# Generative AI Academy

What is AI?

Artificial Intelligence (AI) is the field of computer science focused on creating machines or systems that can perform tasks that would typically require **human intelligence**.

These tasks often include:
- Reasoning
- Learning
- Problem-solving
- Understanding natural language
- Recognizing patterns
- Making decisions
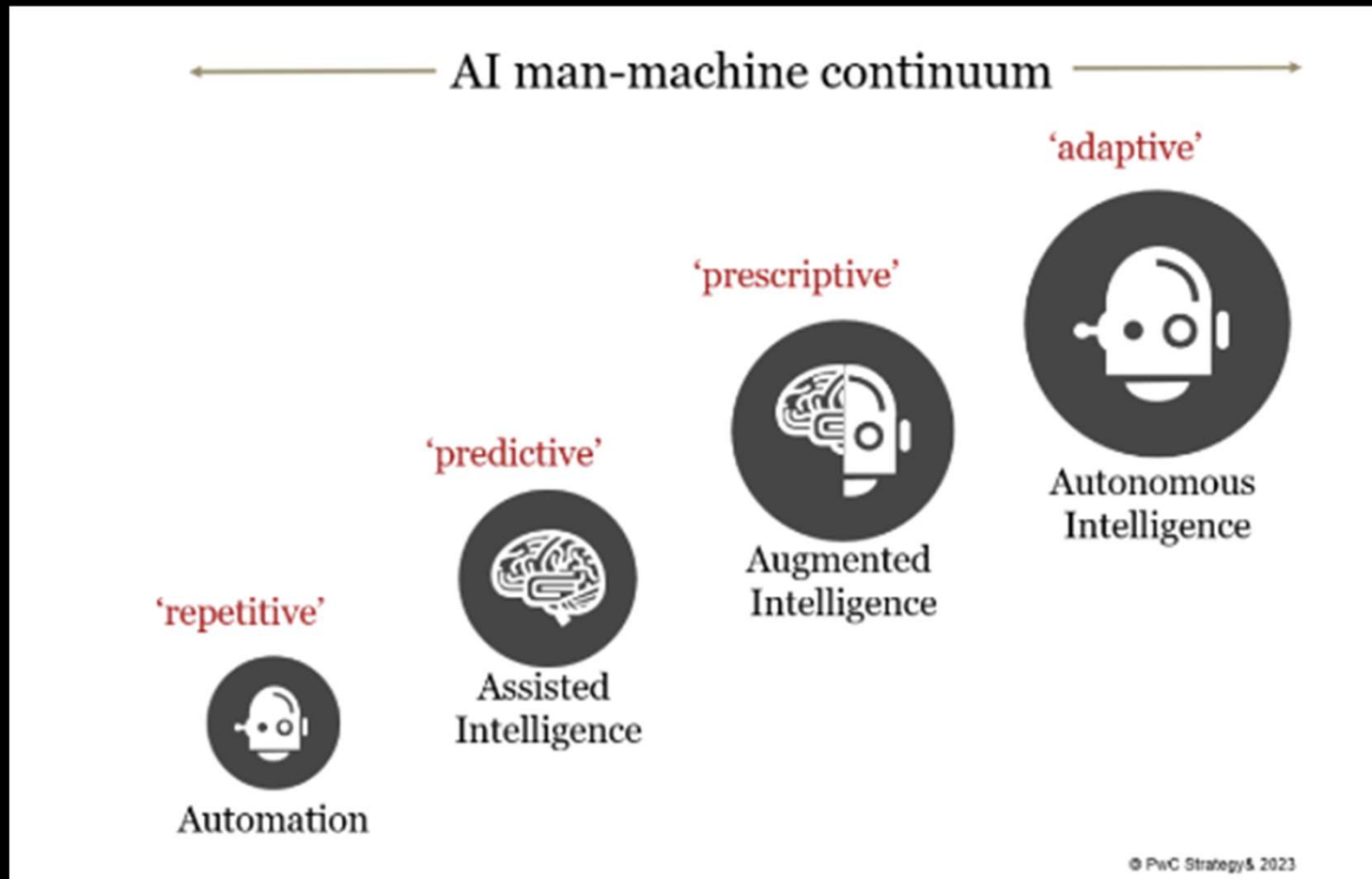- Generating new stuff based on it's learning

AI systems can adapt and improve over time, especially those utilizing advanced techniques like machine learning (ML) and deep learning.

