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| **Title:** | Proposal: A mobile AI approach to biometric identity |
| **Purpose:** | Discussion |
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| **Abstract:** | This submission is in response to the ITU-T Focus Group on Artificial Intelligence for Health (AI4H)’s call for proposals on use cases and data. It describes Element’s deep-learning based, software-only solution for biometric recognition that runs offline, on any mobile device. It outlines opportunities to use mobile biometric ID to link patients to digital health records and the importance of unique patient ID in developing patient-level datasets for machine learning-based health innovations. It also describes Element’s work and data to date in extending the mobile biometric ID to infants and young children. |

Project Title

A mobile AI approach to biometric identity

Overview

Over 1 billion people worldwide do not have formal ID and nearly 1 in 4 children are not registered at birth. This lack of robust identification, particularly in the youngest populations, makes it difficult to create longitudinal medical records and access essential health services. Biometric identification is the gold standard in human identification, but has not been widely adopted in healthcare, where the need to identify patients from infancy presents additional challenges.

Element is a software-only solution for biometric recognition that runs offline, on any mobile device – no specialized hardware or connectivity required. The technology is powered by deep learning, a technique pioneered by Element co-founder Yann LeCun, who developed the modern AI field.

Element works with partners across Africa and Asia to use mobile biometric ID to link patients to digital health records and services. The technology was developed to be compatible with emerging digital health information platforms and integrated into the programs of large-scale health partners in low-resource settings. Through their partnership with Intellectual Ventures’ Global Good Fund, Element is also extending their solution to infants and young children.

At the patient level, biometric ID ensures the right patient gets the right service at the right time – improving quality of care. At a systems level, the digital identity could help facilitate linkages between siloed health platforms without sharing sensitive health data or compromising the privacy of patients. Across both, the introduction of reliable patient recognition – on the mobile devices that already proliferate the health ecosystem – maximizes the investments made in healthcare innovations, helping to ensure greater impact.

Impact

AI holds tremendous promise for transforming the delivery of healthcare, particularly in resource-poor settings. However, the development and testing of nearly all AI-based decision support tools, point-of-care diagnostics, and other healthcare innovations require granular, patient-level datasets. Without unique patient identity, this will be difficult to achieve – particularly with the level of accuracy required of machine learning-based systems.

It is estimated that the use of mobile technology has created more than 5 billion points of contact between consumers, healthcare workers, health system administrators, and supply chain health firms. As such, biometric ID delivered as a pure software service could map to mobile delivery of health services across the ecosystem. For example, it could be used to connect birth registration systems to digital immunization platforms to drive immunization coverage; to enable client management systems for national scale HIV/TB programs; or to link women to longitudinal antenatal care records, both at the community and clinic levels.

Data Availability

There is currently no commercially-available infant biometric solution, as it is difficult to determine classifiers for rapidly-changing features. Of the limited prototypes in development, nearly all are early-stage, hardware fingerprint solutions. These are inflexible and exclusionary (fingerprints wear down over time), cannot be delivered in the same frictionless manner as a software-only, hardware-agnostic approach, and create dependencies that inhibit the implementation of a globally-available infant biometric solution.

In contrast, deep learning is uniquely suited to address the challenges of capturing infant biometrics, as the algorithms learn directly from the natural features of infants, can be deployed to understand changes over time, and can be applied to multiple modalities at once. This creates a more robust method of identity recognition that cannot be achieved with typical biometric sensors.

In partnership with Global Good, the International Centre for Diarrhoeal Disease Research, Bangladesh and Angkor Hospital for Children in Cambodia, Element has developed initial algorithms for infant palm, foot, and ear recognition, using biometric images collected on smartphones from 8,000 infants and young children followed over time. The biometric images were collected by trained study personnel in Bangladesh and Cambodia with the requisite education, training, and experience to conduct this research. The images were uploaded through an encrypted network connection protocol for annotation and algorithm training by Element. Field usability testing of the algorithm is set to begin in Mozambique in December 2018.

Organizer Details

Element develops and distributes a mobile-based, software-only platform for biometric identity. As pioneers of mobile deep learning — and among the first in the field — we work with partners around the world to build more efficient and inclusive societies.

Our current focus is on Asia and Africa, where over 1 billion people lack proper identification. Over the last six years, Element has pioneered many advances in deep learning model compression and mobile software delivery, with experience building for and integrating with health systems, including mobile digital health applications, SAP, DHIS, and web browser-based EMRs.

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