

Object Detection: Accuracy Metrics

Object Detection: Accuracy Metrics

Introduction

- Example: Ship Detection

 Ground truth

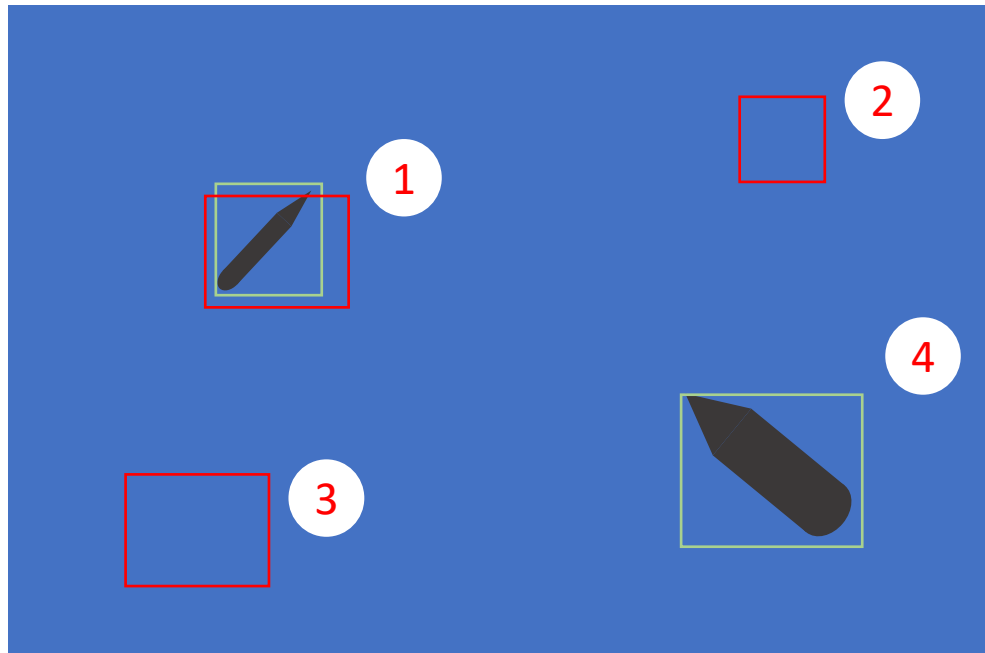
 Prediction

 1 TP

 2 TN

 3 FP

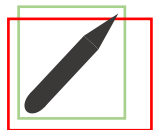
 4 FN




Object Detection: Accuracy Metrics

Intersection over Union

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



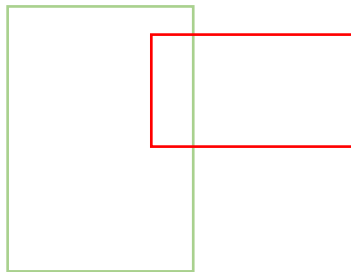
$$\text{IoU} = \frac{\text{Intersection}}{\text{Total combined area}} = \frac{\text{Intersection}}{\text{Total combined area}}$$
A diagram illustrating the components of the IoU formula. It shows two overlapping gray squares. The top square is labeled 'Intersection' and the bottom square is labeled 'Total combined area'.

Object Detection: Accuracy Metrics

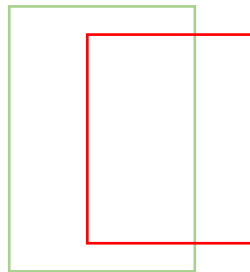
Intersection over Union

 Ground truth

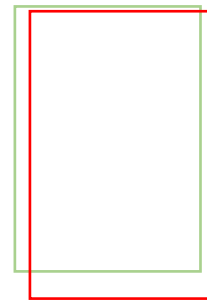
 Prediction



$\text{IoU} = 0.1$



$\text{IoU} = 0.5$



$\text{IoU} = 0.9$

Object Detection: Accuracy Metrics

Derived Metrics: Precision

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

		Predicted Class	
		Yes	No
Actual Class	Yes	TP	FN
	No	FP	TN

Object Detection: Accuracy Metrics

Derived Metrics: Recall

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

		Predicted Class	
		Yes	No
Actual Class	Yes	TP	FN
	No	FP	TN

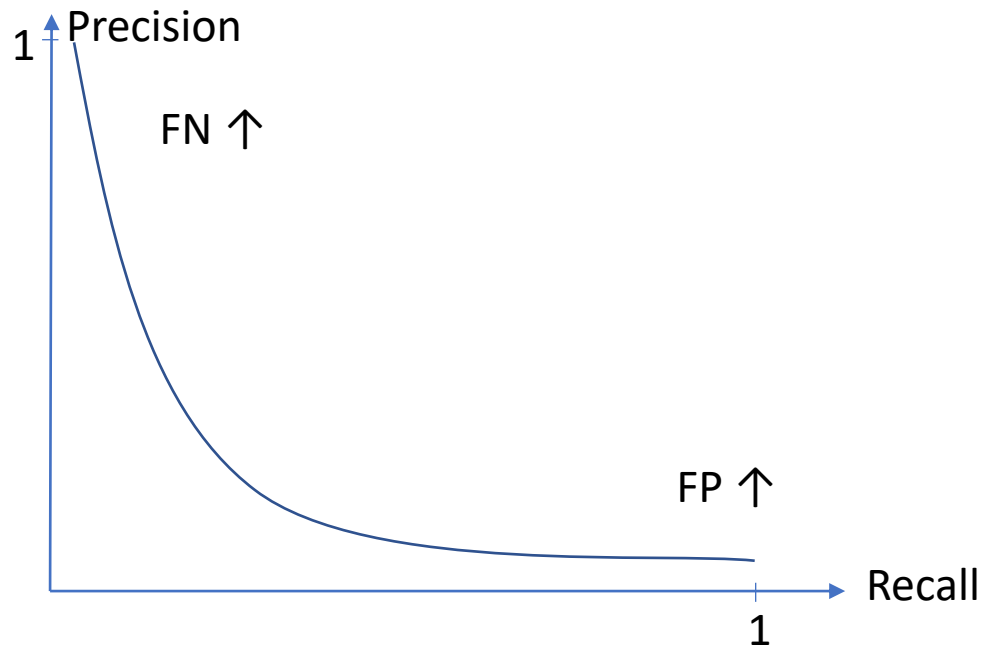
Object Detection: Accuracy Metrics

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

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

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

