Introduction to Machine Learning and Evaluation Metrics

Arif Istiake Sunny

Senior AI Engineer

Brain Station 23 PLC

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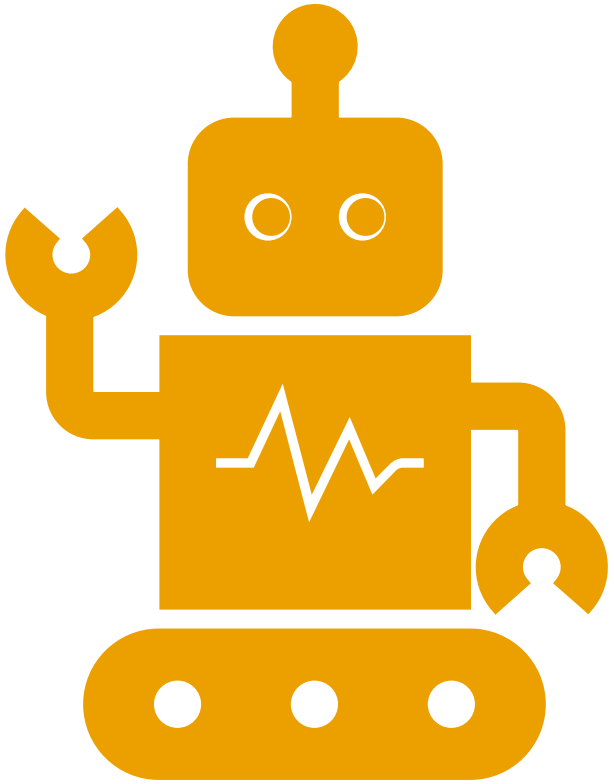
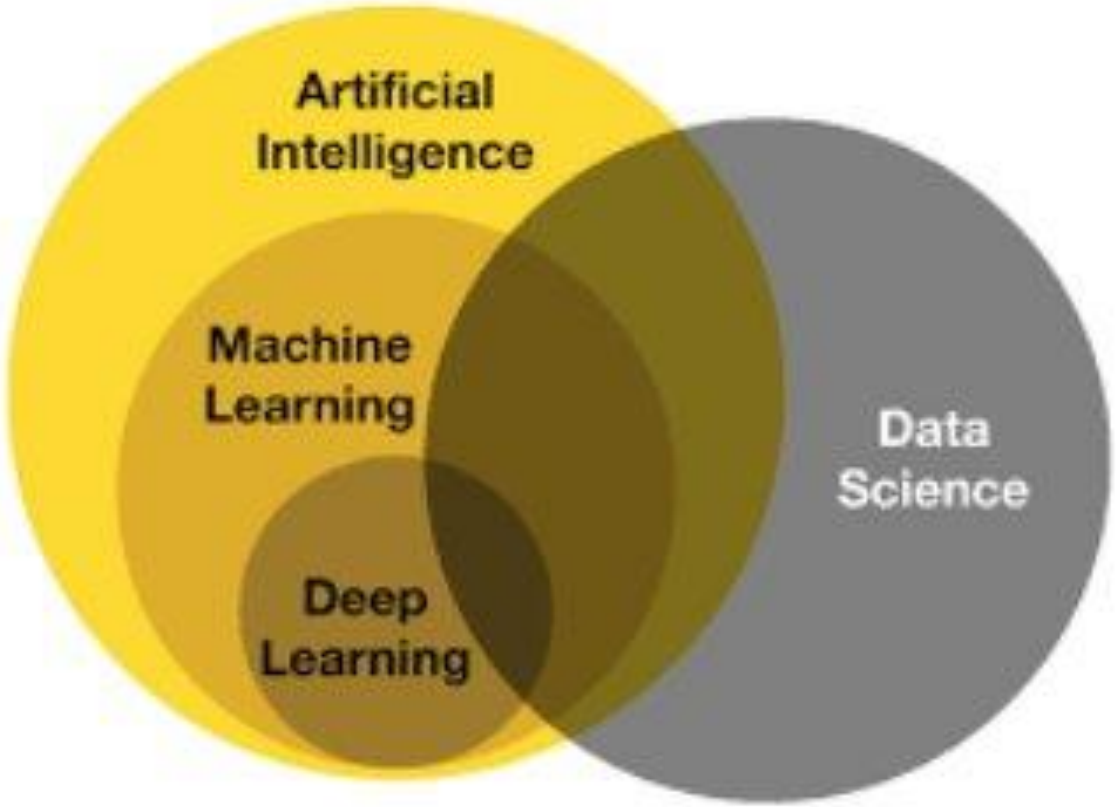
What is Machine Learning

