Introduction to Data Science

DataCoach @ Technion

Apr 2023

AI - Artificial Intelligence
ML - Machine Learning
DS - Data Science

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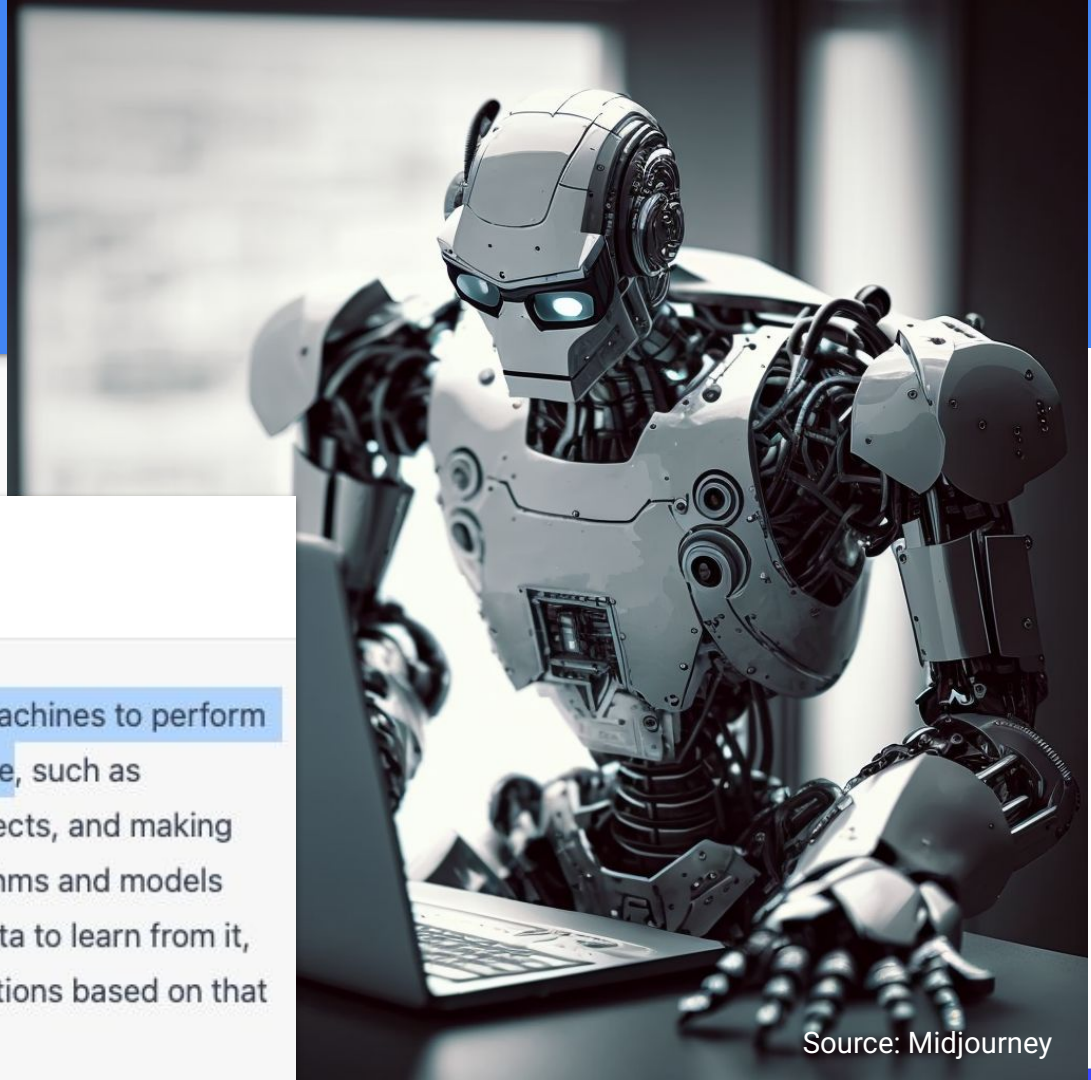
AI - Artificial Intelligence



What is artificial intelligence?

Artificial intelligence (AI) refers to the ability of machines to perform tasks that typically require human-like intelligence, such as understanding natural language, recognizing objects, and making decisions. AI involves the development of algorithms and models that can process and analyze vast amounts of data to learn from it, make predictions, and make decisions or take actions based on that learning.

Source: Midjourney

ML - Machine Learning

What is machine learning?

Machine learning is a subfield of artificial intelligence that focuses on the development of algorithms and statistical models that enable computers to learn from and make predictions or decisions based on data without being explicitly programmed to do so.

Source: Midjourney

DS - Data Science

What is data science?

Data science is a multidisciplinary field that involves using scientific methods, algorithms, and tools to extract knowledge and insights from structured and unstructured data. The field combines elements of statistics, computer science, mathematics, and domain-specific

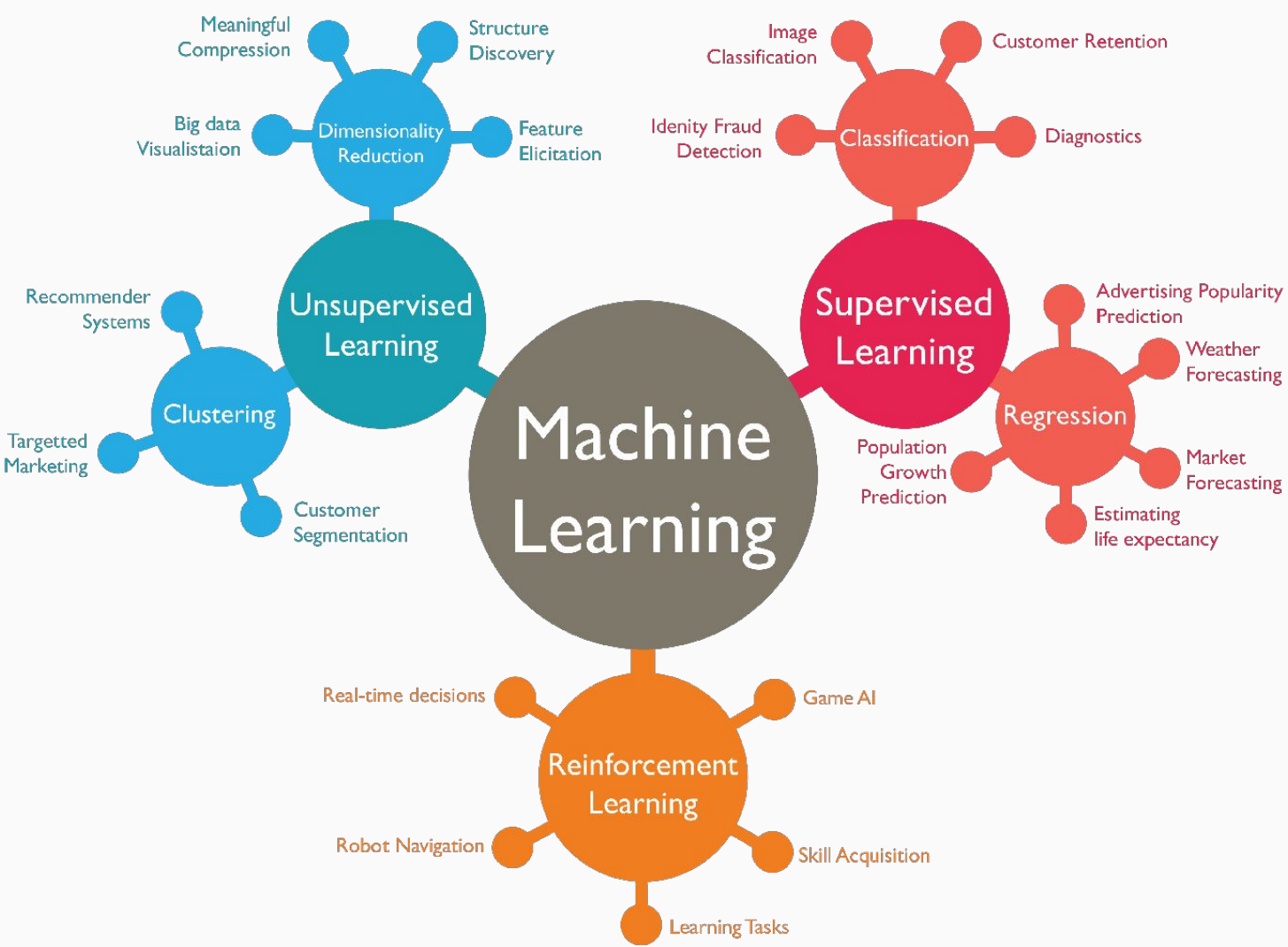
Source: Midjourney

AI
ML
DS

Source: Midjourney

What can you do with ML, AI, DS?

