# Face Recognition in Forensic Applications

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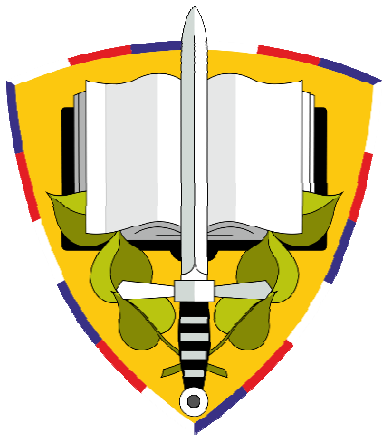
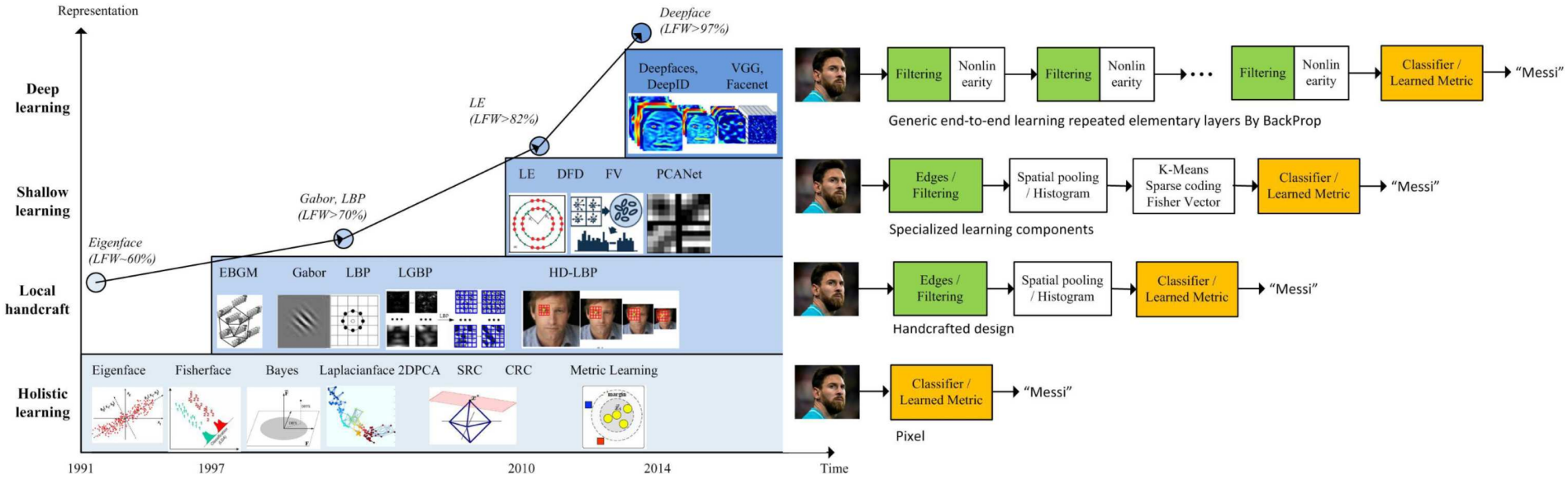
- Collaboration with criminal police and military units





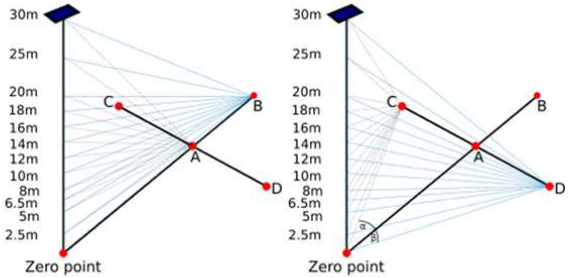
- Face detection algorithms
  - Parametric shape models (e.g. AAM, holistic model)
  - Non-parametric shape models (e.g. deep learning)
- Face recognition algorithms ⇓



