SENG 360 - Security Engineering
Distributed Systems - Identification and Authorization

Jens Weber

Fall 2022

University of Victoria

Learning Objectives

At the end of this class you will be able to

- describe the difference between identification and authentication
- explain multi-factor and out-of-band authentication
- describe different biometric authentication forms and their security properties

University of Victoria

Identification and authentication

Identification: claim or determination of identity

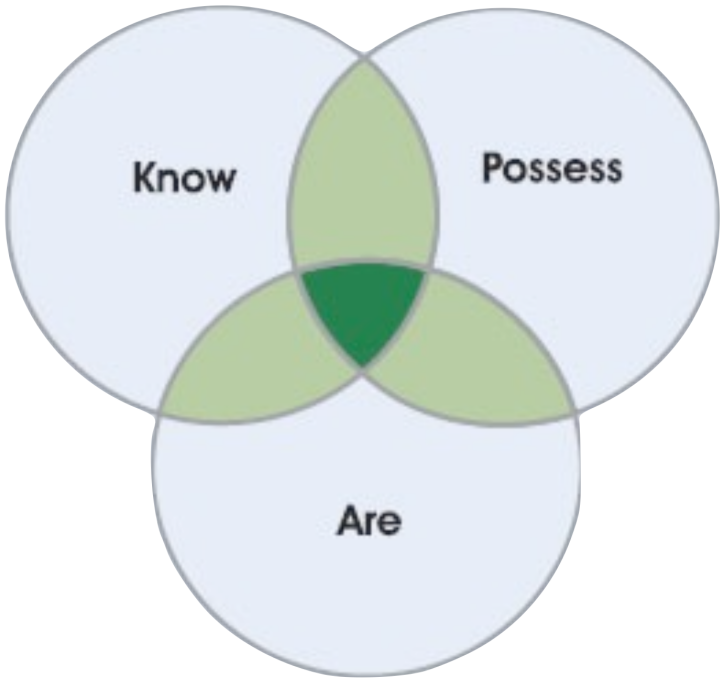
- e.g., enter user name, determine speaker identity

