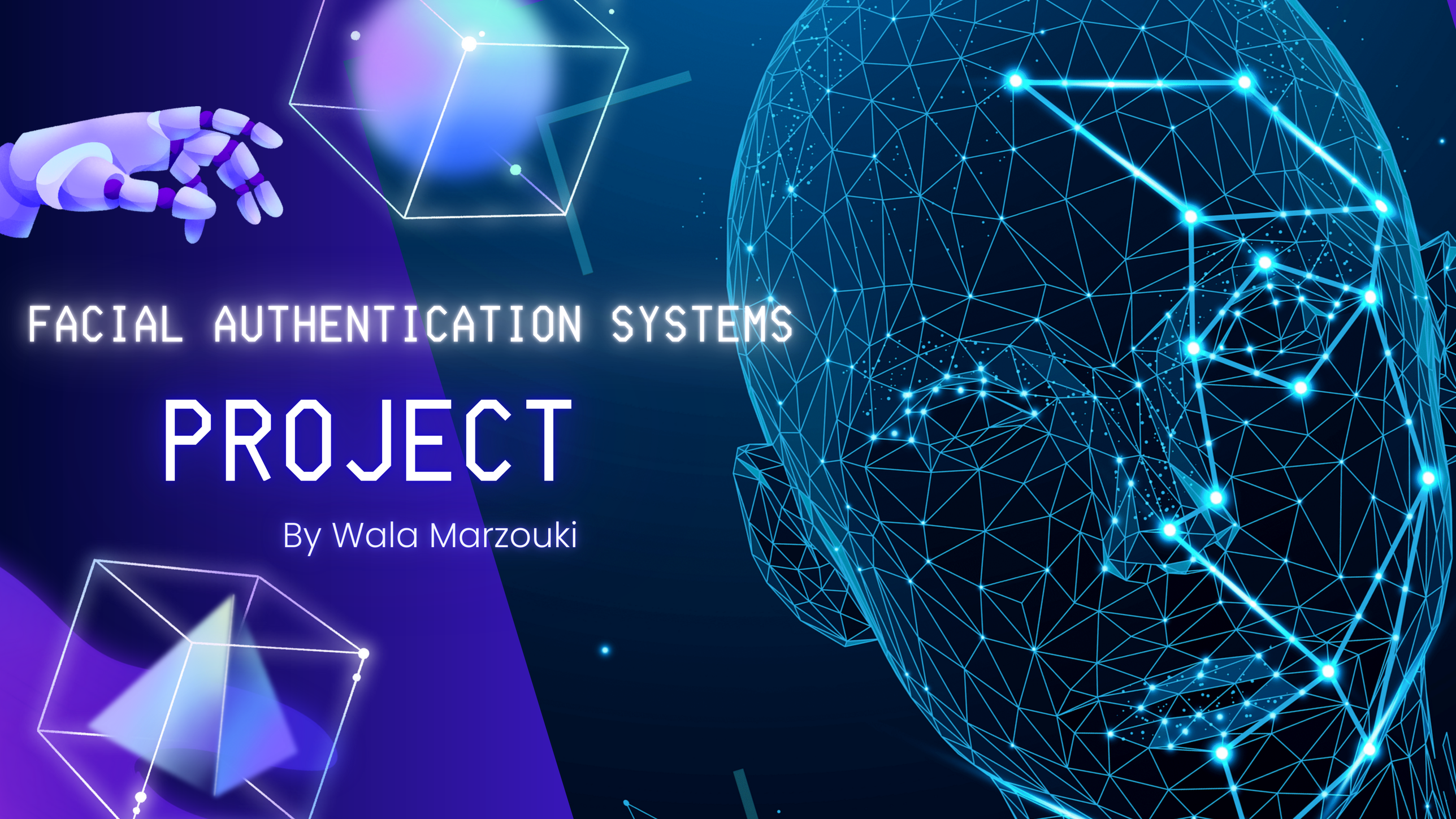
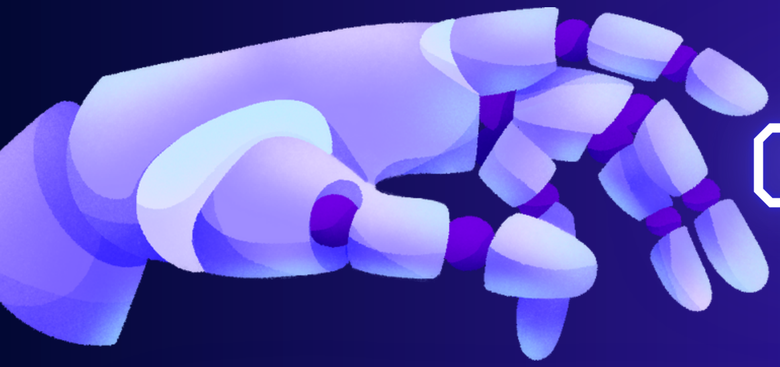


