

# **HANDWRITTEN TO TEXT CONVERTOR USING DEEP LEARNING**

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# **ABSTRACT**

Many organizations like educational institutions, healthcare sectors, IT services etc., require information. These sectors require the customer or client to fill out a form handwritten and later are filled out in the computers manually. This job is tedious and time consuming. Also, there are number of cases of mimicking handwriting and forgery causing authentication issues. But, as each human have unique characteristics out of which handwriting is one, we can easily authenticate the person by checking his/her strokes while writing, pressure on the paper, tilt etc., that cannot be mimicked or forged.

Therefore, this project intends to recognize the characters of handwritten notes with the help of deep learning using convolutional neural networks and converts the handwritten notes into text document.

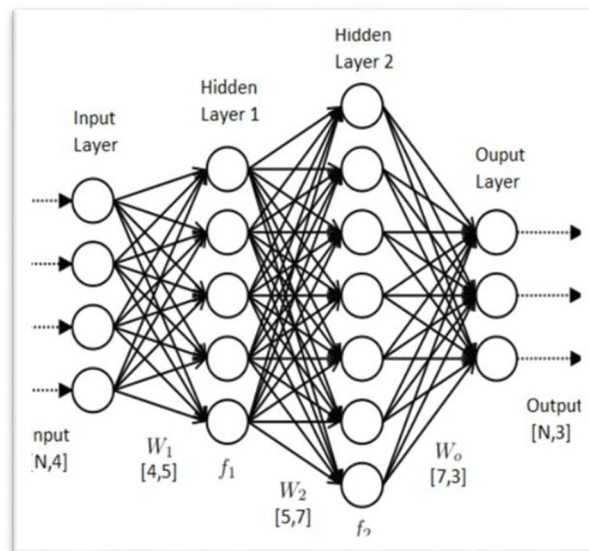
# INTRODUCTION

There are unique characteristics in every human like DNA, fingerprint, iris etc., and handwriting is one such thing which the recent studies on Handwriting analysis has already proved. Although there are many cases regarding the handwriting being mimicked or forged, there is a certain level of uniqueness and individuality like the style of strokes used, the pressure put on paper, tilts, way of holding the pen etc. which can't be mimicked or forged. As computerization is becoming prominent these days, Handwriting Recognition is gaining importance in various fields like authentication of signatures in banks, recognizing ZIP codes addresses on letters, forensic evidence, healthcare centers, IT sectors and educational institutions etc.

## **LITERATURE SURVEY:**

### **DEEP LEARNING:**

Deep Learning is an artificial function that mimics the working of a human brain to process data and create patterns and use it to make decisions. The technical definition of Deep Learning is 'It is a class of machine learning algorithms in the form of a neural network that uses a cascade of layers of processing unit to extract features from data and make predictive guesses about new data'. Deep learning is also called as deep neural learning or deep neural network.



### **CONVOLUTIONAL NEURAL NETWORK:**

A Convolutional Neural Network (ConvNet/CNN) is a Deep Learning algorithm which can take in an input image, assign importance (learnable weights and biases) to various aspects/objects in the image and be able to differentiate one from the other. While in primitive methods filters are hand-engineered, with enough training, ConvNets have the ability to learn these filters/characteristics.

The architecture of a ConvNet is analogous to that of the connectivity pattern of Neurons in the Human Brain and was inspired by the organization of the Visual Cortex. Individual neurons respond to stimuli only in a restricted region of the visual field known as the Receptive Field. A collection of such fields overlaps to cover the entire visual area.

An image is nothing but a matrix of pixel values. A ConvNet is able to **successfully capture the Spatial and Temporal dependencies** in an image through the application of relevant filters. The architecture performs a better fitting to the image dataset due to the reduction in the number of

parameters involved and reusability of weights. In other words, the network can be trained to understand the sophistication of the image better. The role of the ConvNet is to reduce the images into a form which is easier to process, without losing features which are critical for getting a good prediction.

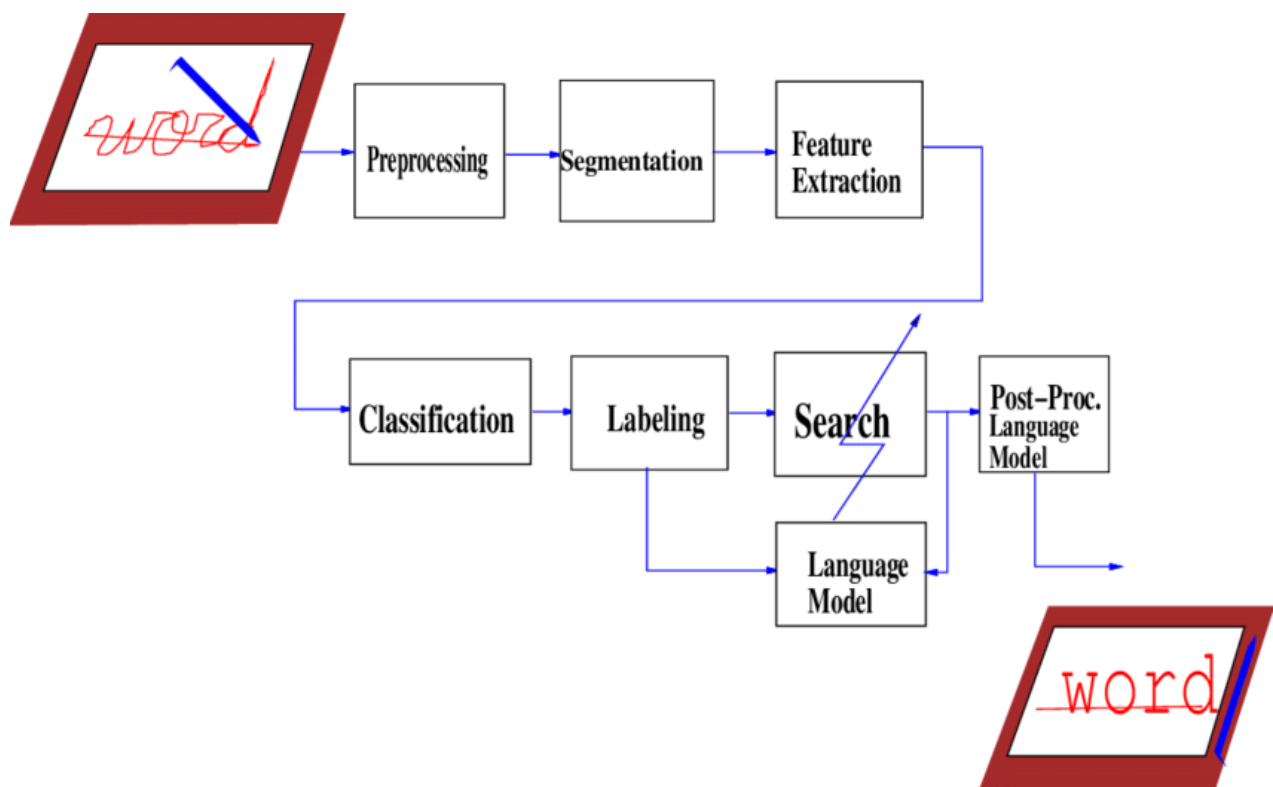
## OCR:

Optical character recognition or optical character reader is the electronic or mechanical conversion of images of typed, handwritten or printed text into machine-encoded text, whether from a scanned document, a photo of a document, a scene-photo or from subtitle text superimposed on an image.

## PROPOSED WORK:

Process of recognition is divided into 4 steps. The initial input is a photo of page with text.

1. Detection of page and removal of background
2. Detection and separation of words
3. Normalization of words
4. Separation and recognition of characters (recognition of words)



Workflow of the model

Data is collected from different sources like Github and various other websites. The dataset which we collect will be mainly divided into 3 parts i.e., validation purpose dataset, testing purpose dataset and training purpose dataset.

Validation dataset: it is a sample of data used to provide an unbiased evaluation of model to fit on the training dataset while tuning our own parameters to check which of our values give desired output.

Training dataset: it is the sample of data used to fit the model.

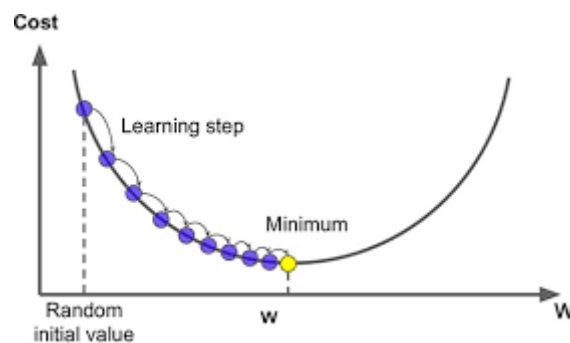
Testing dataset: It is the sample of data used to provide an unbiased evaluation of final model on the

training dataset.

The training and the testing datasets are divided in the ratio 80:20. Once we have divided the dataset, training dataset is applied on the algorithm. Then the evaluation is done and the weights are adjusted using back propagation. The model is trained multiple times to increase the accuracy and once the model reaches the expected high accuracy, we can apply this model on the testing dataset to evaluate the overall model.

Back propagation is an important phase of the entire algorithm as it adjusts the weights of the matrices to get expected output. To get maximum accuracy with minimum training time we have to focus on setting the right values to the hyperparameters.

The major hyperparameters that have to consider and pre-defined are learning rate, epochs and batch size. Learning rate decides the rate at which algorithm learns and adapts to the inputs. Learning rate is a constant that decides the step size of algorithm when the output deviates from the expected output. If the learning rate is low, then training is more reliable, but optimization will take a lot of time because steps towards the minimum of the loss function are tiny. If the learning rate is high, then training may not converge or even diverge. Weight changes can be so big that the optimizer overshoots the minimum and makes the loss worse.



The number of epochs is a hyperparameter that defines the number times that the learning algorithm will work through the entire training dataset. One epoch means that each sample in the training dataset has had an opportunity to update the internal model parameters. Larger the dataset then larger epoch value. The number of epochs is a hyperparameter of gradient descent that controls the number of complete passes through the training dataset. The batch size is a hyperparameter of gradient descent that controls the number of training samples to work through before the model's internal parameters are updated.

Once these hyperparameters are set we feed the training dataset to the model with augmented images with inclinations ranges from +15 to -15 degrees. As the model evaluates itself from the expected outputs weights and biases are being updated. Once the model is trained and provides higher accuracy we can test the model with the testing dataset.

## **CONCLUSION:**

- To create a handwritten character recognition system by training the datasets
- We will then fine-tune our model using convolutional neural network.
- This system can therefore be used in real-time applications in hospitals, IT centers, banking sectors etc., to convert the manually filled forms and documents into text documents for easy retrieval.

## **REFERENCES:**

1. <https://github.com/Breta01/handwriting-ocr/blob/update/README.md>
2. <https://ieeexplore.ieee.org/document/5762513>
3. [https://www.researchgate.net/publication/315053242\\_Handwritten\\_Character\\_Recognition\\_in\\_English\\_A\\_Survey](https://www.researchgate.net/publication/315053242_Handwritten_Character_Recognition_in_English_A_Survey)
4. [https://github.com/Praneet9/Smart\\_Editor](https://github.com/Praneet9/Smart_Editor)