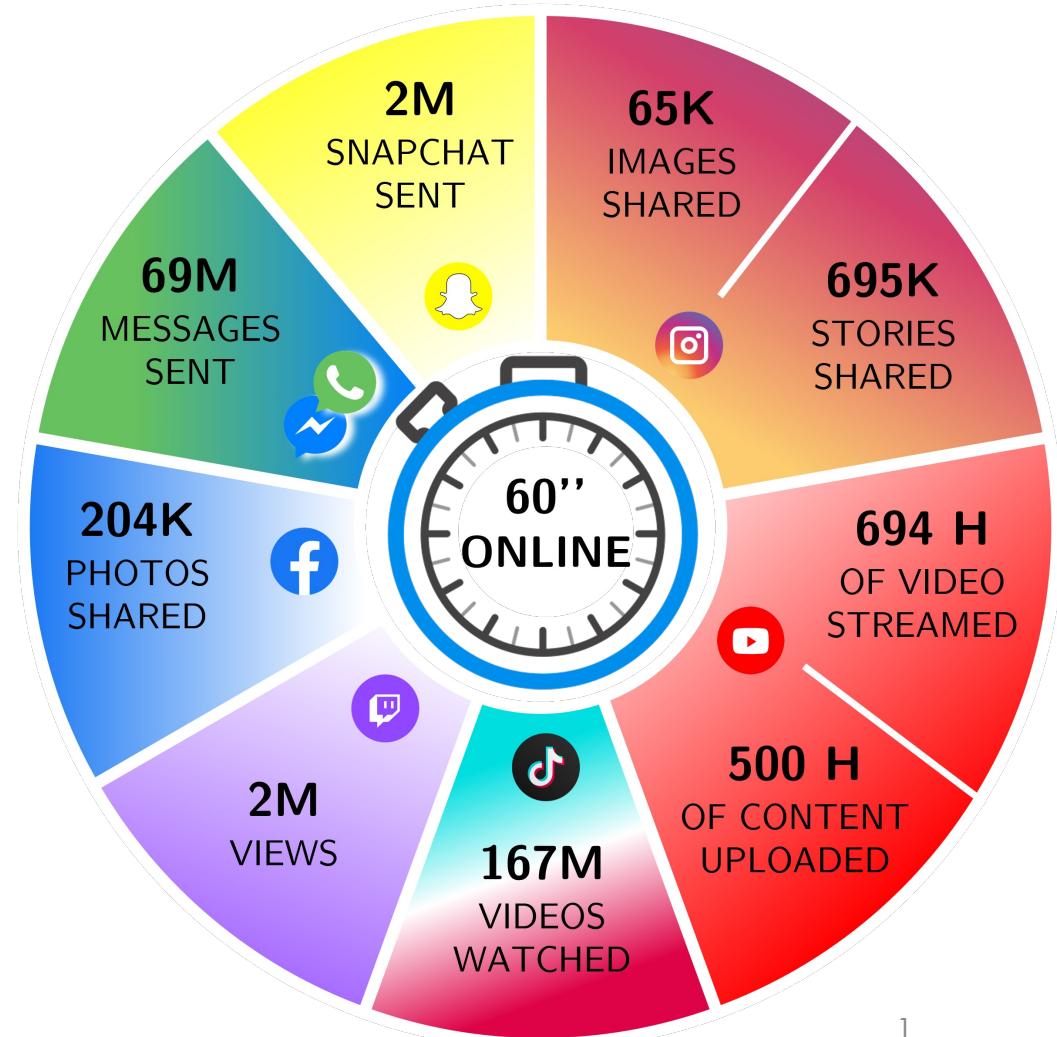


Context

A large part of everyday communication takes place online

This new type of communication makes large use of images and videos

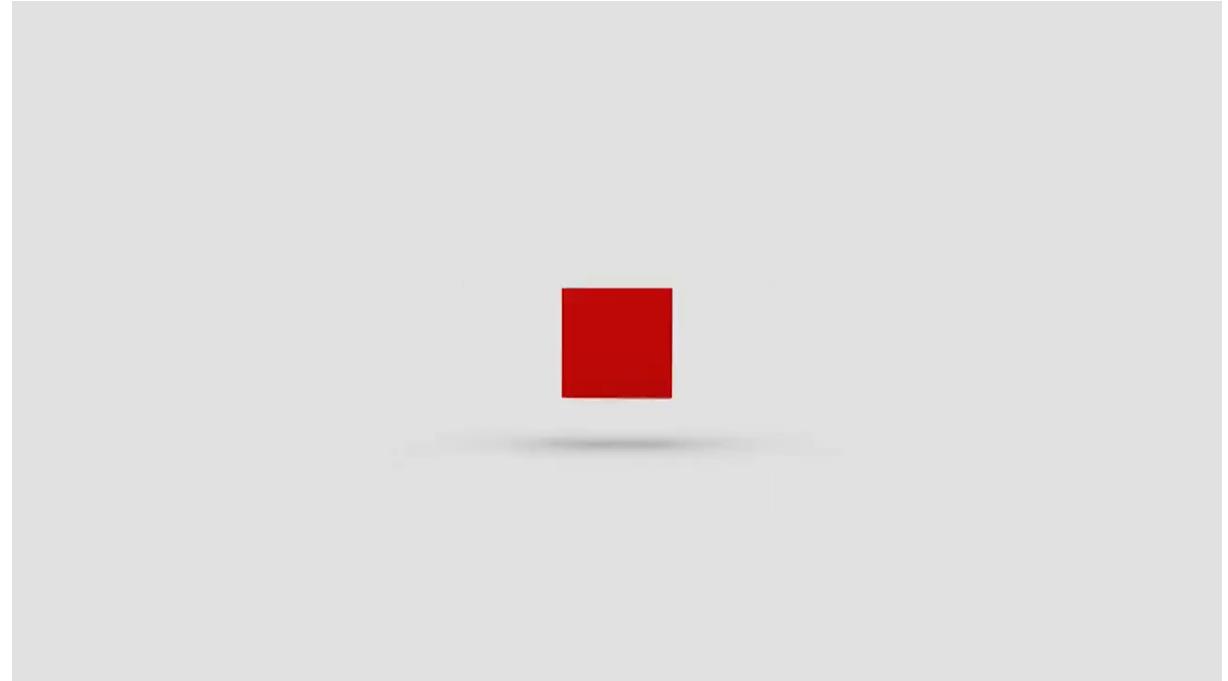


Context

Images and
videos are not
always
trustworthy

Can boost
the phenomenon
of **fake news**

Verification is hard
and time consuming



Context

Images and videos are not always trustworthy



Can boost the phenomenon of **fake news**

Russian Embassy, UK  @RussianEmbassy
Russia government organization

Replies to @XSovietNews @mfa_russia and 9 others

No, it's the indeed pregnant 🇺🇦 beauty blogger Marianna Podgurskaya. She actually played roles of both pregnant women on the photos. And first photos were actually taken by famous propagandist photographer Evgeniy Maloletka, rather than rescuers and witnesses as one would expect.



Ukraine war: How a 'fact-checking' website is spreading Russian propaganda

09.03.2022



A website called "War on Fakes" is using false claims made by Ukrainian outlets to disseminate Russian propaganda. DW takes a look at what and who's behind it.

BBC NEWS

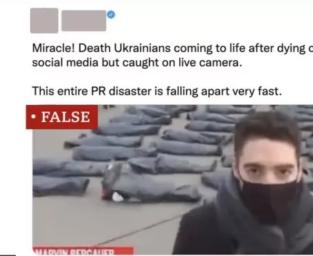
Home UK World Business Politics

Moving corpse

A video of a news reporter in front of multiple body bags has gone viral on several major social networks, and has been spread widely by pro-Kremlin accounts.

Seconds into the clip, one of the body bags starts moving, a man removes the cover and is attended to by a photographer.

