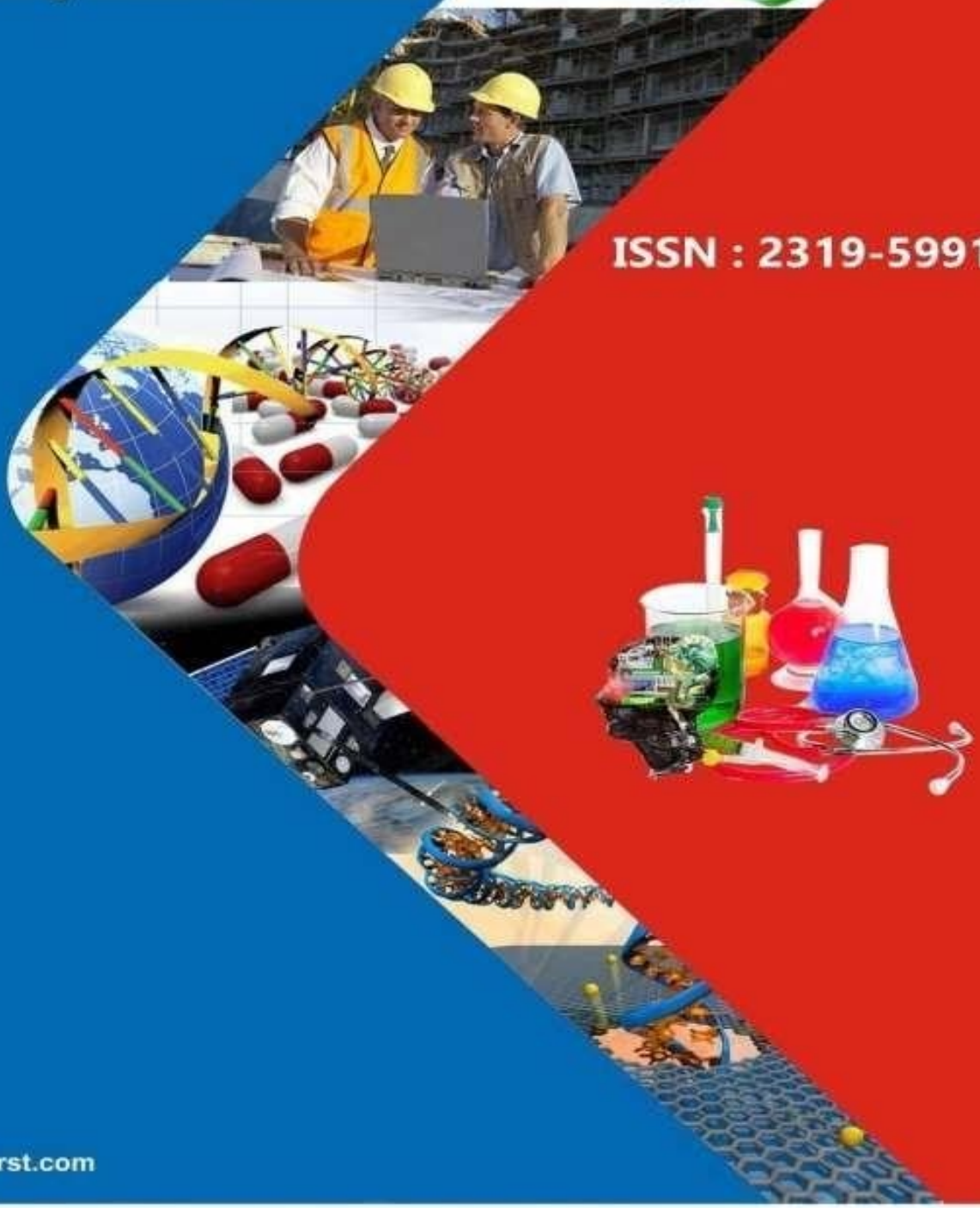
International Journal of Engineering Research and Science & Technology

IJERST

ISSN : 2319-5991



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International Journal of Engineering Research and Science & Technology

ISSN 2319-5991 www.ijerst.com

Vol. 21, Issue 1, 2025

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FACE RECOGNITION ACROSS NON-UNIFORM MOTION BLUR, ILLUMINATION AND POSE

