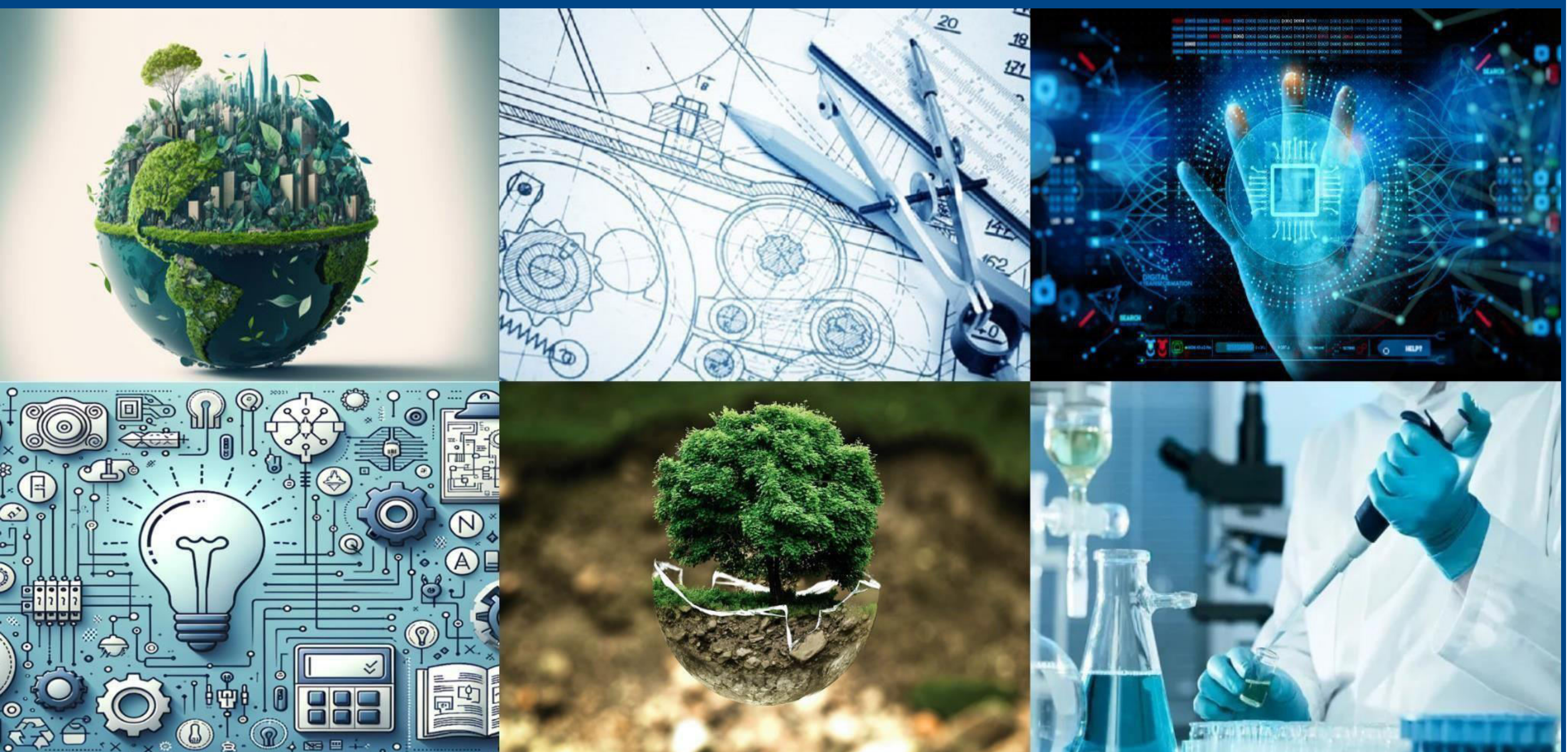
ISSN: 2582-7219

International Journal of Multidisciplinary Research in Science, Engineering and Technology

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)



Impact Factor: 8.206

Volume 8, Issue 8, August 2025

© 2025 IJMRSET | Volume 8, Issue 8, August 2025| DOI:10.15680/IJMRSET.2025.0808153

ISSN: 2582-7219 | www.ijmrset.com | Impact Factor: 8.206| ESTD Year: 2018|

International Journal of Multidisciplinary Research in Science, Engineering and Technology (IJMRSET)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)

SIGNATURE FRAUD DETECTION USING DEEP LEARNING

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ABSTRACT: Signature forgery detection is a critical aspect of security, providing a reliable method for verifying authenticity. This process analyses features such as stroke patterns, length, continuity, and thickness. Variations in these characteristics, even for signatures from the same individual, make forgery detection a challenging task. The system processes signature images by extracting key features using convolutional neural networks (CNNs). Preprocessing steps such as grayscale conversion and binarization are applied to enhance the clarity of features. The CNN model analyses the input signature and compares it against predefined criteria to determine its authenticity. Effective feature extraction and model training are vital to ensure accurate and reliable results. This method simplifies the verification process while maintaining precision and efficiency.

