DeerAI: AI Based Game Monitoring

Supporting Image-Based Wildlife Classification

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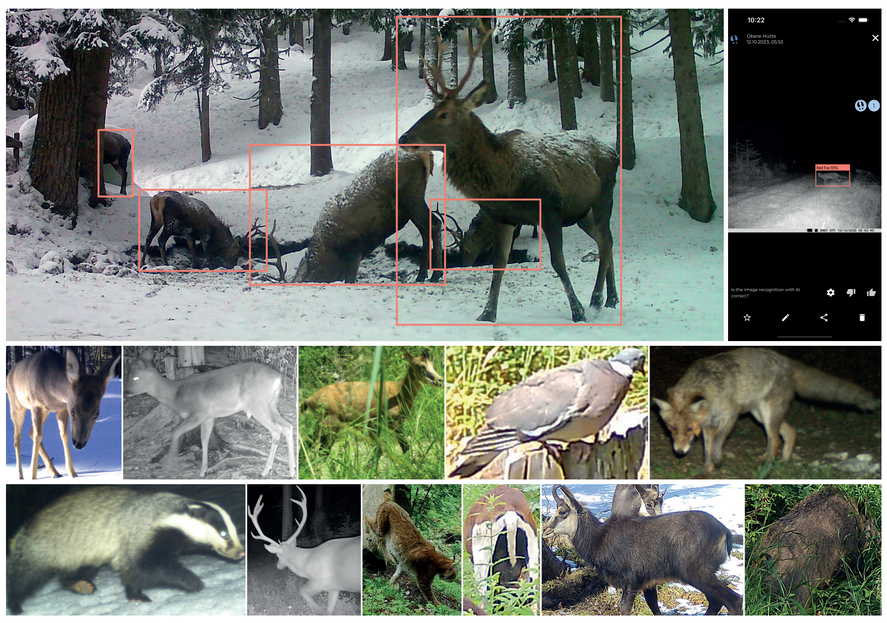
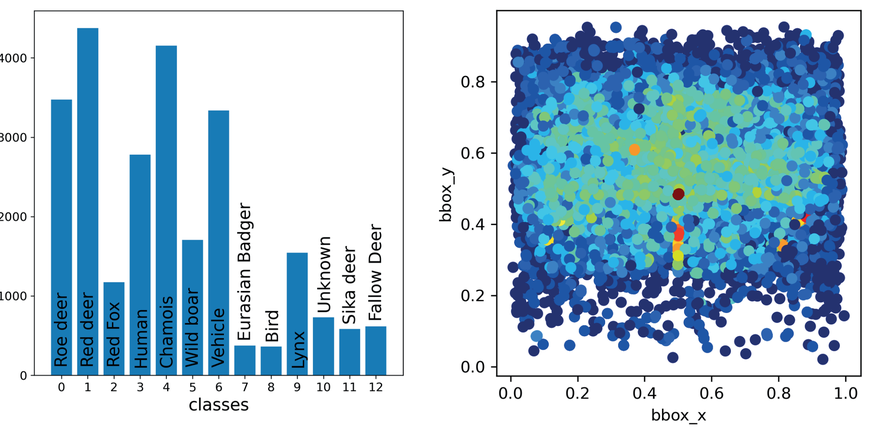
Abstract

This work introduces a computer vision system designed for supporting users in image-based wildlife classification. Leveraging deep learning techniques, the system employs one- and two-stage neural network architecture to detect and classify different wildlife species from input camera trap images with accuracies up to 95%. Additional, a custom tailored data set is presented. The system demonstrates its efficacy in real-world scenarios, providing a valuable tool for wildlife monitoring and conservation efforts.

Input Data Sets



Exemplary labeled image from a red deer (*Cervus elaphus*) feedings site (top left), the user interface of the proposed mobile application (top right), and randomly selected crops of animals of our proposed data set (bottom).