Social media posts claim the video was shot in Ukraine and proves the war is either a hoax or manufactured by "Western propaganda".



TWITTER

Video of a climate change protest in Vienna is being presented as fake Ukrainian victims from the war

BBC NEWS

Home UK World Business Politics

False footage

Different versions of a video of a large crowd being asked by a director to run and scream in fear have racked up hundreds of thousands of views on multiple platforms.

It is claimed the video was leaked from Ukraine, suggesting some of the distressing scenes run by media outlets are actually fabricated.



ootage from the film Invasion shared in the context of the

To support fake news there is no longer the need to recycle material or shoot ad-hoc pictures

Context

Images and videos are not always trustworthy



Irina Kerimova

She was a private guitar teacher until she became editor-in-chief of a Russian propaganda website in 2017.

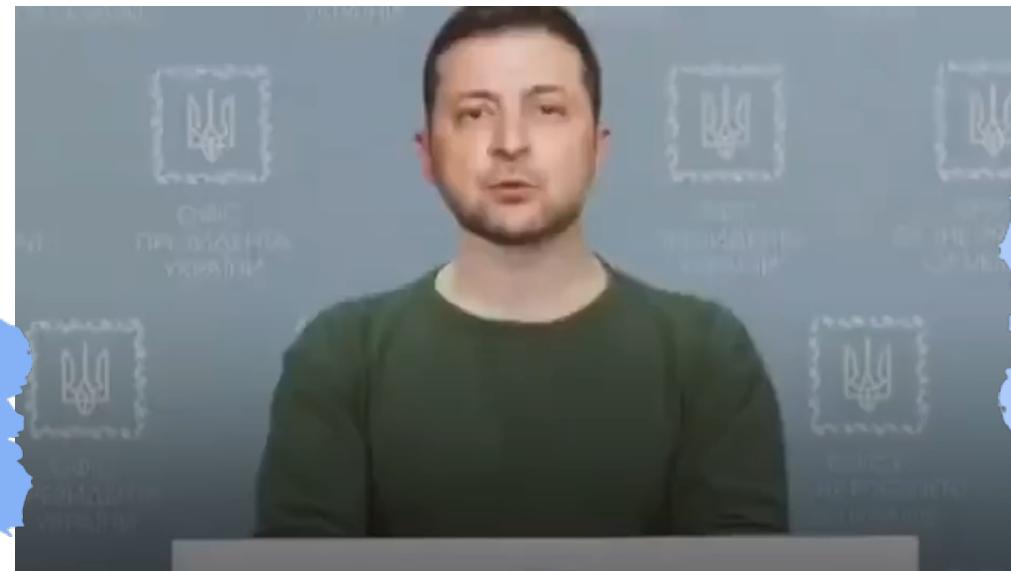
Now she is blogging from Kharkiv.

Vladimir Bondarenko

He was an aviation engineer, until Ukraine's aviation infrastructure "collapsed".



