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Signature Fraud Detection Using Deep Learning for Enhanced Document Verification

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ABSTRACT: Every person has a unique signature that is used primarily for personal identification and verification of important documents or legal transactions. Manual verification of these signatures is quite complicated and time consuming and also critical in preventing document forgery and falsification. As now-a-days all the verification process is done through online so in this paper we had developed an online signature verification application that uses a Deep Learning Algorithm called Convolutional Neural Networks (CNN). We will train the algorithm with more than 100 samples for each signature and after testing is done to detect the forgery. The framework used in this is flask and front end involves HTML, CSS and Javascript. The back end involves MYSQL database and Python.

KEYWORDS: Convolutional Neural Network (CNN), Online Signature Verification, Flask Framework, DeepSignVerify.

I. INTRODUCTION

When it comes to the modern landscape of document authentication, the handwritten signature is a keystone. It not only serves as a unique identifier, but it is also an essential component in the process of establishing the legitimacy of a variety of legal and financial transactions. The traditional method of verifying signatures, which is based on manual inspection and comparison against copies of legitimate signatures, is currently facing challenges brought about by the development of technologies that make it easier to forge and falsify signatures. This paper presents "DeepSignVerify," a novel Signature Verification System that makes use of the power of Convolutional Neural Networks (CNN) and is built within the Flask framework. This system was developed as a solution to the problems that have been presented.

The goal of DeepSignVerify is to overcome the limits of conventional approaches by incorporating cutting-edge CNN technology. This will allow for a dynamic and automated approach to signature authentication. The system's dedication to simplicity, adaptability, and efficiency is highlighted by the fact that Flask is used as the framework that underpins it.

In this paper, a complete investigation of the DeepSignVerify system is presented. It sheds light on the architectural components of the system, the use of CNN in signature classification, and the incorporation of Flask as the foundation for a seamless implementation. As an additional point of interest, it digs into the testing methodology that was utilized in order to validate the system's effectiveness in identifying authentic signatures. While we are working our way through the complicated details of DeepSignVerify, it is becoming increasingly clear that this system has the potential to greatly improve document security and reduce the risks that are connected with signature-based forgery.

II. RELATED WORK

[1]Malakappa Shirdhonkar, et.al, November 2010, "Off-Line Handwritten Signature Retrieval using Curvelet Transforms", Researchgate.

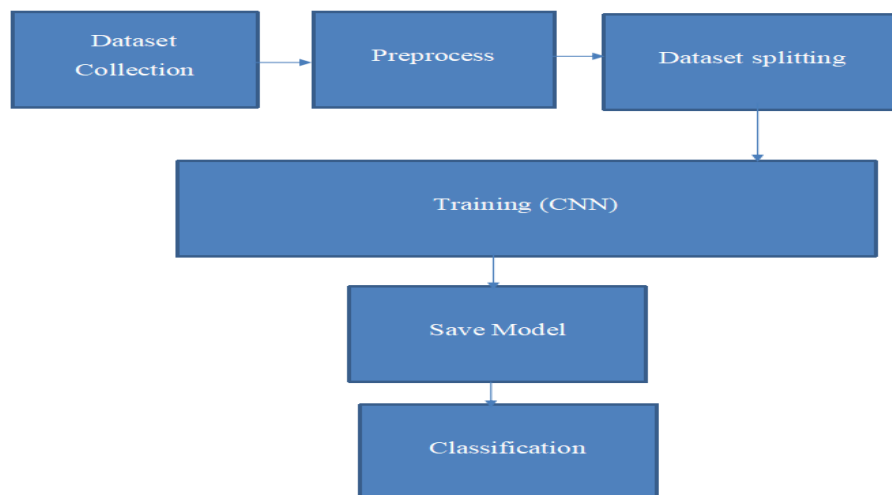
In this paper, a new method for offline handwritten signature retrieval is based on curvelet transform is proposed. Many applications in image processing require similarity retrieval of an image from a large collection of images. In such cases, image indexing becomes important for efficient organization and retrieval of images. These papers address this issue in the context of a database of handwritten signature images and describes a system for similarity retrieval. The proposed system uses a curvelet based texture features extraction. The performance of the system has been tested with

an image database of 180 signatures. The results obtained indicate that the proposed system is able to identify signatures with great accuracy even when a part of a signature is missing.

[2]Suresh Pokharel, et.at, February 2020, “Deep Learning Based Handwritten Signature”, Researchgate. This paper presents a Deep learning model based on the CNN architecture to verify the signature. For experimental purpose, the feature extraction portion of the GoogleNet model has been used to transfer value calculation and the classification layer was retrained using back propagation with the concept of transfer learning. The classification layer of the Deep learning model was retrained with 25 classes of signature image dataset with each class consisting of 85 signatures. After training, the model was evaluated with a testing dataset of 15 signatures from each class. The mean testing precision of the neural network architecture with signature dataset was found to be 85.2%.