Machine Learning is a subset of **Artificial Intelligence (AI)** that enable systems to learn and improve from experience automatically without being explicitly programmed. It builds model from sample data - known as training Data – to make predictions or decisions





Venn Diagram of AI

Types of Machine Learning

SUPERVISED LEARNING

UNSUPERVISED LEARNING

REINFORCEMENT LEARNING

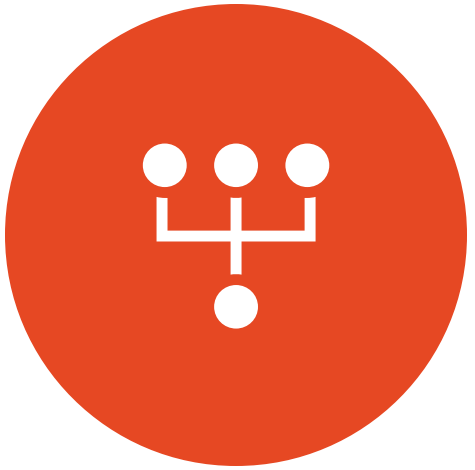
Supervised Learning

USES LABEL DATA TO TRAIN THE MODEL

EXAMPLE: PREDICTING SPAM EMAILS

Unsupervised Learning

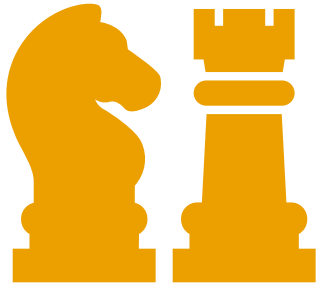
USES UNLABELED DATA



EXAMPLE: GROUPING CUSTOMERS BY PURCHASING BEHAVIOR (CLUSTERING)

Reinforcement Learning

Learning by interacting with an environment and getting feedback (reward/penalties)

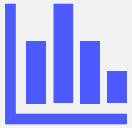


Example: Playing chess

Training, Testing and Validation Data

Training Data: Used to train the ML model

Validation Data: Used to tune model parameters



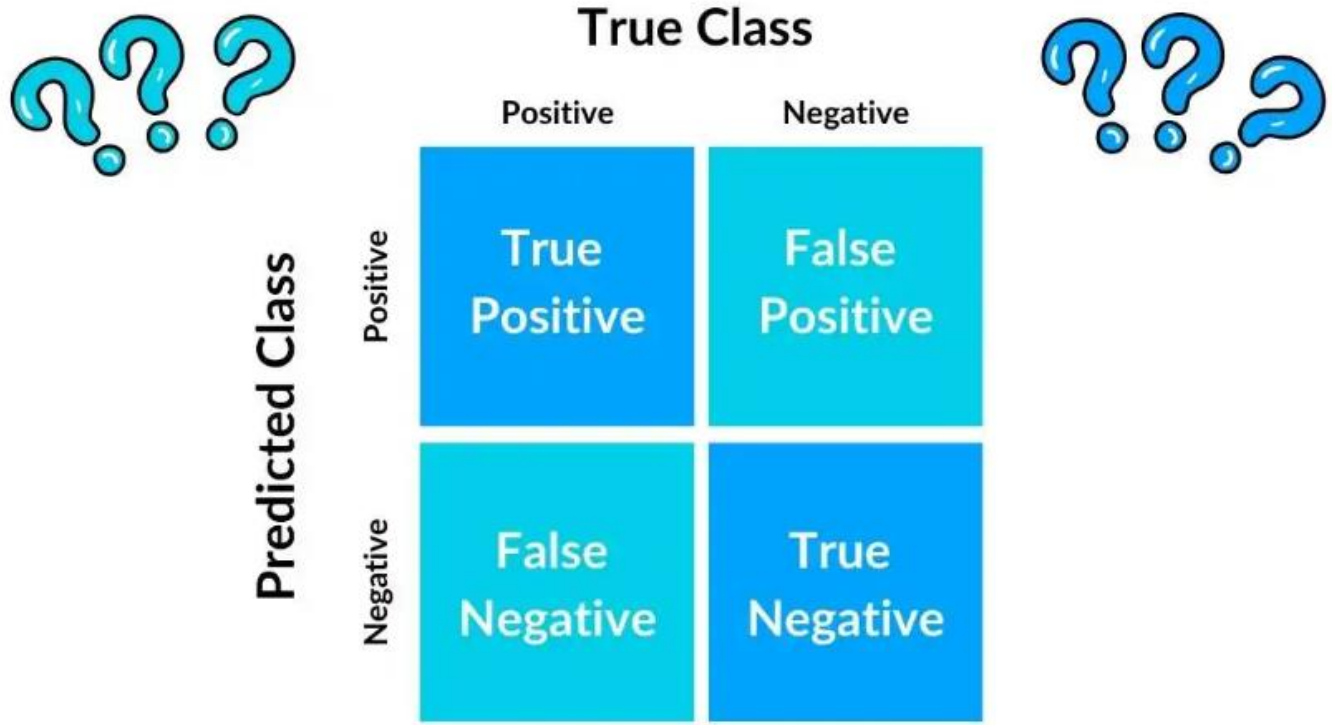
Test Data: Used to evaluate model performance after training