FACIAL AUTHENTICATION SYSTEMS

PROJECT

By Wala Marzouki



OVERVIEW OF THE MAIN EXISTING SOLUTIONS

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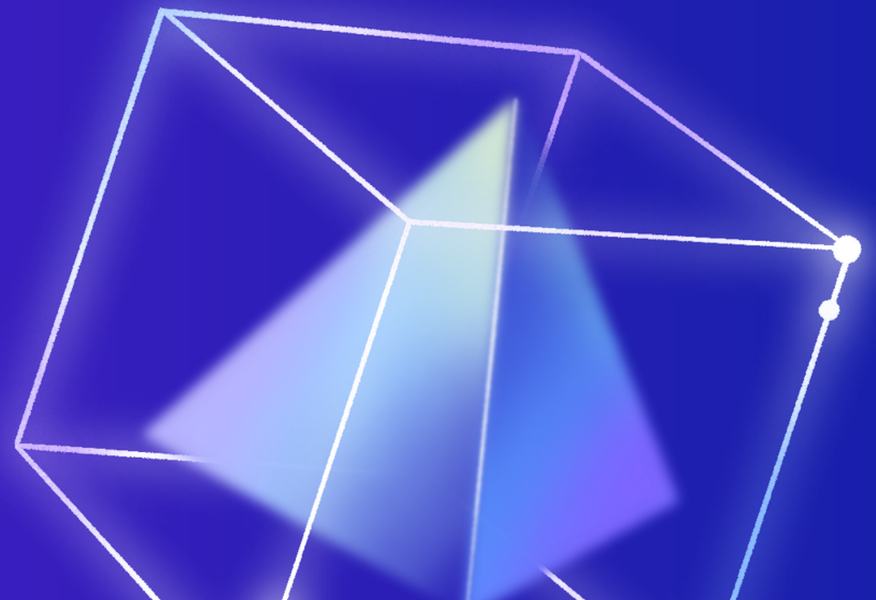
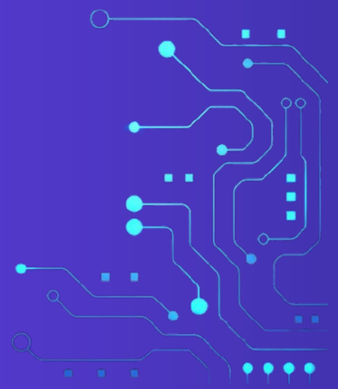


FACIAL AUTHENTICATION: CORE TECHNOLOGIES

What does it take for a Facial authentication system to reliably recognize a specific person both before and after a haircut, in a range of lighting situations, and with varying facial expressions?



In general terms, face recognition can be defined as a sophisticated evolution of computer science and artificial intelligence (AI) that ensure the process of automatically identifying the identity of a person by analysing an image of his or her face. This process encompasses a whole series of intermediate tasks, from the capture of the digital image to the final decision on the analysed identity.
cover all workflow stages it is necessary to make use of different technologies, among which AI models, machine learning (ML) algorithms, human verification, databases system and Neural Networks are key elements.

Core Technologies:

Artificial Intelligence (AI): particularly machine learning and deep learning algorithms, is at the heart of modern facial recognition systems. These algorithms enable the system to learn from vast amounts of data and improve over time.

Computer Vision: This field of AI is concerned with how computers can gain high-level understanding from digital images or videos. It involves the automatic extraction, analysis, and understanding of useful information from a single image or a sequence of images.

Biometric Analysis Software: provide the necessary tools and libraries to integrate facial recognition capabilities for the statistical analysis of biological data “the unique features of the face”.

Neural Networks: Particularly, convolutional neural networks (CNNs) are specialized deep learning algorithms used for image recognition tasks and are crucial for the feature extraction phase in facial recognition systems.

Live Detection and Anti-Spoofing : It is a AI-driven tool able to distinguish between a live person and a photograph or video by analyzing the texture of the skin, detecting blinking or other subtle facial movements, and assessing the three-dimensional structure of the face.

Datasets Management Systems: The effectiveness of facial recognition, and biometric identity verification technology in general, depends heavily on the sample size and diversity of the data used for training. So, Systems to store and manage biometric data securely are crucial for the functioning of a facial authentication system.

FACIAL AUTHENTICATION SOFTWARES OVERVIEW

Facial recognition software (FRS) is a biometric tool used to match faces in images, usually from photos and video stills, against an existing database of identities.