I. INTRODUCTION

Handwritten signatures are a widely trusted form of biometric authentication, especially in finance, where accurate identity verification is essential. However, natural variations in signatures caused by factors like mood, health, and environmental conditions make it difficult to differentiate genuine signatures from forgeries. Forgeries can be particularly deceptive when created by skilled individuals. While such forgeries may closely resemble the original, they often lack the natural fluidity and unique stroke patterns. These limitations make traditional manual verification methods prone to errors and inefficiencies. This project aims to develop an automated offline signature verification system that uses machine learning techniques to address these challenges. The system analyzes geometric and textural features of signatures to assess their authenticity. Neural networks are trained on preprocessed datasets containing both genuine and forged signatures, leveraging Python libraries such as NumPy, Matplotlib, and scikit-learn. The primary goal is to enhance security by automating the verification process, thereby reducing the likelihood of accepting forged signatures as genuine. By emphasizing precision and efficiency, this project seeks to improve the reliability of signature-based authentication systems, particularly in critical areas like financial transactions.

II. LITERATURE SURVEY

Signature verification, a crucial biometric authentication method, leverages a person's handwritten signature to confirm their identity. Recent advancements in deep learning, particularly (CNNs), have significantly improved the accuracy and efficiency of these systems. This review delves into the contributions of CNNs to signature verification, focusing on methodologies, datasets, and performance evaluations.

EXISTING SYSTEM

Before the advent of fake detection technologies, identifying manipulated content relied heavily on manual inspection and the expertise of signature verification professionals. This process was time-consuming and often ineffective against sophisticated fakes that could easily evade human scrutiny. The lack of automated tools meant that many fakes went undetected, spreading unchecked across banking sector platforms and causing widespread misinformation and panic. The inability to quickly and accurately identify fakes allowed malicious actors to exploit these technologies for nefarious purposes, with little risk of being caught or held accountable.

PROPOSED SYSTEM

After implementing advanced fake detection technologies, ability to identify and counteract manipulated content would significantly improve. These systems would empower- proposed signature verification system utilizes cutting-edge deep learning methodologies to enhance accuracy, efficiency, and scalability in authentication processes. At its core, the

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system employs sophisticated neural network architectures, particularly convolutional neural networks (CNNs), to automatically extract and learn intricate signature features such as stroke patterns, pressure variations, and unique stylistic elements. By training on a dataset comprising diverse samples of genuine and forged signatures, signature verification model undergoes rigorous optimization to ensure quality performance across variety of writing styles and conditions.

III. SYSTEM ARCHITECTURE

The system begins with the collection of signature images, where a diverse dataset containing signatures of different people is analyzed for the signature verification project. These collected signature images are then organized into two categories, fake signatures and real signatures, which is essential for training and validating the neural network model so that it can accurately distinguish between them. The structured dataset is further divided into training and testing sets, with typically 80% of the data used for training and the remaining 20% reserved for testing, allowing the model to learn effectively while also being evaluated on unseen data. From the collected signatures, key features such as signature patterns, font styles, and variations across different languages are extracted, as each signature contains unique characteristics.

