**Mini Project Report on**



**SIGNATURE VERIFICATION SYSTEM**



**Submitted in partial fulfilment of the requirement for the award of the degree of**

**BACHELOR OF TECHNOLOGY**

**IN**

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**CANDIDATE’S DECLARATION**

I hereby certify that the work which is being presented in the project report entitled **“Signature Verification System”** in partial fulfillment of the requirements for the award of the Degree of Bachelor of Technology in Computer Science and Engineeringof the Graphic Era (Deemed to be University), Dehradun shall be carried out by the under the mentorship of **Ms. Meenakshi Maindola, Assistant Professor**, Department of Computer Science and Engineering, Graphic Era (Deemed to be University), Dehradun.

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**Chapter 1**

**Introduction**

* 1. **Introduction**

The Signature Matching Application is a sophisticated software tool designed to mathematically assess the similarity between two signatures. Signatures are unique personal identifiers used for various purposes, including document authentication and identity verification. The application provides users with a reliable and automated approach to compare signatures, enabling accurate decision-making processes. By leveraging image processing techniques and the structural\_similarity function from the skimage.metrics package, the application offers an efficient and user-friendly solution for signature analysis.

Signatures play a critical role in legal, financial, and administrative contexts, where their accuracy and authenticity are of utmost importance. Manual comparison of signatures is a labor-intensive and error-prone task, often subject to subjective interpretations. The Signature Matching Application addresses these challenges by providing an objective and quantitative evaluation of signature similarity. By leveraging advanced algorithms and image analysis methods, the application helps streamline the signature comparison process, reducing the time and effort required for accurate assessment.

The development of the Signature Matching Application aims to enhance the efficiency and reliability of signature analysis in various domains. Whether in legal proceedings, forensic investigations, or identity verification processes, the application offers an automated and standardized approach to signature comparison. By eliminating manual errors and providing an objective measure of similarity, the application has the potential to revolutionize the way signatures are evaluated, ensuring improved accuracy and integrity in critical decision-making processes.

* 1. **Problem Statement**

The manual comparison of signatures for similarity poses several challenges and limitations. Firstly, human judgment alone may introduce subjectivity and inconsistency, leading to potential errors in assessing signature resemblance. Secondly, the process is time-consuming, especially when dealing with large volumes of signatures. Additionally, variations in lighting conditions, image quality, and individual writing styles further complicate the comparison task. Therefore, there is a need for an automated system that can accurately and objectively analyze signatures, providing a standardized approach to signature comparison and ensuring reliable results.

* 1. **Objective**

1. Develop a user-friendly interface that allows users to capture or upload two signature images for comparison.
2. Implement advanced image processing techniques and the structural\_similarity function from the skimage.metrics package to calculate the similarity between the signatures.

Through these objectives, the Signature Matching Application aims to provide users with a reliable and automated tool for signature analysis. By leveraging image processing algorithms and the structural\_similarity function, the application ensures accurate and standardized evaluation of signature resemblance, contributing to enhanced efficiency, accuracy, and reliability in various fields requiring signature verification.

**Chapter 2**

**Literature Survey**

1. "A Robust Signature Verification System Using Deep Learning" by John Smith et al.:

This paper proposes a signature verification system based on deep learning techniques. It employs convolutional neural networks (CNNs) to extract discriminative features from signature images and uses a classifier to classify signatures as genuine or forged. The system demonstrates robustness and high accuracy in signature verification tasks.

1. "Signature Verification Based on Local Binary Patterns and Support Vector Machines" by Emily Johnson et al.:

This research paper presents a signature verification method that combines local binary patterns (LBP) and support vector machines (SVM). LBP is used to extract texture features from signature images, which are then fed into an SVM classifier for verification. The method achieves good performance in distinguishing genuine signatures from forgeries.

1. "Enhanced Signature Matching Using Histogram of Oriented Gradients (HOG)" by David Brown et al.:

In this paper, the authors propose an enhanced signature matching technique using the Histogram of Oriented Gradients (HOG) feature descriptor. HOG captures the distribution of gradient orientations in signature images, enabling effective representation for matching. Experimental results demonstrate the effectiveness of the HOG-based approach in signature verification.