The top softwares available in the market:

BioID: is one of the best facial recognition systems that emphasizes privacy and security by focusing on data protection and privacy and Offering secure biometric verification. It offers cloud-based facial recognition software that can be accessed from anywhere using APIs. BioID has two major features: the first one is liveness detection, a tool for fighting online frauds which can easily detect live persons, spoofing attacks and differentiate humans from avatars and the second is photoverify facial recognition which is is a solution for Know Your Customer verification and facial log-in use cases. But BioID May require adjustments for diverse environmental conditions.

Cognitec: Cognitec’s live video scan feature enables the system to detect faces in live video streams. It takes things a step further by numbering the facial detections and recording the demographics. Cognitec offers biometric data protection with cryptographic signing and template encryption, a huge image database that helps with instant face match results, and automatic real-time notifications for banned person entrance detection. Furthermore, it supports Duplicate face detection. one limit for this software is that cognitec is Primarily suited for specific enterprise and government applications.

Kairos: is another AI-powered facial recognition solution that allows users to host the software on their servers or integrate it using APIs. The company offers FaceVACS-based face recognition systems that are flexible and easy to use. This solution covers spoof detection, multi-face detection, age detection, and gender detection. In addition, Its auto-tagging feature enables quicker search and indexing of images and videos. Some limitations of Kairos are that Performance may vary with lighting conditions And The API might be complex for beginners.

Face++: Face++ goes beyond facial detection to include deeper layers of AI-powered recognition of other human attributes. Apart from liveness detection and faceID identity verification, Face++ also provides a sophisticated algorithm for emotion recognition and Offers 3D face model reconstruction and robust anti-spoofing techniques. It also provides a high level of accuracy in its identity detection and matching process by identifying images under challenging conditions, such as bad lighting and low-quality aspect ratios. But it's important to note that it costs twice more as other leading services.
The Face++ pricing starts at USD 100 per day, and a free version is available.

FaceFirst : FaceFirst is a biometric security specializes in face matching and video analytics,. It is primarily aimed at enhancing security in retail environments . It uses Advanced AI for Analytics to enhance threat detection and to mitigate fraud, theft and violence in the business. by controlling access, authenticating customer ID and detecting age. but it still require specific hardware and software setup.

Microsoft Azure Face API: Microsoft Azure Face, part of Azure AI's computer vision services, offers AI algorithms for detecting, recognizing, and analyzing human faces in images also it Performs liveness checks. The service can be accessed through client library SDK or REST API, with focus on AI principles. This approach makes it one of the best face recognition models as it helps companies provide seamless access and secured user experiences .

Paravision: Paravision is a cloud-based AI recognition solution with several quality characteristics. Founded to solve activity recognition and facial recognition issues, Paravision relies on real-time streaming and frame-based techniques to provide face detection solutions. The software easily detects and verifies faces and maps their locations during live sessions. Other features include face clustering, face comparison, spoof detection, phenotype detection and age estimation.

Trueface AI:

Trueface ai offers a face recognition system, liveness verification, weapon detection. it focuses on accuracy and speed. It emphasizes its ability to adapt to the challenges posed by masked faces and diverse environments. It can Effectively identifies faces even with masks and performs well in diverse settings trueface offers some degree of flexibility in cloud deployment options available to customers. It can be deployed in cloud, on-premise or hybrid infrastructures. But this Performance may vary with lighting and background.

