ICPR 2020
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Milan, Italy 10 | 15 January 2021

DEEPRETAIL2020
2nd WORKSHOP ON DEEP UNDERSTANDING SHOPPER BEHAVIOURS AND INTERACTIONS IN INTELLIGENT RETAIL ENVIRONMENTS
Milan, Italy 11 January 2021

Performance assessment of face analysis algorithms with occluded faces

Authors

A. Greco, A. Saggese, M. Vento, V. Vigilante

MIVIA .DIEM UNIVERSITÀ DEGLI STUDI DI SALERNO

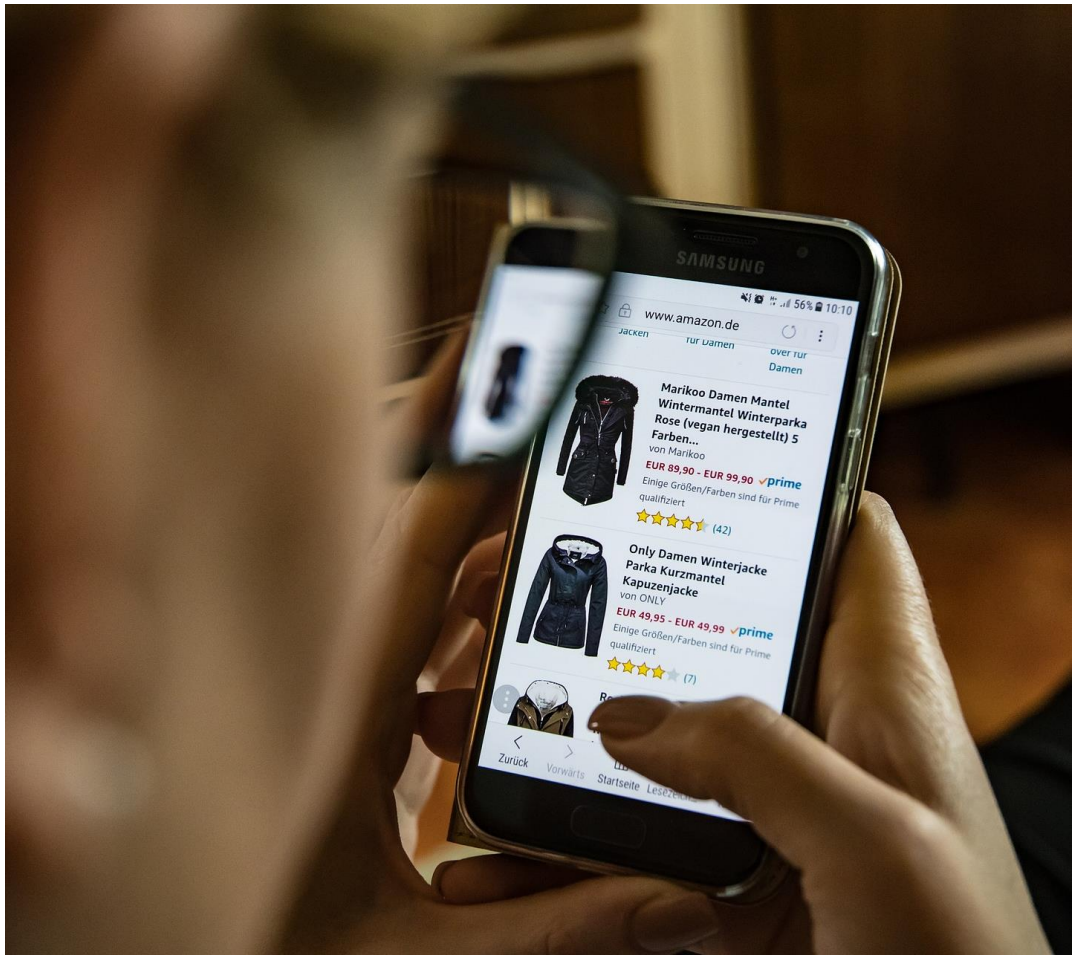
I-MALL
IMPROVE THE CUSTOMER EXPERIENCE BY COMPUTER VISION

AI Tech

Research partially supported by the Italian MIUR within PRIN 2017 grants, Projects Grants iMALL; partially supported by A.I. Tech-srl