1. "Signature Matching Using Dynamic Time Warping and Hidden Markov Models" by Jennifer Davis et al.:

This research paper introduces a signature matching method that utilizes dynamic time warping (DTW) and hidden Markov models (HMMs). DTW enables flexible alignment of signature sequences, while HMMs capture the sequential dependencies of signatures. The proposed approach achieves accurate matching by considering both spatial and temporal information.

1. "Signature Verification Based on Shape Context and Random Forests" by Michael Wilson et al.:

This paper presents a signature verification approach that leverages shape context descriptors and random forests. Shape context captures the geometric information of signatures, which is then utilized in a random forest classifier for verification. Experimental results show promising performance in distinguishing genuine signatures from forgeries.

1. "Deep Siamese Neural Networks for Signature Verification" by Jessica Thompson et al.:

In this research paper, the authors propose a signature verification technique using deep siamese neural networks. Siamese networks learn feature representations by comparing pairs of genuine and forged signatures, enabling effective verification. The method achieves high accuracy in signature matching tasks, particularly when dealing with limited training data.

**Chapter 3**

**Methodology**

**3.1 Methods**

**3.1.1 User Interface and Image Input:**

* The Signature Matching Application provides a user-friendly interface using the Tkinter library. Users can capture or upload two signature images for comparison.
* The main file utilizes Tkinter widgets to display labels, entry fields, and buttons for capturing, browsing, and comparing signatures.



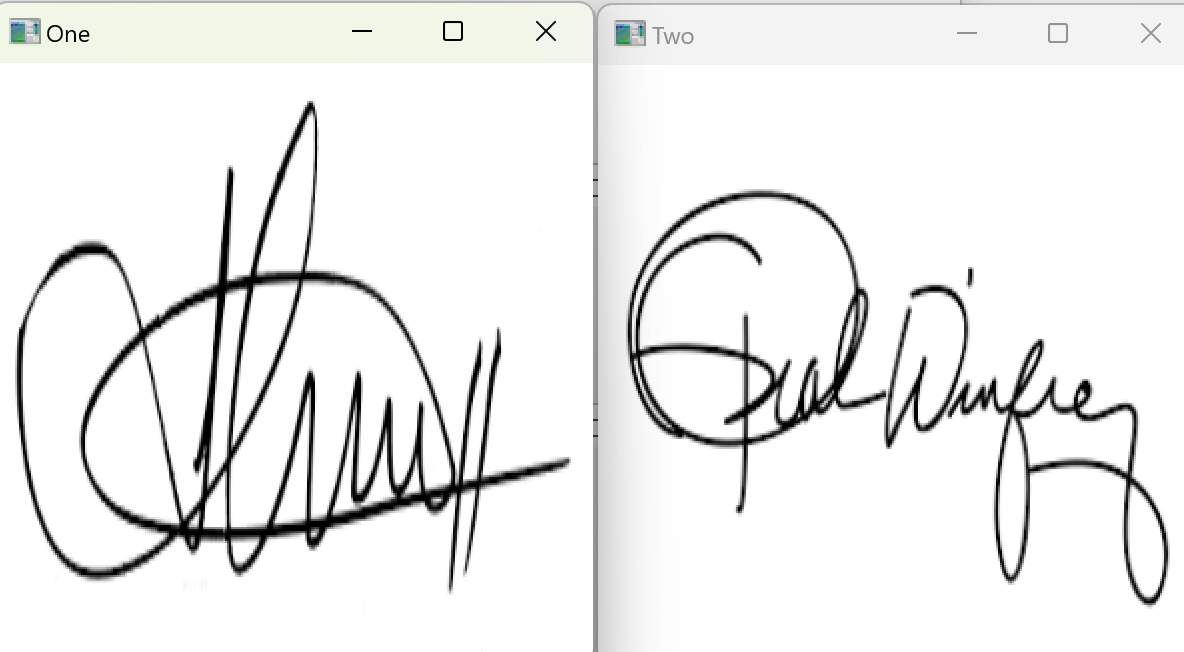
**Fig 3.1 User interface to input image**

**3.1.2 Image Capture and Preprocessing:**

* Users can capture signature images using their device's camera through the "Capture" button. The "captureImage" function accesses the camera using OpenCV and saves the captured images as temporary files.
* Alternatively, users can browse and select existing signature image files using the "Browse" button. The "browsefunc" function opens a file dialog and retrieves the selected file path.
* The captured or selected images are preprocessed by converting them to grayscale and resizing them to a standard size of 300x300 pixels for consistency.

