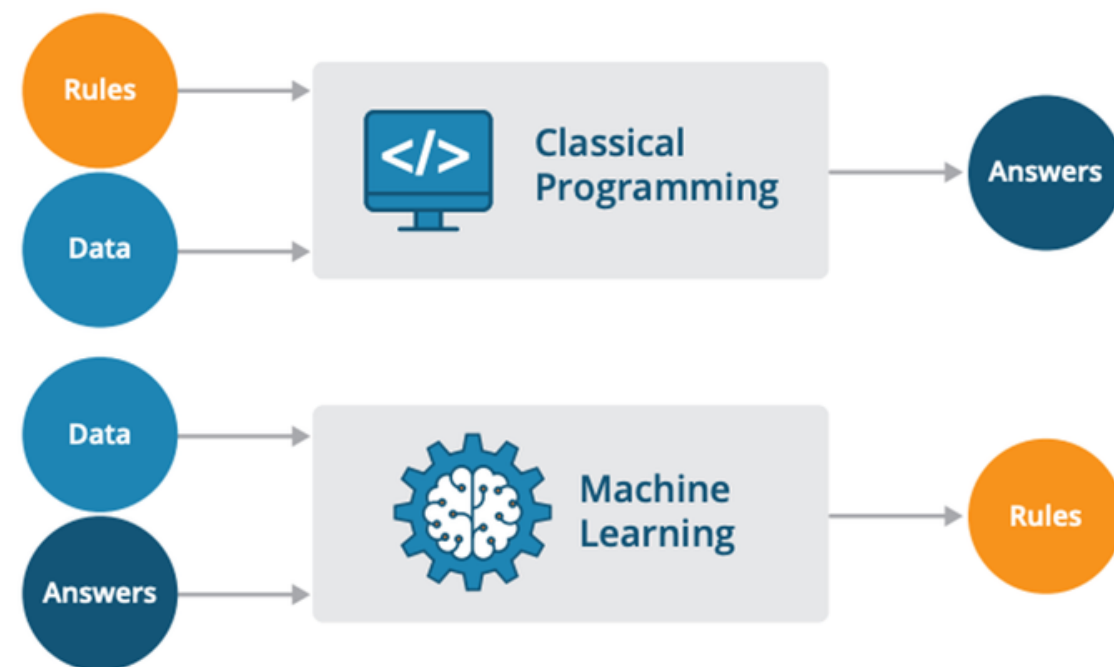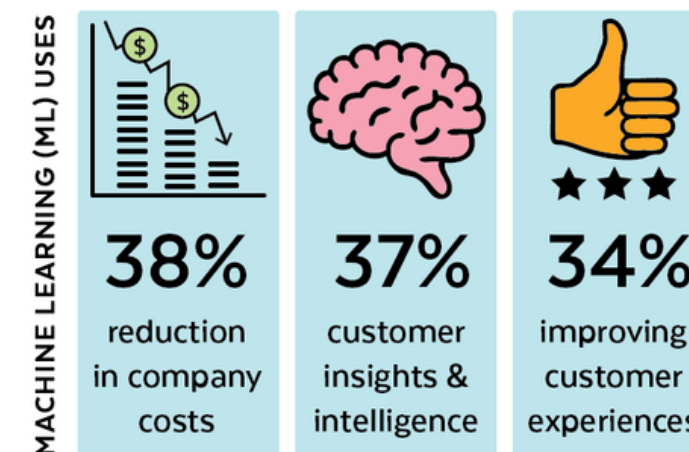# Machine Learning - Introduction

Definition

- Machine Learning (ML) is a subset of artificial intelligence (AI).
- ML involves developing algorithms and statistical models.
- The goal is to enable computers to learn from data and make predictions or decisions.
- ML doesn't require explicit programming for each task.
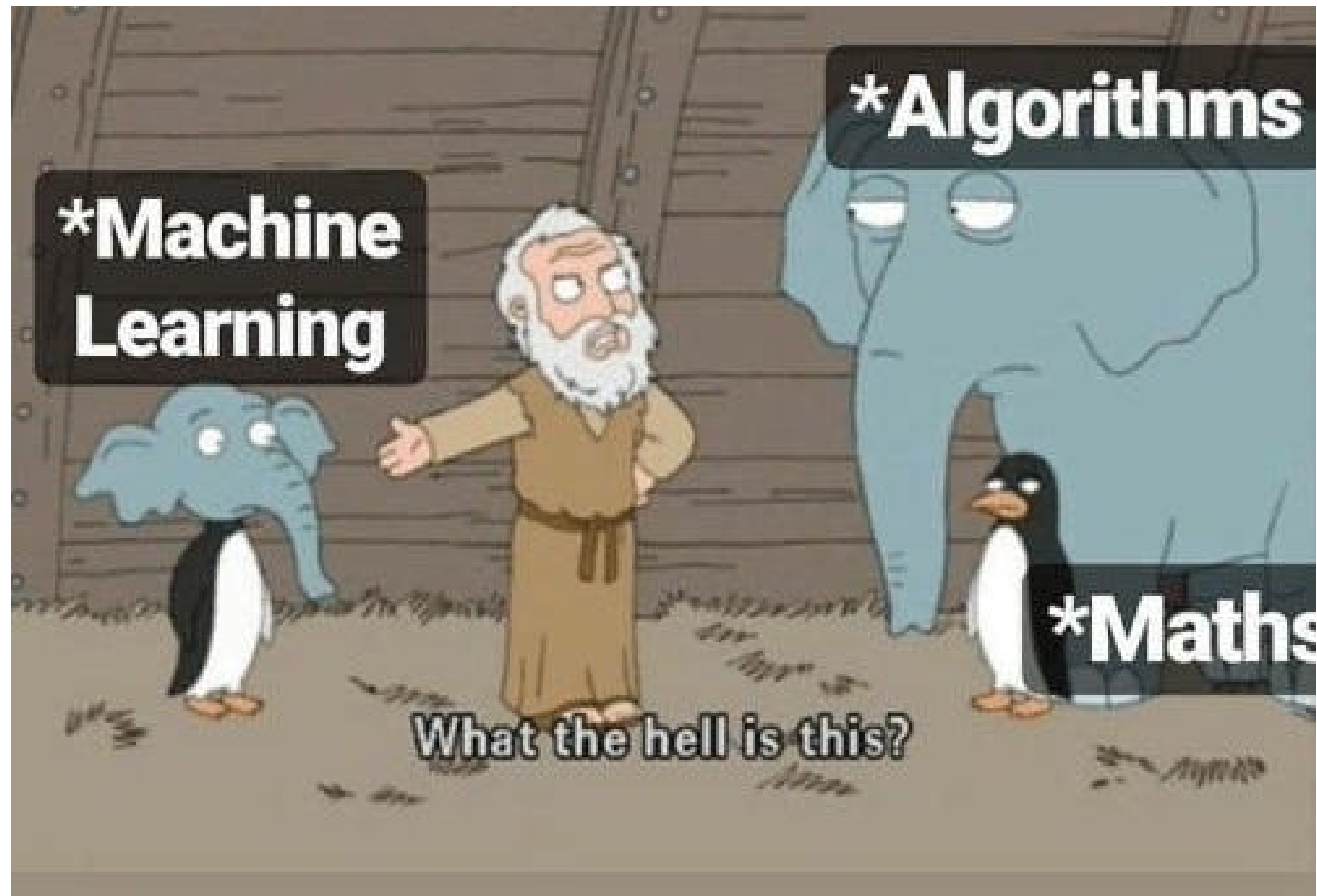- It mimics how humans learn and adapt from experience.