Evaluation Metrics

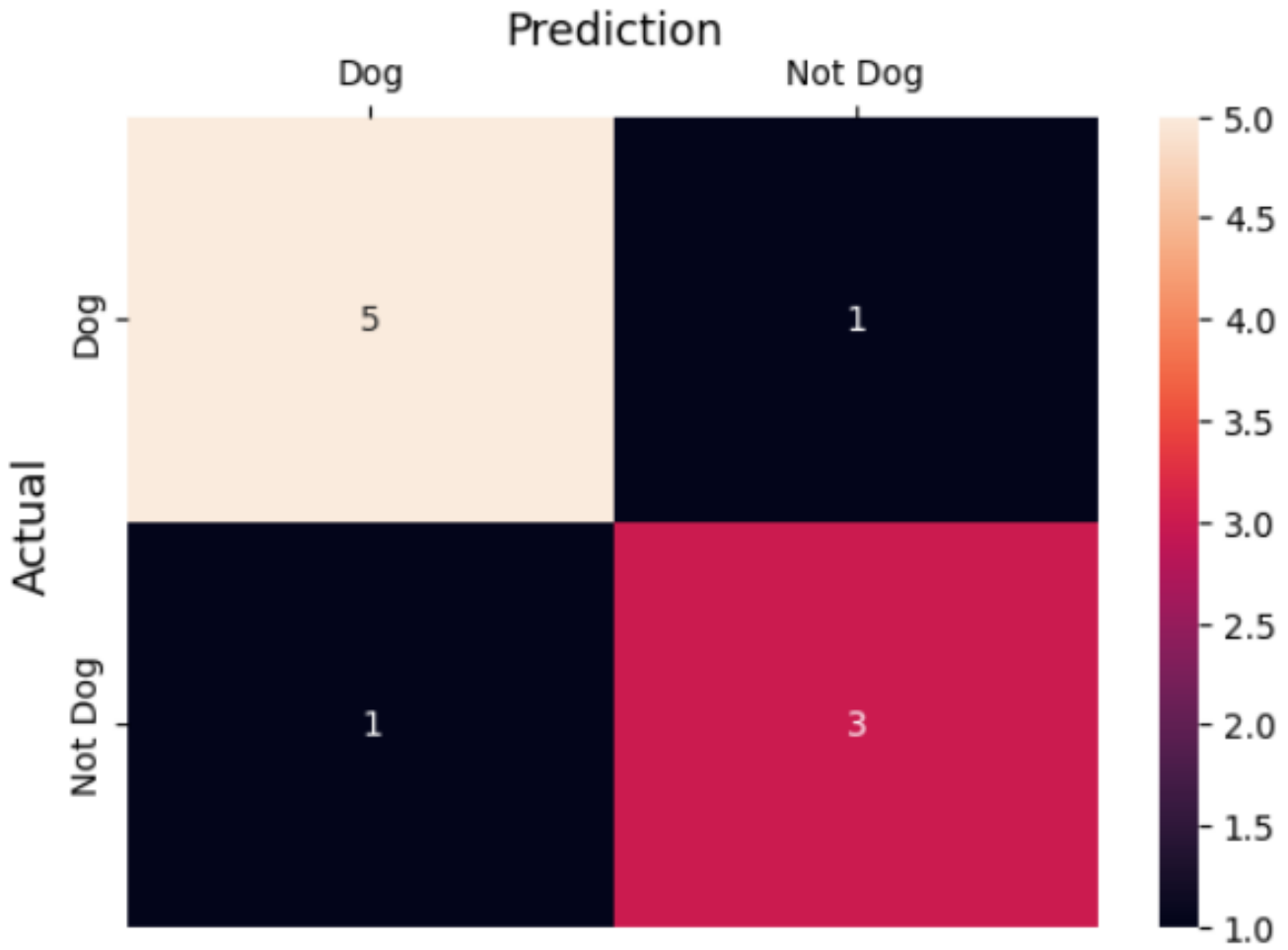
We use these metrics for classification tasks (especially binary classification)

