

# Facial recognition technology; A case study on its adaptation for local traffic management use in the Philippines

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**Abstract**— The Land Transportation Office (LTO) of the Philippines plays a crucial role in regulating land transportation and ensuring road safety across the country according to Executive Order (E.O) No. 125 and 125A dated 13 April 1987 and E.O No. 226 dated 25 July 1987. With millions of transactions annually, the LTO faces challenges related to identity verification, license issuance, vehicle registration, and enforcement of traffic regulations. In response to these challenges, the LTO should embark on a journey to modernize its operations through the adoption of facial recognition technology (FRT). This case study explores the process, challenges, and possibilities of adoptions on implementing Facial recognition technology in the LTO.

**Index Terms**—Biometrics, Facial Recognition, Image processing, Security.

## 1. Introduction

Picture this, you and your vehicle run into a road checkpoint, you take side, get your face captured and right then instantly your information as well as your license record are verified in just a matter of second then you go along your way. On the other hand, a road collision happens, the rescuer will have to pull up information of the victims via facial recognition, then all of the medical and relevant information of the involved are now up for use by medical personnel and/or legal authorities.

Long queue on license renewal and verification has been the struggle of our fellow motorized citizens. The LTO addressed and tried to mitigate these issues but the modern problems need modern solutions.

Facial recognition by definition is in the category of biometric security where the face structure is used for identifying and confirming the identity of an individual may it be in photos, videos or in real time [1].

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Since the pandemic contactless verification is becoming a trend and it is expected to grow by demand up to 14.1 % by 2030 according to the study of Statista [2].

The aim of this case study is to explore further the benefits, challenges and the application of facial technology in our transport local offices or even the government offices in general. In which it will identify the current facial recognition technologies utilized in the Philippines and explore strategies for their integration into the existing system. This study will also investigate the challenges encountered in adapting and integrating facial recognition technology into the current system of the Land Transportation Office (LTO).

Furthermore, the researcher will examine the measures implemented to mitigate potential biases or inaccuracies in facial recognition algorithms, particularly concerning marginalized communities, and evaluate how local traffic management addresses any discriminatory impacts.

And lastly, the study investigates how local traffic management ensures that the deployment of facial recognition technology respects individuals' privacy rights and complies with data protection regulations, considering the sensitive nature of biometric data.

The case study research materials encompass a comprehensive collection of data sources, ranging from scholarly articles and peer-reviewed journals to online archives, news reports, and relevant blogs, meticulously curated to provide a rich and multifaceted exploration of the subject matter under scrutiny.

Conducting research on facial recognition technology is essential to comprehensively understand its capabilities, limitations, and societal implications. By examining its technical aspects, ethical considerations, and potential impacts on privacy and civil liberties, such research helps inform policymakers, developers, and the public alike.

## 2. Methodology

This methodology approach for conducting research utilizes a variety of sources, including articles, studies, blogs, online

materials, and other pertinent resources. The objective is to provide a comprehensive understanding of the chosen topic by synthesizing information from diverse and reputable sources. This methodology ensures the credibility, reliability, and validity of the research findings.

The research process begins with an extensive literature review to identify existing knowledge, key concepts, theories, and empirical evidence related to the topic of interest. Academic databases such as PubMed, Google Scholar, Scopus, and Web of Science will be utilized to search for peer-reviewed articles, scholarly journals, conference proceedings, and research papers. The inclusion criteria prioritize recent publications (within the last 5-10 years), relevance to the research topic, and rigor in methodology and analysis.

Additionally, grey literature sources such as government reports, white papers, policy documents, and institutional publications will be consulted to provide supplementary insights and perspectives. Blogs, opinion pieces, and online forums may also be considered to capture diverse viewpoints and emerging trends within the field.

A systematic search strategy will be developed to ensure thorough coverage of the literature relevant to the research topic. It will be iterative, with initial searches yielding broad results that will be refined and narrowed down based on relevance and quality. Inclusion and exclusion criteria will be applied to screen search results, with a focus on selecting high-quality, relevant sources for further analysis.

Data collection will involve systematically reviewing and extracting relevant information from the selected sources. A standardized data extraction form may be developed to capture key details such as author(s), publication year, study design, methodology, findings, and conclusions. This process ensures consistency and comparability across the retrieved literature.

