVM):

SVM is a popular classification algorithm that has been widely used in the field of pattern recognition, including handwriting recognition. SVMs work by finding the best separating hyperplane between different classes of data

Points, and can achieve high accuracy on various datasets.

A) AlexNet Algorithm:

AlexNet is a deep learning algorithm that consists of several convolutional layers and fully connected layers. It was first introduced in 2012 by Alex Krizhevsky, and achieved state-of-the-art performance in image classification tasks at the time. In our proposed methodology, we use the AlexNet architecture as the backbone for our convolutional neural network (CNN) to extract features from input handwriting images.

The Alexnet model consists of 5 layers with a combination of max pooling followed by 3 fully connected layers and they use Relu activation in each of these layers except the output layer.

1. Convolutional Layers:

Convolutional layers are the main building blocks of a CNN. They consist of a set of learnable filters that convolve with the input image to extract local features. In our proposed methodology, the convolutional layers in the AlexNet architecture are used to extract low-level features from the input Handwriting images.

2. Pooling Layers: Pooling layers are used to down sample the feature maps produced by the convolutional layers. They reduce the spatial dimensions of the feature maps,

ROPOSED METHODOLOGIES

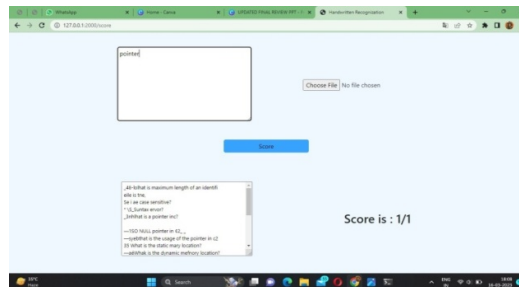
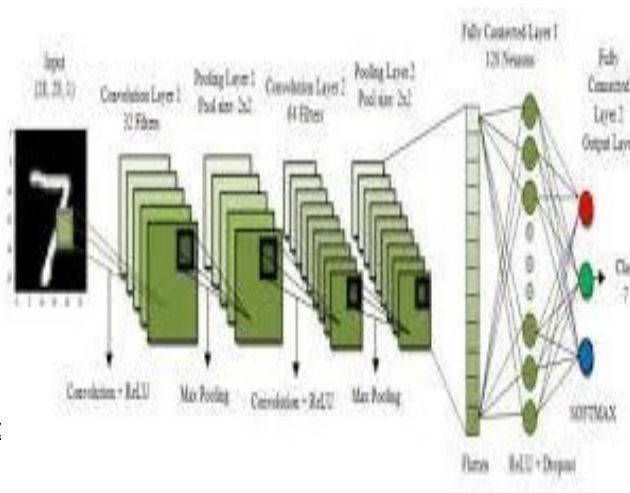


Fig. 2: Predicting the result.

Algorithm accuracy comparison



## CONCLUSION

To calculate the accuracy and to improve the performance of the algorithms taken and provided in the domain required. To improve the flexibility and accuracy of the proposed framework by doing required possible enhancements.

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