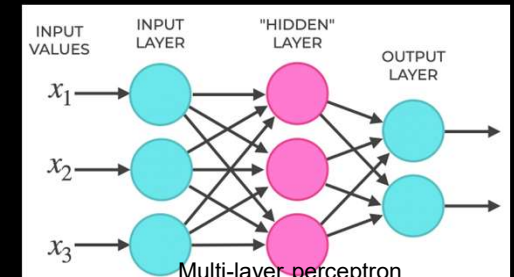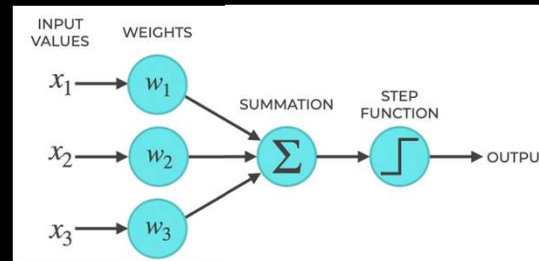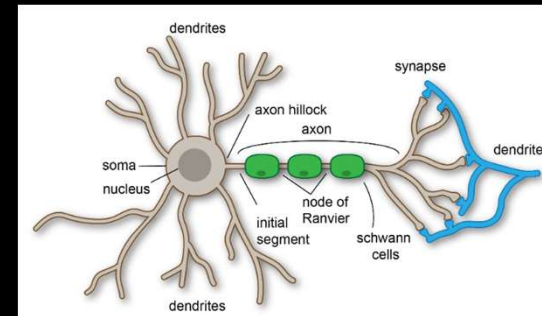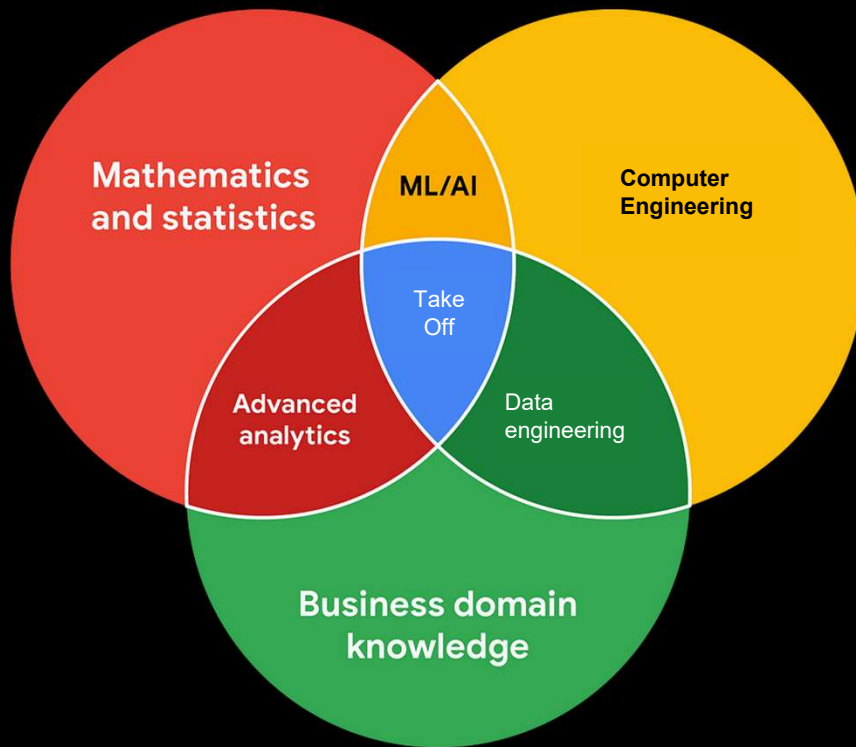# Data science, Machine Learning, Deep Learning, AI
