



e-ISSN: 2319-8753 | p-ISSN: 2347-6710

IJRSET

International Journal of Innovative Research in
SCIENCE | ENGINEERING | TECHNOLOGY



INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

Volume 12, Issue 5, May 2023

ISSN INTERNATIONAL
STANDARD
SERIAL
NUMBER
INDIA

Impact Factor: 8.423

 9940 572 462

 6381 907 438

 ijrset@gmail.com

 www.ijrset.com



Handwritten Character Recognition Using Deep Learning Neural Network

Prof. Jalindar Nivrutti Ekatpure¹, Bharati Rajesh Shinde², Dipti Raju Waidande³, Saniya Raju Kazi⁴

Associate Professor, Department of Computer Engineering, S B Patil College of Engineering Indapur,
Maharashtra, India¹

U.G. Student, Department of Computer Engineering, S B Patil College of Engineering Indapur, Maharashtra, India²

U.G. Student, Department of Computer Engineering, S B Patil College of Engineering Indapur, Maharashtra, India³

U.G. Student, Department of Computer Engineering, S B Patil College of Engineering Indapur, Maharashtra, India⁴

ABSTRACT: Many researchers are operating to alter the method of reading, understanding, and interpretation of the written word. Word recognition is a very important area of Document Analysis and Recognition. Deep learning is a very important topic in pattern recognition and in machine learning. It has the potential to resolve complicated machine-learning problems. The availability of tools that helps in pattern recognition provides an incredible chance for the next Generation application. Convolution neural networks used data-driven learning and extraction of hierarchical features from training Convolution layers in CNN. This system presents the machine learning algorithm for Handwritten word recognition. CNN tends to work better with raw input pixels. The system accepts the whole scan images as raw input and will do further process providing the required output. Our proposed system's purpose of this project is to take handwritten English characters as input, process the character, train the neural network algorithm, to recognize the pattern, and modify the character to a beauties version of the input. Keywords: Machine learning, Deep learning, Convolutional Neural Networks (CNN), Image recognition.

KEYWORDS: Machine learning, Deep learning, Convolutional Neural Networks (CNN), Image recognition, etc

I. INTRODUCTION

Handwritten digit recognition is the ability Computer to recognize human Handwritten digits. It is a hard task for the machine because handwritten digits are not perfect and can be made with many different flavours. Handwritten digit recognition is the image of a digit and recognizing the digit present in the image handwriting recognition is a machine's ability to receive and interpret handwritten input from multiple sources like paper documents, photographs, touch screen devices, etc. Recognition of handwritten and machine characters is an emerging area of research and finds extensive applications in banks, offices, and industries. The main aim of this project is to design an expert system for, "HCR(English) using Neural Network". that can effectively recognize a particular character of type format using the Artificial Convolutional Neural Network approach. Neural computing Is a comparatively new field and design components are therefore less well specified than those of other architectures. Neural computers implement data parallelism. Neural computers are operated in a way that is completely different from the operation of normal computers. Neural computers are trained so that given a certain starting state (data input); they either classify the input data into one of the numbers of classes or cause the original data to evolve in such a way that a certain desirable property is optimized. Handwritten Character Recognition works bit by bit as pre-processing, segmentation, feature extraction, and recognition using neural networks. Pre-processing includes a series of operations to be applied to the document image to form it prepared for segmentation. throughout segmentation, the document image is divided into individual character or numeric images then the feature extraction technique is applied to the character image. Finally, a feature vector is conferred to the chosen algorithmic rule for recognition. Here these extracted options are provided to Neural Network for recognition of character.

II. MOTIVATION

Handwriting recognition of characters has been around since the 1980s. The task of handwritten digit recognition, using a classifier, has great importance and use such as – online handwriting recognition on computer tablets, recognizing zip codes on mail for postal mail sorting, processing bank check amounts, numeric entries in forms filled up by hand (for



example - tax forms) and so on. There are different challenges faced while attempting to solve this problem. The handwritten digits are not always of the same size, thickness, orientation, or position relative to the margins. Our goal was to implement a pattern classification method to recognize the handwritten digits provided in the MNIST data set of images of handwritten digits (0-9).

