

The Spatial Interaction Ecology research group of Prof. Tiffany Knight at the Institute of Biology of the Martin Luther University Halle-Wittenberg offers the following Master thesis topic with a preferred starting date of 1 May 2021:

### **Developing automated tools for detection of insect pollinators**

Project background and thesis subject:

Pollination is critical to many ecosystem services, such as the maintenance of biodiversity and human nutrition. Addressing how plant-pollinator interactions change across environmental gradients requires quantifying pollinator visitation. However, we are limited by the available tools. Ecologists typically observe pollinators in the field, record the species identity of the easily distinguished individuals, and collect with a net the remaining individuals so that they can be later identified to species in the lab.

This research aims to test different approaches with the goal of developing an automated camera system that collects images that can be used in to quantify interactions between plants and insect pollinators. Techniques can include a Raspberry Pi micro-computer, tailored lenses and motion or beam sensors coupled with a deep learning approach for fast object detection like YOLO. The tool must be capable of detecting and capturing clear images or video recordings of visiting insects on flowers and uniquely trace and count each individual. We expect challenges like shade and wind effects, limited battery supply, multiple insects in the camera's field of view, multiple focal lengths, diverse image background, etc.

If interested, the research can also include the next step, which is using the captured images for training state of the art Convolutional Neural Networks with the goal of insect identification. Recent tools developed for bumblebee identification in North America can be modified for our diverse European bumblebee species.

The study will be conducted in grasslands around the Leipzig area. We envision field work this summer 2021 (June-August).

Your tasks:

- Design, test and deploy the automated system in the field;
- Opportunity to test different approaches with the goal of developing a fast, accurate and cost effective automated system;
- Documenting and presenting your results to our team and collaborators;
- Writing a Master thesis;
- Be capable of working alone and also as part of a collaborative team.

Your profile:

- Bachelor in Engineering, Robotics, Computer Science, IT or similar;
- Experience with Raspberry Pi, YOLO, and other deep learning approaches for object detection;

- Familiar with Python;
- Highly motivated to work in an international team of scientists.

Applications should consist of a single PDF file including (i) a letter of interest, a (ii) curriculum vitae and (iii) a current transcript of records. Please submit your full application dossier only in English as E-Mail with the subject line 'Application Master Student Thesis - Ref 2021-01' to Sarah Herbst, E-mail: [sarah-christine.herbst@idiv.de](mailto:sarah-christine.herbst@idiv.de). Applications will be received until position is filled. For any further questions about the project, please contact Valentin Stefan, E-Mail: [valentin.stefan@idiv.de](mailto:valentin.stefan@idiv.de).