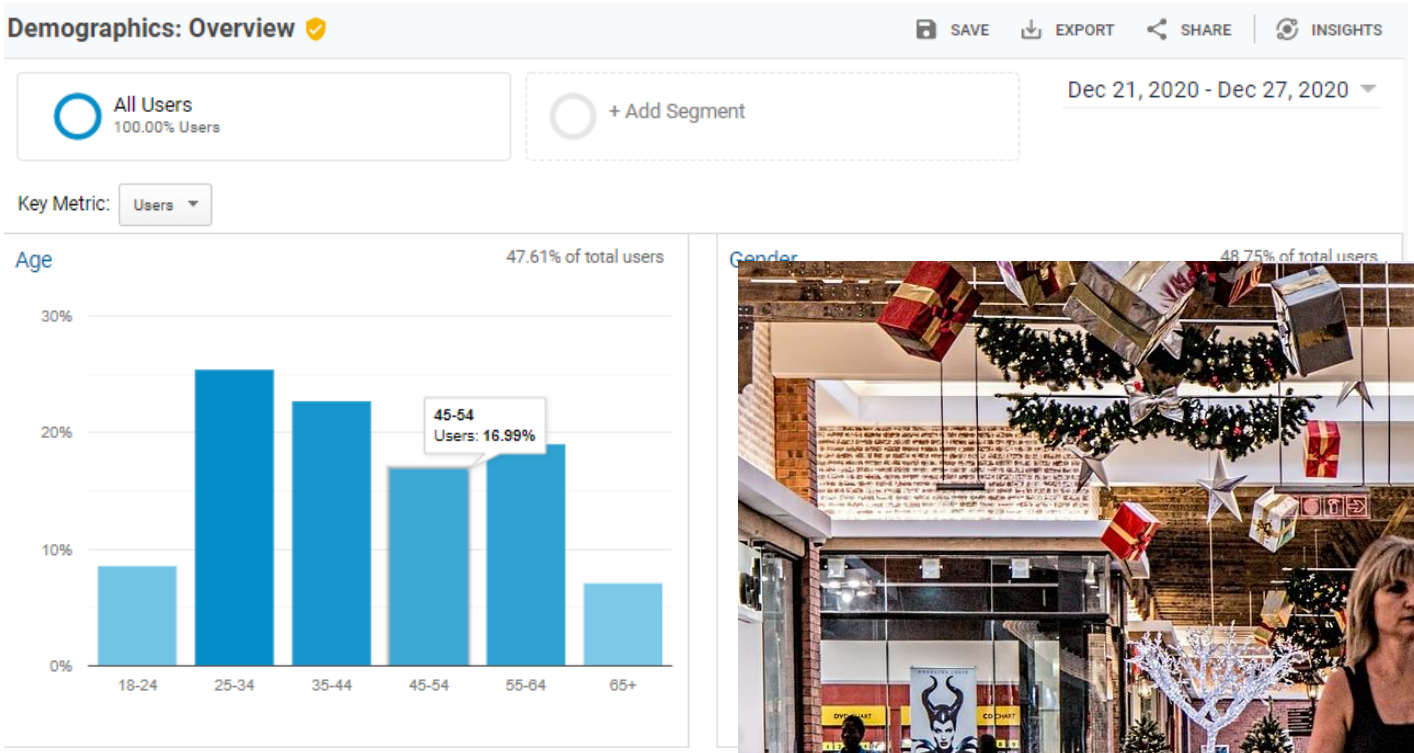
Information is power

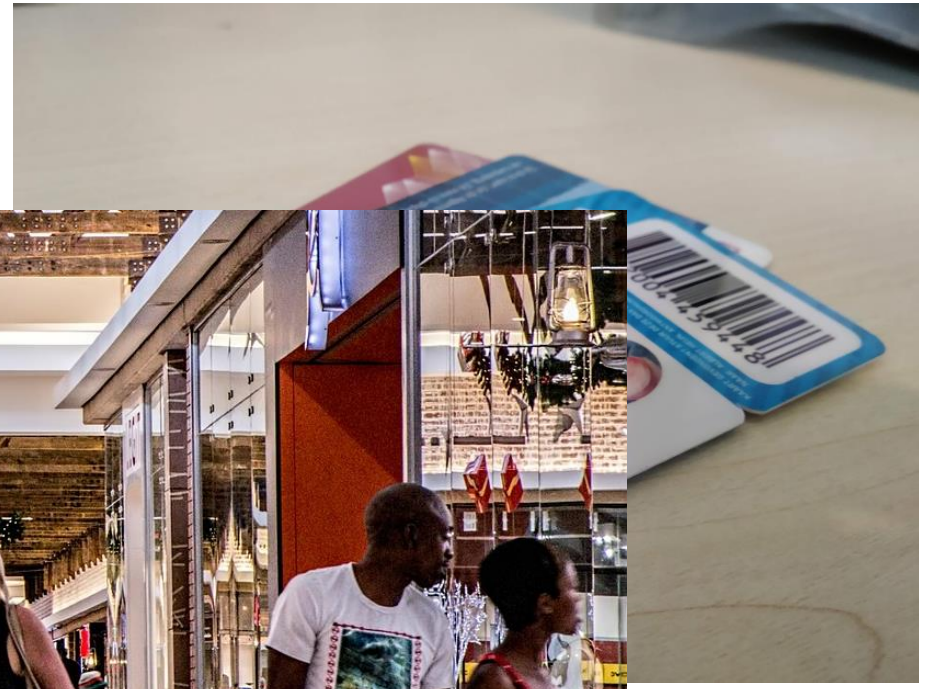
Online shopping

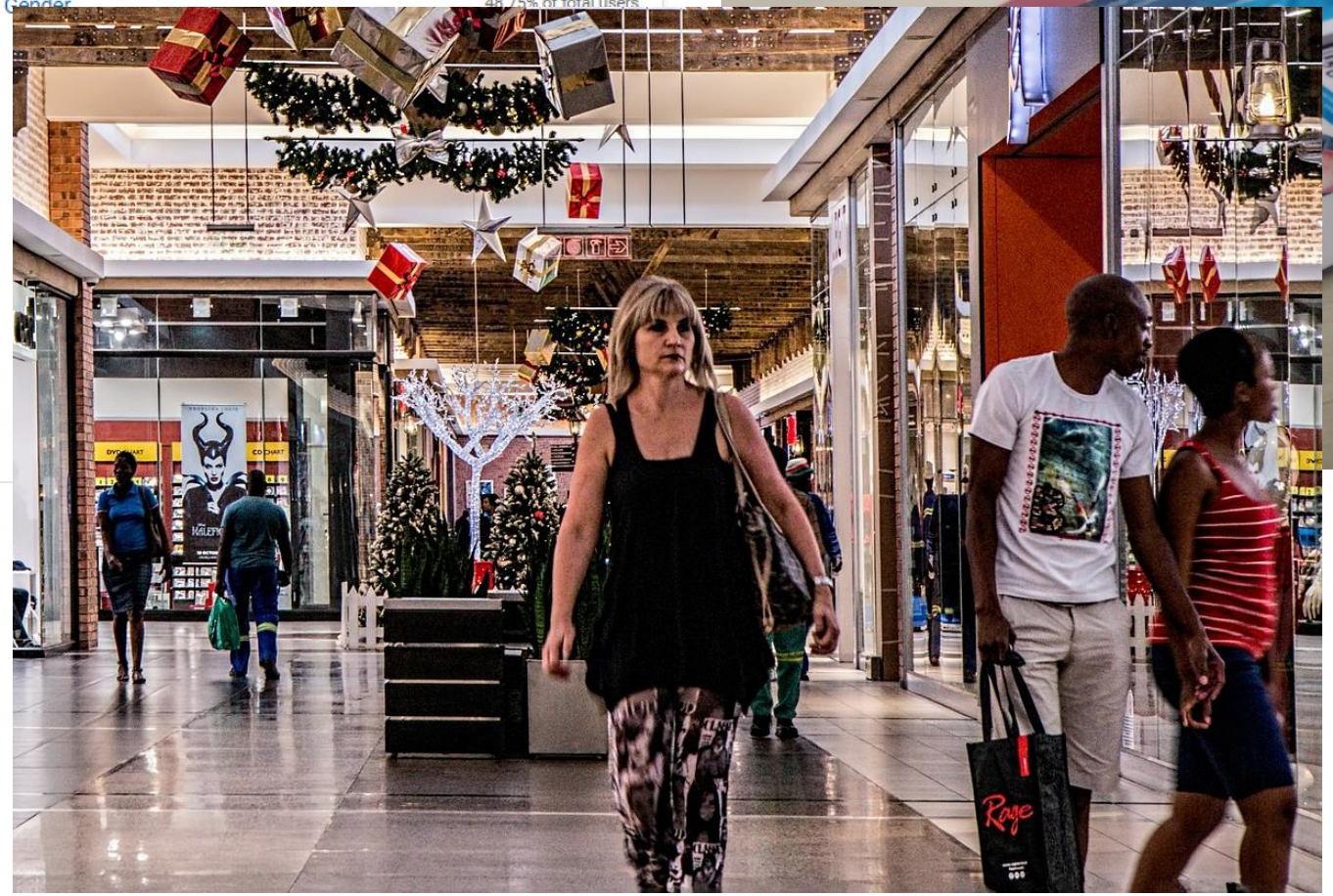


Brick and mortar

Information is power





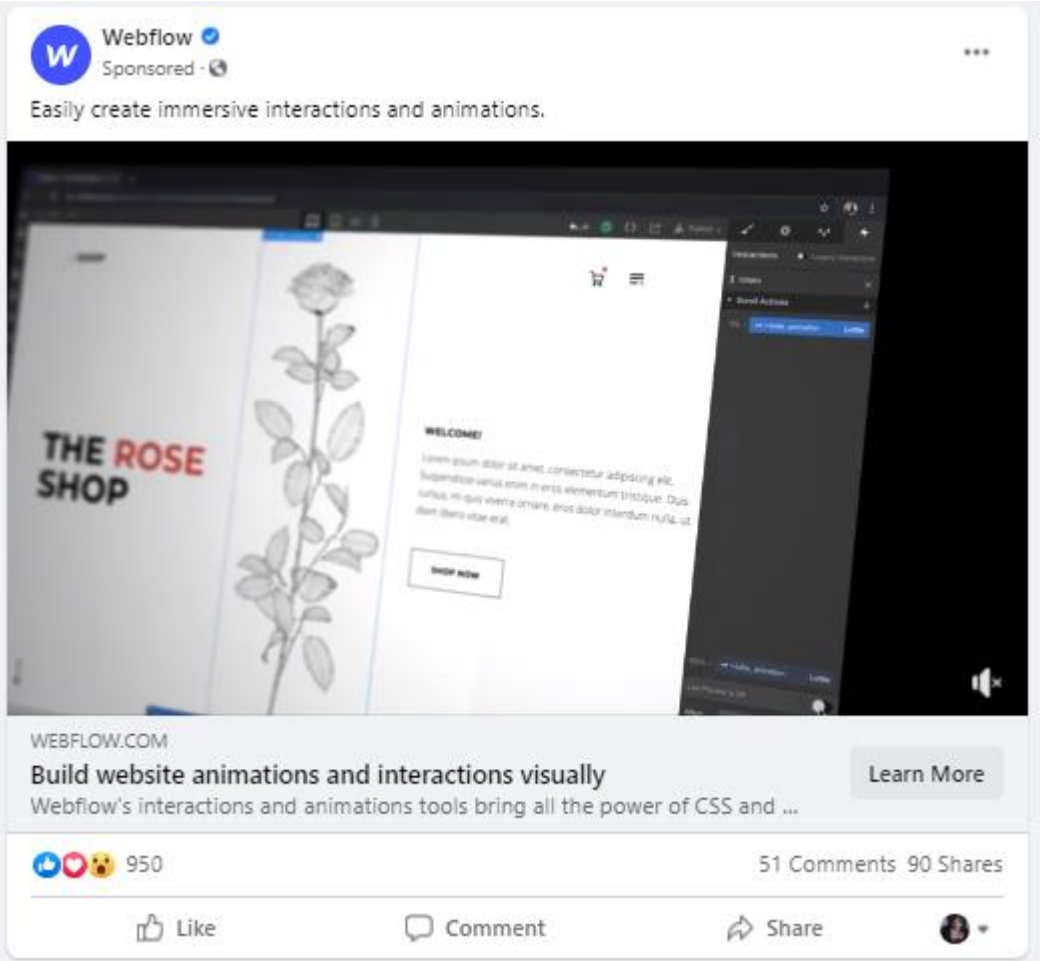


- Online analytics
- Fidelity cards
- Facial analytics