III. RELATED WORK

Handwritten digit recognition (HDR) shows a significant application in the area of information processing. However, correct recognition of such characters from images is a complicated task due to immense variations in the writing style of people. Moreover, the occurrence of several image artifacts like the existence of intensity variations, blurring, and noise complicates this process. In the proposed method, we have tried to overcome the aforementioned limitations by introducing a deep learning- (DL-) based technique, namely, EfficientDet-D4, for numeral categorization. Initially, the input images are annotated to exactly show the region of interest (ROI). In the next phase, these images are used to train the EfficientNet-B4-based EfficientDet-D4 model to detect and categorize the numerals into their respective classes from zero to nine. We have tested the proposed model over the MNIST dataset to demonstrate its efficacy and attained an average accuracy value of 99.83%. Furthermore, we have accomplished the cross-dataset evaluation on the USPS database and achieved an accuracy value of 99.10%. Both the visual and reported experimental results show that our method can accurately classify the HDR from images even with the varying writing style and under the presence of various sample artifacts like noise, blurring, chrominance, position, and size variations of numerals. Moreover, the introduced approach is capable of generalizing well to unseen cases which confirms that the EfficientDet-D4 model is an effective solution to numeral recognition.

IV. EXISTENCE SYSTEM

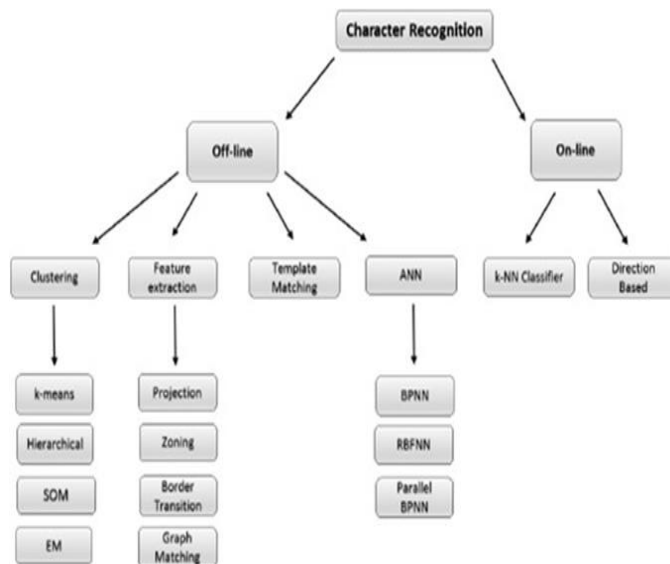


Fig. 1 System Architecture

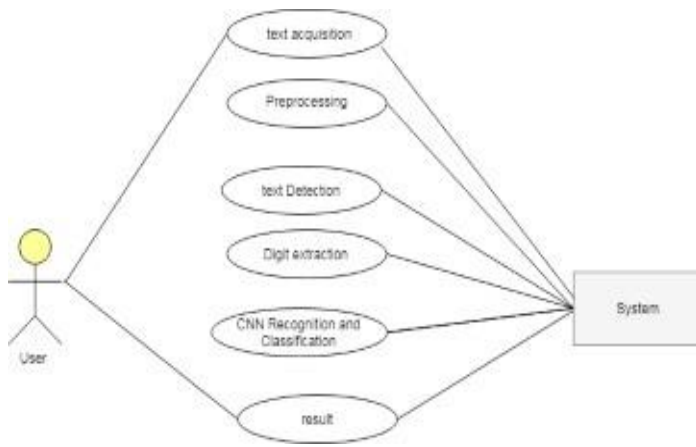


Fig. 2 Use Case Diagram

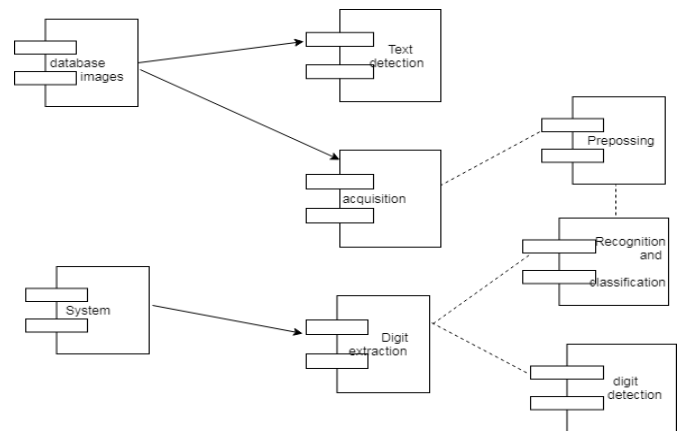


Fig. 3 Component Diagram

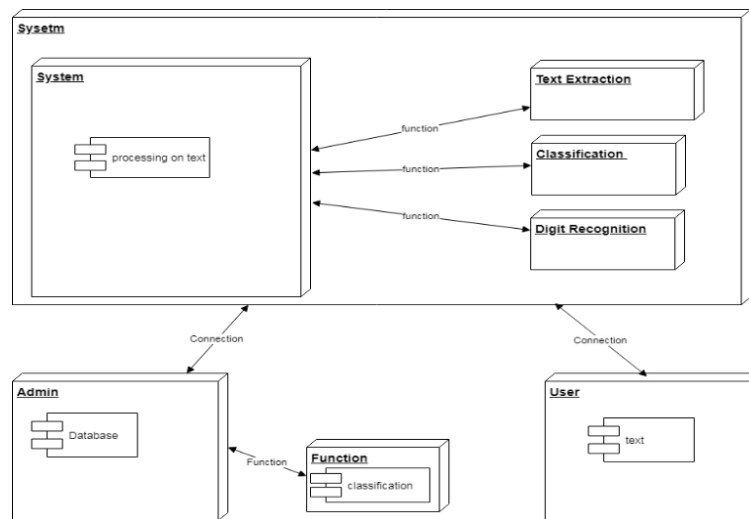


Fig. 4. Deployment Diagram

1. Mathematical Module

Let Us be the Whole system $S = I, P, O$

I-input

P-procedure

O-output

Input(I)

I= Images

Where,

Images - i any text on images

Procedure (P),

$P = I$, Using I System perform operations and detect the text or digit from images.

Output(O)-

O= System detects text or digits.

