

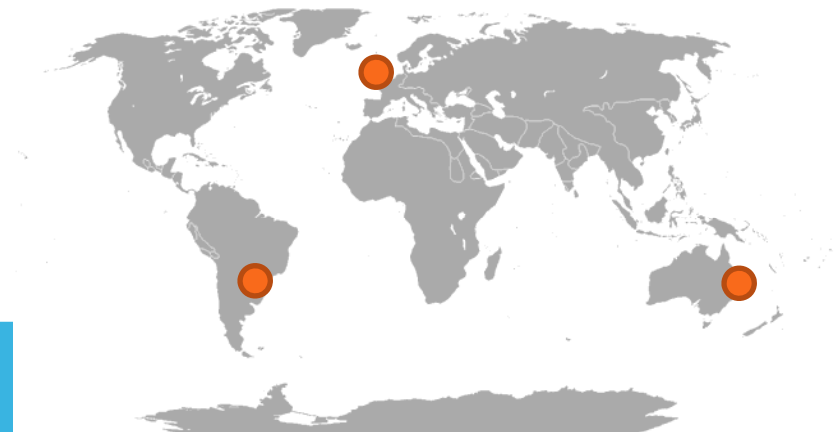
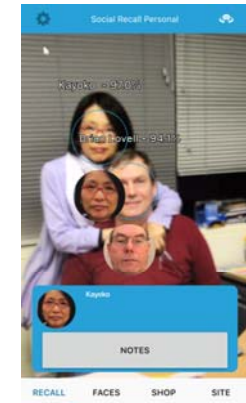
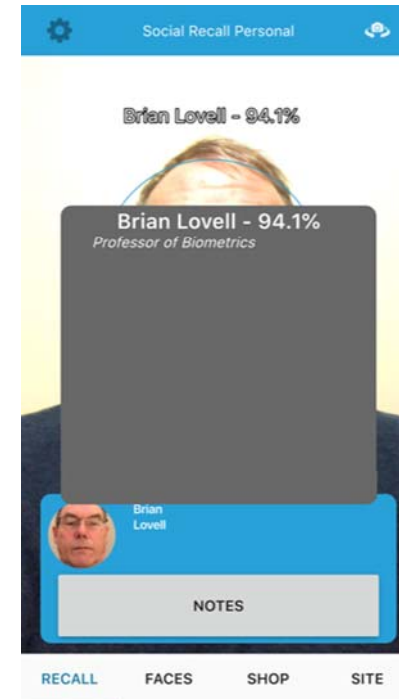
WSB-2019 January 2019



Social Face Recognition

Brian Lovell

The University of Queensland



MOTIVATION

- Face recognition for border security and banking is becoming mainstream.
- I will focus on ubiquitous face recognition applied in social and consumer applications.
- The aim here is to focus on the sheer convenience of face recognition compared to other forms of identification.
- Each of us spends three working weeks of the year simply identifying ourselves to others (ISBA2015: Angela Sasse Keynote, UCL)
- If we could reduce the workload of identification to, say, two weeks, we would boost world productivity by about 2%.
- This leads us to several new and rather interesting research problems.

Outline

- Conventional Cooperative Face Recognition
- Social Recall for Prosopagnosia
- Conference App for Scientific Conferences
- The Core Technology



Airport



Railway Station



Seaport

The Basics

Cooperative Facial Verification

E.g. Airport smart gates, border control, access control

- Known reference image – e.g. passport photo
- Very high resolution
- Perfect artificial lighting
- Multiple high quality cameras
- No movement, no expression allowed
- One person at a time
- Photo based not video based
- Subject co-operation – the subject wants to be recognised
- One-to-one match – verification only, not true one-to-many recognition



Many Commercial Solutions available fully tested by NIST

Australia was first in the World with Face for Border Control
Rollout in 2007 at BNE Airport

Cooperative versus Non-Cooperative Facial Verification

- *SmartGate*
- Are these two faces the same person?
- Primarily used for passenger facilitation not security
- Now used for Departures as well



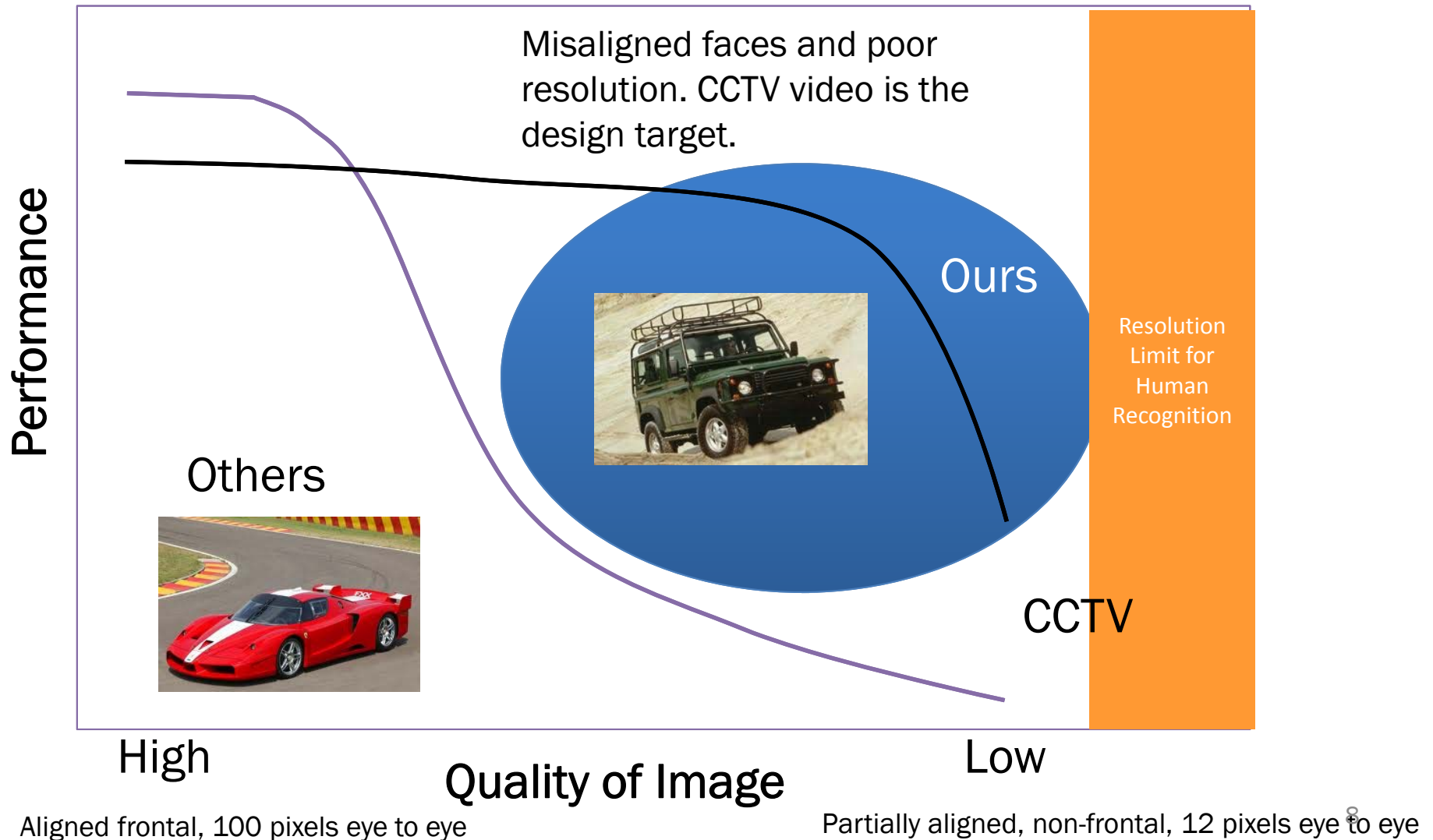


**WE ARE NOT INTERESTED IN THIS
PROBLEM AS IT IS SOLVED (MOSTLY)**



WHAT WE WANT IS LIVE FACE RECOGNITION FOR THE MASSES THAT WORKS RELIABLY FROM ANY CAMERA, EVEN A MOBILE PHONE – NOW THIS IS ALSO LARGELY ACHIEVED

Face Recognition Landscape



Face Recognition is a Parlour Trick

- Researchers must recognize that face recognition is a parlour trick for most people and has no value – just Gee Whiz factor
- Face Recognition must solve a **real** fundamental human need
- FaceRec must be combined with other elements to provide a SOLUTION to a problem.


Social Recall Software



[Apple](#) [Mac](#) [iPad](#) [iPhone](#) [Watch](#) [TV](#) [Music](#) [Support](#) [Search](#) [Cart](#)

App Store Preview

This app is only available on the App Store for iOS devices.



Social Recall Personal



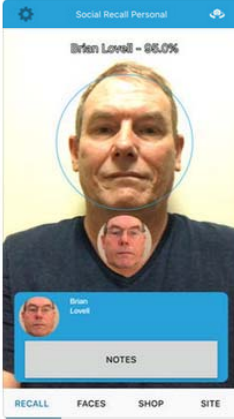

Social Recall

★★★★★ 5.0, 6 Ratings

Free · Offers In-App Purchases

Screenshots

[iPhone](#) [iPad](#)



Remembering a face shows that that person is important to us. Some people suffer from a condition called Prosopagnosia or Face Blindness and can hardly recognize anyone. Our loved ones may one day acquire this condition due to dementia or brain surgery. The app was designed to help anyone who would like to remember faces in social situations.

[more](#)

Why would a Consumer want face recognition?

- Normal People already have good face recognition (mostly)
- Blind people cannot read device screen
- What about face-blindness?
 - Prosopagnosia
 - About 2½% of the population suffer from this condition
 - Often very high functioning people

Prosopagnosia in Medium



Become a member [Sign in](#) [Get started](#)

Living in a World Without Faces: Life with prosopagnosia — face blindness



Barry Sandrew Ph.D. [Follow](#)

Sep 25, 2018 · 5 min read



It's not unusual for most people to occasionally experience an inability to



Never miss a story from **Barry Sandrew Ph.D.**, when you sign up for Medium. [Learn more](#)

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COMPUTING

New App Helps People Remember Faces

An app could help those with face blindness but has raised concerns among privacy experts

By Agata Blaszczyk-Boix | Scientific American January 2019 Issue

[f](#)[t](#)[g+](#)[v](#)[e](#)[p](#)




Credit: Thomas Fuchs


Large gatherings such as weddings and conferences can be socially overwhelming. Pressure to learn people's names only adds to the stress. A new facial-recognition app could come to the rescue—but privacy experts recommend proceeding with caution.

The app, called SocialRecall, connects names with faces via smartphone cameras and facial recognition, potentially eliminating the need for formal introductions. "It breaks down these social barriers we all have in terms of initiating the protocol to meet somebody," says Barry Sandrew, whose start-up, also called SocialRecall, created the app and tested it at an event

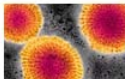
LATEST NEWS




From Dams to Coastal Barriers: How the U.S. Is Fighting Flooding in 2019




Is Our Future Really Written in Our Genes?