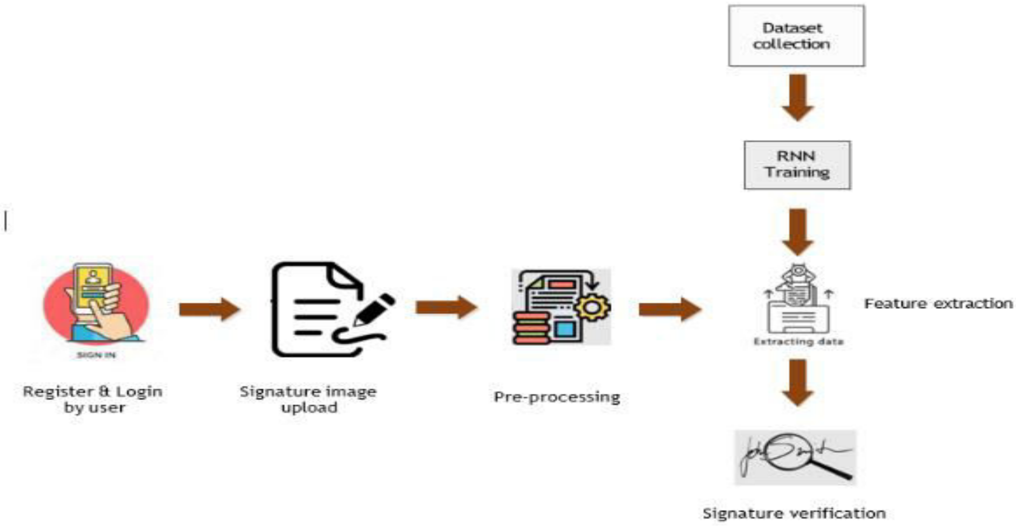

Fig 3.1 Modular diagram

IV. METHODOLOGY

The methodology for the signature verification system is designed to systematically collect, organize, and process signature data in order to build an effective neural network model for distinguishing between real and fake signatures. The process begins with the **collection of signature images**, where a diverse dataset containing signatures of different individuals is gathered. These images are then **categorized into two groups: real signatures and fake signatures**, ensuring proper structuring of the dataset for training and validation purposes.

Next, the **dataset is divided into training and testing subsets**, where typically 80% of the data is allocated for training the model, while the remaining 20% is reserved for testing. This division allows the model to learn from a larger portion of the data while still being evaluated on previously unseen signatures to assess its performance.

Following this, the system performs **feature extraction** from the collected signatures. Important features such as signature patterns, font styles, stroke width, curvature, and variations across different languages are identified. These extracted features capture the unique characteristics of each signature, making them crucial for the verification process.

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V. DESIGN AND IMPLEMENTATION

- **Data gathering:** The initial step in the procedure is to signature as input from the dataset. The user's signature input displayed. For the camera to record crisp, detailed photos of the signature are verified, it must have a high enough frame rate and resolution**.**
- **User:** The user has to upload the image to verify the signature by using the signature verification using deep learning system RNN algorithm the camera has used to upload the signature tested and trained find original or forged.
- **Input image:** The extracted frames undergo several preprocessing steps to enhancetheir quality and prepare them for further analysis. Common preprocessing techniques include converting the frames to grayscale to reduce computational complexity, normalizing pixel values, and applying filters to enhance edges and important features.
- **Pre-processing:** The signature is processing by applying the variety of RNN's algorithm's gray-scale technique the signature is verified whether it is original or forged by applying algorithms technique the image is pre-processed.
- **Feature extraction:** The system gathers pertinent characteristics from the signature region once the signature has been localized. Shape, direction — crucial aspects of the signature are captured by these attributes. Features that are utilized with recurrent neural networks (RNNs) may also contain sequential patterns that span several frames.
- **Signature verification:** The text output is straight forwardly displayed on a screen or stored as accuracy rate, while the signature uploaded is original or forged is generated using to- RNN"s technology.

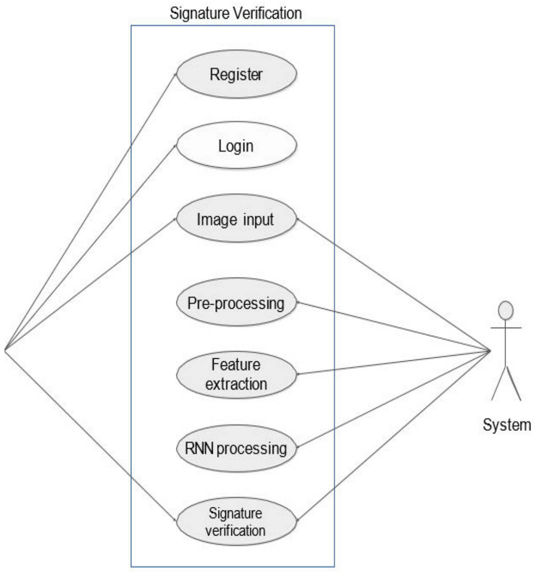

Fig.5.2 User diagram

Fig 5.1 Sequential Diagram

VI. OUTCOME OF RESEARCH

The research successfully demonstrated the effectiveness of using machine learning techniques for automated signature verification. By collecting and categorizing a diverse dataset of real and fake signatures, the system was able to extract significant features such as signature patterns, stroke variations, and font styles, which played a key role in distinguishing between genuine and forged samples.

