Facial Recognition in the Privacy Age

By Martin Anderson

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The meteoric rise of open source facial recognition repositories and GPU-based machine learning has progressed faster than any legislative curbs or ethical and political guidelines could address over the last five years. Estimated at $3.4 billion USD in 2019, the global market is currently forecast to rise to over $10 billion by 2027[1].

The key areas that have galvanized sector leaders over the past five years are biometrics, security applications, marketing and attendance systems – all bolstered by recent advances in machine learning and the increasing use of lightweight mobile deep learning frameworks.

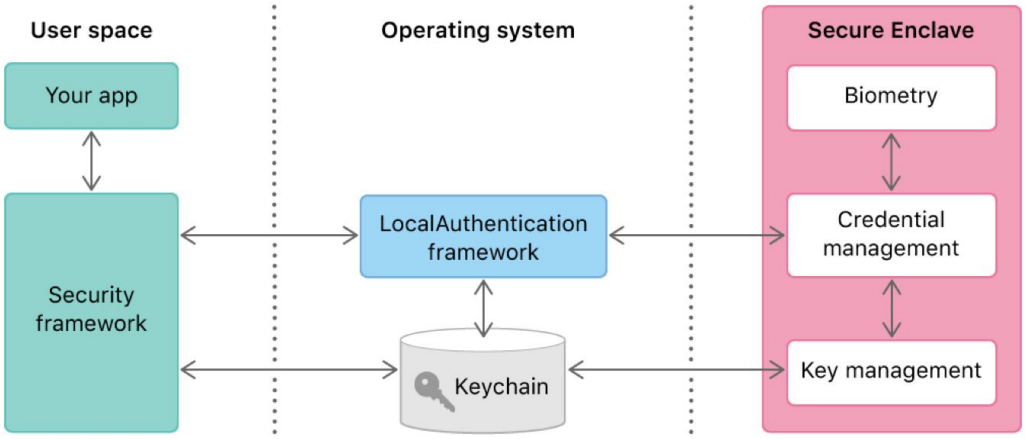
Here we'll examine some of these individual markets, but we'll also acknowledge that the facial recognition landscape is changing rapidly. The good news is that these changes are historically inevitable, and usually lead to a stable and more profitable sector, with stricter legislation, but fewer risk factors for new investors in the technology.

How Businesses Are Currently Using Facial Recognition Apps

The best-publicized uses of facial recognition technology in commercially available products come from the companies that have invested most in such systems, each with a user-base substantial enough to both feed and exploit massive amounts of incoming facial ID data:

Apple Face ID

Apple's sophisticated deployment of face-based login for iOS uses several facets of a facial scan in order to verify the user, including 30,000 distinct facial data points and the use of infra-red imaging for 'liveness', a technique that is difficult to subvert[2]. However, Face ID has come under criticism for occasionally failing to individuate twins[3], for occasions where it could not distinguish Chinese faces[4], and for periodic downtime[5].

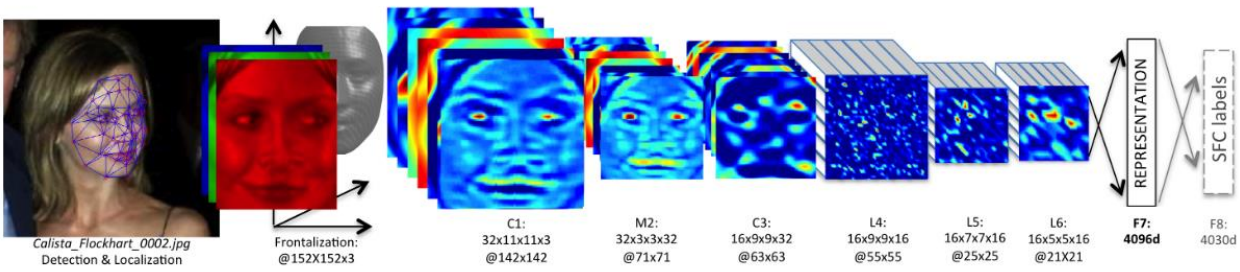


Local key management is critical to Apple Face ID. Source: https://developer.apple.com/documentation/localauthentication/accessing_keychain_items_with_face_id_or_touch_id

In June 2020, Apple announced that it will extend Face ID's reach via a Web Authentication API, allowing users to log in to websites with their faces[6] — a move generally welcomed[7] by the tech community, considering that Apple has no corporate remit to commercialize user data.

