Advanced Seminar in Biometrics

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da/sec - Biometrics and Internet Security Research Group, Hochschule Darmstadt

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Personalia/Formalia

Topics

Contact and Website

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Procedure

- Each group (up to two students) selects one of the presented topics
- Required materials will be handed over by the supervisors (tutorial): database, software, evaluation scripts etc.
- Progress reports have to be sent to both supervisors before the following dates:
  1) 15. November
  2) 13. December
  3) 31. January
- Additional appointments shall be arranged individually and on demand.

Procedure (cont'd)

- Each group has to prepare a (6-8 pages) term paper (see website for template)
- The term paper must be submitted by **1st March**
- The final presentation will be 45 minutes per group + 15 minutes discussion of the results
- Suggested date for the final presentations: **19th March**
- A grade will be given based on the term paper and final presentation

Overview

- Bias in Face Recognition
- Anonymisation in Face Recognition
- Partial Face Recognition
- Impact of Tattoos on Face Recognition
- Colorisation in Face Recognition
- Fingerphoto Presentation Attack Detection
- Contrast Research on touchless Fingerprint Recognition under different Illuminants

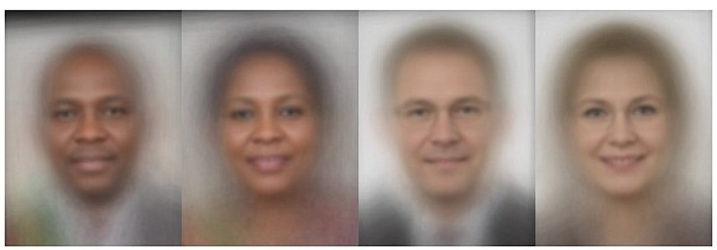
Bias in Face Recognition

In recent years, the possibility of systemic biases inherent to several automated decisions systems (including biometrics) have been reported and debated. In this context, different outcomes (decisions) for different groups (e.g. based on sex, age, and ethnicity) of individuals are generated by a biased algorithm.

- Conduct a literature survey on the existence and mitigation/prevention of bias in facial biometrics.

Gender Classifier	Darker Male	Darker Female	Lighter Male	Lighter Female	Largest Gap
Microsoft	94.0%	79.2%	100%	98.3%	20.8%
FACE++	99.3%	65.5%	99.2%	94.0%	33.8%
IBM	88.0%	65.3%	99.7%	92.9%	34.4%

- Task: Literature research + term paper
- Handout: Starting reading material
- Supervisors: P. Drozdowski



Anonymisation in Face Recognition

In recent years, privacy has arisen as a major concern associated with biometric systems. Obscuring or anonymising faces in images and videos is one option, which can be used to protect privacy, while retaining certain level of visual coherence/intelligibility of the image.

- Conduct a literature survey on anonymisation and de-anonymisation methods for facial images.

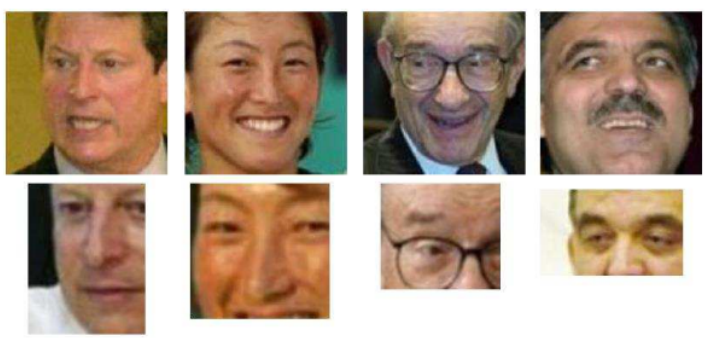
- Task: Literature research + term paper
- Handout: Starting reading material
- Supervisors: P. Drozdowski

Partial Face Recognition

Partial face images frequently occur in unconstrained (in-the-wild) scenarios, such as video surveillance and mobile devices. The holistic facial recognition methods developed in the recent years achieve impressive recognition results. However, the recognition of arbitrary patches from facial images presents an arguably more difficult challenge, which is highly relevant in certain practical applications.