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ABSTRACT

Existing methods for performing face recognition in the presence of blur are based on the convolution model and cannot handle non-uniform blurring situations that frequently arise from tilts and rotations in hand-held cameras. In this paper, we propose a methodology for face recognition in the presence of space-varying motion blur comprising of arbitrarily-shaped kernels. We model the blurred face as a convex combination of geometrically transformed instances of the focused gallery face, and show that the set of all images obtained by non-uniformly blurring a given image forms a convex set. We first propose a nonuniform blur-robust algorithm by making use of the assumption of a sparse camera trajectory in the camera motion space to build an energy function with l1-norm constraint on the camera motion. The framework is then extended to handle illumination variations by exploiting the fact that the set of all images obtained from a face image by non-uniform blurring and changing the illumination forms a bi-convex set. Finally, we propose an elegant extension to also account for variations in pose.

INTRODUCTION

Recognition in classrooms is essential for tracking student attendance, but manual methods are time-consuming and error-prone, while traditional biometric approaches like fingerprint scanning require queuing, causing delays. To address these limitations, an automated face recognition-based attendance system is proposed, which captures classroom images in real time, detects faces, and marks attendance by comparing them with a stored database, eliminating human intervention and reducing errors. The system employs advanced image processing techniques such as skin classification to enhance accuracy and prevent fraudulent attendance marking. A timetable module automatically logs subject, class, date, and time, further optimizing efficiency. Compared to traditional biometric systems, face recognition offers a contactless and seamless approach, leveraging algorithms like AdaBoost, Support Vector Machines (SVM), and SURF for fast and accurate detection, while methods like Principal Component Analysis (PCA) and Linear Discriminant Analysis (LDA) improve recognition performance. Additional enhancements, such as illumination-invariant algorithms, ensure reliability under different lighting conditions. The system has demonstrated high accuracy in various real-world scenarios, including classrooms and office environments, effectively handling challenges like varying facial expressions, occlusions, and dense crowds. By integrating machine learning and continuous improvement techniques, this automated attendance system provides a secure, efficient, and scalable alternative to traditional methods, reducing manual errors and enabling real-time attendance tracking accessible to teachers, administrators, and parents.

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SYSTEM MODEL

The system uses the eigenface approach for face recognition. The method analyzes and computes eigenfaces which are faces composed of eigenvectors. The method also compares the eigenfaces to identify the presence of a person(face) and its identity. The method involves the following steps .As a first step the system should be initialized with a set of training faces. Next, when a face is detected the eigenface is calculated for that face. Then, the system compares the eigenvectors of the current face and the stored face image and determines whether the face is identified or not. The final step(optional) is that if the unknown face is detected repeatedly the system may learn to recognize it.

PROPOSED SYSTEM

The proposed system is an automated face recognition-based attendance system that replaces manual and traditional biometric methods with a contactless approach. It captures students' faces as they enter the classroom, processes the images using machine learning algorithms, and marks attendance automatically. The system integrates PCA for feature extraction and recognition while maintaining a log file to track student entry and exit. The face detection process relies on Viola-Jones and Ad boost classifiers to ensure accurate and real-time processing. Additionally, enhancements such as illumination-invariant algorithms improve reliability under varying lighting conditions. The system is scalable, efficient, and reduces human intervention.