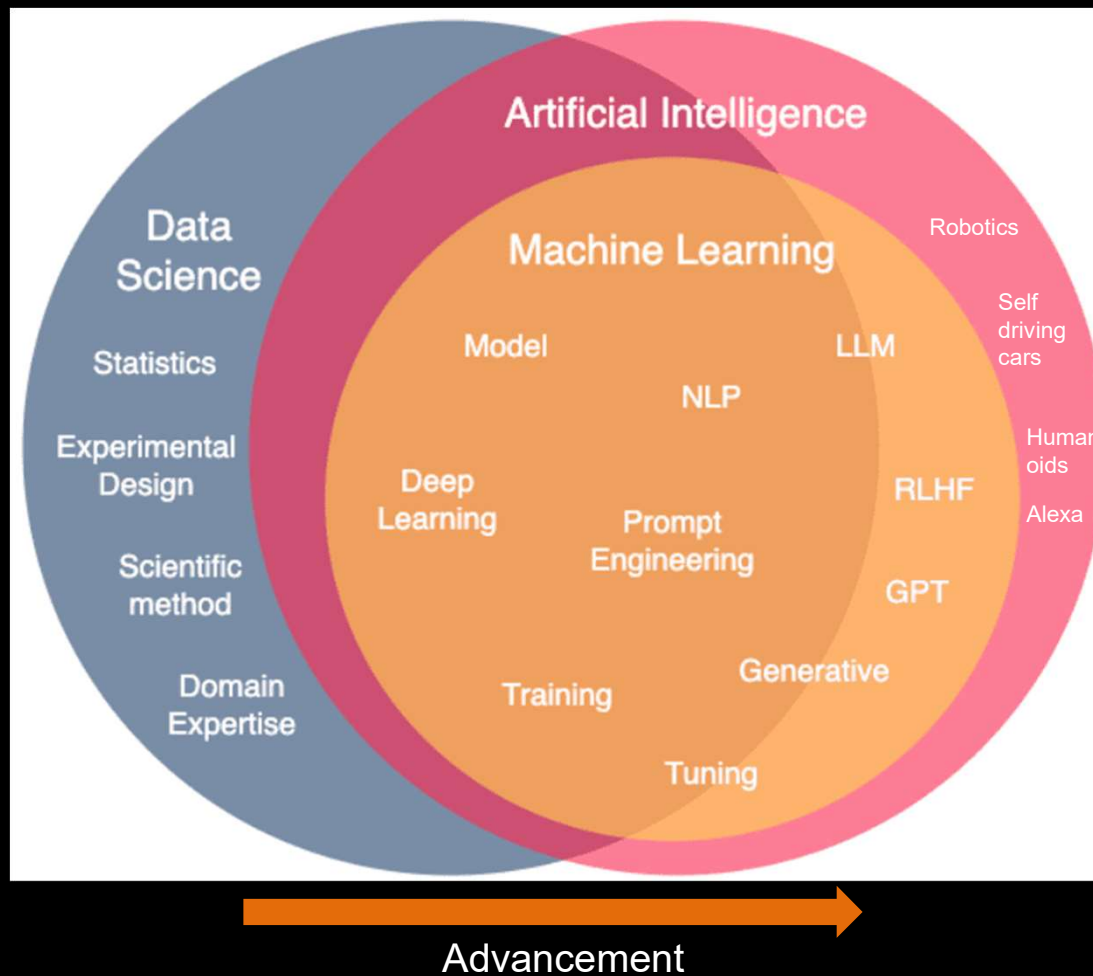
Data Science, Machine Learning, AI overlap and complement each other while still having their own distinct capabilities