- Spam **classification**
- **Play** Chess
- **Predict** weather
- Biometric **security** (face, fingerprint)
- **Recommend** movies
- Trade stocks
- Detect fraud
- **Generate** images and text
- **Identify** faces in photos
- **Translate** text


Machine Learning
Unsupervised Learning
Dimensionality Reduction
Meaningful Compression
Structure Discovery
Big data Visualistaion
Feature Elicitation
Clustering
Recommender Systems
Targetted Marketing
Customer Segmentation
Supervised Learning
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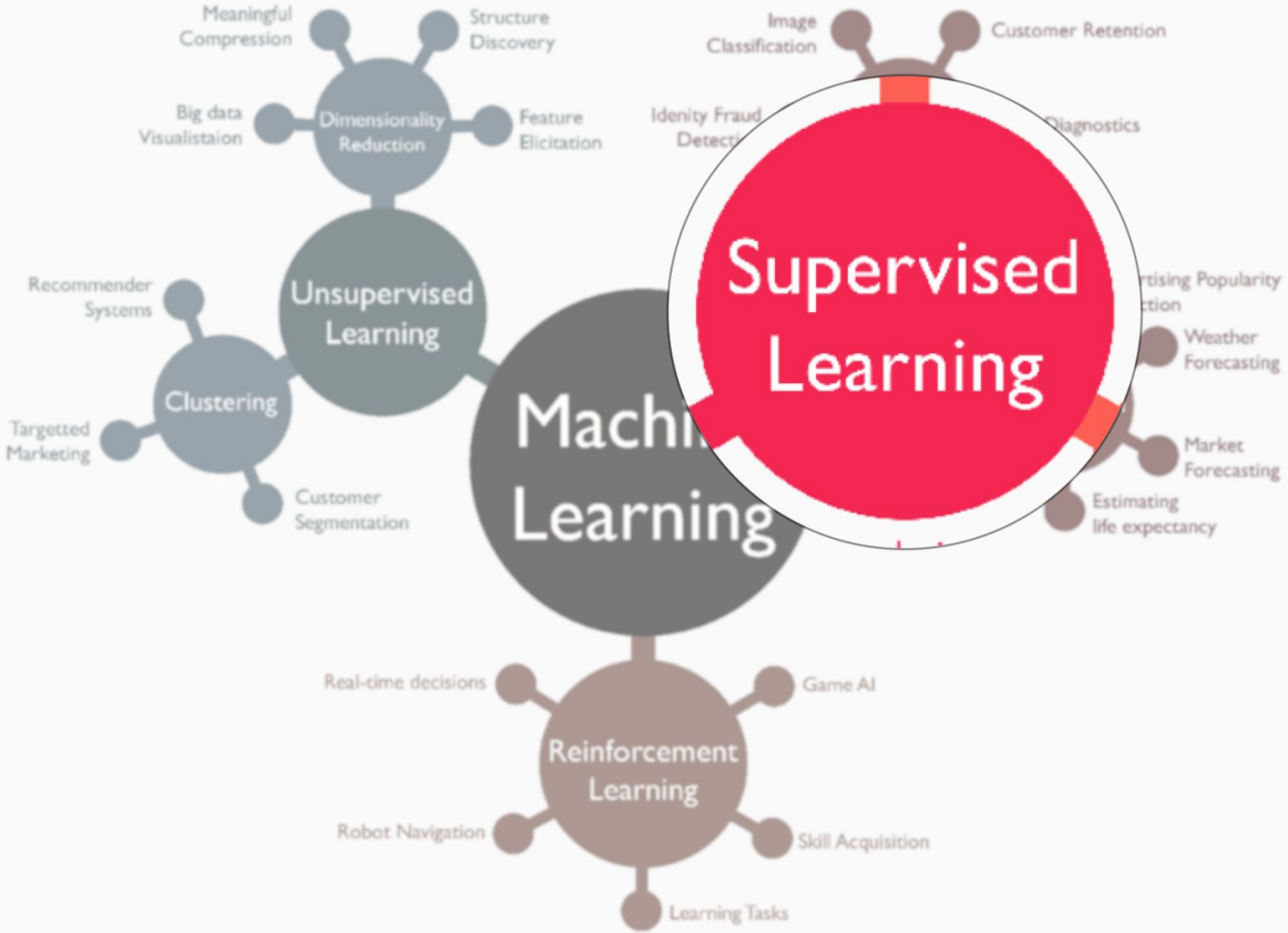
Estimating life expectancy
Population Growth Prediction
Reinforcement Learning
Real-time decisions
Game AI
Robot Navigation
Skill Acquisition
Learning Tasks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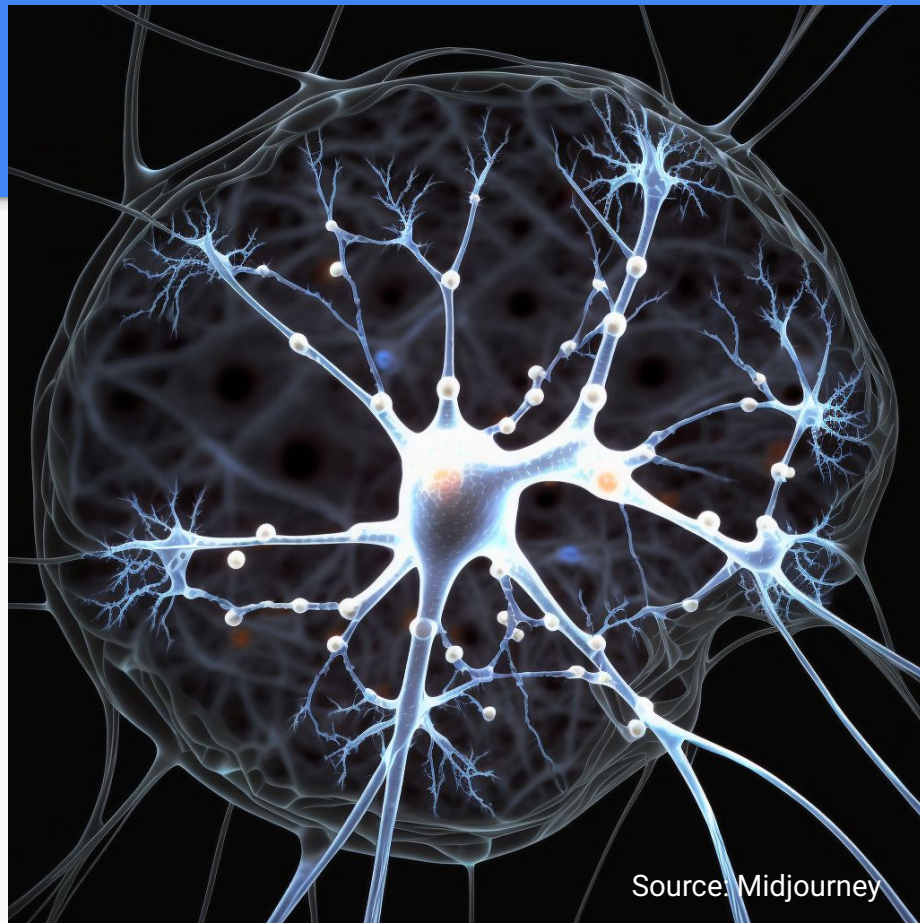
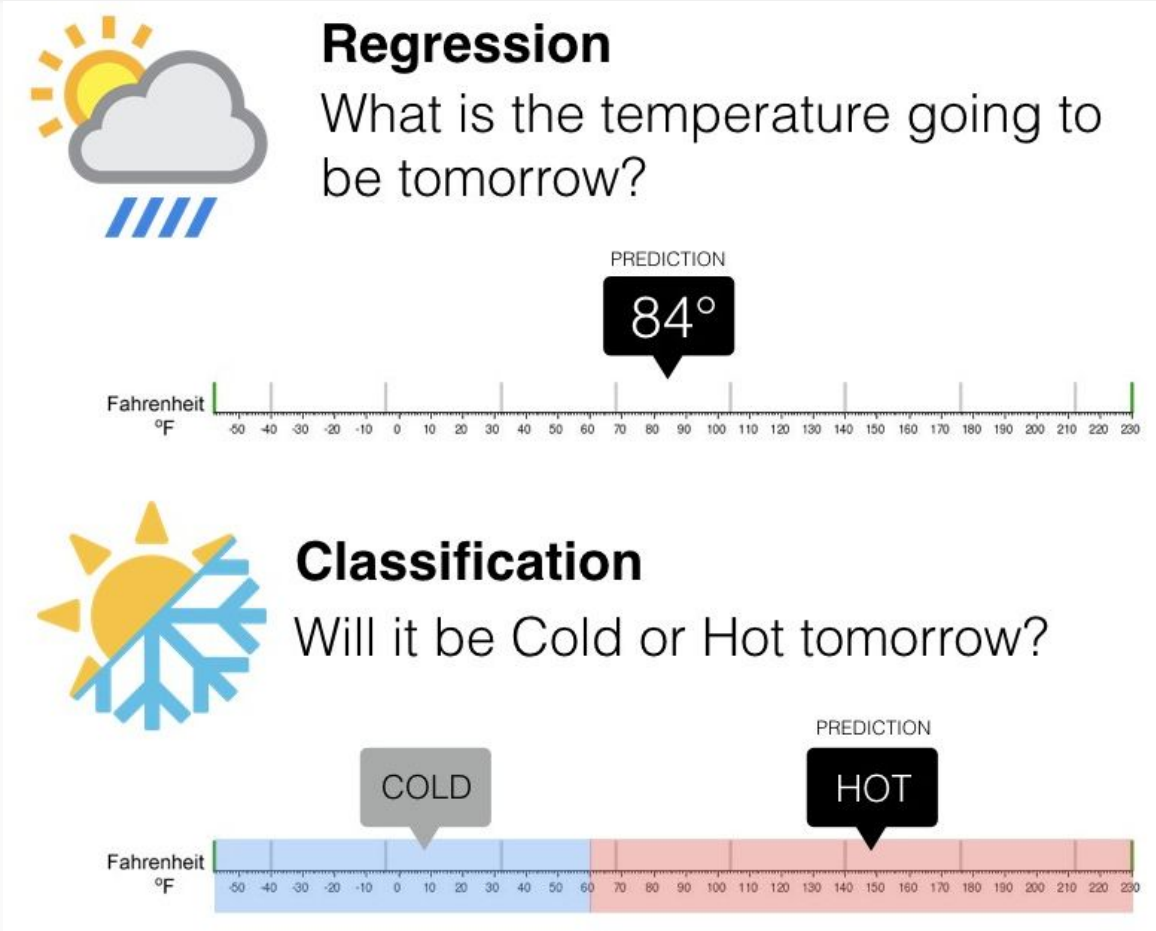
Learning Tasks