The trained neural network model showed strong performance in classification, achieving high accuracy during testing with the reserved dataset. The results indicate that the model can reliably identify real and fake signatures, thereby reducing the chances of manual error in signature verification.

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Furthermore, the system provides a scalable and efficient approach to authentication, which can be applied in various real-world applications such as banking, legal documentation, and identity verification. The outcome of this research highlights that automated signature verification can enhance security, improve processing speed, and reduce the dependency on manual verification methods

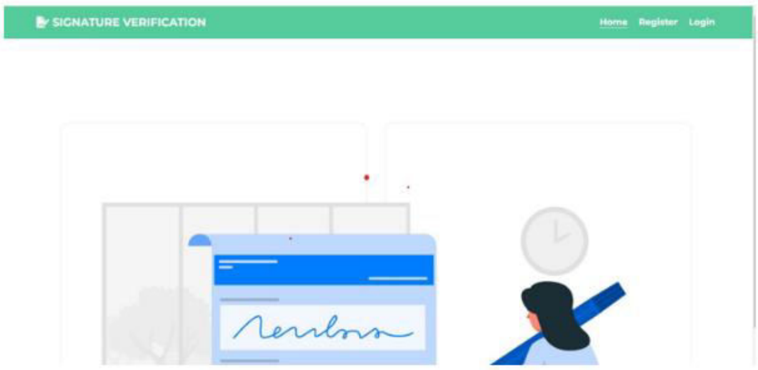

Fig 7.1 Registration page

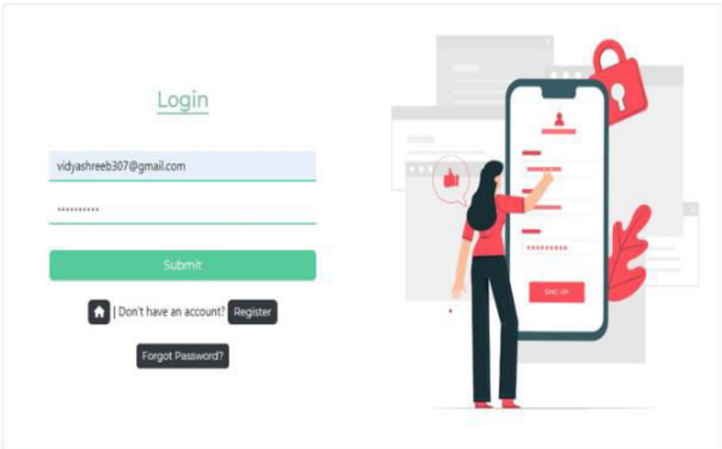

Fig 7.2 Login page

VIII. CONCLUSION

The research concludes that automated signature verification using machine learning and neural networks is an effective and reliable method for distinguishing between real and fake signatures. By collecting a diverse dataset, categorizing it into genuine and forged samples, and extracting meaningful features, the system was able to achieve accurate classification results. This approach not only improves the efficiency of the verification process but also minimizes the risk of human error.

The study highlights that signature verification systems have significant potential for real-world applications, particularly in banking, legal documentation, and identity authentication, where security and accuracy are crucial. With further improvements in dataset size and model optimization, the system can be made even more robust and adaptable to handle complex variations in signatures across different individuals and languages.

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REFERENCES

1. Plamondon, R., & Srihari, S. N. (2000). *On-line and off-line handwriting recognition: A comprehensive survey.* IEEE Transactions on Pattern Analysis and Machine Intelligence, 22(1), 63–84.
2. Hafemann, L. G., Sabourin, R., & Oliveira, L. S. (2017). *Offline handwrittensignature verification—Literature review.* In 2017 Seventh International Conference on Image Processing Theory, Tools and Applications (IPTA) (pp. 1–8). IEEE.
3. Malik, M. I., Liwicki, M., Dengel, A., & Uchida, S. (2013). *Writer independent online signature verification using multi-stage fusion.* Pattern Recognition, 46(1), 132–143.
4. Bishop, C. M. (2006). *Pattern Recognition and Machine Learning.* Springer.
5. Jain, A. K., Ross, A., & Prabhakar, S. (2004). *An introduction to biometric recognition.* IEEE Transactions on Circuits and Systems for Video Technology, 14(1), 4–20.
6. Goodfellow, I., Bengio, Y., & Courville, A. (2016). *Deep Learning.* MIT Press.
7. Official Python Documentation – *TensorFlow and Keras Libraries for Deep Learning.* https://www.tensorflow.org

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