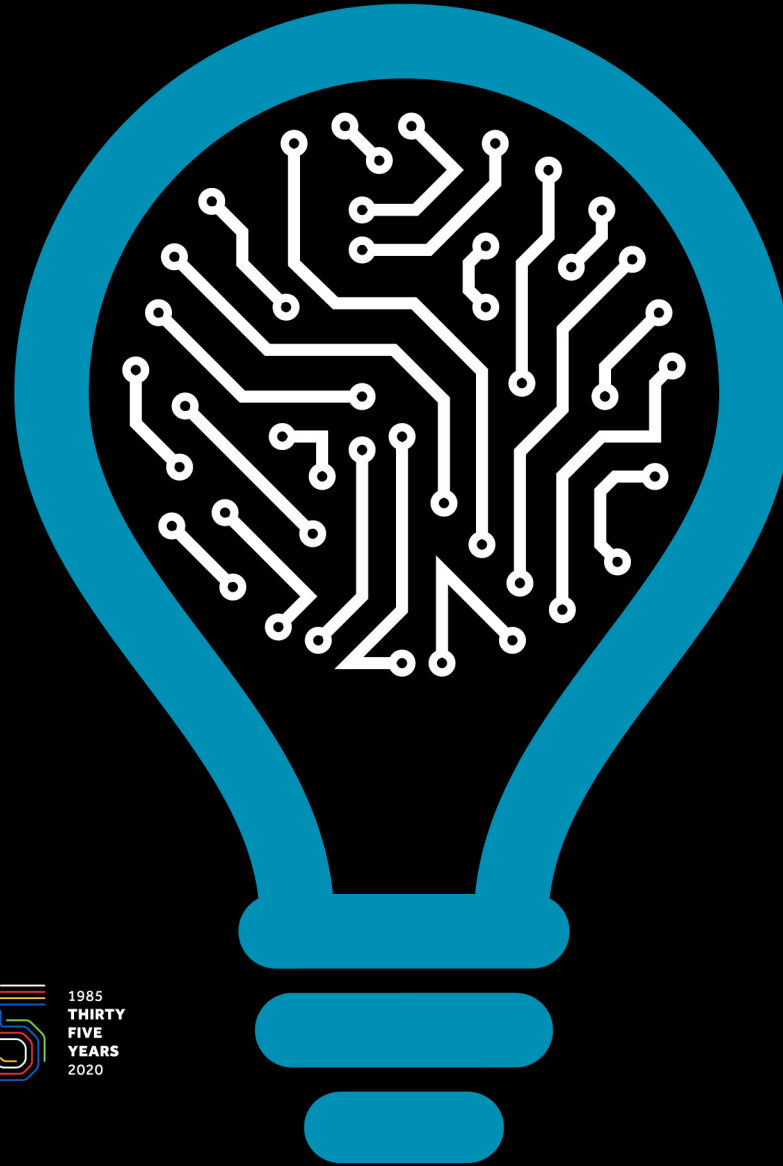


from knowledge  
generation to  
science-based  
innovation

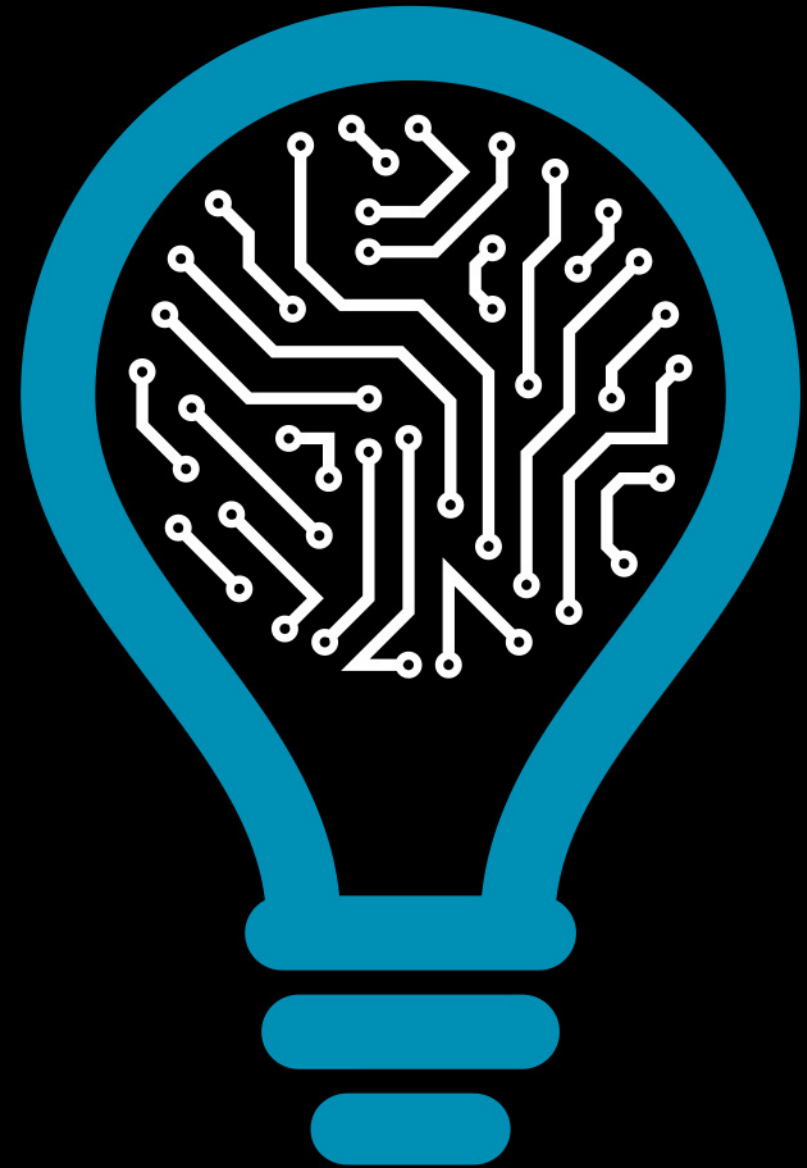


**INSTITUTE FOR SYSTEMS  
AND COMPUTER ENGINEERING,  
TECHNOLOGY AND SCIENCE**

# Edge Computing for Identity and Wellbeing

Ana Filipa Sequeira

May 4<sup>th</sup>, 2021





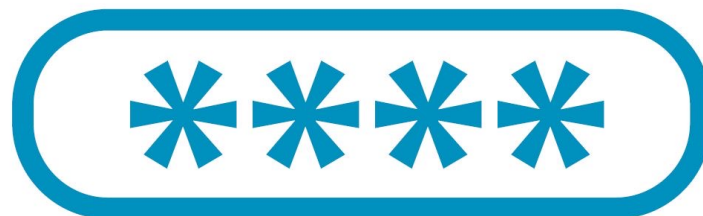
# Identity Recognition

Can be done using...

