

Precision and Recall

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Actual value

		Prediction outcome	
		positive	negative
	positive	TP	FN
	negative	FP	TN

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Actual
value

$$\text{precision} = TP$$

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Actual
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$$\text{precision} = \frac{TP}{TP + FP}$$

		Prediction outcome	
		positive	negative
Actual value	positive	TP	FN
	negative	FP	TN

Evaluation Metrics : Precision

We train a model to detect

Prediction outcome

		positive	negative
Actual value	positive	4	2
	negative	8	486

500 Patients with Cancer symptoms



494 Negative Results 6 Positive Results

Evaluation Metrics : Precision

We train a model to detect cancer

98% Accuracy for model

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Evaluation Metrics : Precision

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- Avoid VIP > Catch Criminal
- Minimise false positives
(arresting innocents)
- False negative rate is high
(all criminals may not be arrested)

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Evaluation Metrics : Recall

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Out of all the actual positives, how many have been predicted as positive?

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Out of all actual positive, how many are predicted positive.

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Actual value	positive	TP	FN
	negative	FP	TN

Evaluation Metrics : Recall

Out of all actual positive, how many are predicted positive.

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Actual
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Actual value

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- Catching weapon > checking
innocent
- Minimize False Negative
(undetected weapon carrier)

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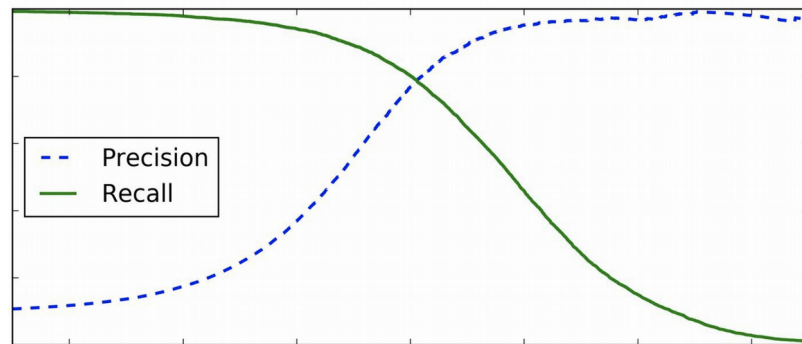
Evaluation Metrics : Recall

- Aim: “ALL” weapon carriers
“MUST” be caught
- Catching weapon > checking
innocent
- Minimize False Negative
(undetected weapon carrier)
- False positive rate is high
(detects innocent as weapon
carrier)

$$\text{recall} = \frac{TP}{TP + FN}$$

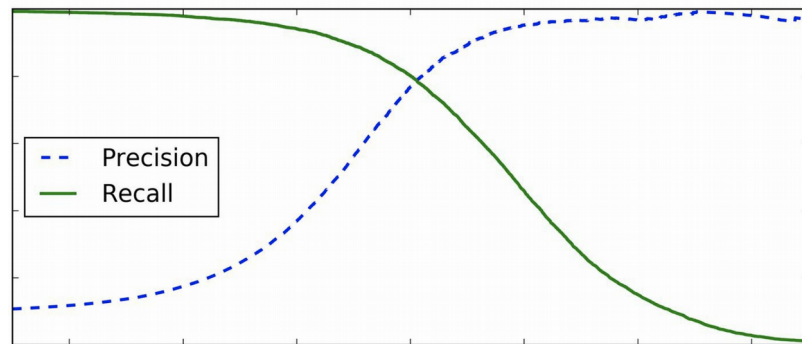
Evaluation Metrics : Precision/Recall tradeoff

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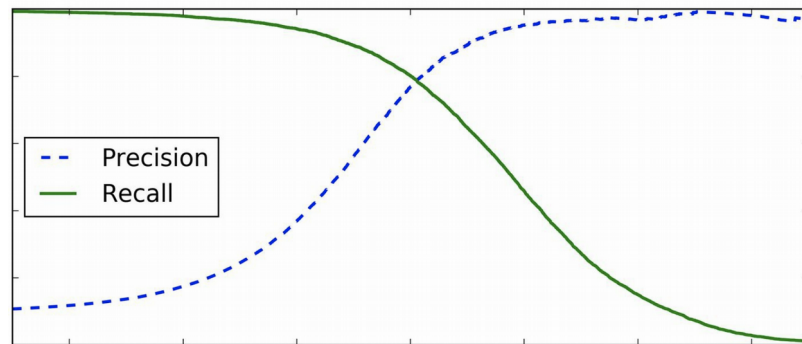
Evaluation Metrics : Precision/Recall tradeoff