Better Diagnostics Could Help in the Fight against Flu



Fishy Smarts: Anchorfish Can Recognize Human Faces in 3-D



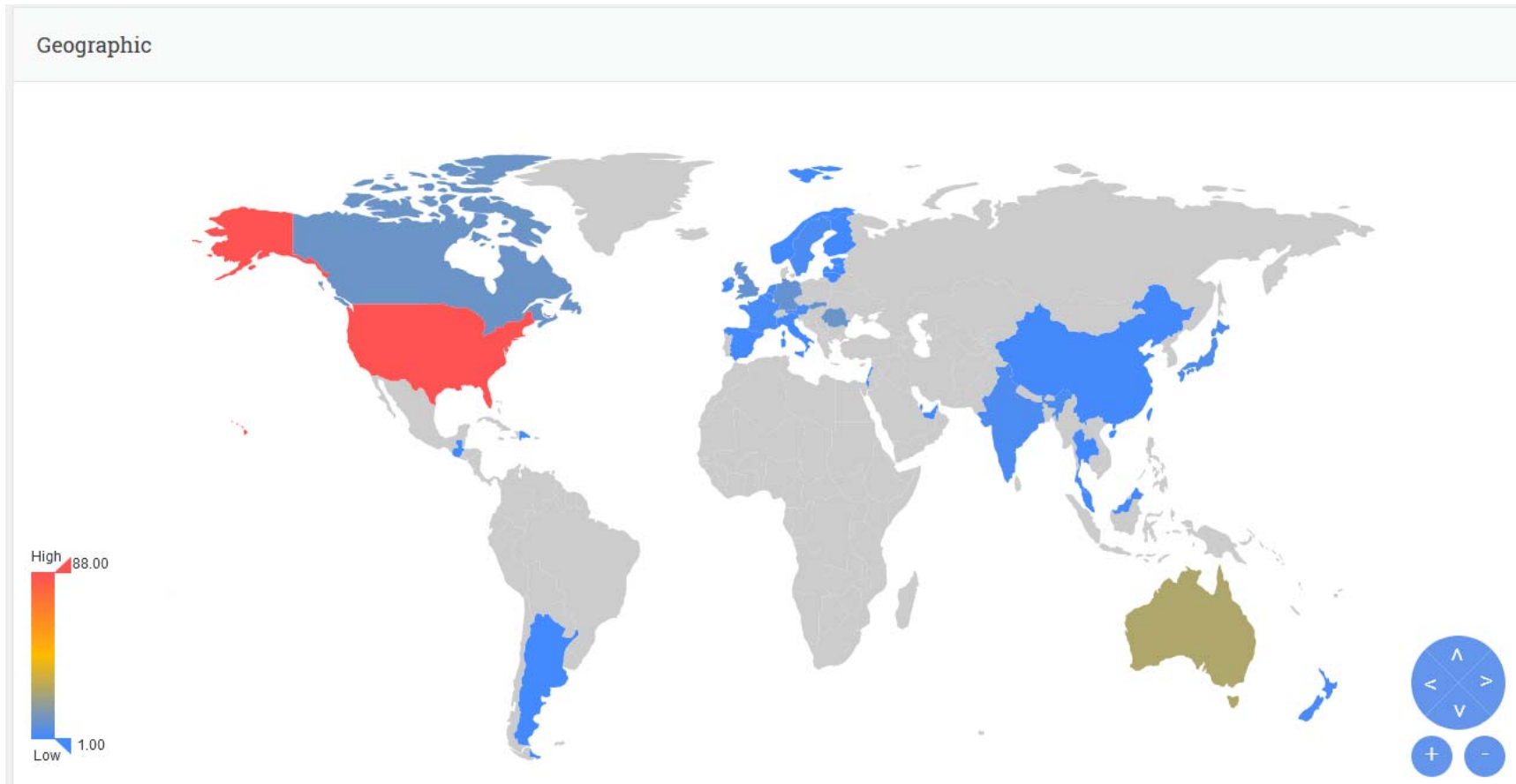
The Dinosaur Who Went out to Sea



Extinction and the Rise of the Dinosaurs

13

App Downloads



Dr Barry Sandrew

IMDb Find Movies, TV shows, Celebrities and more... All

Movies, TV & Showtimes Celebs, Events & Photos News & Community Watchlist [Sign in](#)

Barry B. Sandrew [SEE RANK](#)
Visual Effects | Miscellaneous Crew | Producer

[+ Add or change photo on IMDbPro >](#)

An internationally recognized entrepreneur, digital imaging expert and visual effects pioneer with over 14 patents and 25 years of feature film and TV accomplishments including productions for all 6 major Hollywood studios and 3 major networks. Dr. Sandrew was founder of 2 production studios that became gold standards for color visual effects. In ... [See full bio >](#)

Known For

The Green Hornet
Visual Effects
(2011)

Transformers: Dark of t...
Visual Effects
(2011)

Pirates of the Caribbean...
Visual Effects
(2011)

Ghost Rider: Spirit of V...
Visual Effects
(2011)

Filmography [Hide all](#) [Show by...](#) [Edit](#)

Jump to: [Visual effects](#) | [Miscellaneous Crew](#) | [Producer](#)

Visual effects (11 credits) [Hide](#)

Ghost Rider: Spirit of Vengeance (senior stereographer - as Barry Sandrew)	2011
Transformers: Dark of the Moon (senior conversion stereographer: Legend 3D - as Barry Sandrew Ph.D.)	2011
Pirates of the Caribbean: On Stranger Tides (chief stereographer: Legend 3D)	2011
The Green Hornet (chief stereographer: Legend 3D - as Barry Sandrew)	2011

Quick Links
[Biography](#)
[Awards](#)
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[Filmography \(by Job\)](#)
[Trailers and Videos](#)
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Richard Madden Chats About "Bodyguard" Reunion

Golden Globe-winner [Richard Madden](#) shares what it was like working with "Bodyguard" co-star [Keeley Hawes](#).
[Watch now >](#)

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[Camerimage unveils competition line-up, juries](#)
31 October 2014 | ScreenDaily
[Roland Joffe to preside over Camerimage jury](#)



Prosopagnosia

Prosopagnosia (*prosopon* = face, *agnosia* = unknowing) — also known as *face blindness* — is a medically recognized neuro-cognitive disorder that can be extremely debilitating in social situations. An estimated 2.5 percent of the population — some 8.2 million people in the United States alone — is affected. While many people with a mild case of face blindness may simply conclude they, “are not good with faces,” in reality, they might very well fall within the prosopagnosia spectrum.

- Barry Sandrew

Notable People

- A number of notable people, including the actor, **Brad Pitt**; famed primatologist, **Jane Goodall**; and co-founder of Apple, **Steve Wozniak** suffer to some degree from clinically relevant face blindness
- The social interchange and friendly banter that average people manage innately throughout the day become a huge challenge for those with facial blindness

- Barry Sandrew

Film on Prosopagnosia

W Faces in the Crowd (film) - Wik

https://en.wikipedia.org/wiki/Faces_in_the_Crowd_(film)

Prosopagnosia film

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Italiano

日本語

Polski

Português

Faces in the Crowd (film)

From Wikipedia, the free encyclopedia

Contents [hide]

1 Plot

2 Cast

3 Production

4 See also

5 References

6 External links

Plot [edit]

Anna Marchant (Milla Jovovich) witnesses a murder by a serial killer called Tearjerker Jack. Jack chases and attacks her, but she eludes him by falling from a bridge. Anna wakes from a coma one week later and is diagnosed with **prosopagnosia**, also known as "face blindness". Able to recognize objects but not faces, she works with police detective Sam Kerrest (Julian McMahon) to stop Tearjerker Jack (David Atrakchi) before he can murder her.

Cast [edit]

- Milla Jovovich as Anna Merchant
- Julian McMahon as Detective Sam Kerrest
- David Atrakchi as Detective Eric Lanyon
- Michael Shanks as Bryce
- Sarah Wayne Callies as Francine
- Sandrine Holt as Nina #6
- Marianne Faithfull as Dr. Langenkamp
- Valentina Vargas as Nina
- Anthony Lemke as Bryce #3
- Nels Lennarson as Detective Kerrest #1
- Chris Kalhoon as Kerrest #2
- David Ingram as Bryce #2
- Medina Hahn as Nina #4

Faces in the Crowd

MILLA JOVOVICH

**FACES
IN THE
CROWD**

The one who kills the face,
but is never changing.

Promotional image

Directed by

Julien Magnat

Produced by

Kevin DeWalt

Jean-Charles Levy

Clément Miserez

Written by

Julien Magnat

Kelly Smith

Agnès Caffin

Starring

Milla Jovovich

Julian McMahon

David Atrakchi

Sarah Wayne Callies

Sandrine Holt

Music by

John McCarthy

Cinematography

Rene Ohashi

Edited by

Antoine Varelle

Production company

Minds Eye

Entertainment

Radar Films

Frantic Films

18

Faces in the Crowd Trailer



Conference App



- First tested at ICB2018 on the Gold Coast
- I was the General Co-Chair



Why Conferences?

- I run lots of conferences 😊
- I have trouble recognising friends at conferences as I only see them every few years - embarrassing
- I wanted to give back to the IAPR community
- Needed to solve the wicked problem of DIY mobile distributed enrolment
- Needed to address consent and privacy issues
- Similar to prosopagnosia problem – I can't recognise my friends and it is a source of embarrassment

Welcome Function



IAPR Newsletter July 2018



General Chairs:

Brian Lovell, University of Queensland (Australia)
Miguel A. Ferrer, Universidad de Las Palmas de Gran Canaria (Spain)
Vutipong Areekul, Kasetsart University (Thailand)

World First for IAPR - Face Tags for ICB2018!

As our scientific community wishes to promote and popularize biometrics and demonstrate its applications, we developed a World First Application of mobile face recognition just for ICB2018.

Participation was purely voluntary, but it was fun for the delegates, especially at the Welcome Reception.

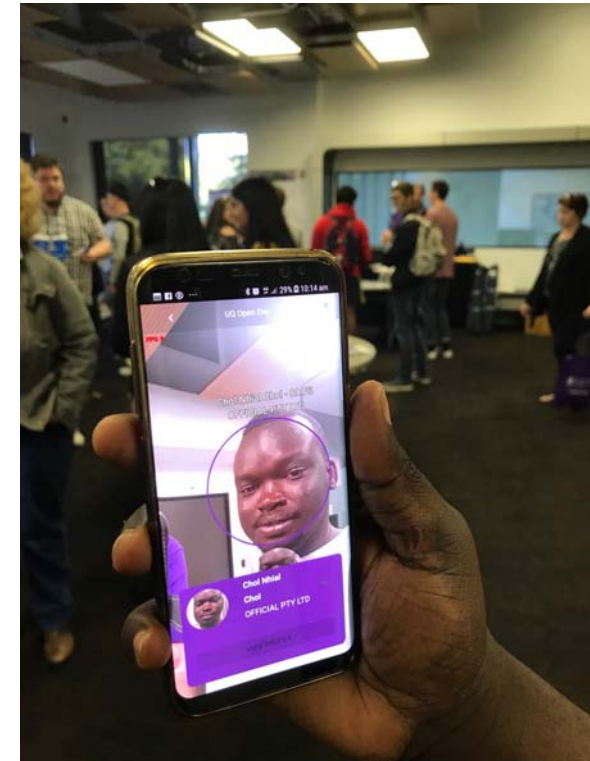
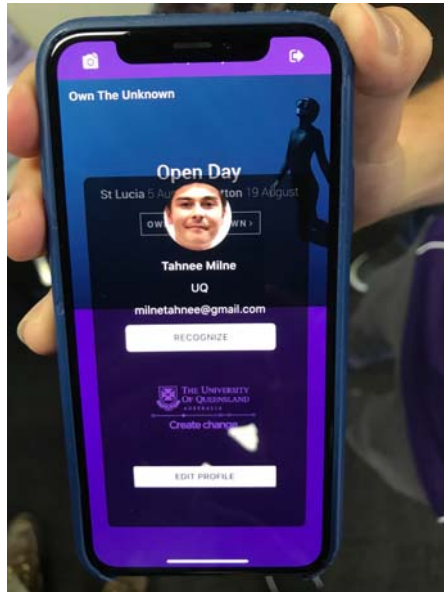
"Highlights of the 11th IAPR International Conference on Biometrics" prepared by the General Co-Chairs on behalf of the ICB2018 Organising Committee

Delegates self-enrolled one or more photos on the ICB2018 website www.icb2018.org before the event and then they could be recognized at the conference. Photo recognition worked on all devices using the

feel intimidated by face technology — the conference organizers weren't being Big Brother, everyone was Big Brother. Also delegates could not search for faces unless they first uploaded their own face. This is a bit like the strongly enforced social rule that you have to be nude to visit a