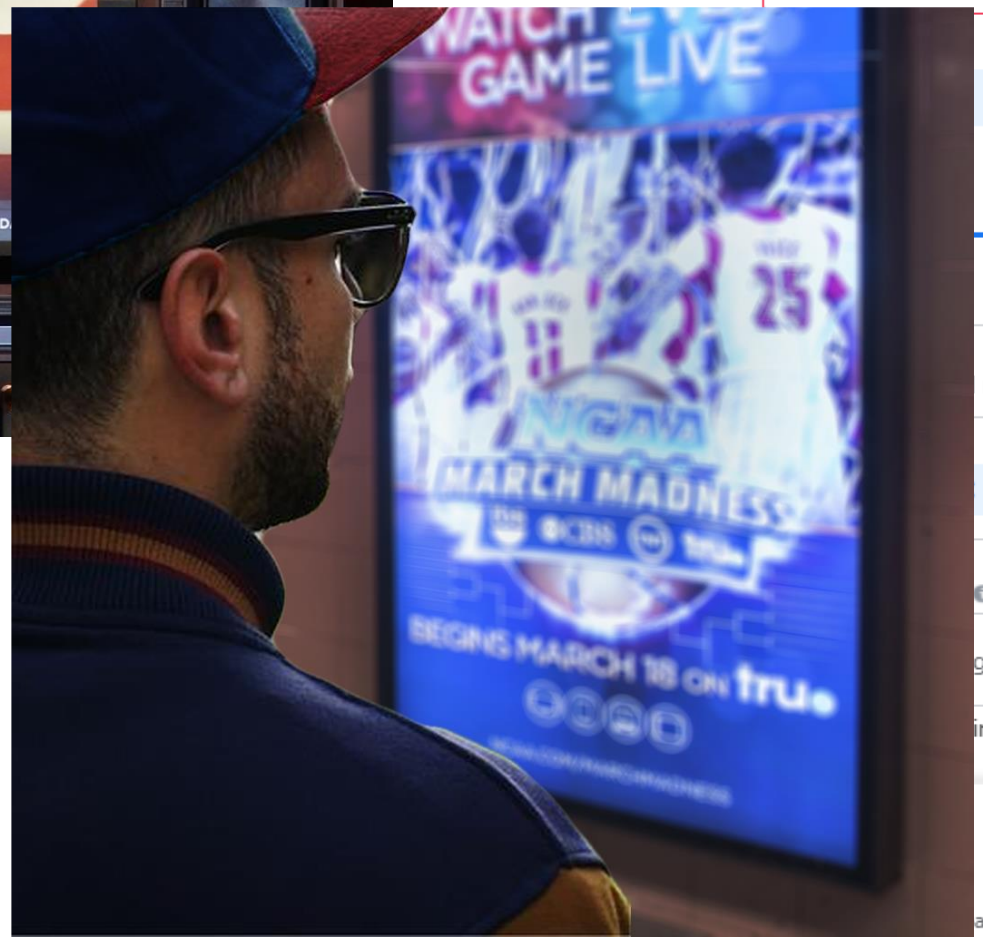
Information is power

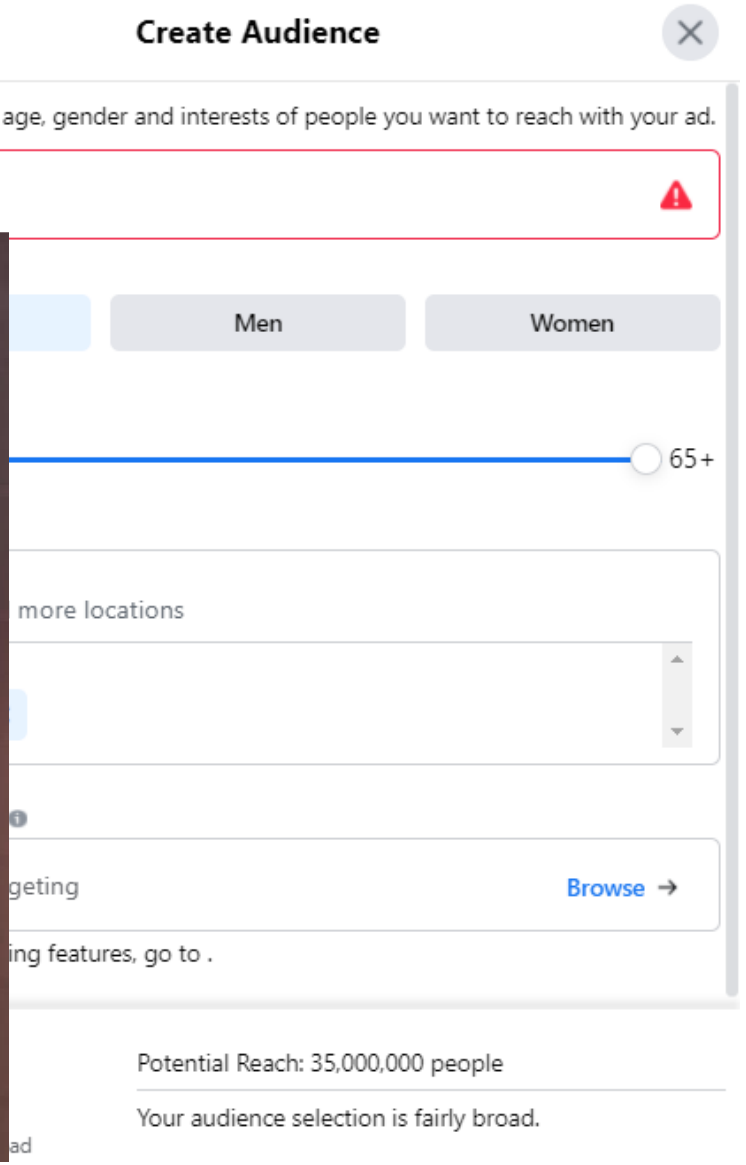
Advertising then

Advertising now



Information is power





- Online advertising
- TV
- Digital signage

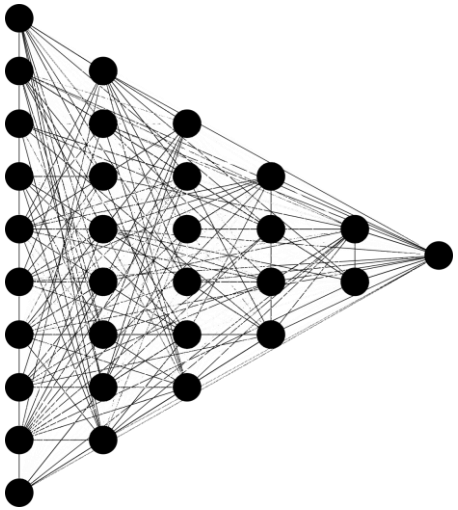
Face Analysis is a difficult task!

- “in the wild” setting
  - Uncontrolled Illumination
  - Unconstrained pose and distance
  - High noise, low contrast and detail
  - Occlusions (glasses, scarfs, hats…)

- AND NOW FACE MASKS!!!

Deep Learning for Face Analysis

- Widely adopted for “in the wild” scenarios
- Not completely resilient to corruptions (noise, blur, etc)*
- Will they be resilient to face masks?