2. Working



Fig. 1. Output 1

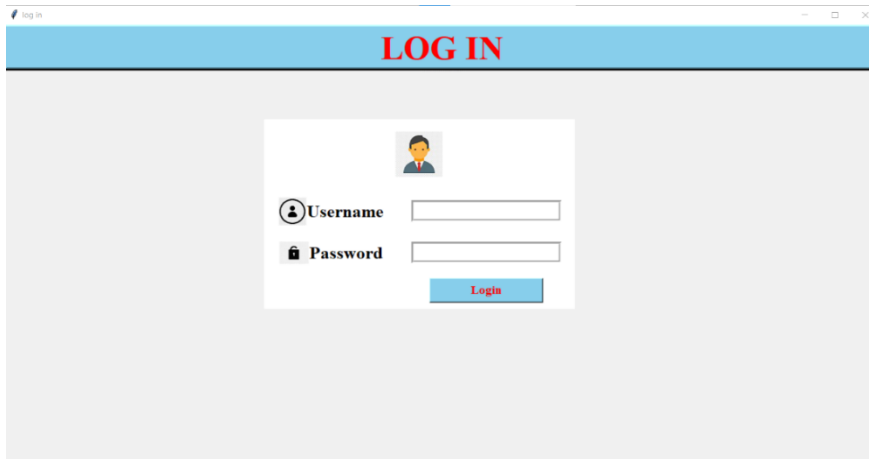


Fig. 2. Login page

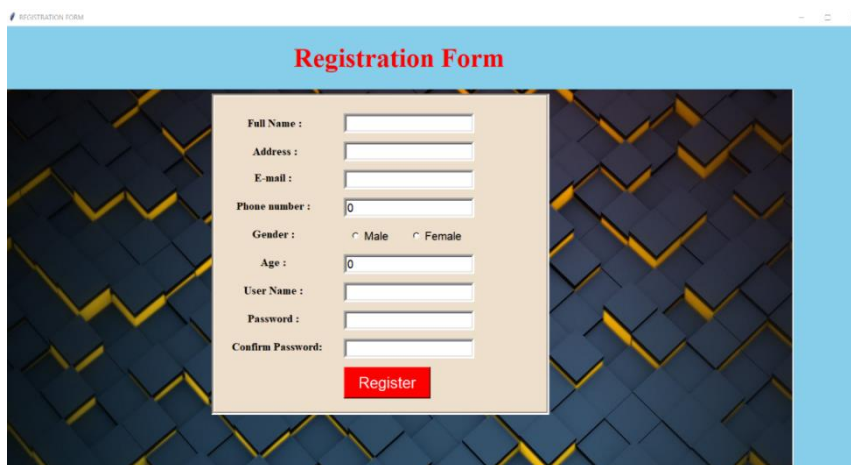


Fig. 3. Registration Page

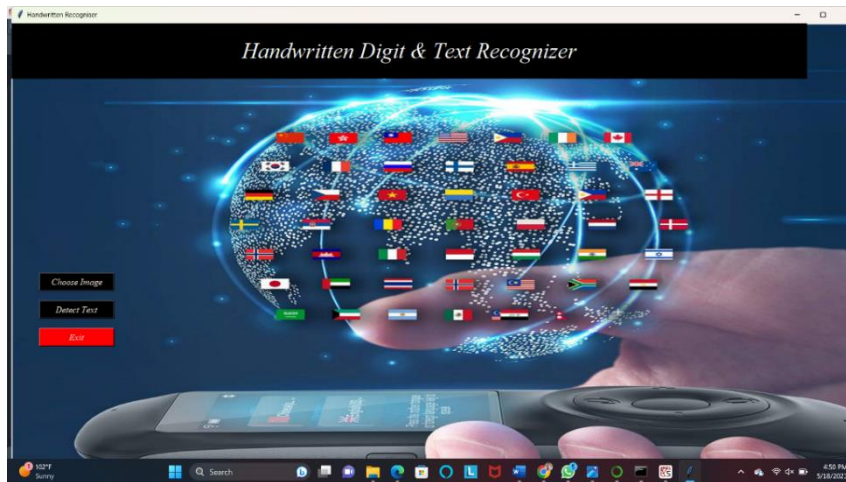


Fig. 3. Recognition Page 1

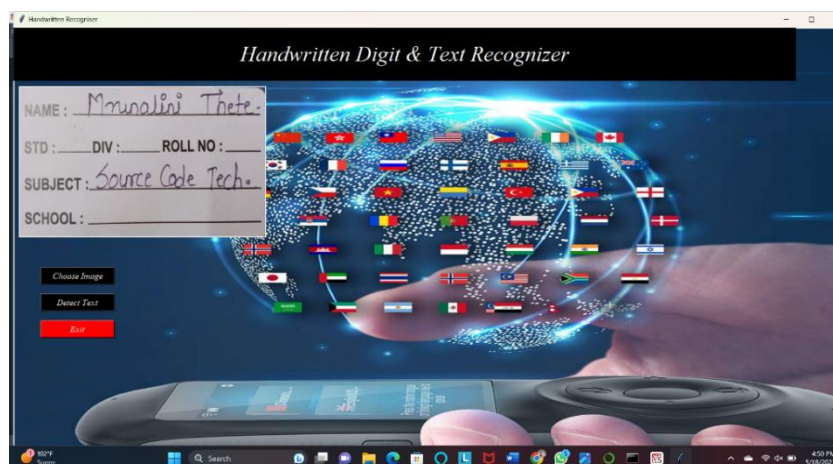


Fig. 3. Recognition Page 2

V. ADVANTAGES

1. helps to transform the writings in the papers to a text document format which can also be said as readable electronic format.
2. Despite of rough handling, one can read the OCR information with a high degree of accuracy. Flatbed scanners are very accurate and can produce reasonably high-quality images.
3. The processing of OCR information is fast. Large quantities of text can be input quickly.
4. A paper-based form can be turned into an electronic form which is easy to store or send by mail.
5. It is cheaper than paying someone amount to manually enter a large amount of text data. Moreover, it takes less time to convert into electronic form.
6. The latest software can re-create tables as well as the original layout.