- High Precision, Low Recall



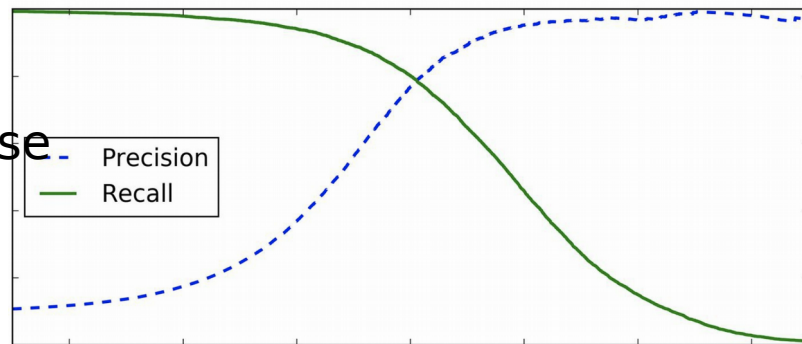
Evaluation Metrics : Precision/Recall tradeoff

- High Precision, Low Recall
- High Recall, Low Precision



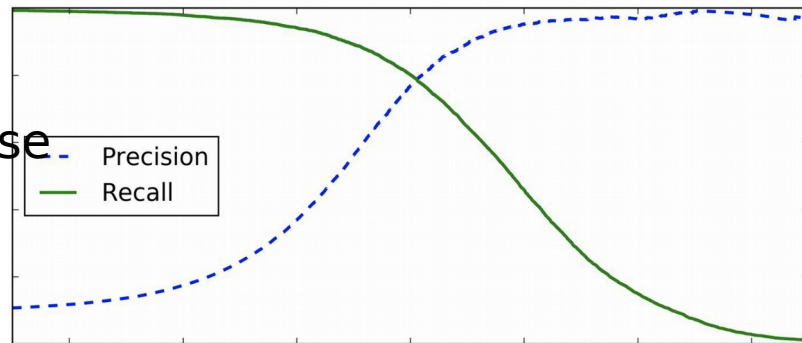
Evaluation Metrics : Precision/Recall tradeoff

- High Precision, Low Recall
- High Recall, Low Precision
- Choice depends upon the use case



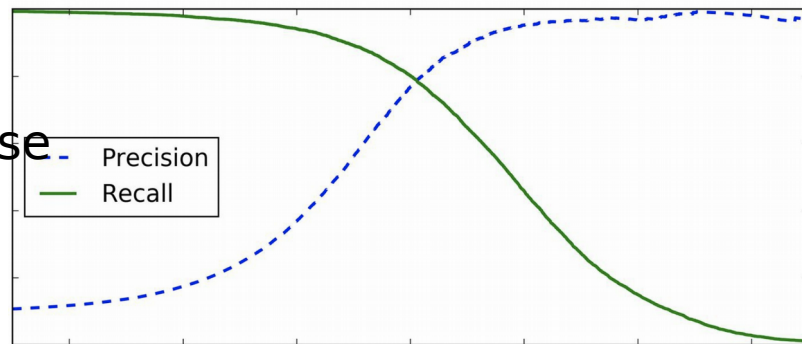
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- Combined using F1 Score



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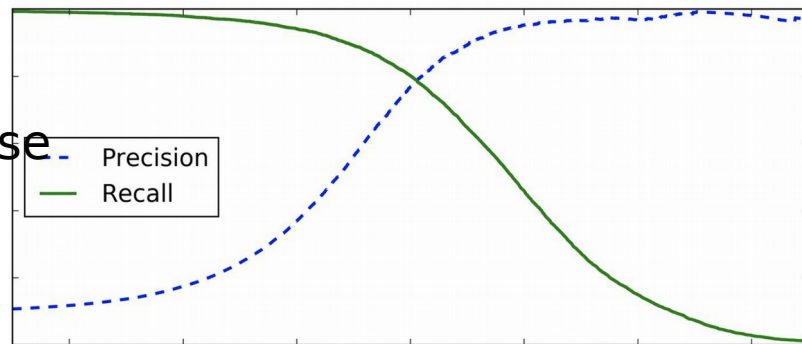
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$$F_1 = \frac{2}{\frac{1}{\text{precision}} + \frac{1}{\text{recall}}}$$

Evaluation Metrics : Precision/Recall tradeoff

- High Precision, Low Recall
- High Recall, Low Precision
- Choice depends upon the use case
- Combined using F1 Score
- F1 is maximum when precision =



$$F_1 = \frac{2}{\frac{1}{\text{precision}} + \frac{1}{\text{recall}}}$$

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- Some models predict probabilities
- Probabilities not considered so far