Facebook

Facial recognition has been the cornerstone of Facebook's AI research over the last ten years. Since 2015, in the wake of the publication of its DeepFace neural net FR system[8], the social network has deployed it to identify users that are tagged in photo and video material uploaded by others.

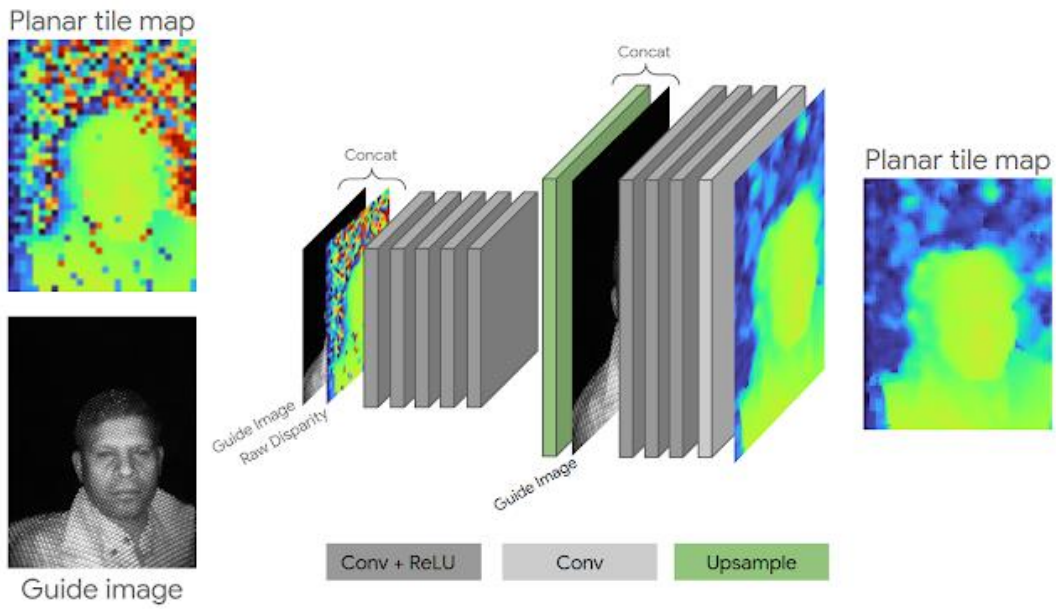


The workflow of a deep neural network architecture for Facebook's facial recognition systems, circa 2014. Source: https://research.fb.com/wp-content/uploads/2016/11/deepface-closing-the-gap-to-human-level-performance-in-face-verification.pdf

In September of 2019, under pressure from lawsuits[9], privacy campaigners and the federal government[10], Facebook gave its users the ability to turn off a range of facial recognition settings for their accounts[11]. In January 2020, the company also agreed to pay $550 million USD to settle a lawsuit regarding privacy violations around facial recognition data in Illinois[12].

Google

Google operates one of the best-funded[13] AI research initiatives in the world, with much of this effort devoted to the improvement of facial recognition architectures. The company has deployed its research for purposes of photo tagging (on Google Photos and for its search capabilities[14]) and for Android-based logins[15], amongst other applications.



Neural depth refinement architecture in Google's uDepth Real-time 3D Depth Sensing mechanism for the Pixel 4. Source: https://ai.googleblog.com/2020/04/udepth-real-time-3d-depth-sensing-on.html

Google is one of the defendants[16] in the State Of Illinois lawsuit, which maintains that – together with Microsoft, Facebook and Amazon – the search engine giant has abused user-uploaded content in violation of state privacy laws. It's not a specious lawsuit, since a growing number of US states are fighting back against tech giants' *laissez faire* usage of user content for facial recognition purposes[17].