VI. APPLICATION

1. Postal mail sorting.
2. Bankcheck processing
3. formdata



VII. COMPARISON

Feature extraction techniques can be important in character recognition because they can enhance the efficiency of recognition in comparison to pixel-based approaches. This study aims to investigate novel feature extraction techniques to use them for representing handwritten characters. In this system, three feature extraction methods (Gradient, DCT, and DWT) are used to compare the effectiveness of handwriting characters. The system is started by acquiring an image containing characters. The characters are processed into several phases: binarization, noise filtering, normalization, and feature extraction before recognition. A multilayer neural network is used for the recognition phase; a feed-forward backpropagation algorithm is applied for training the network. This paper aims to compare different feature extraction methods in terms of recognition accuracy and training time.

VIII. CONCLUSION

Feature extraction techniques can be important in character recognition because they can enhance the efficiency of recognition in comparison to pixel-based approaches. This study aims to investigate novel feature extraction techniques to use them for representing handwritten characters. In this system, three feature extraction methods (Gradient, DCT, and DWT) are used to compare the effectiveness of handwriting characters. The system is started by acquiring an image containing characters. The characters are processed into several phases: binarization, noise filtering, normalization, and feature extraction before recognition. A multilayer neural network is used for the recognition phase; a feed-forward backpropagation algorithm is applied for training the network. This paper aims to compare different feature extraction methods in terms of recognition accuracy and training time.

REFERENCES

- [1] Agaton, S. Kustrin, R. Beresford, "Basic concepts of artificial neural network (ANN) modeling and its application in pharmaceutical research", Journal of biomedical analysis, vol. 22, no. 5, pp. 717-727, 2000.
- [2] <https://irjiet.com/commonsrc/articlefile/162341639056a1092eb35irjiet.pdf>
- [3] S. Y. Zhang, Y. M. Zhao, J. L. Li, "SVM-based image classification algorithm and implementation. Computer engineering and application", vol. 25, pp. 40- 42+86, 2007.
- [4] Ekatpure, J., Nair, D., Deshpande, M., Sagare, S., Jadhav, P. (2021). ATM Security Using Image Processing in Machine Learning. International Research Journal of Innovations in Engineering and Technology, 5(6), 29
- [5] K. Ding, "Research on adaptive technology of Chinese hand-writing writers based on incremental learning", South China University of Technology, 2011
- [6] Dhakane, Vikas Nivrutti, and Jalinder Nivrutti Ekatpure. " Super Resolution of License Plates Using Generalized DAMRF Image Modeling."
- [7] P. Zhou, "Research on Acoustic Modeling of Speech Recognition Based on Deep Neural Network", University of Science and Technology of China, 2014
- [8] Q. Y. Bu, "Design and Implementation of Face Recognition System Based on Open CV", Jilin University, 2015.
- [9] G. E. Hinton, S. Osindero, Y. The, "A fast learning algorithm for deep belief nets", Neural Computation, vol. 18, no. 7, pp. 1527-1554, 2006.
- [10] S. Y. Zhang, "Depth model and its application in visual text analysis", South China University of Technology, 2016
- [11] L. Bottou, "Notes on convolutional neural networks", 2006



INNO SPACE
SJIF Scientific Journal Impact Factor
Impact Factor: 8.423



ISSN INTERNATIONAL
STANDARD
SERIAL
NUMBER
INDIA



INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

9940 572 462 **6381 907 438** **ijirset@gmail.com**



www.ijirset.com

Scan to save the contact details