what you have,



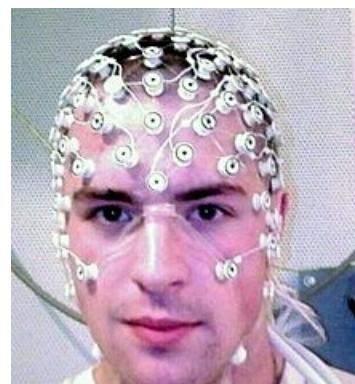
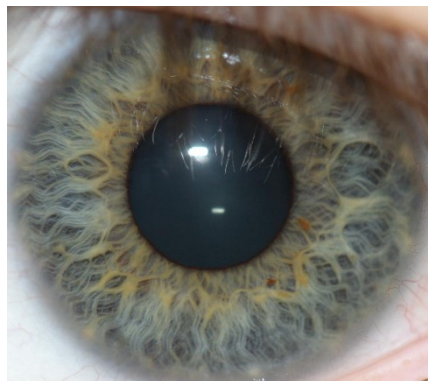
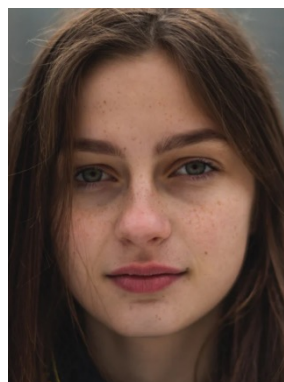
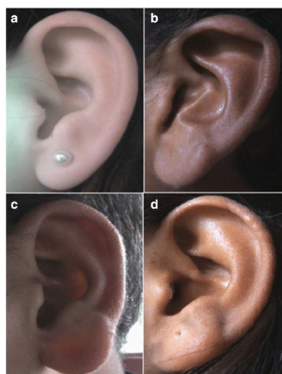
what you know,



...or what you are.



# Biometric Traits





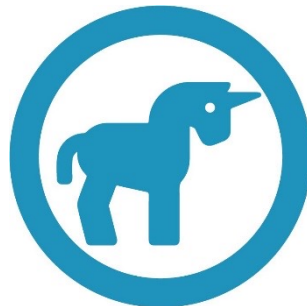


# Biometric Traits & Identity Recognition

Need to take in account some basic requirements.



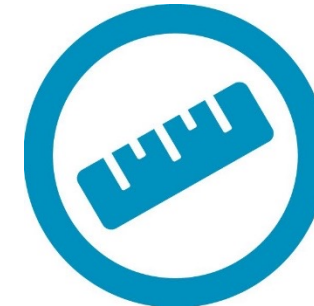
**Universality**



**Uniqueness**



**Permanence**



**Measurability**



**Performance**



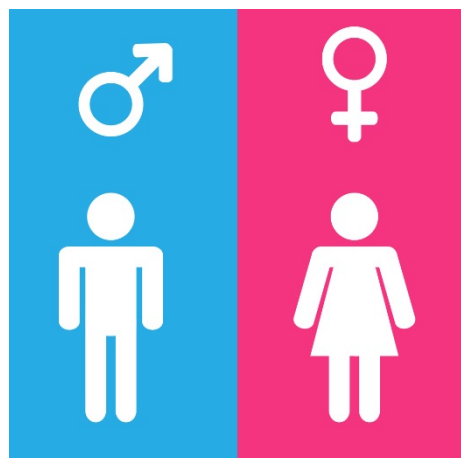
**Acceptability**



**Circumvention**

# Biometric Traits beyond Identity

Provide information about the individual's gender, age, emotions, health, psychophysiological states...



# Biometrics is everywhere

## THE CLOUD

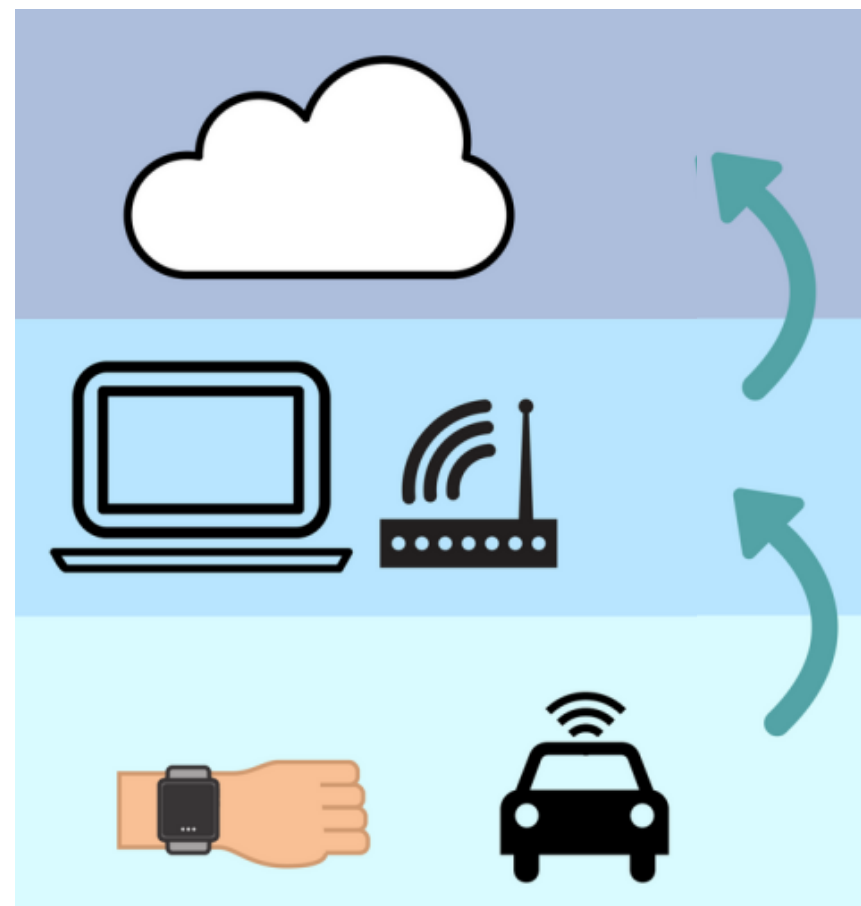
- Big data proc.
- Data warehouses

## THE EDGE

- Real time data proc.
- Local proc.