- Confusion Matrix
- Precision
- Recall
- F1 Score

Confusion Matrix



Confusion Matrix



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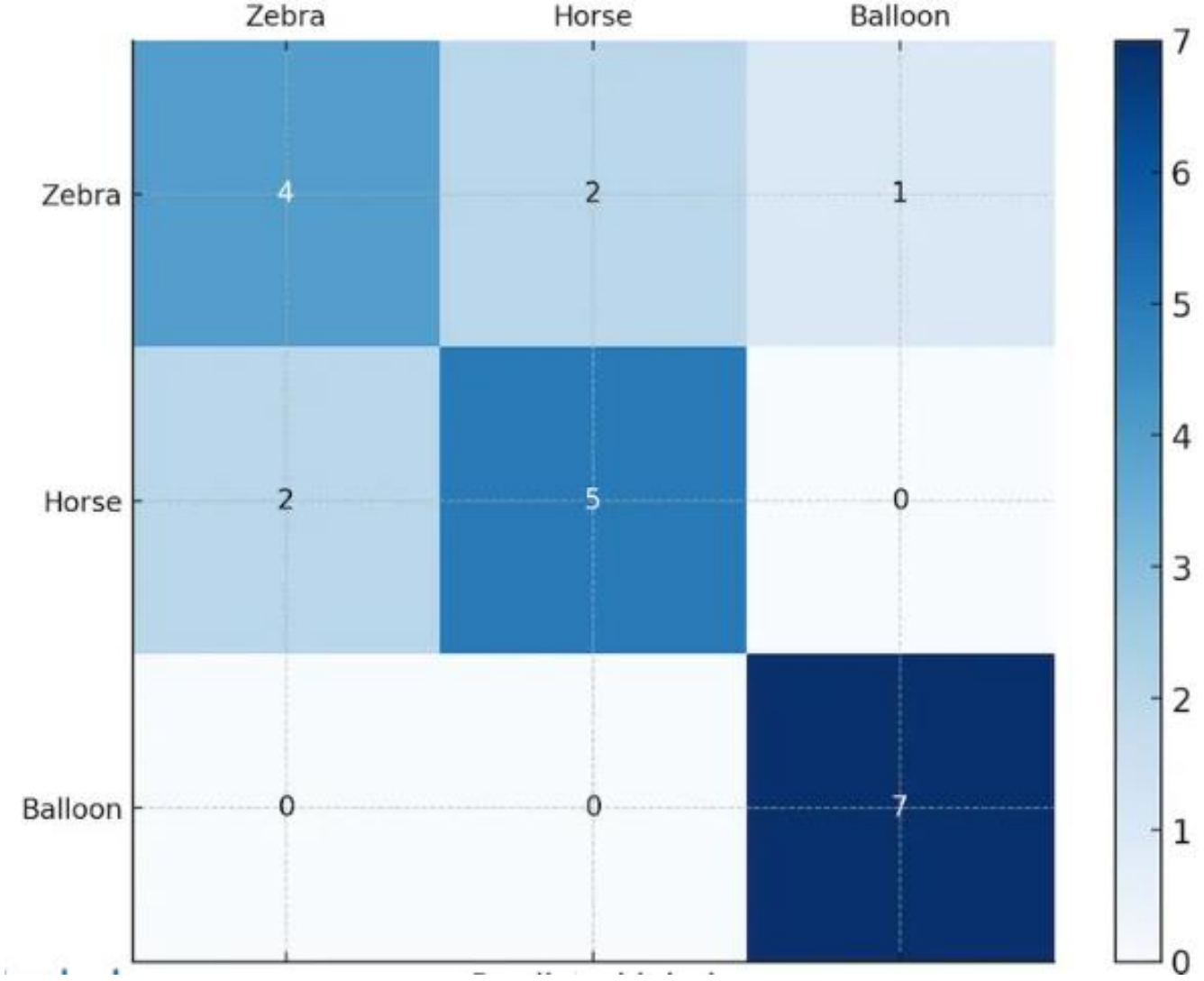

Metrics Formula

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

Formulas:

- **Precision** = TP / (TP + FP)
- **Recall** = TP / (TP + FN)
- **F1 Score** = 2 * (Precision * Recall) / (Precision + Recall)