STIMULATION RESULTS

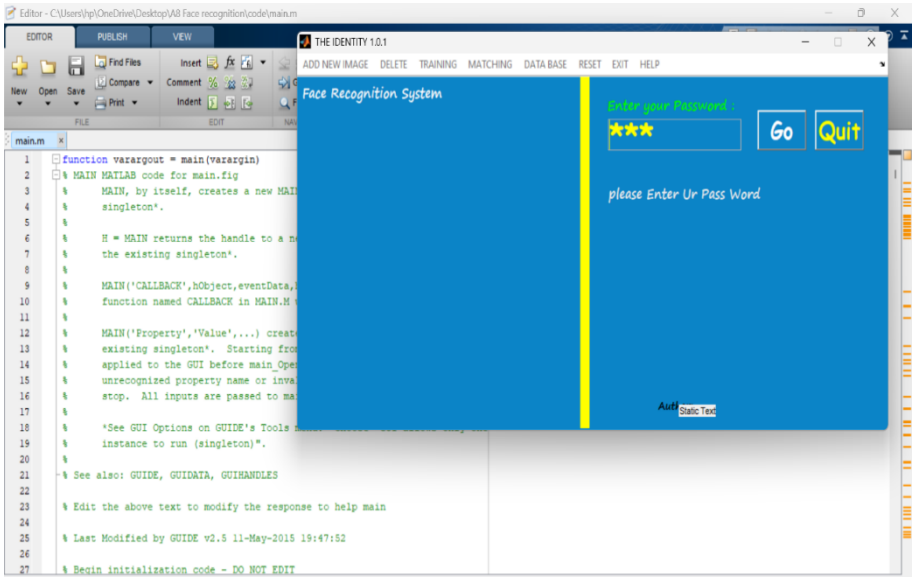

Figure.1 Login page

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ISSN 2319-5991 www.ijerst.com

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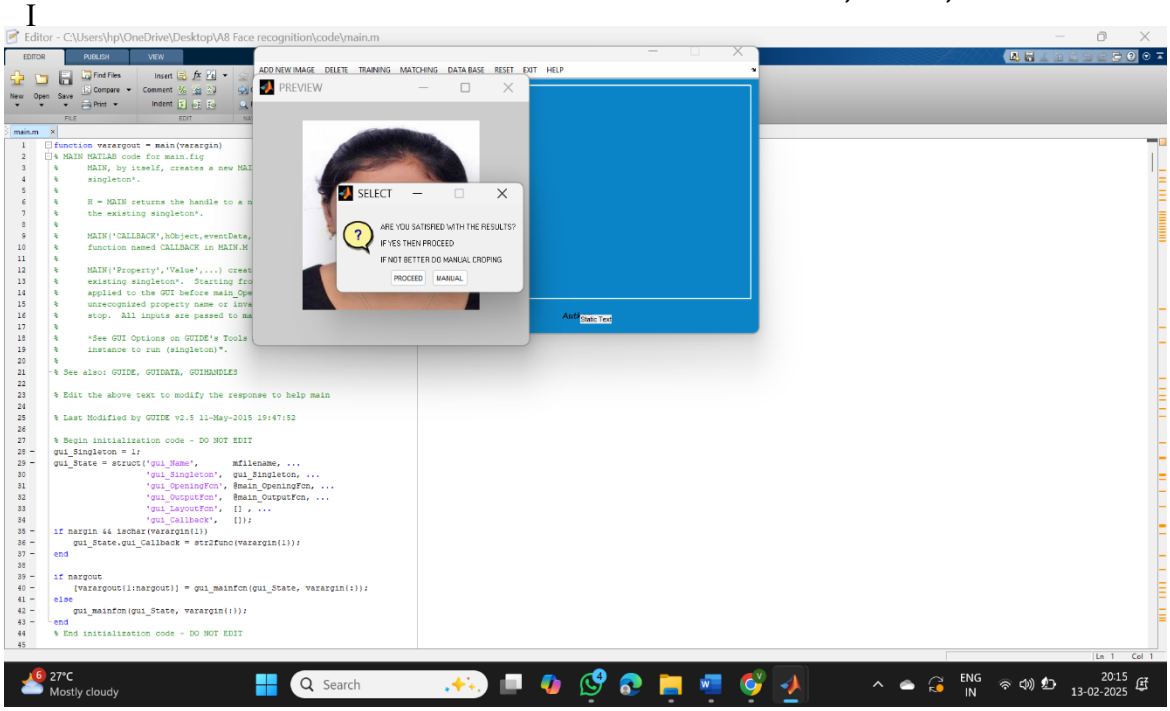

