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Deep Neural Networks based Multiclass Animal Detection and Classification in Drone Imagery

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Abstract

Fauna in deserts regions is increasingly threatened by urbanization and other infrastructural developments. There is thus growing interest among the research community in the search for possible technology-driven strategies for the conservation of desert life. In this work, we investigate the use of one of the best available Deep Neural Networks, YOLO Version-5 (v5), to enable offline detection, identification and classification of three popular desert animals (i.e Camels, Oryxes, and Gazelles). The experimental dataset contains over 1200 images, which were partitioned into training, validation, and testing data sub-sets in a 8:1:1 ratio, respectively. The ultimate goal is to use the otcomes of the proposed research to enable real-time online identification and classification of these animals' activities as captured by UAVs. We trained three Multi-class models, animal classification models, based on YOLO v5 Small(S), Medium(M) and Large(L) representing increasingly deep and complex architectures, to simultaneously detect and label the 3 kinds of animals. Models' performance was compared on the basis of classification accuracy (F1-Measure). The Multi-class detector models generated were also compared with the single animal detector models created using the same network architectures. YOLO v5 L achieved the highest multi-class average classification accuracy of 96.71% (95.39 – 98.98). In comparison with the single animal detector models, the Multi-class models exhibited the ability to correctly detect the target objects even for cases where the objects are located close to each other. We provide comprehensive test results and an analysis of results to demonstrate the effectiveness of the proposed models.
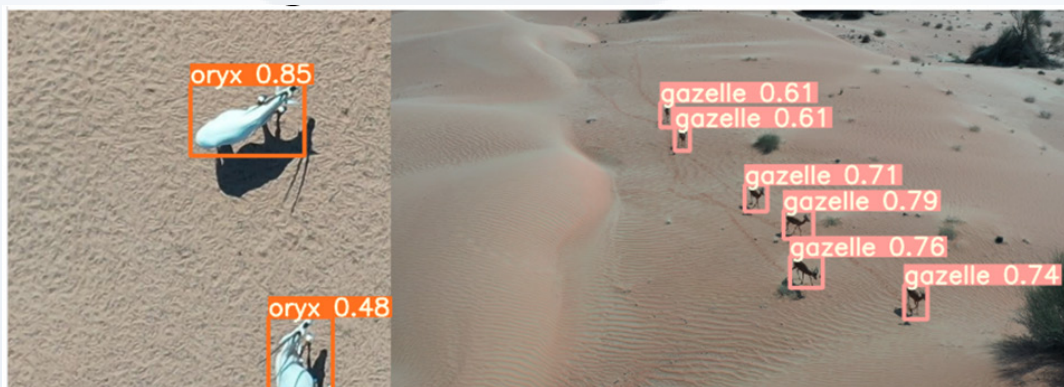
Biography

Changrong Chen received his B.S. degree in software engineering from Northeastern University, Shenyang, China in 2019 and his M.Sc. degree in Computer Science from Loughborough University, UK, in 2020. He is currently working towards his Ph.D. degree in Computer Science, under the supervision of Prof Eran Edirisinghe, Keele University, UK. His research interests include deep learning, machine learning, and computer vision. In particular he is working on using Deep Neural Networks to effectively detect, recognise, count and track objects in drone captured images and camera-trap images in desert areas.