- Conduct a literature survey on recognition methods using partial facial images.

- Task: Literature research + term paper
- Handout: Starting reading material
- Supervisors: P. Drozdowski

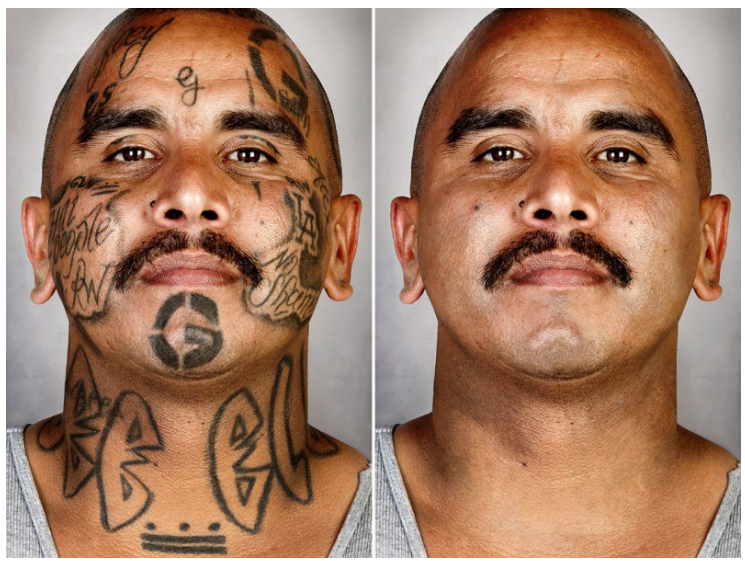


Impact of Facial Tattoos on Face Recognition

Many people have tattoos done on various body part including the face. Generation of face database before and after facial tattoos is required to measure impact on face recognition. In this context:

- Creation of face database of face images before/after tattoos
- Evaluation of face recognition systems on the created database

- Task: Practical research/evaluation + term paper
- Handout: Face recognition software, processing pipeline, DET curve software, ISO biometric standards
- Supervisors: C. Rathgeb



Colorisation in Face Recognition

It has been demonstrated that deep learning can also be used to colorize b/w images. In this work it should be investigated whether such methods could be used to improve the performance of state-of-the-art face recognition systems. In this context:

- Creation of face database of face images before/after colorisation
- Evaluation of face recognition systems on the created database
- Task: Practical research/evaluation + term paper
- Handout: Face recognition/colorisation software, processing pipeline, DET curve software, ISO biometric standards
- Supervisors: C. Rathgeb

Fingerphoto Presentation Attack Detection

Specifically in unsupervised scenarios it is essential that fingerprint sensors can not be spoofed. Examples for such scenarios are mobile payment protocols. Thus an important aspect for the security of a biometric systems is its robustness to artefacts (e.g. fake fingerprints)

- Implemention of at least two selected methods for presentation attacks on smartphone fingerphoto based biometrics and corresponding detection schemes
- Task: Practical research/evaluation + term paper
- Handout: Presentation attack instruments, Android Smartphone, Android App, ISO biometric standards
- Supervisors: J. Priesnitz

Contrast Research on touchless Fingerprint Recognition under different Illuminants

In touchless fingerprint recognition the biometric performance of a captured sample highly depends on the illumination. In mobile scenarios the sample quality can be improved by a sophisticated illumination which is not achievable by e.g. a flashlight of a smartphone.

- Capturing a data set of finger photos under different illuminants and find algorithms and parameters for finger segmentation and fingerphoto contrast enhancement
- Task: Practical research/evaluation + term paper
- Handout: Android Smartphone, Android app, setup for external illumination, DET curve software, ISO biometric standards
- Supervisors: J. Priesnitz

Select your own topic

- Students are also invited to propose their own topic!

Topic selection process

- Send your topic choice to `christian.rathgeb@h-da.de` by the end of the week
- First come, first serve – so you might choose more than one topic (1st and 2nd choice)