## IoT

- Smart devices
- Smart vehicles
- Connected systems



# vCardID

## vCardID - Portuguese Solution for Biometric Authentication through Fingerprint Images



INCM Project, INESC TEC



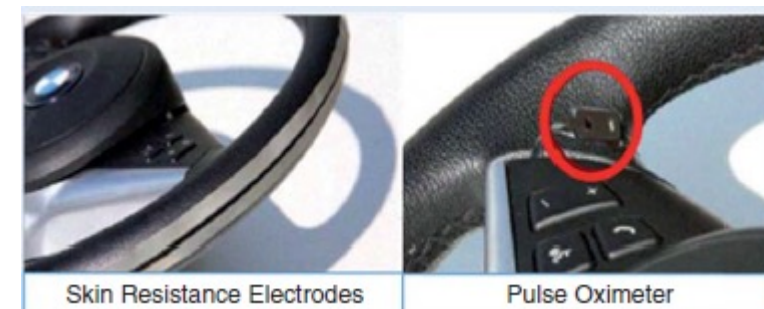
Pioneer “Match-on-Card” (MoC)  
fingerprint matching algorithm





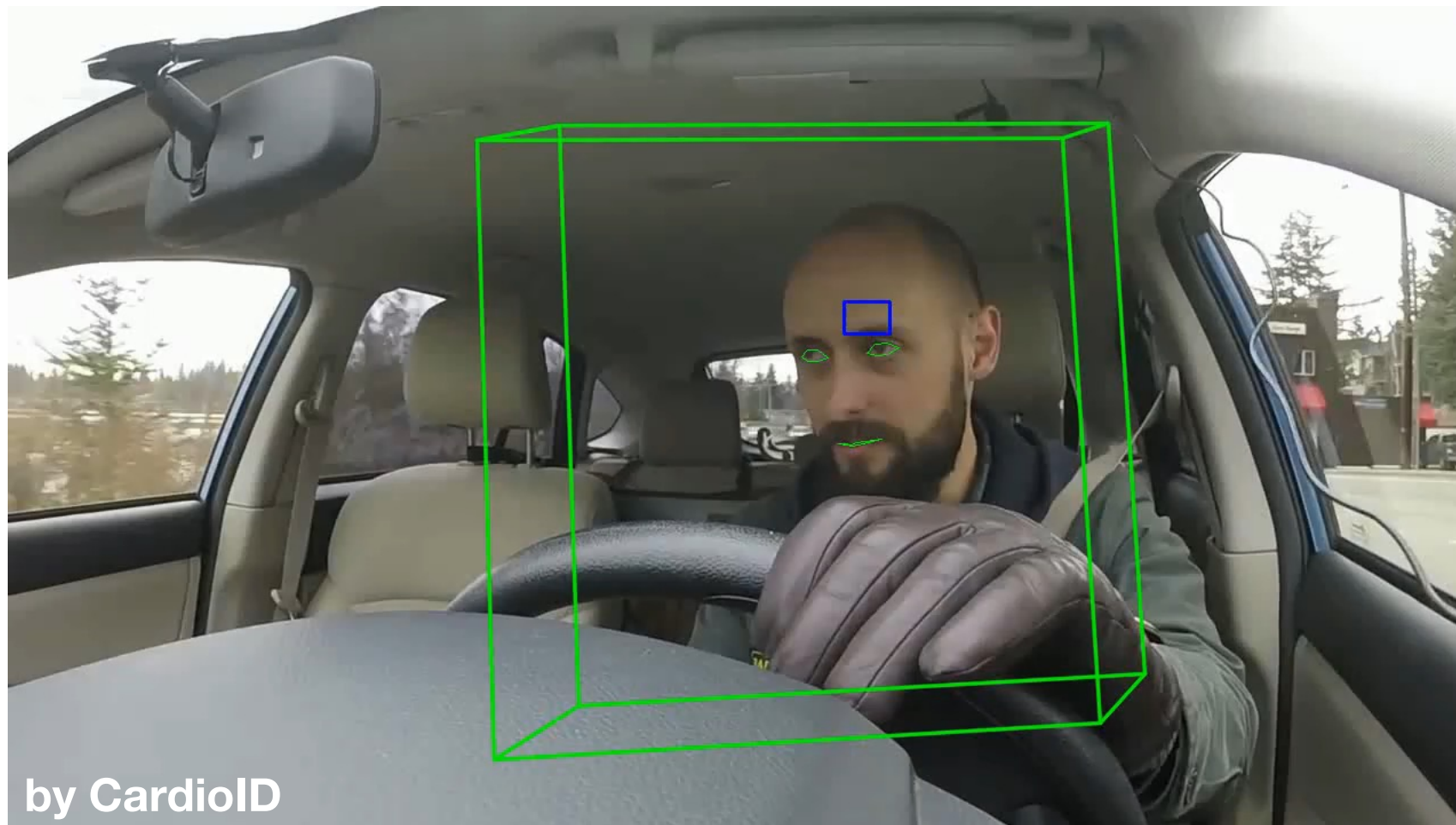
# AUTOMOTIVE

## AUTOMATIC multiMODal drowsiness detection for smart VEHICLES



- Simulator for real and synthetic data
- Signal and Image processing for ECG data and video
- Machine learning: learning from imbalanced data; transfer learning
- Integration the driver status monitoring system in a concept car.