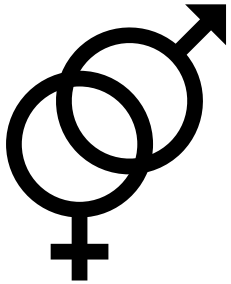


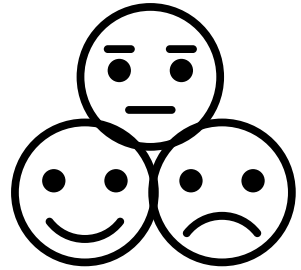
***Gender recognition in the wild: a robustness evaluation over corrupted images**

Journal of Ambient Intelligence and Humanized Computing, 1-12, 2020 - A Greco, A Saggese, M Vento, V Vigilante

Experimental framework

- Tasks:
  - Age
  - Gender
  - Ethnicity
  - Emotion



- Comparison:
  - performance on regular dataset
  - performance on masked dataset

* Wang, Z., Wang, G., Huang, B., Xiong, Z., Hong, Q., Wu, H., Yi, P., Jiang, K., Wang, N., Pei, Y., Chen, H., Miao, Y., Huang, Z., Liang, J. Masked face recognition dataset and application. - arXiv preprint arXiv:2003.09093 (2020)

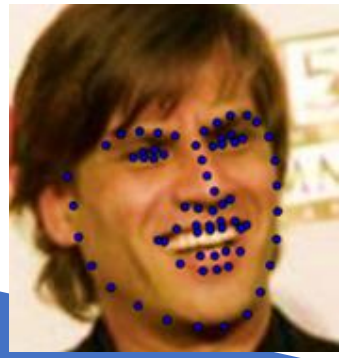
Experimental framework

- Datasets
  - LFW+
    - Age, gender, ethnicity (white/no)
    - 3 annotators
  - RAF-DB
    - 6 basic emotion + neutral
    - 40 annotators
- Masked datasets
  - LFW+M*
  - RAF-DB-M

* Wang, Z., Wang, G., Huang, B., Xiong, Z., Hong, Q., Wu, H., Yi, P., Jiang, K., Wang, N., Pei, Y., Chen, H., Miao, Y., Huang, Z., Liang, J. Masked face recognition dataset and application. - arXiv preprint arXiv:2003.09093 (2020)

