

Face Recognition System

An Experimental Study on Accuracy and Reliability

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Abstract - Face recognition is a widely used biometric technology that allows a system to identify or verify a person using facial images. It is commonly applied in areas such as mobile phone authentication, attendance systems, security surveillance, and access control. Over the years, face recognition techniques have evolved from traditional methods to advanced deep learning-based approaches. Traditional face recognition techniques such as Eigenfaces, Fisherfaces, and Local Binary Patterns rely on manually designed features. With the growth of artificial intelligence, deep learning-based face recognition methods have become more popular. Techniques such as Convolutional Neural Networks (CNN), FaceNet, and VGG-Face automatically learn important facial features from large datasets and provide higher accuracy and robustness. However, these methods require more data and computational resources. This research helps in selecting an appropriate face recognition technique based on system requirements and application needs.

Keywords - Recognition, Traditional Methods, Deep Learning, CNN, Biometric System.

I. INTRODUCTION

Face recognition is a key application of artificial intelligence and computer vision. It automatically identifies a person from an image or video. Traditional identification methods, like passwords and ID cards, have their drawbacks. In contrast, face recognition offers a secure and contactless option. A face recognition system detects the face, extracts features, and compares them with stored data. As deep learning has advanced, these systems have become more accurate and reliable. This project compares traditional and deep learning face recognition techniques to understand their performance and find which method is more effective.

II. PROBLEM STATEMENT

Traditional face recognition methods like PCA and LBP do not provide reliable results when lighting, face angle, or facial expression changes. This limits the system's reliability in real-world situations. Deep learning methods like CNN offer better accuracy, but we need to investigate and compare their performance. Therefore, this project aims to compare traditional and deep learning face recognition techniques to identify the most accurate and efficient method.

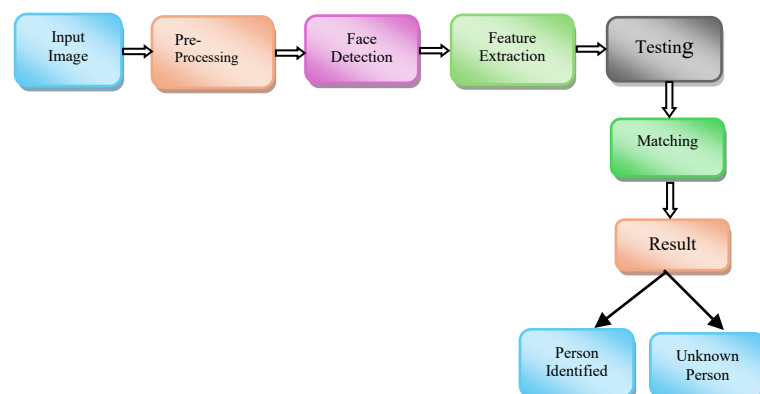
III. PROPOSED SYSTEM

This system is designed to recognize a person's face using both traditional methods and deep learning methods, and it compares their performance. In this system, first, face images are collected with a camera or a dataset. These images are then processed to find the face region. After detecting the face, key features are extracted using two different approaches. In the traditional approach, Local Binary Pattern (LBP) is used to

extract facial features. A classifier, like Support Vector Machine (SVM), is then employed to recognize the person. In the deep learning approach, a Convolutional Neural Network (CNN) is used. The CNN automatically learns facial features from the images and recognizes the person more accurately. After training both methods, the system compares their performance based on accuracy and recognition efficiency. Finally, the system displays the name of the recognized person or shows "unknown" if the face is not in the database. This system helps identify which method performs better for face recognition.

IV. METHODOLOGY

This project involves several steps to develop, First, we collect face images from a standard dataset or capture them using a webcam. These images feature different people, facial expressions, angles, and lighting conditions. Next, we preprocess the images by converting them to grayscale, resizing them to a fixed size, and removing noise to improve quality. After preprocessing, the system detects faces in the images using a face detection algorithm like the Haar Cascade Classifier, which isolates the face region and eliminates the background. Then, we perform feature extraction to obtain key facial features. In the traditional method, we use techniques such as Principal Component Analysis (PCA) and Local Binary Pattern (LBP) to extract features manually. For the deep learning method, we use a Convolutional Neural Network (CNN), which learns and extracts facial features automatically. After feature extraction, the system is trained with training images to learn and recognize different faces. Once the training is finished, we test the system using new face images. The system compares the test image with stored images and identifies the person if it finds a match; if not, it indicates that the person is unknown. Finally, we compare the performance of traditional and deep learning methods based on accuracy and efficiency to see which method yields better results.



ADVANTAGES

- i) Higher Accuracy Identification :- This project helps to identify a person using their face with high accuracy, especially using deep learning methods like CNN.
- ii) Improved Security :- Face recognition provides better security compared to passwords or ID cards because every person's face is unique.
- iii) Contactless System :- This system does not require physical contact like fingerprint devices, so it is more hygienic and easy to use.
- iv) Fast Recognition :- The system can recognize faces quickly, which saves time in applications like attendance systems and security checks.

CONCLUSION

This project concludes that deep learning-based face recognition works better for modern uses like security systems, attendance systems, and surveillance. This study highlights the role of deep learning in improving face recognition technology and lays a solid groundwork for future research and development.

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