# AUTOMOTIVE



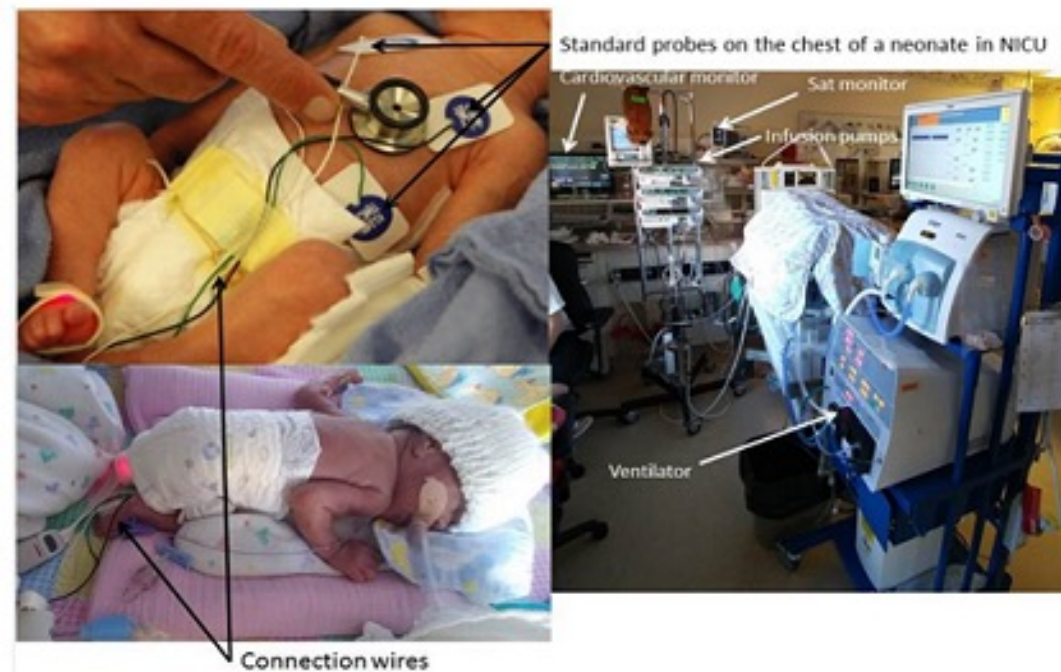
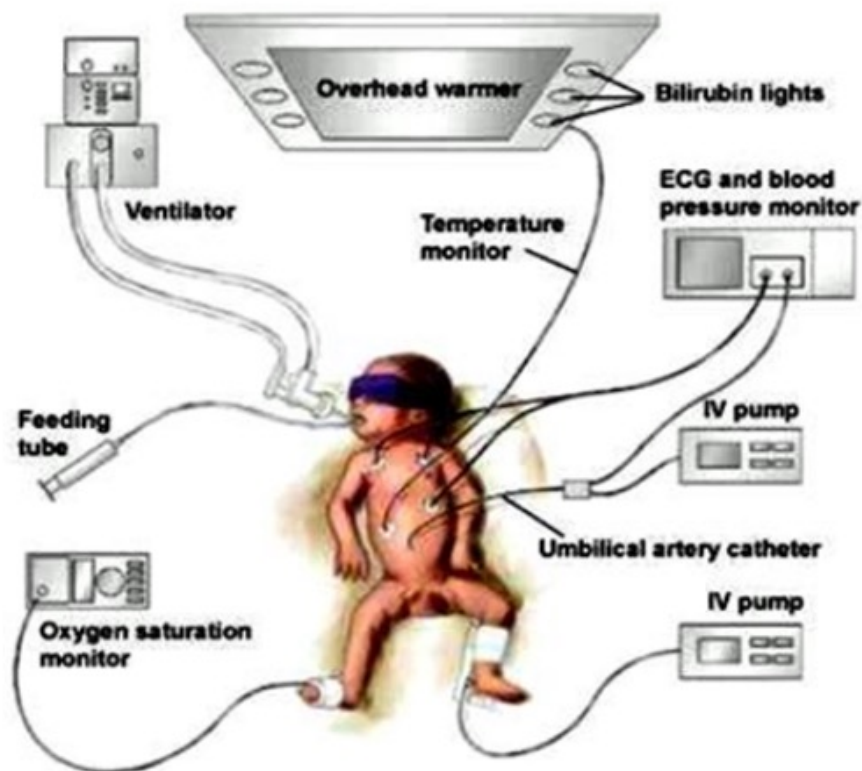
by CardioID

