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# SECURITY (COMP0141): WHAT YOU ARE



# AUTHENTICATION

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Authentication is:

**What you know**

text passwords

graphical passwords

personal details

**What you have**

RFID card

cryptographic tokens

**What you are**

# BIOMETRICS

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Dear Gene

I came across an article about you in a local magazine (*True Blue Spirit*) and I read that you would do a handwriting analysis if we would send you a sample.

The article didn't say anything about whether or not you charge for this — but perhaps you could let me know that.

Right now I'm going through what I'm calling a second "change of life" and it occurred to me that having someone analyze my handwriting might be very helpful — since I'm in the process of trying to figure myself out! (Kernela) 75

When, in the course of human events, it becomes necessary for one people to dissolve the political bands which have connected them with another, and to assume among the powers of the earth, the separate and equal station to which the laws of nature and of nature's God entitle them, a decent respect to the opinions of mankind requires that they should declare the causes which impel them to the separation.

We hold these truths to be self-evident, that all men are created equal, that they are endowed by their Creator with certain unalienable rights, that among these are life, liberty and the pursuit of happiness.

# BIOMETRICS

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A biometric is a property of an individual that can be measured and from which **distinguishing** and **repeatable** features can be extracted to automatically recognise individuals

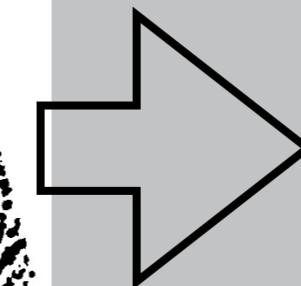
**Biometric sample:** raw data obtained from a capture device

**Biometric template:** stored biometric features

# HOW DO WE STORE DATA?

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phase 1: enrolment

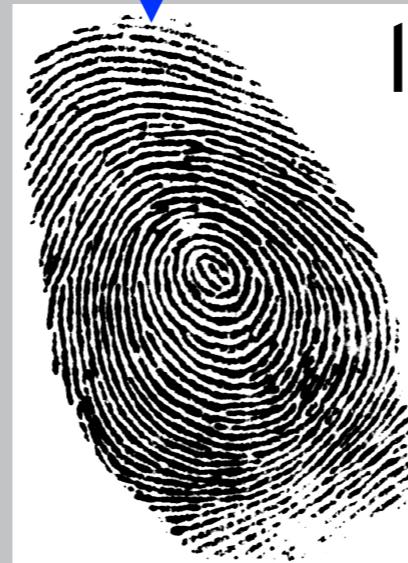


digital features

phase 2: authentication

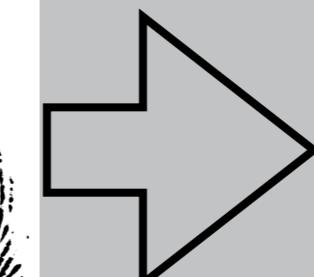
usable?  
maintainable?

feature stability?



how close is the match?

lookup



|                |   |
|----------------|---|
| u1             | (f <sub>11</sub> , ..., f <sub>1m</sub> ) |
| u2             | (f <sub>21</sub> , ..., f <sub>2m</sub> ) |
| ...            | ...                                       |
| u <sub>n</sub> | (f <sub>n1</sub> , ..., f <sub>nm</sub> ) |

# FINGERPRINT SCANNERS

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challenges

usable?

maintainable?

how close is the match?

feature stability?

how does it do?

okay

okay

good

good

check for  
“liveness”  
to avoid  
amputation

# HAND SCANNERS

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challenges

usable?

maintainable?

how close is the match?

feature stability?

how does it do?

good

good

okay

good

hard to  
train

# RETINA SCANNERS

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challenges

usable?

maintainable?

how close is the match?

feature stability?

how does it do?

okay

good

good

okay

think  
contact  
lenses

# TECHNICAL CONSIDERATIONS

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## Advantages:

- Nothing to remember
- Passive
- Can't share
- Unique (assuming perfect accuracy)

## Disadvantages:

- Revocation is difficult (impossible?)
- Invasive
- Private but not secret (easy to steal off glass, door handle, ...)
- If false acceptance rate is 1 in a million, chance of false match is above 50% with only 1609 samples (birthday paradox)

# USER ACCEPTANCE

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Threat to **privacy** in terms of stored templates

- Who is using the data, and for what purposes?
- Implicit identification (facial recognition)

Doubts about **reliability**

- Sophisticated attackers can bypass system
- Successful attacks erode confidence

# YOU ARE A HUMAN!

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CAPTCHA (Completely Automated Public Turing test to tell Computer and Humans Apart)



pros? cons?

# MULTI-FACTOR AUTHENTICATION

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**What you have**

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**What you are**

biometrics

# MULTI-FACTOR AUTHENTICATION

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Authentication is:

Email

Password

Sign In

2-Step Verification

A text message with your code has been sent to: \*\*\*\*\* 39

Enter code

Verify

What you know

graphical passwords

personal details

What you have

cryptographic tokens

What you are

biometrics

# MULTI-FACTOR AUTHENTICATION

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Authentication is:

text passwords

RFID card

What are the  
options?

What is the  
process?

How would you like to log in?

Membership number  [Forgotten your membership number?](#) [?](#)

Card number [?](#)

Sort code and account number [?](#)

PINsentry  Passcode and memorable word

Enter your passcode  [Forgotten your passcode?](#) [?](#)

Enter **3rd** and **6th** characters of your memorable word   [?](#)

# MULTIPLE FACTORS DO HELP!

## Account takeover prevention rates, by challenge type