Supervised Learning

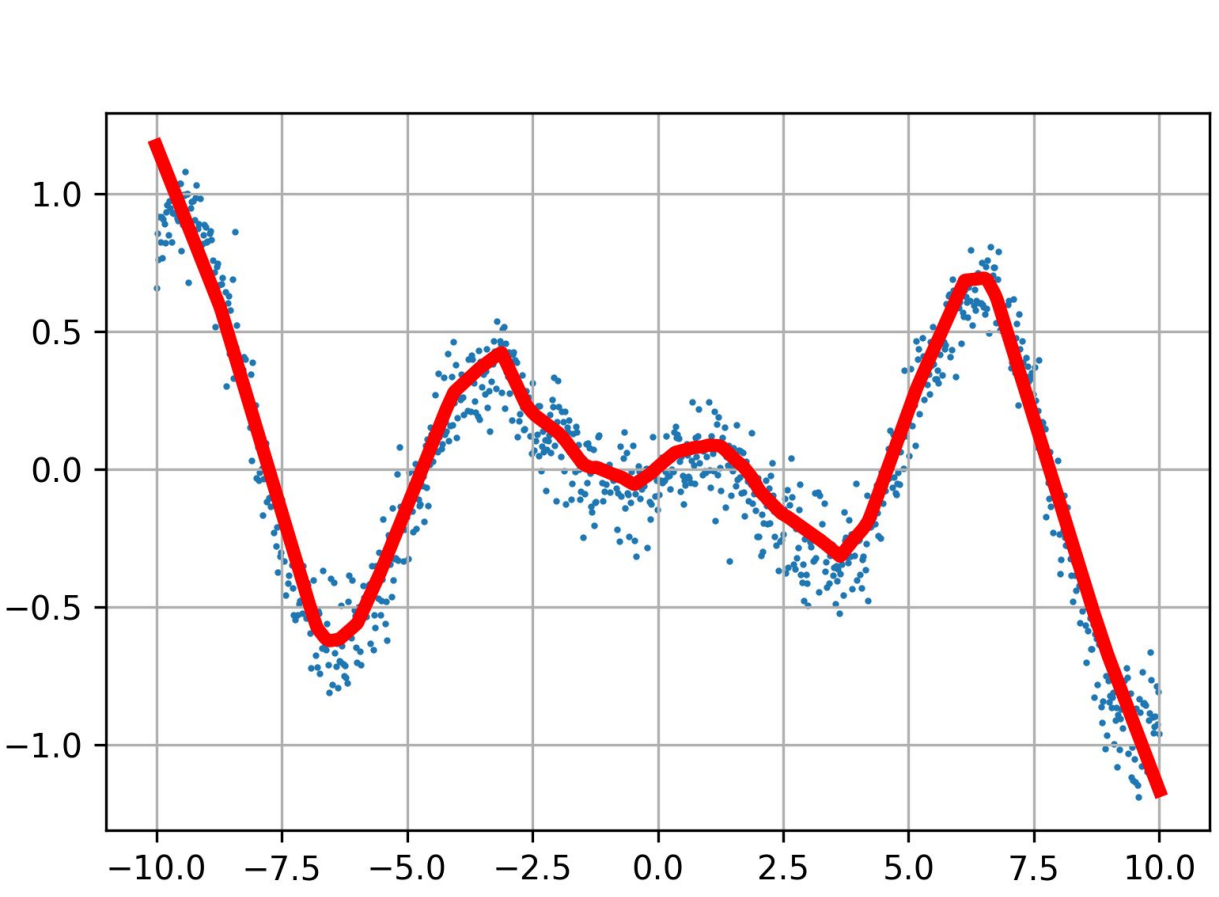
- Train on labeled data
- Predict
- Classification / Regression



