

The background of the slide is a light gray gradient. It is decorated with numerous realistic water droplets of various sizes. Some droplets are large and prominent, while others are small and subtle. They are scattered across the slide, with a higher concentration in the top-left and bottom-right corners, framing the central text.

CONFUSION MATRIX, ROC-AUC, AND BIAS- VARIANCE TRADEOFF

MACHINE LEARNING EVALUATION CONCEPTS

1. CONFUSION MATRIX

	Predicted Positive	Predicted Negative
Actual Positive	True Positive (TP)	False Negative (FN)
Actual Negative	False Positive (FP)	True Negative (TN)

CONFUSION MATRIX METRICS

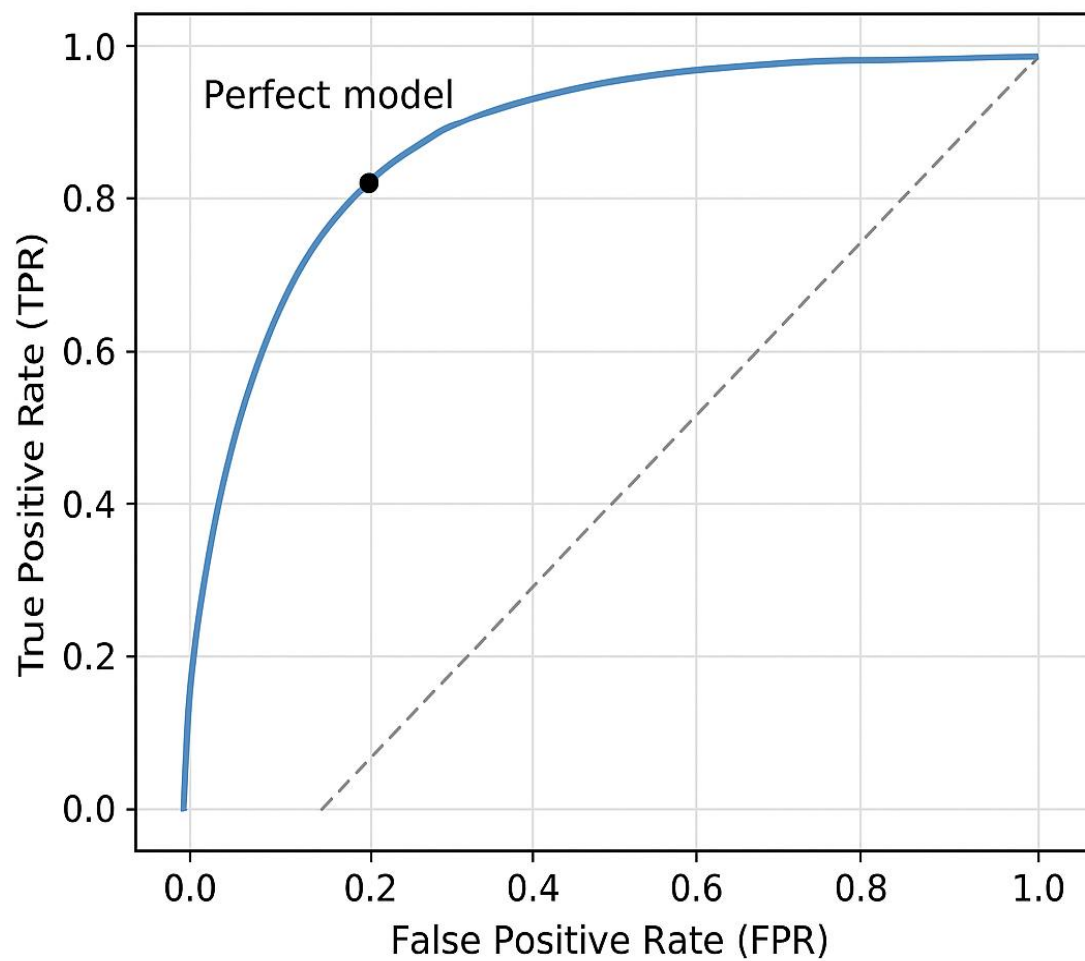
FROM THE CONFUSION MATRIX, WE CALCULATE:

- $\text{ACCURACY} = (TP+TN)/(TP+TN+FP+FN)$
- $\text{PRECISION} = TP/(TP+FP)$
- $\text{RECALL (SENSITIVITY)} = TP/(TP+FN)$
- $\text{SPECIFICITY} = TN/(TN+FP)$
- $\text{F1 SCORE} = 2 * (\text{PRECISION} * \text{RECALL}) / (\text{PRECISION} + \text{RECALL})$

2. ROC CURVE AND AUC

- ROC CURVE PLOTS TRUE POSITIVE RATE (TPR) VS FALSE POSITIVE RATE (FPR).
- AUC MEASURES THE AREA UNDER THIS CURVE.
- $AUC = 1 \rightarrow$ PERFECT CLASSIFIER, $AUC = 0.5 \rightarrow$ RANDOM GUESSING.

ROC Curve



3. BIAS—VARIANCE TRADEOFF

- BIAS: ERROR DUE TO OVERSIMPLIFICATION (UNDERFITTING).
- VARIANCE: ERROR DUE TO TOO MUCH COMPLEXITY (OVERFITTING).
- THE BEST POINT IS THE TRADEOFF BETWEEN BIAS AND VARIANCE.

Bias-Variance Tradeoff