Why ML?

- **Email Spam Filtering:**
- **Product Recommendations:**
- **Predictive Text and Autocorrect:**
- **Image Recognition in Social Media:**
- **Voice Assistants:**
- **Fraud Detection in Banking:**
- **Traffic Prediction and Navigation:**
- **Health Monitoring and Diagnostics:**
- **Recommendation Systems for Streaming Services:**
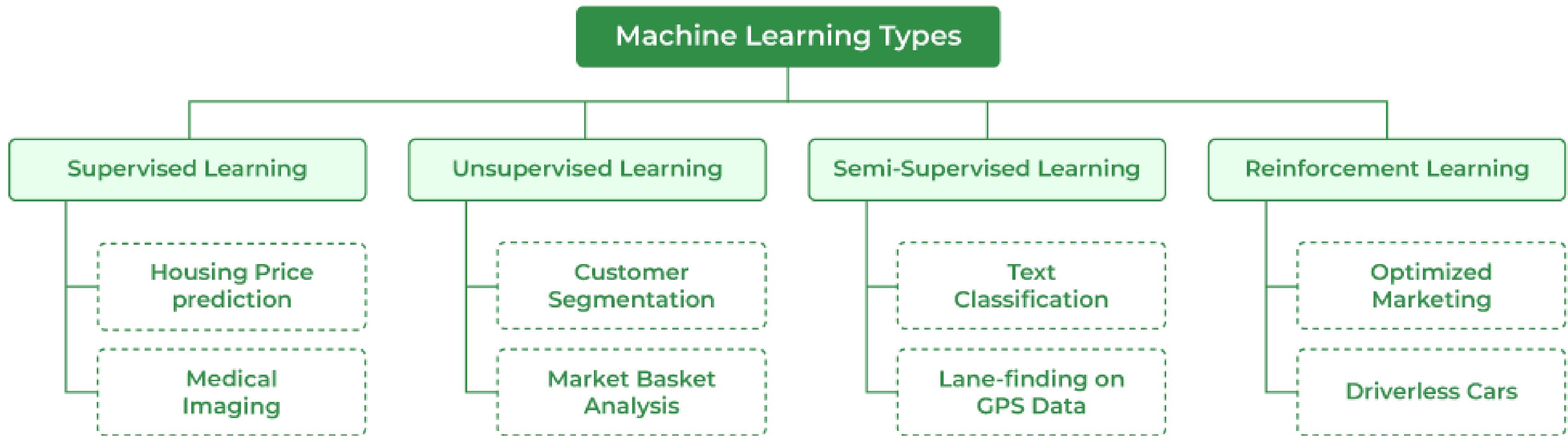- **Predictive Maintenance in Manufacturing:**

Rules + Data → Classical Programming → Answers

Data + Answers → Machine Learning → Rules

MACHINE LEARNING (ML) USES

38% reduction in company costs

37% customer insights & intelligence

34% improving customer experiences

Machine Learning - Introduction

Machine Learning - Types

ML Study

Machine Learning Types

Supervised Learning
- Housing Price prediction
- Medical Imaging

Unsupervised Learning
- Customer Segmentation
- Market Basket Analysis

Semi-Supervised Learning
- Text Classification
- Lane-finding on GPS Data

Reinforcement Learning
- Optimized Marketing
- Driverless Cars

Machine Learning - Types

Supervised Learning:

