FaceQnet:
A Deep Learning Face Quality Measure

Javier Galbally

European Commission – DG Joint Research Centre
Unit E.3: Cyber and Digital Citizens' Security

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NIST-EAB Workshop on Face Image Quality

Joint
Research
Centre

FaceQnet: Brought to you by UAM + DG JRC

European Commission

UAM: BIDA Lab

Universidad Autónoma de Madrid

BIOMETRICS

http://biometrics.eps.uam.es/

European Commission

EC: DG-JRC E.3

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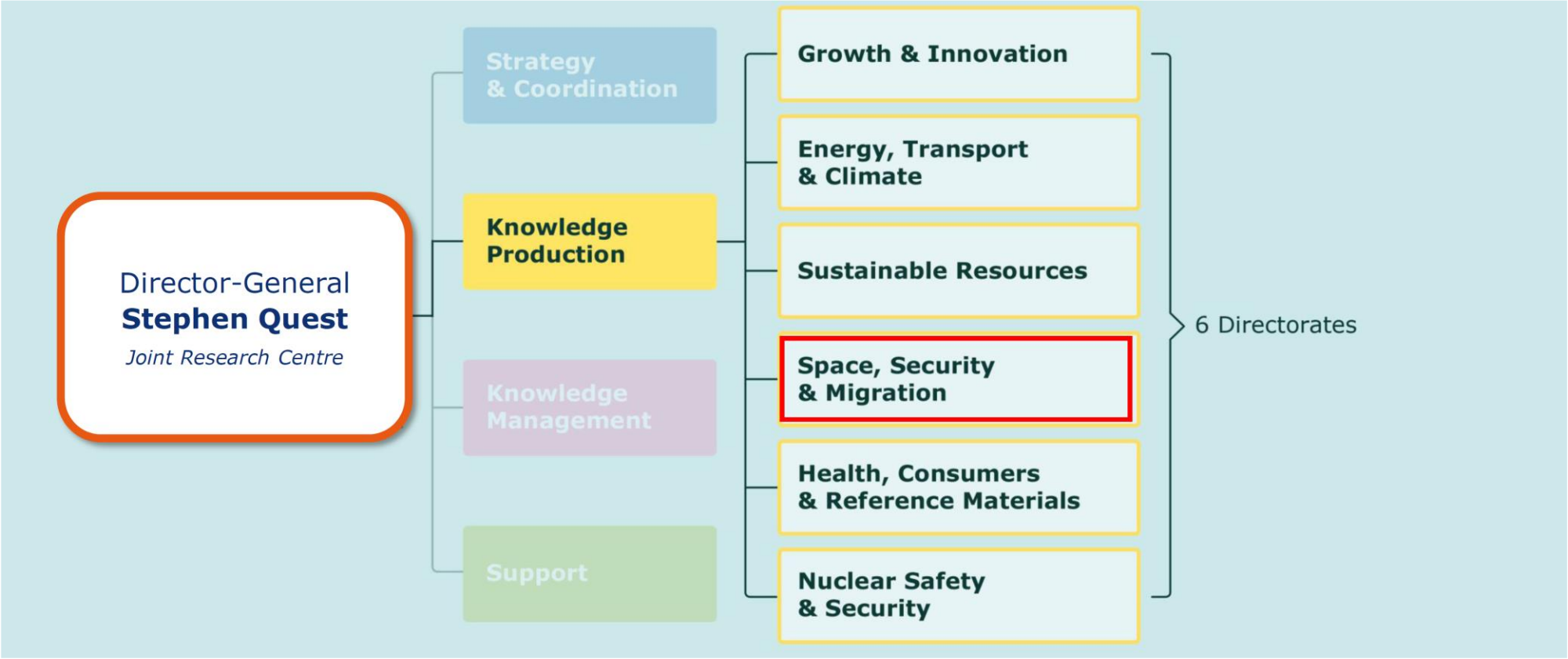
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FaceQnet: Initial Remarks

FaceQnet: A predictor of accuracy

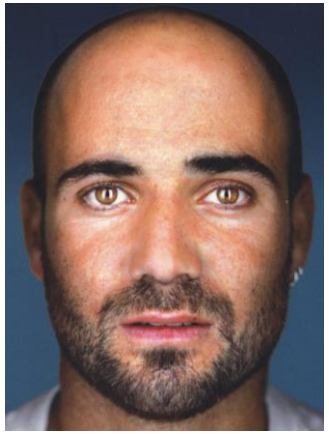
UTILITY DEFINITION:

Biometric quality

is a **PREDICTOR** of

biometric accuracy

FaceQnet: One input one single score

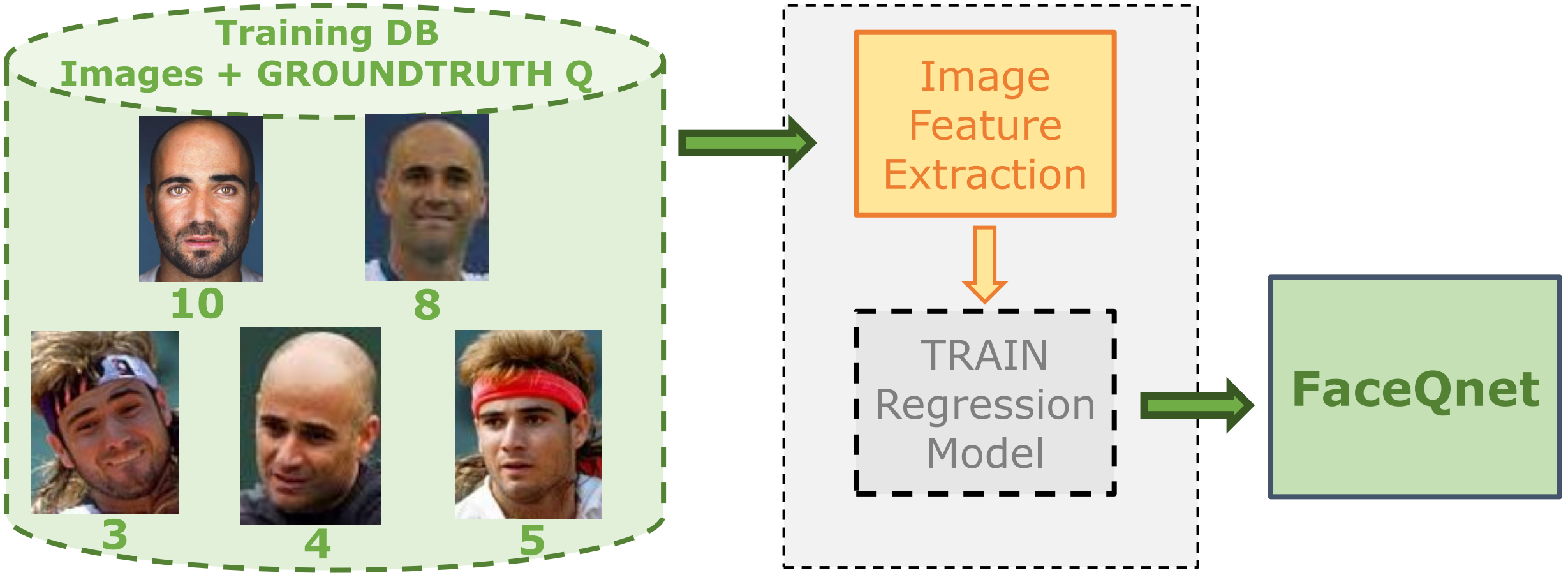


FaceQnet → 10

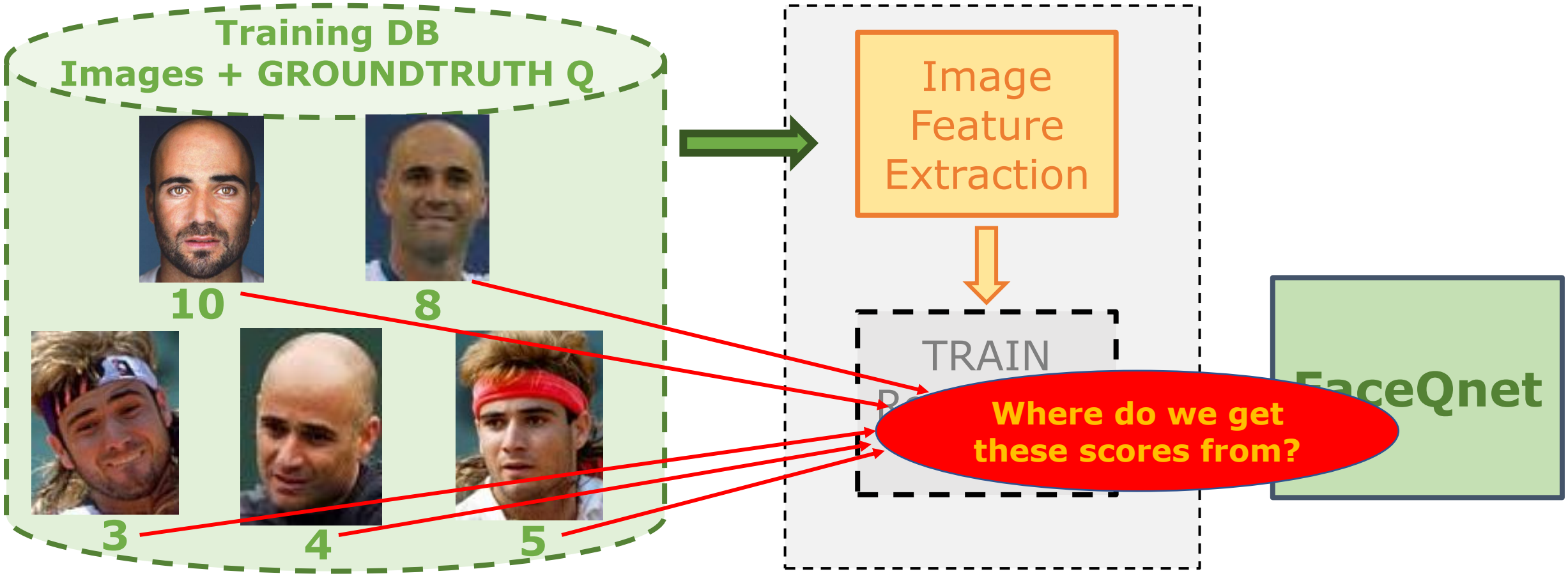
FaceQnet → 3

Development of FaceQnet: Challenges and solutions

FaceQnet at a glance



CHALLENGE 1: Groundtruth scores



CHALLENGE 1: Groundtruth scores

CHALLENGE 1

Definition of the GROUNDTRUTH quality scores

(Quality is a SUBJECTIVE concept,
how can we define the OBJECTIVE groundtruth scores?)

