

Anil K. Jain

**Michigan State
University**

<http://biometrics.cse.msu.edu>

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Biometrics: India's Singular Contributions

Legal Identity for All



Vaccination Clinic




Food distribution

U.N. Sustainable Development Goal (16.9): ***“By 2030, provide legal identity for all, including birth registration.”***

<https://bit.ly/1oIVAOf>

Aadhaar: World's Largest Identity System



The image shows a full Aadhaar letter on the left and a cut-out portion on the right. The letter contains the following text:
- Top header: भारतीय विशिष्ट पहचान प्राधिकरण (Bharatiya Vishist Pechan Pradhikaran), भारत सरकार (Bharat Sarkar), Unique Identification Authority of India, Government of India.
- Enrolment No.: 12345678901234.
- To: सपना सिंह (Sapna Singh), D/O Pawan Singh, A/B-34, Budhnagar, Indrapuri, New Delhi - 110012.
- Aadhaar No.: 4444 5555 6666.
- Bottom header: आपका आधार क्रमांक / Your Aadhaar No. : 4444 5555 6666, आधार - आम आदमी का अधिकार (Aadhaar - Aam Aadmi Ka Adhikaar).
The cut-out portion contains:
- Photo of Sapna Singh.
- Name: सपना सिंह (Sapna Singh).
- Date of Birth: 1990.
- Gender: महिला / Female.
- Aadhaar No.: 4444 5555 6666.
- Bottom header: आधार - आम आदमी का अधिकार (Aadhaar - Aam Aadmi Ka Adhikaar).
A hand is shown using scissors to cut the letter along a dashed line.

Unique Identification Authority of India
Planning Commission, Government of India

ALWAYS CARRY YOUR AADHAAR WITH YOU
and avail benefits of various services

Cut this portion of Aadhaar letter
and carry it with you.
(You may get it laminated too)

Aadhaar : your proof of identity and proof of address for

- opening a Bank account
- getting a Mobile connection
- getting a LPG connection
- AADHAAR helps in proving ID during Train travel
- ...and many more services

AADHAAR
Aam Aadmi Ka Adhikaar
www.uidai.gov.in

**Mera Aadhaar,
Meri Pehchaan**

~1.244 billion unique Aadhaar issued



Biometrics For Individualization of 1.3B

gettyimages
JohnnyGreig

Biometrics

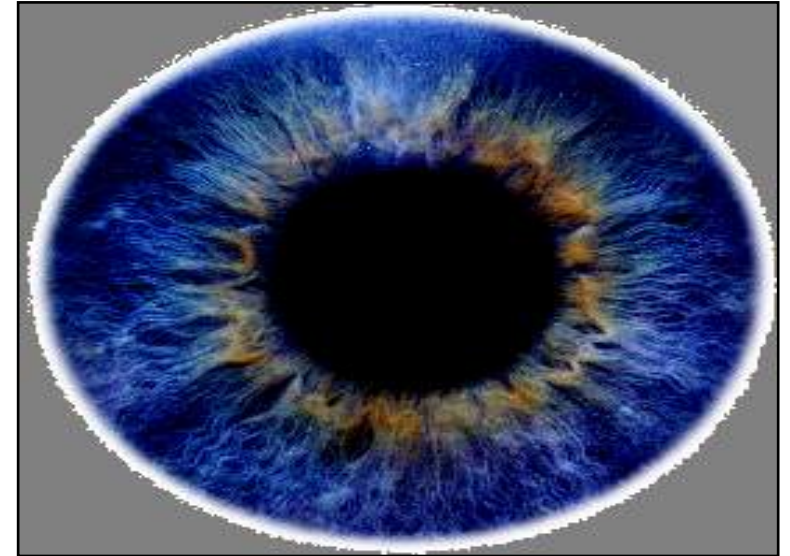
- **Biometrics:** *You are your password (Bios: life; Metron: a measure)*
- *Biometric matching ensures “one person, one Aadhaar” and provides a “verifiable identity”*



Fingerprint



Face



Iris

Unique Identification Authority of India (UIDAI)

To empower residents of India with a unique identity and a digital platform to authenticate anytime, anywhere.