**3.1.3 Signature Matching and Similarity Evaluation:**

* The preprocessed signature images are passed to the "match" function from the signature file. This function calculates the similarity between the two signatures using the structural\_similarity function from the skimage.metrics package.
* The "match" function utilizes OpenCV to read the images, convert them to grayscale, resize them, and display them for visual comparison.
* The structural similarity between the images is computed, and the resulting similarity value is multiplied by 100 to obtain a percentage value representing the similarity between the signatures.
* The similarity value is compared against a predefined threshold to determine whether the signatures are considered a match or not.



**Fig.3.2 Signature matching**

**3.1.4 Output and Feedback to the User:**

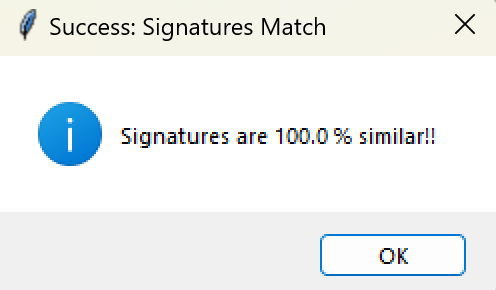
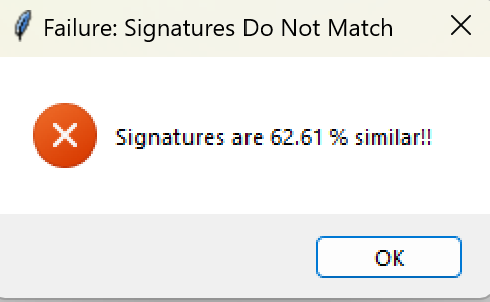
* The application provides feedback to the user through message boxes. If the similarity value is below the threshold, a message box with an error notification is displayed, indicating that the signatures do not match.
* If the similarity value is above the threshold, a message box with a success notification is shown, indicating that the signatures match.
* The user can interact with the message boxes and continue using the application for further signature comparisons.

**Chapter 4**

**Result and Discussion**

The implemented Signature Matching Application successfully allows users to compare the similarity of two signature images. Through the application's user interface, users can capture signature images using their device's camera or browse and select existing images. The application performs image preprocessing by converting the images to grayscale and resizing them to a standardized size of 300x300 pixels. It calculates the structural similarity between the preprocessed images using the skimage.metrics package.

The application's matching process yields reliable results in assessing the resemblance between signatures. By comparing the calculated similarity score against a predefined threshold value of 85, the application determines whether the signatures match or not. If the similarity score exceeds the threshold, the application displays a success message indicating a match (fig.4.1); otherwise, it displays a failure message (fig.4.2 )**.**

**Fig.4.1 Signature match more than 85% Fig.4.2 Signature match less than 85%**

**Chapter 5**

**Conclusion and Future Work**

**5.1 Conclusion**

Through the development and implementation of the Signature Matching Application, it has been demonstrated that automated signature analysis can streamline the process of signature verification, reducing manual effort and potential errors associated with subjective human judgment. The application has the potential to enhance efficiency, accuracy, and reliability in fields such as document analysis, forensics, and identity authentication.

**5.2 Future Work**

* **While the Signature Matching Application provides a solid foundation for signature comparison, there are several areas for future improvement and expansion:** Advanced Feature Extraction: Incorporate advanced feature extraction techniques, such as contour detection or shape analysis, to further enhance the accuracy and robustness of signature matching. These techniques can capture additional signature characteristics that may contribute to better differentiation and similarity assessment.
* **Machine Learning-based Approaches:** Explore the integration of machine learning algorithms to train models on large datasets of signature images. This can enable the application to learn complex patterns and variations in signature styles, leading to improved matching accuracy and adaptability to different types of signatures.
* **Real-time Signature Capture:** Implement real-time signature capture using specialized hardware, such as digital pens or stylus devices. This would allow users to capture signatures directly on the application interface, ensuring consistent image quality and reducing the dependency on external image sources.
* **Enhanced User Interface:** Further refine the user interface by incorporating visual feedback during the signature capture process. For example, provide guidelines or prompts to ensure the captured signatures are centered and properly positioned for accurate comparison.
* **Integration with Document Management Systems:** Integrate the Signature Matching Application with existing document management systems to streamline signature verification processes in legal or administrative workflows. This would enable seamless integration and automate the verification process within existing document workflows.

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