Can boosts the phenomenon of **fake news**

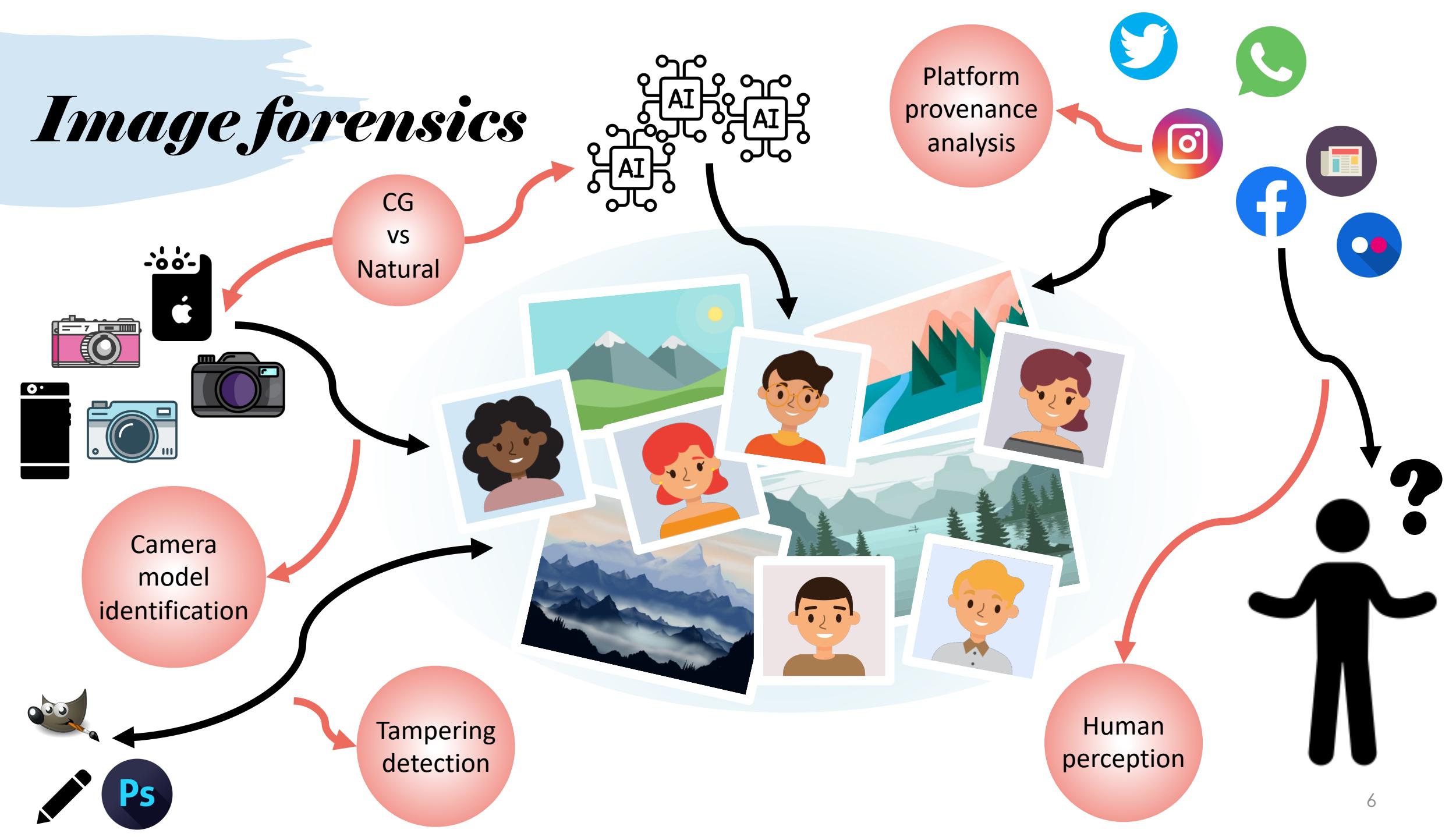


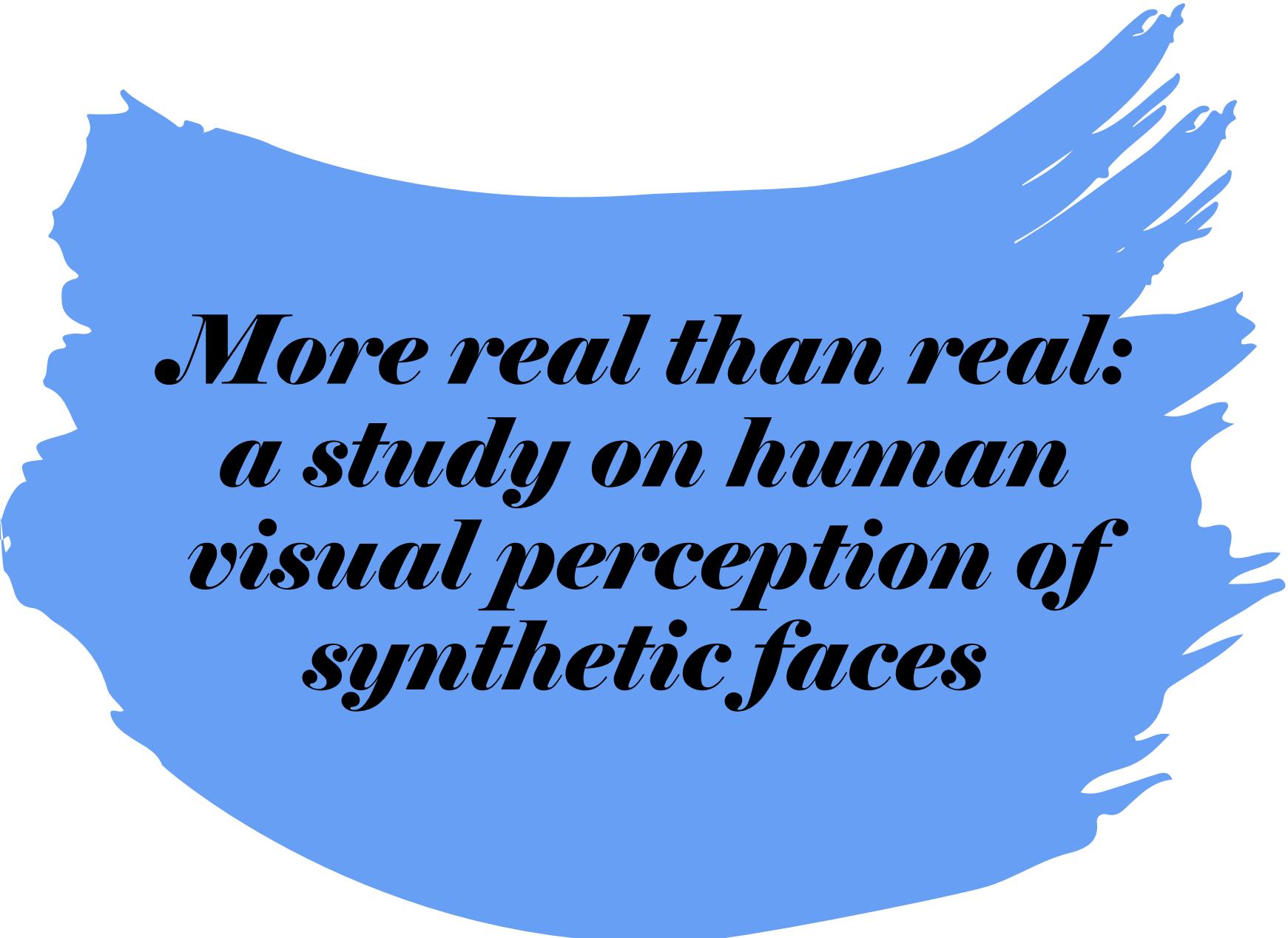
To support fake news there is no longer the need to recycle material or shoot ad-hoc pictures

Context



Image forensics





*More real than real:
a study on human
visual perception of
synthetic faces*



More real than real: a study on
human visual perception of
synthetic faces.

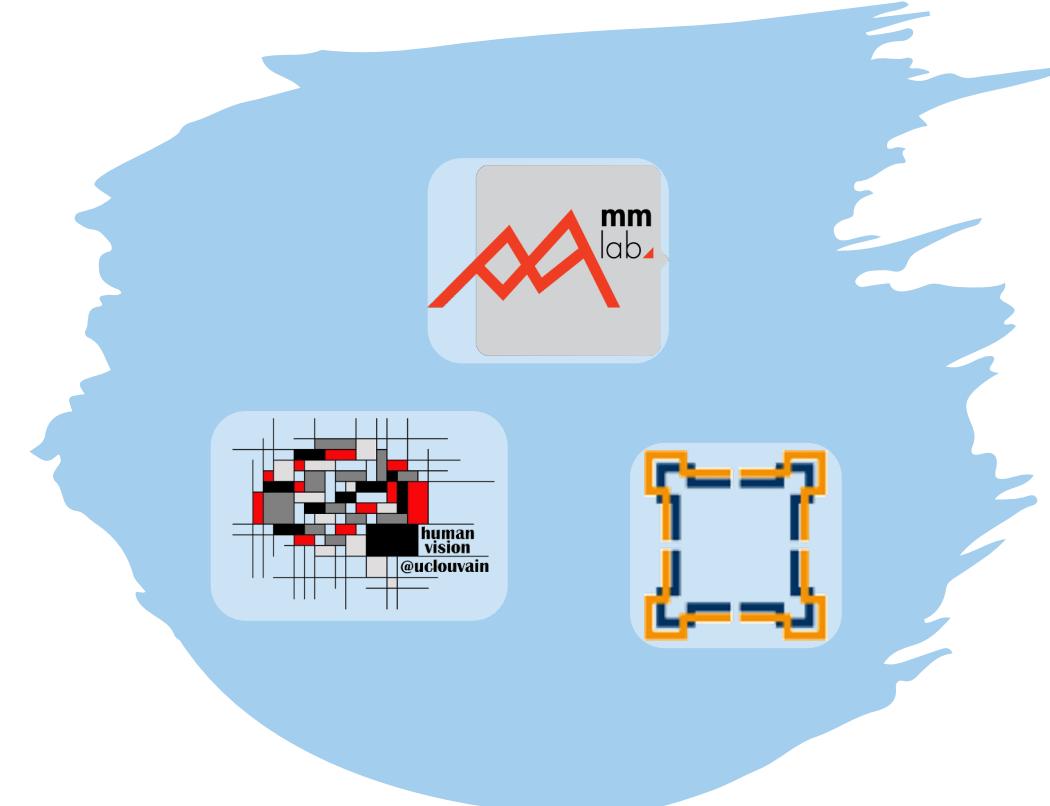
In IEEE Signal Processing Magazine
[Applications Corner], 2022



Best PhD Presentation Award
ICT Days 2021



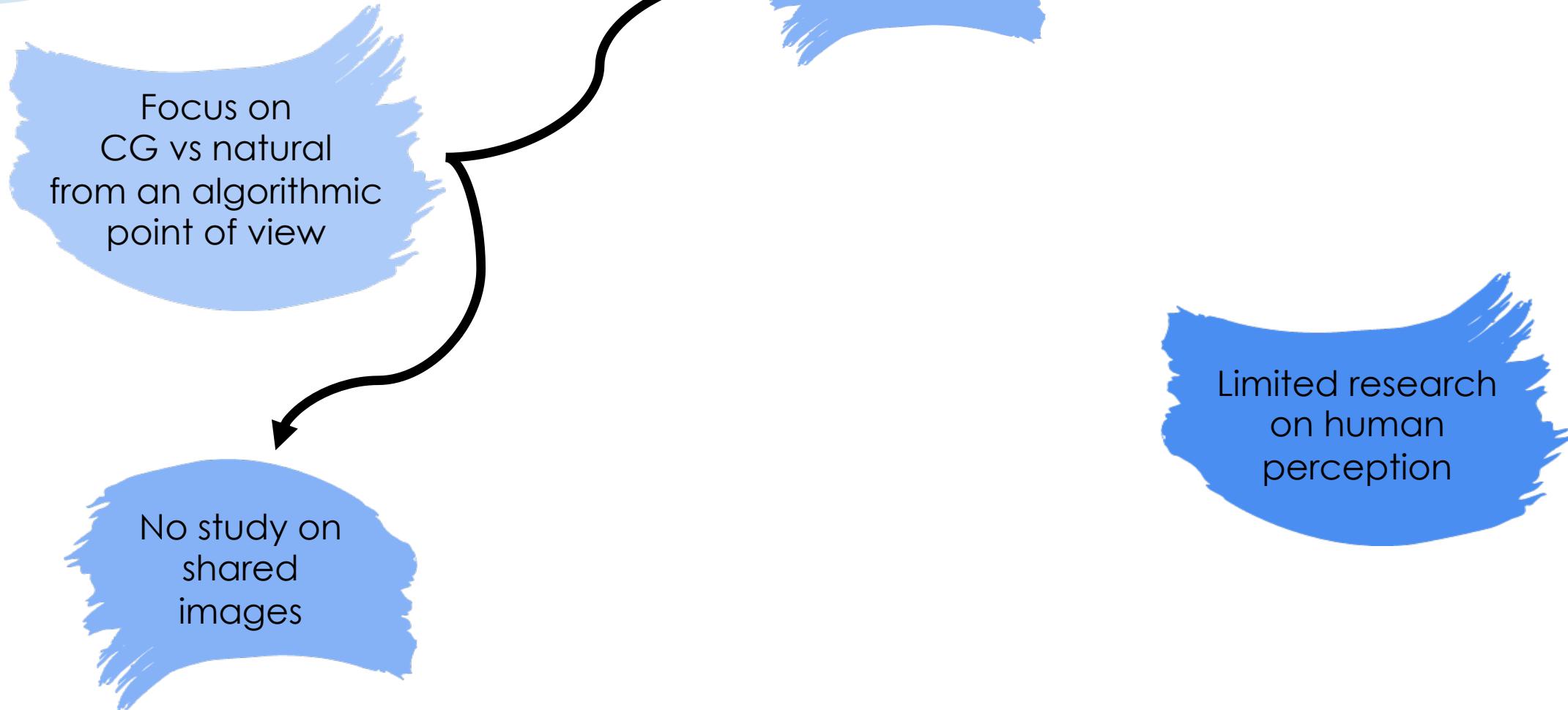
Best Demo Award
GTI-SPS Thematic Meeting 2021