Evolution of AI

AI man-machine continuum

'adaptive'
'prescriptive'
'predictive'
'repetitive'

Automation
Assisted Intelligence
Augmented Intelligence
Autonomous Intelligence

© PwC Strategy& 2023
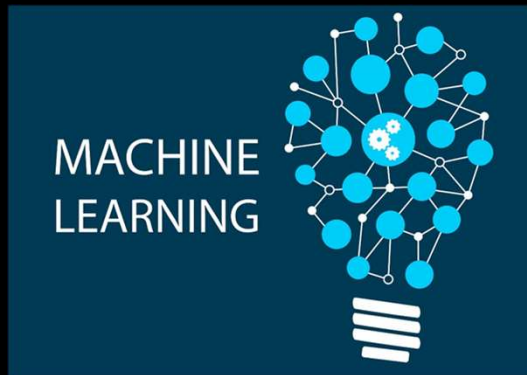
End goal: Mimic human brain

Key building blocks of modern AI

Machine Learning

Deep Learning

Natural Language Processing

Computer Vision

Cognitive computing

Cognitive computing represents a broader system that leverages both machine learning and deep learning to achieve human-like intelligence and decision-making capabilities.

Feature	Machine Learning	Deep Learning	Cognitive Computing
Goal	Identify patterns, predict outcomes	Automate feature extraction, handle unstructured data	Simulate human thought, assist decision-making
Data	Structured	Structured and unstructured	Structured and unstructured
Scope	Predictive tasks	Complex recognition tasks	Decision support, reasoning
Technology	Algorithms (SVM, trees, etc.)	Neural networks	AI, ML, NLP, DL
Human Interaction	Limited	Limited	High

Cognitive Computing

How to make the machine predict the animal from its picture?
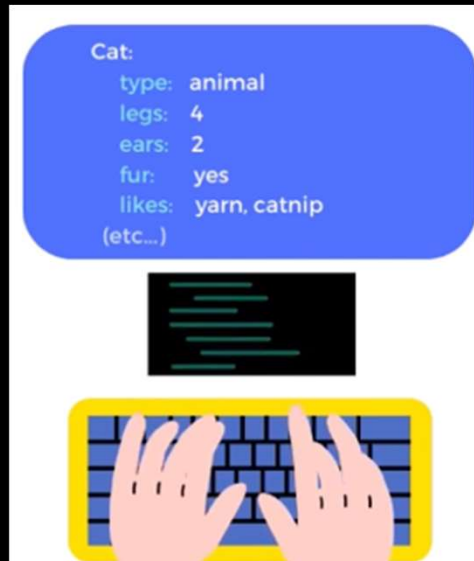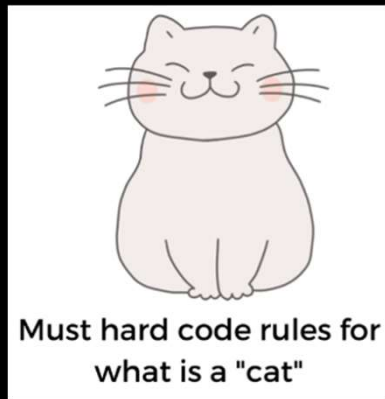
Is this a cat or a dog?

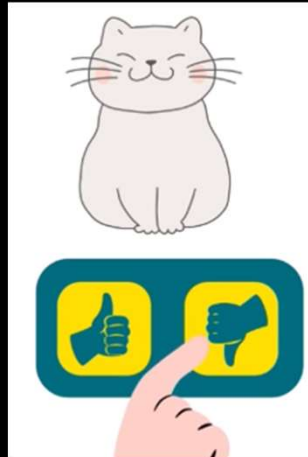It's all about learning to find patterns and relationships in the data

Traditional programming Vs Machine Learning

To Answer, "Is this a cat?"

Traditional Programming

Cat:
type: animal
legs: 4
ears: 2
fur: yes
likes: yarn, catnip
(etc...)

Must hard code rules for what is a "cat"

With Machine Learning

- Must give the network pictures of cats and dogs
- Makes a prediction based on training

Machine learning (ML) is defined as a discipline of artificial intelligence (AI) that provides machines the **ability to automatically learn** from data and past experiences to identify patterns and make predictions with minimal human intervention ,operating **without explicit programming**

