



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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- ▶ URL of seminar:
`https://dasec.h-da.de/teaching/
advanced-seminar-rathgeb-drozdowski-priesnitz-ws-2018-19`



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 (8-10 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 dates for the final presentations: **14th March**
- ▶ A grade will be given based on the term paper and final presentation



Overview

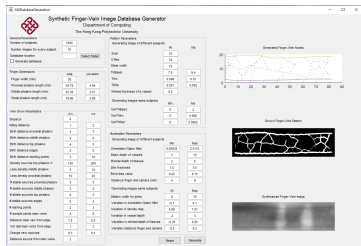
- ▶ Vein image quality assessment
- ▶ Synthetic finger-vein data generation and evaluation
- ▶ Application scenarios of machine Learning within the field on touchless fingerprint recognition
- ▶ Usability issues on slap hand acquisition schemes using smartphones
- ▶ Finger movement estimation
- ▶ Issues and challenges of touchless fingerprint database collection



Synthetic Finger-Vein Data Generation and Evaluation

Synthetic generation of biometric data enables evaluations on scale normally impossible for manually collected research datasets. In this context:

- ▶ Create a large synthetic finger-vein database
- ▶ Perform a biometric performance evaluation and report the results
- ▶ **Task:** Practical research/evaluation + term paper
- ▶ **Handout:** Vein image generation software, processing pipeline, DET curve software, ISO biometric standards
- ▶ **Supervisors:** P. Drozdowski, C. Rathgeb

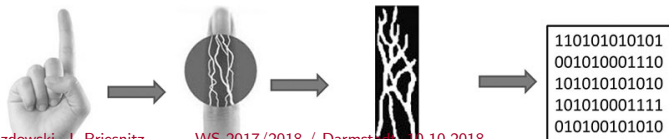




Vein Image Quality Assessment and Enhancement

In near-infrared hand/finger images, the blood vessels containing deoxidized haemoglobin become visible. Their patterns are unique to each individual and can be used for biometric recognition. In this context, investigate:

- ▶ The impact of the image quality on the biometric performance
- ▶ Suitable metrics for quantifiable image quality assessment
- ▶ Useful image enhancement methods
- ▶ **Task:** Literature survey + term paper
- ▶ **Handout:** Starting literature, ISO biometric standards
- ▶ **Supervisors:** P. Drozdowski, C. Rathgeb





Online Signature Acquisition

Publicly available datasets of biometric data, collected from voluntary data subjects, enable research into various biometric modalities. In a typical acquisition protocol, during a single session, the data is captured repeatedly (multiple samples). In the context of online signature acquisition, investigate:

- ▶ Are differences between successive acquisitions? This could relate to, for example (but not necessarily be limited to), typing consistency and speed, applied stylus pressure, and, finally, biometric performance.
- ▶ **Task:** Practical research/evaluation + term paper
- ▶ **Handout:** Online signature database, online signature recognition system, DET curve software, ISO biometric standards
- ▶ **Supervisors:** P. Drozdowski, C. Rathgeb



Machine Learning within the field on touchless fingerprint recognition.

Motivation:

- ▶ Machine learning is rapidly growing in the field of image processing
- ▶ Different ML-strategies exist at various stages of touchless fingerprint recognition
- ▶ New solutions are thinkable

Goals of the Paper:

- ▶ Extract relevant touchless fingerprint processing stages
- ▶ Give an overview on different machine learning techniques
- ▶ Evaluate application scenarios of machine learning on several processing stages



Usability issues on slap hand acquisition schemes using smartphones

Motivation:

- ▶ Slap hand acquisition offers a higher performance compared to a single finger
- ▶ Usability on fourprint smartphone acquisition has rarely been studied so far

Goals of the Paper:

- ▶ State of the research on related topics
- ▶ Define framework conditions for an acquisition scheme
- ▶ Suggest an own acquisition scheme
- ▶ Evaluate and compare the usability of different schemes and own approaches



Finger movement estimation

Motivation:

- ▶ Mobile touchless devices can easily acquire a fingerprint in one impression
- ▶ To capture a high quality finger image the finger movement should be minimal

Goals of the Paper:

- ▶ Implement a video-based hand detection on a common Android device
- ▶ Research on hand recognition and movement estimation algorithms
- ▶ Compute a hand and finger movement estimation in real time
- ▶ Detailed evaluation of the implementation and results



Issues and challenges of touchless fingerprint database collection

Motivation:

- ▶ Different touchless fingerprint acquisition devices and workflows are used for development
- ▶ Research activities need test dataset to evaluate their performance and usability

Goals of the Paper:

- ▶ Implement simple image quality checking mechanisms
- ▶ Research on the best practises of biometric databases
- ▶ Suggest metrics and a workflow for the database acquisition
- ▶ Evaluate the usability of the proposed scheme
- ▶ Establish a suitable database storage system and transfer channel (optional)



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BIOMETRICS AND INTERNET-SECURITY
RESEARCH GROUP

Topics



CRISP

Center for Research
in Security and Privacy

Select your own topic

- ▶ Students are also invited to proposed 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)