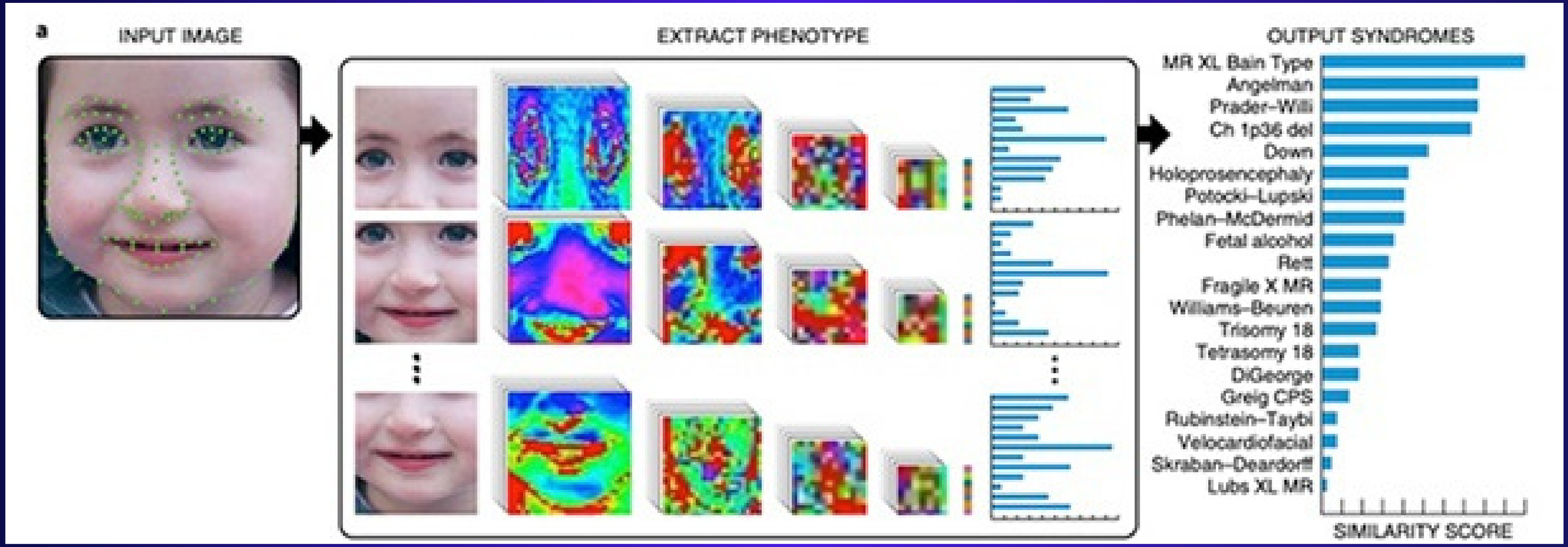
Sky Biometry :

Sky Biometry is an AI-based API and facial recognition service provider that helps businesses automate human identification processes. Sky Biometry can identify gender and age based on facial features. It can also determine facial expressions and detect objects on the user's face. It offers an easy-to-use API and can be accessed on the web, PC, or mobile at an Affordable price. The Sky Biometric service is ideal for companies with their developers who only require the Sky FRS API to integrate into their applications.

Sky Biometry pricing starts at €50 per month, and a free option is available.

Face2Gene:

developed by FDNA FDNA, a U.S.-based AI firm. The app's user interface is tailored to the needs of medical professionals, facilitating quick and accurate diagnosis of genetic disorders and their variants. With the help of deep learning algorithms, the FDNA app can take a patient photo and convert it into mathematical facial descriptors that can then be compared to syndrome-specific computational-based classifiers to quantify the degree of similarity. As a result, a ranked list of syndromes with a shared morphology is produced.



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DeepVision AI: offers a robust facial recognition solution integrating AI and deep learning for accurate and speedy recognition. The software is capable of detecting and matching multiple faces simultaneously, with an emphasis on anti-spoofing measures. DeepVision AI provides FRS solutions for marketing and planning and for businesses looking to use facial verification for security. Based on user reviews and feedback, some limitations states that Optimal performance requires high-quality facial images And Accuracy may vary in different lighting and background conditions.

Amazon Rekognition:

Amazon Rekognition is a managed computer vision service that is part of Amazon Web Services (AWS). It provides highly scalable real-time facial analysis and facial recognition capabilities via simple API calls. It can detect, track, and analyze faces and instantly search against a face collection to identify persons of interest which makes it suitable for security, surveillance, and access control applications. Furthermore, this software uses advanced machine learning algorithms to analyze facial features and has access to an enormous database, which improves its object identification accuracy which can lead to more accurate identification than traditional methods. But this Facial recognition technology can raise privacy concerns, particularly when it comes to the collection and storage of biometric data, and may be less accurate when used on individuals with darker skin tones, or when the lighting conditions are poor.

KEY FEATURES OF FACE RECOGNITION SOFTWARE

When selecting face recognition software, it’s essential to look for certain key functionalities that ensure:

- **High Accuracy:** The software should have a high success rate in correctly identifying individuals.
- **Real-Time Processing:** The capability to perform face detection and recognition in real-time is crucial for dynamic environments.
- **Robust Security Measures:** The software should include strong security protocols to protect sensitive data.
- **User-Friendly Interface:** A straightforward and intuitive user interface ensures ease of use for operators, reducing the learning curve and operational errors.
- **Scalability** The software should be scalable to accommodate growing needs, whether it’s adding more users or expanding to more locations.

CONCLUSION

Facial recognition softwares, with their ability to detect, recognize, and identify faces using AI algorithms, offer numerous benefits across various domains. From enhancing security systems to streamlining attendance management and identity verification, the applications are vast. However, challenges related to privacy, accuracy, biases, ethics, and security need to be addressed to ensure responsible and effective implementation.

THANK YOU!