# HANDWRITING RECOGNITION SYSTEM-USING MACHINE LEARNING

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## ABSTRACT

In this research we developed and tested a Handwriting Recognition System. Handwriting Recognition is an important task in document analysis, digital security etc. Handwriting Recognition system have a great advancement in future. We studied different techniques used for handwriting recognition. The research is conducted to study and improve the accuracy of Handwriting Recognition System.

## I.     INTRODUCTION

Handwriting Recognition is the process of teaching computers to read and understand human handwriting that's important in today's world. It's a challenging research area because people have different handwriting styles and it's not always neat and sleek. It's very important recognizing handwritten text in various places like postal addresses and bank cheques to recognize the numbers and words. Recognizing handwritten words was very difficult, even close to impossible in the fast . Over the years researchers have made progress but they didn't make significant advances. A survey in 1992 mentioned that not much progress had been made up until then. Since 1992, there has been some progress. There are two main types of Handwriting Recognition : Online and Offline. In Online recognition system computer recognizes your handwriting while writing typically on a touchscreen device using a digital pen or stylus. The computer captures information about pen such as speed and timing of the movement of pen. In offline recognition computer analyse the text of scanned document or an image.

## II.     LITERATURE REVIEW

In past methods like Hidden Markov Models (HMMs), Connectionist Temporal Classification (CTC),  Dynamic Time Wrapping (DTW) make a fundamental approach to Handwriting Recognition. To improve the performance Machine learning is used in this systems. Deep learning techniques such as Convolutional Neural Networks (CNNs) and Recurrent Neural Networks (RNNs) made a great success in the field of Handwriting Text Recognition (HTR). For improving the quality of the image data techniques like smoothing, denoising and augmented methods like Scaling, Rotation and jittering played a very crucial role recognition systems. Regardless of the advancements HTR faces some challenges-

1) Large Variability - Person to person handwriting is different. Irregularities in letters and characters, different strokes, different handwriting styles makes a great variability in handwriting.

2)  Low image quality – Older documents contains a lot of noise and the quality is also low. Due to this it's hard to recognize those data.

## III.     METHODOLOGY

In this paper a method for handwriting recognition using python and machine learning is described. In this research to understand the current state of the field, techniques and key challenges , reviewing existing research and studies on Handwriting Recognition was done. We collect a distinct dataset of Handwritten samples including various writing styles and variations. Preprocessing of images was done to remove noise or inconsistencies. A dataset of images assigned with its corresponding label is created. We train the system model, calculate the accuracy of the code and analyze the results of the system to check the correctness of the program.
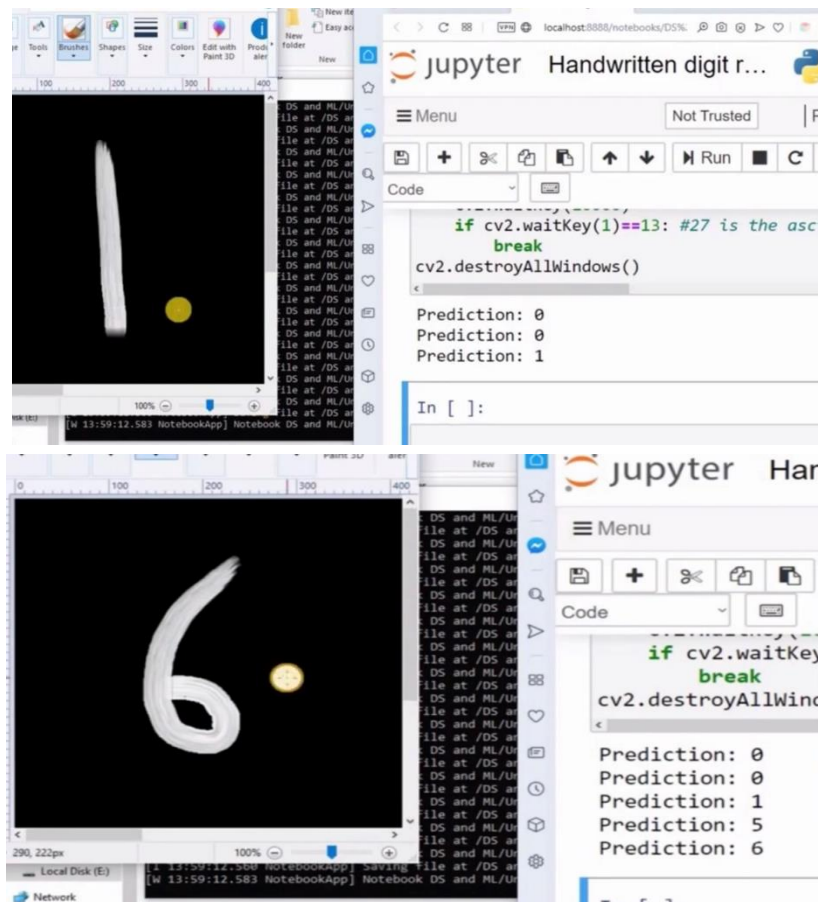
## IV.    RESULTS



**Figure 2:** Result of the program

## V.    CONCLUSION

As an evolving field in technology there should be lots of advancements in HTR. We can apply more deep learning techniques to improve correctness of the system. We proposed an Offline Handwriting Digit Recognition model using Python and Machine Learning. The results are satisfactory but not fully accurate.

## VI.    REFERENCES

[1]    Yadav, Pooja. "Handwriting Recognition System- A Review." International Journal of Computer Applications 114, no. 19 (n.d.).

[2]    Z. Xinbo and W. Lili, "Handwritten Digit Recognition Based on Improced Learning Rate BP Algorithm". The 2nd International Conference on Information Engineering and Computer Science (ICIECS), pp. 1-4.2010.

[3]    Jayashree R Prashad, Dr. U V Kulkarni "Trends in handwriting recognition" IEEE 2010, Third international conference on emerging trends in engineering and technology.

[4]    Sameer singh , Adnan Amin "Neural network recognition and analysis of hand printed letters. IEEE 1998

[5]    Pratik Madhukar Manwatkar, Dr. Kavita R. Singh "A Technical Review on Text Recognition from Images", IEEE Sponsored 9th International Conference on Intelligent Systems and Control (ISCO)2015

[6]    M.Y. Chen, A. Kundu, J. Zhou, S.N. Srihari: Offline handwritten word recognition using HMM. U.S. Postal Service, 5th Adv Technol Conf, pp 563-587 (1992)

[7]    Keysers, Daniel, Thomas Deselaers, Henry A. Rowley, Li-Lun Wang, and Victor Carbune. "Multi-Language Online Handwriting Recognition." IEEE Transactions on Pattern Analysis and Machine Intelligence 39, no. 6 (June 1, 2017): 1180–94. https://doi.org/10.1109/TPAMI.2016.2572693.