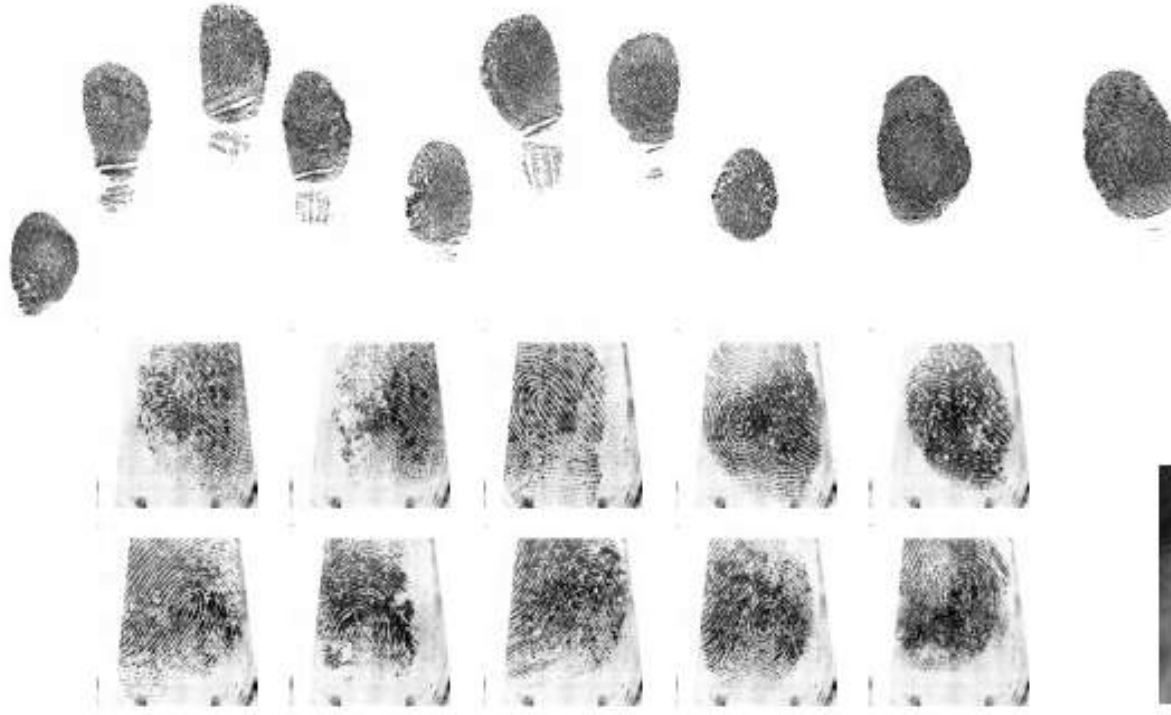
Unique Identification Authority of India
Planning Commission, Government of India

- Established in 2009
- No other country has been able to replicate such a large and successful system