CHALLENGE 1: Groundtruth scores

We want to predict accuracy (i.e., mated comparison scores) so…

Let’s use mated comparison scores as groundtruth quality scores

CHALLENGE 1: Groundtruth scores

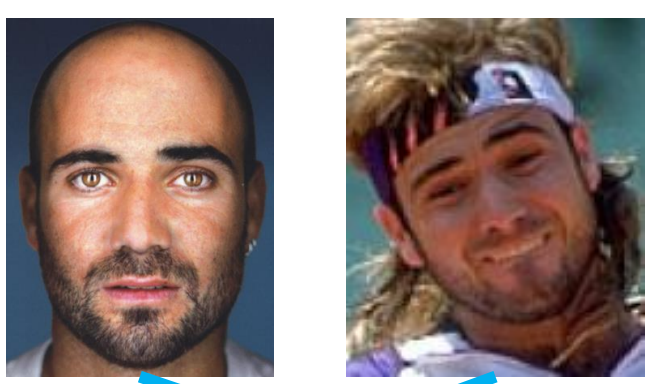
The quality paradox

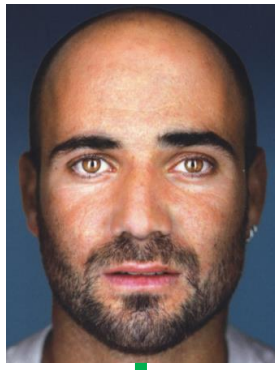
With only **ONE input**

we have to **predict** the output

of a system with **TWO inputs**

CHALLENGE 1: Groundtruth scores





FR System

Biometric Q-measure

Comparison Score: 3

(Prediction of…)

Quality Score: 10

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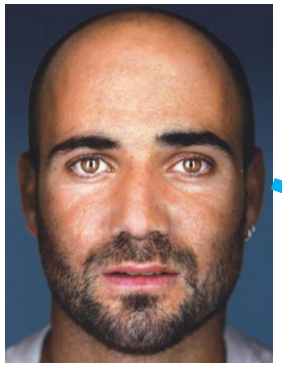
CHALLENGE 1: Groundtruth → Our solution

Sample A: **PERFECT** quality **(10/10)**



Sample B: Other quality **(3/10)**

FR System

Comparison Score: 3

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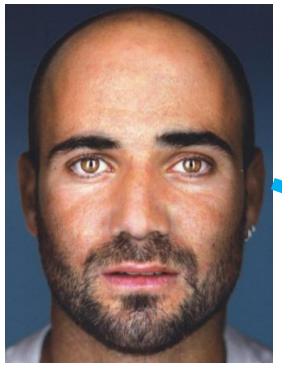
CHALLENGE 1: Groundtruth → Our solution

Sample A: **PERFECT** quality **(10/10)**



Sample B: Other quality **(3/10)**

Comparison Score: 3

QUALITY Groundtruth for…

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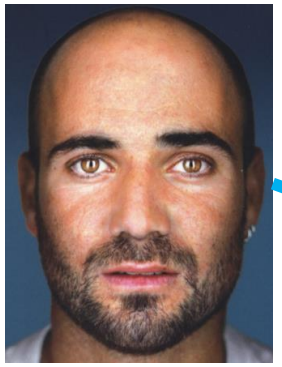
CHALLENGE 1: Groundtruth → Our solution

Sample A: **PERFECT** quality **(10/10)**



Sample B: Other quality **(3/10)**

Use multiple training systems to minimise system dependency!

FR System

Comparison Score: 3

QUALITY Groundtruth for…

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CHALLENGE 1: Groundtruth → Our solution

HYPOTHESIS:

Given a sample A of perfect quality

and a sample B of any quality,

the comparison score will reflect the quality of sample B

- It predicts machine accuracy
- Machines do not get tired
- Fully scalable

Who defines "PERFECT" quality?