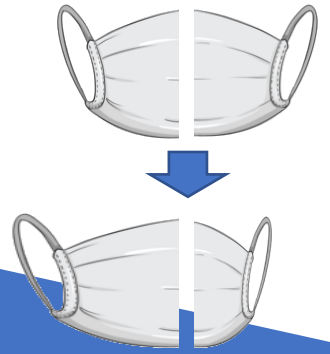
Experimental framework

- Masked versions are synthetically generated



Facial landmarks

- Dlib detector
- 4/68 points used
- chin and nose



Split & resize

- Each half resized to match the pose
- Stitch back together

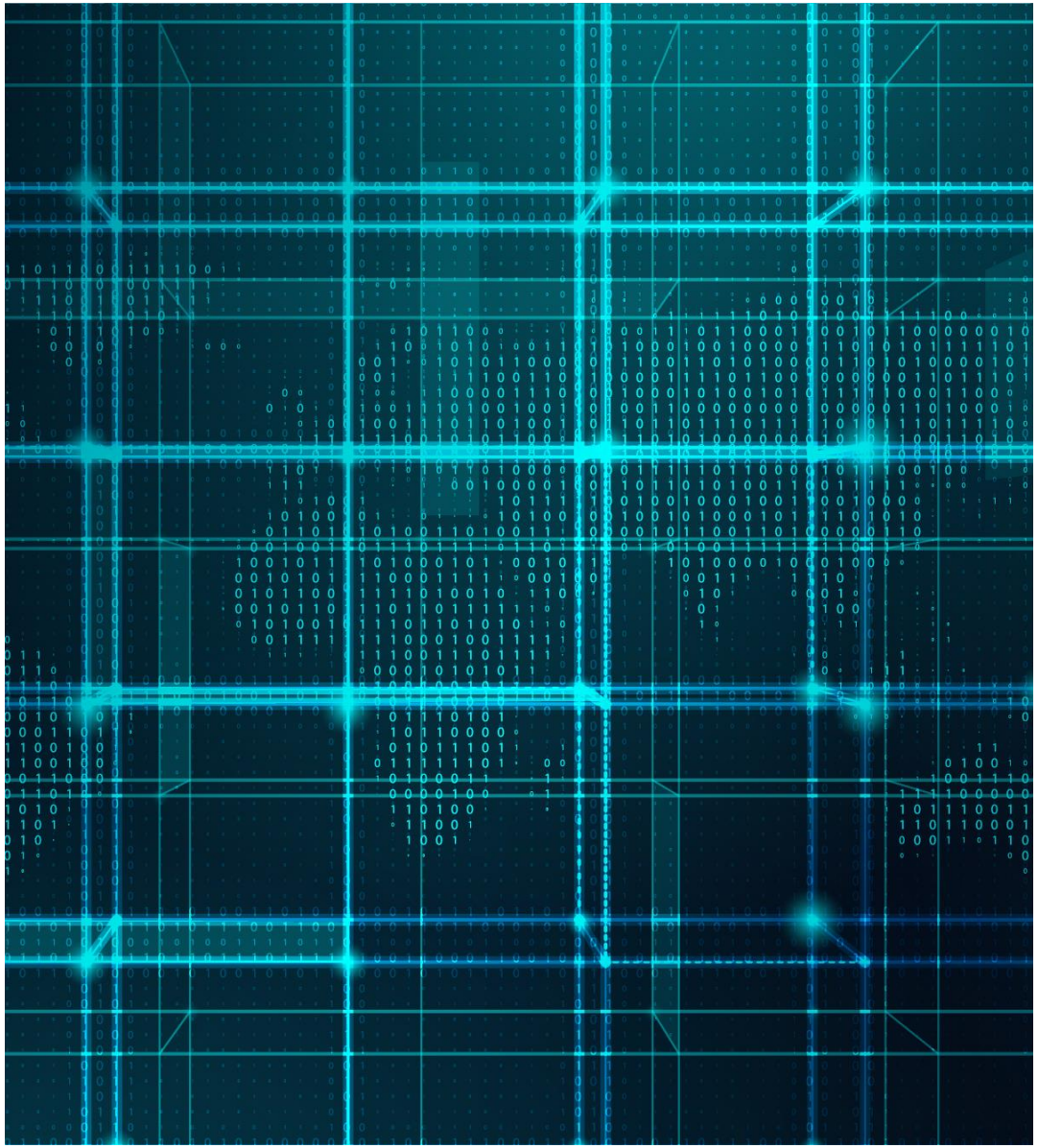
Rotate & apply

- Rotate
  - chin to nose vector
- Position
  - Bottom = chin
- Paste the mask

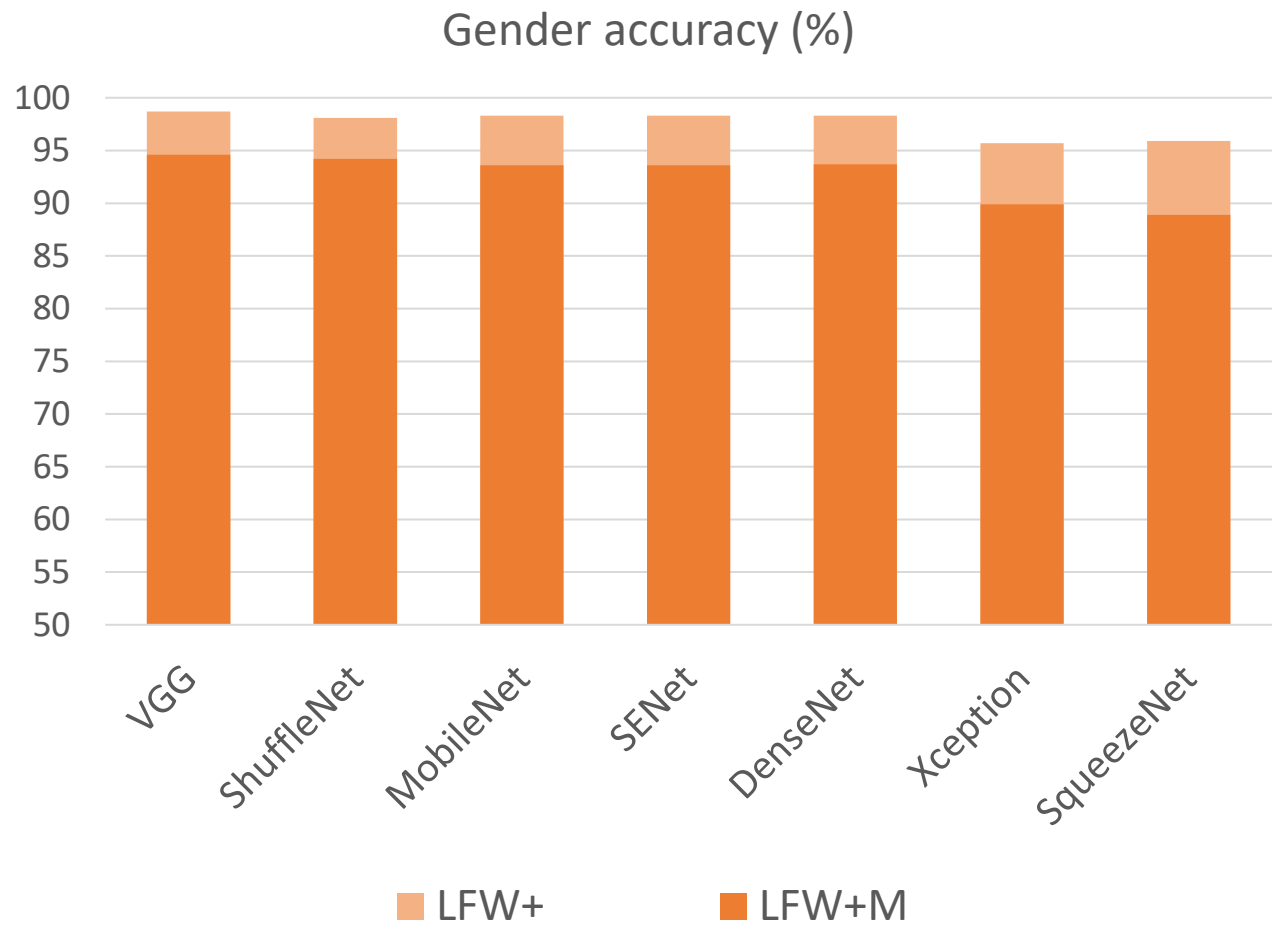
Wang, Z., Wang, G., Huang, B., Xiong, Z., Hong, Q., Wu, H., Yi, P., Jiang, K., Wang, N., Pei, Y., Chen, H., Miao, Y., Huang, Z., Liang, J. Masked face recognition dataset and application. arXiv preprint arXiv:2003.09093 (2020)

Experimental framework

- Network architectures:
  - VGG-16
  - SE-ResNet-50
  - DenseNet
  - MobileNet v2
  - ShuffleNet
  - SqueezeNet
  - Xception