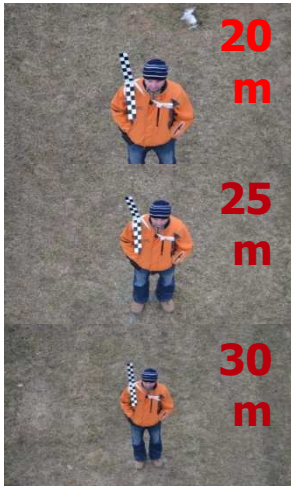

WANG, Mei; DENG, Weihong. Deep face recognition: A survey. *arXiv preprint arXiv:1804.06655*, 2018

# Testing of face biometric algorithms II.

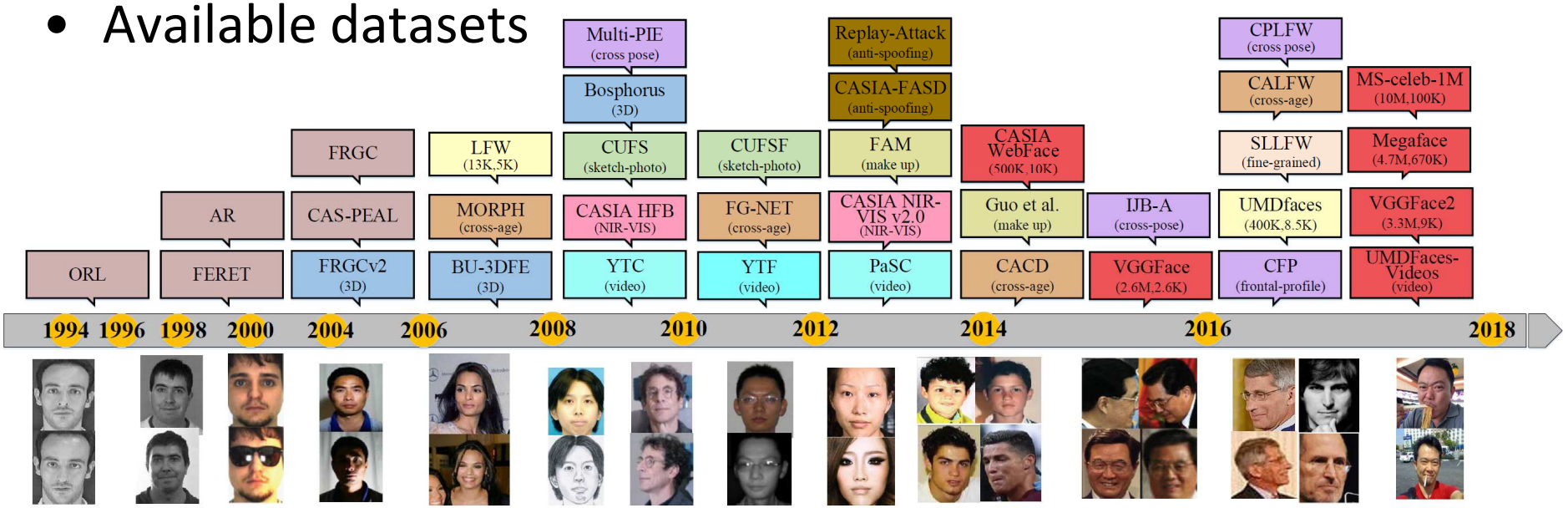
- Our own databases





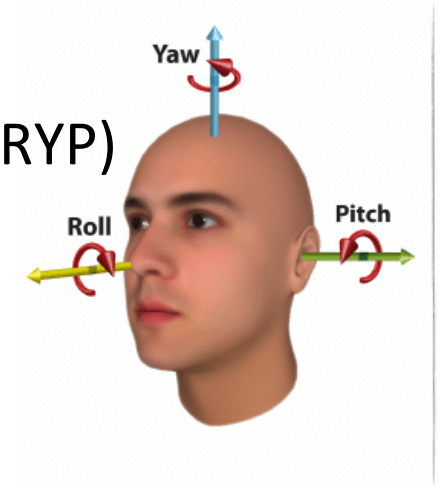

