

MASTER PROJECT/ THESIS

in the EIT/ISE Master's course programs

for: **available**
Posed by: **Prof. Dr.-Ing. Jan C. Balzer**
Topic: Insect Classification using Artificial Neural Networks

Insects are vital for maintaining ecological balance, contributing to pollination, and serving as a food source for other species. Monitoring insects is essential for understanding ecosystem health, detecting environmental changes, and conserving biodiversity. Advancements in radar technology, particularly the use of higher frequencies like the terahertz (THz) band, enable the precise detection of smaller insects. To enhance classification accuracy, radar digital twins generate data that can be processed using deep learning techniques, such as artificial neural networks (ANN). This study aims to leverage deep learning techniques to develop a robust and scalable system for classifying insect species, contributing to ecological studies and biodiversity conservation.

The objective of the project/ thesis is to employ artificial neural networks (ANN) within Python/MATLAB to classify different insects using available radar datasets for training.

The task entails the following:

- Creating a time and work plan,
- getting familiar with the types of neural network models (FFNN, CNN, RNN, etc) and their implementation in Python/MATLAB,
- analyzing the available datasets for insect classification, and evaluate their quality and relevance,
- implement a neural network architecture suitable for insect classification,
- analyzing the models' classification results, identifying strengths and limitations,
- regular participation in group seminars,
- presentation of an interim report,
- documentation, and final presentation of the work,
- the submission of the documentation and the presentation in PDF format as well as the hand in of the printed documentation to the Prüfungsamt according to the regularisation in the Prüfungsordnung.

Second reviewer: Prof. Dr.-Ing. A. Czulwik

Duisburg, _____

Supervisor: _____

Prof. Dr.-Ing. Jan C. Balzer