Understanding Facial Recognition Systems: Executive Summary

PARTNERSHIP ON AI

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Foundational facial recognition concepts emerged more than 50 years ago.[1] Recent advancements in machine learning, coupled with advancements in camera and computer vision technologies, have accelerated the design, development, testing, deployment, and operation of facial recognition systems. Concerns about systems used to collect, track, or surveil a unique and exposed part of the human body - one that is, for many, directly associated with identity, privacy, safety, democracy, and security - raise important questions about the appropriate role of this technology in society.[2] These considerations have prompted calls for policymakers around the world to take immediate steps to determine whether and how facial recognition systems can be used to benefit people without violating human rights and civil liberties. [3]

The Partnership on AI (PAI) believes that policymakers must understand how facial recognition systems work in order to craft comprehensive legal and regulatory environments.[4] PAI's Facial Recognition Project is intended to demystify facial recognition systems and provide a common language for policymakers and other stakeholders to use when discussing and evaluating their capabilities.[5] Explaining these systems can help bridge conversations between those developing and using the technology, policymakers, and those whose faces and names are wittingly or unwittingly included in these systems.

This paper is the result of a series of workshops on facial recognition systems convened by PAI between September 2019 and January 2020. The workshop series brought together Partner organizations and communities developing, engaging with, and affected by these systems. Presenters illuminated the state of the art in today's systems, described advancements in research, and provided societal context for the environments where facial recognition technologies are currently being deployed.

PAI's Facial Recognition Project also reinforces the importance of increasing transparency and understanding around the design, development, testing, procurement, deployment, and operation of AI systems - especially those deployed in high-stakes domains. To further this objective, we define facial recognition systems, and illustrate how they work. We also include a list of questions for policymakers and other stakeholders to elicit additional information about the technical and related aspects of facial recognition systems. While specific policy recommendations related to the use of facial recognition systems are out of the scope of this paper, it sheds light on common misunderstandings about these systems and is intended to provide useful information to inform the important policy debates unfolding on this topic around the world.

1 Li, S. & Jain, A. (Eds.). (2011) *The Handbook of Face Recognition*. London: Springer-Verlag

2 Ball, K., Haggerty, K. D., & Lyon, D. (Eds.). (2012). *Routledge Handbook of Surveillance Studies.* London/New York: Routledge.

3 *See for instance:* Brad Smith (Dec. 2018) *Facial recognition: It's time for action*. Blogs.microsoft.com; (Jan. 2020) *Google boss Sundar Pichai calls for AI regulation* BBC News; Montgomery, C. & Hagemann, R. (Nov. 2019) *Precision Regulation and Facial Recognition.* IBM Policy Lab; Dastin, J. (Sept. 2019) *Amazon CEO says company working on facial recognition regulations.* Reuters Technology News; and (June, 2019) *ACLU Coalition Letter Calling for a Federal Moratorium on Face Recognition.*

4 For an example see: Sapra. B. (Dec. 2019) *San Francisco is changing its facial recognition ban after it accidentally made the iPhones it gave to city employees illegal.* Business Insider.

5 *Note that while these systems are used globally, the people involved in informing this paper largely represent US and Western European perspectives.*

While it is important to understand how these systems work, PAI also recognizes that facial recognition systems are developed by humans, and their use cannot be separated from existing cultural, social, and economic power dynamics. These systems can make some aspects of life easier, and they can also amplify civil liberties and human rights concerns, including challenges of bias.[6] [7] PAI believes that meaningfully engaging underrepresented and at-risk communities, including women and gender non-binary people, communities of color, the LGBTQI community, immigrants, workers, those with disabilities, low-income individuals, and religious minorities, is essential for truly equitable outcomes.

Our work is informed by the following key findings and understandings:

- Facial Recognition Systems Defined - Facial recognition systems predict similarity between two faces in order to attempt to verify or determine someone's identity.

- How These Systems Work - A facial recognition system works by first detecting whether an image contains a face. If so, it then tries to recognize the face in one of two ways:
    - During facial verification, the system attempts to verify the identity of the face. It does so by determining whether the face in the image potentially matches a specific face (identity) previously stored in the system.
    - During facial identification, the system attempts to predict the identity of the face. It does so by determining whether the face in the image potentially matches any of the faces (identities) previously stored in the system.

- Each System is Unique - There is no one standard system design for facial recognition systems. Not only do organizations build their systems differently, and for different environments, but they also use different terms to describe how their systems work. The explanations in this paper, informed by briefings from experts participating in our workshops, aim to provide a consistent set of descriptions to ground future discussions.

- Design Matters - The results that facial recognition systems present to users are dependent on how the systems were designed, developed, tested, deployed, and operated. The impact of key aspects of the system such as training datasets, enrollment databases, and match thresholds need to be understood in order to properly evaluate these results.

- Beyond Facial Recognition - "Facial recognition" is sometimes described as encompassing facial characterization - also called facial analysis - systems, which detect facial attributes in an image, and then sort the faces by categories such as hair color, gender, or race. We do not consider such systems to be a part of facial recognition systems because they are not used to predict the identity of a person.

Though this paper incorporates suggestions from many of PAI's Partner organizations, it should not under any circumstances be read as representing the views of any specific member of PAI. Crucially, PAI is an independent organization. While supported and shaped by our Partner community, PAI is ultimately more than a sum of its parts, and makes independent determinations. Our Partners contribute in service of PAI's mission, which is in the public interest. For additional information, including an interactive graphic on facial recognition systems, please visit: partnershiponai.org/facial-recognition-systems

6 *In this instance, PAI is referring to bias in both the social and technical understandings. For a detailed discussion of bias in prediction systems, see* the Partnership on AI *Report on Algorithmic Risk Assessment Tools in the U.S. Criminal Justice System.*

7 Special Rapporteur on the promotion and protection of the right to freedom of opinion and expression. (May 2019) Report on Surveillance and Human Rights UNGC Human Rights Council or *Access Now 2018 discussion of technology and human rights*

About the Partnership on AI

The Partnership on AI (PAI) is a global multi-stakeholder nonprofit committed to the creation and dissemination of best practices in artificial intelligence through the diversity of its Partners. By gathering the leading companies, organizations, and people differently affected by artificial intelligence, PAI establishes a common ground between entities which otherwise may not have cause to work together – and in so doing – serves as a uniting force for good in the AI ecosystem. Today, PAI convenes more than 100 partner organizations from around the world to realize the promise of artificial intelligence. Find more information about PAI at partnershiponai.org.