Mask RCNN Final Results on Scale Rapid Annotated Images:

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Author: Srirupa Guha (LinkedIn: https://www.linkedin.com/in/srirupa-guha/)

Dataset used: Scale.Rapid annotations on Mosquito Body Parts Dataset with augmentation

Dataset path: https://drive.google.com/drive/folders/1HK5Tk3KgwaQ8XRFzNql_VTtUQLzo7HQG

Train, Val Split: 420 images for training, 23 images for validation

DagsHub Repository:

https://dagshub.com/Omdena/Vectech/src/master/Mask_RCNN_Mosquito_DatasetCustom_Instance_Segmentation

Model Used: Mask RCNN by Matterport

Trained Model Path: https://drive.google.com/drive/folders/1CJRgaTCZk7l5gW-3NRFWVygB2q2hETE1

(File Name: Full_Trained_MRCNN_ModelOnMosquitoDataset.h5)

Source Code Used as Reference : https://github.com/matterport/Mask_RCNN

Other Relevant References:

https://github.com/matterport/Mask_RCNN/blob/master/samples/coco/coco.py

https://github.com/cocodataset/cocoapi/blob/master/PythonAPI/pycocotools/coco.py

Resources and Source Code for converting annotated masked images to COCO json format for training Mask RCNN:

https://www.immersivelimit.com/tutorials/create-coco-annotations-from-scratch

https://github.com/chrise96/image-to-coco-json-converter/blob/master/src/create_annotations.py

https://github.com/chrise96/image-to-coco-json-converter/blob/master/create-custom-coco-dataset.ipynb

Description:

1. Scale Rapid annotated images were converted to COCO json format

2. Matterport's Mask RCNN source code was implemented with necessary changes and the pre-trained Mask RCNN on COCO dataset was trained on the mosquito dataset

3. Model Backbone used: ResNet 101

4. **Results:**
 Mean validation IoU Score across all images and classes: 0.851259177092646 (85.1%)

Mean classwise validation IoU scores are as follows:

abdomen	wing	leg	thorax	head	palps	proboscis	antennae
0.8677507390578588 (86.7%)	0.8831375563144683 (88.3%)	0.9675170501073201 (96.7%)	0.7542110135157903 (75.4%)	0.6977986574172974 (69.7%)	0.8933212757110596 (89.3%)	0.8815563746861049 (88.1%)	0 (0%)

Observations and Insights:

- The Mask RCNN model fits well on the training mosquito data and generalizes well on the validation dataset as well
- Due to small dataset size, the dataset was split into only train and validation, no test dataset was used
    - On increasing the dataset size the model can be further evaluated on a test dataset
- It is observed that all classes except the class "antennae" exhibit high IoU score, indicating that the model is able to identify these class masks well
    - Low IoU score for antennae is mainly due to class imbalance in the dataset and can be improved by training the model on more images containing the class antennae

5. **Next Steps:**

To train this model further on more Scale.Rapid annotated images with more data collected for minority classes where IoU scores are low (e.g.: proboscis, antennae etc.) and augmentations
6. Mask RCNN for instance segmentation reference article:

https://towardsdatascience.com/computer-vision-instance-segmentation-with-mask-r-cnn-7983502fcad1