Classification v/s Regression

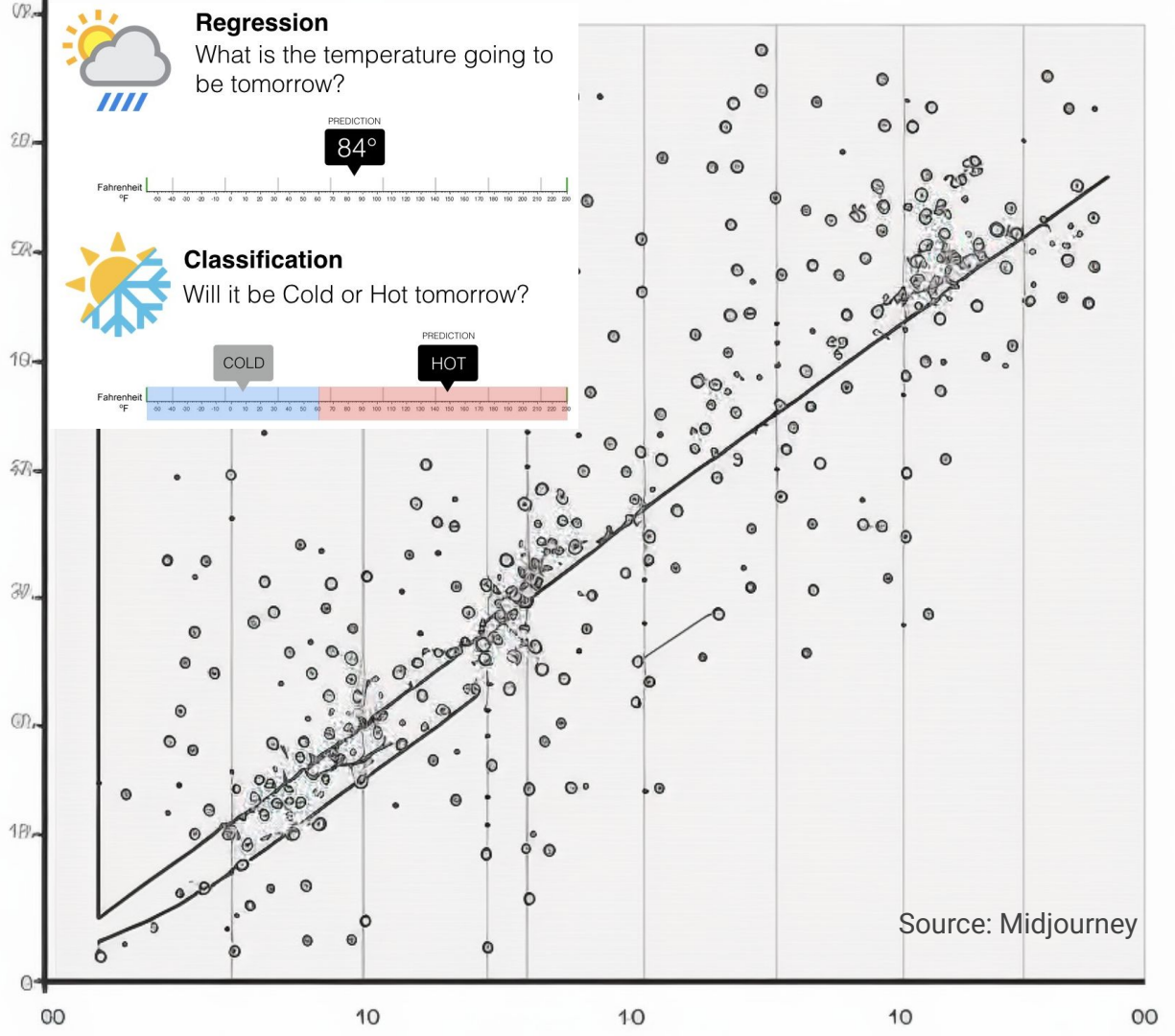


Regression



Regression - Tools

- Data
- Regressor
  - Linear regressor
  - Cubic regressor
  - Polinomial
  - Bayesian
  - Tree
  - Random forest
  - Neural Network
  - ...



Regression - How

1. Train
2. Predict

Regression - How

1. Train
2. Predict

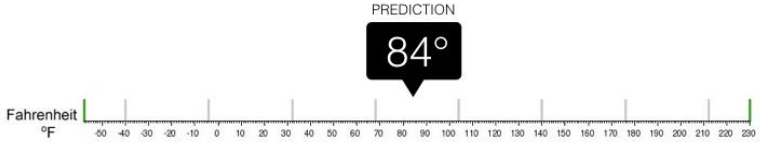
Source: Midjourney

Classification

Determine one of many classes

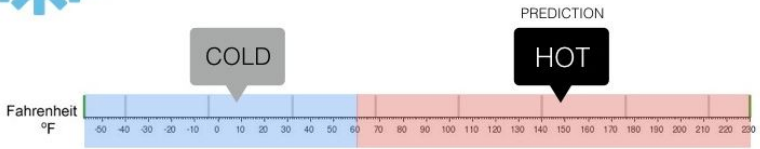
Regression

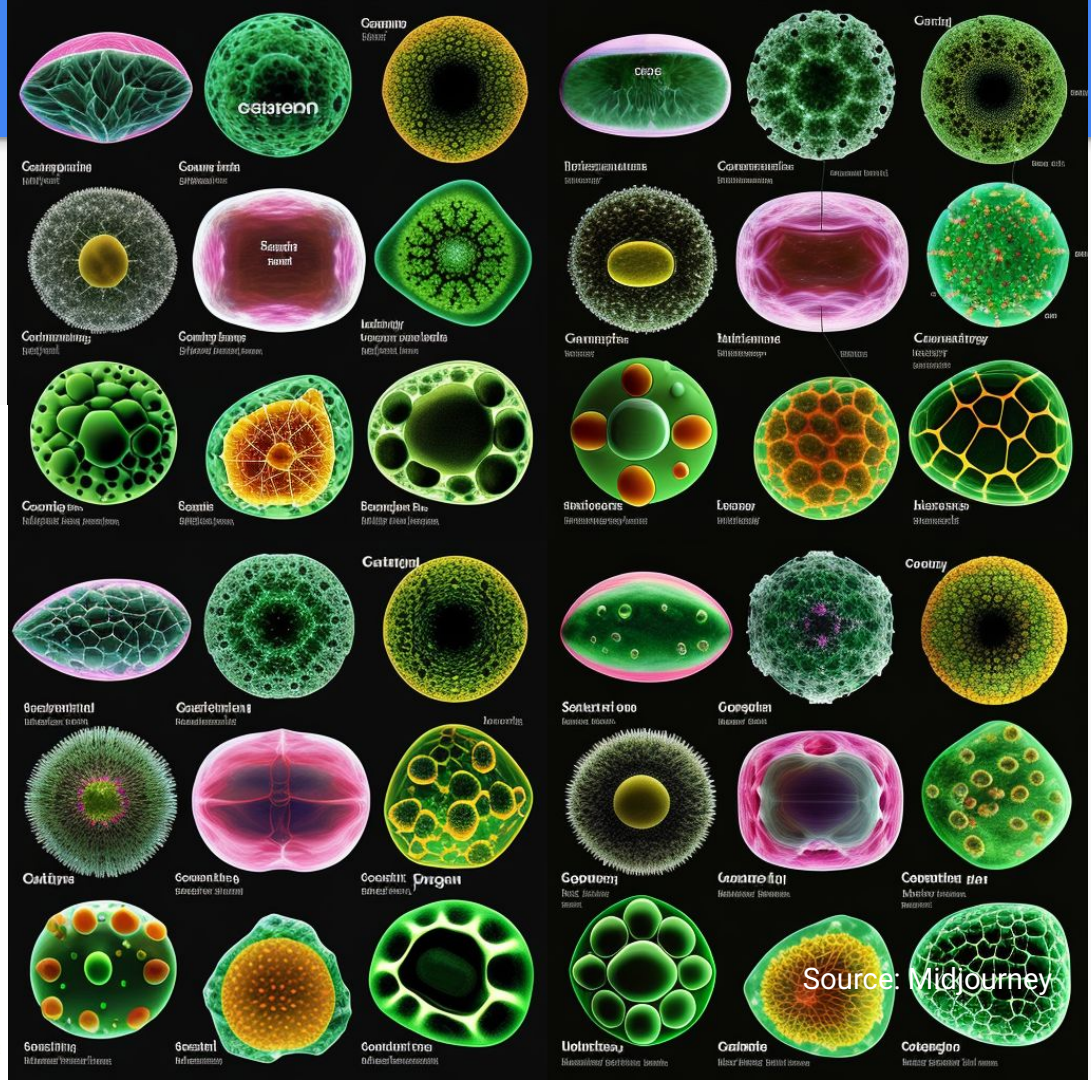
What is the temperature going to be tomorrow?