# MICOS - Preterm Infants Monitoring



**CMIN**  
CENTRO MATERNO  
INFANTIL DO NORTE  
CH PORTO

## MICOS - Monitoring Infants with a Contactless Solution



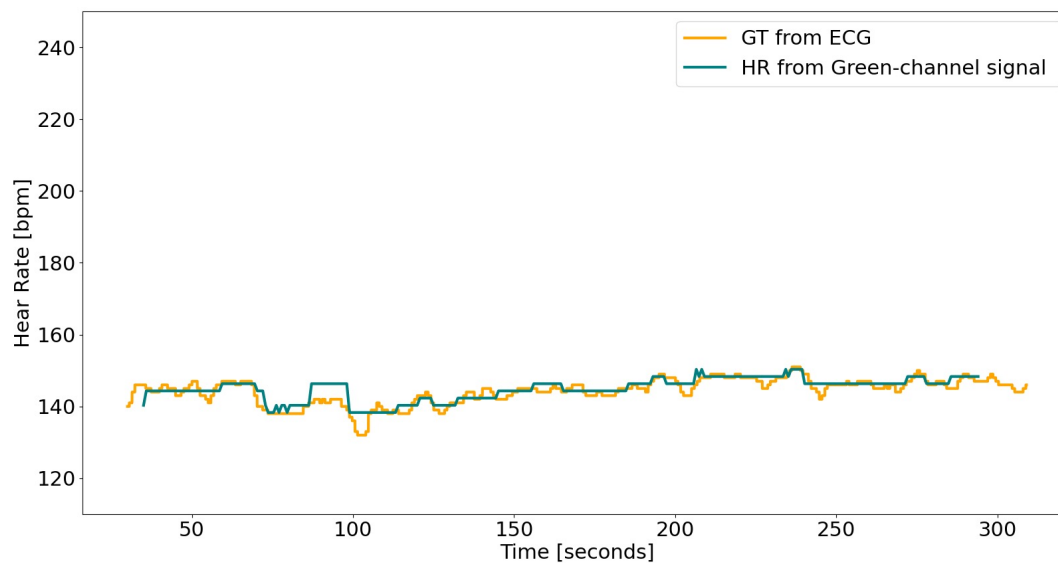


# MICOS - Preterm Infants Monitoring



**CMIN**  
CENTRO MATERNO  
INFANTIL DO NORTE  
CH PORTO

- Heart Rate Detection



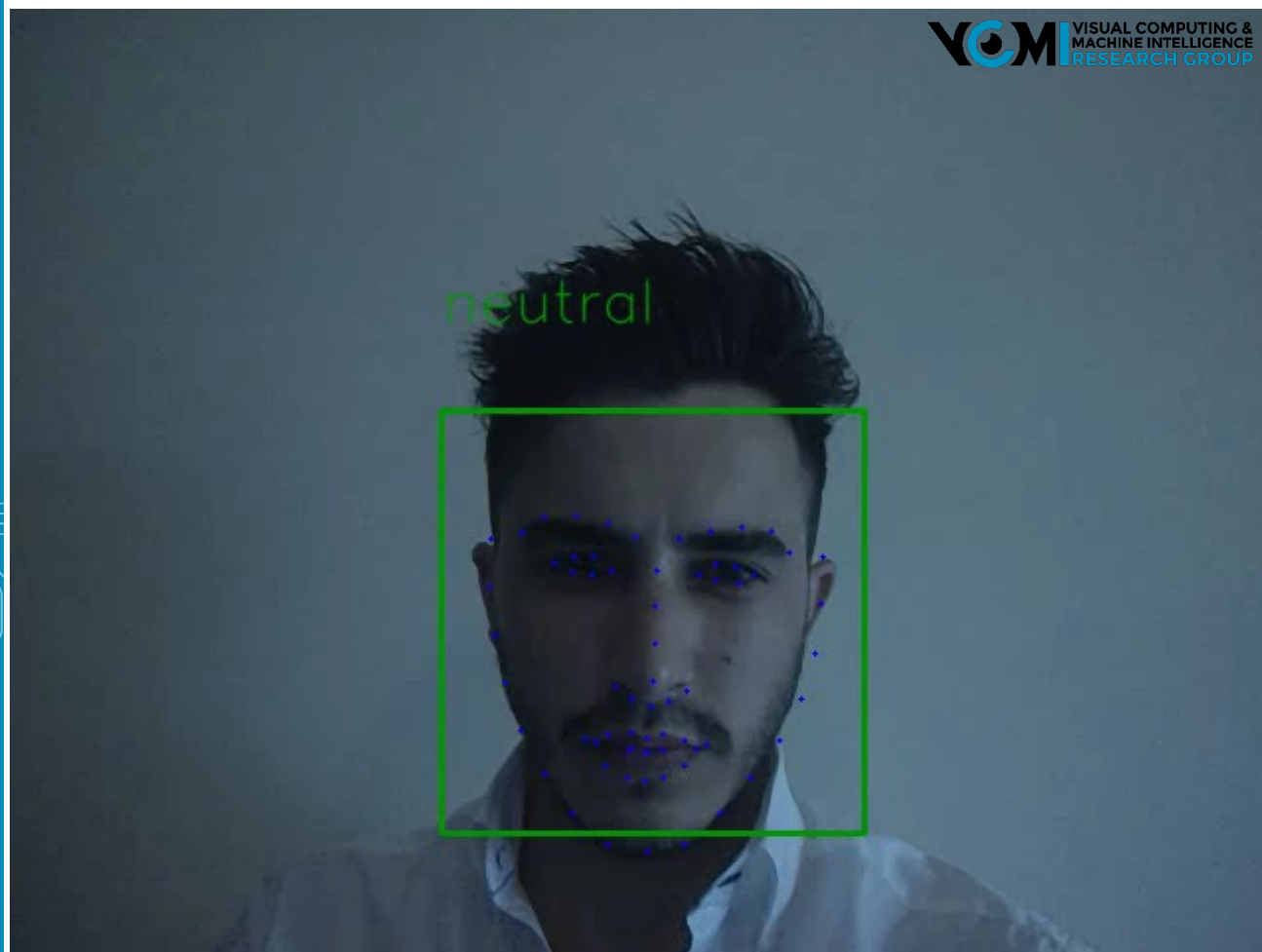
# MICOS - Preterm Infants Monitoring

- Monitoring Pulse (magnified)
- Monitoring Respiratory rate (magnified)