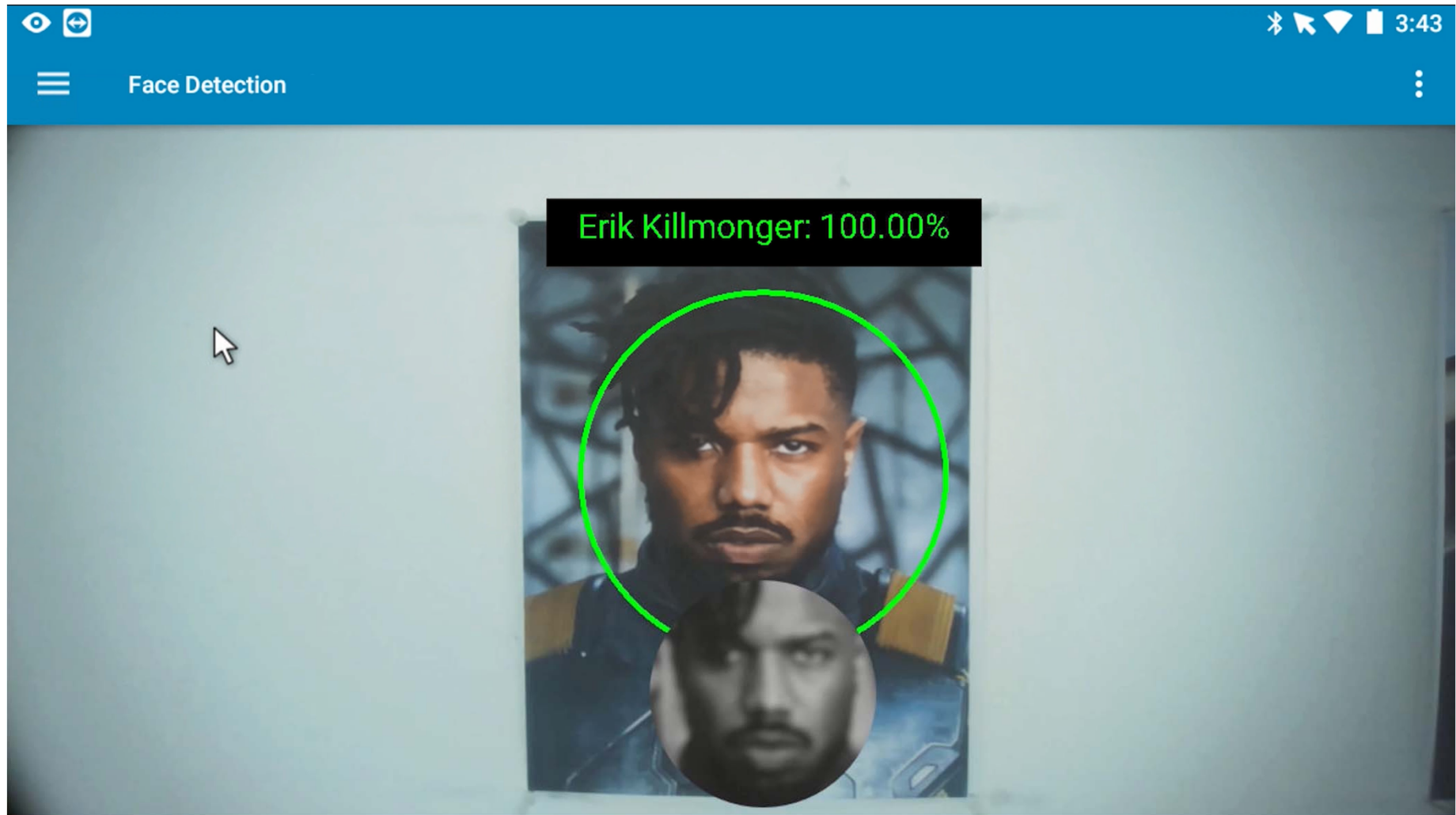
UQ Open Day, 5-8-18



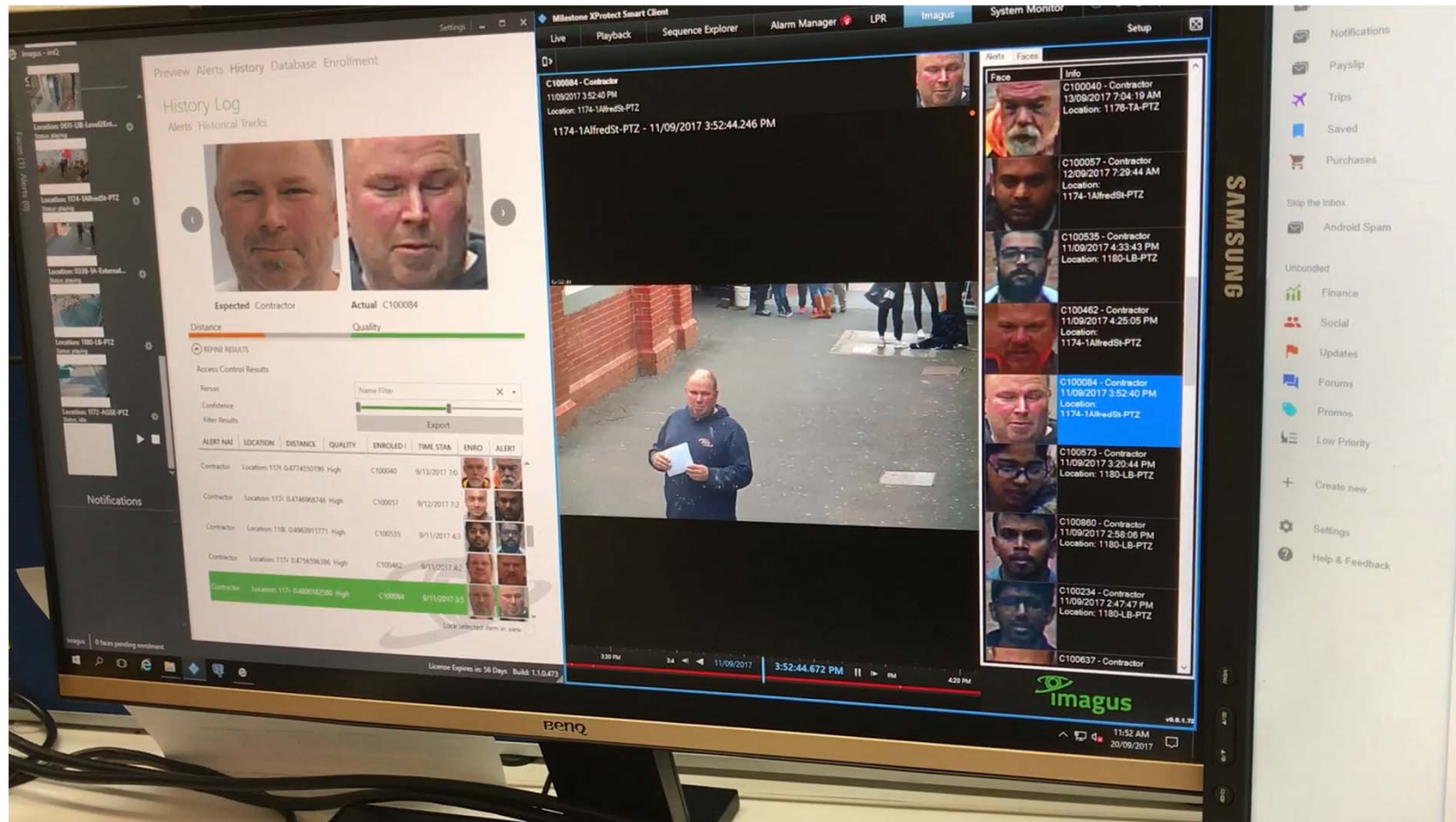
Magnify World, August 2018



Also Available on AR Glasses



Deployed at Swinburne Uni



Endorsed By Swinburne



10 August, 2018

TO WHOM IT MAY CONCERN

Dear Sir/Madam,

Subject: Endorsement of Imagus Technology and solutions.

Swinburne University has partnered with Imagus Technology since 2016 to assist the University in identifying and monitoring people of interest (POI) entering and moving around our campuses.

Swinburne has same issue that many other Universities have to deal with which is securing a campus spread out across an inner urban environment, including public streets, other business and domestic housing.

The University does not have the benefit of a controlled border or fencing around our campuses or buildings, as a result we have to look at and deploy soft controls and monitoring, to ensure and maintain the safety of our Staff, Students and General public.

This is where Imagus fits into our environment. As we had been seeking a way to identify people at distance without their direct interaction or impedance.

Face detection and matching was considered an easy way to achieve this, but we found in

2011: Person Identification in a Crowd




2011: IFSEC2011 Award

- IFSEC is the World's largest security show
- It is held in Birmingham each year
- 25,000 visitors
- 700 companies
- 700 guests at award dinners
- We won the Major Category of **CCTV System of the Year** for **Face Recognition in a crowd** via partner



Mr Dori Schmetterling, iOmniscient's Manager for European Operations receiving the award at IFSEC.

2011 System Deployed at USF



USF of San Francisco Founded 1855

BIOMETRICS NEWS

open or available made or held under

MorphoTrust discusses patent trolls, biometrics

BIOMETRICS FEATURES

BORDERPOL

BORDERPOL International Security Meeting: Q&A interview with Janice Kephart

BIOMETRICS RESEARCH

Banking and Biometrics White Paper

Special Report: Biometrics and Banking


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iOmniscient and CISCO provide facial recognition solution to University Of San Francisco

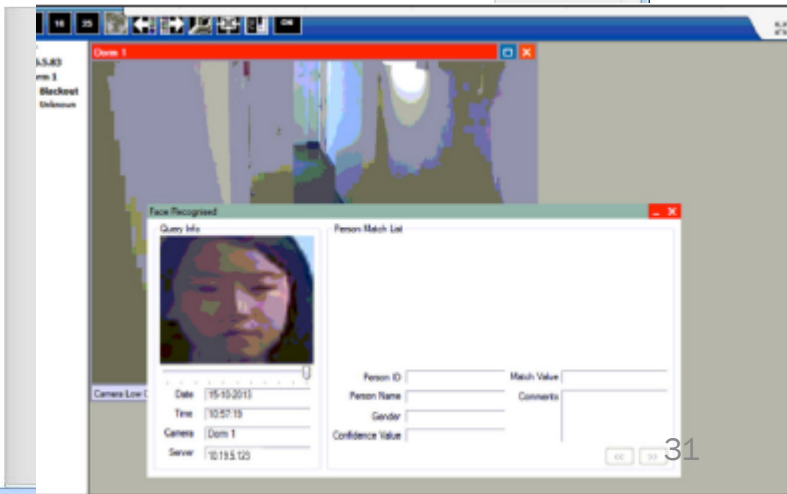


By [Stephen Mayhew](#)

[Like](#) [5](#) [Tweet](#) [7](#)

October 27, 2014 - [iOmniscient](#) announced it installed its facial recognition software in partnership with [Cisco](#)'s video management system at the University of San Francisco to improve physical security in residence halls.

USF was seeking technology that could effectively manage access to their halls of residence halls without it being intrusive or inconvenient for the school's 10,000



Client 1

Face Recognized

Query Info

Person Match List

Person ID

Person Name

Gender

Confidence Value

Date

Time

Camera

Server

Match Value

Comments

31

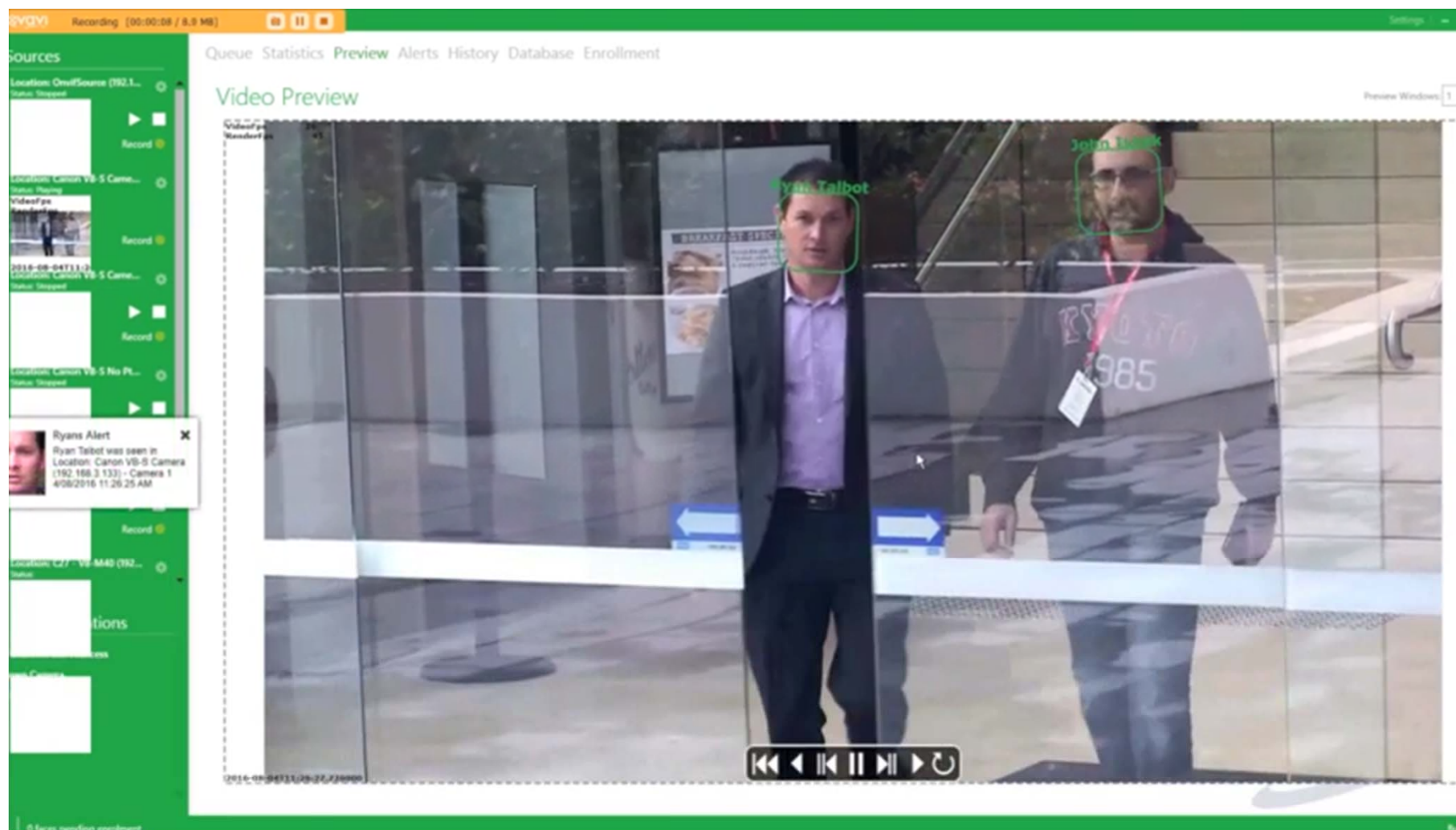
Technology Reboot in 2013

- Research Lab was defunded in 2012
- 2011 technology and all IP sold in fire sale
- Options to consider
 - Walk away
 - Start again from scratch recoding all source
- No possibility of grants on short notice
- Only option was private equity
 - FFF Friends, Fools, and Family

