

Detection of bike parts using transfer learning in Tensorflow 2.0

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- **Specifications of datasets created**

Dataset	No. of images	No. of instances of each label						
		seat	fuel tank	tyre	head lamp	tail lamp	rear view mirror	rear indicator
train	28	27	23	44	17	21	35	28
validation	5	5	4	9	5	4	7	5
test	7	7	6	11	5	6	9	10

The training dataset contains roughly the same number of images of the front, back, left and right view of the bikes so that an even distribution of all labels are parsed through the model.

- **Specifications of neural network chosen**

Base Model Chosen: SSD ResNet50 V1 FPN 640x640 (RetinaNet50)

This model was chosen because of its appropriate benchmarks on the base dataset - it gave a decently high mAP (34.3) at a very high speed of 22 frames per second, as compared to the other models. Moreover, the model uses anchor based object detection which is appropriate for our custom dataset that contains such a small number of training images (28) and contains objects of roughly even sizes (apart from rear indicators). It is a single-step detection model which implies lower complexity and higher speed of detection.

Base Data Set: [COCO 2017 dataset](#)

The COCO 2017 is a large-scale object detection, segmentation, and captioning dataset that contains images of everyday scenes and common objects. The COCO 2017 Dataset has about 153,000 images (118,000 for training, 40,000 for testing and 5,000 for validation), 900,000 object annotations and about 90 classes with median image ratio of 640 x 480 pixels. It is an ideal dataset for building pre-trained object detectors using transfer learning.

Hyperparameters Modified in the original pipeline:

batch_size= 4

num_of_steps= 2400

warmup_steps= 200

min_threshold_confidence=0.6

• Specifications of results

Evaluation Metrics (Calculated on test dataset)

Mean Average Precision = 0.482

```
Average Precision (AP) @[ IoU=0.50:0.95 | area= all | maxDets=100 ] =  
0.482
```

```
INFO:tensorflow: + DetectionBoxes_Precision/mAP: 0.482468
```

