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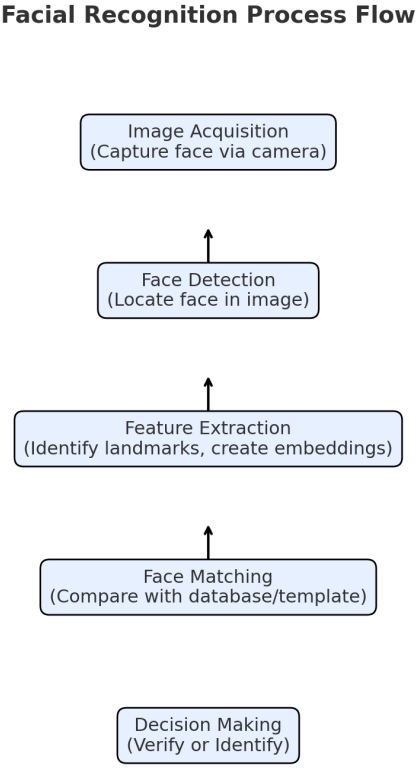
# Facial Recognition

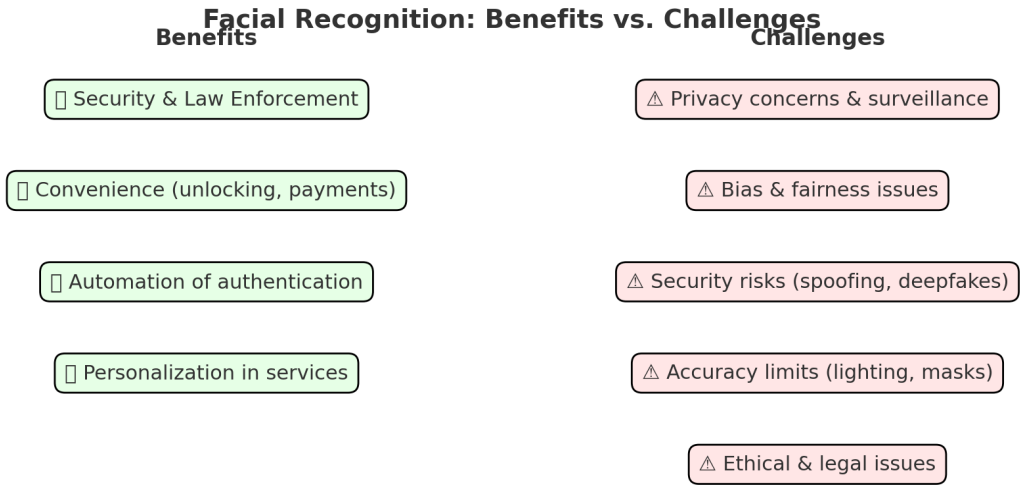
Facial Recognition is a powerful biometric system driven by computer vision and deep learning. It offers significant benefits in security, convenience, and automation, but faces serious challenges around privacy, fairness, and ethical deployment. Facial Recognition is a biometric technology that identifies or verifies a person's identity by analyzing their facial features. It works by capturing an image or video of a face, processing it with algorithms, and comparing it against a stored database of faces or a single reference template. The steps involved to make Facial recognition work are Image Acquisition, Face Detection, Feature Extraction, Face Matching, and Decision Making (output). Image Acquisition captures an individual's face using devices that have cameras like a CCTV or smartphone. Face Detection locates the person's face in the image and separates it from other objects and the background. The system then extracts key facial features that could be used as key identifiers like the eyes, jawline, mouth, or nose. Then the system compares these extracted features to its database of persons it has already seen and either verifies or identifies the person.




Some key benefits of Facial Recognition are Security and Law Enforcement, Convenience, Automation, and Personalization. This system could potentially help Law

Enforcement find and capture wanted individuals. It has also boosted convenience in many ways over the years from unlocking phones, to speedy check-ins at places like airports. We have also seen improvements that have streamlined authentication in workplaces, banking, and online services. Lastly, the retail and entertainment world has used it for personalized customer experiences.

Some challenges of Facial Recognition include privacy concerns, bias & fairness, security risks, inaccuracies, ethics, and data security. Many people believe that there are serious privacy concerns with facial recognition because they could be surveilled and have their data collected and sold without their consent. Bias and fairness is a big challenge because depending on the demographic the system may show higher false positives based on gender or race. Most people think of deep fakes when they consider the security risks of this system. It may open them up to having their identity used for spoofing. Spoofing is when a cyberattacker disguises themselves as a trusted entity to deceive a victim into giving sensitive information, clicking malicious links, or downloading harmful attachments. The systems are not always accurate and show lower performance when identifying a subject if the lighting or pose is not good and if the subject being identified has a mask or glasses on. Ethics is a big concern as well because this system if used without consent violates a person's civil liberties. Finally, the security of the data is always a challenge in any Machine Learning/Deep Learning system because some users provide private information that is not to be made public. A victim's picture, if leaked, could be used by criminal organisations to do all kinds of heinous crimes using the victim's identity as a scapegoat.




As far as the potential future developments go I am hoping there will be advancements in how to better detect deep fakes when they start getting indistinguishable from real videos. I am also looking forward to seeing better practices in ensuring that no one is a victim of data leaks or failures in data security practices. Furthermore, I think there is going to be an increase in convenience pertaining to access. For example, Amazon was trying out a food store where individuals could just walk into the store grab what they want and walk out and the payment is

automatically taken out. From the research I've done in this assignment, I now think Facial Recognition is one way this is achieved.

I think the technology could both positively and negatively impact society depending on what it's used for. If individuals use these systems to exclude certain demographics based on race or gender then that could have a negative impact on society. On the other hand, if people use it to catch bad guys, criminals, or identify someone in say a homicide or a murder then that would definitely have a positive impact on society.