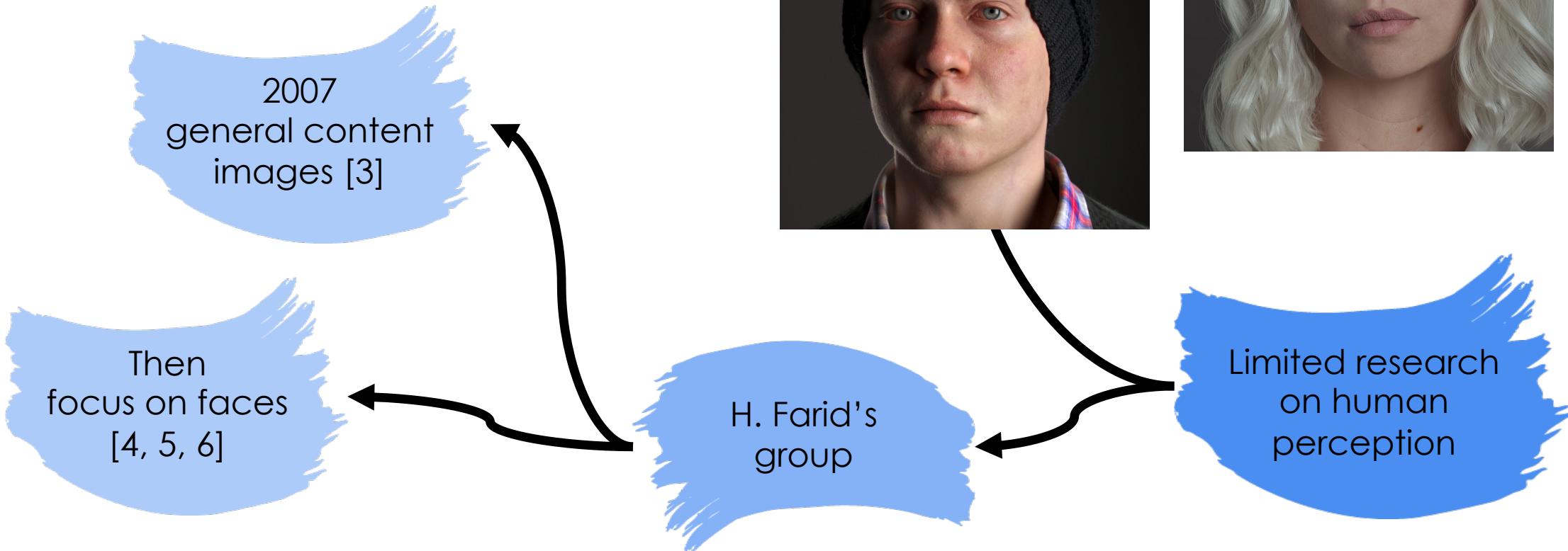
Goal

Study the human ability to recognize synthetic human
faces with respect to last-generation GAN images

State of the art

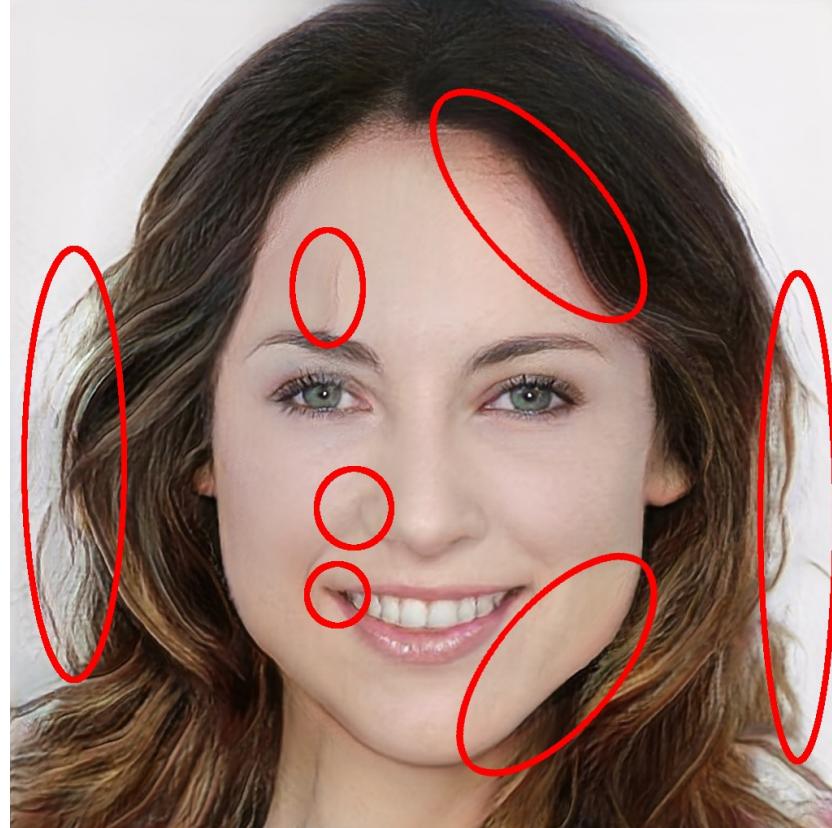
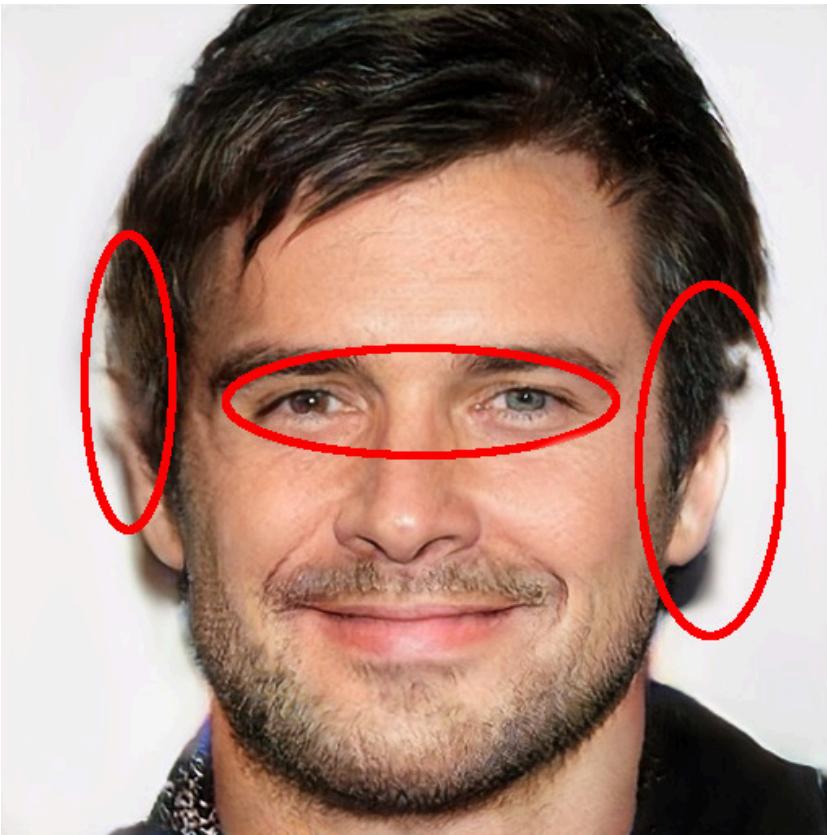