2016 imQ Development

- Multicamera support in a single instance
- Queuing Measurements
- Cross Camera Transit Time
- Demographics (Age, Gender)
- Better Face Detection
- NVR functionality
- NVR Integration

2016: Canon Innovation Centre Video



Mobile

Video Face Recognition

IOS8 AND ANDROID



Mobile Live Video Face Recognition

- Still image is relatively easy to process on a phone because there is only one face detection required
- Live video face detection requires real-time detection
- Fortunately modern devices have hardware face detection and sometimes even feature detection

Why Mobile Face Rec?

- Whole CV system is contained in one app so very easy to deploy compared to CCTV
- Able to capture faces at eye level
- Most CCTV Cameras are badly positioned
- Ability to move camera for better viewpoint
- Originally designed for Police Street Checks and Military Operations
- Gives human validated recognition, time, and location in the field

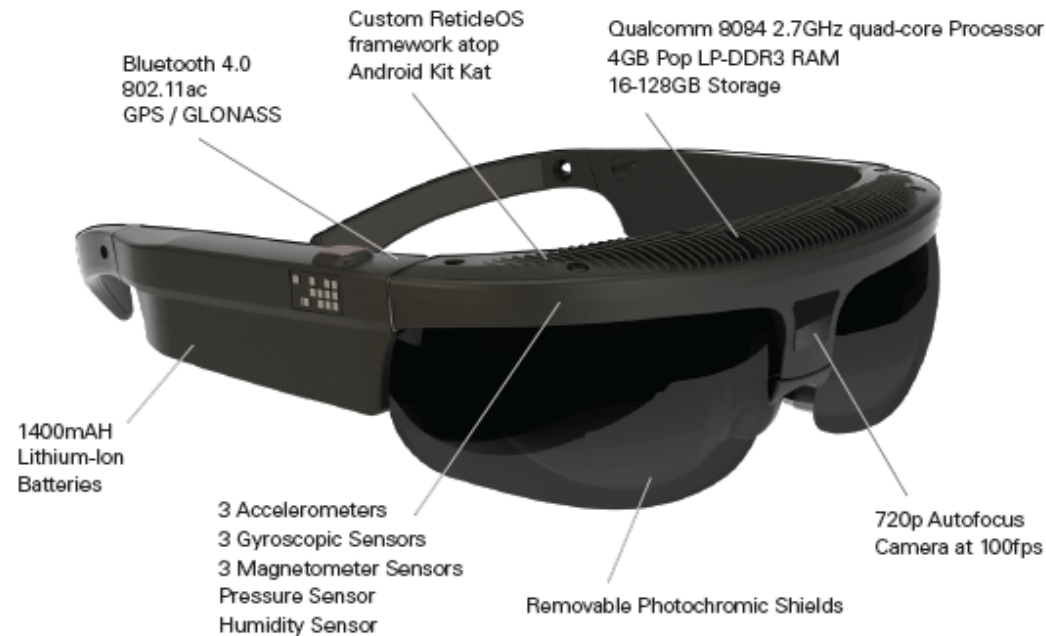
Wearable AR Glasses for Video Face Recognition **ANDROID**



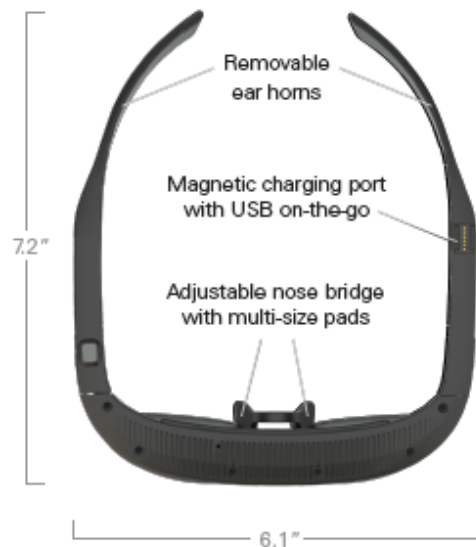
X6 and R7 Glasses



Ralph Osterhout
The Real Life “Q”



TOP VIEW



Dual 720p 16:9 stereoscopic
see-through displays at 100fps



REAR VIEW



SIDE VIEW

Magnetic stereo audio
ports with ear buds

Weight: 5.5oz

HARDWARE

Qualcomm Snapdragon 805
8084 2.7GHz quad-core Processor

4GB Pop LP-DDR3 RAM

16-128GB Storage

1400mAH Lithium-Ion Batteries

Adjustable nose bridge with multi-size
nose pads

Removable ear horns

OPTICS

Dual 720p Stereoscopic See-through
displays at 100fps

Removable Photochromic Shields

COMMUNICATIONS

Bluetooth 4.0

802.11ac

GPS / GLONASS

SENSORS

Integrated Inertial Measuring Unit with
3-axis accelerometer, 3-axis gyroscope,
3-axis magnetometer

Pressure Sensor

Humidity Sensor

Ambient Light Sensor

INPUT/OUTPUT

720p Autofocus Camera at 100fps

2 Digital Microphones (User & Environment)

Magnetic charging port with USB on-the-go

Magnetic stereo audio ports with ear buds


http://www.ab...topic=latest x W Prosopagnosia - Wikipedia... x Imagus Forensic Demo x D The Military Is About to Ge... x +

www.defenseone.com/technology/2014/06/military-about-get-new-spy-glasses/87292/ x x glasses spy

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The Military Is About to Get New Spy Glasses

JUNE 25, 2014 BY PATRICK TUCKER

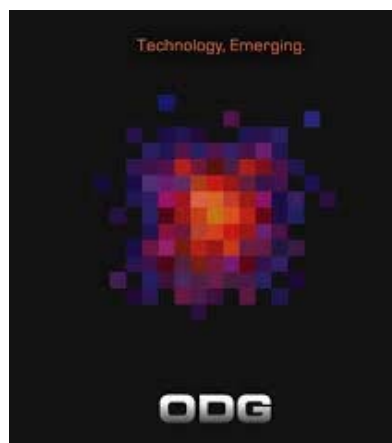
The Defense Department's new smart spectacles go beyond Google Glass. By Patrick Tucker Pentagon ▼ /

Intelligence ▼ / Technology ▼

Getting secret information to specific people, like the location of the nearest nuclear power plant, in a way that doesn't draw attention from outside is a classic spy problem. Another one is giving agents the ability to match names to



41



Ever been to a gathering where you saw someone's face but you couldn't remember her name or why she was important? It's not just a cocktail party problem but a national security one. A year old startup from Australia called Imagus, has developed a program for the X6 that fixes the problem.

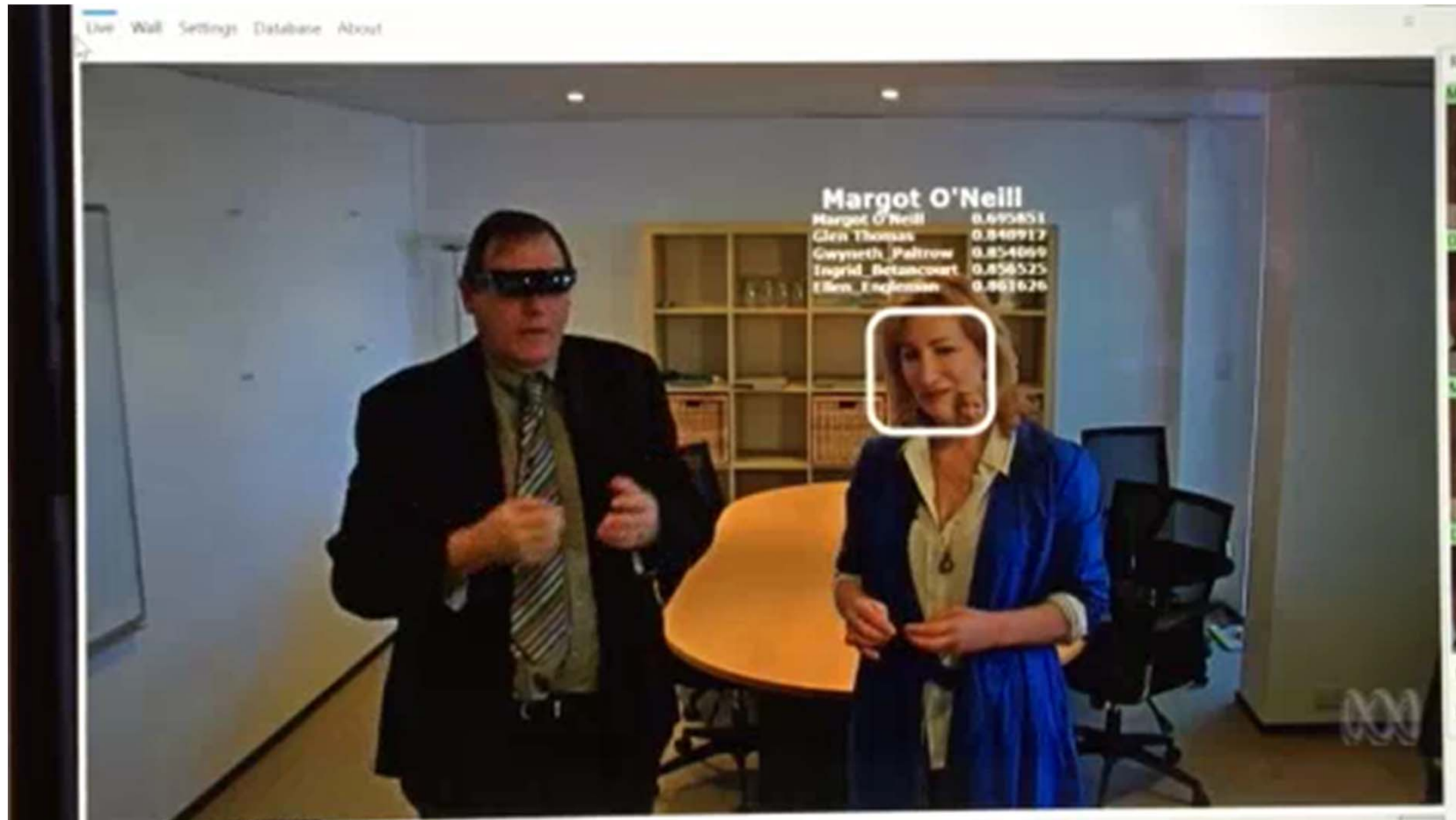
Peering through the glasses at a poster of faces while wearing the X6, a tester using the Imagus facial recognition app sees a pair of small circles appear on the eyes of the various targets and then a quick match showed up in the view as demonstrated in a somewhat unnerving video from General Dynamics Information Technology, GDIT, highlights the "dynamic environment of non-cooperative facial recognition."

The Imagus app can match a face in real time to one in a database at a resolution of just twelve pixels between the eyes according to lead software engineer Steve Brain. (Anything under sixty is considered very good in the facial recognition world.) The size of the headset seems to help with targeting the camera to improve speed and accuracy. The glasses could be modified to connect to a military biometrics databases such as **BEWL, King confirmed.**

GDIT is working with Osterhout, Imagus and other small companies to develop a host of apps and programs around the X6 platform.