End to end – predict weight of a person based on height

1 Start with training dataset

2 Determine the model to use
Linear regression in this case
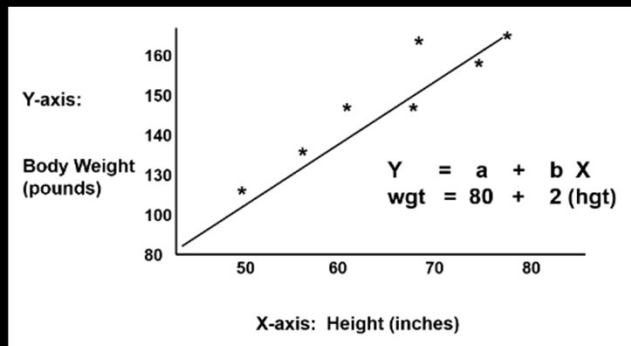
y = mx + c

3 Measure error / accuracy

$$Cost\ Function(MSE) = \frac{1}{n}\sum_{i=0}^{n}(y_i - (mx_i + c))^2$$

Cost function (or loss function) measures the error.
Our goal is to minimize the cost function to find the best fit line

4 Tune the model - Minimise error (improve accuracy)

Gradient Descent is a mathematical function that can help compute the model parameters (m, c) that will minimize the loss function in minimum number of iterations.
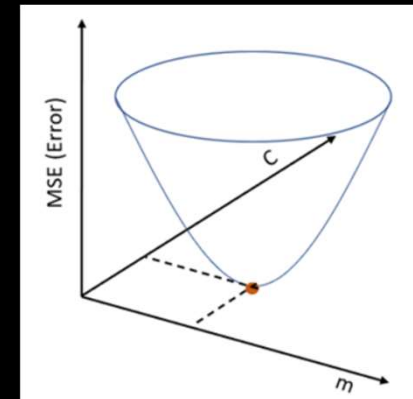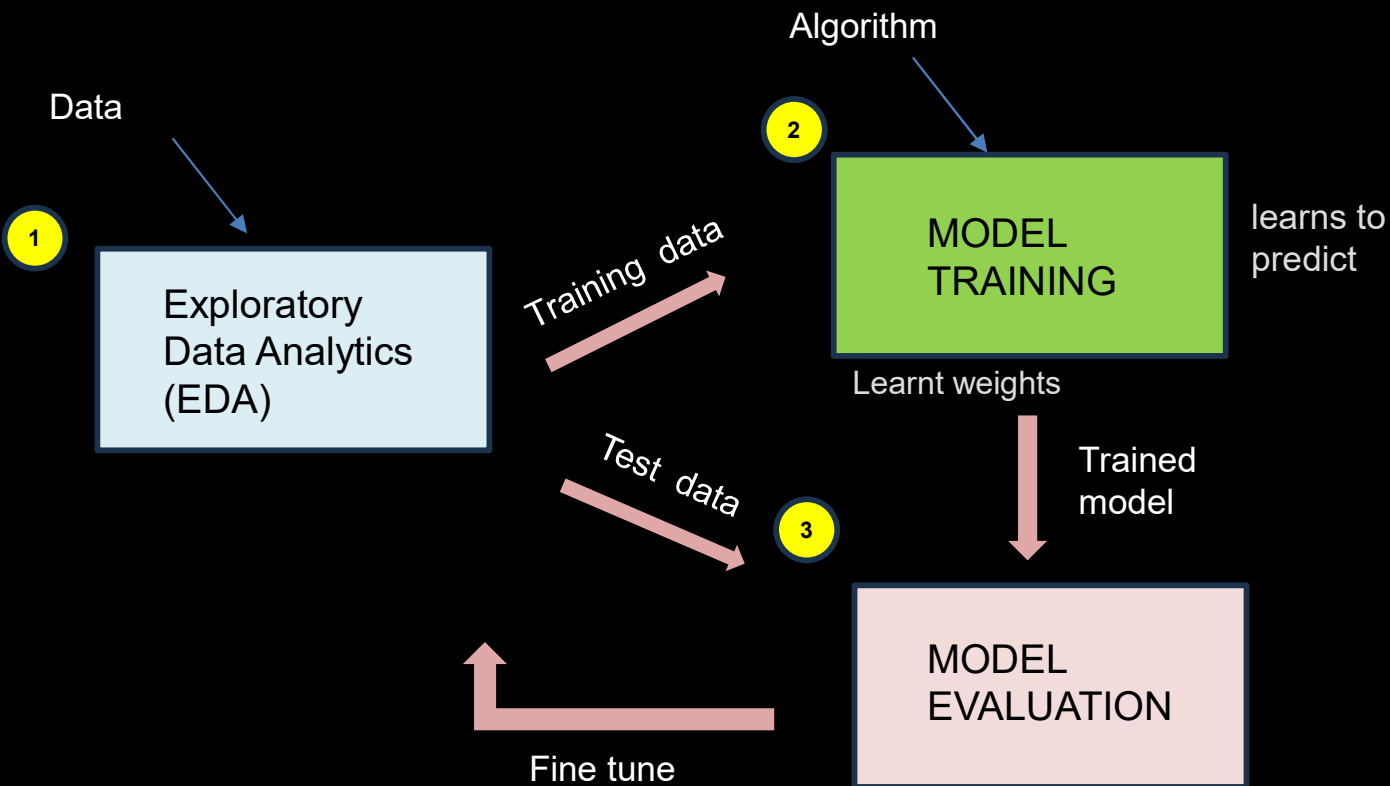