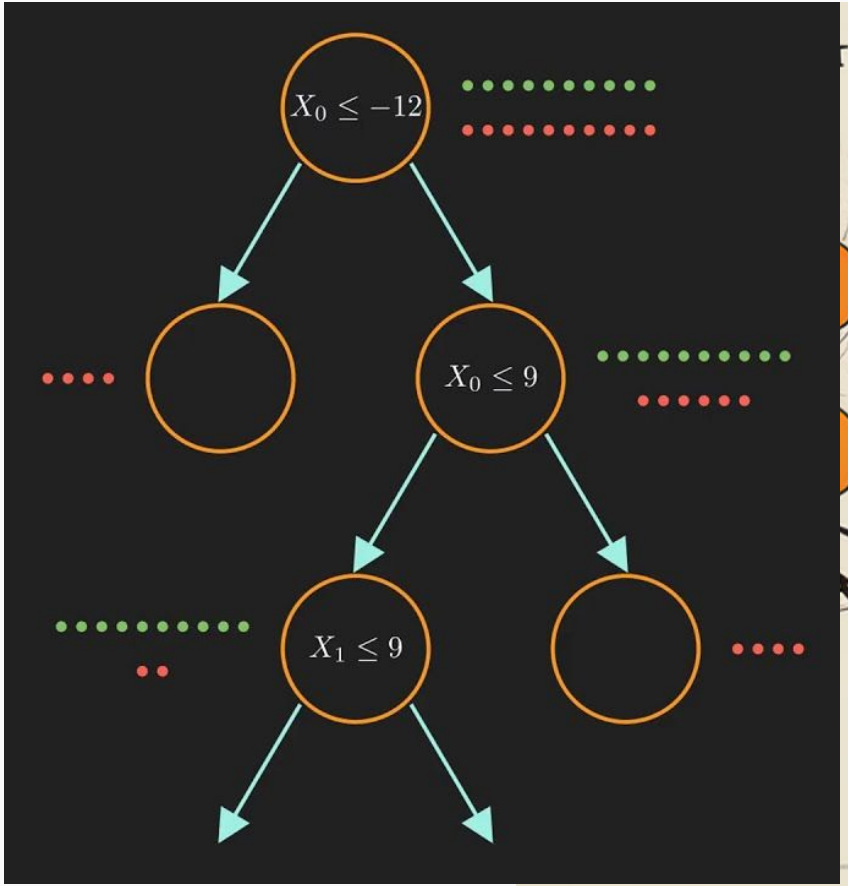
Classification

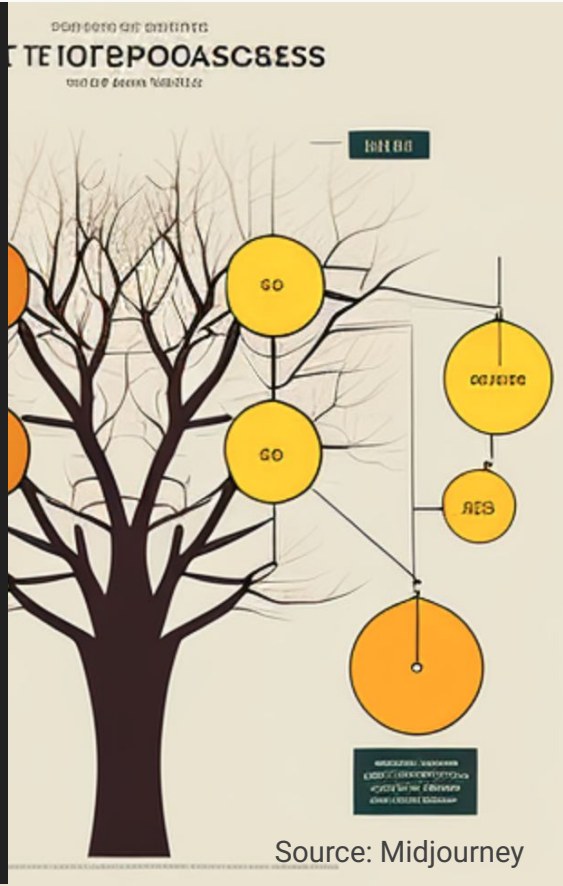
Will it be Cold or Hot tomorrow?