- In supervised learning, the model is trained on labeled data, where each input is associated with a corresponding output label.
- Examples: Classification (e.g., spam detection, image recognition) and Regression (e.g., predicting house prices, stock prices).
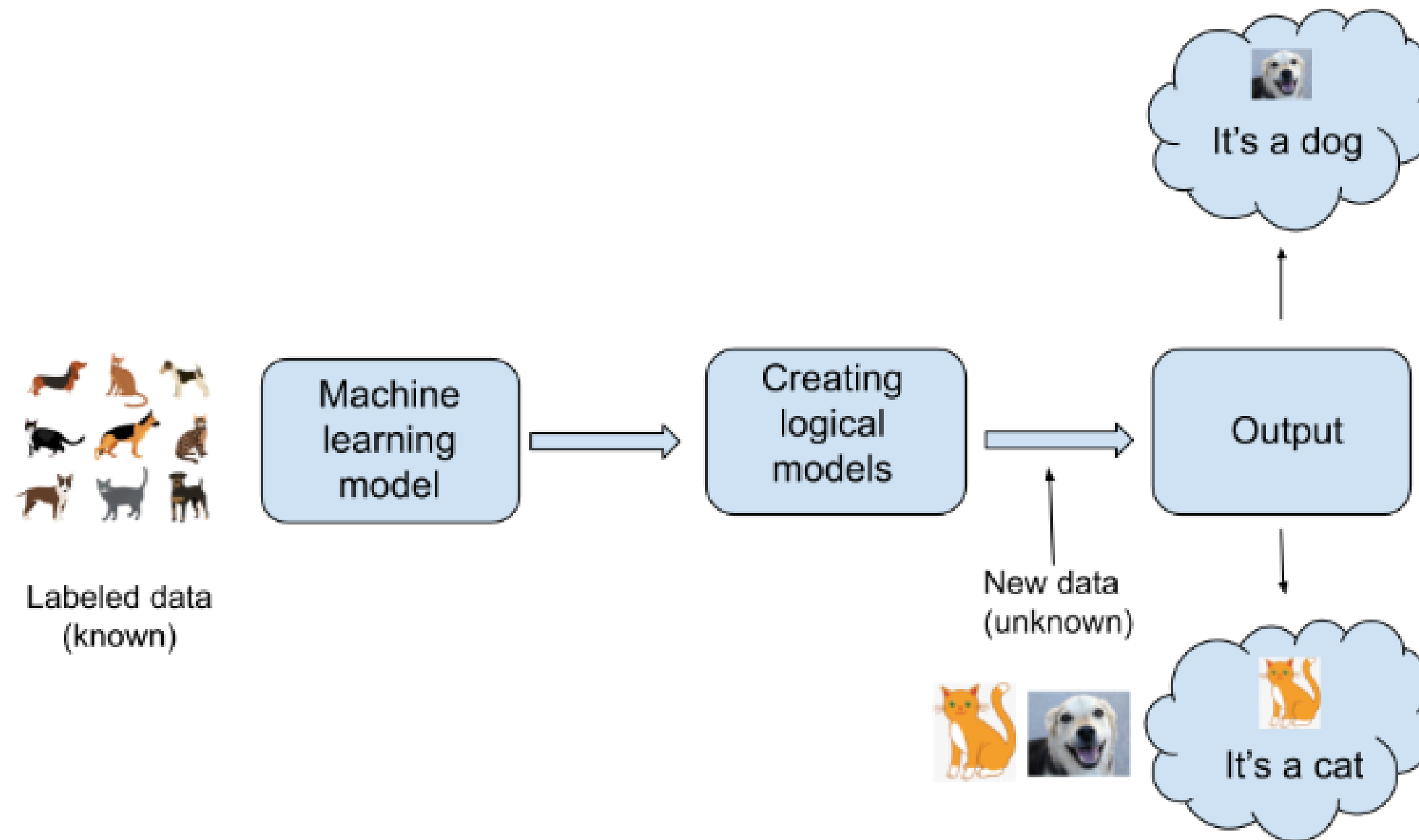
Semi-supervised Learning:

- Semi-supervised learning combines elements of supervised and unsupervised learning, where the model is trained on a mix of labeled and unlabeled data.
- Example: Training a model with a small labeled dataset and a large unlabeled dataset to improve performance.

Unsupervised Learning:

- Unsupervised learning deals with unlabeled data, where the model learns patterns and structures without explicit supervision.
- Examples: Clustering (e.g., customer segmentation, anomaly detection) and Association (e.g., market basket analysis, recommendation systems).

Reinforcement Learning:

- Reinforcement learning involves training an agent to make decisions by interacting with an environment and receiving rewards or penalties based on its actions.
- Examples: Game playing (e.g., AlphaGo), robotics control, and autonomous driving.
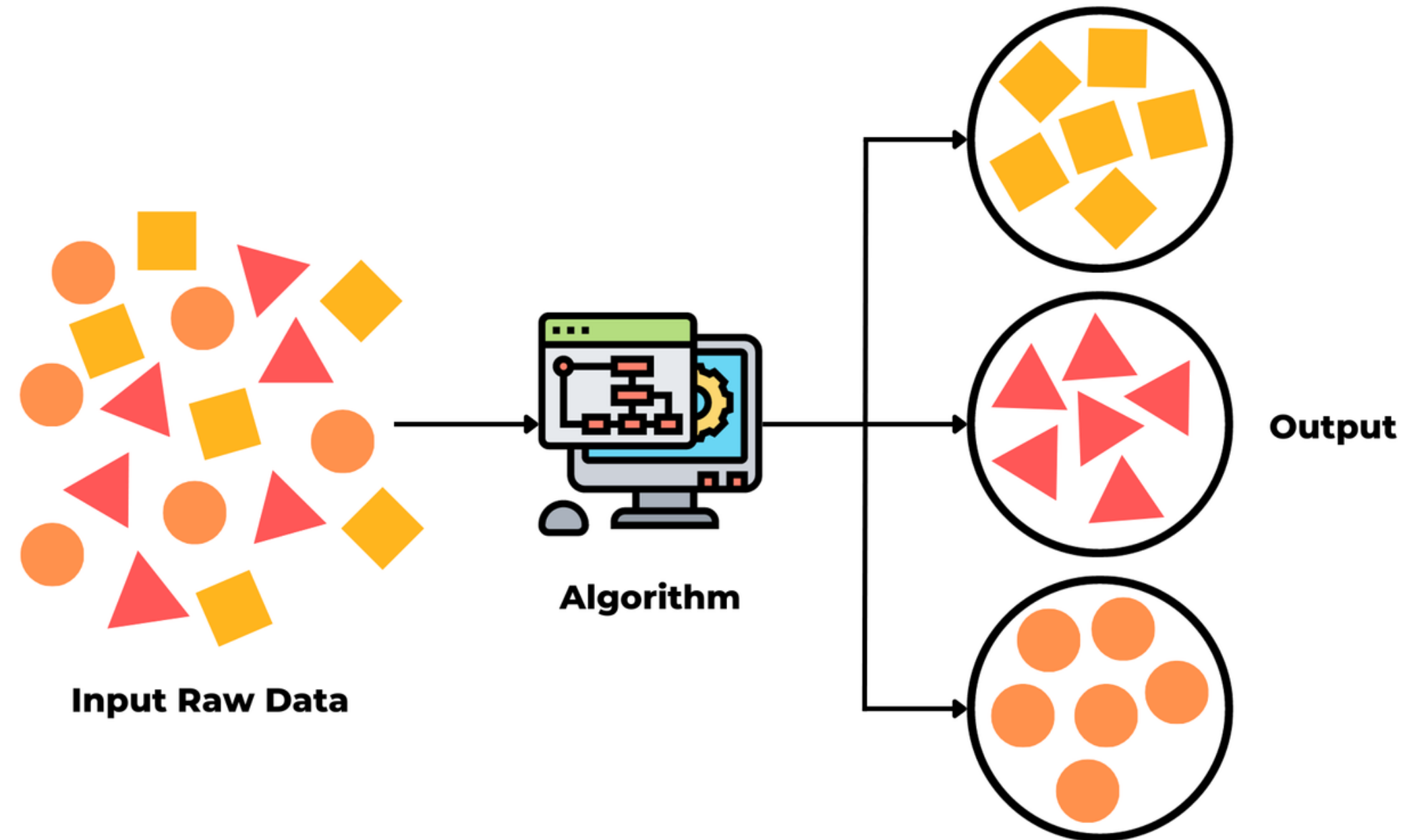
Machine Learning - Supervised