"What they want with the glasses is to bring in a lot of different applications. Facial recognition technologies from images is just one example," Lynn Schnurr, vice president at General Dynamics Information Technology, told *Defense One*.

ABC Lateline 2015



Ralph Osterhout



ThirdEye X1 CES 2019



Facial Recognition
Demo

Using our own Phone GPU Face Detection Module

Biometric Access Control (on the Cheap)



Building and Site Security

- Unauthorized persons enter building or site with swipe card
- Impossible to check photo ID on every card
- Design system to Biometrically Check and log every person at full walking speed
- Upgrade any card system to Biometric
- Application: Secure Shipyard or Commercial Port

Cost Effective High-Speed Biometric System for Secure Building or Site





UAV Face Recognition

Airborne Face Recognition

- Some interest in Satellite face recognition but resolution (10cm) and slant angle make this extremely challenging
- More achievable is UAV face recognition
- Noise of UAV may get people to look up
- High speed camera (300fps) could improve speed of capture in crowds
- Problem of slant angle as faces are much harder to recognise from above

Real-Time Geometric Corrections

- Correct for foreshortening due to slant angle
- Correct for non-square pixels



Civilian UAV

Imagus iFaceDemo

Live Wall Tracks Settings Database About

Redline2 27Px Manuel Wildhaber 25Px

2015-03-12 11:52:35.425000

Open File... Open

Results Enrol Alerts

Manuel Wildhaber High

Manuel Wildhaber	0.830
Redline1	0.908
Bono	0.937
Arnold Schwarzenegger	0.942
Redline2	0.952
George P. Bush	0.993

Redline2 High

Redline2	0.673
Redline1	0.843
Arnold Schwarzenegger	0.932
Manuel Wildhaber	0.933
Bono	0.973
George HW Bush	0.974

Redline1 High

Redline1	0.680
Redline2	0.799
Manuel Wildhaber	0.911
Arnold Schwarzenegger	0.931
Bono	0.963
John Howard	0.989

Include Tags Type to add... AND

Exclude Tags Type to add...

 **IMAGUS**

Military UAV

Imagus iFaceDemo

Live Wall Settings Database About

2014-11-24 22:18:45

ScanEagle 327
Alticam09-EO+
+45.74480 d
-119.79309 d
1133ft MSL

Unknown 24Px
Anonymous_4 0.954251
Anonymous_2 0.958772
POI_1 0.979704
Anonymous_9 1.00241
POI_2 1.00479

1.031,000,990,990,960,939606

RCM
HOLD
171.0±1.0=0.3°
1/100s
Ping n/a

+45.74738 d
-119.79373 d
533ft MSL
BRG 352°
RNG 1144ft
TWD 8ft
BOX 2ft
SVP 1249ft

POI 1 POI 1 Low
Anonymous 2 0.812
POI 1 0.811
Anonymous 4 0.814
Anonymous 7 0.847
Anonymous 1 1.000

POI 1 POI 1 Low
Anonymous 2 0.811
POI 1 0.811
Anonymous 4 0.841
Anonymous 7 0.844
Anonymous 1 1.000

Include Tags Type to add... AND
Exclude Tags Type to add...

IMAGUS

The screenshot displays the Imagus iFaceDemo software interface. The central video feed shows a man in a grey hoodie walking on a street. Overlaid on the video are several data elements: a timestamp '2014-11-24 22:18:45' in the top left; a list of parameters on the left including 'RecallRate', 'SatFaces', 'Compressed Queue', 'Decompressed Queue', 'Drop Rate', 'Inflight Frames', 'Inflight Models', 'Send Play Buffer', and 'Send Queue'; a list of identified faces in the center with names like 'Unknown 24Px' and 'Anonymous_4' along with confidence scores; a small sequence of face images below the main face list; a list of flight parameters on the right such as 'ScanEagle 327', 'Alticam09-EO+', and coordinates; and a search bar at the bottom right with 'Include Tags' and 'Exclude Tags' options. The Imagus logo is in the bottom right corner.

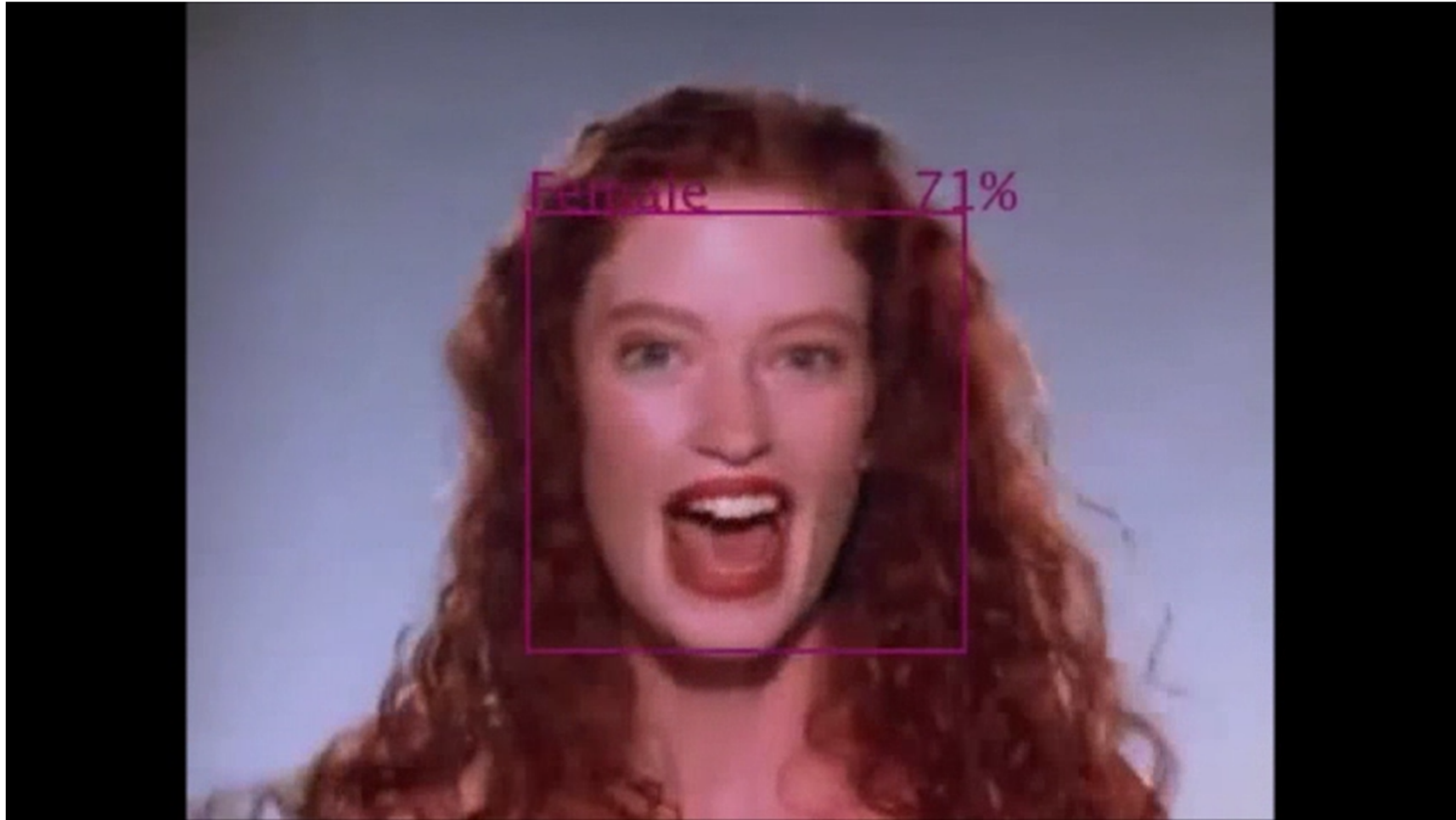


Gender, Age, People Counting

Other Biometrics

- In many applications most people will not be in the gallery
- How do we add value for these unrecognisable people
 - Gender
 - Age
 - People count
 - Cross Camera Transit times

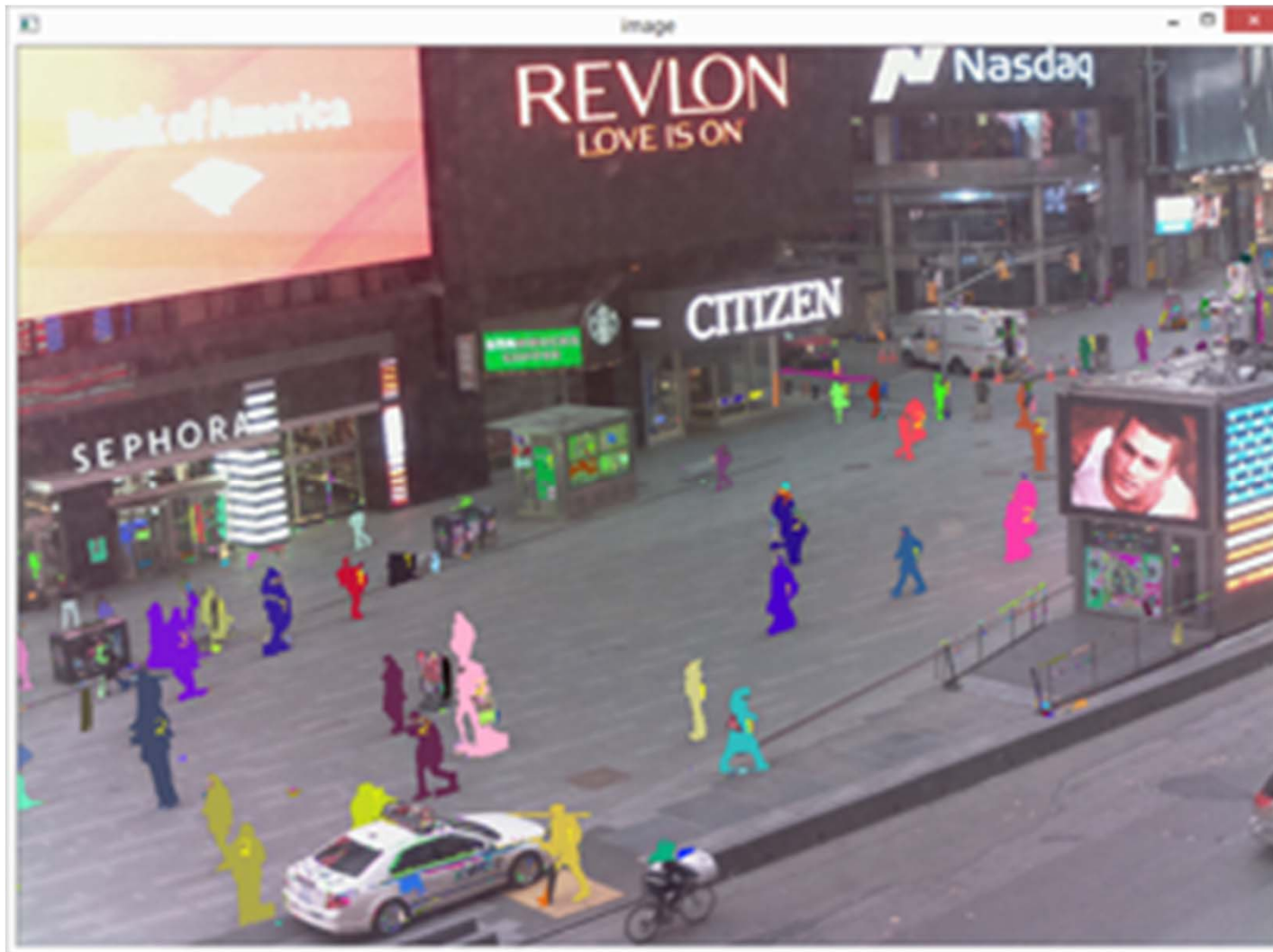
Gender Estimation



Gender and Age



Billboard Crowd Counting



Times Square

Detecting Genetic Disorders

Table 2 Diagnostic accuracy of NFR technology within database of 3144 photographs				
Syndrome	Total number of photos	Correct diagnosis	Match within top 5	Match within top 10
Coffin-Lowry	164	92 (56%)	145 (88%)	159 (97%)
Cornelia de Lange	193	123 (64%)	183 (96%)	188 (97%)
Floating-Harbor	97	65 (67%)	92 (95%)	94 (97%)
Kabuki	197	108 (55%)		
Rubinstein-Taybi	162	97 (60%)	156 (96%)	162(100%)
Smith-Magenis	135	81 (60%)	133 (98%)	135(100%)
Williams	196	120 (61%)	189 (96%)	192 (98%)

with Tracy Dudding, Geneticist with Hunter Genetics

Figure 3 Original published photographs of individuals with Coffin Lowry syndrome-
Top left: number 3 match; top centre: number 1 match; top right number 1 match;
bottom left: number 1 match; bottom centre: number 4 match; bottom right: number 1
match



