Object Detection: Accuracy Metrics

Bert Gollnick

Object Detection: Accuracy Metrics

Introduction

- Example: Ship Detection

Ground truth

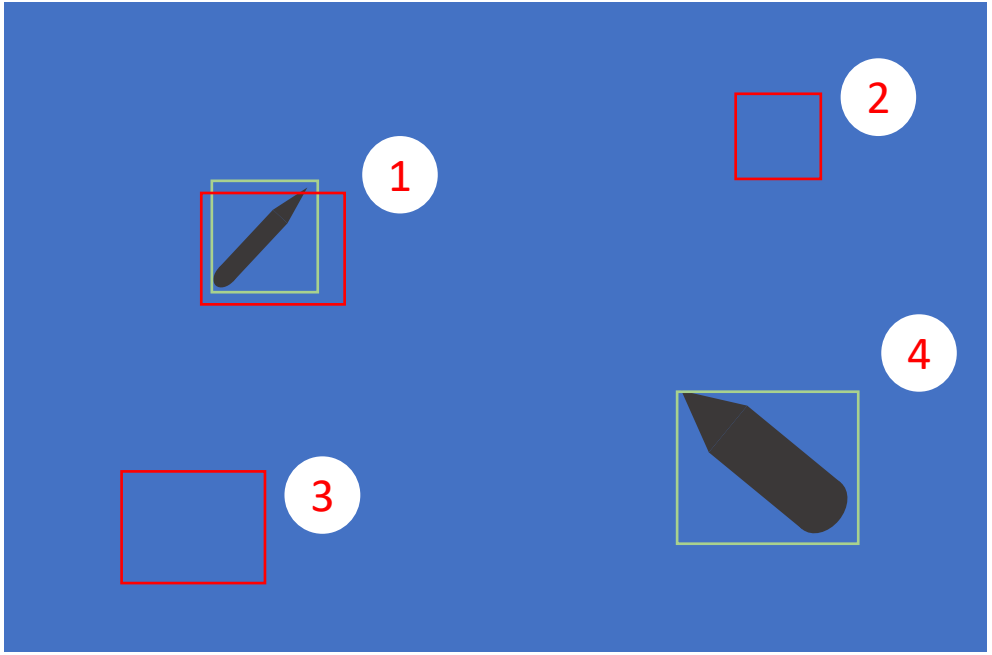
Prediction

1 TP

2 TN

3 FP

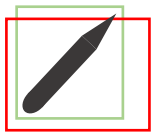
4 FN



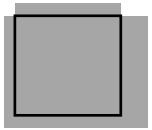
Object Detection: Accuracy Metrics

Intersection over Union

- How correct is a prediction?
- Intersection over Union (IoU)
  - Determine FP or TP



