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SIGNATURE VERIFICATION SYSTEM USING IMAGE PROCESSING

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Abstract:
To avoid forgery and ensure the confidentiality of Information in the field of Information Technology Security an inseparable part of it. In order to deal with security, Authentication plays an important role. A person's signature is a representative of his identity. For us at the Bank, a signed document by a customer is an instruction from him for carrying out an approved transaction for him. To avoid forgery and ensure the confidentiality of Information in the field of Information Technology Security an inseparable part of it. In order to deal with security, Authentication plays an important role.
This Project is basically, a type of Machine Learning algorithm which you will put on images of signature that banks have of their customers and this algorithm will compare it with for ged signatures and tell whether the signature submitted while making a cheque payment, DD is true or not. The purpose of this project is to ensure that the rendered services are accessed only by a legitimate user, and not anyone else. By using this method it is possible to confirm or establish an individual's identity. The plan of action of this project was to develop a sophisticated algorithm and code using the different identified liberties and tools with the methods mentioned in this report and to design a GUI using Java Swings and implement the project. Basically to build a system that can help distinguish forgeries from actual signatures. This system should be able to study signature parameters as strokes, curves, dots, dashes, writing fluidity & style, in a Writer Independent manner and create features for identification of the signature.
Key Words: Signature, Image, Artificial Intelligence, Convolutional Neural Networks.

1. INTRODUCTION

A person's signature is a representative of his identity. For us at the bank ,a signed document by a customer is an instruction from him for carrying out an approved transaction for him. To avoid forgery and ensure the confidentiality of Information in the field of Information Techno logy Security an inseparable part of it. In order to deal with security, Authentication plays an important role.
This is basically, a type of Machine Learning algorithm which you will put on images of signature that banks have of their customers and this algorithm will compare it with forged signatures and tell whether the signature submitted while making a cheque payment, DD payment is true or not. The purpose of this project is to ensure that the rendered services are accessed only by a legiti mate user, and not anyone else. By using this method it is possible to confirm or establish an individual's identity.

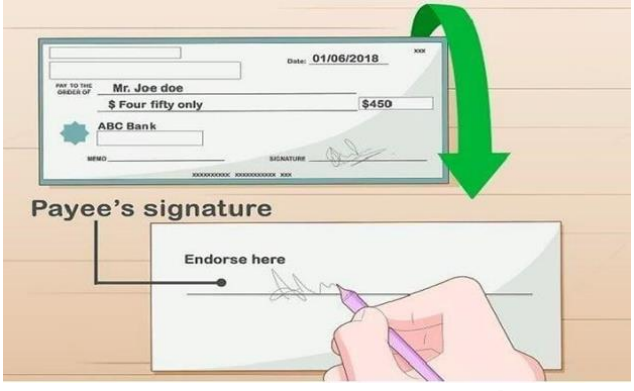

Fig 1: Payee Signature on DD or Cheques

On on-boarding a customer we capture an image of his signature in our systems, and on receiving a signed document (Cheques, DDs and others) from him we match the signature on the document with the one recorded in the database before proceeding with the instruction. In the case of skilled forgeries, it becomes very difficult to verify the identity of the customer. This project is a system that can help in distinguishing forgeries from actual signatures. This system will be able to study signature parameters as strokes, curves, dots, dashes, writing fluidity & style, in a Writer-Independent manner and create features for identification of the signature Image processing is any form of signal processing for which our input is an image such as photographs or frames of videos and our output can be either an image or a set of character ristics related to the image . Image processing is defined as the use of computerized algorithms for the analysis of images with respect to an application Image processing basically includes the following three steps:

1. Importing the image via image acquisition tools.
2. Analyzing and manipulating the image.
3. Output in which result can be altered image or report that is based on image analysis.

Signature verification is a type of software that compares signatures and checks for authenticity. This saves time and energy and helps to prevent human error during the signature process and lowers chances of fraud in the process of authentication. The software generates a confidence score against the signature to be verified. Too low of a confidence score means the signature is most likely a forgery.