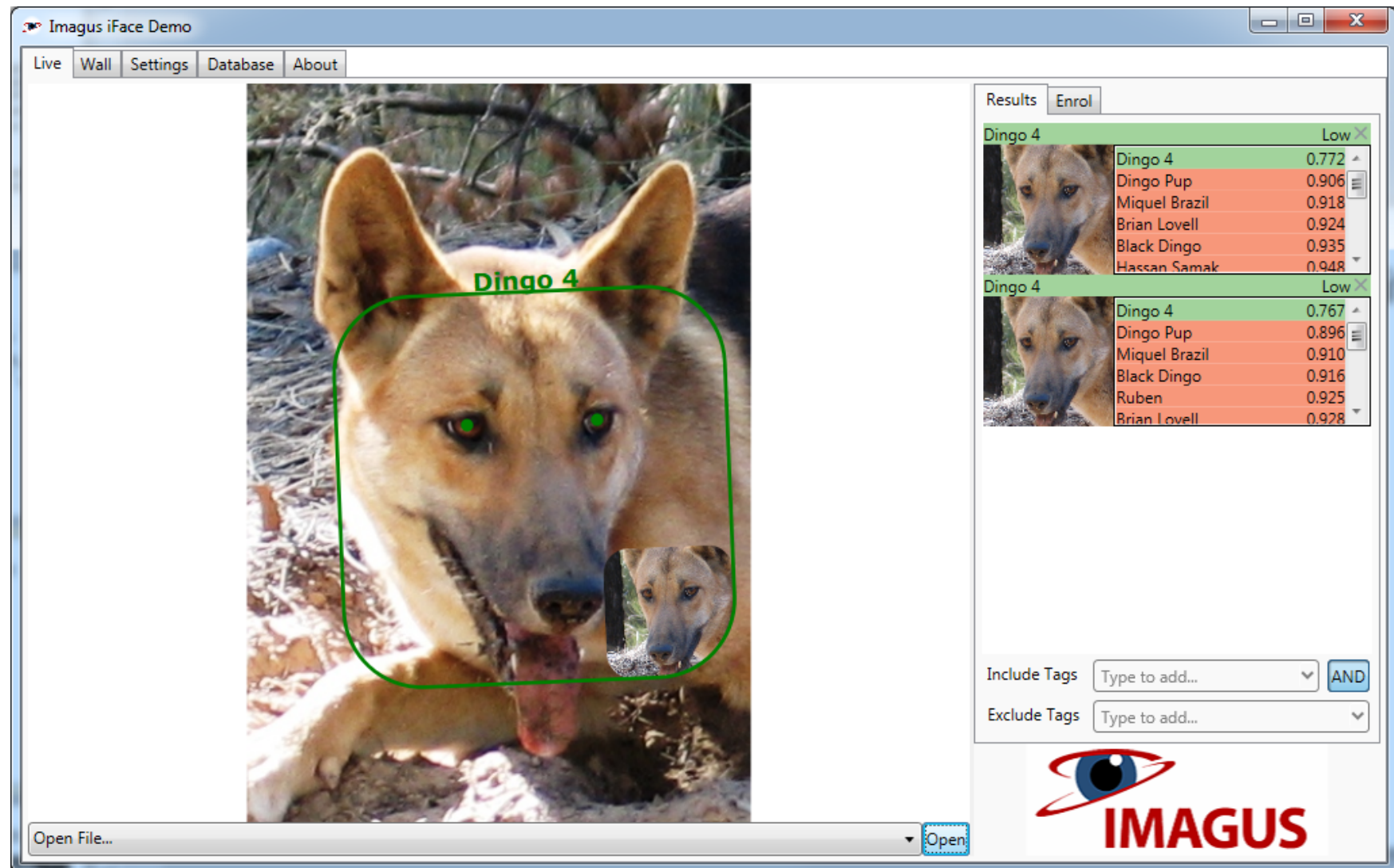
Figure 4. Original published photographs of individuals with Cornelia de Lange syndrome-Left: number 1 match; centre: number 2 match; right: number 1 match



Figure 5. Original published photographs of individuals with Floating Harbor syndrome-From the left: number 4 match; number 1 match; number 2 match, number 2 match; number 3 match

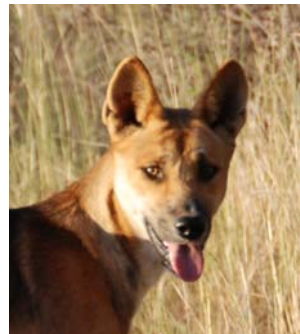
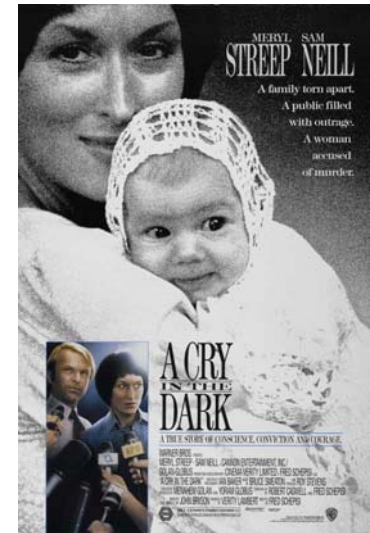


Dingo Face Recognition



A Dingo Ate My Research

- Dingo Face Recognition
- 80 Animals, 340 images
- 60.9% recognised rank 1
- 78.4% were recognised top 10
- Next Step: A mobile social media app for dingo identification on Fraser island



Mobile Dingo App

- Dingoes could be recognised by the public by photographing their faces with iPhones/Android Devices
- This would give identification, time, and location information which could be collected on a server.
- Animals interacting with humans could be identified and their behaviour captured
- Could also collect video

So What's Next?

- The next step is to connect up a huge number of biometric appliances and harvest all of the faces
 - How do we position the cameras?
 - How do we connect to the cameras?
 - How do we make this truly scalable?
 - How do we address privacy issues?
 - How do we architect the system?
 - How do we manage all the faces and alerts?

Issues with Large CCTV Networks

- Data rates are huge and the cost of connecting all cameras by fibre is prohibitive
- Processing should be done at edge or better still in camera
- Then only alerts need be sent to central system
- Could send full frames or just faces
- Privacy can be improved since only small parts of CCTV (possibly none) is sent not the whole video.
- Whole video may contain sensitive material that is hard to vet.

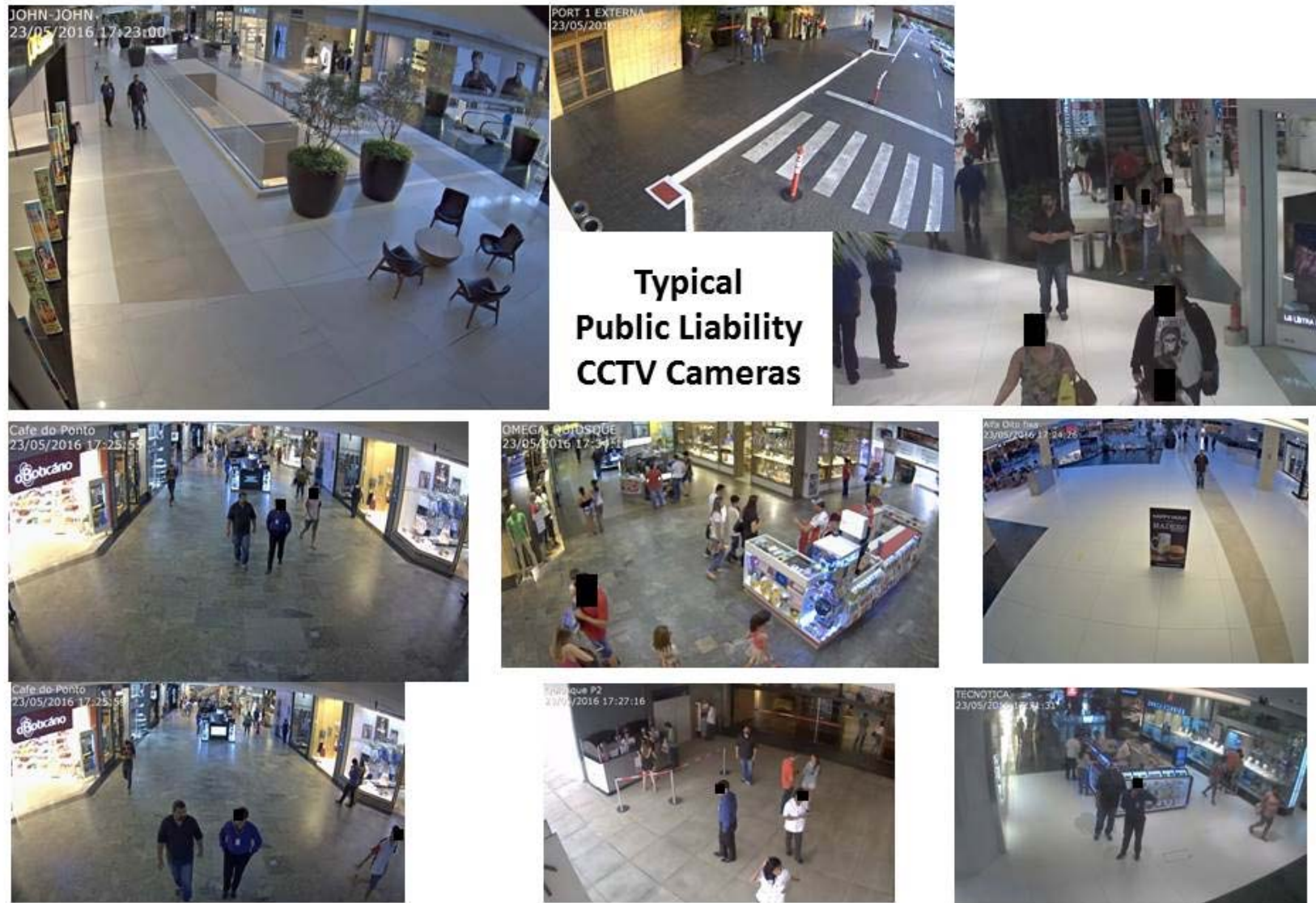
2016 Brazil Project

- Approached by Security firms in Brazil to trial non-cooperative face recognition in shopping centres and to consolidate alerts in cloud based incident management system
- Stage 1: Face Detection in cameras and AWS server based recognition
- Stage 2: Face Detection and Recognition in imQ video face recognition appliance