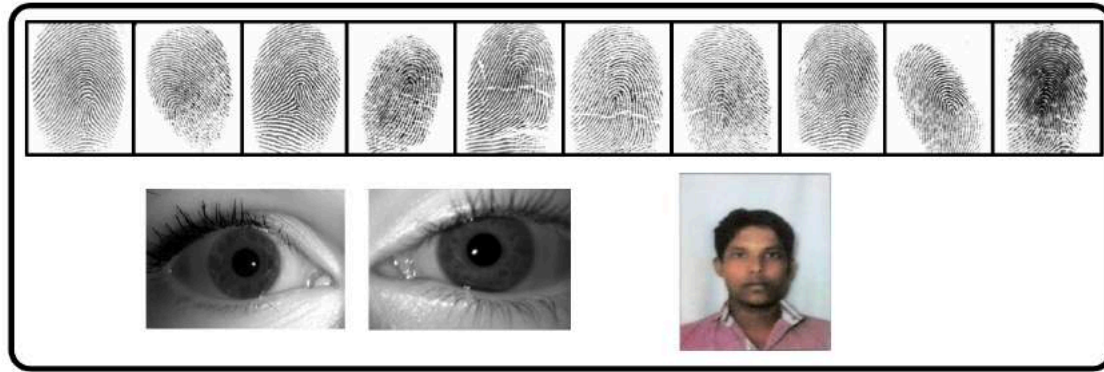
Enrollment



**Proof of Identity, address
and relationship; DoB**

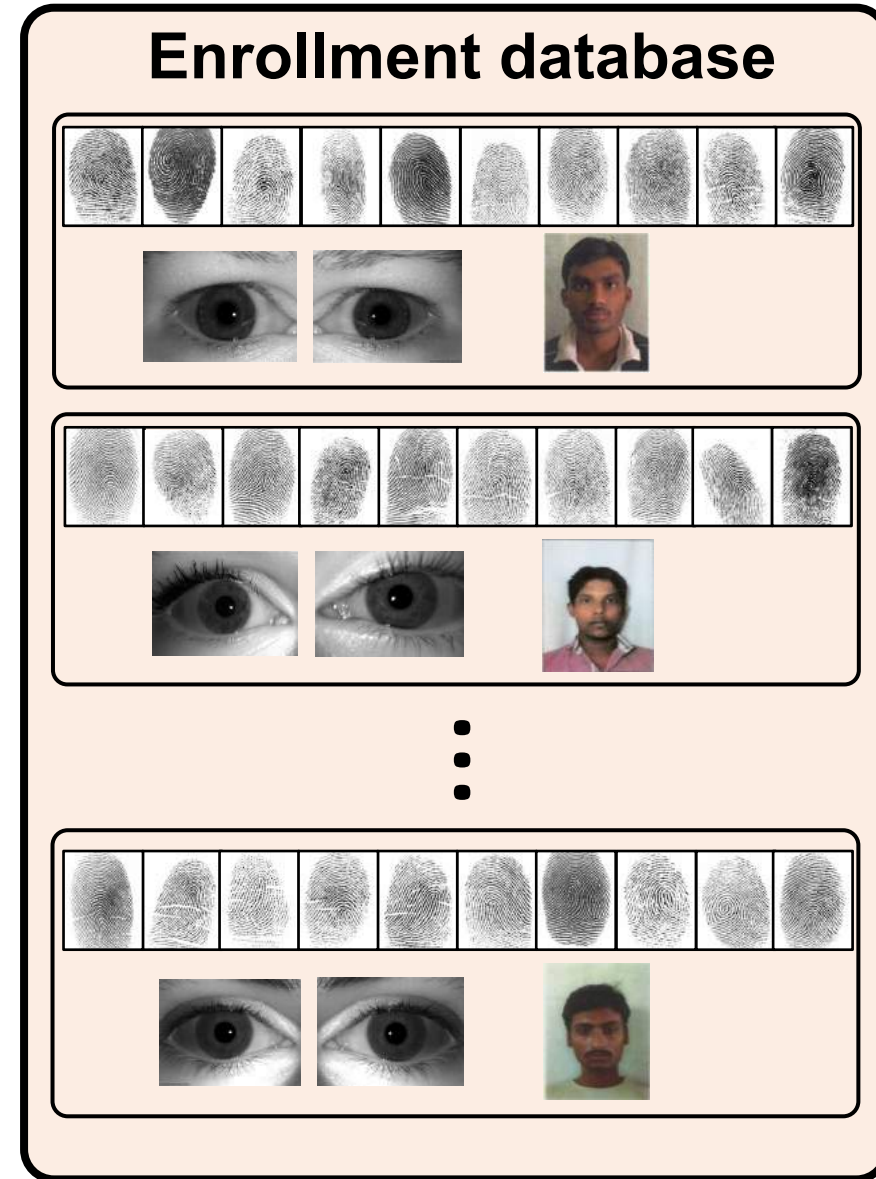


De-duplication



New Applicant

Fusion of face, fingerprint and iris improves finding duplicates



Already Exists in the Database?