In October of 2019 Google temporarily suspended facial recognition research for its Pixel 4 smartphone after it came to light that contracted researchers were targeting minority subjects from the student and homeless communities, in order to re-balance the racial bias that besets FR systems[18] (see *'Check For Bias, Even If You Need Bias'* below). Work has since resumed on the system[19].

Amazon

Amazon's Rekognition[20] system was first leased to police authorities in Washington in 2017[21]. Further deployments, including a controversial and aborted use by Orlando police in Florida in 2019[22], among other incidents, culminated in a grass-roots protest from Amazon employees, who, together with numerous

academic voices[23], successfully lobbied[24] their bosses to limit the sale of facial recognition products to police, military and government services.

Video: *'I tried Amazon's controversial facial recognition software'* - https://www.youtube.com/watch?v=6SWI3DdaRpU

After an initial retrenchment[25], in June 2020 Amazon surprised the sector with a sweeping retraction of the sale of its facial recognition technology to police authorities, stating that it would end the one-year moratorium pending new legislation from the US Congress[26].

The Changing Face of Facial Recognition

There's significant evidence that the 'wild west' years of facial recognition are drawing to a close under pressure from privacy campaigners, and from the politicians tasked with juggling the interests of the state with the will of voters.

Over the next five to ten years, increasing regulation is set to rationalize research and deployment of facial recognition technologies into a more stable state. New legislative boundaries are likely to cut away the early opportunists, but leave behind a regulated industry that's ready to enter a more traditional business cycle of competition and conglomeration.

Besides the extent to which the advent of COVID-19 has altered the facial recognition landscape, other political and social pressures have begun recently to bear down on its us, both in the private and public sector:

- In June, IBM sent a letter to the United States House of Representatives stating that it will no longer supply facial recognition or analysis software, and urging a 'national dialogue on whether and how facial recognition technology should be employed by domestic law enforcement agencies'.[27]
- Public calls increased[28] for a general moratorium on facial recognition technologies until suitable regulation is established, after the Washington Post revealed that the Federal Bureau of Investigation and Immigration and Customs Enforcement (ICE) transposed immigration records into a facial recognition database without consent[29].
- In June 2020 Microsoft imposed a ban on the sale of facial recognition technologies pending clear and agreeable legislation[30].

- The trial roll-out of a facial recognition scheme by the UK's Metropolitan Police[31], together with controversies about the force's ad hoc use[32] of facial recognition, has increased calls[33] for more oversight mechanisms[34].
- At the same time that prominent privacy regulators warn that AI-based facial recognition could become illegal in the European Union[35], pan-European police forces are pushing for an EU-wide facial recognition database[36].

The current lack of consensus is creating a turbulent and volatile landscape for business investors in facial recognition. When even a notable company such as IBM abandons it[37] as a PR liability, under pressure from shareholders[38] responding to public sentiment[39], we can assume that automated facial ID technologies have arrived at a critical juncture – or even the beginning of market decline.

Regulation as an Enabler for Business Facial Recognition Systems

In fact, increased regulation and growing public skepticism is more likely a sign that the new technology is beginning a long-term relationship with society, and negotiating the terms of its future successes. Some of the most revolutionary technological advances proliferated their way into regulation and rationalization, usually under protest from their proponents. These include the telegraph[40], the printing press[41], the automobile[42], the typewriter[43], opiates[44], and genetic engineering[45].

When crowd-sourced data and open source technologies are perceived as a global challenge to government authority around the world[46], the result is, historically, assimilation and regulation rather than annihilation or prohibition.

This regulated environment is the inevitable future of facial recognition for business. Deployments are not an issue: world-leading open source libraries, funded or co-funded by the biggest tech entities on the planet, are a massive enabler for facial recognition project development. The key to a successful project, rather, is governance and due diligence regarding the project's scope and legal exposure.

