FACE RECOGNITION USING MODERN DAY RESEARCH

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Motivation

The localization of human faces in digital images is a fundamental step in the process of face recognition which is used for various applications(eg - Biometric Surveillance, Geofencing, Law Enforcement, Banks).

Face recognition system consist of three phases:

1. Face detection phase
2. Feature extraction phase: Extract efficient face features (Nose, eyes, ears, etc).
3. Classification Phase: classify a query image by comparing the features which we extracted in features extraction phase.

Can any of these phases be improved to give a better result with modern-day research?

Also, this topic presents a combination of concepts involving Computer Vision, Machine Learning and Artificial Intelligence Algorithms, integrating the major domains and hence attracting towards this research problem.

Data Sets

- **Yale Face Database-** Contains 165 grayscale 11 images in GIF format of 15 individuals. There are with different facial expression or configuration.
- **Georgia Tech Face Database-** Contains images of 50 people. The average size of the faces in these images is 150x150 pixels. The pictures show frontal and/or tilted faces with different facial expressions, lighting conditions, and scale.
- **ORL Database of Faces-** There are 10 different images of each of 40 distinct subjects. the images were taken at different times, varying the lighting, facial expressions, and facial details. All the images were taken against a dark homogeneous background.

Problem statement

Given an image of an unknown face as an image, report back the decided identity from a database of known individuals.

Project objectives

To tackle the given problem using 2 approaches:

- Genetic Algorithm Based approach
- ML Based approach using SVM

Compare and contrast the results obtained from the 2 approaches and draw inferences based on them.

Literature Review

Human Face Detection Using Genetic Algorithms : Matheus Borges, Rodrigo Faccioli, Adilson Gonzaga : This paper proposes a method to detect a human face region in an image using Genetic Algorithms with the individuals being a string of 4 chromosomes (Position X, Position Y, Ratio of X, Ratio of Y), written in binary form.

B. Heisele, P. Ho, T. Poggio, Face Recognition with Support Vector Machines: Global versus Component-based Approach: Contrasts 2 different approaches to Face recognition and concludes component-based approach to give better results.

K. Jonsson, J. Matas, J. Kittler, Y.P. Li, Learning Support Vectors for Face Verification and Recognition: The paper studies (SVM) as a method in face verification and recognition.

Timeline

Data collection, Preprocessing
Week 1-2

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ML based approach
Week 2-3

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Training and testing
Week 3

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GA based approach
Week 4-5

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Training and testing
Week 5-6

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Compilation of result
Week 6

Performance metrics

- Precision
- F1 Score
- ROC