University of Basel
Department of
Biomedical Engineering

University of Basel, Department of Biomedical Engineering, Hegenheimermattweg 167c, 4123 Allschwil

Master of Science – Biomedical Engineering
Thesis Proposal

Master Thesis Title: *SpermAID – Development of AI-based assistance in forensic sperm detection and identification*

The microscopic detection of spermatozoa in sexual assault samples remains a key task in forensic genetics but is often challenging, especially when only trace amounts of semen are present among abundant epithelial cells, blood cells, and bacteria. Conventional methods rely on stained microscopic slides and manual examination, making the process labor-intensive, time-consuming, and subjective despite the use of the four-eye principle. Recent advances in bioinformatics and imaging technologies offer promising opportunities to streamline, standardize, and objectify sperm detection. Thus, this project aims to develop SpermAID, a custom software solution based on deep convolutional neural networks (CNNs) for automated slide scanning, image acquisition, and analysis. The student will define datasets and develop the code for training and testing a dual AI-based approach in collaboration with Optimal Systems Jena, supporting future integration into the in-house Zeiss PALM MicroBeam system. **Start date:** asap, latest start date 01.03.2027.

Nature of the Thesis
Experimental: 10%
Programming: 70%
Documentation: 20%

Specific Requirements
- Core programming and software engineering (e.g., Python)
- Image acquisition and processing
- Machine learning / deep learning
- Domain knowledge or fundamentals in Forensics or Microscopy-based work
- Solid communicational and organisational skills, enthusiastic and reliable

Group Leader / Supervisor
Dr. rer. medic. Iris Schulz

Collaborators
Optimal Systems Vertriebsgesellschaft Jena, Germany,
University of Applied Science, Mittweida, Germany
Landeskriminalamt Thüringen, Erfurt, Germany

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