# SYNOPSIS

## Report on

**Face Recognition System**

**by**

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# ABSTRACT

Face Recognition is a computer application that is capable of detecting, tracking, identifying or verifying human faces from an image or video captured using a digital camera. Although lot of progress has been made in domain of face detection and recognition for security, identification and attendance purpose, but still there are issues hindering the progress to reach or surpass human level accuracy. These issues are variations in human facial appearance such as; varying lighting condition, noise in face images, scale, pose etc.

This research paper presents a new method using Local Binary Pattern (LBP) algorithm combined with advanced image processing techniques such as Contrast Adjustment, Bilateral Filter, Histogram Equalization and Image Blending to address some of the issues hampering face recognition accuracy so as to improve the LBP codes, thus improve the accuracy of the overall face recognition system. Our experiment results show that our method is very accurate, reliable and robust for face recognition system that can be practically implemented in real-life environment as an automatic attendance management system.

Face recognition is a critical component of modern biometric security and surveillance systems. This abstract provides an overview of a face recognition system that utilizes advanced computer vision techniques and artificial intelligence algorithms to accurately identify and verify individuals based on their facial features.

The core of the system involves a face recognition model, typically based on deep learning architectures such as convolutional neural networks (CNNs) or Siamese networks. This model compares the extracted facial features with a database of known individuals' facial encodings to identify or verify the person in question. The matching process is often fine-tuned using metric learning techniques to improve accuracy.

**Keywords:-** Face recognition, Image blending

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## Introduction

In an era characterized by rapid technological advancements, face recognition systems have emerged as a cutting-edge technology with vast applications across various domains. These systems are designed to identify and verify individuals based on their facial features, providing a secure and efficient means of authentication and access control. The Face Recognition System Project aims to explore, develop, and implement a robust facial recognition solution for a range of practical applications.

Although lot of achievements have been made in devising facial recognition algorithms and systems, but to reach human level accuracy of facial recognition, some major issues associated with these algorithms/systems should be greatly mitigated or addressed as argued so as to realize a reliable and accurate facial recognition.

In conclusion, the Face Recognition System Project represents a significant endeavor to harness the power of face recognition technology for practical use cases. By achieving its objectives, this project will contribute to enhancing security, efficiency, and user experience across a wide range of industries and domains.

## Literature Review

A literature review of face recognition systems provides an overview of the key developments, trends, challenges, and applications in the field of facial recognition. Face recognition has gained significant attention in recent years due to its wide-ranging applications in security, surveillance, biometrics, and human-computer interaction. Here is a concise literature review of face recognition systems.

Face recognition is a biometric technology that involves identifying or verifying individuals based on their facial features. It has found applications in various domains, including law enforcement, access control, and personal devices.

Face recognition has come a long way, evolving from traditional methods to deep learning-based approaches. While it offers numerous applications, it also poses significant challenges related to privacy, bias, and robustness that require ongoing research and development efforts.

This literature review should provide you with a comprehensive overview of the key aspects of face recognition systems and serve as a starting point for further research in the field.

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## Project Objective

The objective of a face recognition system can vary depending on its application, but some common objectives include:

Security:- To enhance security by allowing access only to authorized individuals, such as in unlocking smartphones or gaining entry to secure facilities.

Identification verification:- To verify a person's identity for various purposes, like online account authentication or government services.

Surveillance:- To identify and track individuals in surveillance footage for security and law enforcement purposes.

**User Convenience**: Some face recognition systems aim to provide a convenient and user-friendly way for individuals to access services or devices without the need for passwords or keys.

**Security Enhancement**: Face recognition systems can be used to enhance security in various applications, such as airport security, border control, and critical infrastructure protection

**Data Security**: Some face recognition systems focus on data security by ensuring that only authorized personnel can access sensitive information or devices.

RESEARCH METHODOLOGY

**Define Research Objectives:**

Clearly state the goals and objectives of your research. What aspects of face recognition are you investigating, and what do you hope to achieve?

Data Collection:

Gather or generate a dataset of facial images that will be used for training, testing, and validation of your face recognition system. Ensure the dataset is diverse and representative.

**Preprocess:-**Preprocess the collected data by resizing, normalizing, and augmenting the images as needed. This step is crucial to ensure data quality and consistency.

Feature Extraction:

Select appropriate feature extraction methods ( Deep Learning) to extract meaningful features from facial images.

Model Selection:

Choose the type of face recognition model (PCA, CNN, Siamese networks) that best suits your research objectives.

Training:

Train your selected model using the training dataset. Fine-tune optimize the model's performance.

## Project Outcome

A face recognition system typically involves several components, including data collection, preprocessing, feature extraction, model training, and application. Here's a simplified overview of a project outcome for a face recognition system:

1.Data Collection:

Gather a diverse dataset of images containing faces. Ensure the dataset represents a wide range of ages, genders, and ethnicities.

2.Data Preprocessing:

Resize and standardize the images to a consistent resolution.

Apply face detection to locate and crop faces within the images.

Normalize pixel values and augment the dataset to increase its size.

3.Feature Extraction:

Use a suitable feature extraction technique like Principal Component Analysis (PCA) or deep neural networks (e.g., Convolutional Neural Networks or CNNs) to extract meaningful features from the face images.

4.Model Training:

Train a machine learning model, such as a Support Vector Machine (SVM), k-Nearest Neighbors (k-NN), or a deep learning model, to recognize faces based on the extracted features.

Split the dataset into training and testing sets to evaluate the model's performance.

5.Model Evaluation:

Assess the model's accuracy, precision, recall, and F1-score using the testing dataset.

Fine-tune the model parameters if necessary to improve performance.

6.Face Recognition Application:

Develop a user-friendly application that allows users to input images or use a webcam to capture faces.

Implement the trained model to recognize faces in real-time or from images.

Display the results, including the recognized person's name or ID.

7.Security and Privacy Considerations:

Implement security measures to protect the system from unauthorized access.

Address privacy concerns, such as data storage and sharing.

8.User Interface (UI):

Design an intuitive and user-friendly interface for the application.

Include features like user registration and management, if required.

9.Deployment:

Deploy the face recognition system on a suitable platform (e.g., a web server, desktop application, or mobile app).

10.Testing and Maintenance:

Continuously test the system's accuracy and performance in real-world scenarios.

Provide regular updates and maintenance to address any issues or improvements.

Remember that the specific details and technologies used in your face recognition system may vary depending on your project's goals and constraints. Additionally, ensure compliance with relevant laws and regulations, especially regarding data privacy and consent.

**Proposed time duration**

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| --- | --- |
| **Week Number** | **Tasks** |
| **Week 1-2:**  **Project Initiation and Planning** | 1. Define project objectives and goals. 2. Assemble the project team. 3. Establish communication and collaboration tools. 4. Identify user requirements and technical specifications. |
| **Week 3-4:**  **System Design and Front-end Development** | 1. Develop the system architecture. 2. Design the database structure. 3. Create the user interface. |
| **Week 5-6:**  **Core Development for Backend** | 1. Ensure seamless data flow between the front-end and back-end. 2. Develop the face recognition. 3. Create initial question/response logic. |
| **Week 7-8:**  **Testing, Refinement, and Deployment** | 1. Conduct thorough system testing. 2. Gather initial user feedback. 3. Identify and address issues and bugs. 4. Continue testing and refinement based on user feedback. 5. Finalize the project codebase and configurations. 6. Prepare a presentation and demonstration for the project's final submission. |

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