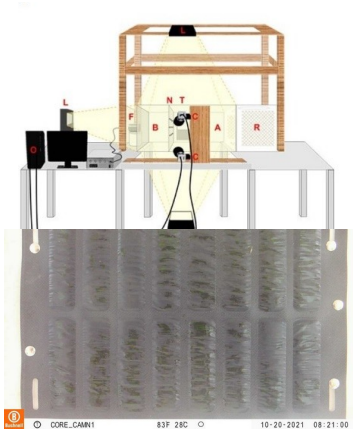
University of Basel
Department of
Biomedical Engineering

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

Master of Science – Biomedical Engineering, Thesis Proposal

Deep Learning for Automatization of Video-Analysis for Malaria Vector Behavioural Studies



Malaria is an infectious disease that is transmitted via different *Anopheles* mosquito vectors, each with their own unique behaviour. In order to develop and deploy effective and efficient vector control products, it is essential to understand the behaviour of each mosquito species. In particular, knowing how mosquitoes move in space and time in relation to both the local environment and the vector control tool they interact with can help improve the effectiveness and efficiency of such vector control strategies. Some studies have already been conducted employing video tracking analysis, revealing that *Anopheles gambiae* may be targeted and killed by small insecticidal net barriers positioned above a conventional net as they tend to approach a net more frequently from above.

The aim of this master thesis is to develop a series of Deep Learning models to support malaria vector behavioural studies based on video analysis. In particular, these models will focus on aiding in the automatization of common tasks performed during these experiments, such as mosquito sexing and counting, species identification, and the classification of behavioural patterns. For this purpose, the student will need to develop a pipeline to process the 2D images that constitute the 24-hour-long videos (taken with normal and infrared cameras) along with the vectorized 3D trajectory of the mosquitoes. The next step will be to develop a series of Deep Learning approaches using this data to provide a working solution for each application. Ground truths for all applications will be provided by the Swiss TPH. Finally, should all objectives be completed before the end of the thesis, additional work related to the Swiss TPH's malaria control projects will be conducted.

Nature of the Thesis
Experimental: 30%, Programming: 60%, Documentation: 10%

Specific Requirements
- Experience in Deep Learning
- Good programming skills (Python)

Supervisors
Dr. Julia Wolleb*, University of Basel, Center for medical Image Analysis and Navigation (CIAN)*
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Scientific Collaborators
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