Aadhaar Authentication



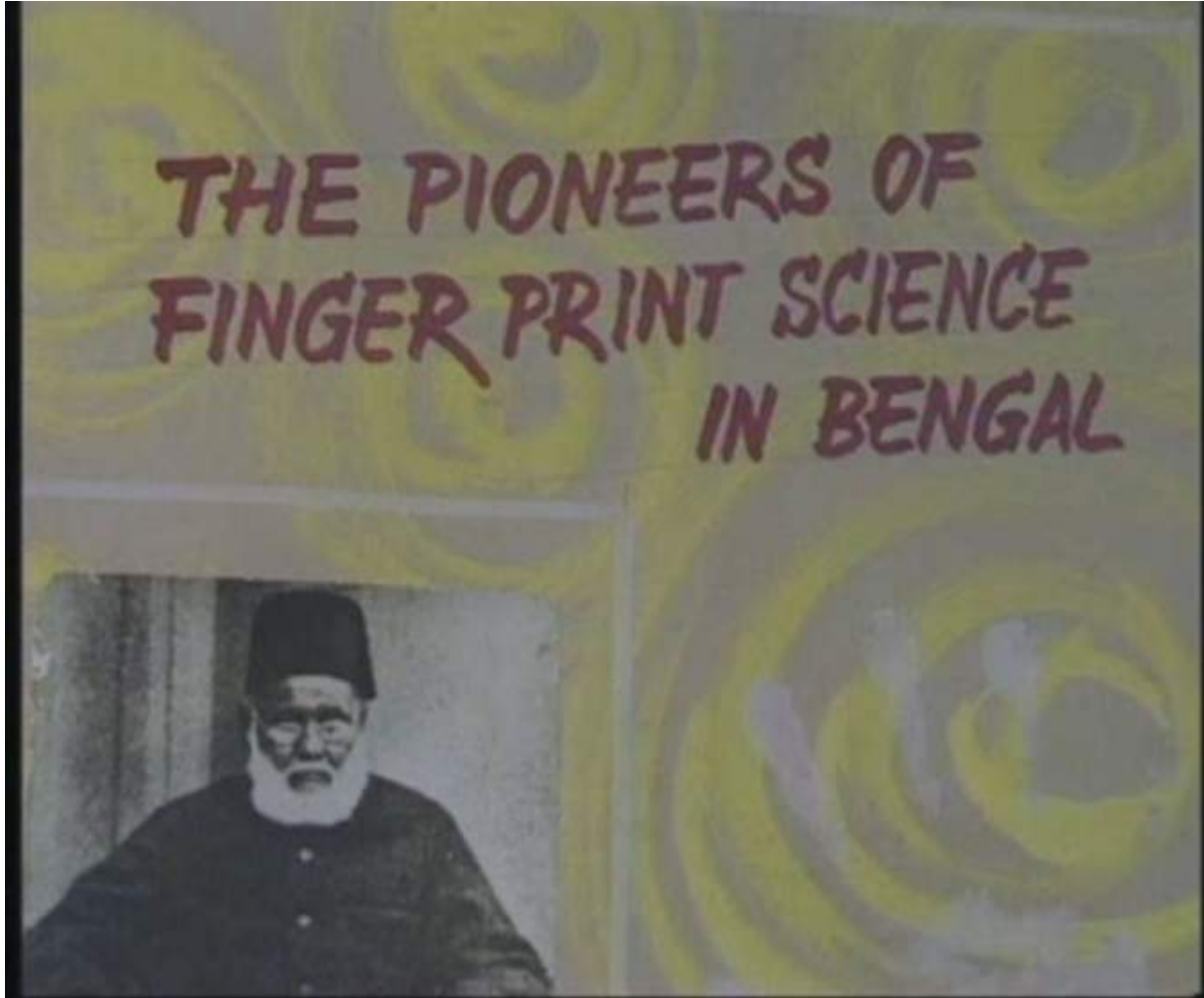
~30 million authentication transactions/day

Supreme Court upholds the constitutional validity of Aadhaar



“Aadhaar gives dignity to the marginalized. Dignity to the marginalized outweighs privacy” - Justice Sikri (September 2018)

