# WORKSHOP ON FACE IMAGE QUALITY
# Facial image quality related problems and applications

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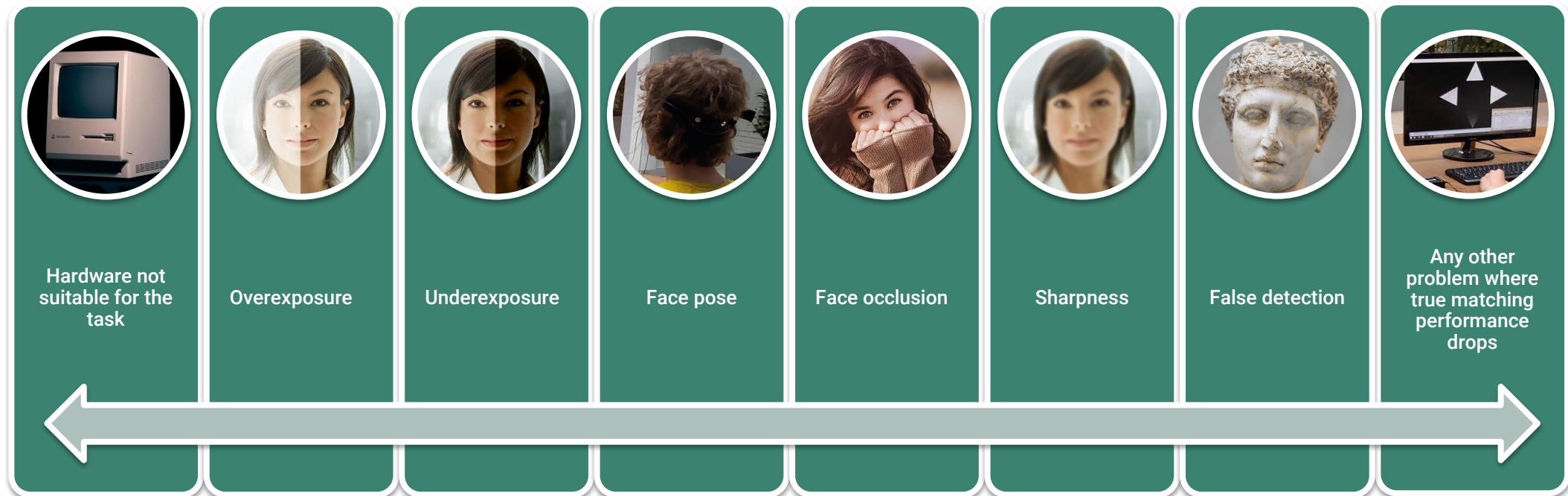17th November 2021

# Mainly how we view face quality metric

Let's call it a filter which is used for keeping the biometrics system healthy.

In particular keeping the biometrics database clean from problematic impressions

which  have a high probability of generating *false positives* or *true negatives*.

# WHAT PROBLEMS CAN WE HAVE ?
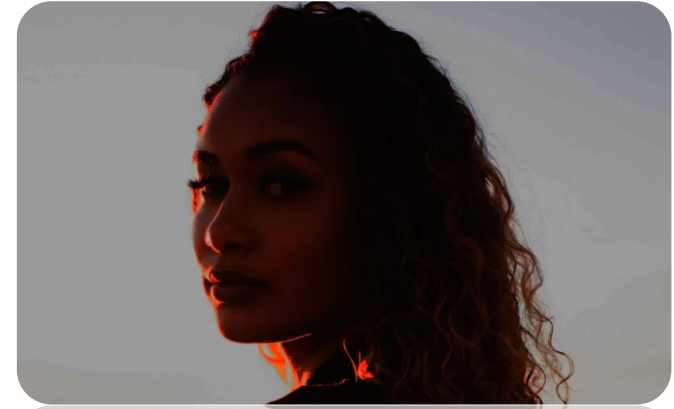


**Hardware not suitable for the task**

**Overexposure**

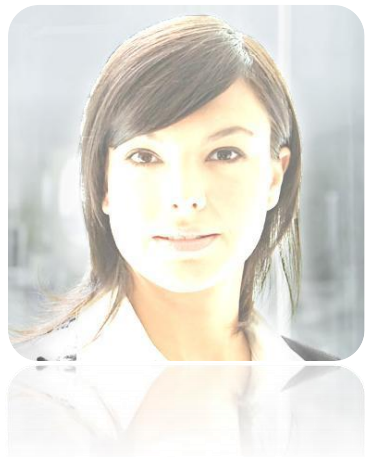**Underexposure**

**Face pose**

**Face occlusion**

**Sharpness**

**False detection**

**Any other problem where true matching performance drops**

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# HARDWARE NOT SUITABLE FOR THE TASK