- Available datasets

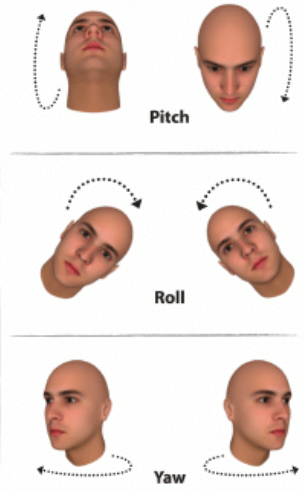


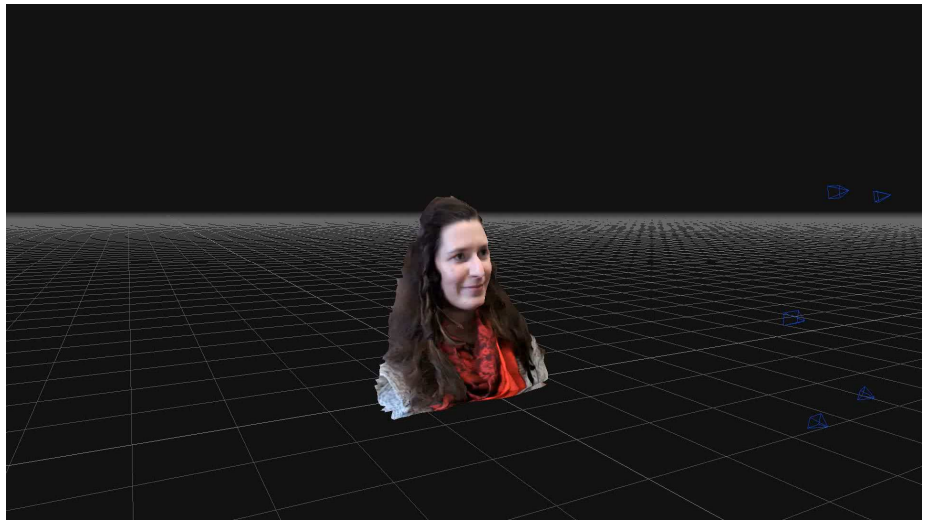

WANG, Mei; DENG, Weihong. Deep face recognition: A survey. *arXiv preprint arXiv:1804.06655*, 2018

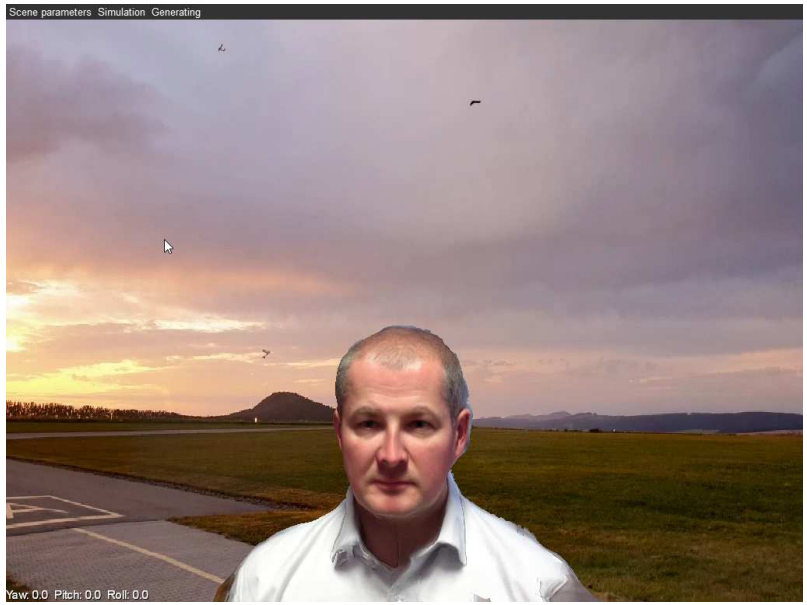
# Testing of face biometric algorithms III.