Relies on derivatives and calculus

$$D_m = \frac{\partial(Cost\ Function)}{\partial m} = \frac{\partial}{\partial m}\left(\frac{1}{n}\sum_{i=0}^{n}(y_i - y_{i\ pred})^2\right)$$

$$D_c = \frac{\partial(Cost\ Function)}{\partial c} = \frac{\partial}{\partial c}\left(\frac{1}{n}\sum_{i=0}^{n}(y_i - y_{i\ pred})^2\right)$$
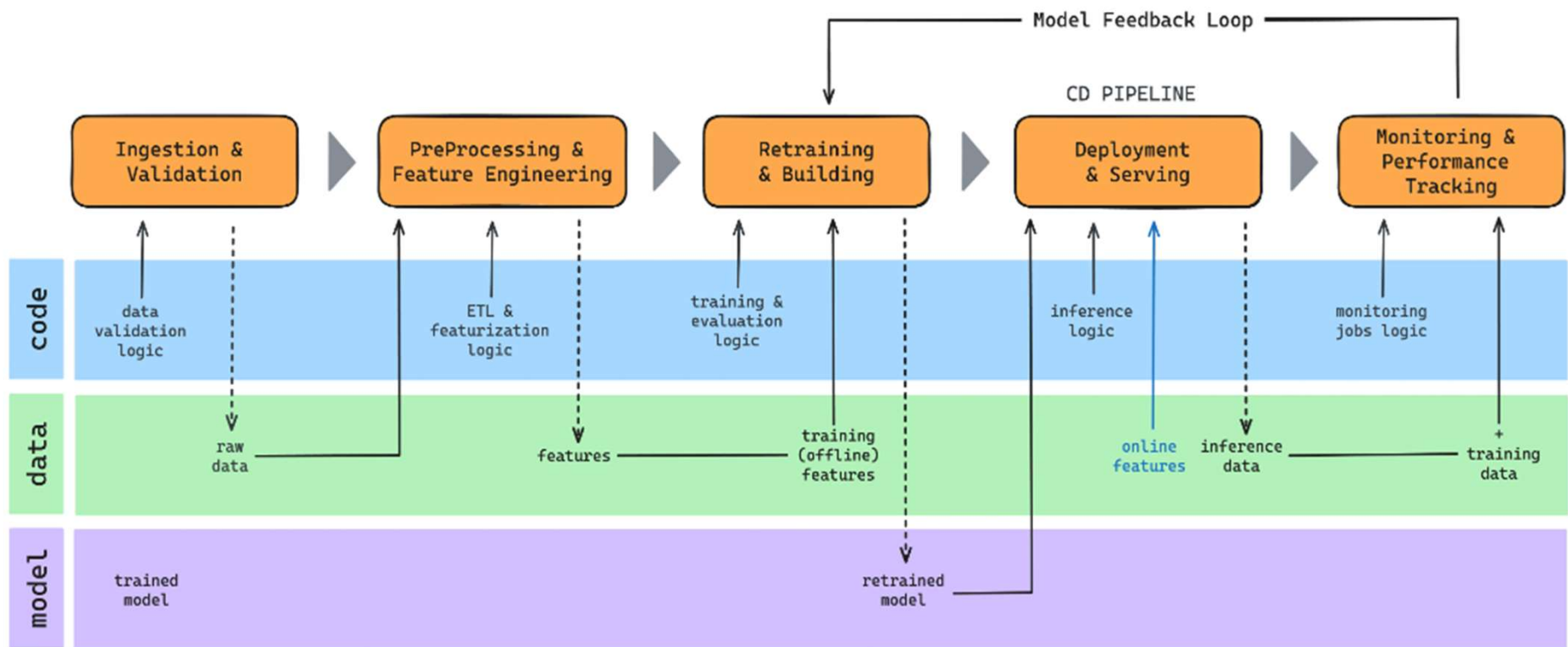
$$m = m - LD_m$$