State of the art



- [1] S. Fan et al. Real or fake? Human judgments about photographs and computer-generated images. SIGGRAPH Asia Technical Briefs, 2012
- [2] S. Fan et al. Human perception of visual realism of photo and computer-generated face images. ACM Transaction on Applied Perception, 2014
- [3] H. Farid et al. Photorealistic rendering: How realistic is it?. Journal of Vision, 2007
- [4] H. Farid et al. Perceptual discrimination of computer generated and photographic faces. Digital Investigation, 2012
- [5] O. Holmes et al. Assessing and improving the identification of computer-generated portraits. ACM Transaction on Applied Perception, 2016
- [6] B. Mader et al. Identifying computer-generated portraits: The importance of training and incentives. Perception, 2017

State of the art



State of the art

No current study
targets the
extremely realistic
GAN images



Goal:
fill the gap

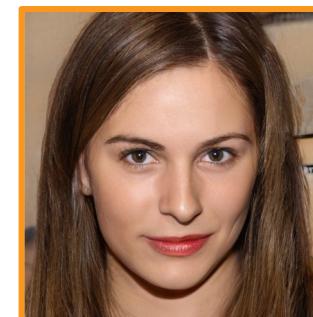
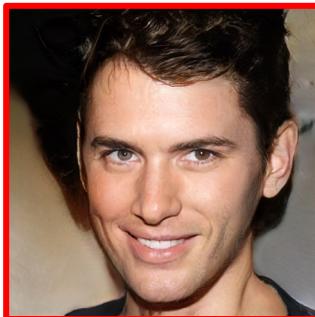
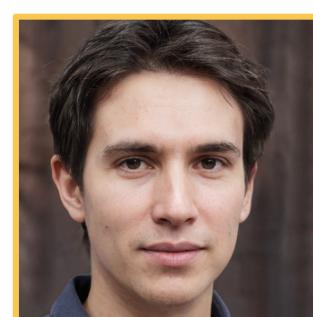
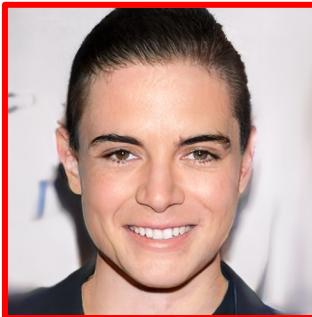


Try the experiment first!



Datasets

FFHQ
real images



PGGAN [1]

StyleGAN [2]

StyleGAN2 [3]

[1] T. Karras et al. Progressive growing of GANs for improved quality, stability, and variation. In International Conference on Learning Representations, 2018

[2] T. Karras et al. A style-based generator architecture for generative adversarial networks. In Proceedings of the IEEE CVPR, 2019

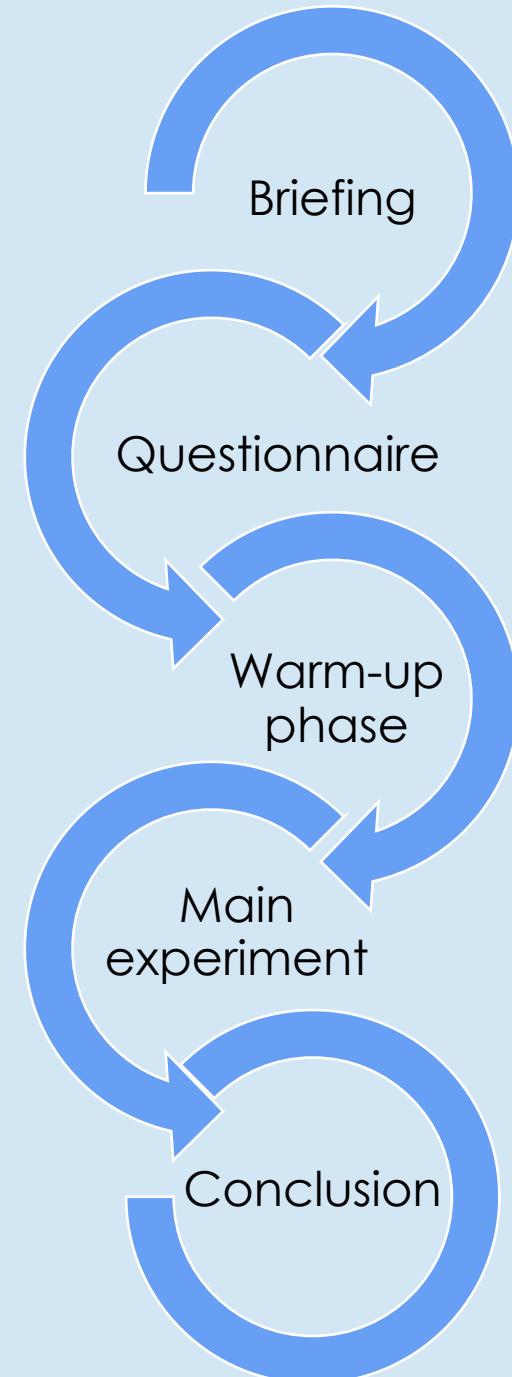
[3] T. Karras et al. Analyzing and improving the image quality of Stylegan. In Proceedings of the IEEE CVPR, 2020

Experiment Design

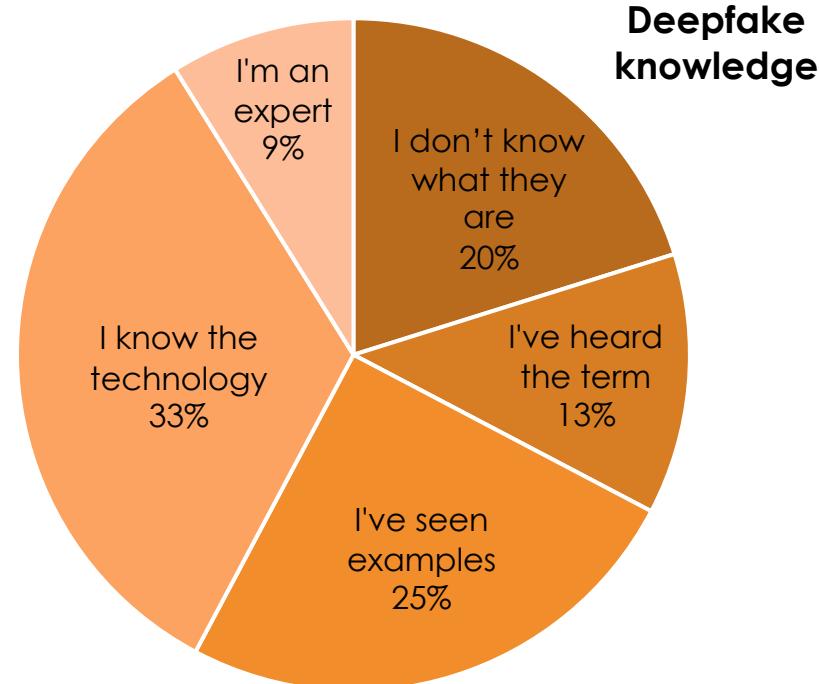
This image is synthetic.