The extracted data will be synthesized and analyzed to identify patterns, themes, and gaps in the literature. Comparative analysis may be employed to explore contrasting viewpoints, conflicting findings, and areas of consensus or controversy within the field. Qualitative and quantitative data may be analyzed using thematic analysis, content analysis, or statistical techniques, depending on the nature of the data.

The analysis will aim to identify whether the adoption of facial recognition technology to the LTO existing system will be integrated successfully. The strengths and limitations of the evidence will be critically appraised, and recommendations for future research, policy, or practice may be proposed based on the findings.

### 3. Results And Discussions

The questions associated with this case study were addressed through the discussion of all the data gathered in this section.

#### A. Current Facial Technology Available in The Philippine Market

Biometrics are expected to experience a significant increase in usage over the next few years. Due to the use of unique

mathematical patterns, this biometric security measure is considered one of the safest identification processes. The following suppliers are available in the Philippine market and provide state-of-the-art quality products [2] [iotphils n.d]:

Suprema station is one of the leading global biometric system providers who has a wide-ranging security product that ranges to biometric access control systems like facial and Iris recognition, time-and-attendance applications, fingerprint, live scanners, and integrated fingerprint modules. [2] [iotphils n.d]:

Their product in facial recognition technology continues to provide Filipinos with advanced, multi-featured, and cost-friendly security solutions like the following:

Biostation 3: This biometric security solution enables facial recognition by having a neural processing unit that provides improved accuracy when it comes to biometric facial authentication. [2] [iotphils n.d]:

Facestation F2: This product of Suprema keeps up with a post-pandemic society as it can identify individuals' faces without masks and facilitate facial recognition for those who are wearing masks. It also houses IR recognition technology that can verify faces under dim light conditions, enabling smooth facial recognition in all indoor lighting conditions [3]. [Hitec Int'l n.d].

HIKVISION, another one of the world's leading innovators in biometric technology, offers a wide range of security products, including video surveillance, access control, and alarm systems. The integration of security solutions powered by AI technology provides end-users with new applications and possibilities for safety management and business intelligence. [4] [Hikvision]

Their Minmoe series that combines practical functions with advanced deep learning algorithms, the security and efficiency in access control and time attendance are enhanced by the use of Minmoe's Face Recognition and Iris Recognition Terminals, making it easier than ever. Entry points are more secure with the embedded face image anti-spoofing technology. Effective information protection is achieved by using encryption on all user data, and the optional privacy protection mode also safeguards users' personal information [4] [Hikvision]

The Philippines currently utilizes various facial recognition technologies, including software and hardware solutions developed by both domestic and international providers. These technologies range from basic facial recognition software used for identification purposes to more advanced systems capable of real-time tracking and analysis. Integration into the existing system of the Land Transportation Office (LTO) can be achieved through collaboration with technology partners, software customization to meet specific LTO requirements, and infrastructure upgrades to support the deployment of facial recognition hardware, such as cameras and sensors.

#### B. Challenges In Adoption of Facial Recognition to Existing System in LTO

Facial recognition technology stands poised to revolutionize various aspects of governance and public service, promising

enhanced security, efficiency, and accuracy. Within the domain of the Land Transportation Office (LTO), the integration of such technology holds potential for streamlining processes related to identification, licensing, and law enforcement. However, this endeavor is not without its hurdles.

1) *Privacy and Data Security Concerns:*

Facial recognition systems necessitate the collection and storage of individuals' biometric data, raising significant privacy concerns. The unauthorized access or misuse of such sensitive information poses a threat to citizens' privacy rights. Addressing these concerns requires the implementation of robust data protection measures and adherence to stringent privacy regulations.[5] Jain, A.K., & Ross, A. (2016).

2) *Accuracy and Reliability:*

The efficacy of facial recognition algorithms is contingent upon factors such as lighting conditions, image quality, and facial variations. Inaccuracies or false positives can lead to erroneous identifications and subsequent consequences, undermining trust in the technology. Ensuring the accuracy and reliability of facial recognition systems within the LTO framework necessitates rigorous testing, validation, and ongoing optimization. [6] Li, S.Z., & Jain, A.K. (2011).