III. METHODOLOGY

The system introduces a comprehensive suite of features, including a user authentication module that ensures the secure storage of essential user data during the sign-in process. Leveraging the power of CNN, the signature verification module allows users to submit two images – the original and the comparison signature – with results promptly displayed on an intuitive web interface. The integration of a MySQL Database guarantees secure data storage, facilitating future analyses and system enhancements. Notably, DeepSignVerify prioritizes user experience, employing HTML, CSS, and JavaScript to create a responsive interface. Rigorous testing, using a diverse set of samples, including approximately 100 pictures of a single signature, aims to validate the CNN model's accuracy in distinguishing between genuine and forged signatures.



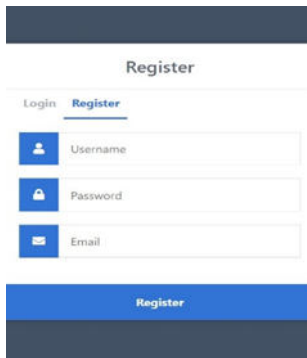
The system comprises many modules with their sub-modules as follows:

- Sign In:
 - The user would need to sign in using their: Username, Email, Password.
- Login:
 - The user can log in after signing in.
- Start Matching:
 - The user will fill in two images, one will be the original image, and the second will be the comparison image.
 - The system will direct users to the results page to see the results.

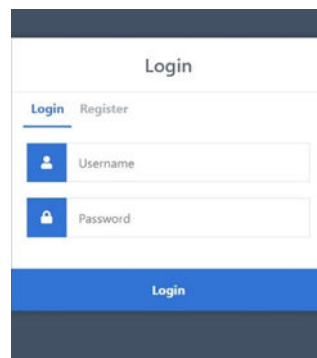


IV. EXPERIMENTALS RESULTS

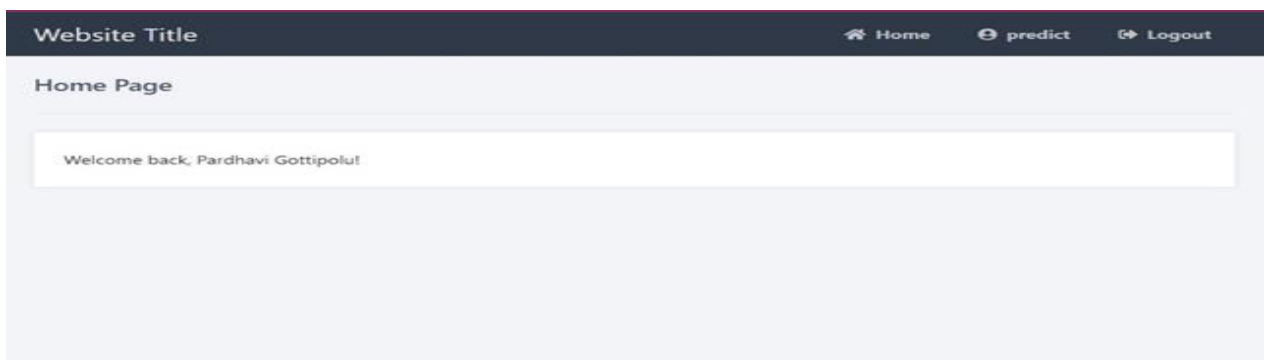
Figures below shows the working of the algorithm.fig(a):shows that first we need to register into our website by giving username,password and email.fig(b):shows once register is completed we can enter any time by giving the correct username and password.fig(c):shows the home page of our website were we can see our username we also had logout option to close our account in website.



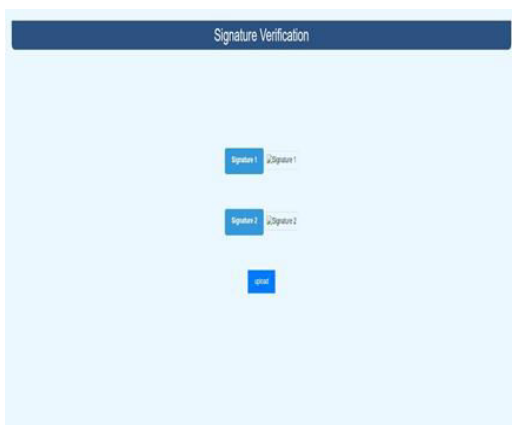
(a)