- 3D ⇒ 2D generator – SYDAGenerator https://www.fit.vut.cz/research/product/564/
  - Position
  - Orientation (RYP)
  - Illumination
  - Resolution
  - Background



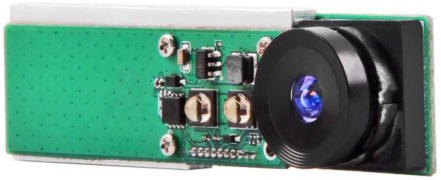



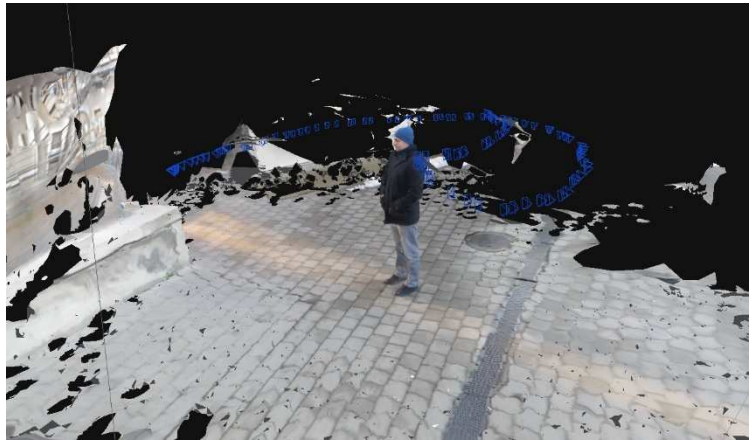


# 3D face acquisition

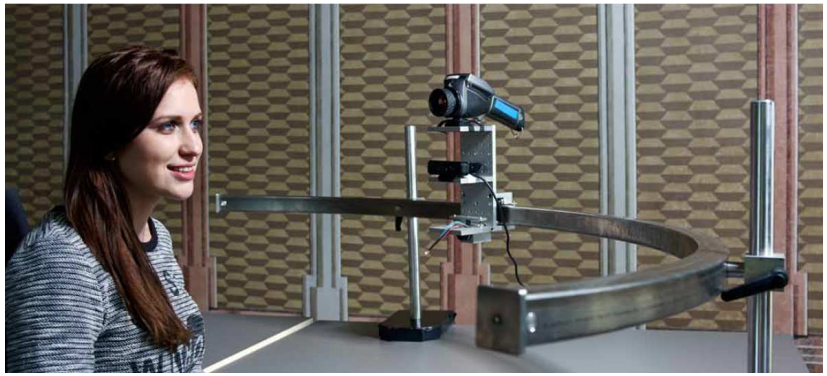