3) *Infrastructure and Technological Requirements:*

Integrating facial recognition technology into existing LTO systems demands substantial infrastructure upgrades and technological investments. This includes the deployment of high-resolution cameras, powerful computing hardware, and secure data storage facilities. Furthermore, seamless integration with legacy databases and software platforms presents additional technical complexities. Reference: Li, S.Z., & Jain, A.K. (2011). Handbook of Face Recognition. Springer.

4) *User Acceptance and Training:*

The successful adoption of facial recognition technology hinges on the acceptance and cooperation of end-users, including LTO staff and the general public. Resistance to change, concerns regarding technology reliability, and a lack of familiarity with the system can impede user acceptance. Comprehensive training programs and stakeholder engagement initiatives are imperative to foster trust and promote understanding.[7] Jain, A.K., Ross, A., & Nandakumar, K. (2016).

5) *Ethical and Bias Considerations:*

Facial recognition algorithms are susceptible to biases, stemming from factors such as dataset composition and algorithmic design. Biased outcomes can perpetuate societal inequities and exacerbate discrimination, particularly against marginalized communities. Mitigating bias and ensuring algorithmic fairness require meticulous attention to data collection practices, algorithm development, and ongoing monitoring. [9] Buolamwini, J., & Gebru, T. (2018).

The integration of facial recognition technology into the systems of the Land Transportation Office holds immense promise for enhancing operational efficiency and bolstering security measures. However, overcoming the aforementioned challenges is paramount to realizing these benefits while

upholding principles of privacy, accuracy, and fairness. By addressing these challenges proactively and leveraging best practices from related domains, the LTO can navigate the integration process successfully, paving the way for a more secure and streamlined transportation ecosystem.

C. *Measures Are in Place to Address Potential Biases or Inaccuracies in Facial Recognition Algorithms, Particularly Concerning Marginalized Communities and Impact in Local Traffic Management.*

Artificial intelligence (AI) systems and machine learning algorithms are being increasingly used by the private and public sectors to automate simple tasks decision-making procedures that are complex. Most economic sectors, including transportation and retail, are being disrupted by the mass digitization of data and the emerging technologies that use it. Algorithms are using macro- and micro-data to influence decisions that affect people in various tasks. In machine learning, algorithms rely on multiple data sets, or training data, that specifies what the correct outputs are for some people or objects.[4]

Face recognition algorithms have a high classification accuracy of over 90%, but these results are not universal. Face recognition, despite accuracy, can be a powerful tool for a law enforcement system with a long history of racist and anti-activist surveillance and can expand pre-existing inequalities.[10]

D. *Ensuring Local Traffic Management Facial Recognition Technology Respect Individual's Privacy Rights and Adheres Data Protection Regulations.*

Every time an organization collects sensitive information from an individual, the organization must inform the individual of the collection of sensitive information. If it's not feasible to inform beforehand, it's best to give this notice of collection before or as soon as possible after the information is collected. In addition to notification of collection and obtaining consent, an organisation must have a legitimate reason for collecting and using biometric information. This involves:

- Identifying the purpose for collecting the information and its relation to the organisation's business operations.
- Determining whether the purpose of collection is reasonably necessary for one of the organisation's business operations.

Such an organization may collect biometric information to control access to secure areas or verify the compliance of individuals entering the logistic. [6]

Biometric data is data that allows individuals to be recognized based on their biological or behavioral characteristics, such as data extracted from fingerprints, irises or facial features. It is more permanent and less alterable than other personal data; it cannot be changed easily. Biometric data extracted from a facial image can be used to uniquely identify an individual in a range of different contexts. It can also be used

to estimate or infer other characteristics, such as their age, sex, gender or ethnicity. The UK courts have concluded that “like fingerprints and DNA [a facial biometric template] is information of an “intrinsically private” character.”<sup>2</sup> LFR can collect this data without any direct engagement with the individual. [7]

#### 4. Conclusion

The integration of facial recognition technology into the systems of the Land Transportation Office (LTO) in the Philippines presents both opportunities and challenges. This study has explored the current landscape of facial recognition technologies available in the Philippine market, highlighting key suppliers such as Suprema and Hikvision. These suppliers offer a range of advanced facial recognition products designed to enhance security and efficiency in various applications, including access control, time-and-attendance tracking, and surveillance.