Figure.2 Selecting the image

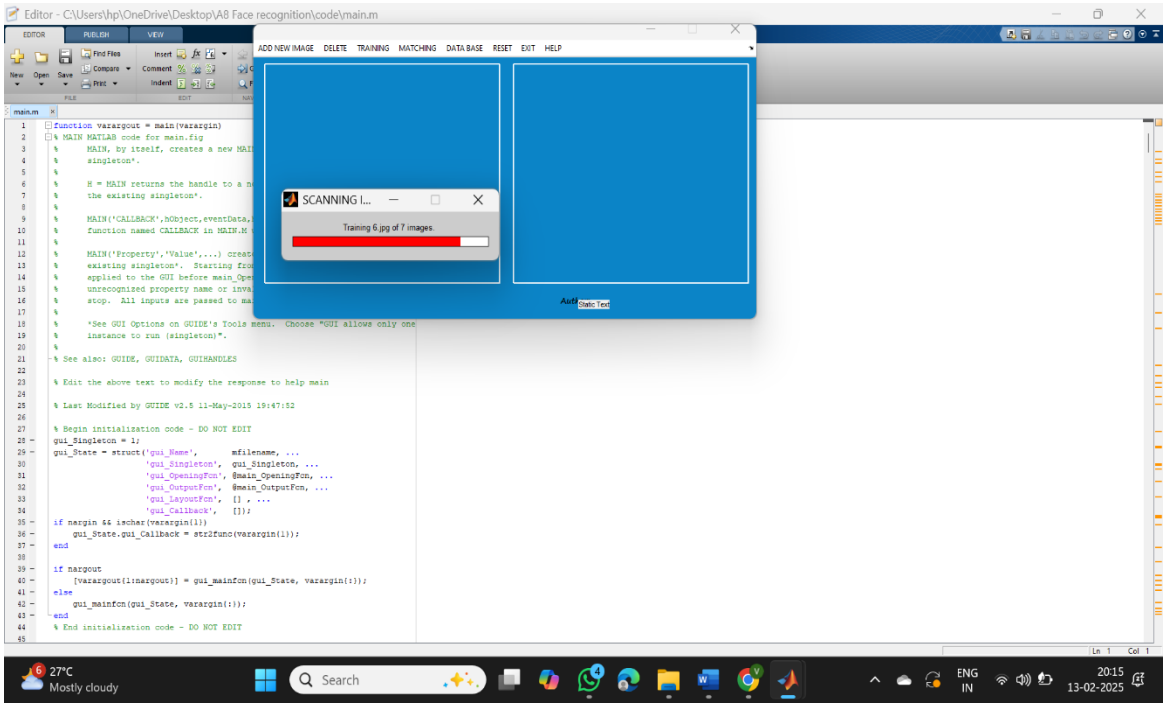

Figure.3 Scanning the image

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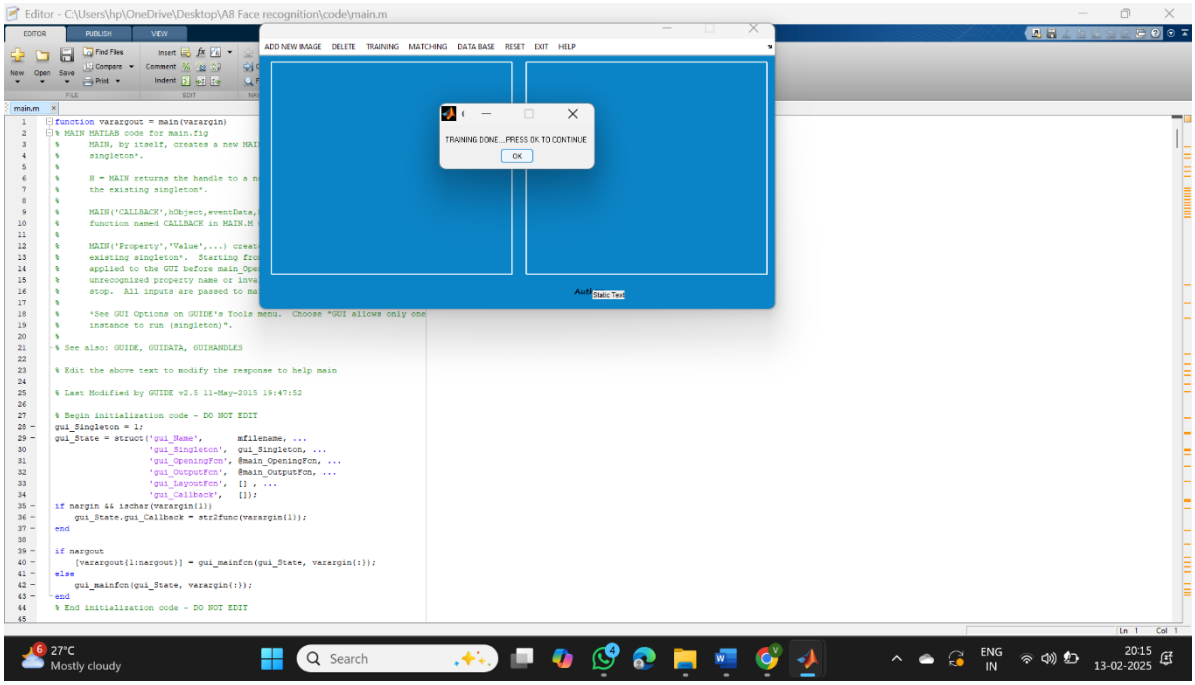

