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TensorFlow Practice

Today I have learned TensorFlow's Fuctional API. TensorFlow has two types of High Level API
  ➢ Sequential API
  ➢ Functional API

Sequential API means , it like a stack structure we can add as much of layer in sequential way.But it is not flexible.

Functional API , It is very flexible API ,we can add any layers in between them.

I have created one simple CNN structure ,for CIFAR-10 datasets which has 10 different classes. I got around 94% accuracy.

```
Model: "model_4"
_____
Layer (type)                   Output Shape              Param #
=================================================================
input_6 (InputLayer)           [(None, 32, 32, 3)]       0

conv2d_9 (Conv2D)              (None, 30, 30, 64)        1792

batch_normalization_8 (Batch   (None, 30, 30, 64)        256

tf.nn.relu_8 (TFOpLambda)      (None, 30, 30, 64)        0

conv2d_10 (Conv2D)             (None, 30, 30, 128)       73856

batch_normalization_9 (Batch   (None, 30, 30, 128)       512

tf.nn.relu_9 (TFOpLambda)      (None, 30, 30, 128)       0

flatten_4 (Flatten)            (None, 115200)            0

dense_9 (Dense)                (None, 64)                7372864

dense_10 (Dense)               (None, 128)               8320

dense_11 (Dense)               (None, 10)                1290
=================================================================
Total params: 7,458,890
Trainable params: 7,458,506
Non-trainable params: 384
```