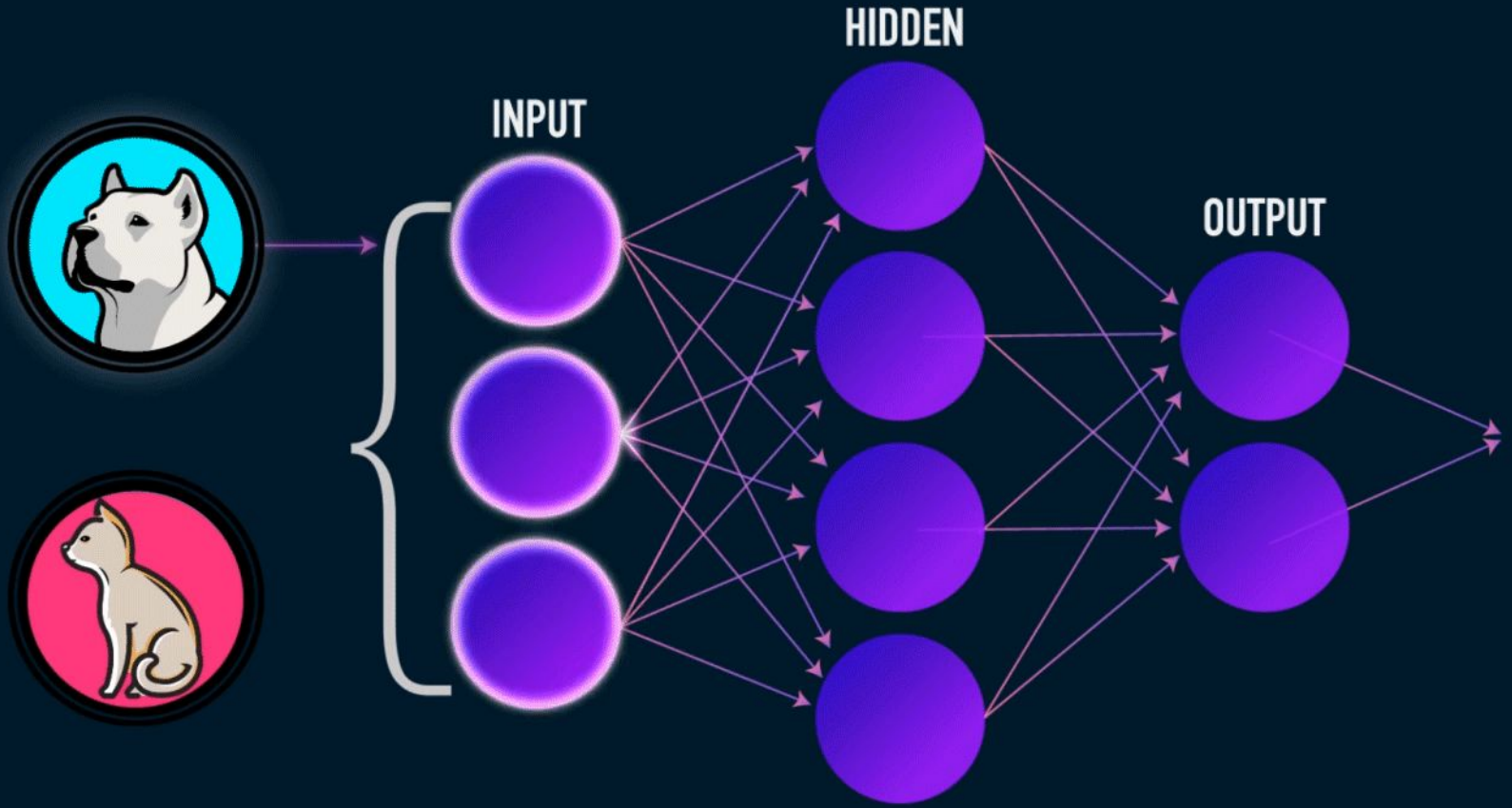
Classification - Decision trees





Source: Midjourney

Classification - Neural Network



Deep Learning

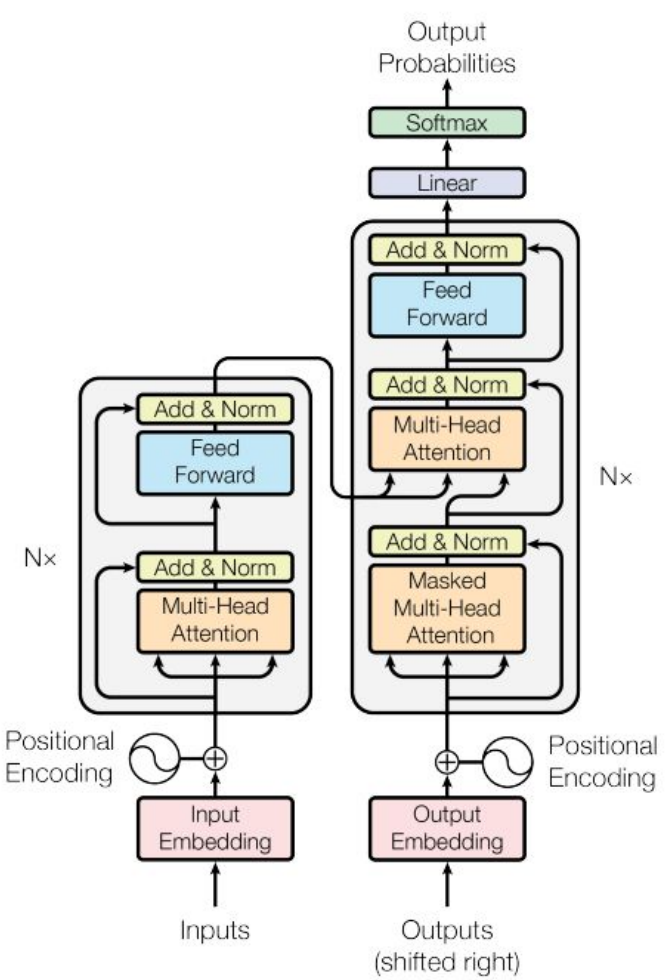
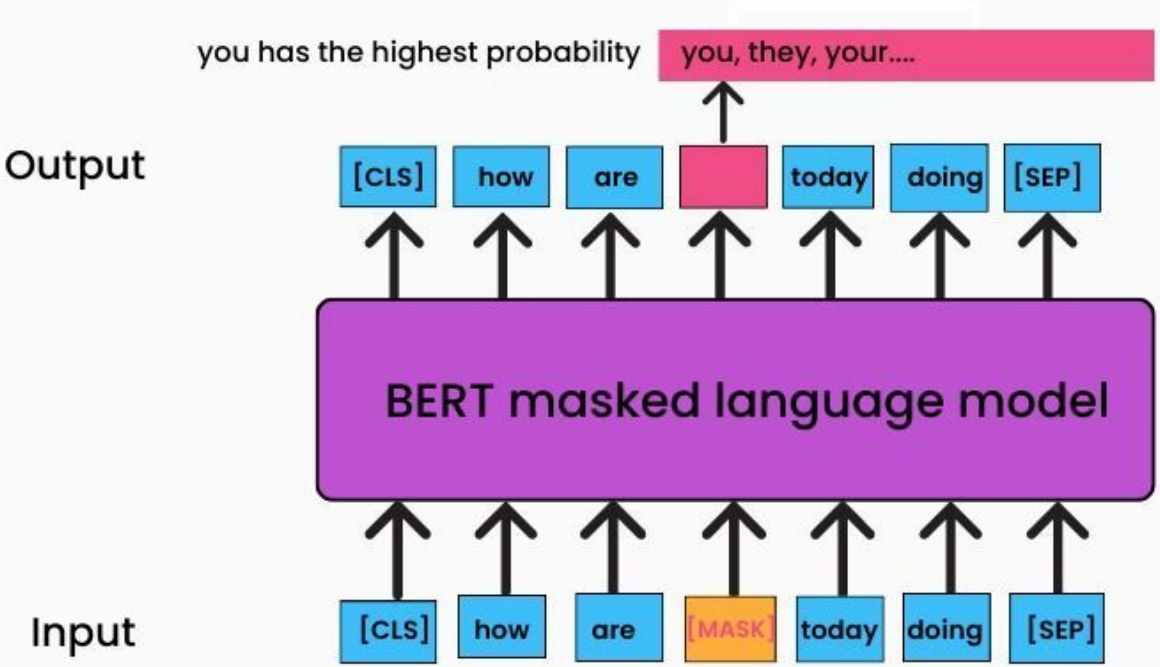