Authentication: prove of the above identity

- e.g., enter password

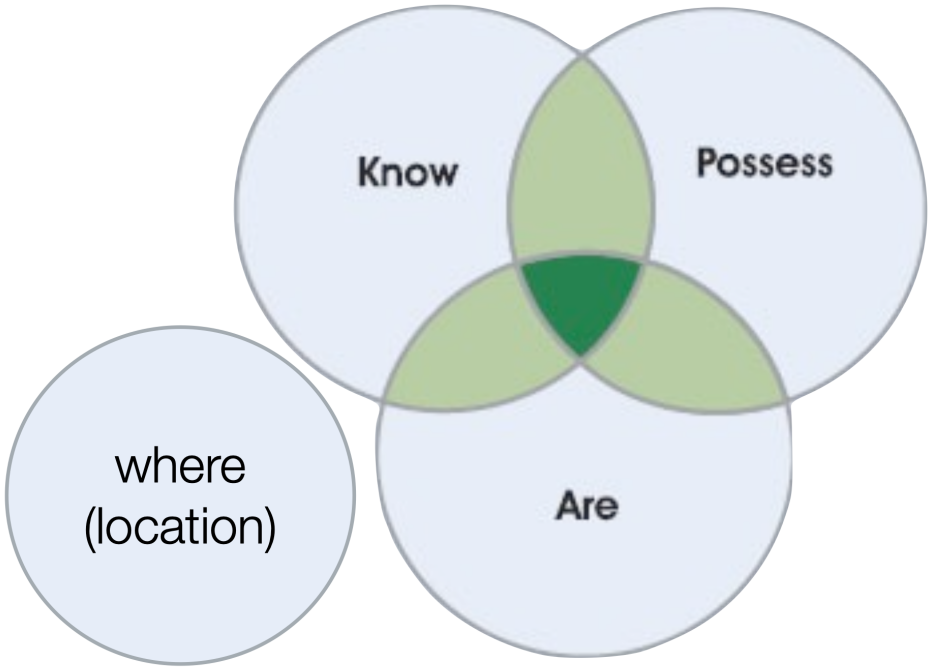
University of Victoria

Multi-factor Authentication



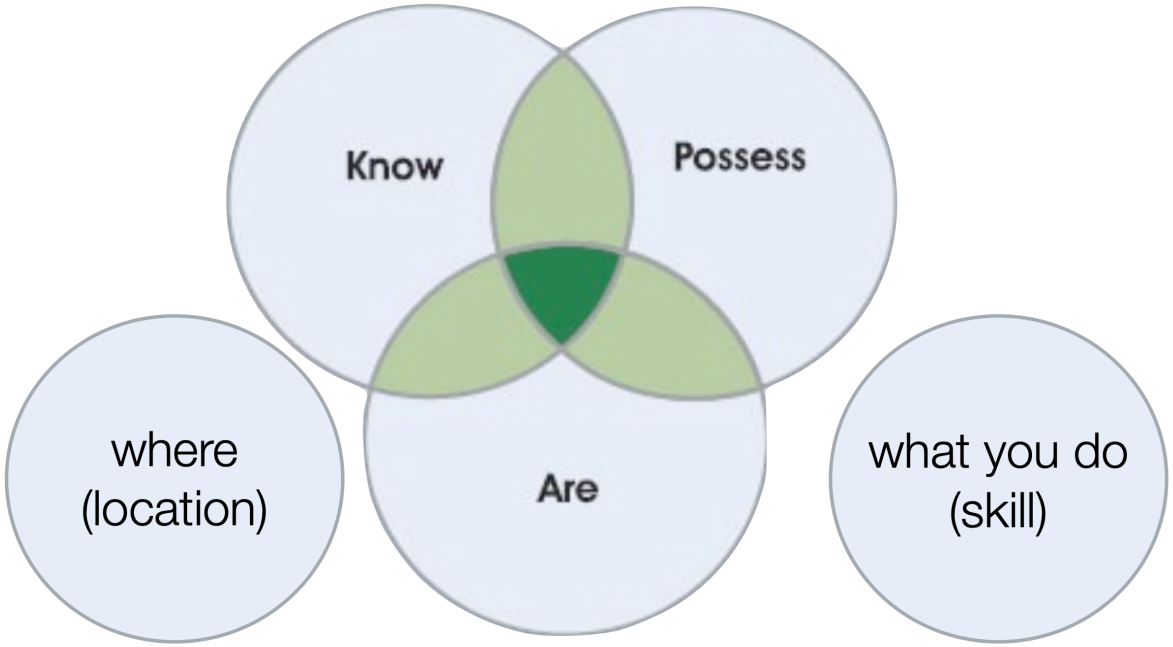
University of Victoria

Multi-factor Authentication



University of Victoria

Multi-factor Authentication



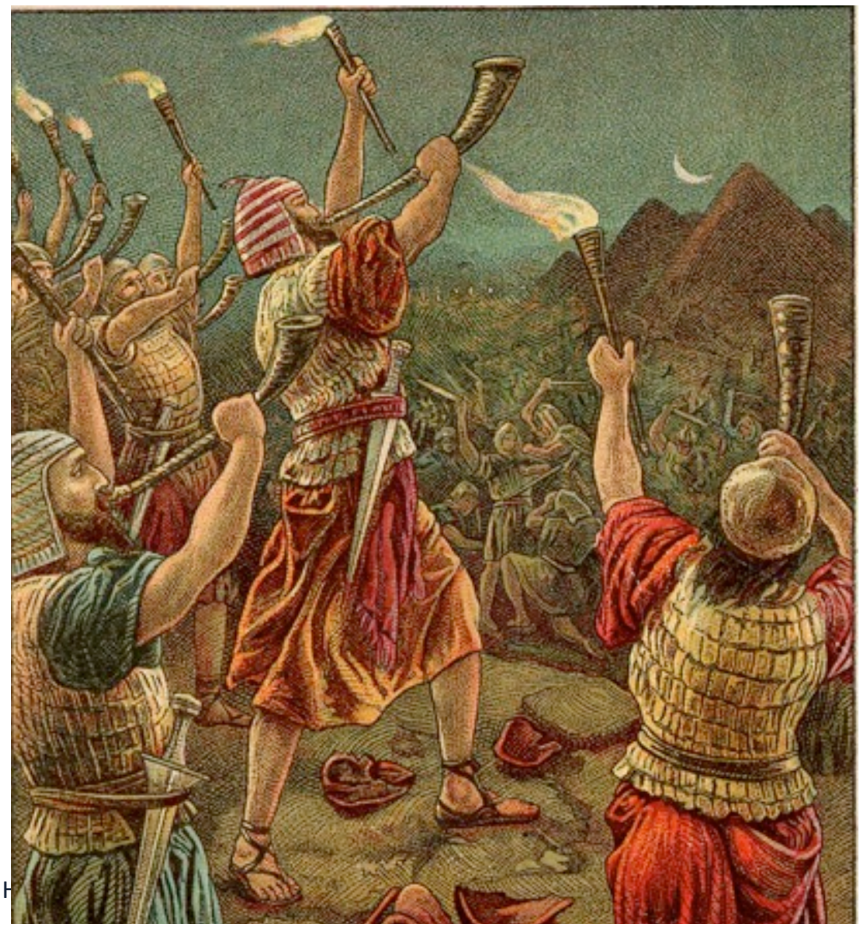
University of Victoria

Related: Out-of-band authentication (OOBA)

Using another band (communication channel) to exchange a second (or third) credential

University of Victoria