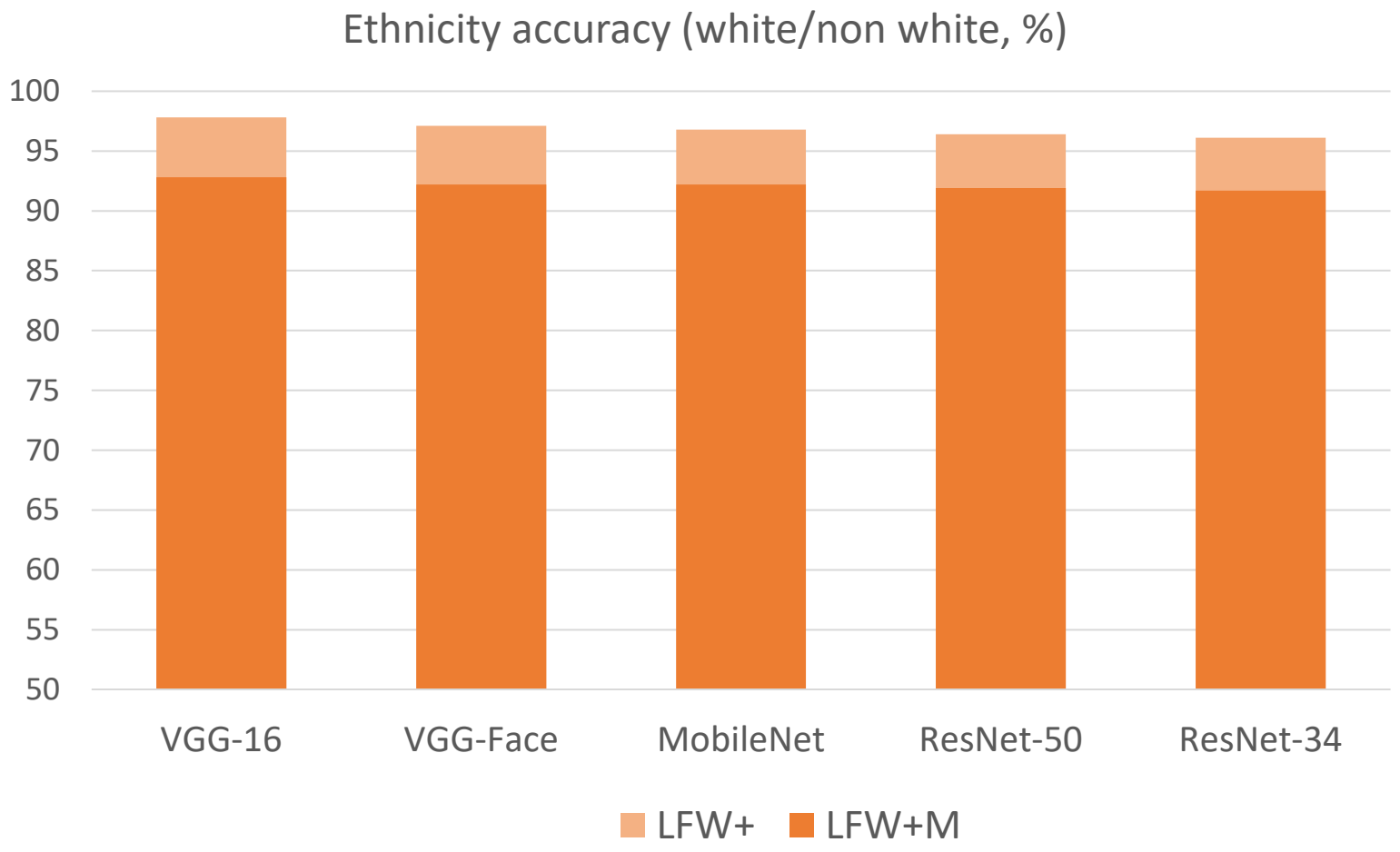
Results



Average drop:

- 5.1% (LFW+)

