# BACKGROUND STUDY

## Paper1: shorturl.at/swxMS

**Objective and motivation of the work:**

In this paper, they research offline handwritten character recognition and describe a method that gets more than 90% accuracy. They intend to create software with high preciseness and with the least time and area complexity and which also gives optimal performance. The inspiration for this task is to reduce the time when entering data and also the storage space. It can process crucial and sensitive information much faster without human intervention.

**Proposed methodology in the work:**

There are six steps to recognize a handwritten character. They follow those steps to acquire their ultimate goal. Those steps are:

Image acquisition: In this stage, the input format is determined.

Preprocessing: This stage is important for gaining a higher recognition rate. In this process, the missing pen stroke, distorted character size, space size, unusual bent of character has been fixed. Also noise removing, binarization and normalization done in this step.

Segmentation: In this stage make individual characters from the input characters.

feature extraction: the aim of this stage to extract the pattern from the character which is very important for classification.

Classification: The extracted features of characters are used for recognition. For this classifier like SVM and Neural Networks are used. Softmax regression is used for finding the best matching class for input.

Post-processing: In this final phase natural language is used for correcting the misclassified output.

**Contributions of the work:**

After their research, they found that the diagonal and directional technique of feature extraction gives a better result. Its accuracy is greater than the vertical and horizontal methods. Neural networks help to reduce the noise which gives accurate results. With a good neural network design and a larger training set, the results it shows are mostly accurate. Those observations will be very helpful for future research. The research accuracy can be much improved with that knowledge.

**Lacking of the works:**

By training the machine with more training sets this work can be improved much further.

**Summary:**

Lastly, after going through the paper I get to know how neural networks work and tensor flow used for recognition. By using the softmax regression it is easy to find the probability of classification. If we can use that thing in our project I think it will be helpful to improve the accuracy and less error result.

## **Paper2:** shorturl.at/kxKS3

**Objective and motivation of the work:**

In this paper, they introduce a new method for off-line handwritten character recognition. With this new method, they try to reach their goal and show the best results. On-line character recognition is more accurate than the off-line system. The off-line system catches more and more attention because the on-line system shows promising results. But getting an accurate result in an off-line system is not easy. The researcher tries to achieve that goal with that point on their mind.

**Proposed methodology in the work:**

In the new approach, they manage the geometric features of letters. Their recommended system integrates two procedures which are a neural network and preprocessing of geometric features extraction. Preprocessing helps to reduce the dimensionality of the neural network input and get protection against image interpretation. In the pre-processing step, the text goes under digitization, binarization, noise elimination, normalization, and segmentation. In the next step, the center of mass of the character is determined and with this, the vector is drawn. Depending on the geometric analysis neural networks' training structure is made. Individual characters are the input of this system.

**Contributions of the work:**

In this paper, the researcher submits a new strategy and this approach to identifying specific characters depends on the number of learning time. The more the learning time the better the accuracy gets. After testing with 60 series of all structures the error percentage decreased by 90%. By following this new approach future researchers can get better results. This approach adds another way for the researcher to recognize off-line the handwritten characters.

**Lacking of the works:**

This work gives a 90% accurate result but which is less than other research. Where other research shows more than 90% accuracy. This research will take more time because it has to train with more training sets to get more accurate results and it is very time-consuming.

**Summary:**

Lastly after going through the paper I get to know a new method where geometric features extraction is used. By discussing with my groupmate I think it can be used at some point in our project.