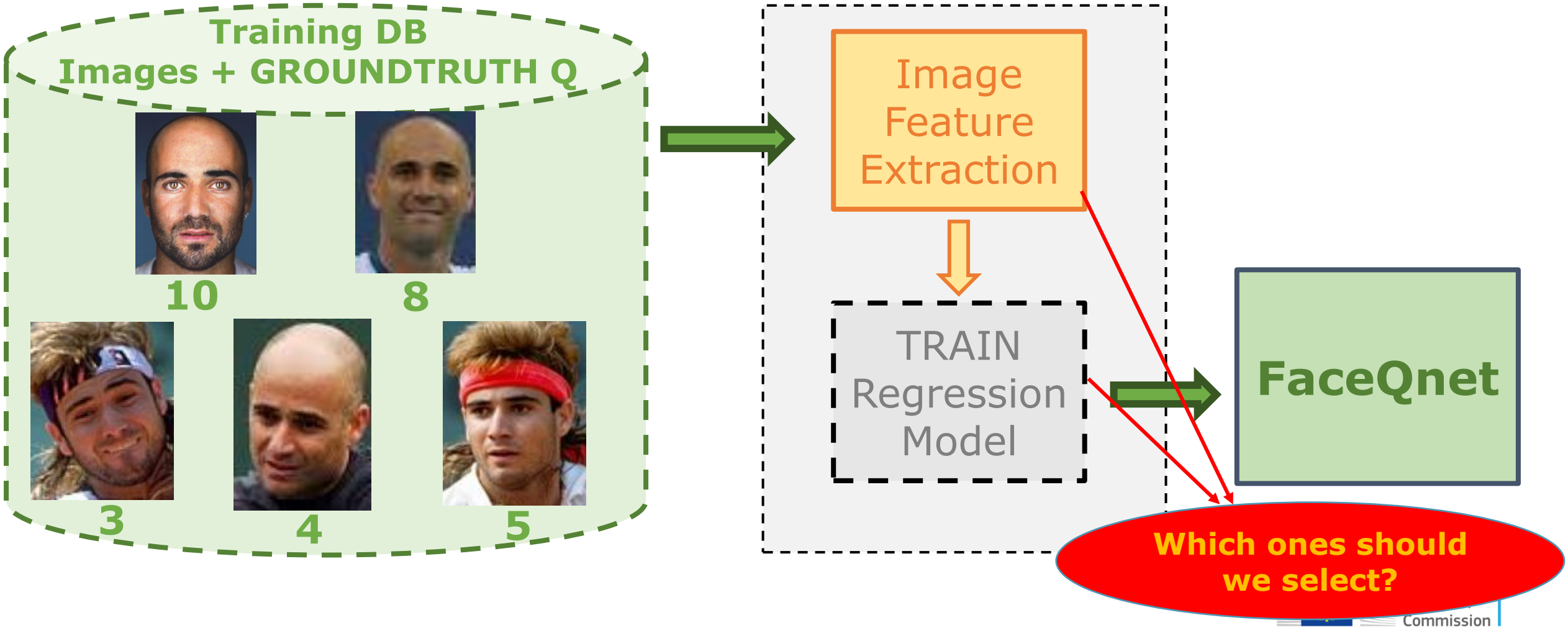
CHALLENGE 1: Groundtruth → Our solution

PERFECT quality is referred to compliance with

ISO/IEC 39794-5

(MRTD requirements, ICAO)

CHALLENGES 2+3: Feature Extraction + Reg. Model



CHALLENGE 2+3: Our solution

DEEP LEARNING

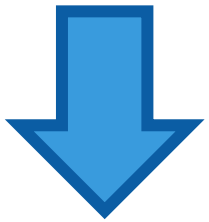
(if you cannot beat the machine, let her do it)

Deep Learning sounds good but, IT NEEDS A GREAT AMOUNT OF TRAINING DATA

CHALLENGE 2+3: Our solution

HYPOTHESIS:

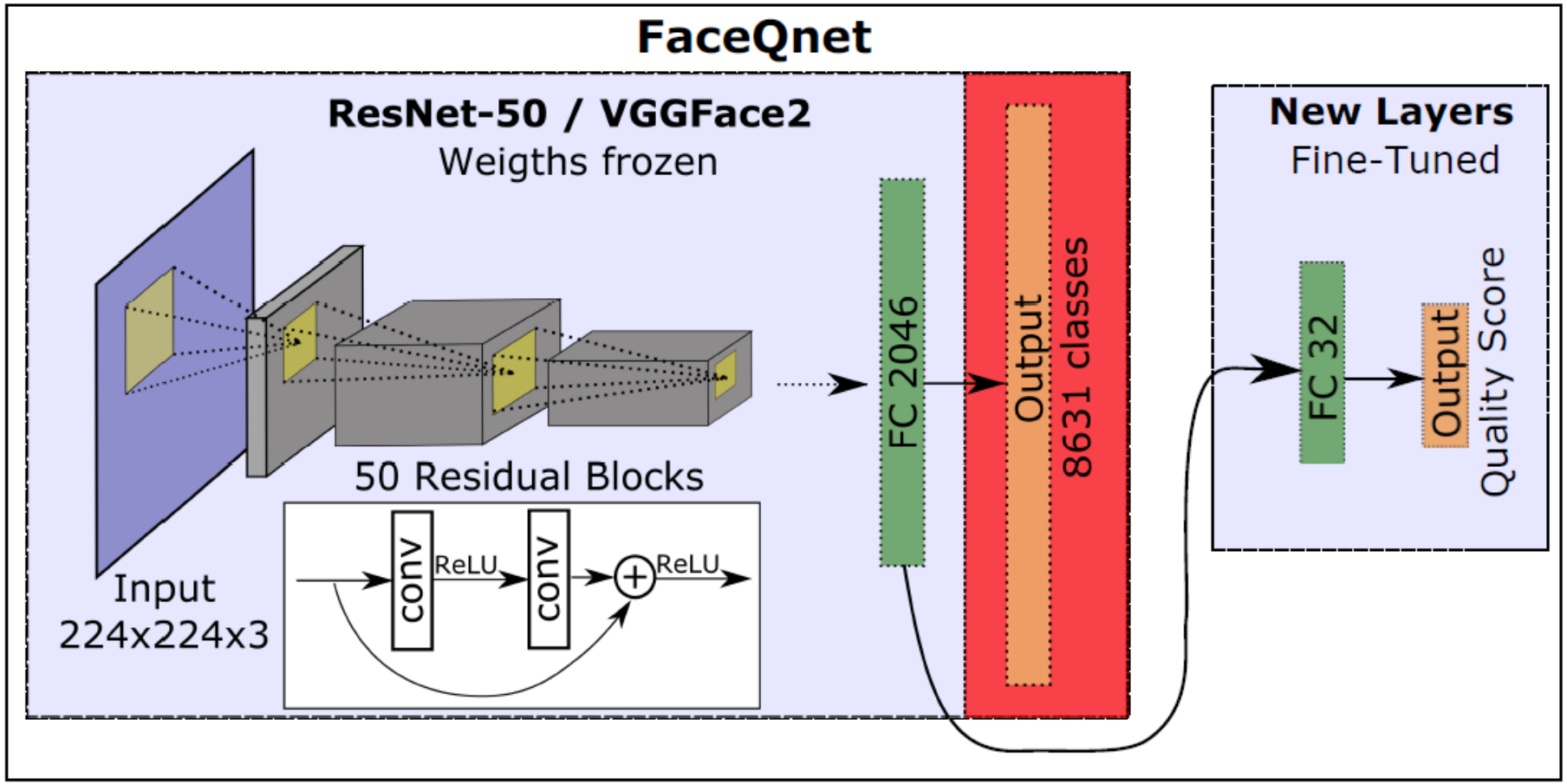
Features that comprise the identity of faces (ACCURACY), are expected to also comprise the information of their QUALITY