Future-Proofing Your Facial Recognition Deployment

Though legislation around facial recognition technologies is in flux around the world as well as within the individual states of the US[47], a rigorous approach to data governance and a thorough acquaintance with local and national laws is fundamental to the longevity of a business facial recognition deployment.

1: Be Aware of Existing and Pending Regulations

Consult your national and, where applicable, your state's legislature around privacy and data governance where it relates to facial recognition technologies. Stay aware of pending bills and amendments that may change the regulations at some future date.

Research current case studies of facial recognition deployments in the private and the public sector, and acquaint yourself with clauses in recent legislation which facilitate implementations. These might include projects in the interests of national security, or where the use of facial recognition has been officially acknowledged as non-challengeable, such as in workplaces where facial recognition is included in the limited right-to-privacy of employees; prisons and other state institutions; educational environments; and experimental scenarios where the subjects have specifically opted in to facial recognition, and where such exceptions are permitted by local and national laws.

2: Build Data Governance Mechanisms Into Facial Recognition Projects From the Outset

Even where current regulations may not require it, your facial recognition project should have accessible, human-readable policies around data retention, which in turn should fall in line with at least the minimum requirements of applicable law for your area.

Provide mechanisms where users can be apprised of the facial recognition data they have generated, and means by which the users can delete their data and/or opt-out of the facial recognition scheme. Even if there is no current legal necessity to provide this functionality, it may be required in the future, and will be far easier and cheaper to implement (and hide) at the start, rather than retro-fit if it should be needed later.

3: Maintain Detailed, Long-Term Logs

Implement a comprehensive and secure logging system in accordance with any prevailing laws that may specify policies around scope, granularity and retention of logs for the use and passage of facial recognition data.

4: Define and Publish Clear Information Around Sharing of Facial Recognition Data

A transparent approach to the journey of users' facial recognition information is essential. With the exception of *sub judice* requests from authorities, or where requirements for data retention may have expired, it should remain possible to deliver a complete account of where and when facial recognition data has been shared with parties included in terms of an opt-in, or more generally under prevailing local and national laws.

5: Check for Bias, Even if You Need Bias

Most goal-oriented facial recognition projects are in search of a relevant sub-set of surveilled subjects, whether the aim is marketing (most likely buyers), security (most likely offenders), or any other sector.

However, many of the most useful and popular libraries and datasets, components that frequently find their way into deployments, have caused controversy due to evidence of bias[48] either at the data-gathering or deployment stage.

The National Institute of Standards and Technology (NIST) has identified 'empirical evidence' of racial and gender bias among some of the most popular algorithms and datasets[49], while individuals of color have been falsely identified by facial recognition systems used by authorities, with notable cases in Michigan[50], Denver[51] and the UK[52].

Where facial recognition is a subset of object recognition/segmentation, the PR nightmares can multiply: Google was put in an uncomfortable position after its own facial recognition software defined two ethnic subjects as 'gorillas'[53].

It's inevitable that the goals of a facial recognition program will drill down to 'median' subjects, who may or may not have any particular characteristics in common among themselves. But it's essential to ensure that your tools and dataset development techniques are engineered to be impartial. Don't aim for results that you're already expecting, and ensure any eventual distilled data were developed neutrally, and that this can be demonstrated later if necessary.

Conclusion

If identity has become the new currency, then developing a facial recognition system will in the next ten years require the same diligence and adherence to regulation as creating a banking system, where handling the money itself is a relatively trivial logistic, but overseeing its safe and legal passage and usage is the central challenge of the work.

The current wave of public resistance to unregulated facial recognition has already thinned down the lazy opportunists – the business models that failed to see that ad hoc facial recognition deployment would inevitably hit a firewall of public objection, leaving the sector to evolve into a regulated and useful industry with acceptable checks and balances, and appropriate terms of entry.

It's this serious mind-set that will distinguish the most successful uses of facial recognition in the public and private sector in the years to come.

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