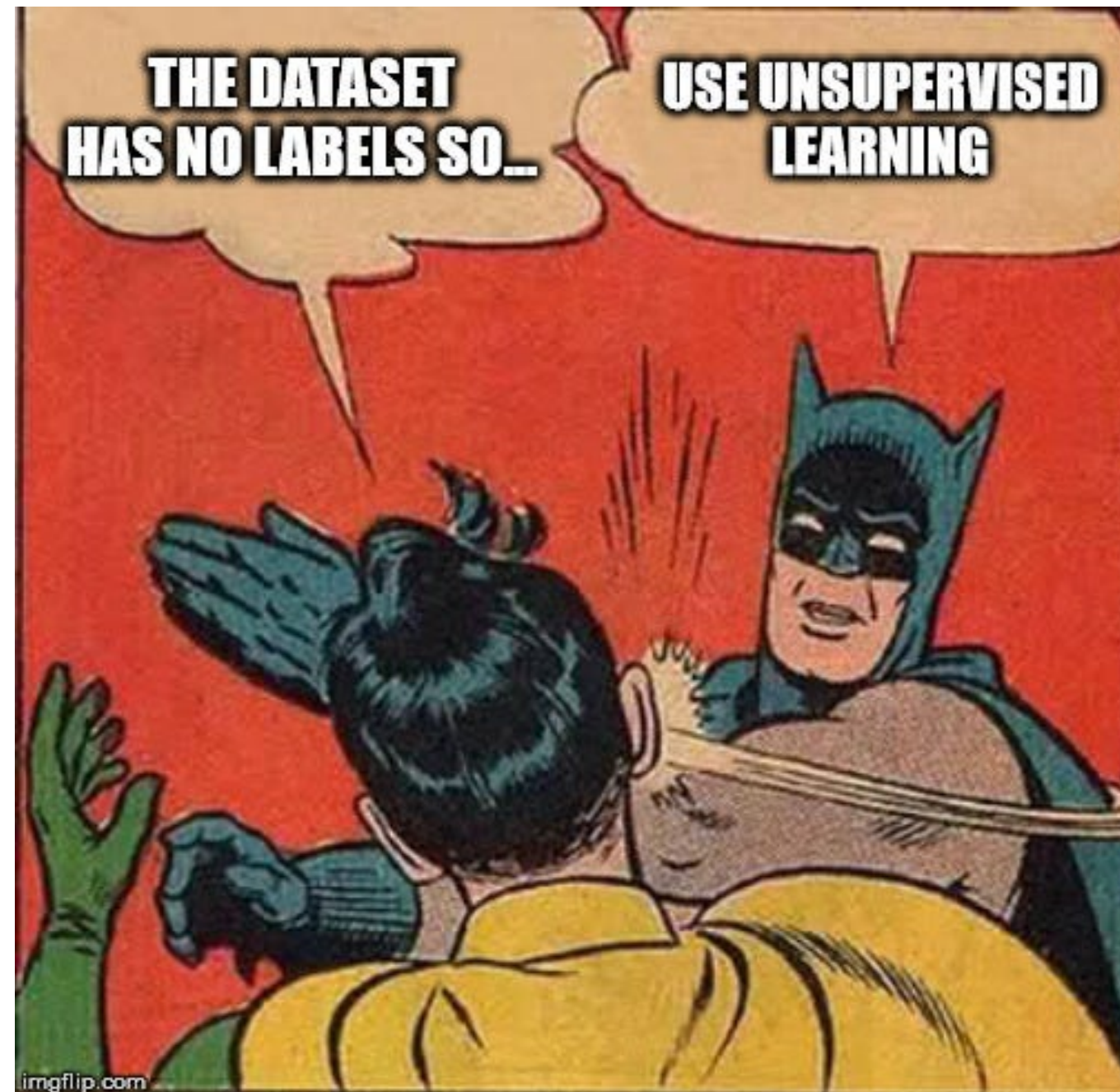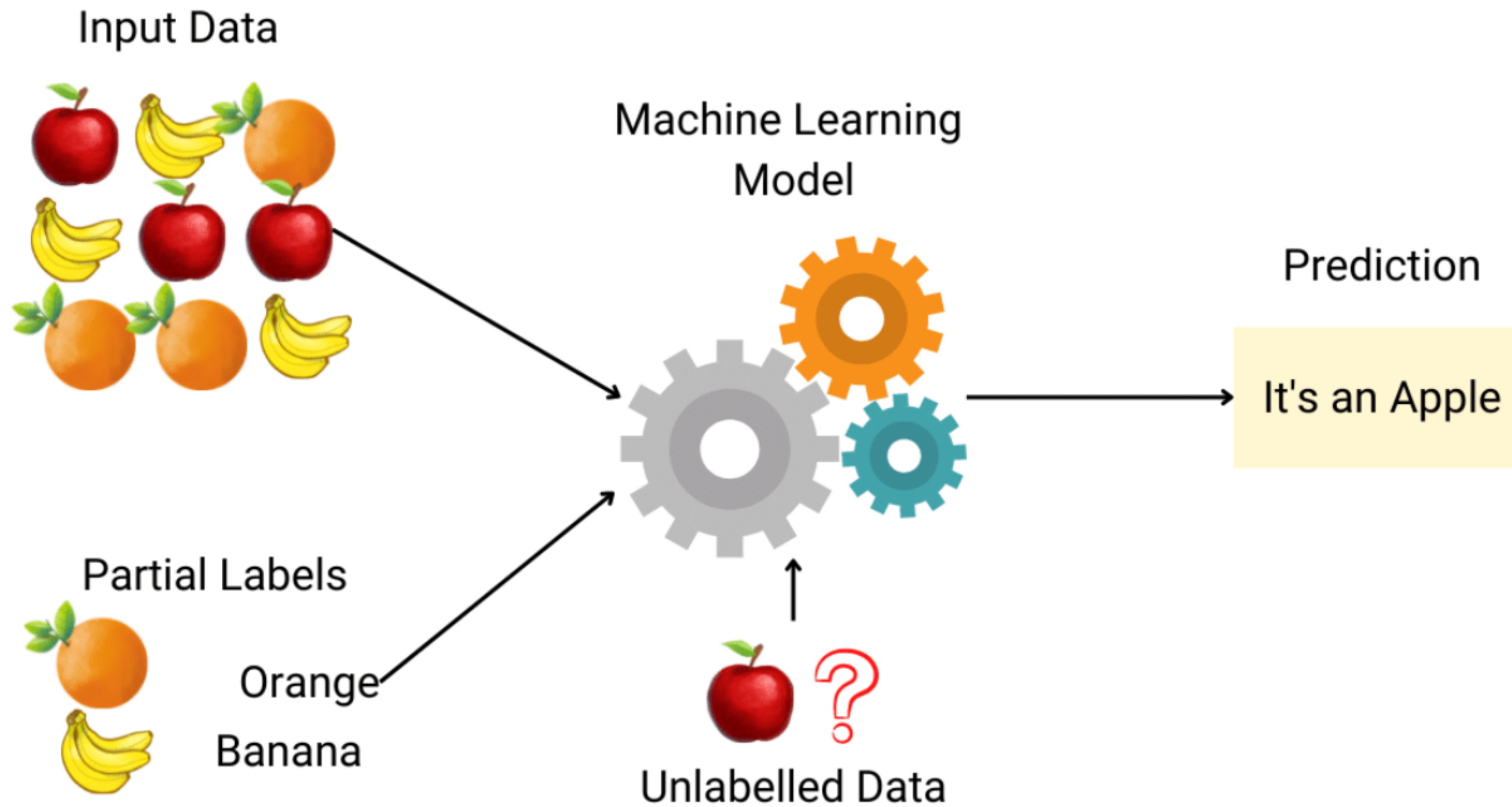# Machine Learning - Supervised