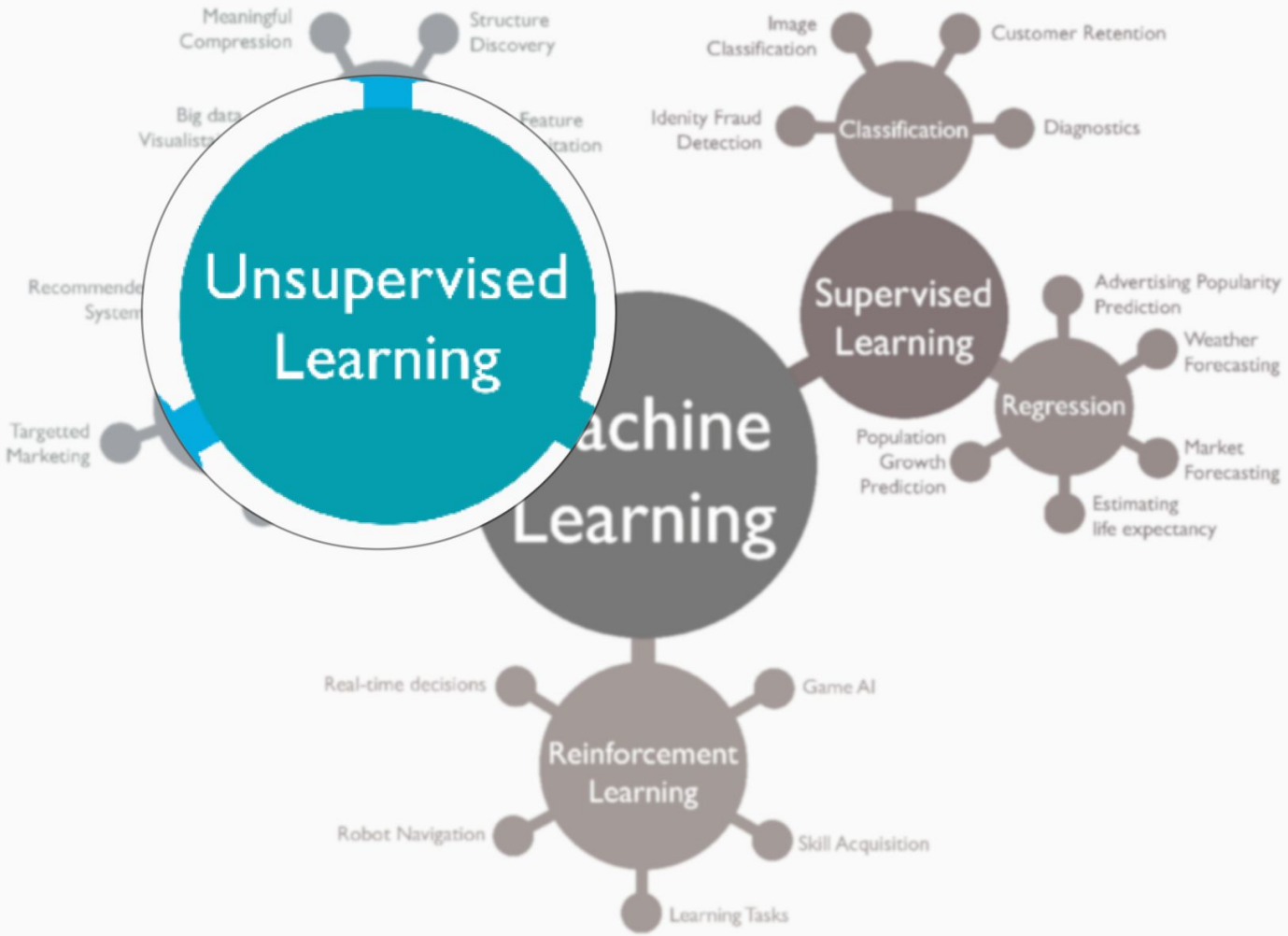
Figure 1: The Transformer - model architecture.

Deep Learning - Applications

Source: Midjourney

GPT - how does it work?

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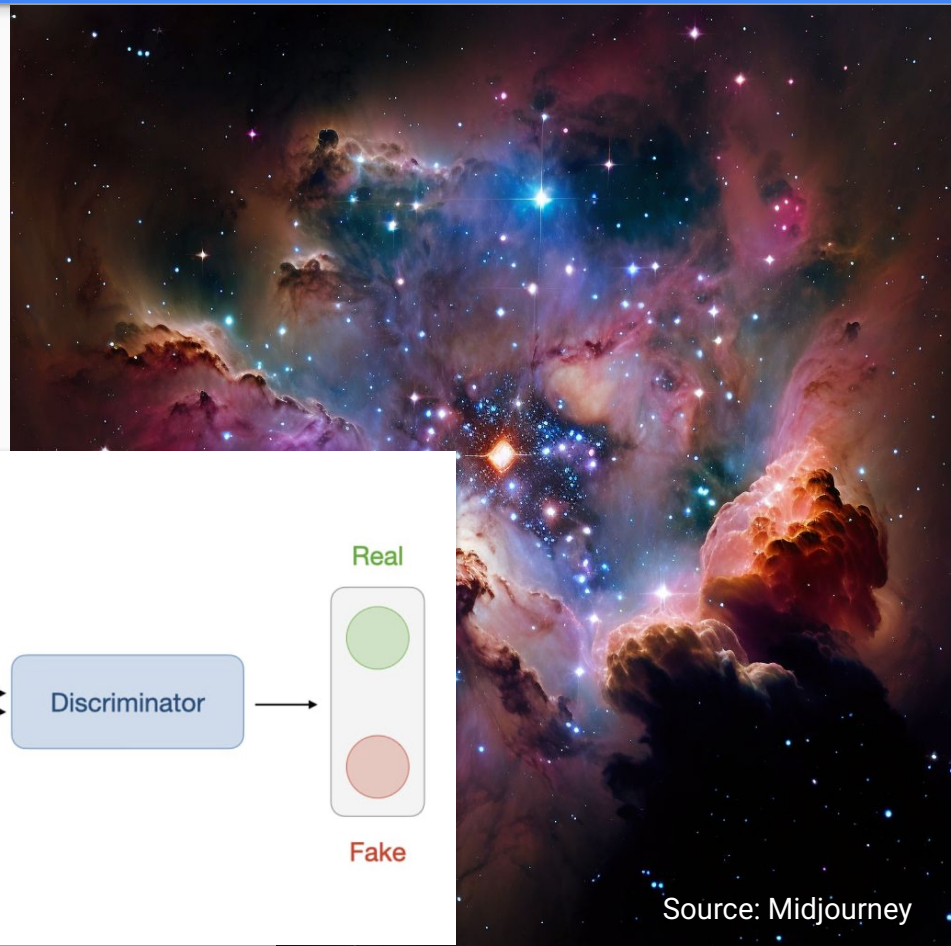
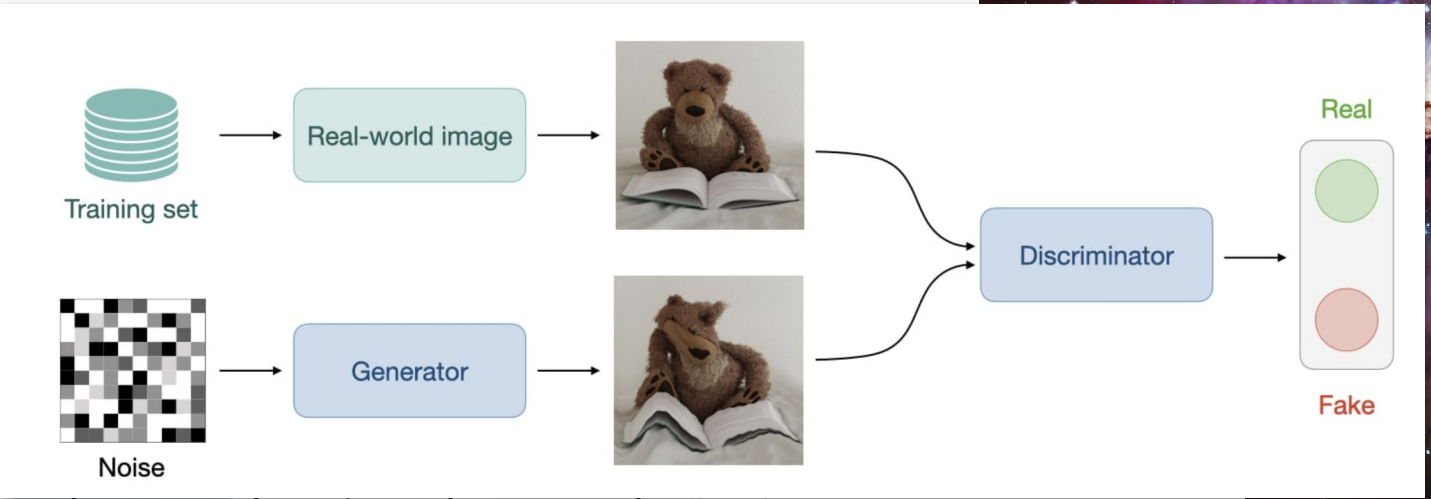
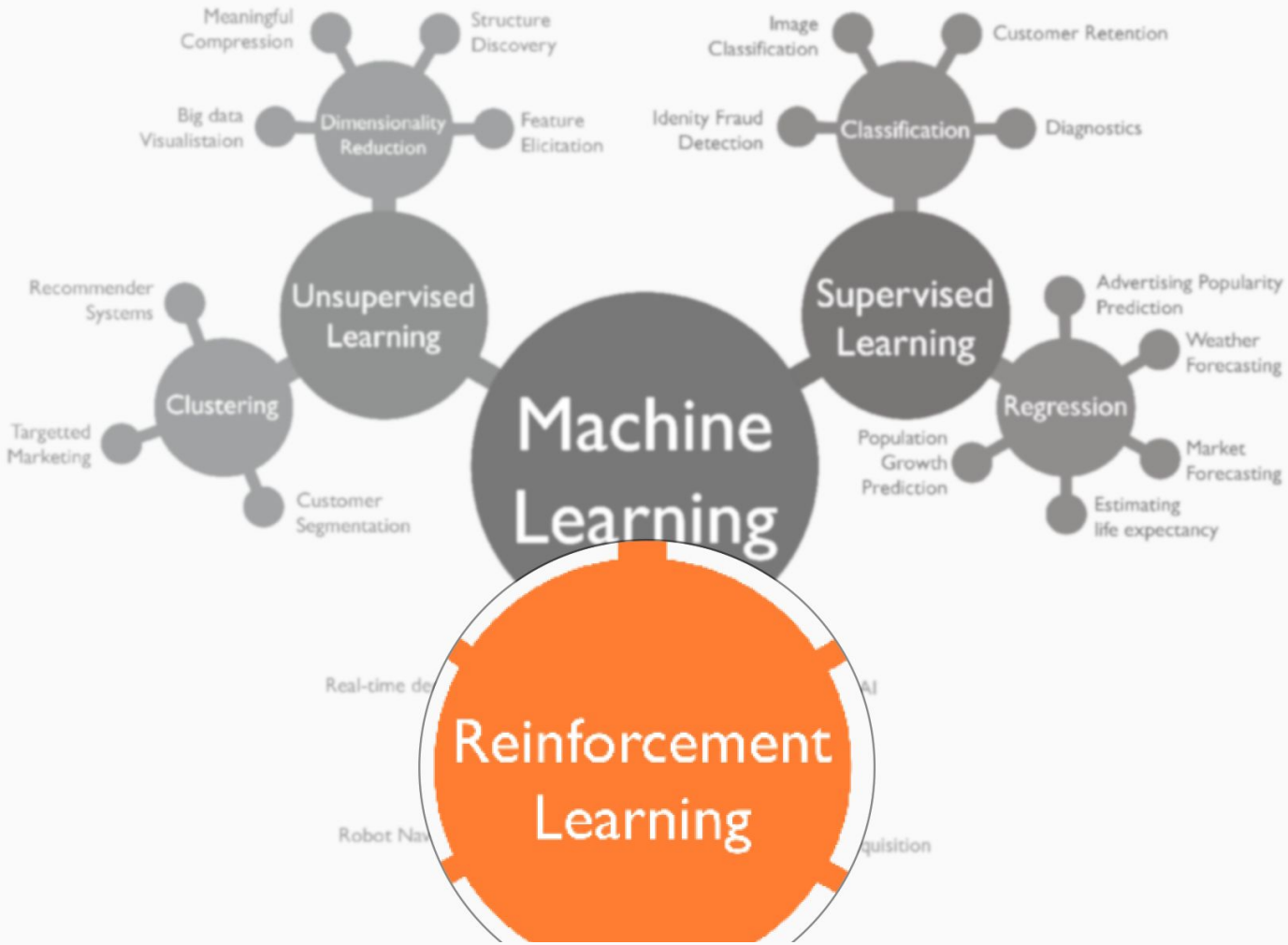
Unsupervised Learning

