DETAILED SURVEY OF SIGNATURE VERIFICATION USING MACHINE LEARNING APPROACHES

Abstract

The signature of a person is one of the most common forms of biometrics that has applications in day-to-day life. A signature plays a vital role in indicating the identity of a person and providing any details about that person. Signature verification is a technique used to validate the identity of an individual. It is used in various industries, such as banks, intelligence agencies, and high-profile institutions. Despite being one of the earliest, most basic, and most popularly accepted methods for identification and verification, confirming the genuineness of a signature is particularly challenging. The signature doesn't tend to be the same every time as there are numerous factors that are involved while signing, such as emotion and eye-to-hand coordination. Signature verification plays an important role in the banking sector, where the signature on the cheques has to be verified to complete the financial transaction. It is an important task, as people tend to forge signatures to initiate fake transactions and steal huge amounts of money.

Keywords: Signature, machine learning, verification

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I. INTRODUCTION

There are two types of signature verification: static and dynamic. Static verification is the process of verifying when the signature has been made offline. Dynamic verification is the process of verifying a person's signature, when he creates it on a digital tablet or a similar device. In the early days, this process was carried out manually, which involved a lot of manpower. For static verification, carrying out this task of verification manually would possess a high probability of error, as the difference between the original and forged signatures is very minimal in the majority of cases. Sometimes, noticing this minimal difference becomes a challenging task for the naked eye. With the advancement of technologies such as Artificial Intelligence and Machine Learning, the entire process of signature verification can be automated. With the availability of huge datasets and many machine learning algorithms, this process can be automated using different techniques and highly accurate results can be obtained. These algorithms and models have the capability to detect any minimal difference and are able to detect forged signatures. Many researchers have conducted numerous research in this field and have been able to successfully develop algorithms that work with high accuracy. In particular, CNN's have very good accuracy, although there is still a lot of scope for improvement in these techniques and algorithms. Like all image classification and detection techniques, the steps in signature verification have similar steps involving pre-processing, feature extraction, and classification. This ensures that the process of verification can be obtained with less human effort and high accuracy.

II. LITERATURE SURVEY

Title	Author	Methodology	Remarks
Enhanced offline signature recognition using neural network and MDA	Prashath C.R • K. B Raja	Offline signature verification using angular frequency By using this methodology achieved	False acceptance rate is 4.61%, and False Rejection rate is 7.51%.
Handwritten signature verification using deep learning	Emanlajrami Belal A. M AshqarSamy. S Abu- Naser	File management technique	By using File Management methodology, we are able to differentiate the forgery and real signature of a person.
Deep Learning Based Handwritten Signature Recognition	Suresh Pokharel Santosh Giri SubarnaShakya	Deep Learning model based on CNN architecture	The feature extraction portion of GoogleNet used. Classification layer of pre-trained GoogleNet model was re-trained with

			collected signature data set by using transfer learning mechanism based on CNN architecture. The precision value of 95.2% was obtained for signature recognition.
Signature Recognition Using Machine Learning	ShalawMshir Mehmet Kaya	Tow dataset for training the model by a Siamese network.	The dataset contained 30 users all of whom have 15 signatures of Signatures. The CNN Model was trained with one kernel and TL as a classifier
Comparison among different CNN Architectures for Signature Forgery Detection using Siamese Neural	Soumya Jain Mehahanna Ankita Singh	CNN :- Siamese Neural Networks and some variants of these neural networks	Datasets used were CEDAR, GPDS300 GPDS, BHSig260. Contractive loss function was used to evaluate the distance to an example of the same class. The three variants of Siamese networks created using three different CNN architectures were trained on the chosen dataset for 50 epochs each. High value of recall (0.92) was achieved in this implementation and Contrastive loss was minimized (0.43).
Offline Handwritten Verification	Amjad H Alkilani Mohammad I	Feature extraction using TSVD and verification using	The proposed AOVM model has better accuracy of

Model for Processing Bank Checks Based on Truncated-SVD and Support Vector Machine (SVM).	Nusir	SVM classifiers. It was implemented using python programming language.	(94.08% and 86.66%). The experiment tells that normalization image size of (75x75, 100x100 and 125x125) is the best size for optimum system performance.
An Offline Writer-independent Verification System using Auto Embedder	Zabir Mohammad Israt Jahan • Md. Mohsin Kabir • M. Ameer Ali • M. F Mridha	Improved the signature quality by python script based on OpenCV script and dimension	The accuracy, FAR(False Acceptance Rate) and FRR (Fasle Rejection Rate) reduction technique using SNN architecture of these model is 92.76%,7.34% and 6.94%. Better than other CNN architecture model.
Signature Recognition Models: Performance Comparison.	Atharvaadre PradyumnaPund Prof.Shubhangi Kale	Siamese network ,VGG16 network, A deep learning algorithm CNN (convolution Neural Network)	VGG16 network shows 85-90% accuracy, Siamese shows 65-75% and CNN shows 50-55%. Siamese network is fastest network, new model can be created by combining VGG 16 and Siamese
Signature verification using support vector machine and convolution neural network	Kritika Vohra S.V. Kedar	Support vector machines Convolution neural network	Overall accuracy using SVM obtained is 86.39%. Overall accuracy using CNN obtained is 83.76%. The further objectives is to improve accuracy by adding more features
Online Signature	Mohammad	Deep Learning using	Comparison with 2

Verification using Deep Representation : A new descriptor	Saffar Mohsen Feyyaz Mohammad Sabokrou Mahmood Fathy	Auto encoder and Convolution and Pooling Self-thought learning with feature learning	standard benchmarks- SVC2004, SUSIG, proved superiority on both datasets. Features in this method can be replicated on other benchmarks. The deep convolution networks can be tested on both online and offline signature datasets.

III. MACHINE LEARNING ALGORITHMS

The Machine Learning Algorithms that were applied for the signature verification

- Convolutional Neural Network (CNN).
- Siamese Network.
- VGG 16 Network.
- Support Vector Machine (SVM).
- Feature Extraction using Truncated-Singular Value Decomposition (TSVD)
- Self-Thought Learning
- Feature Learning

IV. TOOLS

- Python programming higher installed in windows 10 or any distribution of Linux.
- Arduino IDE software
- Training of an ANN model using Coding Source in MATLAB.
- Python open source library called TensorFlow1 is used in order to train the neural network.

The most commonly used software for implementing the above algorithms were found to be, Python MATLAB, Tensor Flow

Hardware: Most of these Machine Learning algorithms were only simulated, there were no hardware implementation of these algorithms for Signature Verification.

V. APPLICATIONS

Signature verification is thus very important in ensuring security of financial and legal documents. Some of the practical applications are:

1. Bank cheques for demand drafts or deposits: Cheque's are the most important documents that go through the signature verification. Identifying false signature on cheques should be immediately identified to safeguard from any kind of financial damages.

2. Loan and mortgage documents: Verifying that a signature on a loan or mortgage document is authentic and can be very important. The bank can then use automatic signature verification to show that the person disputing the loan did indeed sign the original document and owes as agreed.

3. Business Contracts: Signatures on contracts of any kind, including business or employment contracts, can be confirmed with signature verification software to ensure of the contract has gone through legal procedure.

4. Insurance Documents: Verifying that a signature on an insurance document is genuine can help to authenticate an individual in circumstances where validating that a person is who they say they are is of particular importance.

Some Broader Application of Signature Verification also Include:

- Legal documents
- Financial services
- Digital authentication
- Transactions
- Voter registration and identification
- Know your customer (KYC)

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