Biometric authentication

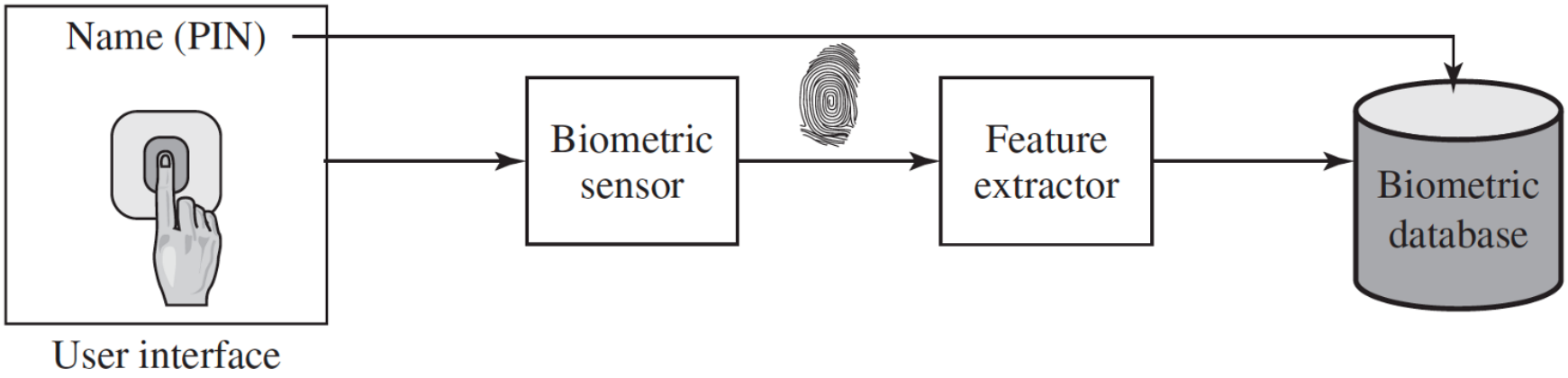


And the Gileadites took the passages of Jordan before the Ephraimites: and it was so, that when those Ephraimites which were escaped said. Let me go over; that the men of Gilead said unto him, Art thou an Ephraimite? If he said, Nay; Then said they unto him, Say now Shibboleth: and he said Sibboleth: for he could not frame to pronounce it right. Then they took him, and slew him at the passages of the Jordan: and there fell at that time of the Ephraimites forty and two thousand. —