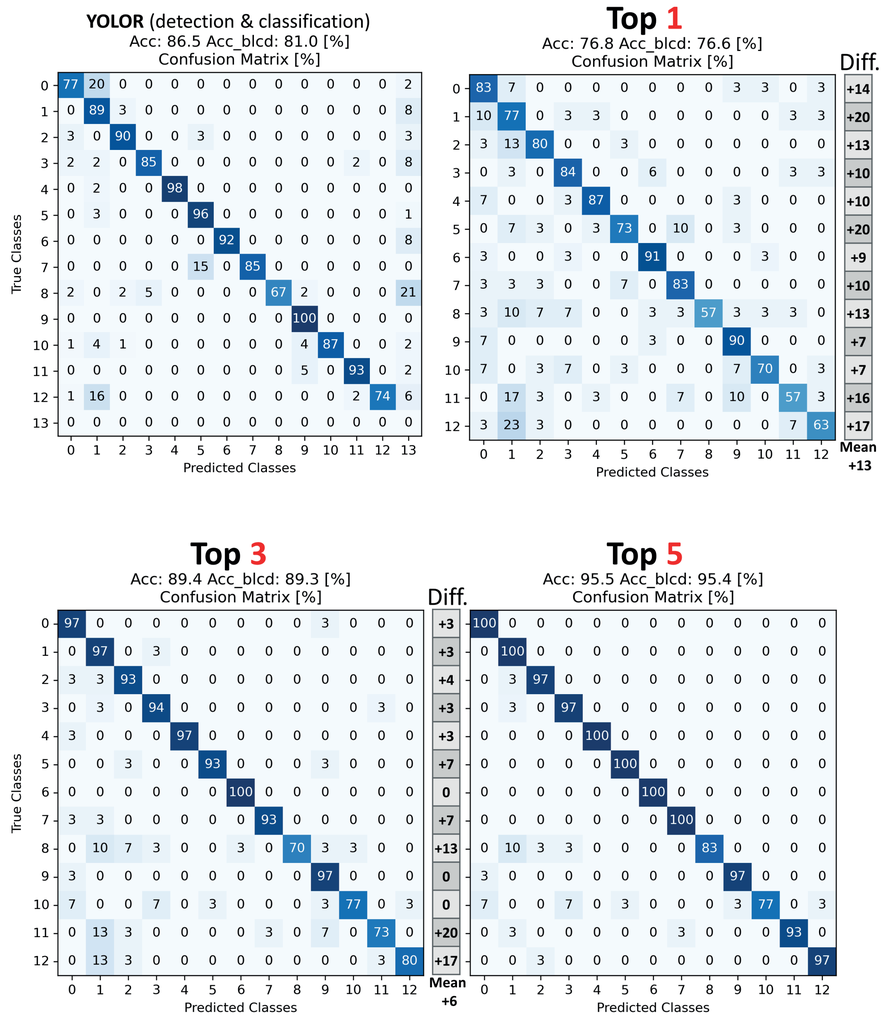


Custom data set used for this study. Shown are the class distribution (left) and the distribution of the bounding box centroids holding animals within the images (right).

Methodology and Results

Two paths for animal detection and species classification:

- One-stage detection and classification based on YOLOR.
- Two-stage detection and classification with EfficientNetB7.



Results of detection and classification with YOLOR (top left). Classification of reference bounding boxes using EfficientNetB7 also showing the improvements between top 1 (top right), top 3 (bottom left), and top 5 (bottom right). Classes are 0:roe deer, 1:red deer, 2:red fox, 3:human, 4:chamois, 5:wild boar, 6:vehicles, 7:eurasian badger, 8:bird, 9:lynx, 10: unknown animal, 11:sika deer, 12:fallow dear, 13:not detected objects.

Conclusions and Outlook

The proposed computer vision system for wildlife classification yielded accuracies in the range of 77 to 87% w.r.t. species classification. With 95% the correct species is between the top 5 predictions allowing an user to correct initial classifications manually. Future developments will deal with the optimization and enlargement of the data set, by adding underrepresented and rare species. Furthermore, methods are being expanded with a focus on the automatic determination of the sex and age class of animals and the re-identification of individuals.

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