- 3D cameras




- Mobile phone / tablet and photogrammetry software

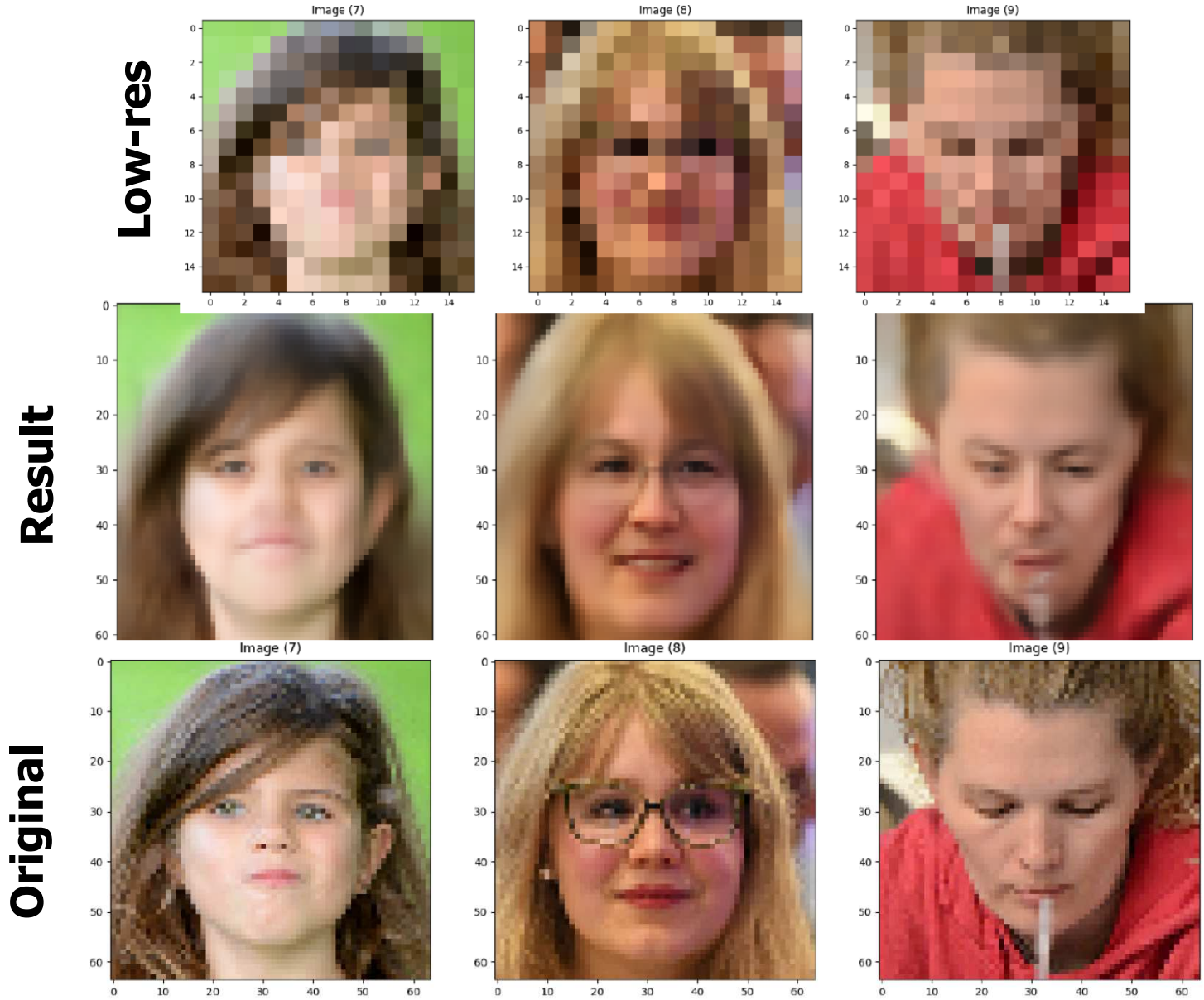


- U-ramp or unique device for police capturing of suspect people (patent submission running)



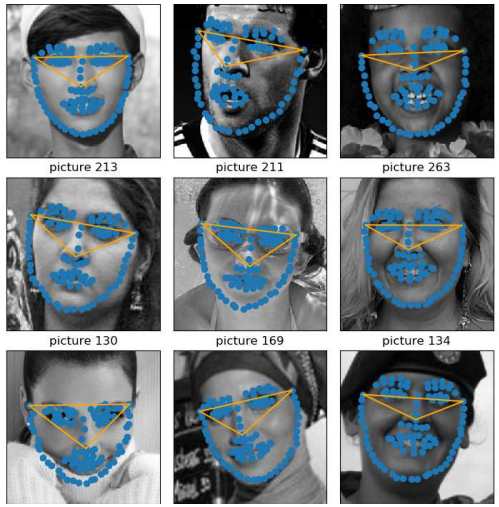
# Enhancement of low-resolution images I.