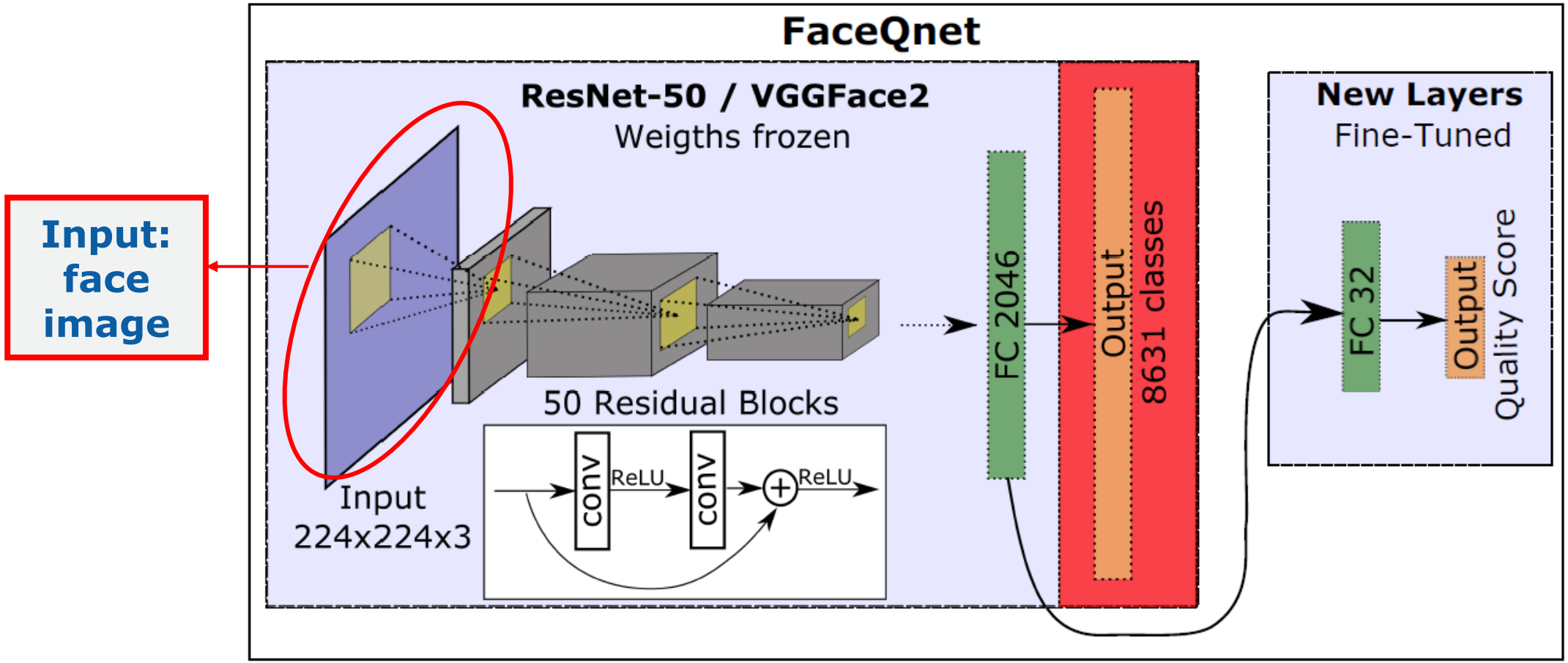
Knowledge transfer

Use a CNN trained for FR as basis for Q-estimation

CHALLENGE 2+3: Our solution