Too far

Too light

Too dark

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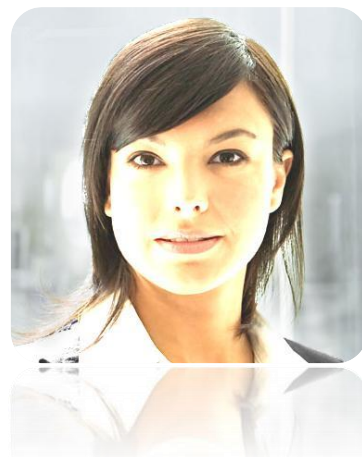# OVEREXPOSURE



1          2          3          4          5

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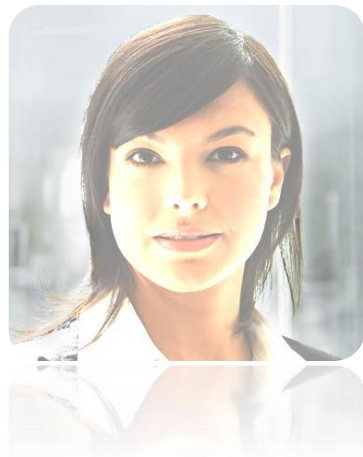
# UNDEREXPOSURE



1          2          3          4          5

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# FACE POSE



1 2 3 4 5

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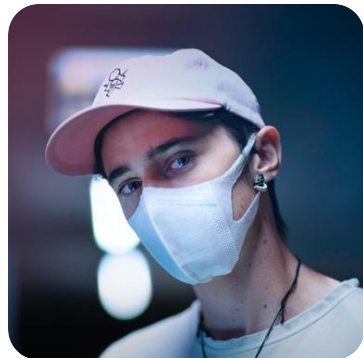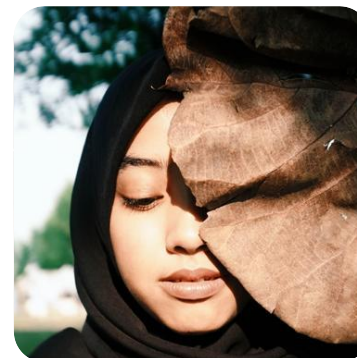
1          2          3          4          5

# FACE SHARPNESS



| 1 | 2 | 3 | 4 | 5 |

# FALSE DETECTION



1        2        3        4        5

# DIFFERENT SCENARIOS OF FACE CAPTURING

**SUPERVISED** capturing with the **possibility of recapture.**

**UNSUPERVISED** capturing with the **possibility of recapture.**

**UNSUPERVISED** capturing with **no possibility of recapture.**

**PRE COLLECTED DATA** fixed set of data collected  with or **without any quality metrics applied.**

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## SUPERVISED capturing with the possibility of recapture.

- Hardware is selected to provide the best possible quality.

- Face capture scene is prepared according to ICAO standard.

- All the quality and ICAO compliance features can be estimated automatically and recapture can be requested if needed by the supervisor.

- In this scenario face images usually are compliant with Portrait Quality (Reference Facial Images for MRTD).

- **Our related product**
  **MegaMatcher ABIS**

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## UNSUPERVISED capturing with the possibility of recapture.

- Hardware is selected to provide the best possible quality.

- Face capture scene can be prepared.

- All the quality features can be estimated automatically and recapture can be requested if needed without the need of the supervisor.

- In this scenario face images usually are good quality as bad quality images are recaptured.

- Our related product :
  ## Ncheck Bio Attendance

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- Hardware can be selected to provide the best possible quality.

- Face capture scene can't be prepared. Faces can have different lighting conditions, pose, sharpness and etc.

- All the quality features can be estimated automatically and the quality algorithm can estimate which impressions of the faces are suitable for facial recognition.

- In this scenario face images usually are bad quality.

- Our related product
  **SentiVeillance SDK**

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## PRE COLLECTED DATA fixed set of data collected with or without any quality metrics applied

- Hardware cannot be selected as images cannot be recaptured.

- Face capture scene can't be prepared. As images have already been captured.

- All the quality features can be estimated automatically and the quality algorithm can estimate which impressions of the face are suitable for facial recognition.

- As quality metrics can't be applied during the collection of data, the database can have various quality images.

- Several Examples:
  - NIST FRVT evaluation
  - Re enrollment of old database

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# FACE QUALITY PROBLEMS/SOLUTIONS DURING PANDEMIC

- One of the problems in face image is occlusion.
- Before the pandemic facial masks were very uncommon and could be marked as bad quality regarding facial occlusion.
- During the pandemic, facial masks became mandatory in public places.
- Facial quality algorithm had to adapt and make exceptions regarding facial occlusions and especially masks.