# Enhancement of low-resolution images II.



# Face detection and comparison in bad conditions

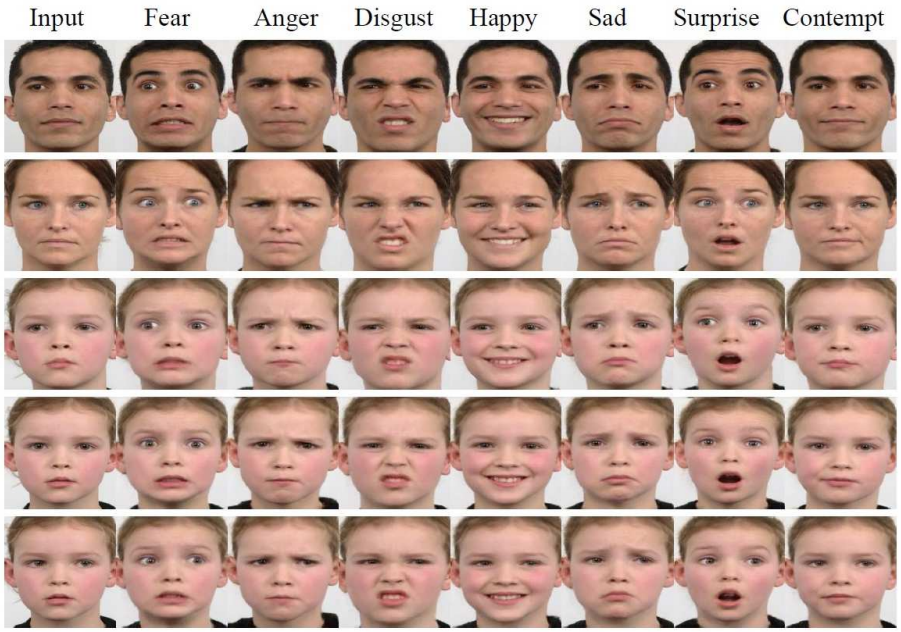
- We use pre-trained and modified face detection algorithms in combination with correlation methods (general head profile search)
- We use our own algorithm for head position (RYP) estimation – approx. 72 % reliability
- We use professional face comparison algorithms (e.g. MegaMatcher from Neuro-technology) for frontal face images



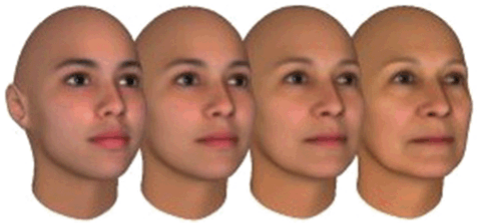

- We are working on an algorithm for non-frontal image comparison, based on 2D and 3D data (shape similarity comparison and correlation based methods)
- Results not available in any form for publishing, the most data from police are confidential

# Race, gender, age and mood estimation

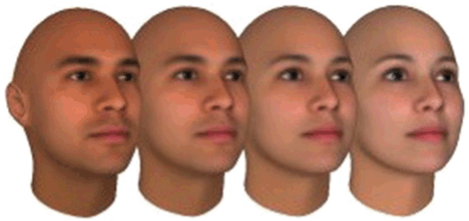
- Keras and Tensorflow (generally deep learning frameworks)
- The pre-trained models are based on available datasets which are often not annotated (possible mistakes)
- Age categorization into 8 groups (0–2; 4–6; 8–13; 15–20; 25–32; 38–43; 48–53; 60+)