Results

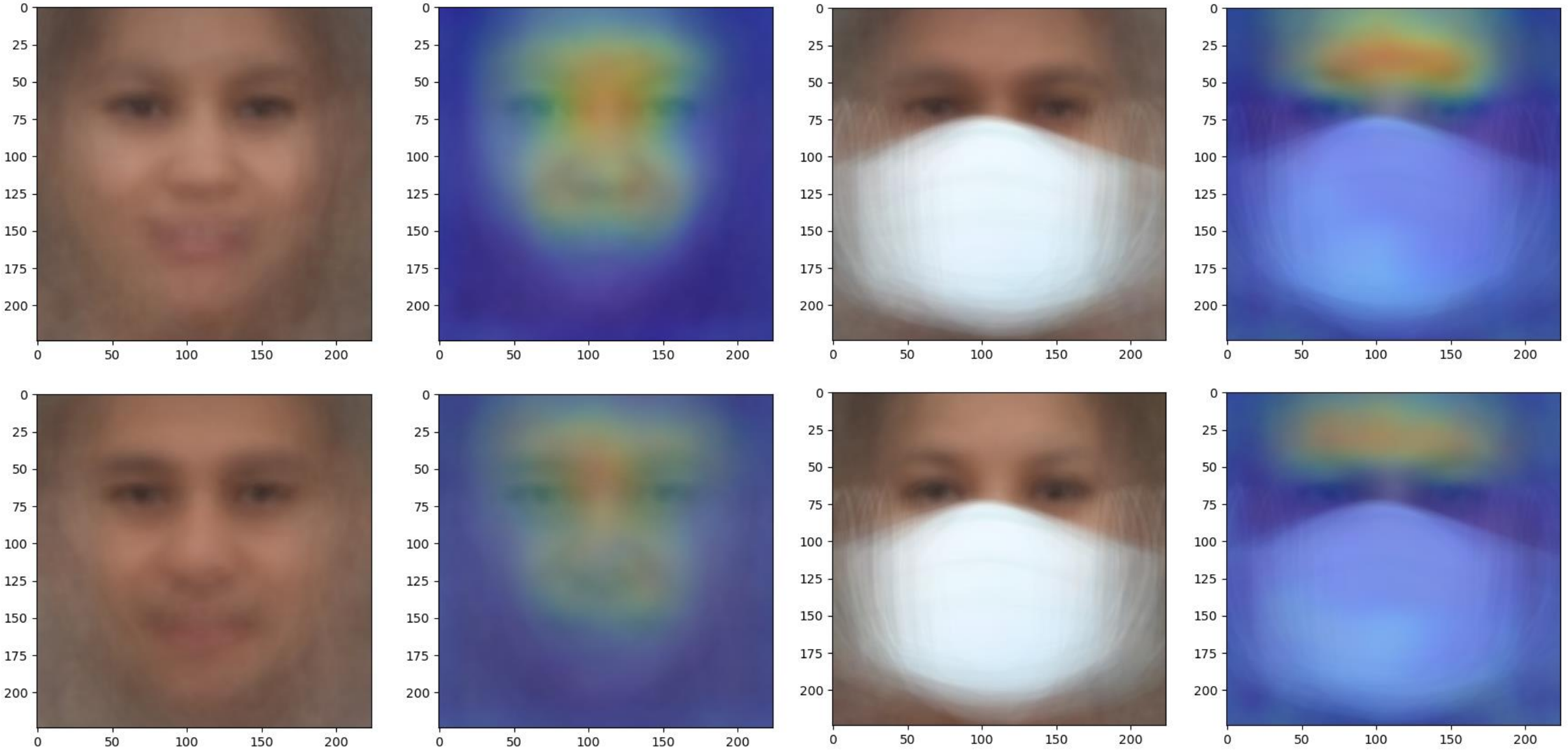


Small drop

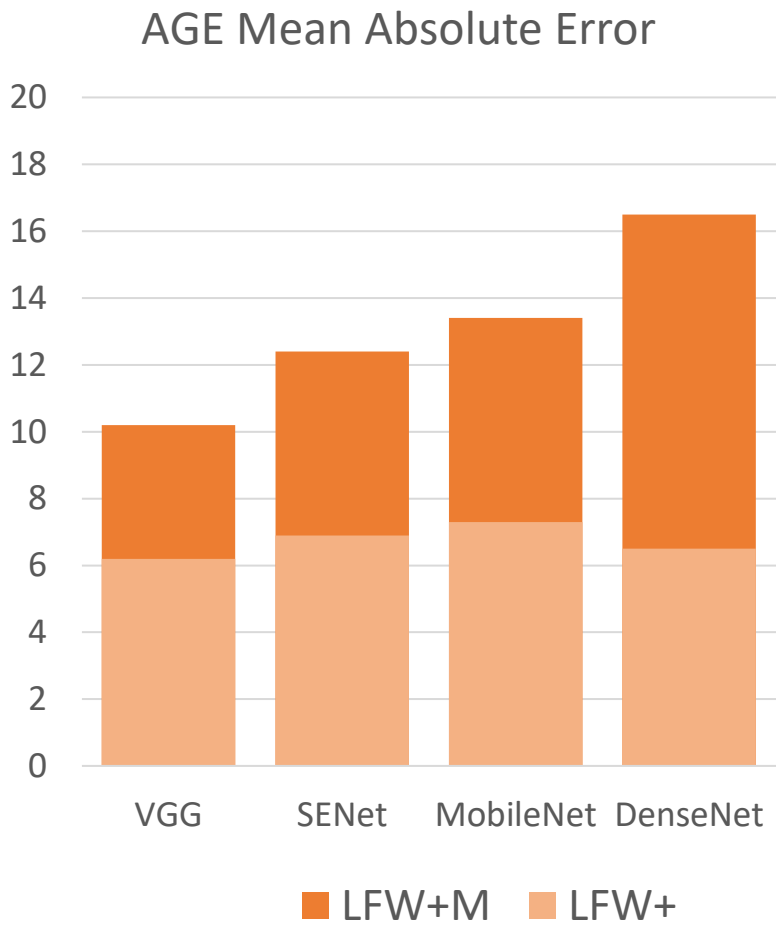
- 4~5%

Results

Results



Results



Harder task

- Architecture dependent
- 4~10 years drop

0-15

16-20

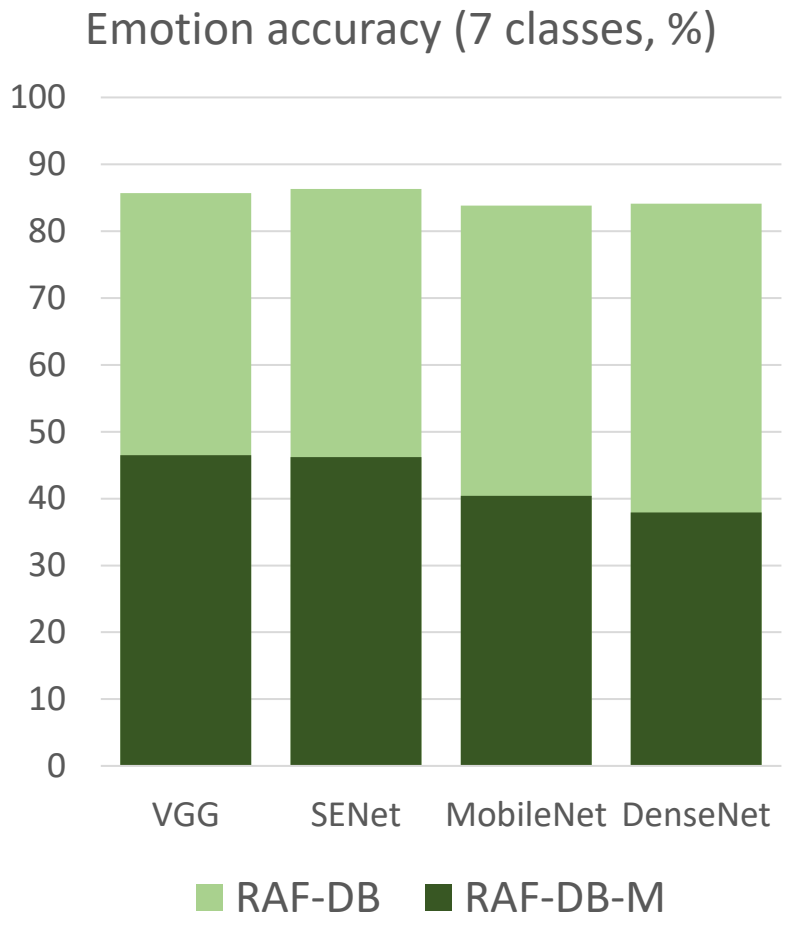
21-30

31-45

46-60

60+

Results



- ~50% drop
- Network rely on mouth
  - Will training on partial faces work?


Anger


Disgust


Fear

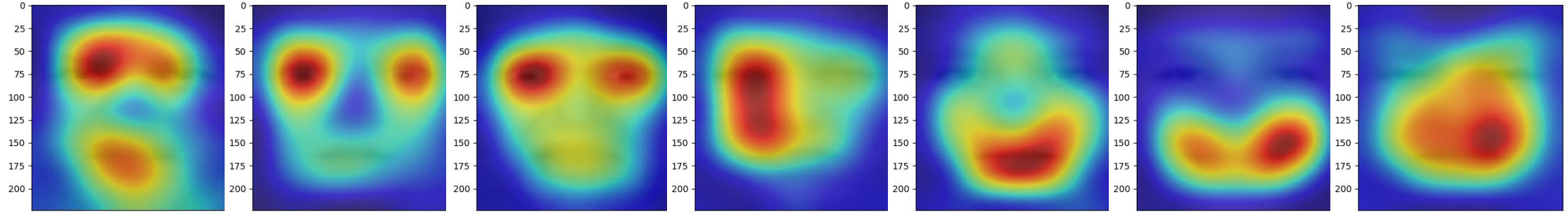

Happiness


Sadness


Surprise

Results

Anger Surprise Fear Disgust Neutral Happiness Sadness



Conclusion

- Summary:
  - Gender, ethnicity: ok
  - Age: possibly ok, with some architectures
  - Emotion: not ok

- Future direction
  - Training on masked faces? Training on partial faces?
  - Novel architectures resilient to severe occlusions

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Thanks for your attention!

Any questions?

The authors:


Antonio Greco
agreco@unisa.it


Alessia Saggese
asaggese@unisa.it


Mario Vento
mvento@unisa.it


Vincenzo Vigilante
vvigilante@unisa.it

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