**Automatic recognition of insect behavior with computer vision and artificial intelligence**

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Manual animal behavior analysis is a limited method and produces subjective results. The implementation of artificial intelligence and computer vision can be interesting tools for these types of evaluations. Deep learning is a recent artificial intelligence technique that has shown good results in different fields. In this work was used convolutional neural network - a deep learning technique - for automatic recognition of trophallaxis in workers of the stingless bee Melipona quadrifasciata (Hymenoptera, Apidae). Trophallaxis is a behavior of food exchange between individuals. The workers were recorded (video at 30 frame per second) in Petri dish to record this behavior. A heuristic based on the body size and body area of the workers was used for generate, automatically, the dataset of labeled images from video. The labeled images were resized to low resolution (124 x 124 pixels) to improve processing, and the dataset was divided into 75% for training and 25% for validation. The convolutional neural network was set with optimizer as stochastic gradient descent (learning rate at 0.0001 and momentum at 0.9) and the loss function was binary cross-entropy. For preventing overfitting was used data augmentation and K-fold cross-validation for decreasing variance in the validation scores. The model proposed here obtained good accuracy (global accuracy = 87%, Kappa coefficient = 0.91) in the classification of this behavior. In this study, a deep learning method was demonstrated that achieved good accuracy in recognizing complex behavior in a social insect. Therefore, it is an important tool for real-time animal behavior analyses in entomology and related areas.

**Keywords:** convolutional neural networks, data augmentation, deep learning.

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