JUDGES 12:5–6

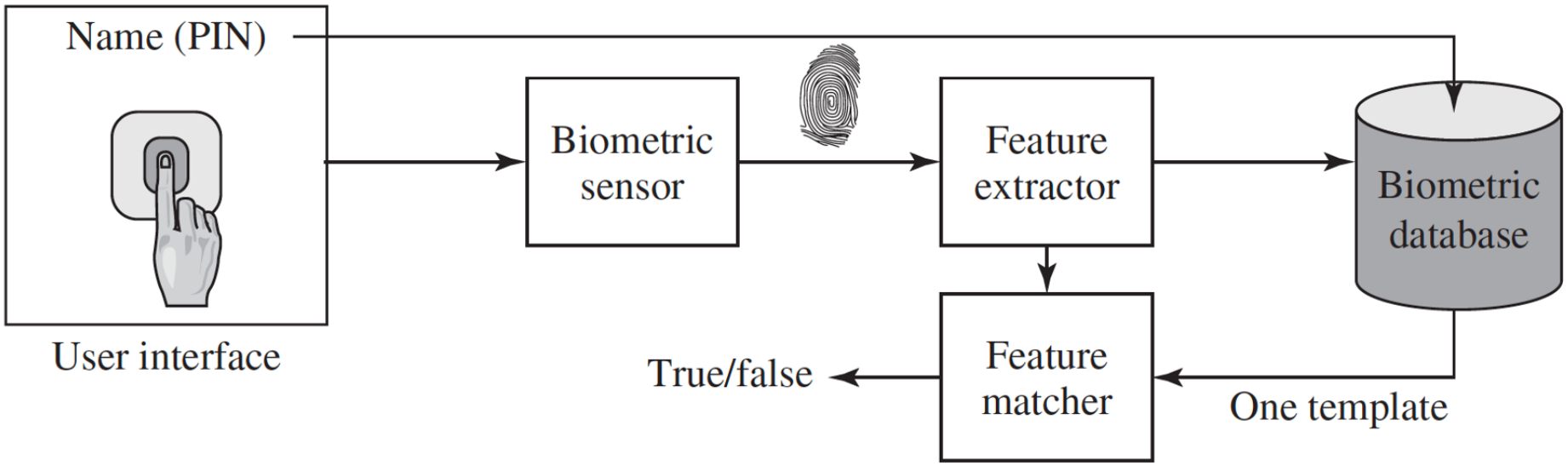
University of Victoria

Enrolment



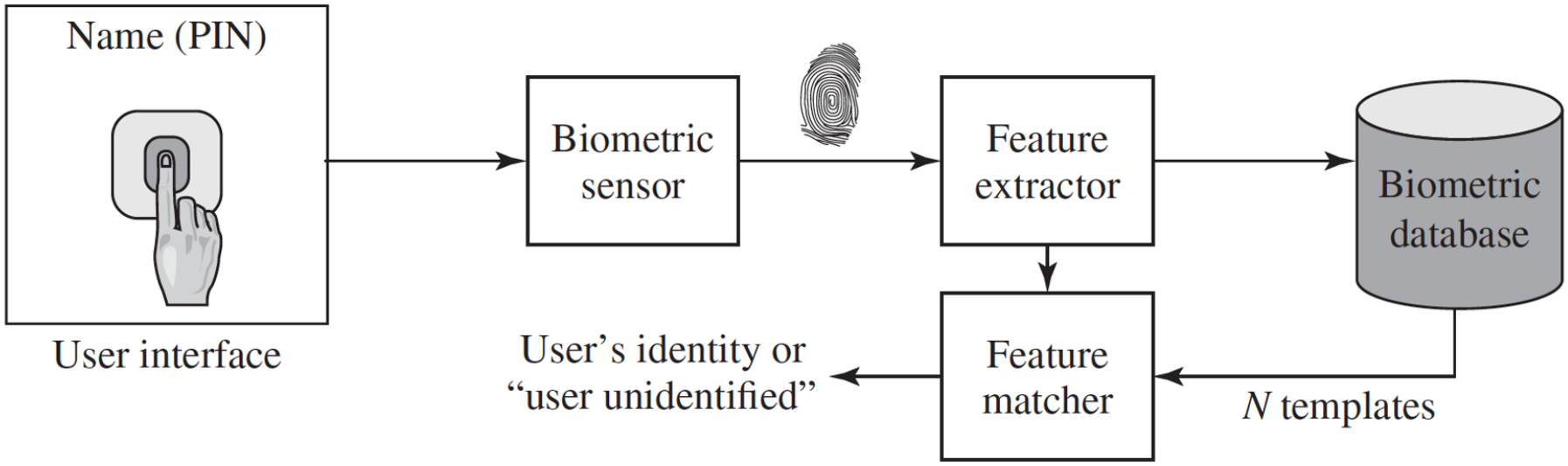
University of Victoria

Authentication



University of Victoria

Identification

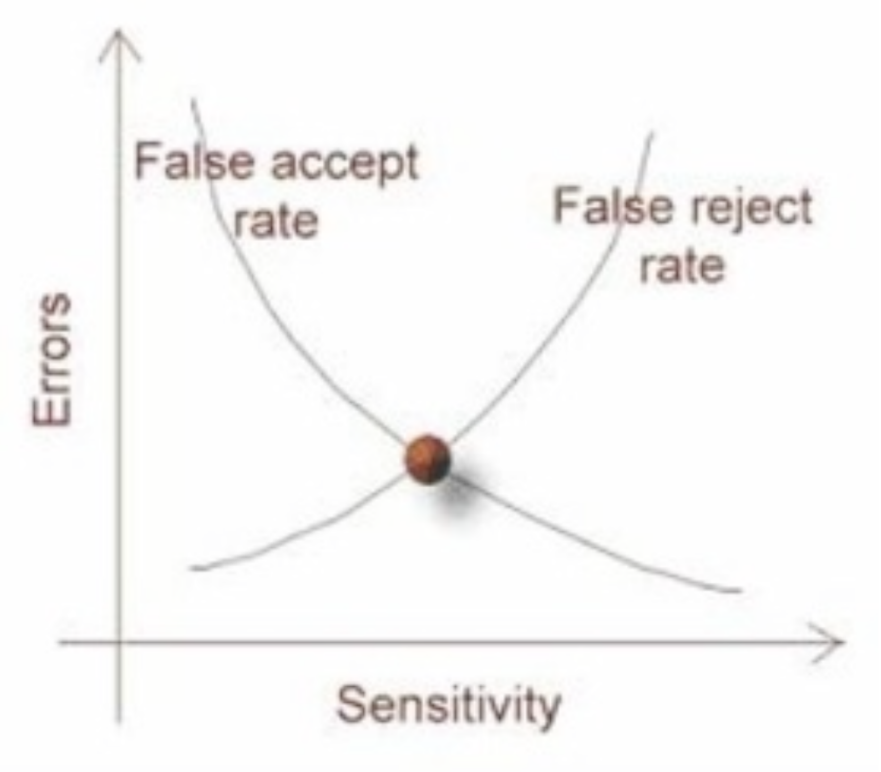


University of Victoria

Balancing frauds and insults

False Accepts

"fraud rate"



False Rejects
false positive

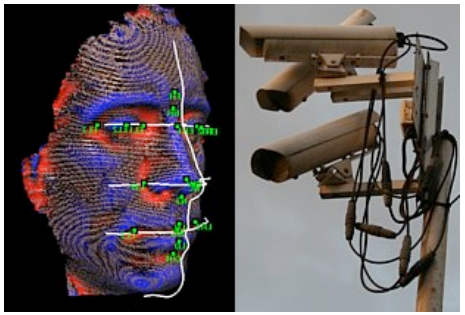
"insult rate"

Equal error rate: fraud rate = insult rate

Handwritten Signatures

- Used for centuries and still in use today
- expert failure rate: 6.5%, non-expert: 38.3%
- electronic capture improves on this
  - -> capture dynamics (not just shape)
  - equal error rate at best 1%
  - *(not good for banking industry, where insult rate is target 0.01% and fraud rate target is 1%)*