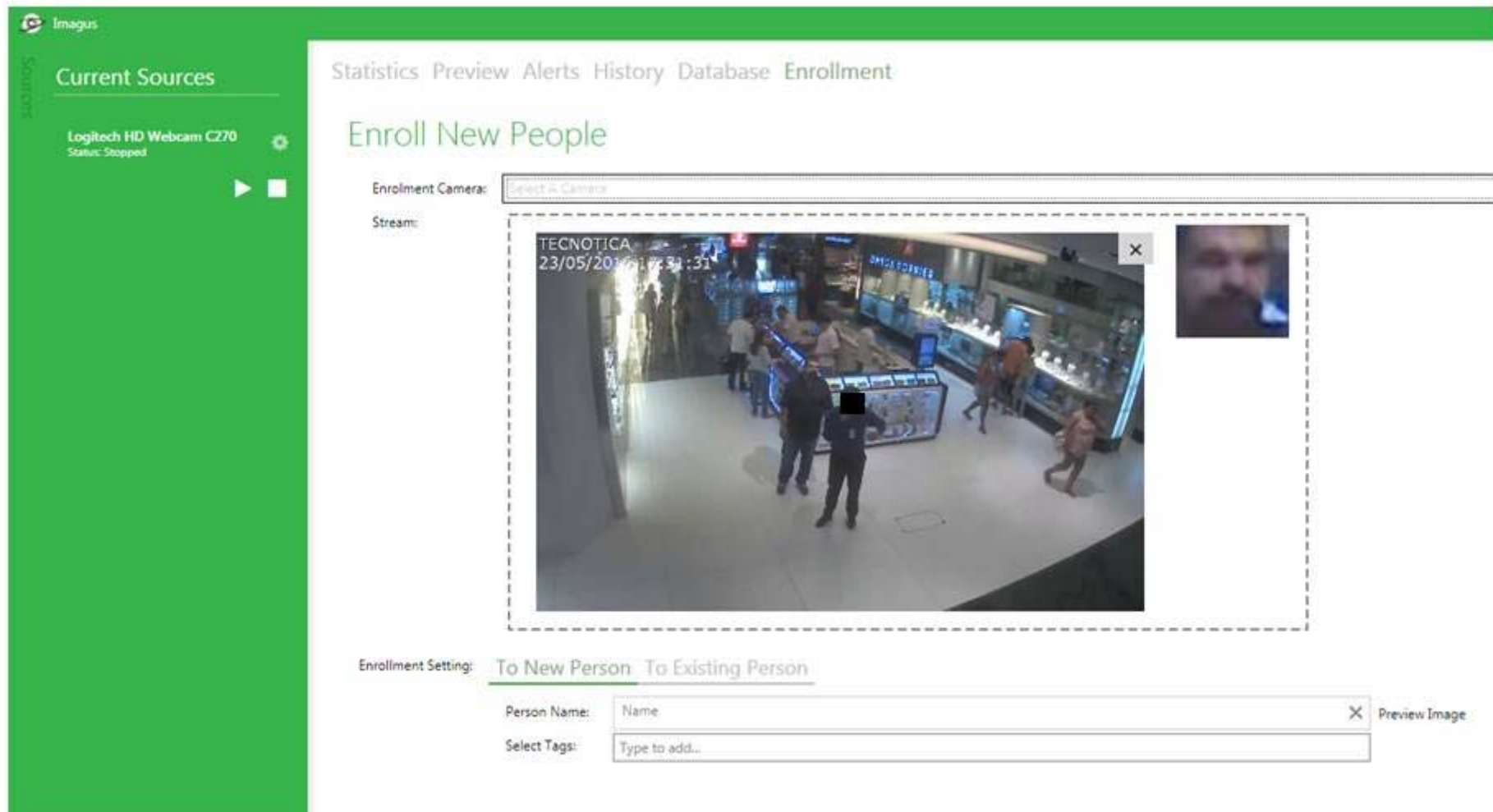
True Transcontinental Surveillance

- Cameras were in Brazil, Australia, and UK
- Face Recognition was performed locally or transcontinentally
- Cost was potentially very low if cameras could do detection
- Highly scalable architecture
- Pilot ran for several months

Typical CCTV Cameras – Useless for Face Harvesting

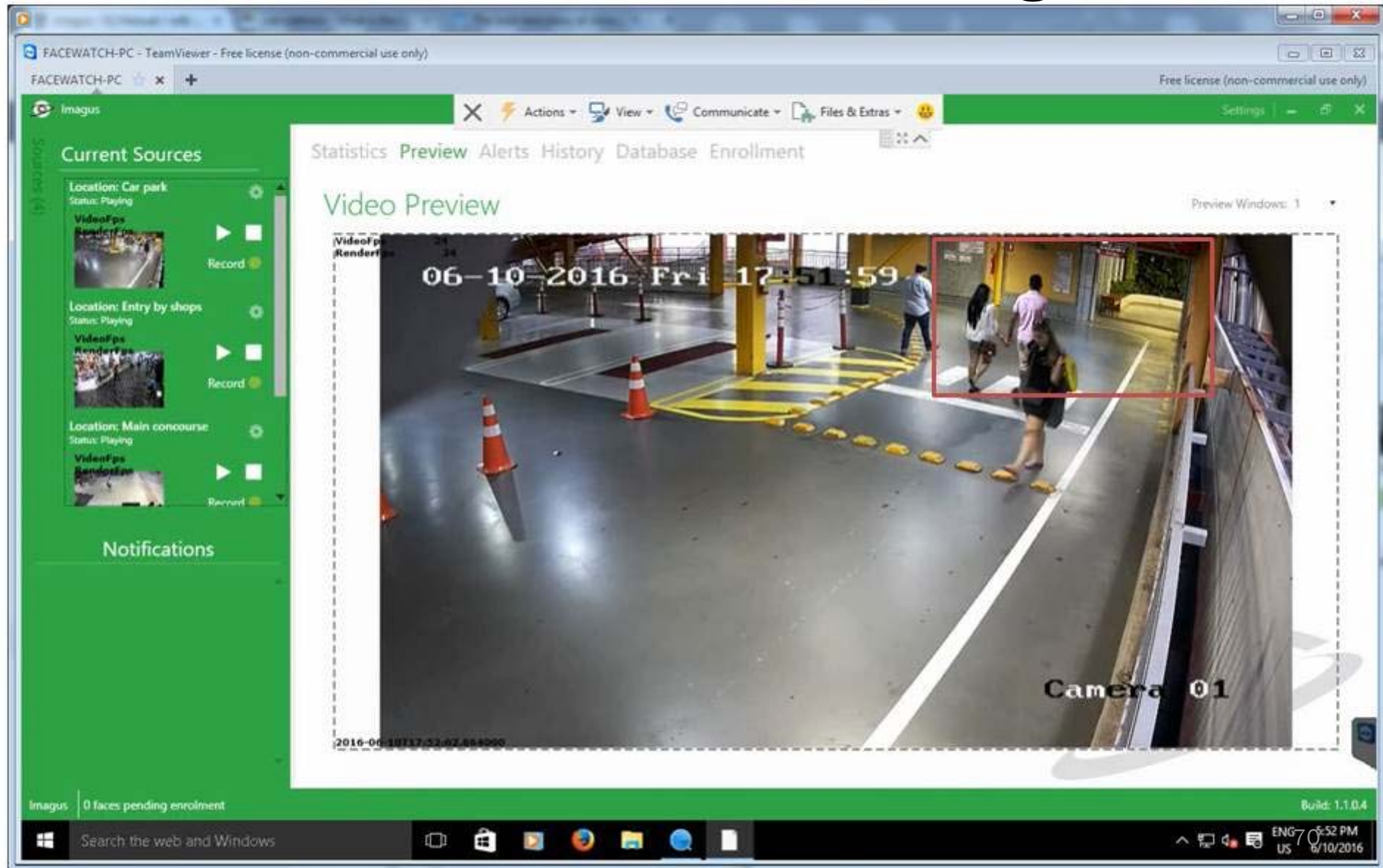


Existing Cameras

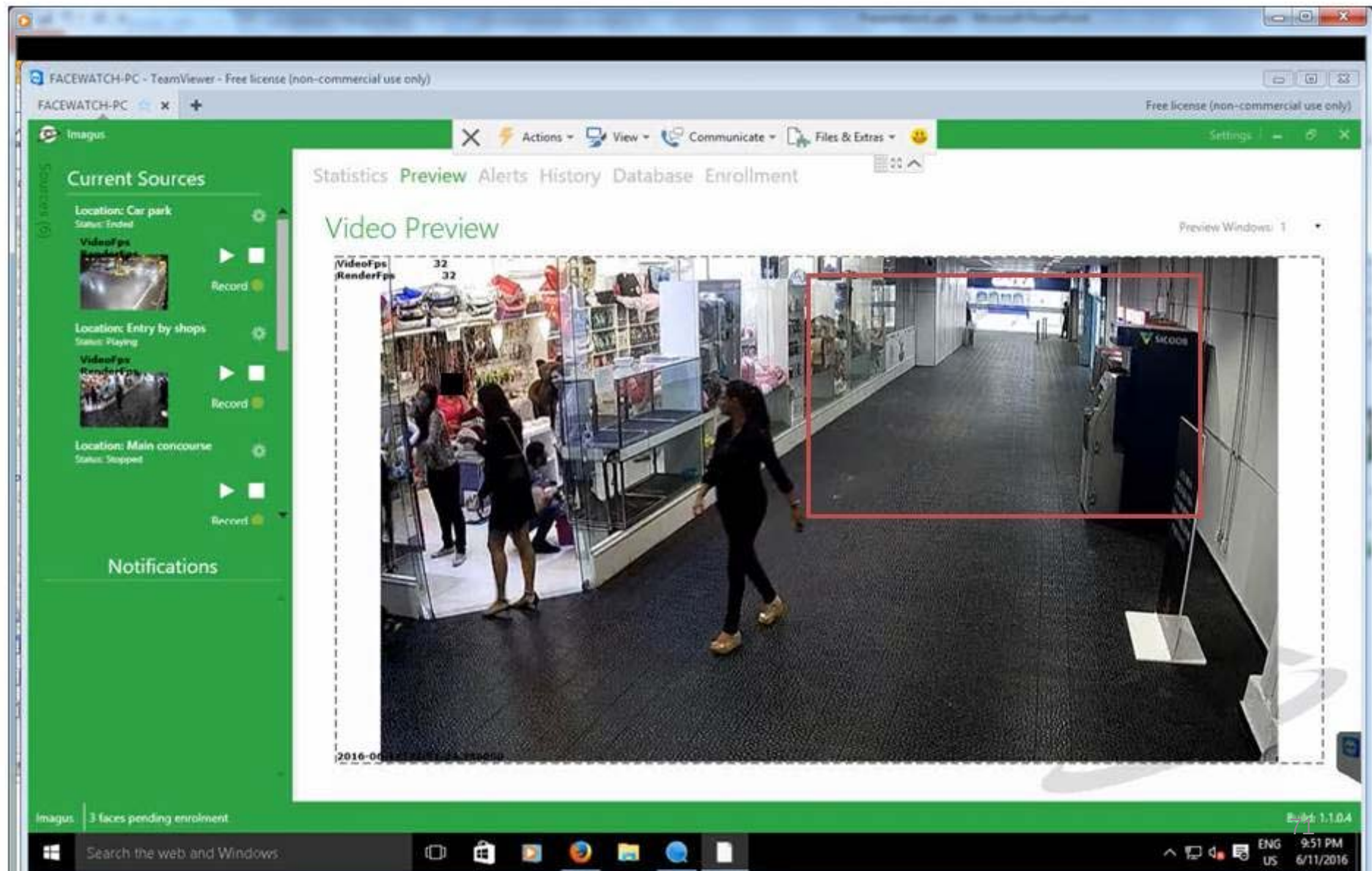


Not enough resolution. Slant angle is excessive.

Need More Focal Length



Need More Focal Length



Issues Encountered in Camera-Based Detection

- Low Cost
- About 60s latency in camera based detection
- Poor detection rates, many bad images
- Large data rates due to full frame image size
- Hard to demonstrate live
- Hard to know what is going wrong
- Low rate of face harvesting as people often do not look at camera
- Some good matches and low false alarm rates

Issues Encountered in imQ Video based detection

- Much better face harvesting due to greater number of frames
- People still do not look at camera
- Motion blur issues on almost all faces
- Strong H264 artifacts obscuring faces
- Much lower latency (2s)
- Instant local feedback and alerts
- Practical system once camera issues sorted

Transuburban Network

- Deployed similar system at Brother's Leagues Club
- Much easier due to local access, no time zone issues, and language
- Good positioning of cameras near eye level
- 3 cameras to cover foyer from a variety of angles
- System working well with regular alerts

Person Alerts – Marketing Manager


The screenshot displays the Facewatch CCTV software interface. The browser address bar shows the URL <https://www.facewatch-aus.com/app/#imagus>. The top navigation bar includes the Facewatch logo, the text "CCTV", and a user profile for "Brian Lovell". A green button labeled "Report an Incident" is visible. A yellow banner contains a "DATA PROTECTION" warning. The left sidebar lists various modules: News Feed, Users, Premises, Groups, Incidents, Watch List, Statistics, **Imagus FR** (highlighted), Police Toolkit, Training, and Support. The main content area features the "Imagus" logo and an "Alerts" section. This section lists several alerts, each with a subject ID, a small image, a count, and a best similarity score. The most recent alert at the bottom includes a timestamp, a subject image, a name "Cahn McGreal", a link to "Brothers", a distance value, and a note about a service match.

Subject	Count	Best Similarity
Subject: SOI118	123	0.5650486
Subject: SOI137	43	0.7017204
Subject: SOI149	73	0.7187948
Subject: SOI124	2	0.7279137
Subject: SOI147	2	0.7464463
Subject: SOI139	1	0.7579593


19:42 | 7th Oct 16 Cahn McGreal → Brothers
Distance: 0.7579593
- Fr/Anpr service detected match with SOI139

Lasts until: 19:42 | 8th Oct 16

Another Match – General Manager




Subject: SOI142 Count: 2 Best Similarity: 0.7598916




18:36 | 15th Oct 16 Cahn McGreal → Brothers
Distance: 0.7598916

Gaming Area Dahua Camera SOI142




Just Seen!