Machine Learning - Unsupervised

Input Raw Data

Algorithm

Output

Machine Learning - Unsupervised

Machine Learning - Semi-Supervised
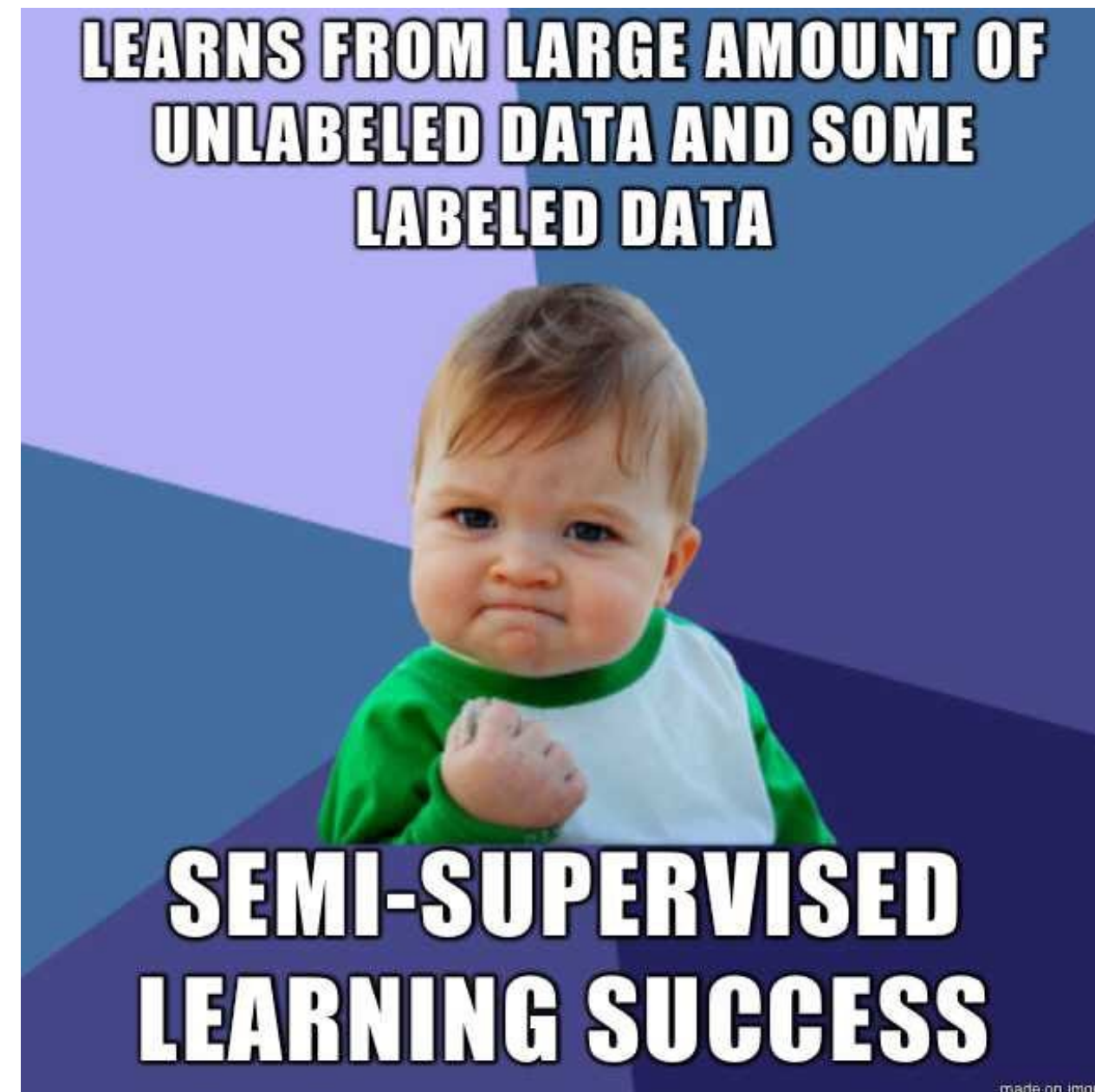
Input Data