CHALLENGE 2+3: Our solution



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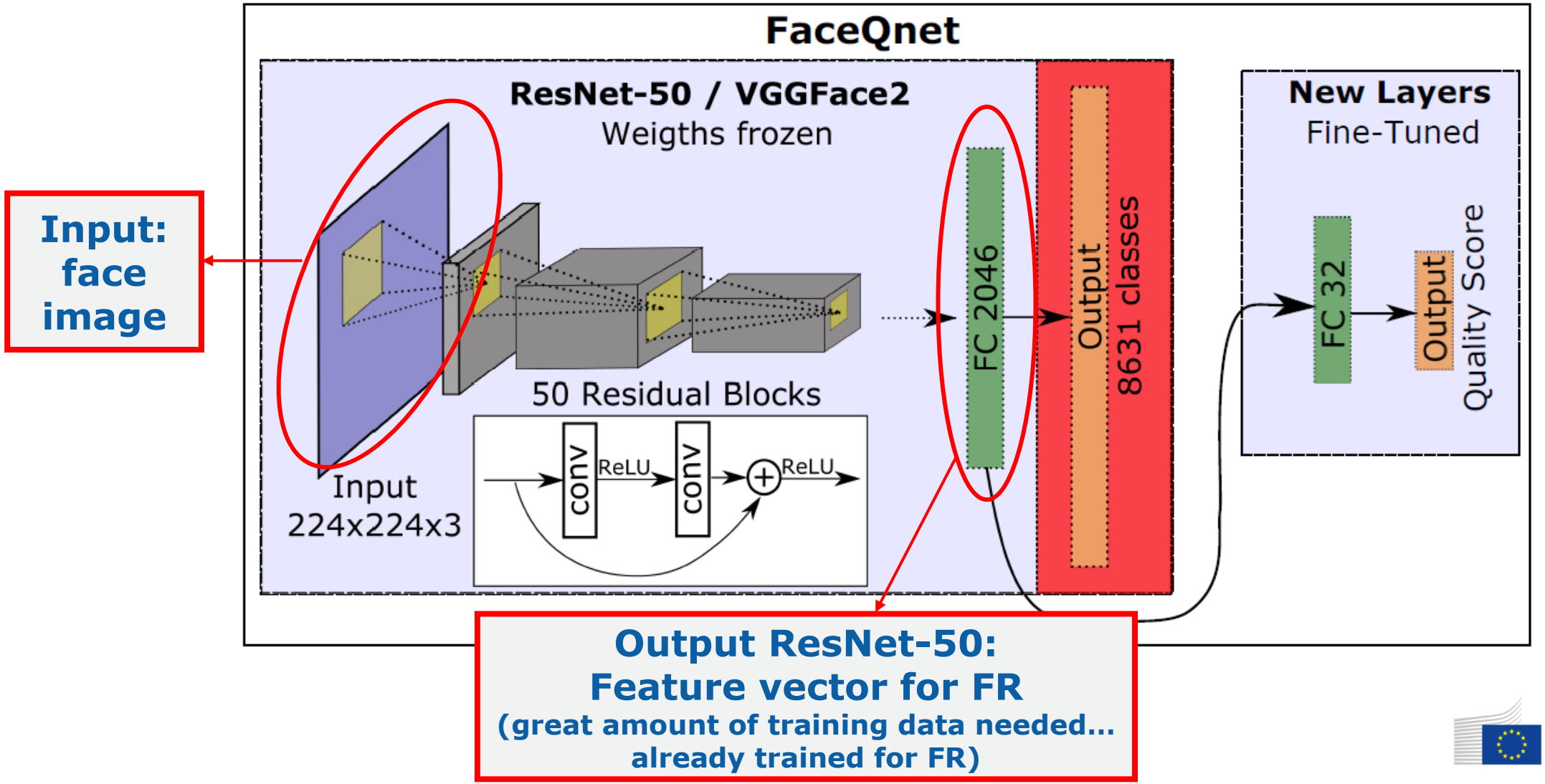
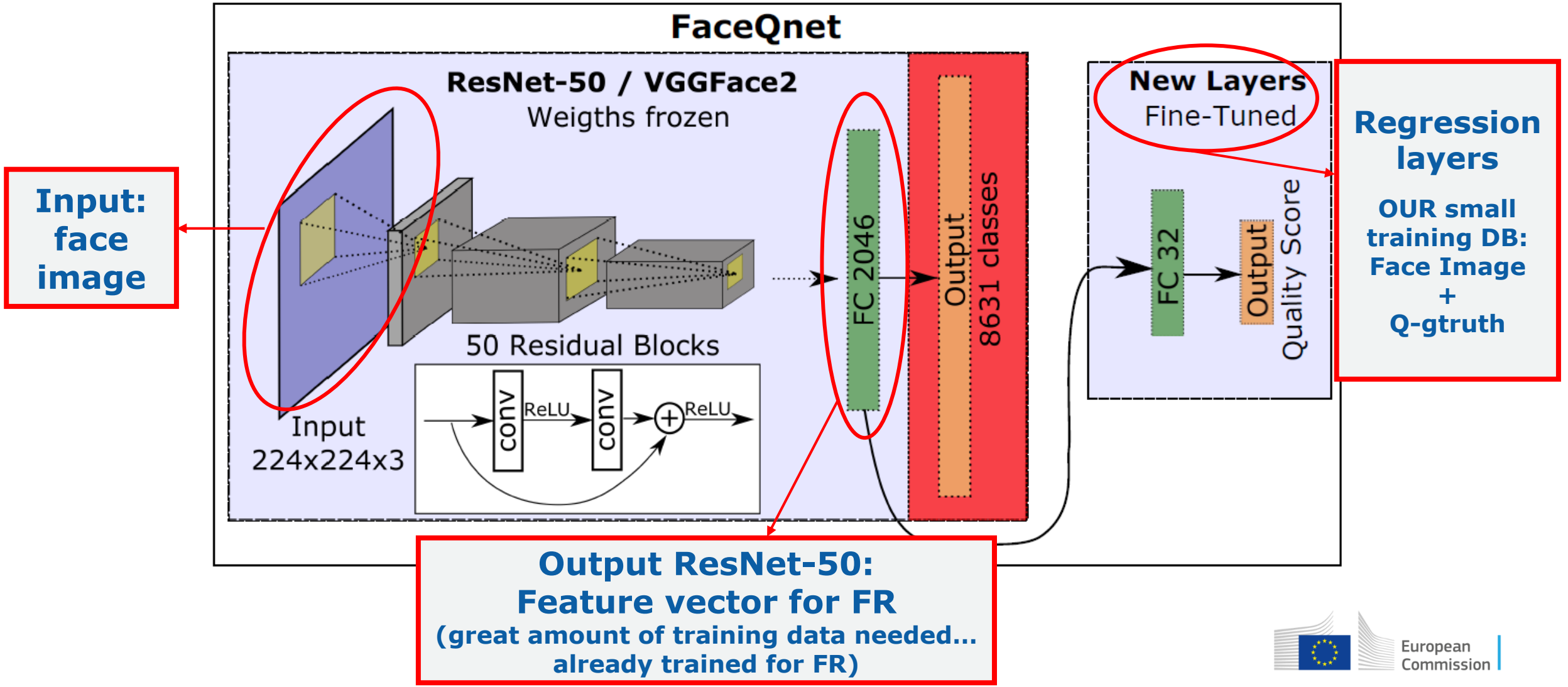


