LITERATURE REVIEW

[1] Hai Pham, Amrith Setlur, Saket Dingliwal, Tzu-Hsiang Lin, Barnab´as P´oczos, Kang Huang, Zhuo Li, Jae Lim, Collin McCormack, Tam Vu., "Robust Handwriting Recognition with Limited and Noisy Data" in 17th International Conference on Frontiers in Handwriting Recognition (ICFHR)

Despite the advent of deep learning in computer vision, the general handwriting recognition problem is far from solved. Most existing approaches focus on handwriting datasets that have clearly written text and carefully segmented labels. In this paper, we instead focus on learning handwritten characters from maintenance logs, a constrained setting where data is very limited and noisy. We break the problem into two consecutive stages of word segmentation and word recognition respectively, and utilize data augmentation techniques to train both stages. Extensive comparisons with popular baselines for scene-text detection and word recognition show that our system achieves a lower error rate and is more suited to handle noisy and difficult documents.

[2] Anuran Chakraborty, Rajonya De, Samir Malakar, Friedhelm Schwenker and Ram Sarkar, "Handwritten Digit String Recognition using Deep Autoencoder based Segmentation and ResNet based Recognition Approach" in 2020 25th International Conference on Pattern Recognition (ICPR) Milan, Italy, Jan 10-15, 2021

Recognition of isolated handwritten digits is a wellstudied research problem and several models show high recognition accuracy on different standard datasets. But the same is not true while we consider recognition of handwritten digit strings although it has many real-life applications like bank cheque processing, postal code recognition, and numeric field understanding from filled-in form images. The problem becomes more difficult when digits in the string are not neatly written which is commonly seen in freestyle handwriting. The performance of any such model primarily suffers due to the presence of touching digits in the string. To handle these issues, in the present work, we first use a deep autoencoder based segmentation technique for isolating the digits from a handwritten digit string, and then we pass the isolated digits to a Residual Network (ResNet) based recognition model to obtain the

machine-encoded digit string. The proposed model has been evaluated on the Computer Vision Lab (CVL) Handwritten Digit Strings (HDS) database, used in HDSRC 2013 competition on handwritten digit string recognition, and a competent result with respect to state-of-the-art techniques has been achieved.

[3] Jinze Li, Gongbo Sun, Leiye Yi, Qian Cao, Fusen Liang , Yu Sun, "Handwritten Digit Recognition System Based on Convolutional Neural Network " in 2020 IEEE International Conference on Advances in Electrical Engineering and Computer Applications (AEECA)

Image recognition is widely used in the field of computer vision today. As a kind of image recognition, digit recognition is widely used. Today, the online recognition technology in digit recognition is relatively mature while the offline recognition technology is not. This paper mainly introduces an offline recognition system for handwritten digits based on convolutional neural networks. The system uses the MINST dataset as a training sample and pre-processes the picture with the Opencv toolkit. Then it uses LeNet-5 in the convolutional neural network to extract the handwritten digit image features, repeatedly convolution pooling, and pull the result into a one-dimensional vector. And finally find the highest probability point to determine the result to achieve handwritten digit recognition with the Softmax regression model. The application of this system can greatly reduce labor costs and improve work efficiency, which is of great significance in many fields.

[4] Hao Zeng, "An Off-line Handwriting Recognition Employing Tensorflow" in 2020 International Conference on Big Data, Artificial Intelligence and Internet of Things Engineering (ICBAIE).

Abstract-Handwriting has been a conventional means of communication and recording in daily life since early time. Given its ubiquity in human transactions, machine recognition of handwriting has practical significance, such as, in reading handwritten notes in a PDA, in postal addresses on envelopes, in amounts in bank checks, or in handwritten fields in forms. Handwriting recognition is a vital application in daily activities and the researches of especially handwritten digits recognition is vital. This paper focuses on using simpler neural network instead of complicated ones that require high quality of computer configuration to recognize handwriting digits

with´ relatively promising accuracy. To do this research, a neural network to recognize handwriting in MNIST dataset using Softmax Regression algorithm with a high accuracy is built.

[5] Ayush Kumar Agrawal; A.K. Shrivas; Vineet kumar Awasthi, A Robust Model for Handwritten Digit Recognition using Machine and Deep Learning Technique in 2021 2nd International Conference for Emerging Technology (INCET).

In the era of research, pattern recognition is one of the most famous and widely used area in the field of research work. There are various types of patterns are available for the researches like: audio, video, handwritten digit images and handwritten characters images etc. In this paper, we concentrate in the field of handwritten digit recognition for classification of patterns. We have used famous handwritten digit datasets named as MNIST, which is collection of 70000 images. Many of machine learning and deep learning techniques have been already used by the researches for handwritten digit recognition like Support Vector Machine (SVM), RFC, K-nearest Neighbor (K-NN), Multilayer Perceptron (MLP), Convolutional Neural Network (CNN) etc. In this research work, we have suggested CNN as deep learning technique on keras for MNIST handwritten digit recognition and compare the performance of CNN with SVM and KNN. The proposed CNN based on keras model used to classify handwritten digit images with RMSprop optimizer for optimizing the model. The main contribution of this research work is to increase the convolutional layer with pooling and dropout and also tuned the model using filter, kernel size and number of neurons. The proposed CNN model achieves 99.06% of training accuracy and 98.80% of testing accuracy with epoch 10. Experiment results reveals that proposed CNN is more effective compare to other techniques.