- Clustering
- Dimensionality reduction
- Anomaly Detection
- Recommender systems
- Generative (GAN)



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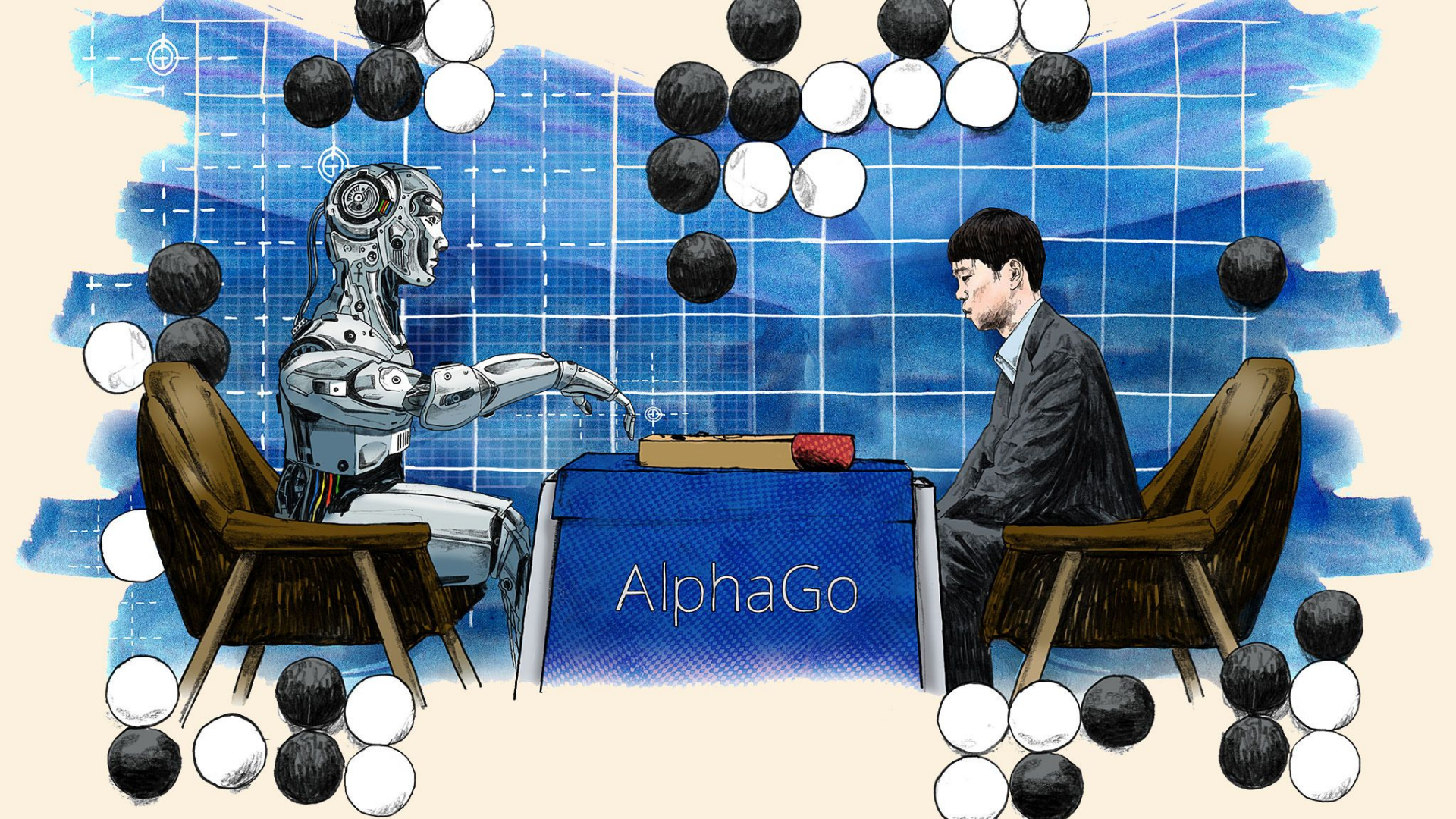
AlphaGo

DS, AI and ML are awesome!

Source: Midjourney

Thank you
@rantav
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