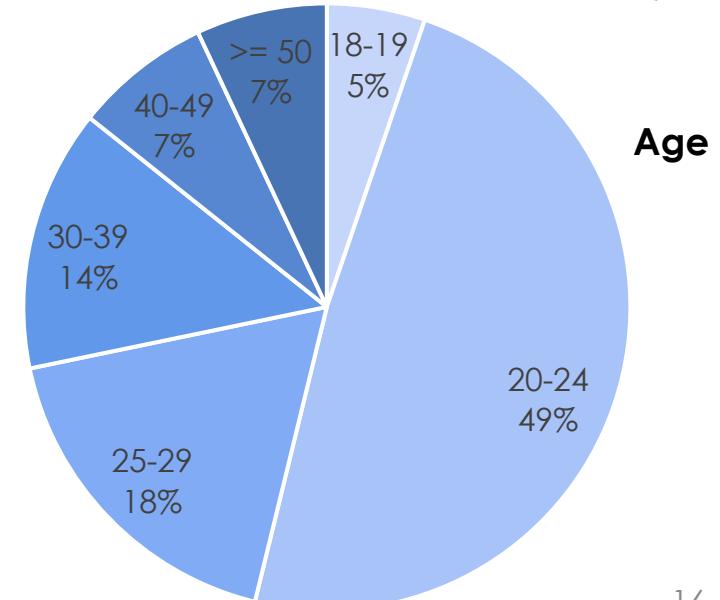
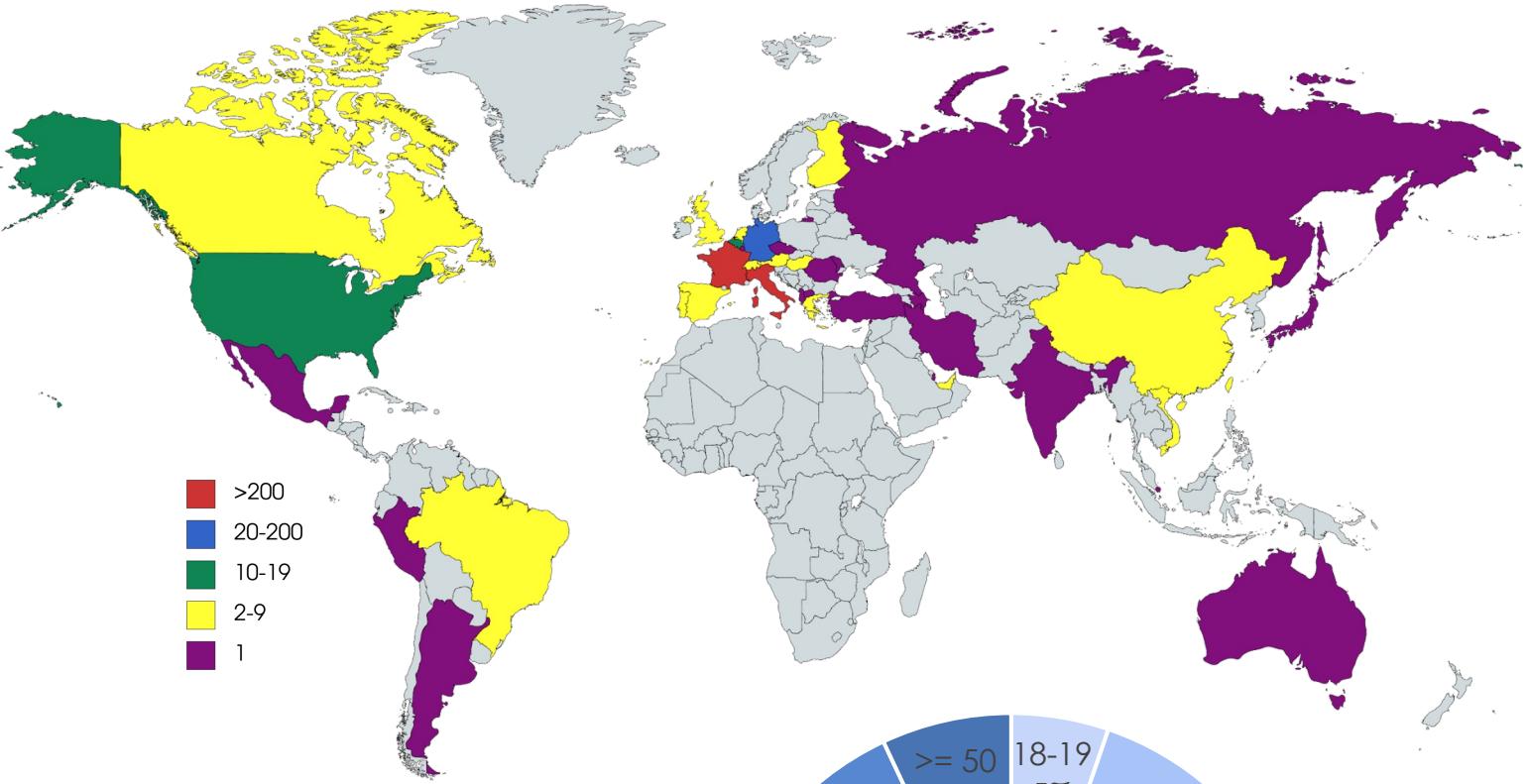
Next



Data collection



630
participants

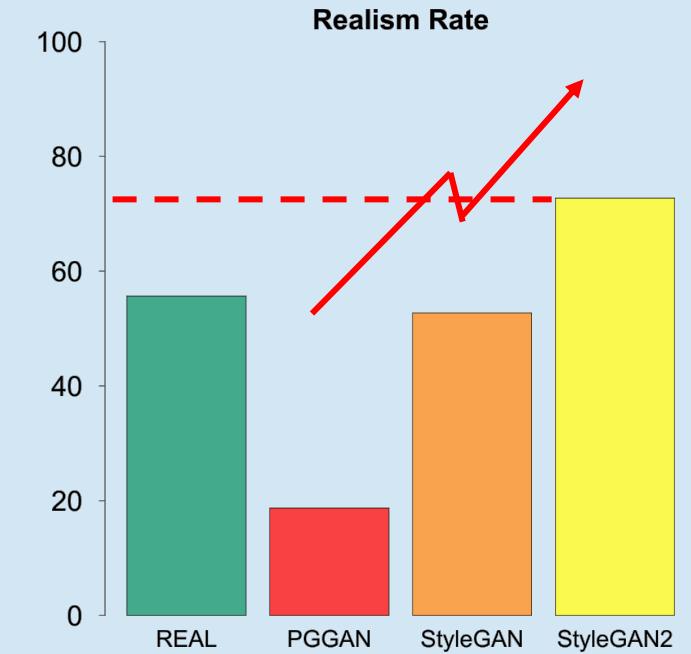
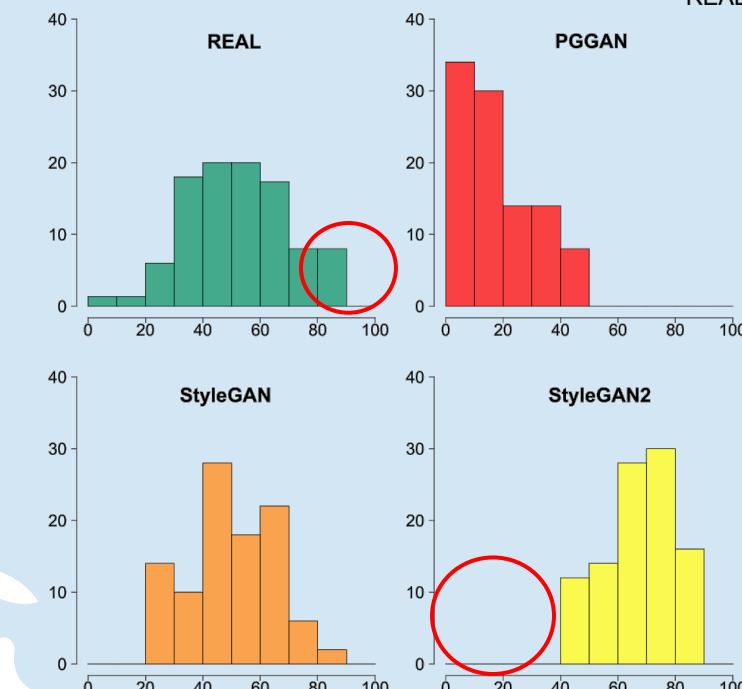