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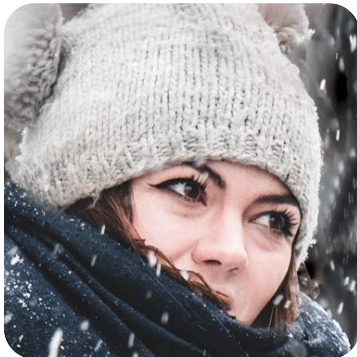
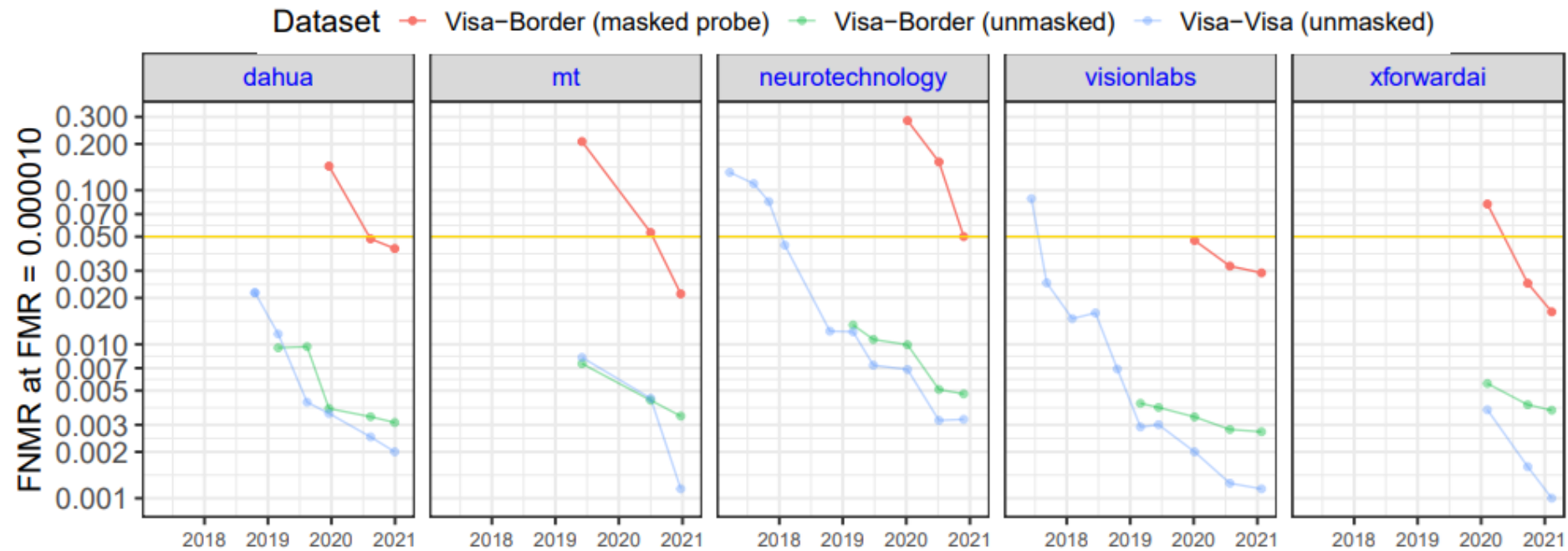# CHANGES OF ACCURACY RELATED TO FACIAL MASK



Figure 1: Examples of developer evolution of accuracy on masked and unmasked datasets.

See Figures 10, 5, and 11

**NISTIR 8331 Draft Supplement, Part 6B: Face recognition accuracy with face masks using post-Covid-19 algorithms 2021/03/04**

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# POSSIBLE QUALITY VARIATIONS

Single value quality, as a predictor of true matching performance.

Multiple value quality, as several predictors of true matching performance.

Multiple value quality + ICAO checks.

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# SHOULD WE HAVE ONE GENERAL FACE QUALITY ALGORITHM LIKE NFIQ?

- **Pros**
  - Positive impact on recognition accuracy.
  - Effective filtering of matching scenarios.
  - Possibility to gather a range of facial and environment statistics.

- **Cons**
  - Trade Off between complexity, accuracy and speed.
  - Limited control over different scenarios.

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# WHAT WOULD HELP FOR FURTHER DEVELOPMENT OF FACE QUALITY/RECOGNITION?

Knowing global problems of facial recognition algorithms in general.

Estimating which part of the facial recognition algorithm should fix it.

Evolving facial quality and recognition algorithms together.

**The key to progress is problem identification and elimination.**

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# THANK YOU FOR YOUR ATTENTION!

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