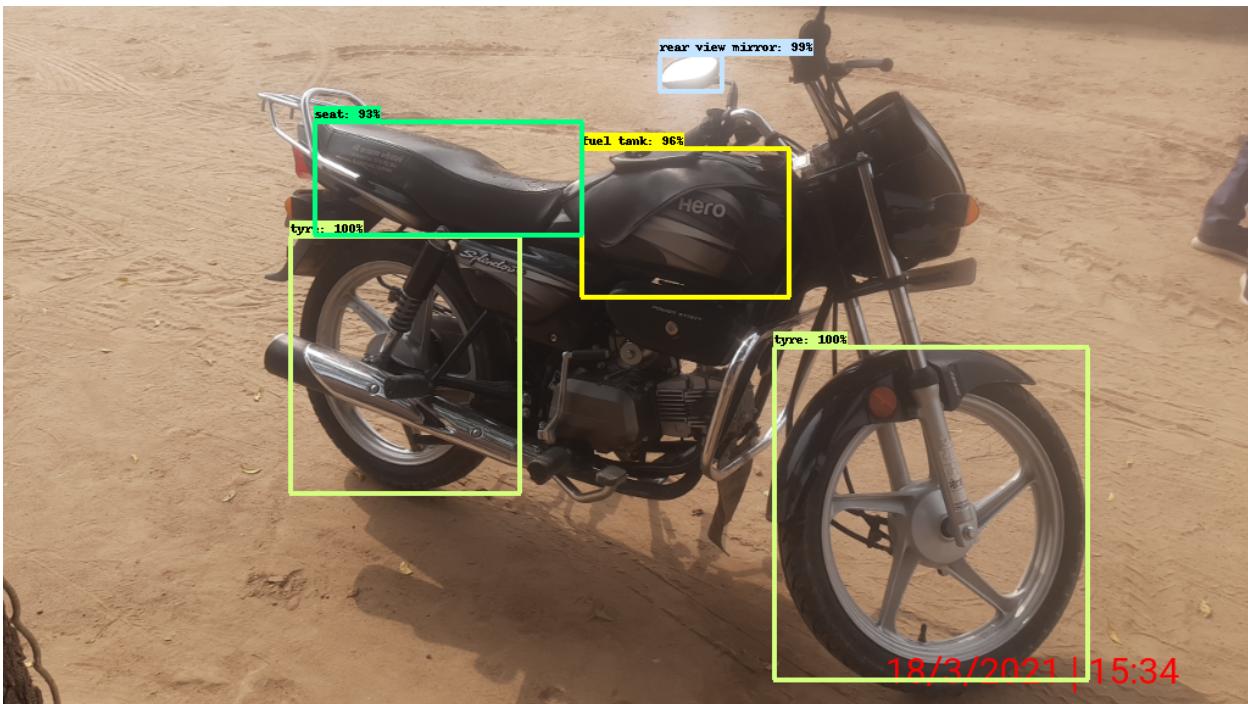
Mean Average Recall = 0.377

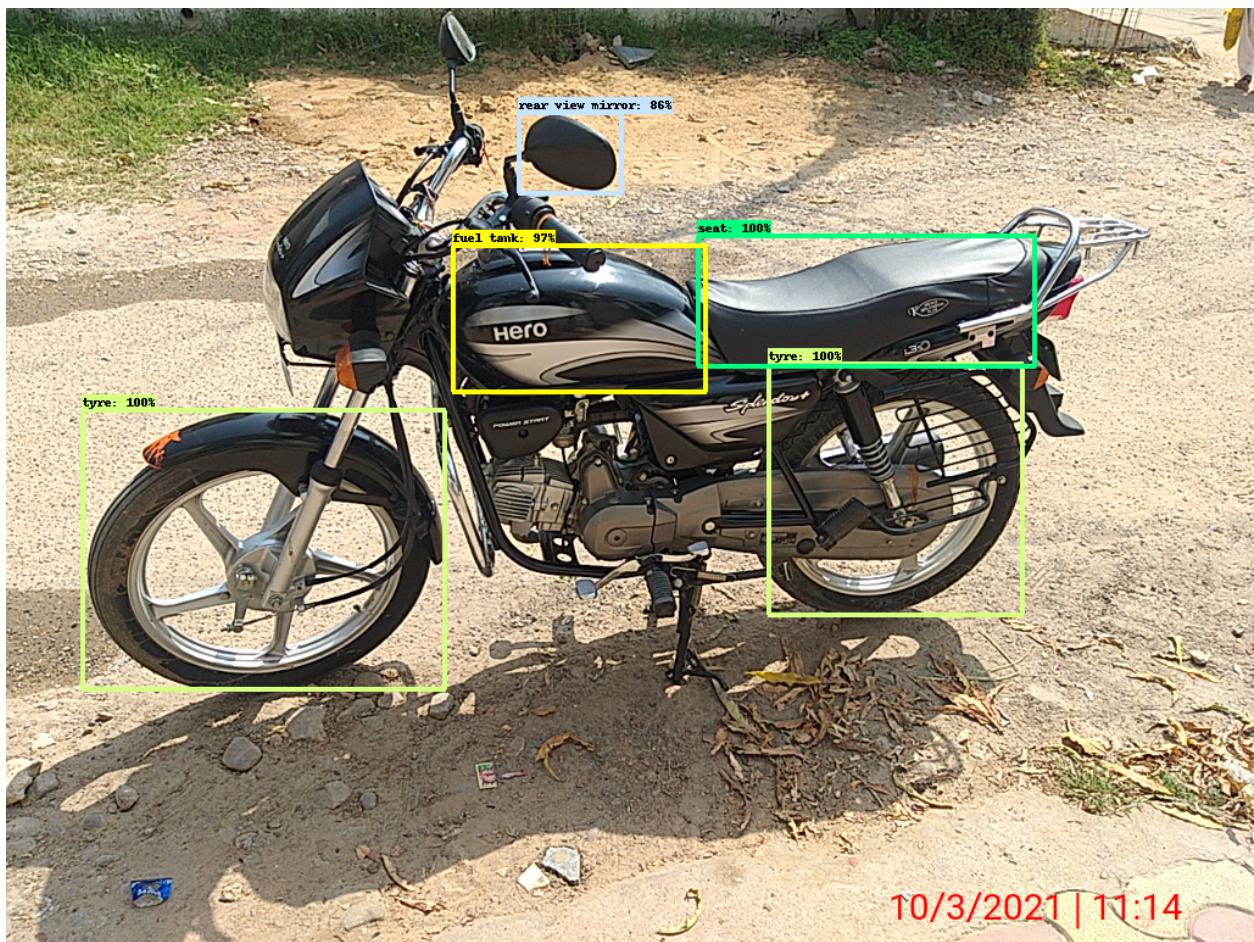
```
Average Recall (AR) @[ IoU=0.50:0.95 | area= all | maxDets= 1 ] =  
0.377
```