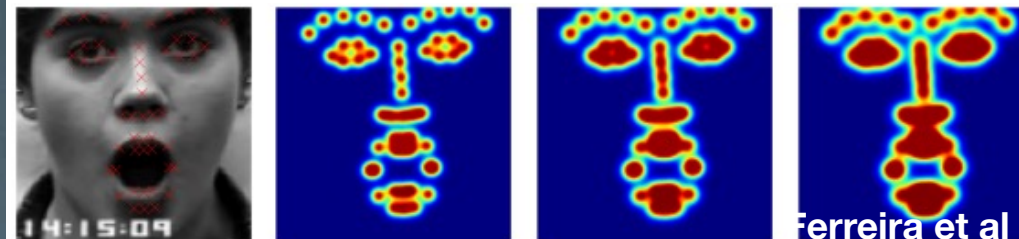




# Emotion Recognition & Sign Language Analysis



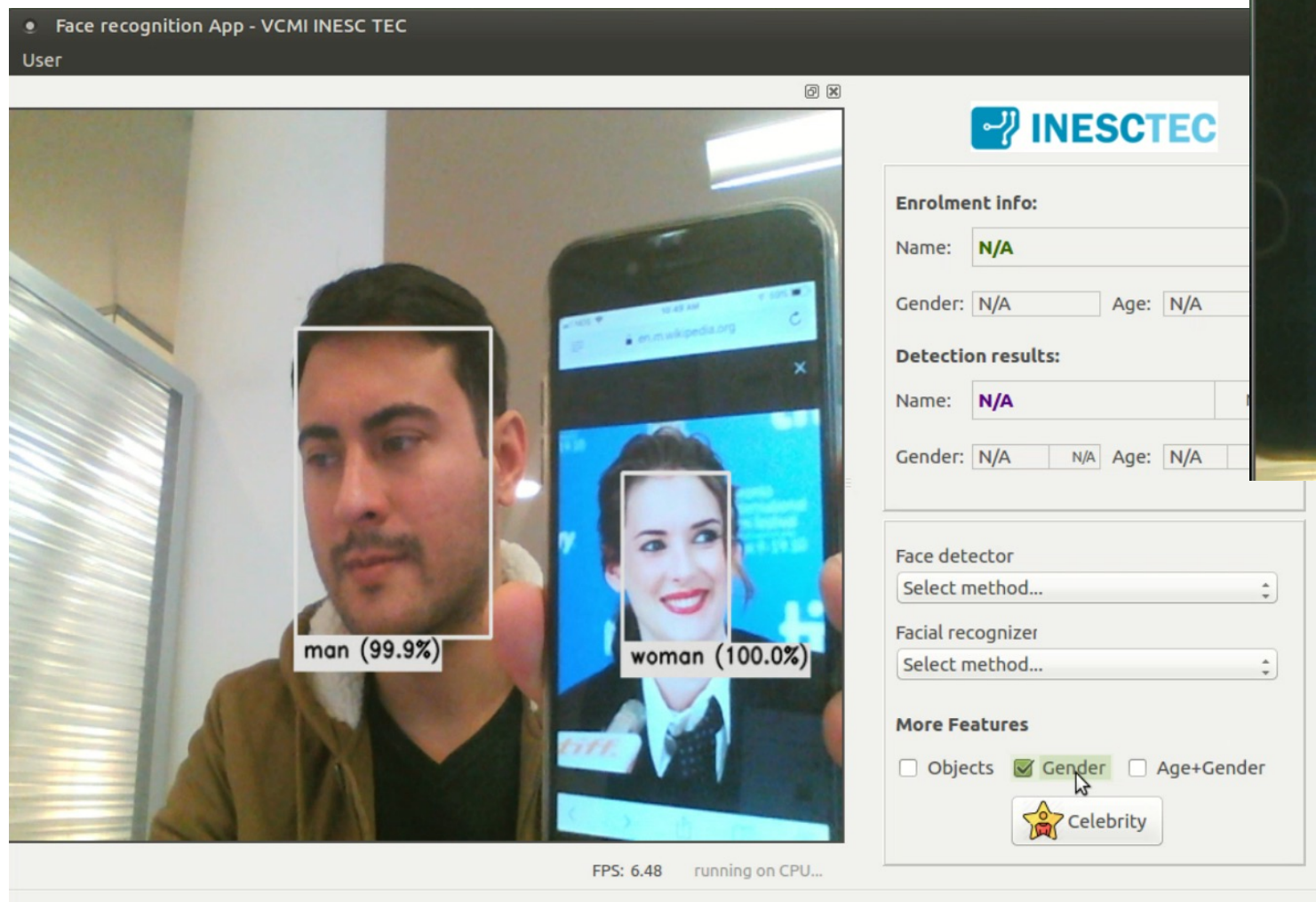
Automatic recognition of human emotions from face images