However, the adoption of facial recognition technology in the context of the LTO is not without its hurdles. Privacy and data security concerns loom large, as the collection and storage of individuals' biometric data raise significant ethical and legal questions. Unauthorized access or misuse of such sensitive information could pose a threat to citizens' privacy rights, necessitating the implementation of robust data protection measures and adherence to stringent privacy regulations.

Moreover, challenges related to accuracy, reliability, and infrastructure requirements must be addressed to ensure the successful integration of facial recognition technology into the existing system of the LTO. Factors such as lighting conditions, image quality, and facial variations can affect the efficacy of facial recognition algorithms, leading to inaccuracies or false positives. Infrastructure upgrades, including the deployment of high-resolution cameras and secure data storage facilities, are essential to support the deployment of facial recognition hardware.

User acceptance and training also pose significant challenges, as the successful adoption of facial recognition technology hinges on the cooperation of end-users, including LTO staff and the general public. Resistance to change, concerns regarding technology reliability, and a lack of familiarity with the system can impede user acceptance, necessitating comprehensive training programs and stakeholder engagement initiatives.

Ethical considerations, particularly concerning biases and discrimination, must also be addressed to ensure the responsible deployment of facial recognition technology. Facial recognition algorithms are susceptible to biases stemming from factors such as dataset composition and algorithmic design, which can perpetuate societal inequities and exacerbate discrimination, particularly against marginalized communities. Mitigating bias and ensuring algorithmic fairness require meticulous attention to data collection practices, algorithm development, and ongoing monitoring.

In light of these challenges, it is crucial for local traffic management authorities to implement measures to address potential biases or inaccuracies in facial recognition algorithms and ensure compliance with data protection regulations. This includes engaging with community stakeholders to gather feedback, conducting regular audits of the facial recognition system, and implementing bias detection algorithms. Additionally, measures such as obtaining informed consent, identifying legitimate purposes for data collection, and implementing encryption and privacy protection measures are essential to safeguard individuals' privacy rights.

In conclusion, while the integration of facial recognition technology into the systems of the Land Transportation Office holds immense promise for enhancing operational efficiency and bolstering security measures, it is essential to navigate these challenges proactively and responsibly. By addressing privacy concerns, ensuring accuracy and reliability, promoting user acceptance, and mitigating biases, local traffic management authorities can realize the full potential of facial recognition technology while upholding principles of privacy, accuracy, and fairness.

#### References

- [1]. What is Facial Recognition – Definition and Explanation (n.d) 2024 AO Kaspersky Lab What is Facial Recognition
- [2]. Biometrics in the Philippines: Here’s Everything You Need to Know (n.d) 2024 Internet of Things Philippines Inc.
- [3]. Benefits of Facial Recognition System in the Philippines (March 17, 2023). Hitec International. Benefis of facial recognition system in the Phillipines
- [4]. MinMoe Face Recognition Terminals HIKVISION n.d
- [5]. Handbook of Biometrics. Springer. Jain, A.K., & Ross, A. (2016).
- [6]. Handbook of Biometrics, Springer
- [7]. Handbook of Face Recognition. Springer.Li, S.Z., & Jain, A.K. (2011)
- [8]. Handbook of Face recognition
- [9]. Introduction to Biometrics. Springer. Jain, A.K., Ross, A., & Nandakumar, K. (2016).
- [10]. Introduction to Biometrics, Springer
- [11]. Gender Shades: Intersectional Accuracy Disparities in Commercial Gender Classification. Proceedings of the 1st Conference on Fairness, Accountability and Transparency. Buolamwini, J., & Gebru, T. (2018).
- [12]. The conscious code, Buolamwini, J., & Gebru, T. (2018).
- [13]. Algorithmic bias detection and mitigation: Best Practices and Policies to reduce consumer harms. (May 22, 2019) Governance Studies Media Office.
- [14]. Algorithmic bias detection and mitigation: Best Practices and Policies to reduce consumer harms.
- [15]. Blog, Science Policy, Special Edition: Science Policy and Social Justice.
- [16]. Nirovision: Facial Recognition and Australian Privacy Law.
- [17]. Information Commssioner ‘s Opinion: The use of live facial recognition technology in public places.