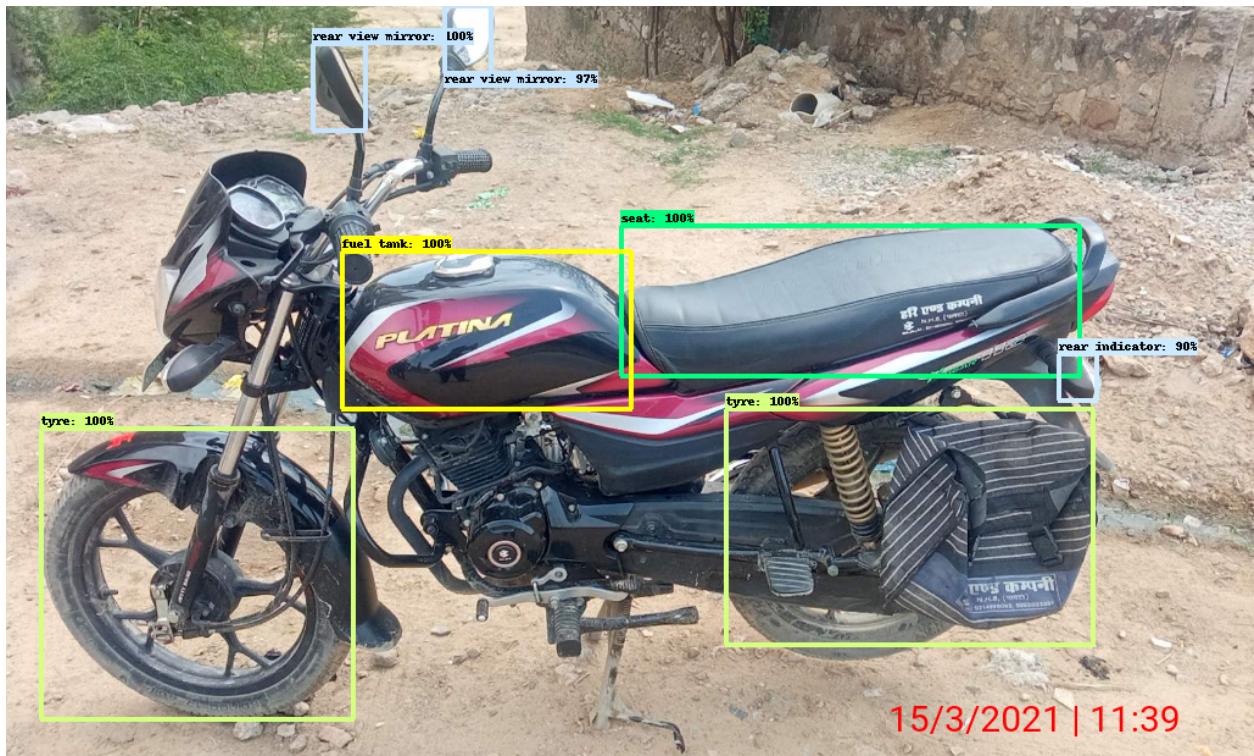
```
INFO:tensorflow: + DetectionBoxes_Recall/AR@1: 0.377403
```

F1 Score = 0.423

Inferencing Results on the test dataset







● References

- <https://tensorflow-object-detection-api-tutorial.readthedocs.io/en/latest/training.html#training-the-model>
- <https://github.com/nicknochnack/TensorflowObjectDetectionMetrics/blob/main/Tutorial-Walkthrough.ipynb>
- https://github.com/tensorflow/models/blob/master/research/object_detection/g3doc/tf2_detection_zoo.md
- <https://cocodataset.org/#home>
- <https://neptune.ai/blog/tensorflow-object-detection-api-best-practices-to-training-evaluation-deployment>