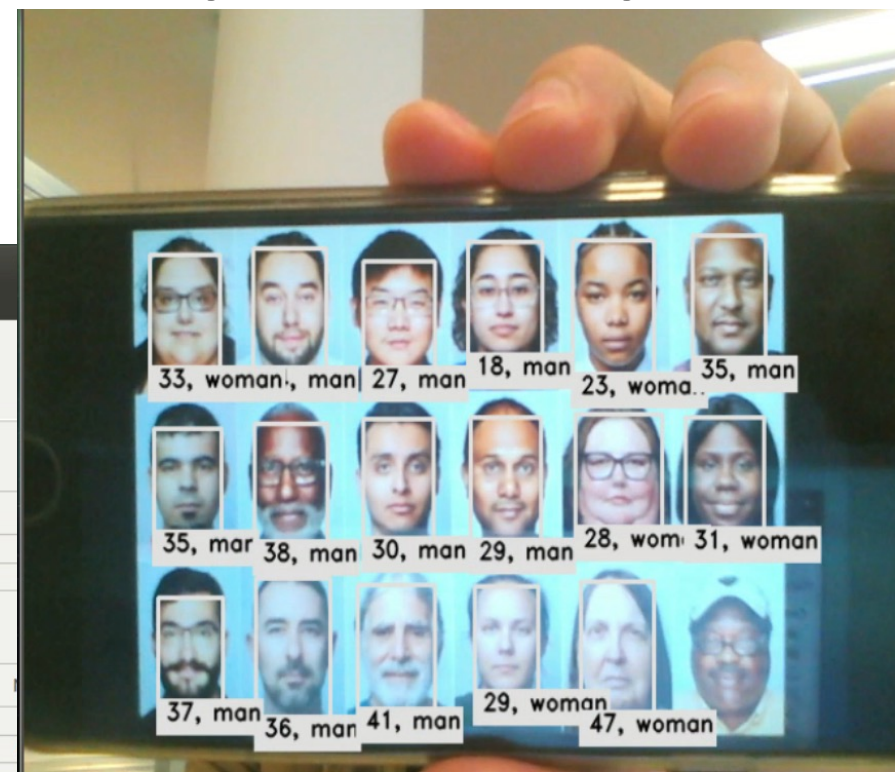
Subject invariant sign language

# Face & Scene Analytics

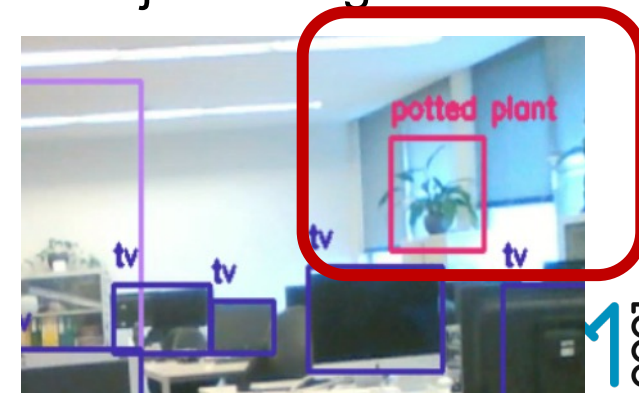
## Gender recognition



## Age + Gender recognition

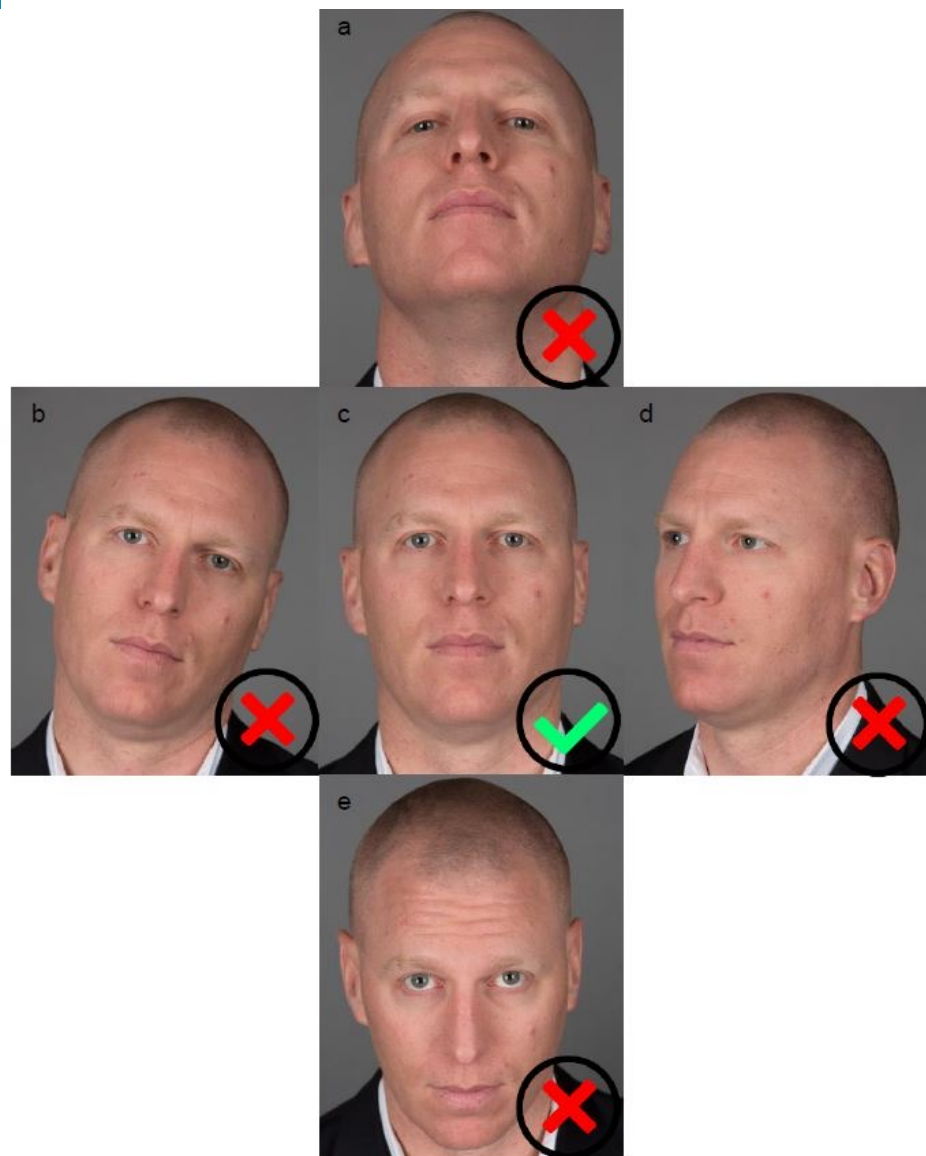


## Object recognition



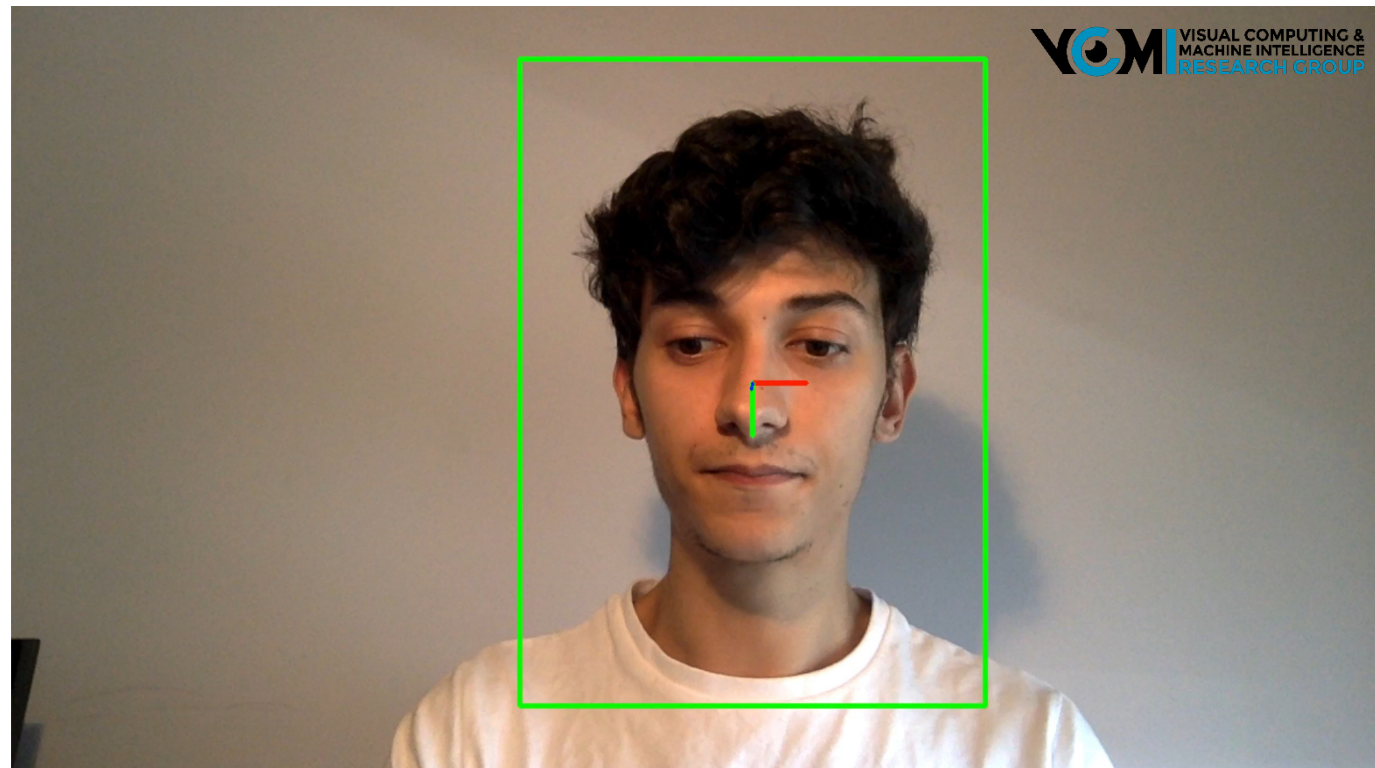


# ICAO guidelines for MRTD

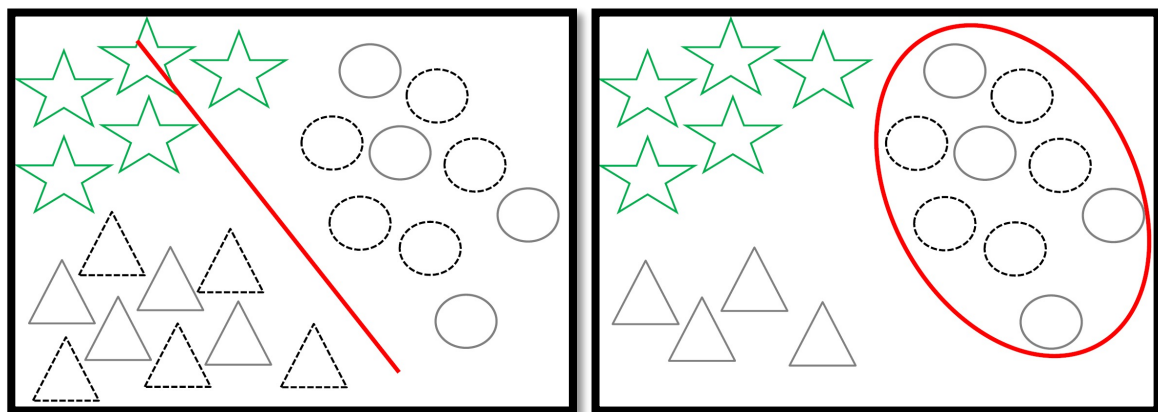


—a) Too large pitch up, b) Too large roll angle, c) Compliant portrait, d) Too large yaw angle, e) Too large pitch down.

## Head Pose Detection

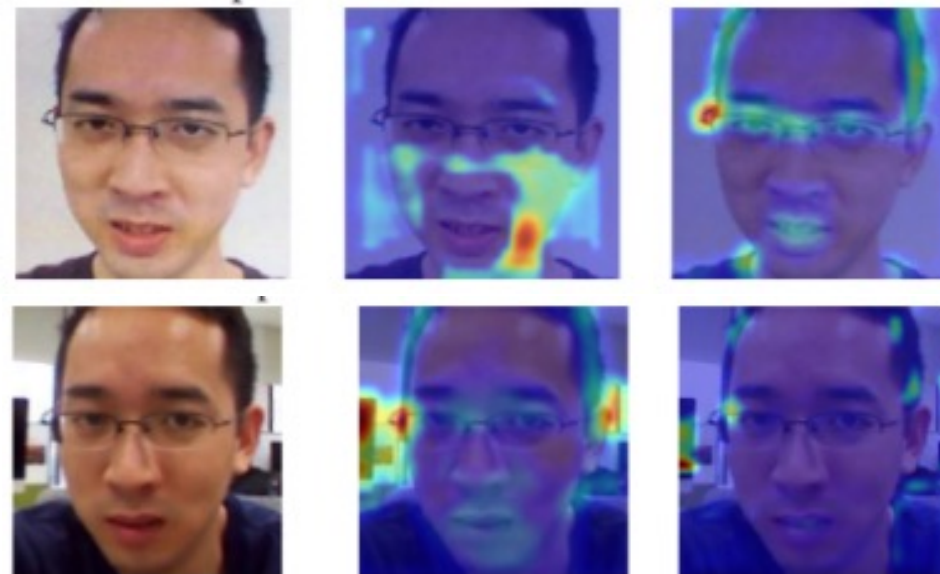