Yolov4 Custom Model Validating

```
class_id = 0, name = aeroplane, ap = 98.36%        (TP = 126, FP = 21)
class_id = 1, name = bird, ap = 92.00%             (TP = 159, FP = 41)
class_id = 2, name = boat, ap = 96.14%             (TP = 260, FP = 60)
class_id = 3, name = cow, ap = 97.52%              (TP = 204, FP = 33)
class_id = 4, name = motorcycle, ap = 99.09%       (TP = 198, FP = 25)
class_id = 5, name = umbrella, ap = 99.91%         (TP = 125, FP = 8)

 for conf_thresh = 0.25, precision = 0.85, recall = 0.96, F1-score = 0.90
 for conf_thresh = 0.25, TP = 1072, FP = 188, FN = 41, average IoU = 66.67 %

 IoU threshold = 50 %, used Area-Under-Curve for each unique Recall
 mean average precision (mAP@0.50) = 0.971710, or 97.17 %
Total Detection Time: 39 Seconds
```
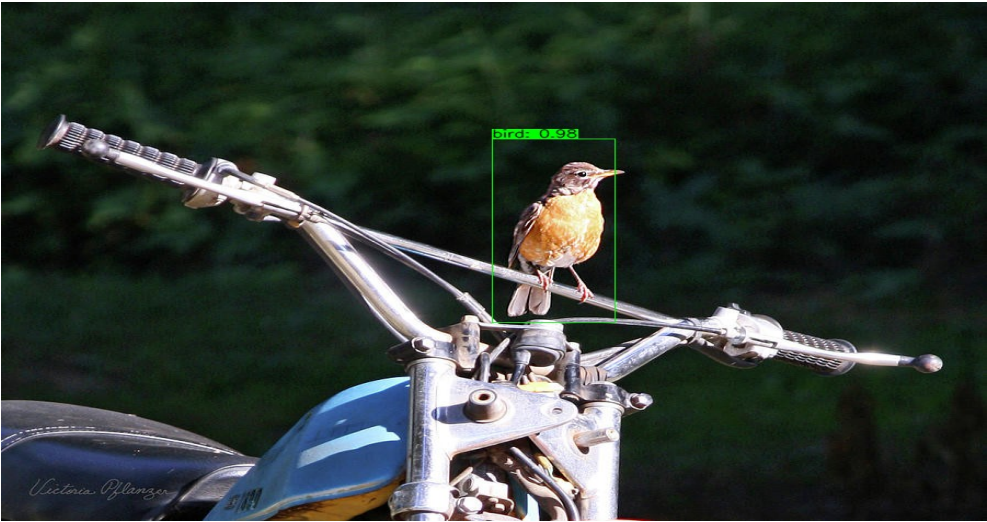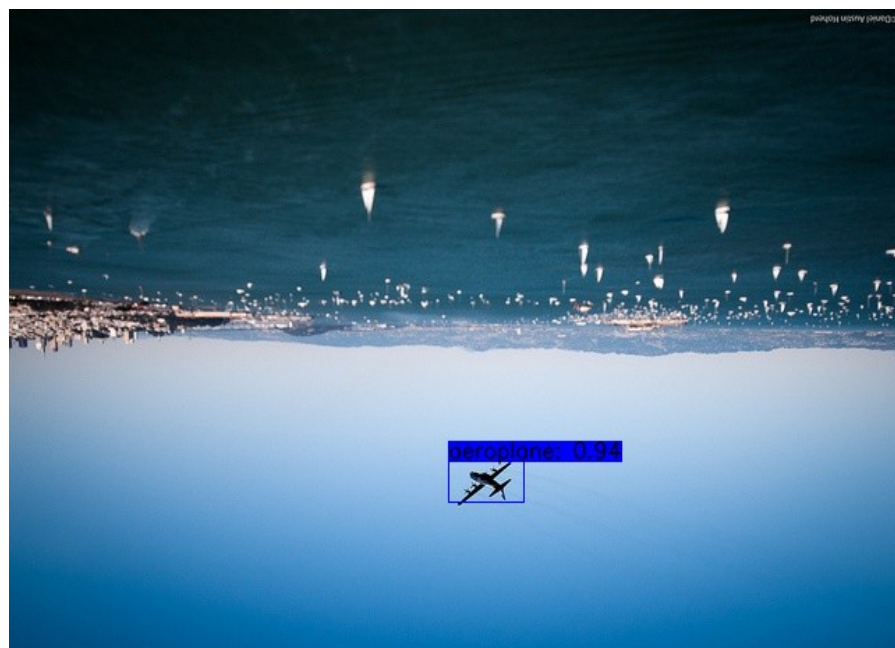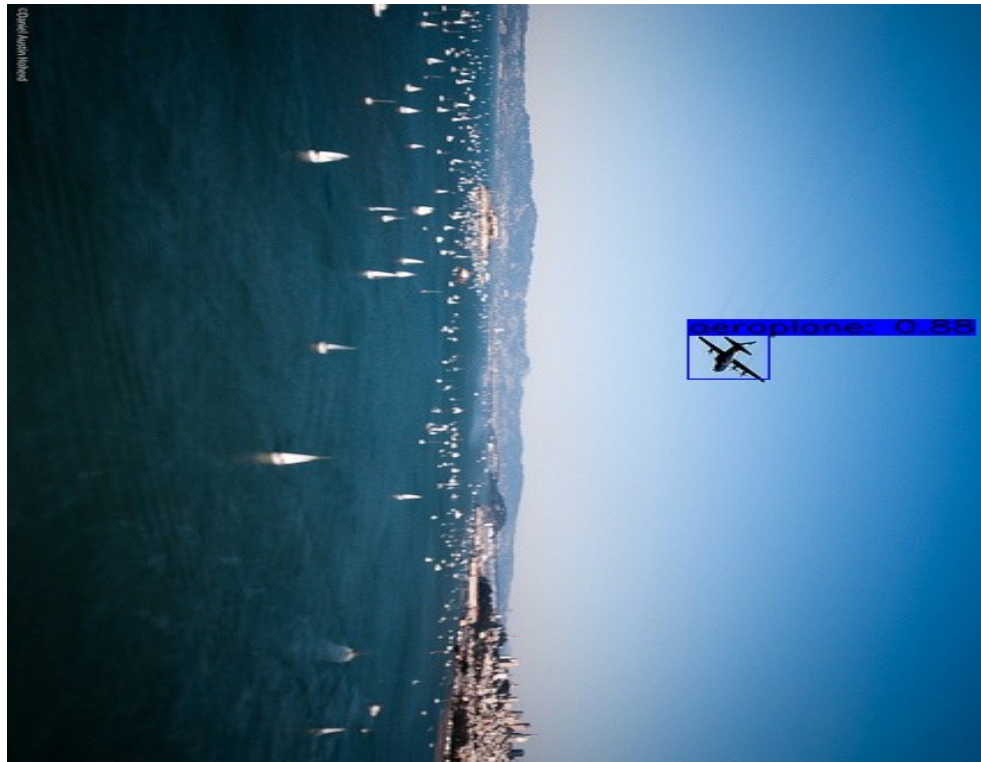
Above image shows performance of my model during training, I had trained around 7-8 hrs with 3400 epochs.

Image with Single class:

Image with Multiple Classes :

Conclusion :
Model fails when multiple objects in one image.This is because of model over-fitting . I have used only 1200 images for 6 classes, that's why model doesn't well on multiple objects.