Face recognition



- Identification or authentication? or both?
- Humans are surprisingly bad at this
- Massive progress in face recognition technology
- Can be improved with special hardware (like iPhone's dot projector) - but then the pandemic hits…
  - claimed false acceptance rate of 0.000000001%
  - Huge ethical discussions w.r.t. **Identification**

University of Victoria

RFR - Retrospective FR vs Live FR

https://www.wired.co.uk/article/met-police-facial-recognition-new

WIRED LONG READS BUSINESS CULTURE GEAR SCIENCE SECURITY VIDEO SUBS

SAMUEL WOODHAMS SECURITY 27.09.2021 06:00 AM

London is buying heaps of facial recognition tech

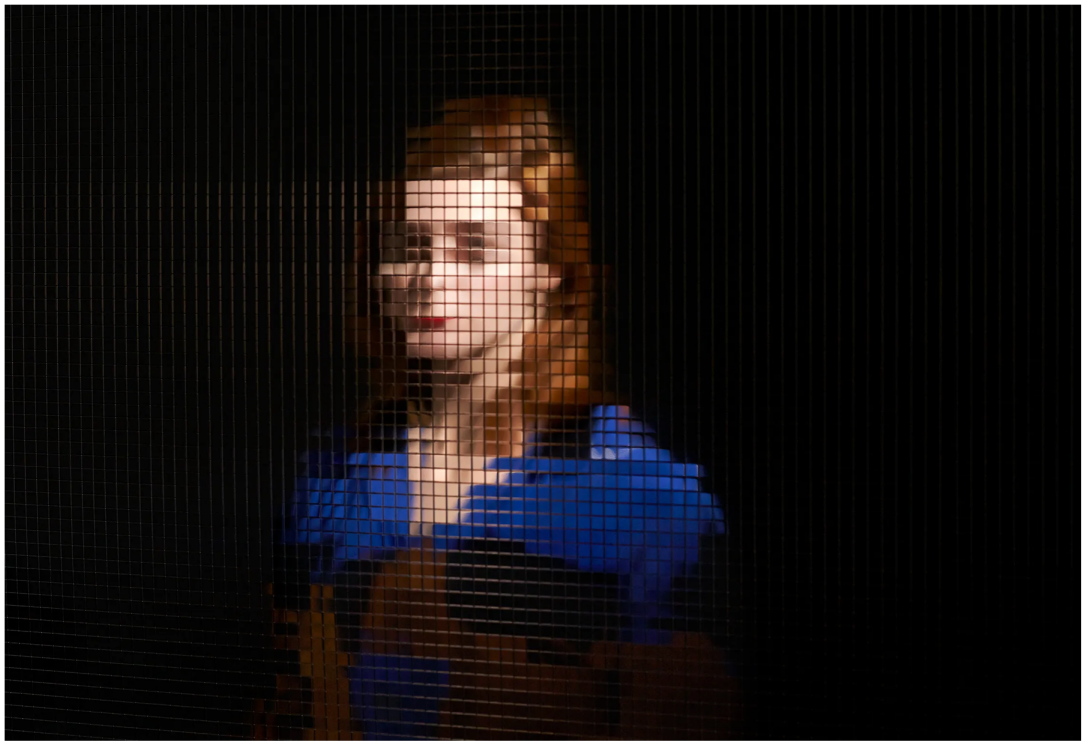
The Metropolitan Police is buying a new facial recognition system that will supercharge its surveillance technology capabilities

University of Victoria

LILY HAY NEWMAN SECURITY 08.19.2016 08:00 AM

Hackers Trick Facial-Recognition Logins With Photos From Facebook (What Else?)

Researchers use online photos to create 3-D renders of faces and successfully dupe four facial recognition systems.