Results

Realism Rate

Percentage of times that an image is judged as real

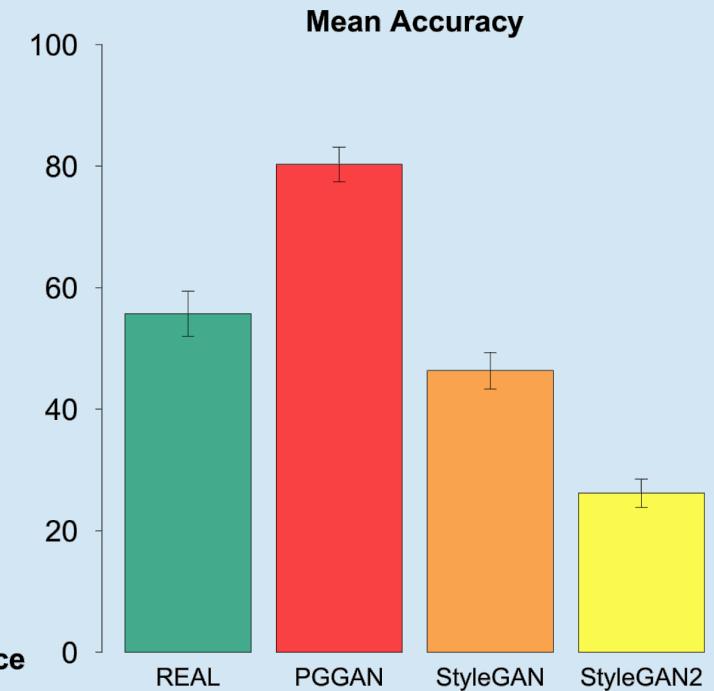
- GAN datasets have an increasing *realism rate*
- StyleGAN2's *realism rate* is higher than real images
- Some real images were almost never considered real
- StyleGAN2 images rated real at least 40% of the time
- Distributions for REAL and StyleGAN are similar; for PGGAN and StyleGAN2 are opposite



Results

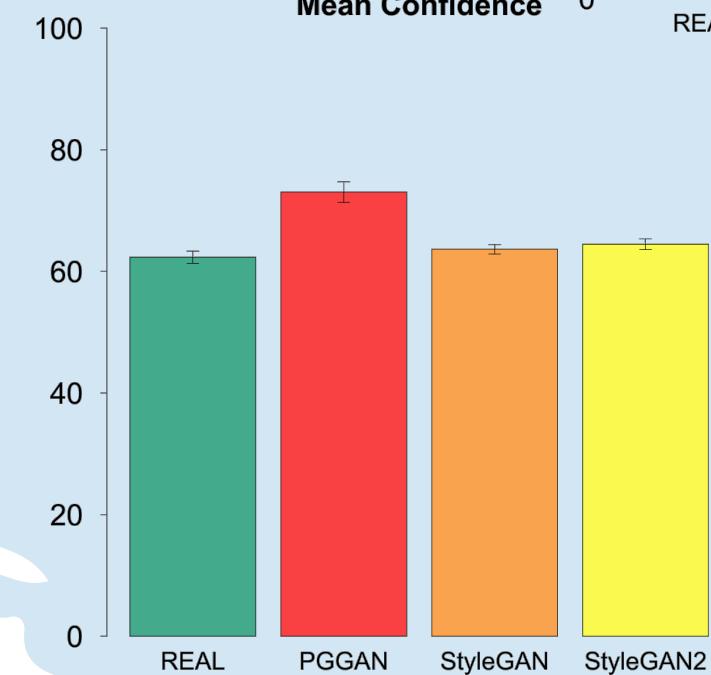
Accuracy

Frequency of correct ratings over all task instances for a given image



Confidence

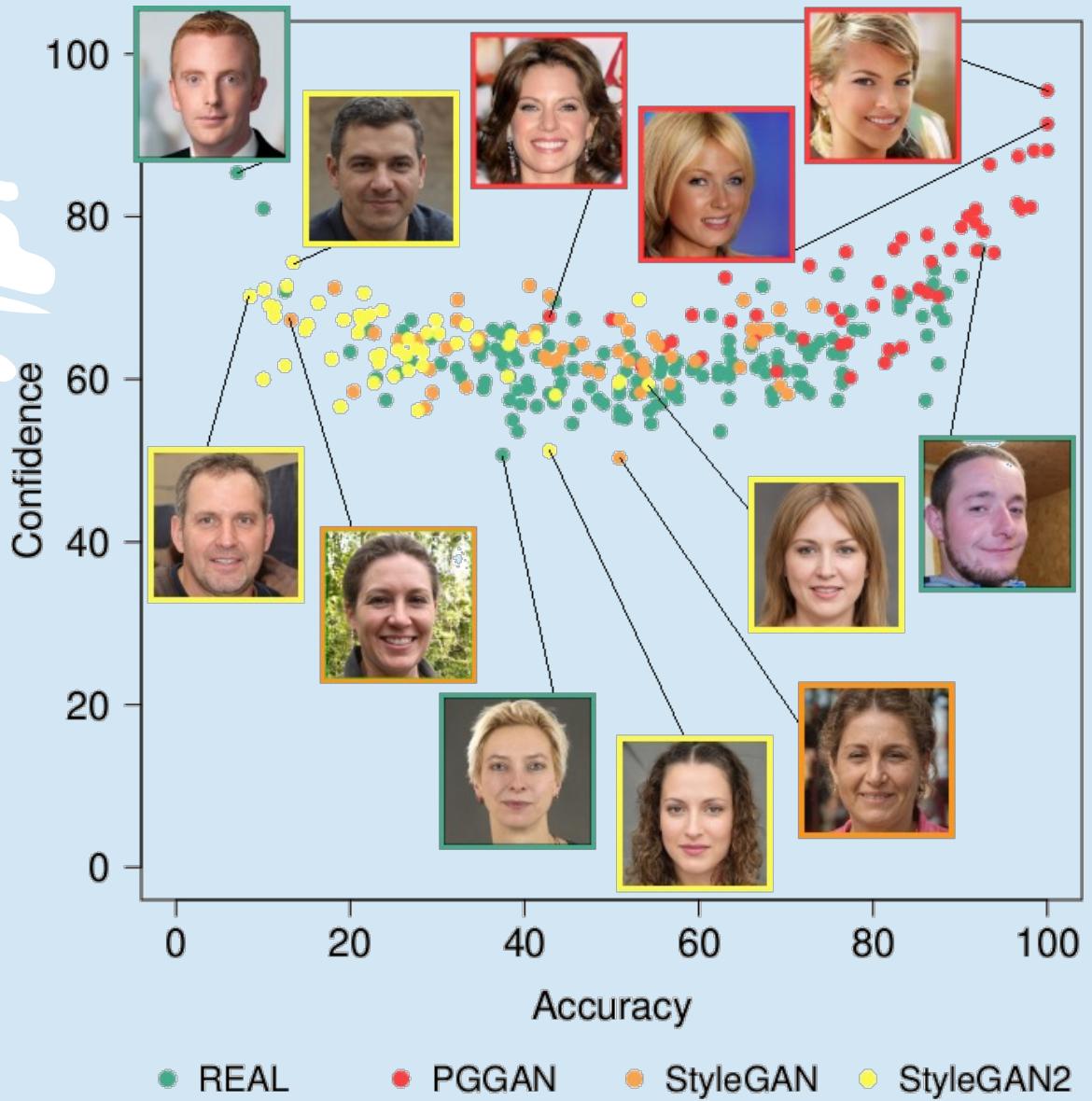
Is computed by mapping the rating value for a given task instance to the values $[1, \frac{2}{3}, \frac{1}{3}, 0, \frac{1}{3}, \frac{2}{3}, 1]$



