

Automatic Video Monitoring of Honeybee Foraging Behavior using Convolutional Neural Networks

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In this work Machine Learning methods for the automatic video monitoring of foraging behaviour in Honey Bee are presented. The proposed system consists on pose estimation on videos recorded at the entrance of the hive and automatic pollen bearing detection.

The proposed system builds on the recent advances in computer vision for Human pose estimation using deep learning methods. In particular, we used body part detection and Part Affinity Fields for pose estimation using the anatomy of honeybees. Using this method we obtained 98% recall for part detection and 95% of correct part association. For pollen recognition, the proposed method with pre-alignment of the images using the pose estimation reached 100% accuracy, compared to 96% using only bee location.

Relying on the precision of the detection, tracking was performed using the Hungarian assignment algorithm. With this information, behaviour classification for foraging behaviour was performed by classifying trajectories into entries and exit.

This set of methods was implemented on the High-Performance Computing facility servers and applied to a week of video recordings. The results show the potential of the proposed models as a tool for studying honey bee behaviour at ethological and ecological level.

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