Match?

Alert: Potential Gaming Area Dahua Camera match from Brothers Leagues Club.
Please click this [link](#) to review and confirm.



18:36 | 15th Oct 16 Cahn McGreal → Brothers
Distance: 0.7598916
- Fr/Anpr service detected match with SOI142

Daily Alerts

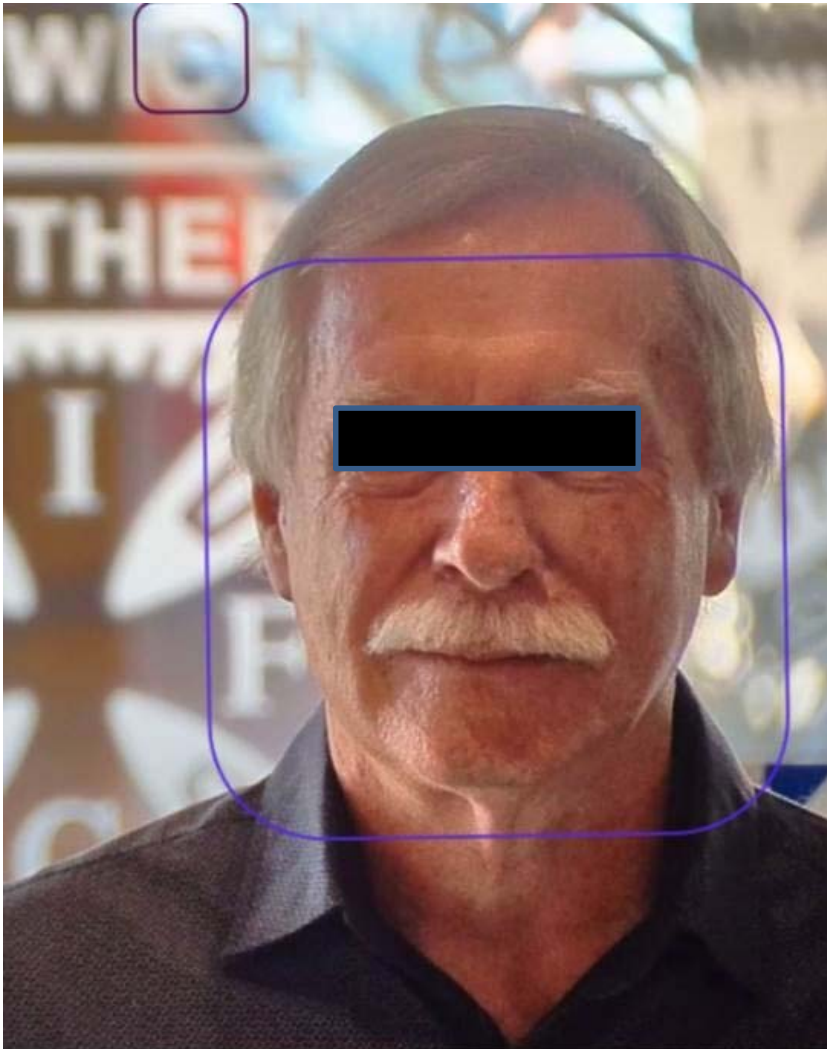
The screenshot shows the Facewatch web application interface. The browser address bar displays <https://www.facewatch-aus.com/app/#imagus>. The left sidebar contains navigation links: News Feed, Users, Premises, Groups, Incidents, Watch List, Statistics, **Imagus FR** (highlighted), Police Toolkit, Training, and Support. The main content area features the 'Imagus' logo and an 'Alerts' section. The alerts are organized into two groups. The first group is for 'Subject: SOI143' with a 'Count: 4 Best Similarity: 0.7428649'. It contains four entries, each with a timestamp, a small photo, the name 'Cahn McGreal', a link to 'Brothers', a distance value, and a note '- Fr/Anpr service detected match with SOI143'. The second group is for 'Subject: SOI137' with a 'Count: 2 Best Similarity: 0.7537992'. It contains two entries with similar details. The interface includes a search bar and various utility icons at the top.

Alert Group	Subject	Count	Best Similarity
1	SOI143	4	0.7428649
2	SOI137	2	0.7537992

Alerting on Me

The screenshot shows the Facewatch web application interface. The browser address bar displays <https://www.facewatch-aus.com/app/#>. The top navigation bar includes the Facewatch logo, 'CCTV' text, and a user profile for 'Brian Lovell'. A green 'Report an Incident' button is visible on the left. A yellow banner at the top contains a 'DATA PROTECTION' notice. The left sidebar lists various features: News Feed, Users, Premises, Groups, Incidents, Watch List, Statistics, Imagus FR, Police Toolkit, Training, and Support. The main content area features the 'imagus' logo and a '+ Notification' button. Below this, the 'Alerts' section is displayed with a 'Expand All' button. The first alert, dated 13:34 on 18th Oct 16, is from 'Brian Lovell' and points to 'Brisbane Neighbourhood Watch', with a duration of 'Lasts until: 13:34 | 19th Oct 16'. It includes a 'Mark as read' link. The alert details show two side-by-side face images: 'Brian's MacPro' (labeled 'Just Seen!') and 'SOI118' (labeled 'Match?'). A text box below the images reads: 'Alert: Potential Brian's MacPro match from Roving Camera Technologies. Please click this link to review and confirm.' There is an 'Add comment' button. Below the first alert, four more alerts are listed, all from 'Cahn McGreal' and dated 18th Oct 16, with durations ranging from 11:40 to 11:57. Each of these alerts also has a 'Mark as read' link. A 'Load more alerts ↓' link is at the bottom of the alerts list. On the right side of the interface, a 'Coming Events' section states 'No events found'.

Best Camera for Doorway Installed in October

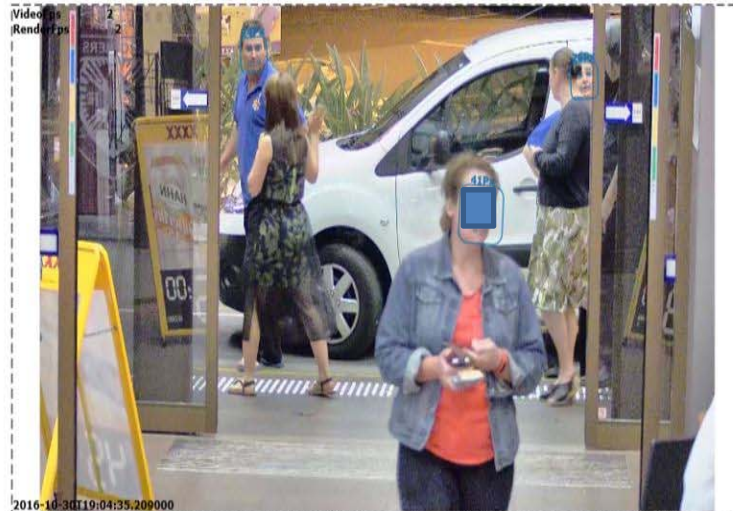


We tried 15 models of camera and could not get detection on the doorway due to backlight issues.

This model was installed in October and replaces 3 others.

Case Study - IMQ Leagues Club

Video Preview

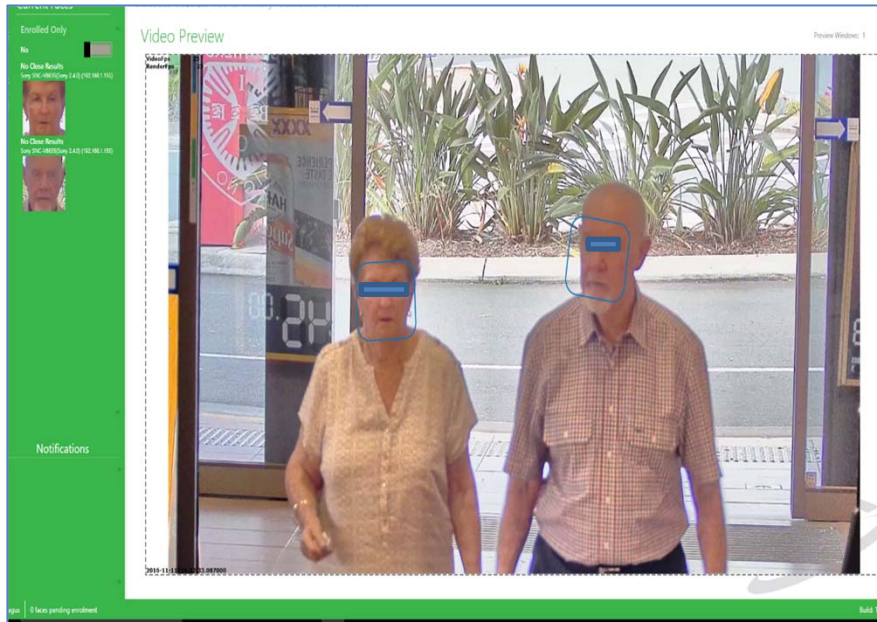


Alerts

- 1 Subject: SOI118 Count: 274 Best Similarity: 0.5198622
- 1 Subject: SOI137 Count: 1 Best Similarity: 0.7229155
- 1 Subject: SOI149 Count: 1 Best Similarity: 0.7258798
- 1 06:33 | 5th Oct 16 Cahn McGreal → Brothers Distance: 0.7258798 - Fri/Anpr service detected match with SOI149, SOI133
- 1 Subject: SOI133 Count: 1 Best Similarity: 0.7582519
- 1 08:52 | 4th Oct 16 Cahn McGreal → Brothers Distance: 0.7582519 - Fri/Anpr service detected match with SOI133
- 1 Subject: SOI138 Count: 2 Best Similarity: 0.7586789

Imagus IMQ PC
Platform

IMQ Leagues Club



Sony SNC-VB635(Sony 2.4.0) (192.168.1.155)	11/14/2016 9:23:33 PM	11/14/2016 9:23:38 PM	29 %	Ben	High	♂
Sony SNC-VB635(Sony 2.4.0) (192.168.1.155)	11/14/2016 9:23:30 PM	11/14/2016 9:23:30 PM	31 %			♂
Sony SNC-VB635(Sony 2.4.0) (192.168.1.155)	11/14/2016 9:22:21 PM	11/14/2016 9:22:23 PM	26 %			♀

Imagus IMQ PC Platform

History Log									
Alerts Historical Tracks									
REFINE RESULTS									
Filter Results									
Name Filter									
Match Quality Threshold									
Face Variance Threshold									
Start Date									
Refresh Data									
Refresh									
LOCATION	START	END	VARIANCE	RESULT PERSON	CONFIDENCE	FACE	GENDER		
Sony SNC-VB635(Sony 2.4.0) (192.168.1.155)	11/12/2016 10:36:09 PM	11/12/2016 10:36:12 PM	22 %				♀		
Sony SNC-VB635(Sony 2.4.0) (192.168.1.155)	11/12/2016 10:34:13 PM	11/12/2016 10:34:15 PM	24 %				♂		
Sony SNC-VB635(Sony 2.4.0) (192.168.1.155)	11/12/2016 10:34:11 PM	11/12/2016 10:34:13 PM	25 %				♂		
Sony SNC-VB635(Sony 2.4.0) (192.168.1.155)	11/12/2016 10:30:06 PM	11/12/2016 10:30:10 PM	24 %				♀		
Sony SNC-VB635(Sony 2.4.0) (192.168.1.155)	11/12/2016 10:29:33 PM	11/12/2016 10:29:36 PM	25 %				♂		

IMQ Leagues Club

Imagus IMQ PC



Sources

Foyer Entry

is Playing

off ps

derFps

Recording

Foyer Exit (192.168.1.38)

is Playing

off ps

derFps

Recording

Sony Entry Foyer

137 was seen in Sony Foyer Entry

21/10/2016 6:43:09 PM

Recording

Vision Foyer Exit (192.16...

is Started

Record

Statistics Preview Alerts History Database Enrollment


Video Preview

VideoFps

RenderFps

8

8



Notifications

or Entry alert success

Where to from Here?

- We are planning to connect up a network of pubs and clubs
- Strong interest from banking sector
- Strong interest from hospitals

Research Issues for My Group

- Primarily we need better Face Detection not better Recognition
- Investigating many new detectors to find a replacement for Viola-Jones
- Evaluating on IJB-A and Wider Datasets
- Need to get false alarms down as much as possible because CCTV provokes this problem
- Investigate joint detection and landmarking

Questions