# Anti-spoofing + XAI for Biometrics



## Biometric Presentation Attack Detection

How can the model distinguish a real sample from an unknown type of fake samples?



## XAI for Face Presentation Attack Detection

Is it a real face, a printed photo, a screen, or a cutout mask?

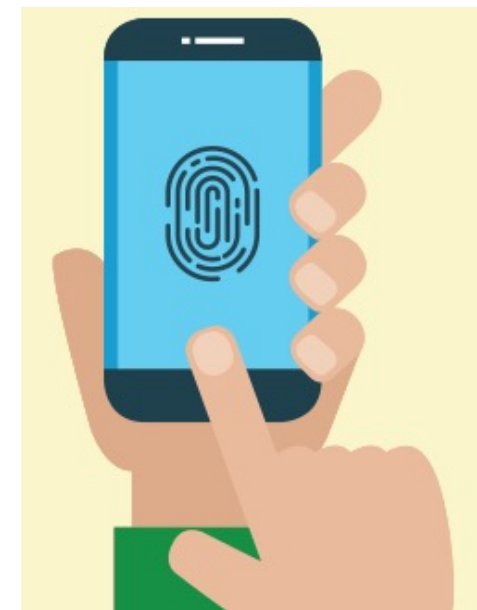
How can the model distinguish these?

# Recognition + Anti-spoofing + XAI

## Kiosk for Border control



## Mobile Biometrics







Reach us @ <http://vcmi.inesctec.pt>



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# VISUAL COMPUTING AND MACHINE INTELLIGENCE

MAKING COMPUTERS A LITTLE BIT SMARTER

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