CHALLENGE 2+3: Our solution



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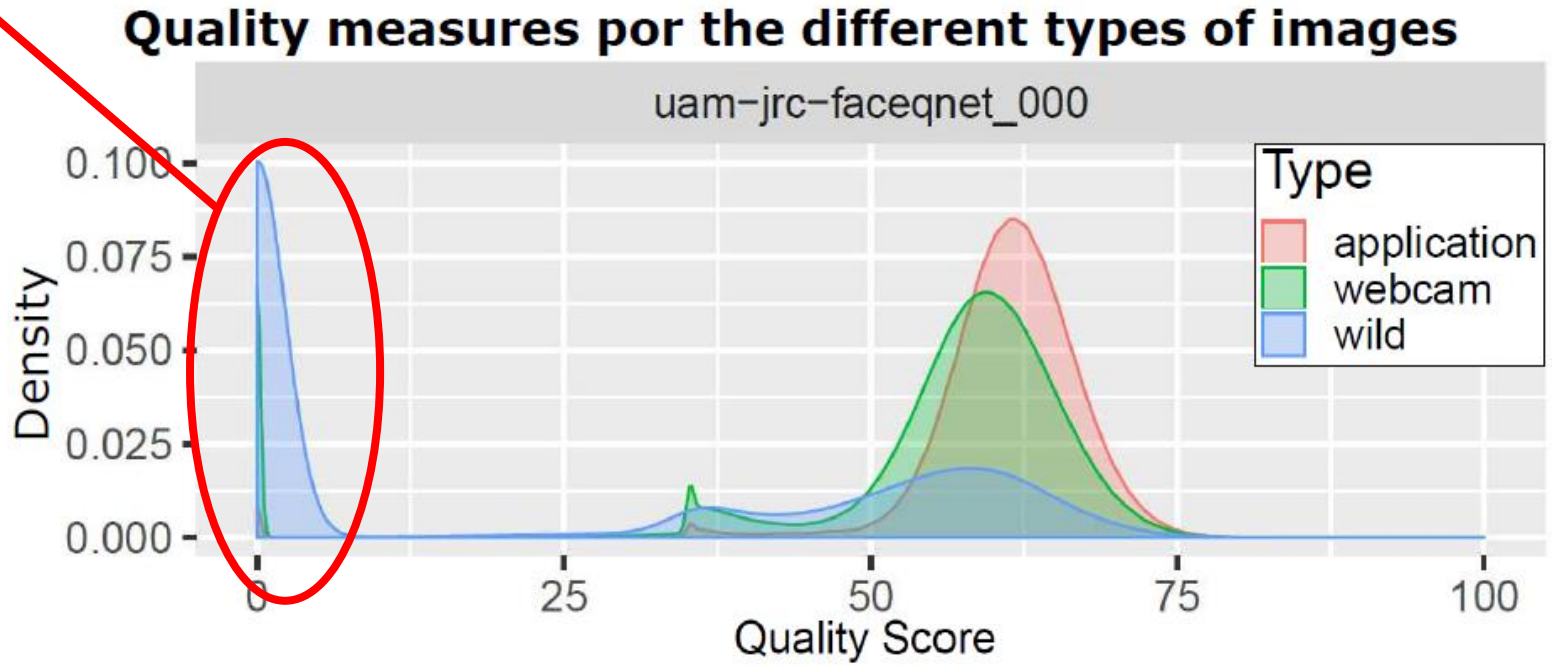
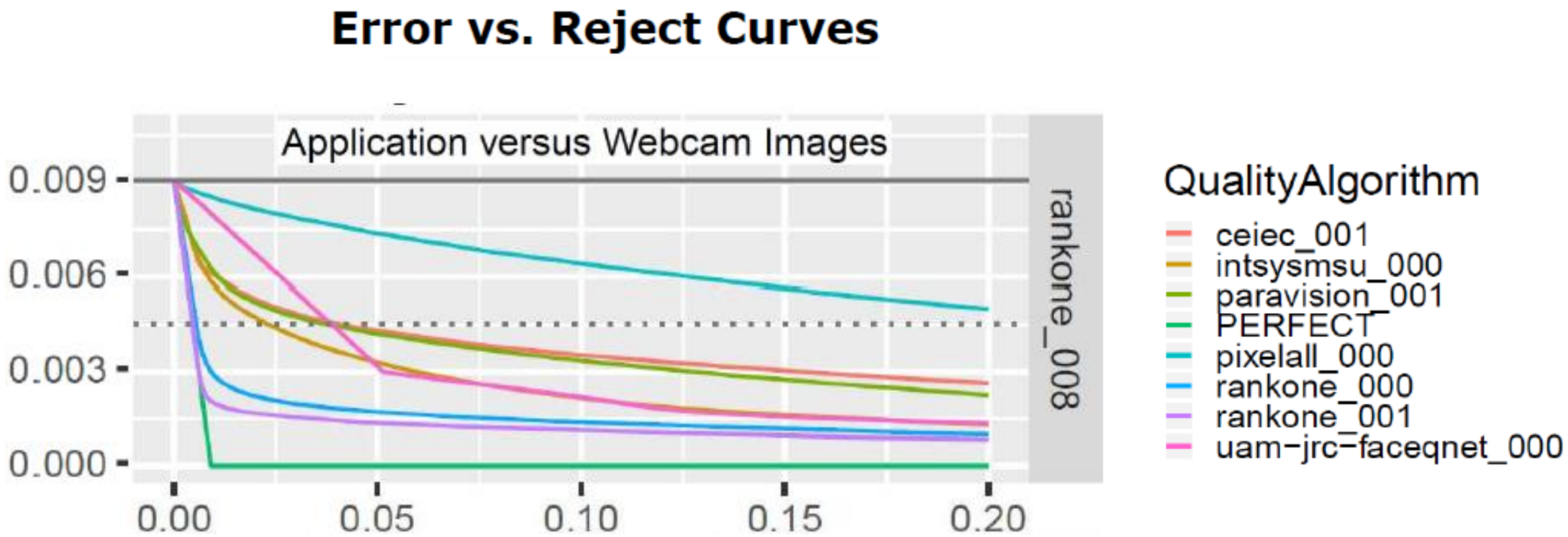
FaceQnet_v0 @ NIST FRVT: Initial Results

Issue



FaceQnet_v0 @ NIST FRVT: Initial Results



FaceQnet: What we have

FACE QUALITY: Deep-learning based, machine-produced groundtruth

GOAL: Contribute to ISO/IEC 29794-5 → get to NFIQ2 for face

INDEPENDENTLY ASSESSED: NIST FRVT Ongoing Quality Evaluation

OPEN SOURCE: https://github.com/uam-biometrics/FaceQnet

FURTHER READING:
J. Hernandez-Ortega, J. Galbally, J. Fierrez and L. Beslay,
"Biometric Quality: Review and Application to Face Recognition with FaceQnet", arXiv:2006.03298 [cs.CV], 2021
https://arxiv.org/abs/2006.03298

FaceQnet: What we are working on

TRAINING DB: ICAO compliant + other quality

SYSTEM DEPENDENCY: Add more face comparators

LOW QUALITY: Improve discerning low quality images

Thank you

javier.galbally@ec.europa.eu

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