Signature verification software has now become lightweight, fast, flexible and more reliable with multiple options for storage, multiple signatures against one ID and a huge database. It can automatically search for a signature within an image or file. Signature verification is a type of software that compares signatures and checks for authenticity. This saves time and energy and helps to prevent human error during the signature process and lowers chances of fraud in the process of authentication. The software generates a confidence score against the signature to be verified. Too low of a confidence score means the signature is most likely a forgery.

2. METHODOLOGY

The sequence of deploying this ANN and CNN are used. It just requires above mentioned tools and software's. Offline handwritten signature verification system composed of two part:

- Data pre processing (Image Processing, Feature Extraction)
- Model training (Training Classifier, Feature Matching)

Data pre processing:

In this each image is processed such that bounding box is created around the signature and that part of image is only taken which consists of signature (lets name it as cut piece image), and many important features are extracted.

List of features extracted from images are:

- Hu Moments
- Hara lick
- Eccentricity Solidity
- Skew Kurtosis
- Aspect ratio,
- Bounding rectangle area,
- Contour area
- Centroid
- Center of mass
- Baseline shift
- Signature actual Height
- Signature actual Width

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• Cut piece image is broken into 16 parts and for each part center of mass is calculated and then angle is calculated between center of mass of each part with the right bottom most part, these angles is then used as features along with above mentioned one, these angles turn out to be the most important features for signature verification system.

Once these features are extracted from images a data set is created such that training and validation data is obtained after splitting the image database (containing the features of each image in the chosen directory) into 80:20 ratios. Many different approach for features extraction was also tried but that turn out to be bad for our model such as features like Surf, Sift, PCA ,Codebook vector generated using LVQ(Learning vector Quantization) all these features when used for training our model decreases its accuracy as a result these features are neglected.

Model training:

Bagging technique (type of Ensemble technique) has been applied as this technique gives the best accuracy when datasets is small. Two Random Forest Classifier model is trained one for identity check of signatures and another one for status check (i.e. 1 for genuine and 0 for forged signature) And each model is trained independent of each other and finally they are combined once they are fully trained. Each model is tuned and best parameters are obtained for which model gives maximum accuracy score on validation set. Training time depends upon the size of database used for training for example it took approx. 10 min to train both the model on dataset4(folder present inside dataset folder containing signa -ture of 18 persons 5 for each person) and approx. 16-17 min to train both the model on sample_signatures database (containing signature of 30 persons 5 for each person). This model performs better than many existing models, its accuracy is better than LVQ, VQ, SVM approach.

SYSTEM DESIGN

The System designs of the product are mentioned below as follows:- Project diagram Data Flow Diagram Signature Verification Architecture Use case diagram Activity diagram Class diagram State Diagram

Project Diagram:

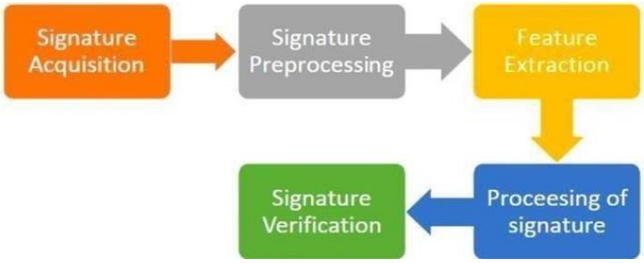

Fig. 2 Project Diagram

Data flow diagram:

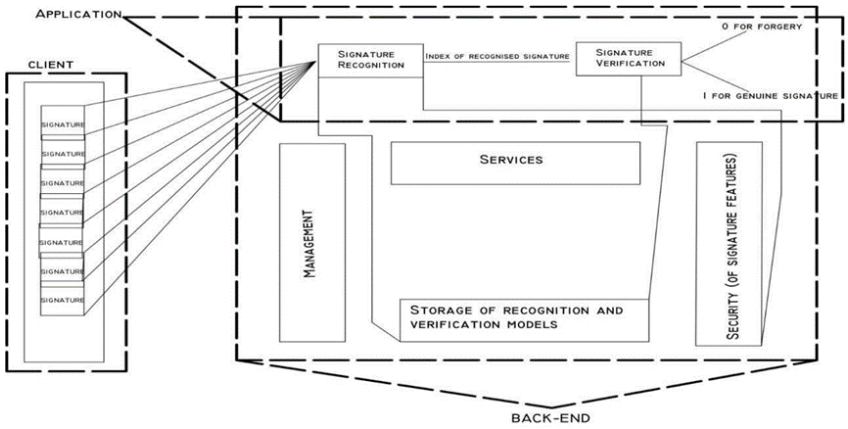

Fig. 3: Flow Diagram

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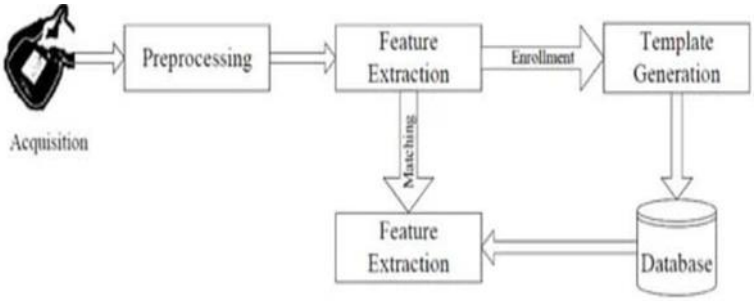


Fig. 4: Project Diagram

Use Case Diagram :

. It is captures the system's functionality and requirements.
. It is uses the actors and use cases.
. Use case denoted by an oval shape.
. Actor is used inside use case diagrams.

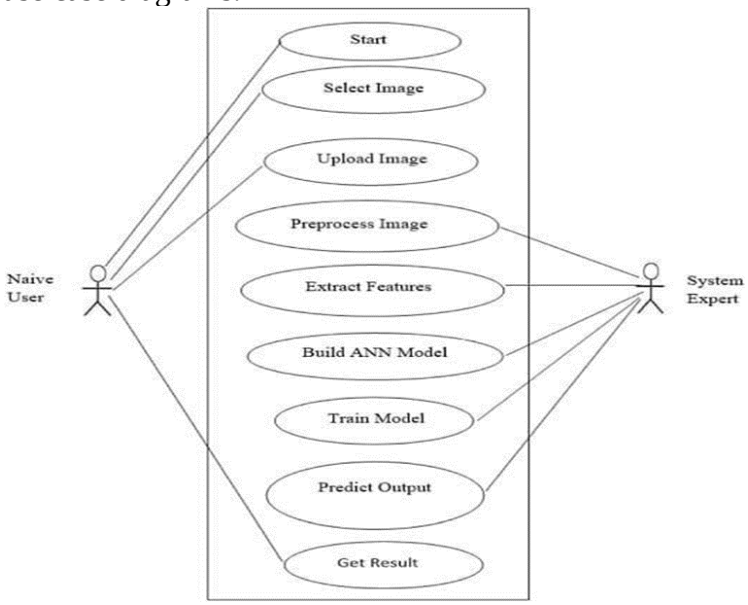
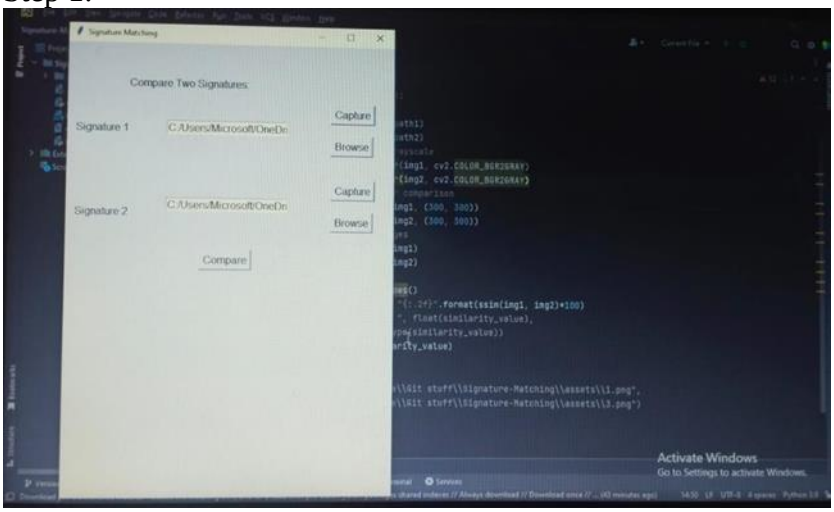