$$c = c - LDc$$
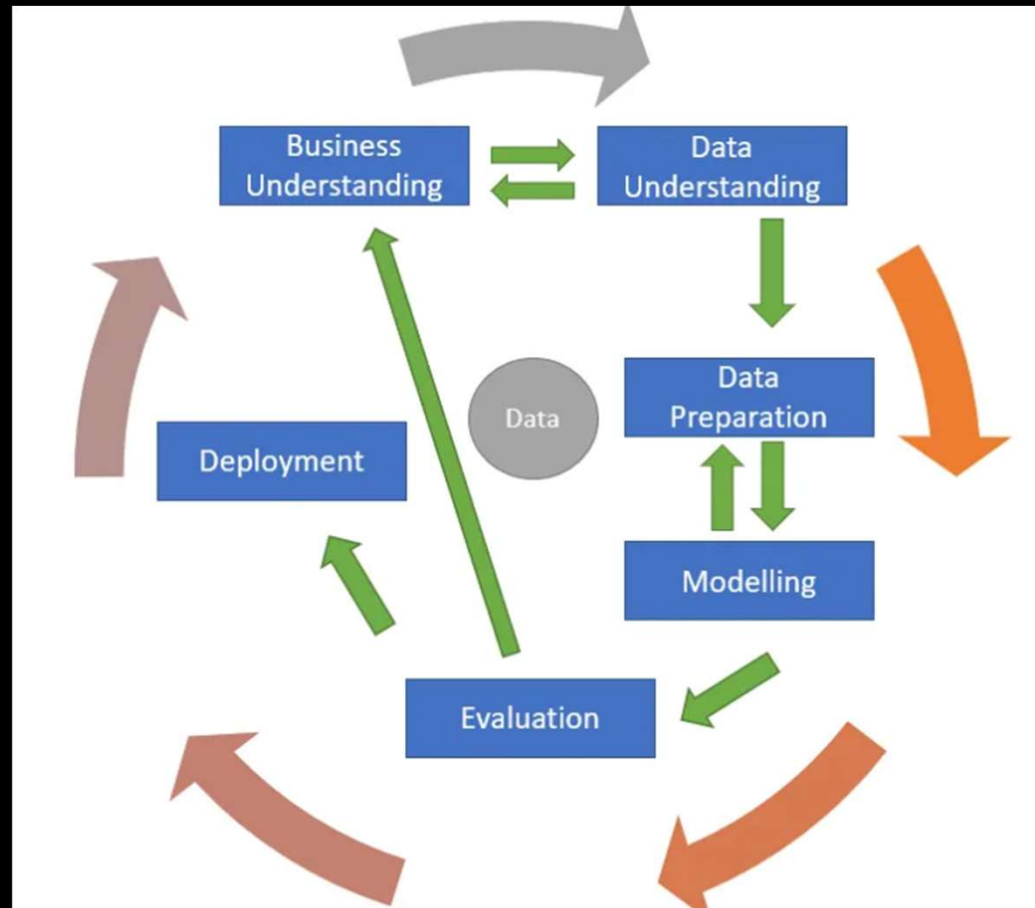
Data Science part of the solution

Machine learning pipeline

Production Machine Learning Pipeline

CRISP-DM Framework

Cross-Industry Standard Process for Data Mining

Detailed flow and steps to execute a data science project