Figure.4 Training is Done

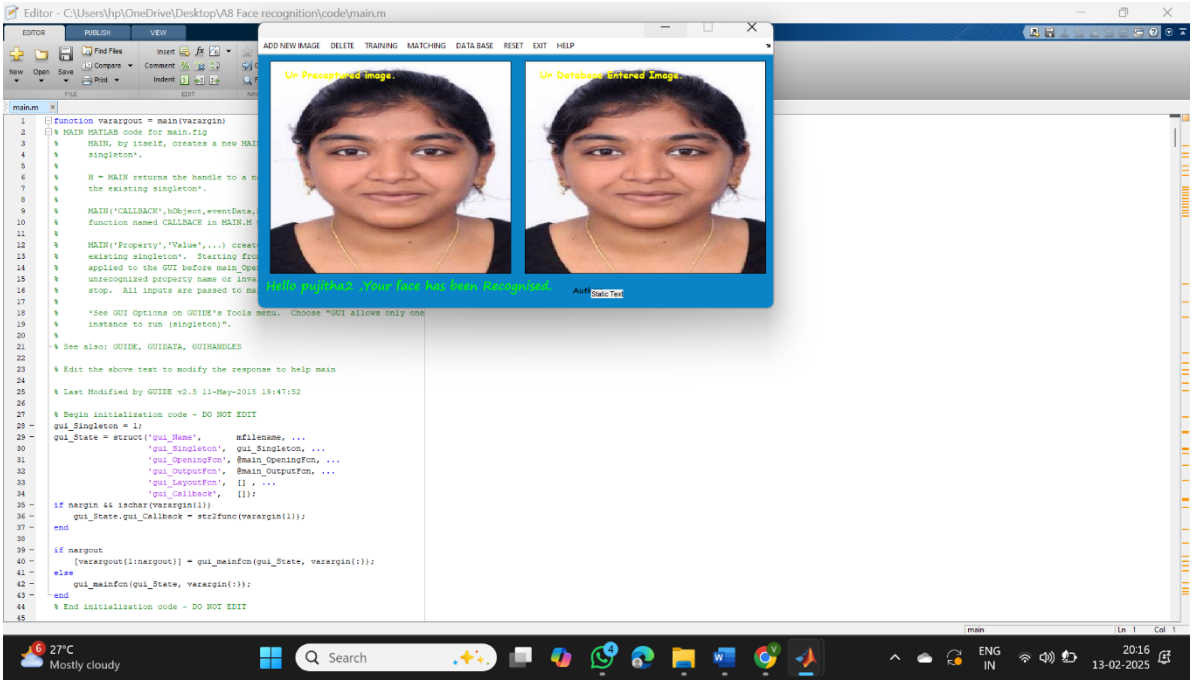

Figure.5 Face recognize

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ADVANTAGES

- Robustness to Motion Blur
- Adaptability to Illumination Variations
- Pose-Invariant Face Recognition
- Multi-Modal Data Fusion
- Real-Time Processing & Edge AI

APPLICATIONS

- Medical Applications
- Remote Sensing Image Retrieval
- Natural Image Retrieval
- Forensic Applications
- Business Applications

CONCLUSION

Automated recognition systems based on facial recognition techniques have proven to be both time-efficient and secure. These systems can also be employed to identify unknown individuals. In real-time scenarios, Principal Component Analysis (PCA) has demonstrated superior performance compared to other algorithms, offering a higher recognition rate and a lower false positive rate.

However, there are several challenges that need to be addressed for further improvement. One major limitation is the system's sensitivity to unintentional changes in a person's appearance, such as shaving, growing a beard, wearing a scarf, or tonsuring the head. Future work should focus on enhancing the robustness of recognition algorithms to account for these variations.

Additionally, the current system is capable of recognizing faces only up to a 30-degree angle variation. To improve its effectiveness, advancements in pose-invariant face recognition techniques should be explored. Another promising approach is integrating gait recognition with facial recognition, which could enhance the overall accuracy and reliability of the system, especially in scenarios where facial features are obscured.

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