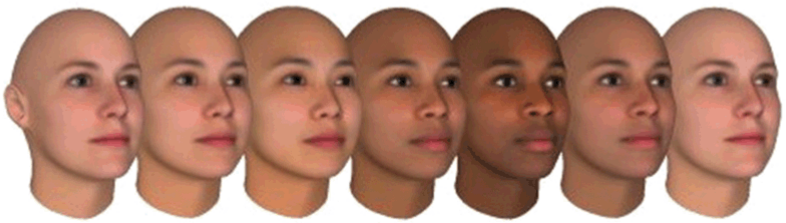

http://irip.buaa.edu.cn/Research/Research_Highlights.htm



*Age Morphing*



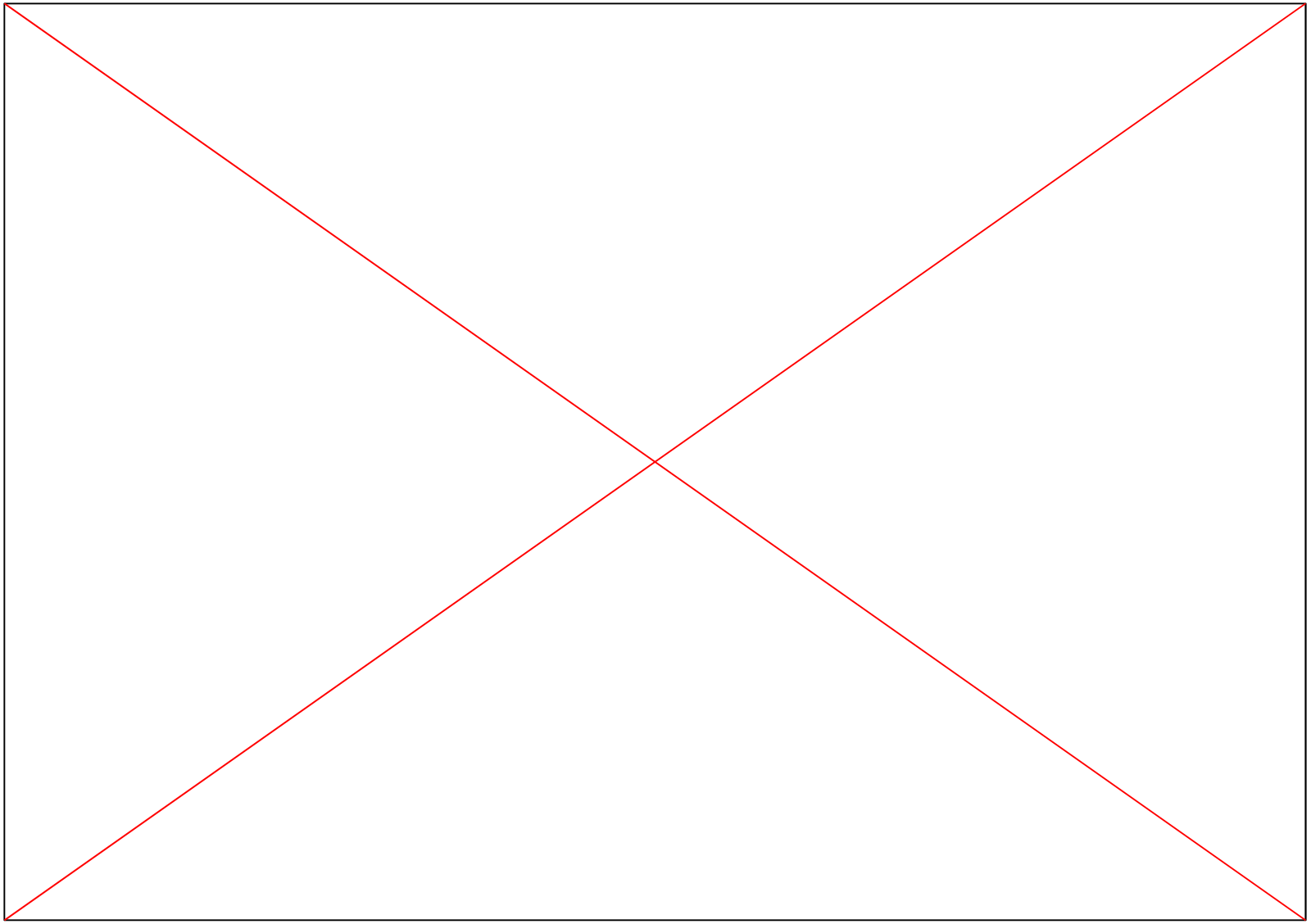
*Gender Morphing*



*Race Morphing*

https://www.computer.org/csdl/journal/tp/2014/12/06810000/13rRUwfZC1F

# Lost children/person search using 3D model



Thank you for your attention !