Machine Learning
Model

Prediction

It's an Apple

Partial Labels

Orange

Banana

Unlabelled Data

LEARNS FROM LARGE AMOUNT OF UNLABELED DATA AND SOME LABELED DATA

SEMI-SUPERVISED LEARNING SUCCESS

Machine Learning - Reinforcement Learning
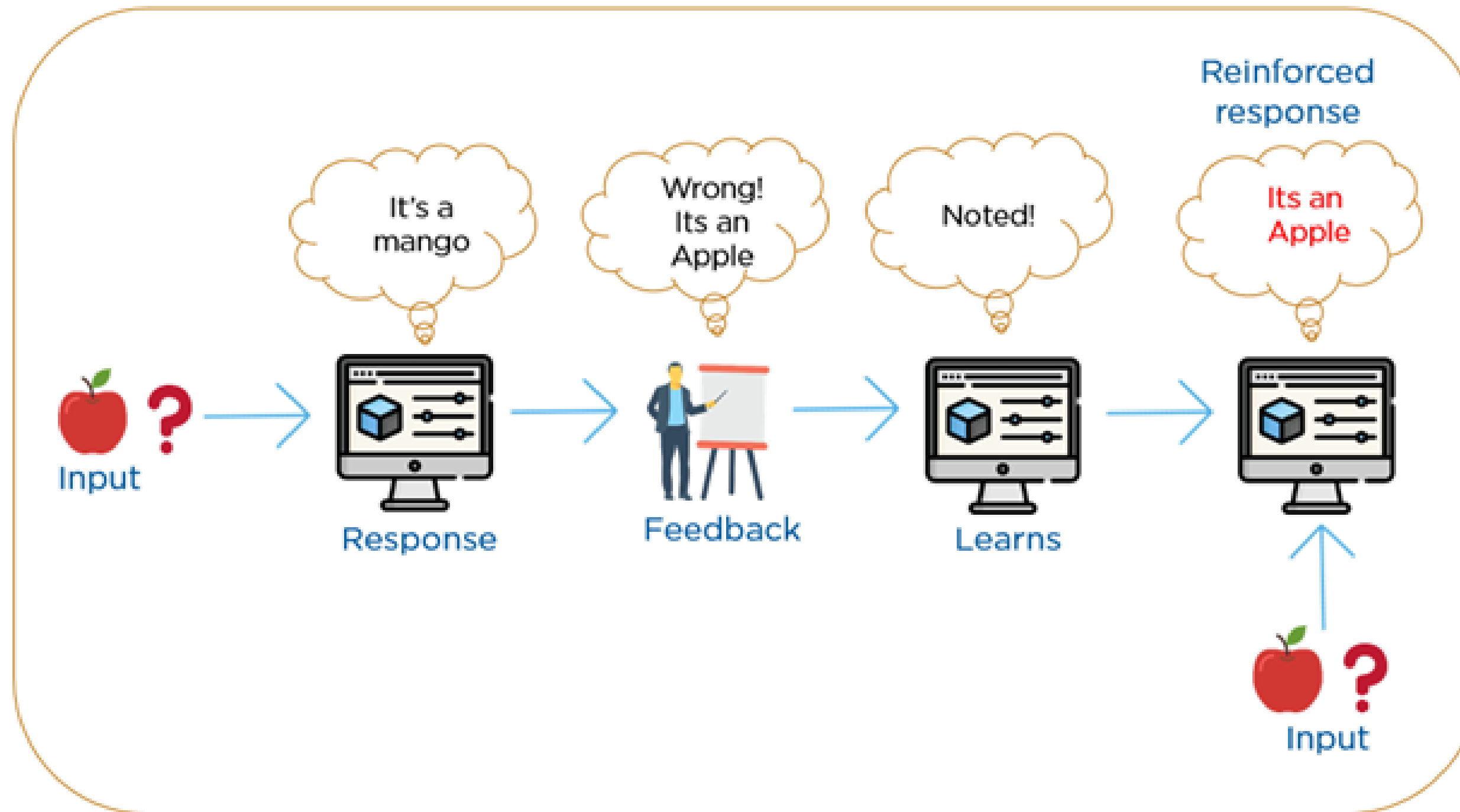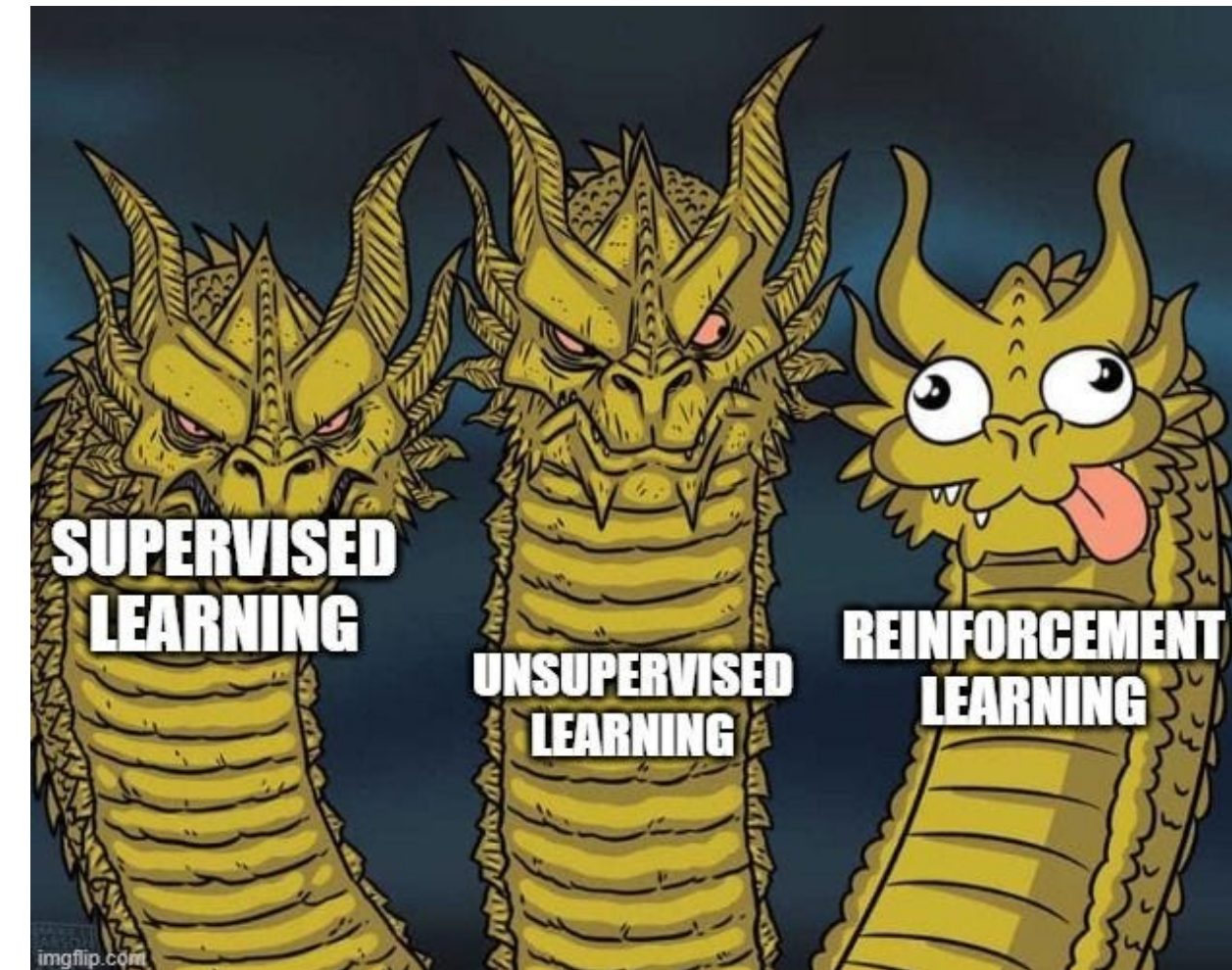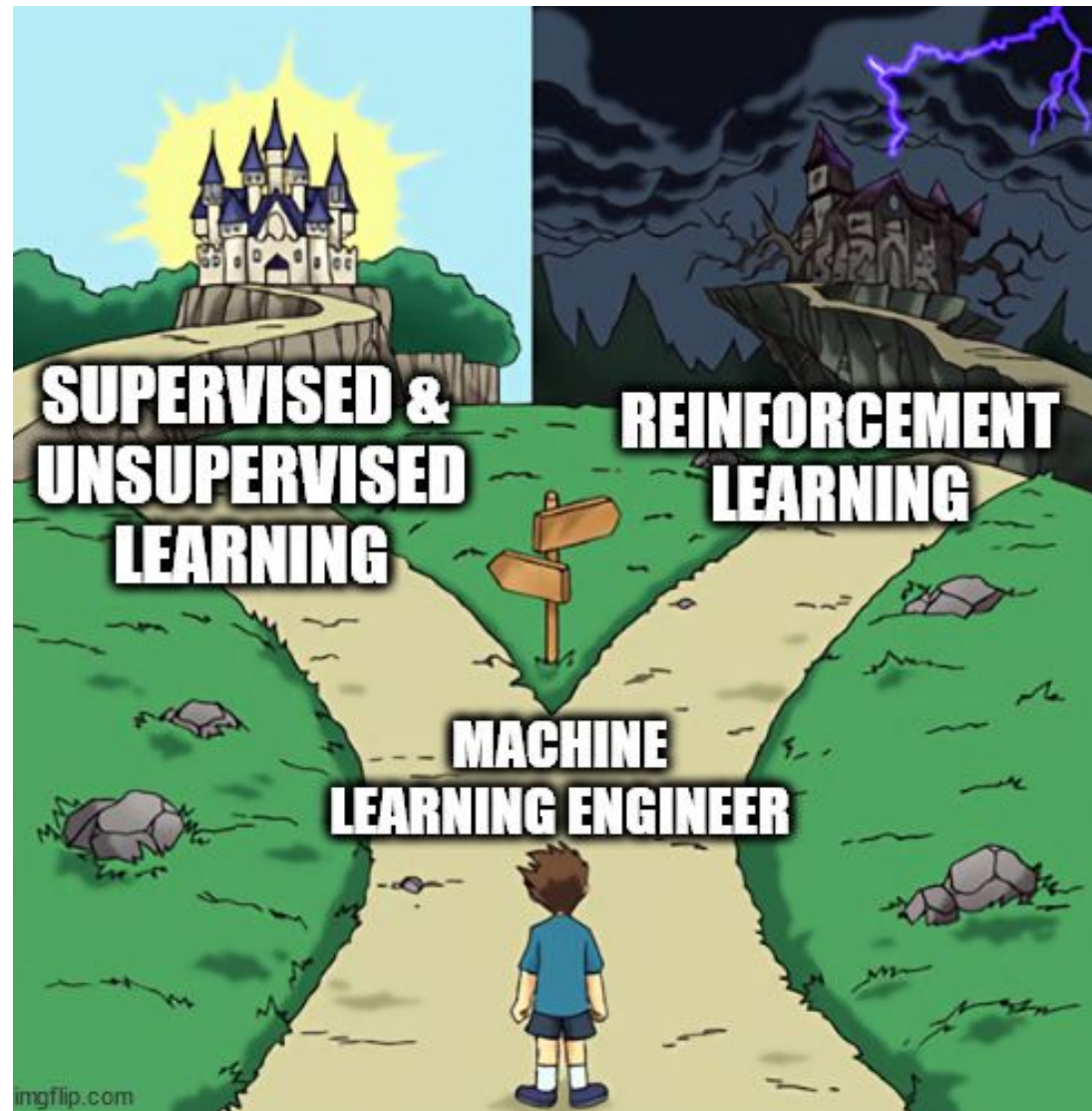
Machine Learning - Reinforcement Learning

Machine Learning - Important Terms

Basic ML Terms:

- **Algorithm:**
- Notation: A
- Example: Linear Regression algorithm predicts house prices based on features.
- **Model:**
- Notation: M
- Example: Trained Linear Regression model predicts house prices.
- **Dataset:**
- Notation: D
- Example: Housing dataset contains house features and labels.
- **Feature:**
- Notation: X
- Example: Feature matrix with columns like size, bedrooms, and location.

- **Label:**
- Notation: Y
- Example: House prices are the labels for each house in the dataset.
- **Training Set:**
- Notation: D(train)
- Example: Training set contains 80% of the housing dataset.
- **Validation Set:**
- Notation: D(val)
- Example: Validation set used to tune hyperparameters during training.
- **Test Set:**
- Notation: D(test)
- Example: Test set used to evaluate model performance.

Machine Learning - Important Terms

Student ID	Exam 1 Score	Exam 2 Score	Study Hours	Pass/Fail
1	85	90	8	Pass
2	70	75	6	Pass
3	60	65	4	Fail
4	90	95	10	Pass
5	75	80	7	Pass

TensorFlow
User Group Durg

ML Study
JAM

Thank You!