GETTY IMAGES

University of Victoria

Fingerprints

Used to dominate the biometric technology (78% in 1998) down to 43.5% in 2005 (recent come-back d.t. masks)

Equal error rate of 1%

single finger ok ***authentication***, but 10 fingers for ***identification***

University of Victoria

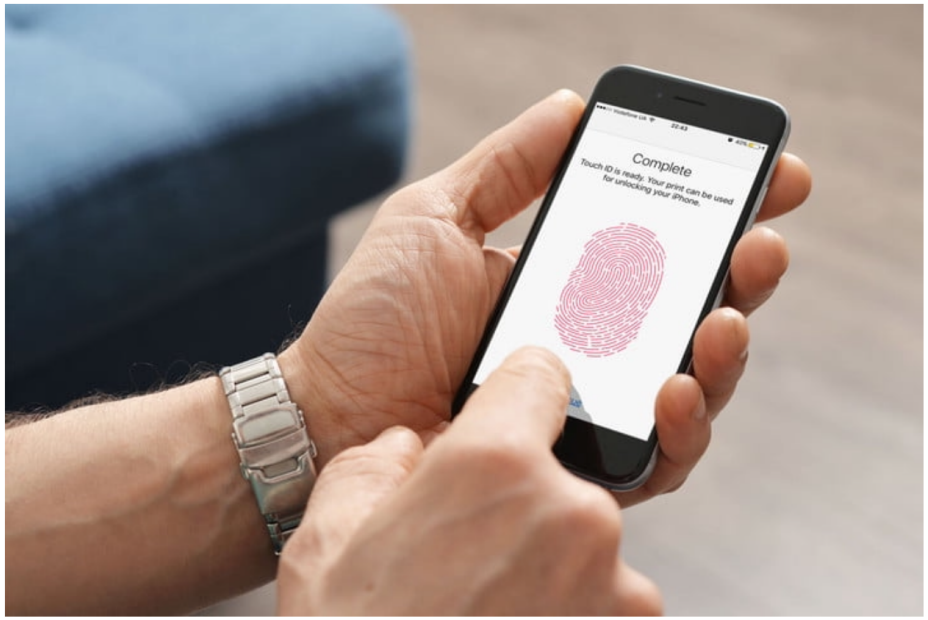
Fingerprints (hacking)

University of Victoria

EMERGING TECH

‘Master prints’ could be used to unlock nearly any phone’s fingerprint sensor

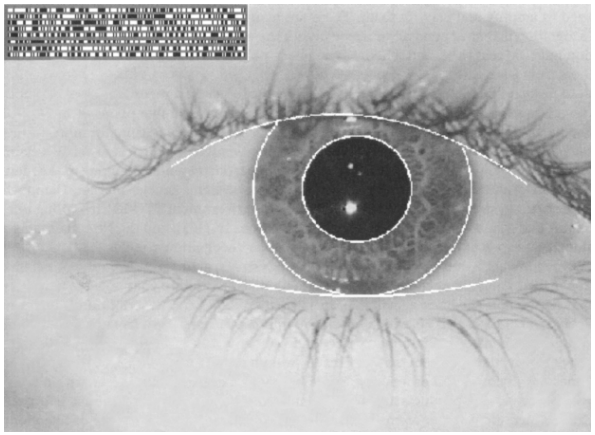
By Luke Dormehl
April 14, 2017



123RF

University of Victoria

Iris codes



irises are unique

equal error rate = 0.0000001
(can be tuned for false acceptance rate of ~0)

In practice, false-reject rate higher (4-6%)

University of Victoria

Voice recognition and morphing

aka *speaker recognition* (but **not** speech recognition)

not very good for identification and authentication

easy to morph voices to fake victim's speech

University of Victoria

Other systems

- Typing patterns, mouse movements (cont. auth)
- facial themograms

- ear shape

- gait

- lip prints

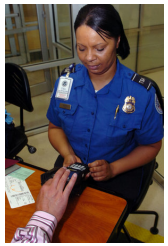
- electocardiograms
- DNA

University of Victoria

What goes wrong

Compulsion

Procedural issues:



Social Regression

Freshness

Exploiting Fallback Functionality (Collusion)

Summary and Outlook

- Identification is act of linking two names
- Authentication is act of proving link correctness
- Multifactor authentication (know, have, are)
- Biometric balances “fraud” and “insult”
- Many issues related to biometric authentication
- Next week: Database security

University of Victoria

Questions?

University of Victoria