$$IoU = \frac{\text{Intersection}}{\text{Total combined area}} =$$



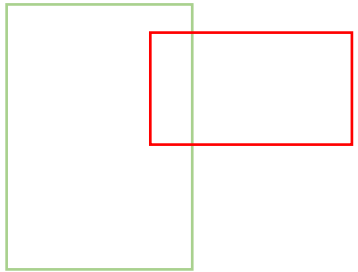
1

Object Detection: Accuracy Metrics

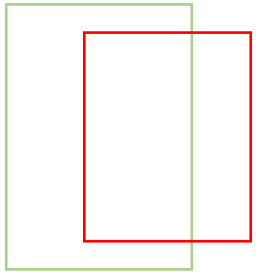
Intersection over Union

Ground truth

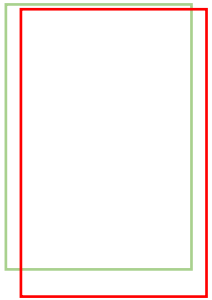
Prediction



IoU = 0.1



IoU = 0.5

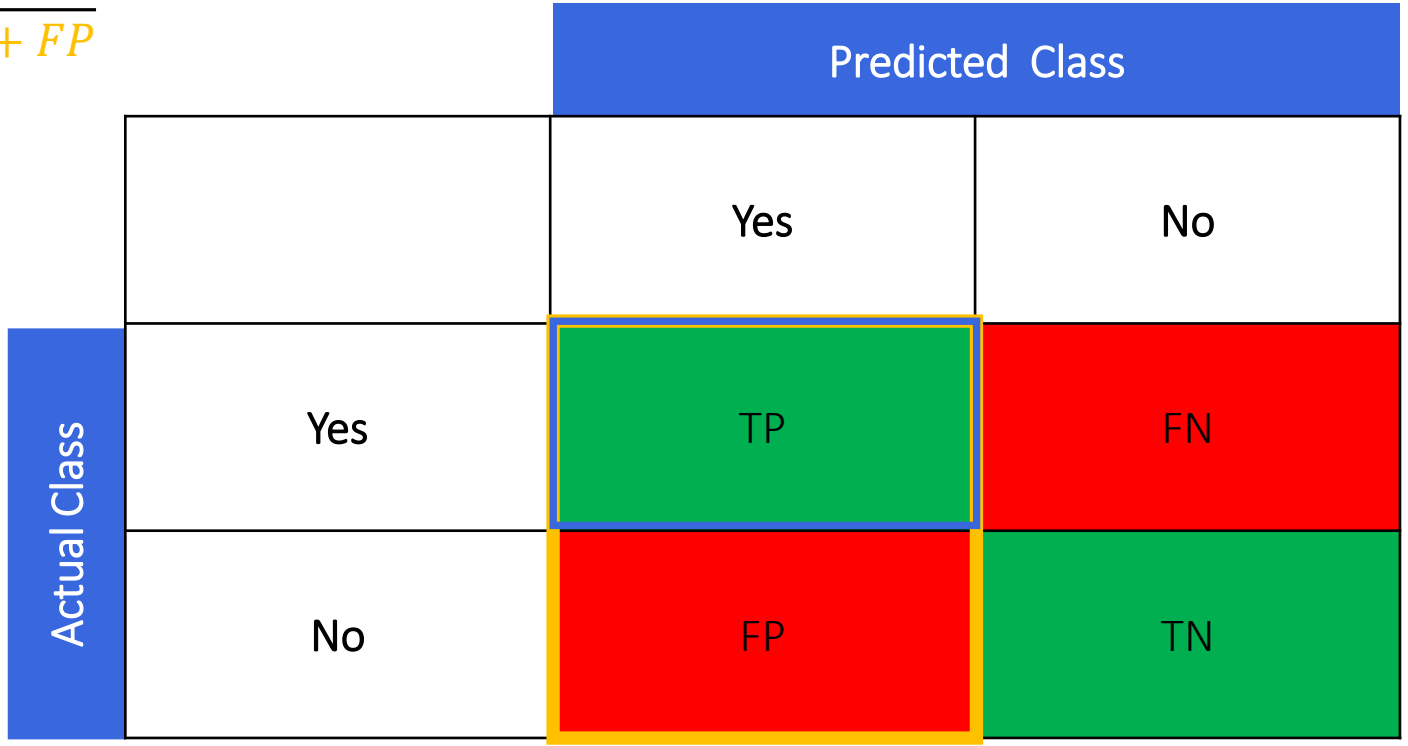


IoU = 0.9

Object Detection: Accuracy Metrics

Derived Metrics: Precision

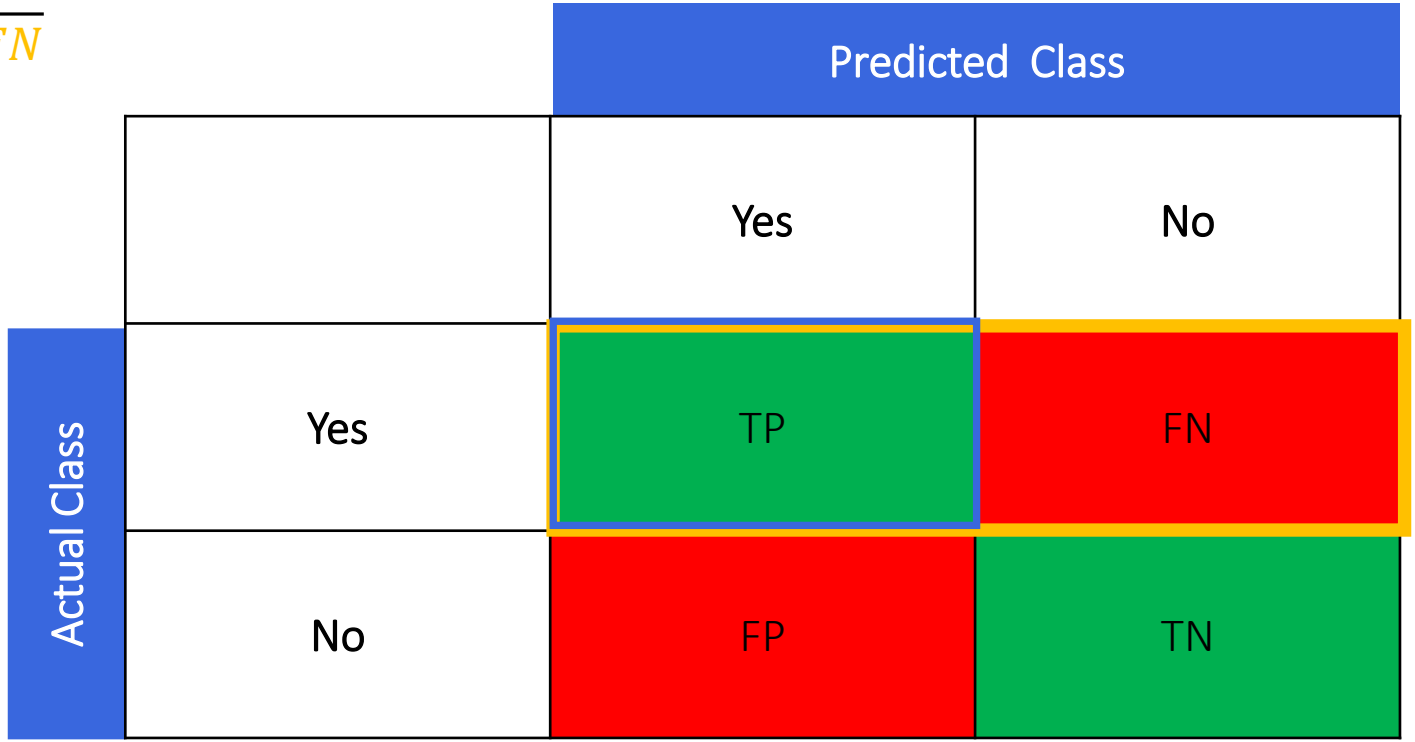
$$Precision = \frac{TP}{TP + FP}$$



Object Detection: Accuracy Metrics

Derived Metrics: Recall

$$Recall = \frac{TP}{TP + FN}$$



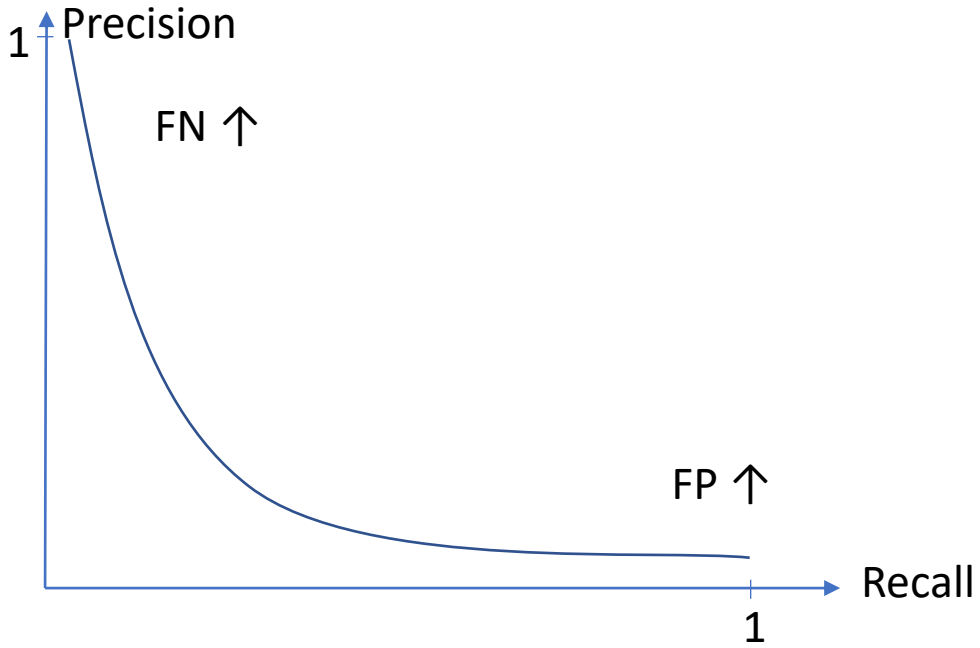
Object Detection: Accuracy Metrics

Derived Metrics: F1 score

$$F1\ score = \frac{Precision \cdot Recall}{(Precision + Recall)/2}$$

Object Detection: Accuracy Metrics

Derived Metrics: Precision Recall Curve



- Good model has high precision for increasing recall values

Object Detection: Accuracy Metrics

Derived Metrics: Average Precision

Average Precision

- Summarises precision-recall curve into one KPI
- Values between 0 and 1
- Corresponds to area under precision-recall curve

$$AP = mean(Precision) \text{ over all Recalls}$$

Object Detection: Accuracy Metrics

Derived Metrics: Mean Average Precision

Mean Average Precision

- Average Precision over multiple IoU thresholds
- mAP@[0.3:0.01:0.5]
- Averaged over all classes