Fig. 5: Flow Chart

2. Results

Following section contains the screenshots of the output Screenshots:

Step 1:



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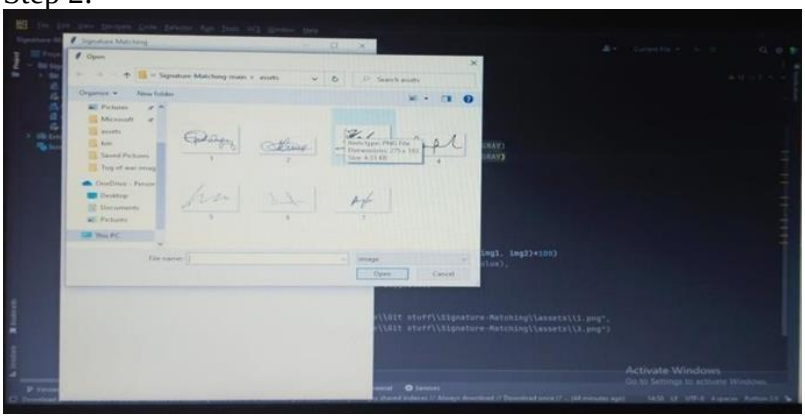
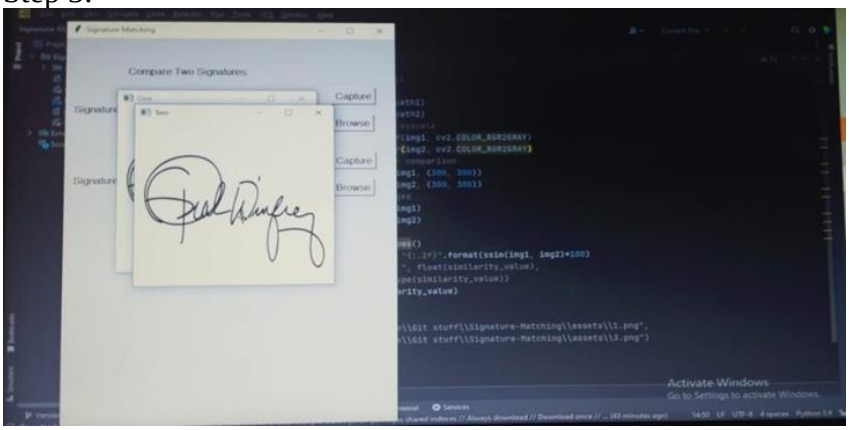
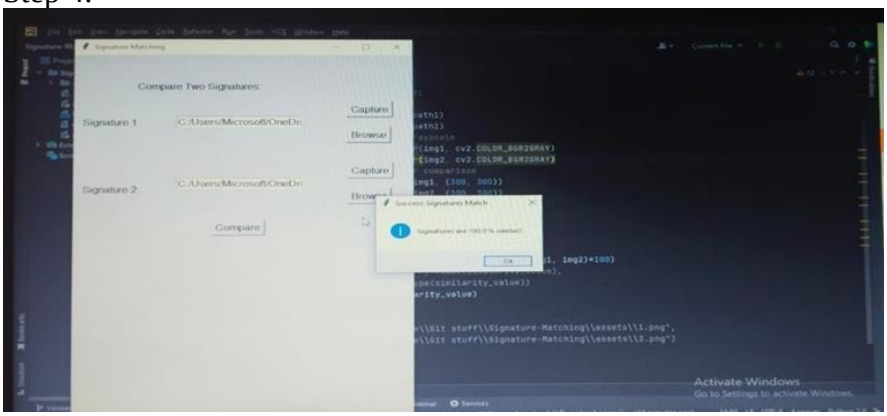
Step 2:



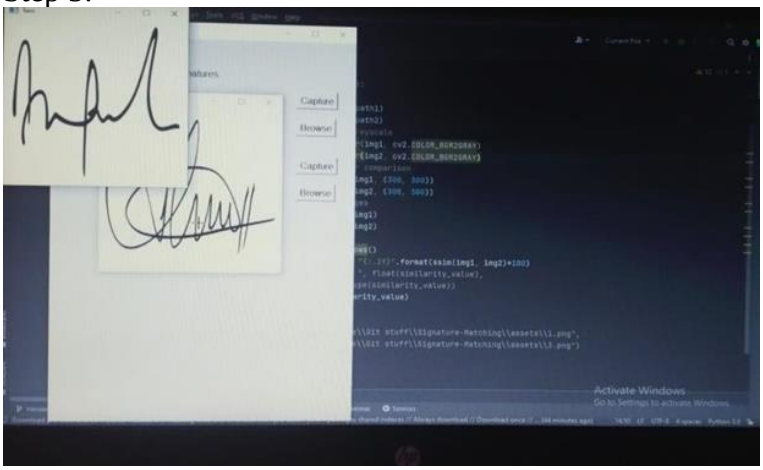
Step 3:



Step 4:



Step 5:



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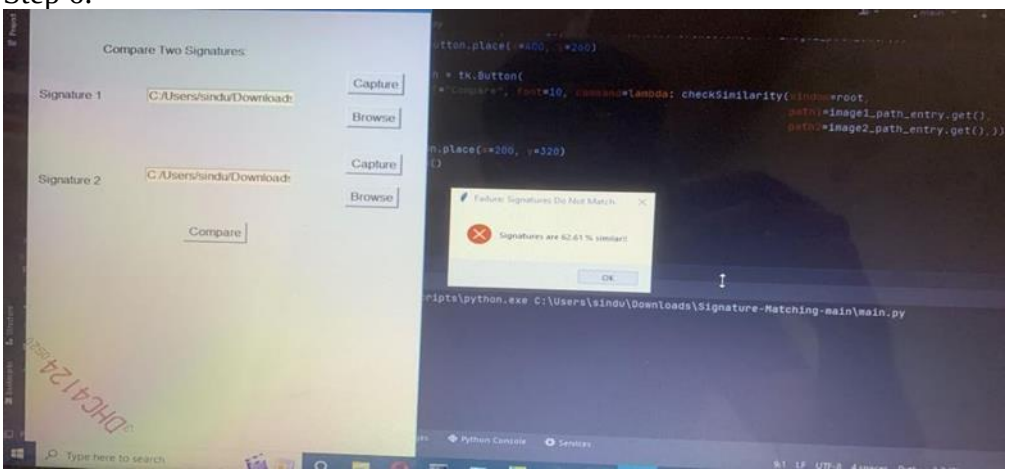
Step 6:



3. CONCLUSION

In this project as far as challenges are considered to implement this, the current approach requires more computation power than any normal algorithm that does something similar to this but as the product scales to larger customer base the importance of performance over this larger customer base is out performed by the current proposed model than others in predictions. This increase in requirement of more computation is due to the fact that verification models are unique for every signature and hence training process consumes more computation power. The tools are platforms required are installed successfully and tested with different algorithms and examples available online. Collection of different datasets is also been done and most importantly the literature survey and requirements for this project is defined. The plan of action of this project was to develop a sophisticated algorithm and code using the different identified liberties and tools with the methods mentioned in this report and to design a GUI using Java Swings and implement the project. Basically to build a system that can help distinguish forgeries from actual signatures. This system should be able to study signature parameters as strokes, curves, dots, dashes, writing fluidity & style, in a Writer Independent manner and create features for identification of the signature.

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