Results

Correlation between **Accuracy** and **Confidence**

Overall	REAL	PGGAN	StyleGAN	StyleGAN2
✓	X	✓✓	X	✓✓-



Images with worst accuracy



Real - 3.7%



SG2 - 8.2%



SG2 - 8.9%



SG2 - 9.3%



SG2 - 9.6%



Real - 9.7%



SG2 - 10.8%



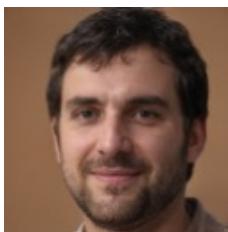
SG2 - 11.3%



SG2 - 12.2%



SG2 - 12.9%



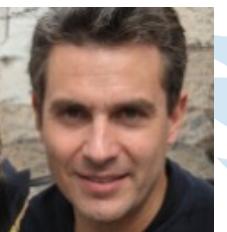
SG2 - 13.0%



Real - 13.6%



SG2 - 14.0%



SG2 - 14.9%



SG2 - 15.0%



SG1 - 15.7%



SG1 - 16.1%



SG2 - 17.0%

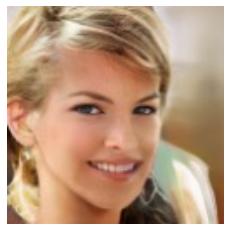


SG1 - 18.6%

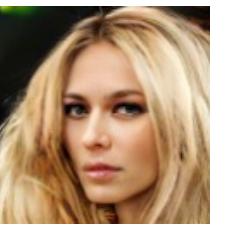


SG2 - 19.2%

Images with best accuracy



PG - 100%



PG - 98.1%



PG - 98.1%



PG - 97.9%



PG - 95.0%



PG - 94.9%



PG - 93.3%



PG - 92.7%



PG - 91.7%



PG - 91.4%



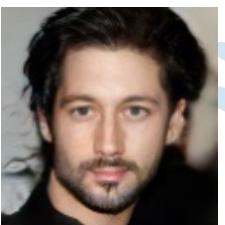
PG - 91.3%



PG - 91.2%



Real - 90.0%



PG - 89.7%



PG - 89.6%



PG - 89.3%



Real - 88.5%



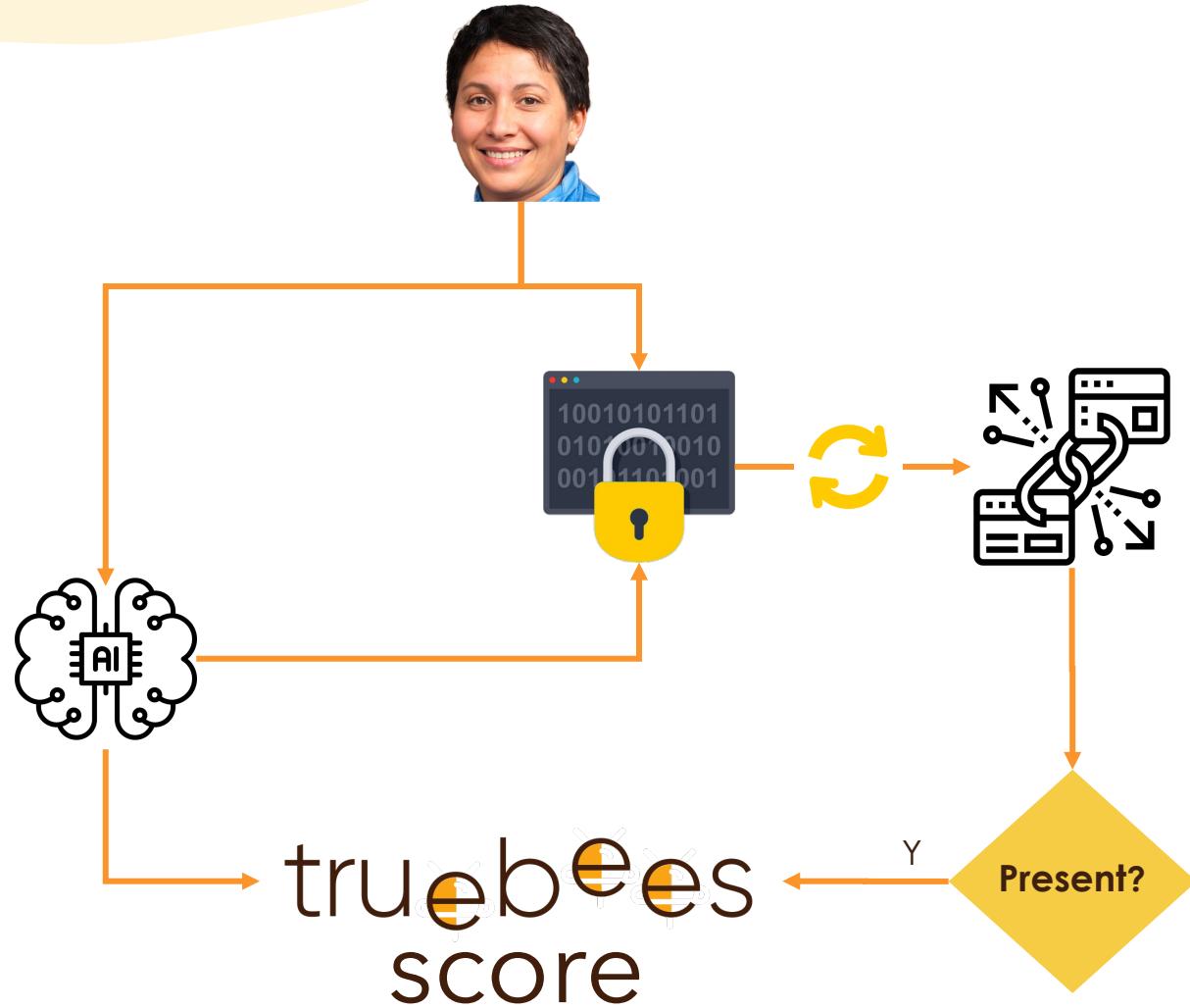
Real - 87.8%



Real - 87.0%



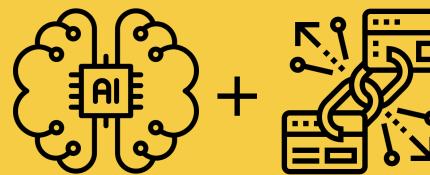
PG - 85.5%



Blockchain & AI against.. AI! Our SOLUTION to fight Deep Fakes

To fight the diffusion of synthetically AI-generated images on social networks, **TrueBees combines innovative AI digital image forensics** methods **with blockchain technology** to guarantee that a given visual user-generated content is trustworthy.

AI engine
for
images
classification



Blockchain
for querying
image hash