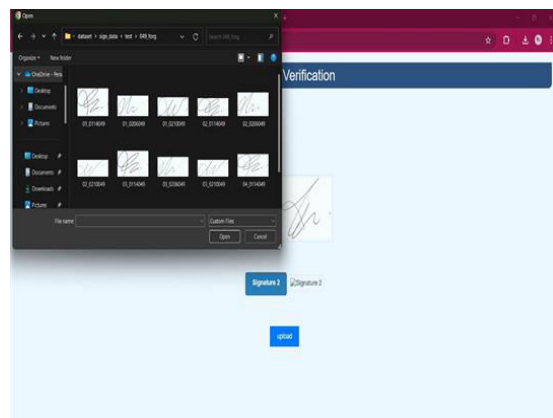
(b)



(c)

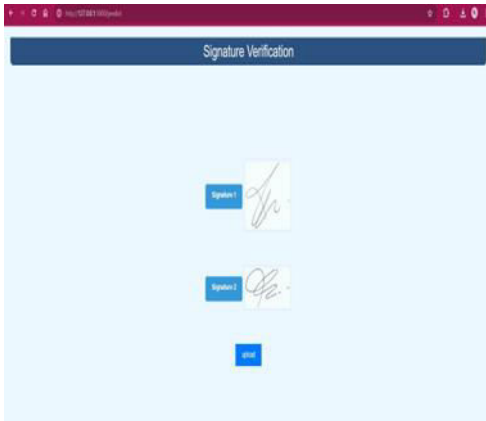


(d)

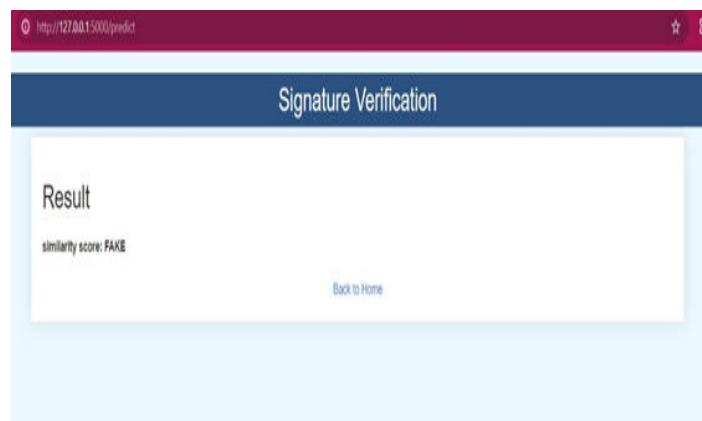


(e)

Fig(d):shows the prediction layout where we need to upload images.fig(e):shows the images are taken from training data.

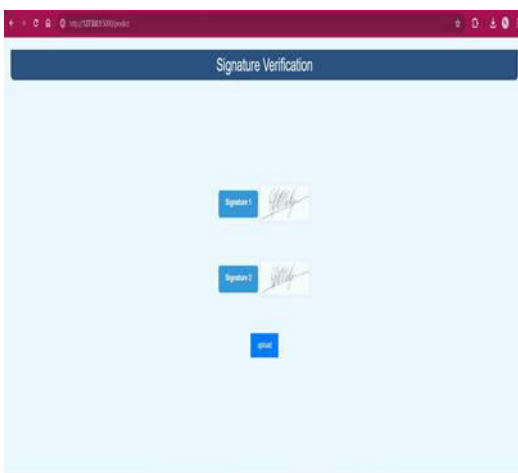


(f.1)

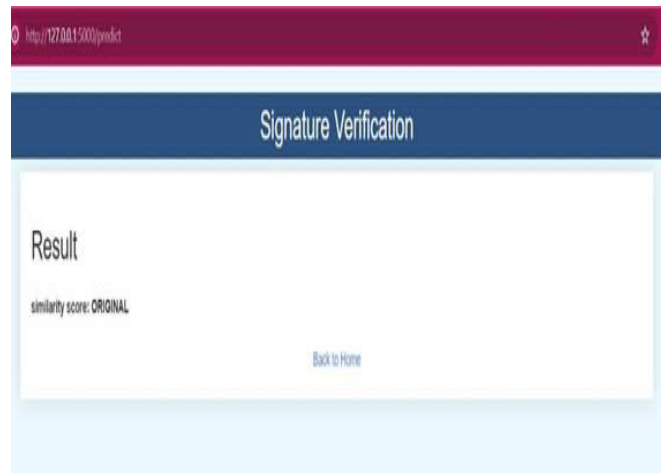


(f.2)

Fig:(f.1),(f.2) shows the fake sign detection.



(g.1)



(g.2)

Fig:(g.1),(g.2) shows the original sign detection.

V. CONCLUSION

We have implemented an automatic signature fraud detection technique using Convolutional Neural Network. Our algorithm successfully detects the forgery signs and will give the results. The results of this system is more precise, efficient, and secure. By gathering critical user information for future logins and verifications, the user authentication module guarantees a safe onboarding procedure. We have applied our algorithm on many images and found that it successfully detect the result.

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