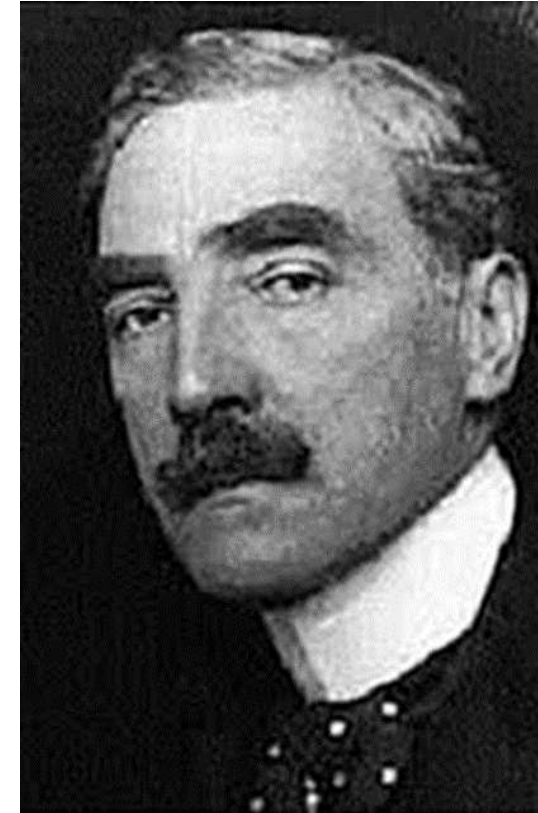
Forgotten Indian Wizards



Azizul Haque



Hem Chandra Bose



**Edward Henry,
IG Bengal Police,
took the credit
(1899)**

Henry Classification System



Left loop



Right loop



Whorl



Arch



Tented Arch

65%

30%

5%

Manual Classification and Matching



**Michigan
State Police,
1960s**

William Herschel: Fingerprints/Handprints



Posted in India, 1853-1878



To avoid impersonation and fraud related to contracts and wage payments

Oldest Fingerprint Bureau, Calcutta



<http://www.aparchive.com/metadata/youtube/aa45e16396fc636eb59a816aeb6063a7>

What's Next?

Growing Use of Face Recognition



Pedestrians walk past a surveillance camera near Parliament House in New Delhi.
Photographer: Anindito Mukherjee/Bloomberg

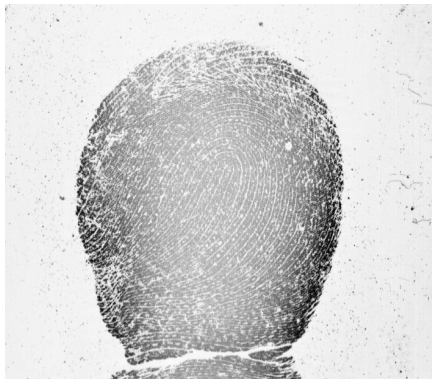


Entry into the United States



Exit from the United States

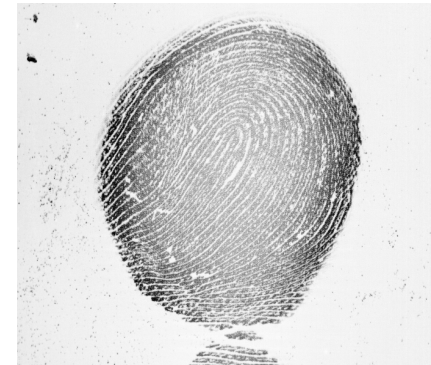
Recognition of Infants



6 hours old



2 days old



3 months old

To provide legal identity for all, we must recognize ~130M newborns every year

Image Quality



Worn out & damaged fingers



Henna

Fingerprint Spoofs



Silicone



Monster Liquid Latex



Play Doh



2D Printed Paper



Wood Glue



Gold Finger



Nanotips Coating



BarePaint Coating



Gelatin



Dragon Skin



Latex Body Paint



2D Printed on Transparency



Conductive Ink on Paper



Universal Targets



Silver Colloidal Ink Coating



TangoPlus Ag Coating on VeroBlack

Privacy

- Biometrics (fingerprints, voice, face) user ID & passwords of over 1M were compromised **(August 2019)**
- Privacy regulations:
 - **GDPR**, 2018
 - Non-invertible biometric encryption for secure matching



Summary



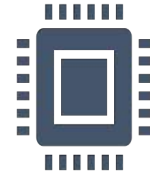
Biometrics

- Only way to ensure: **one person, one Aadhar!**



India's Contributions

- Henry classification system
- Oldest fingerprint bureau
- Herschel: civil application (1877)
- Aadhaar: World's Largest biometric system (2009-)



Responsible use

- Privacy & security
- Fair & ethical use