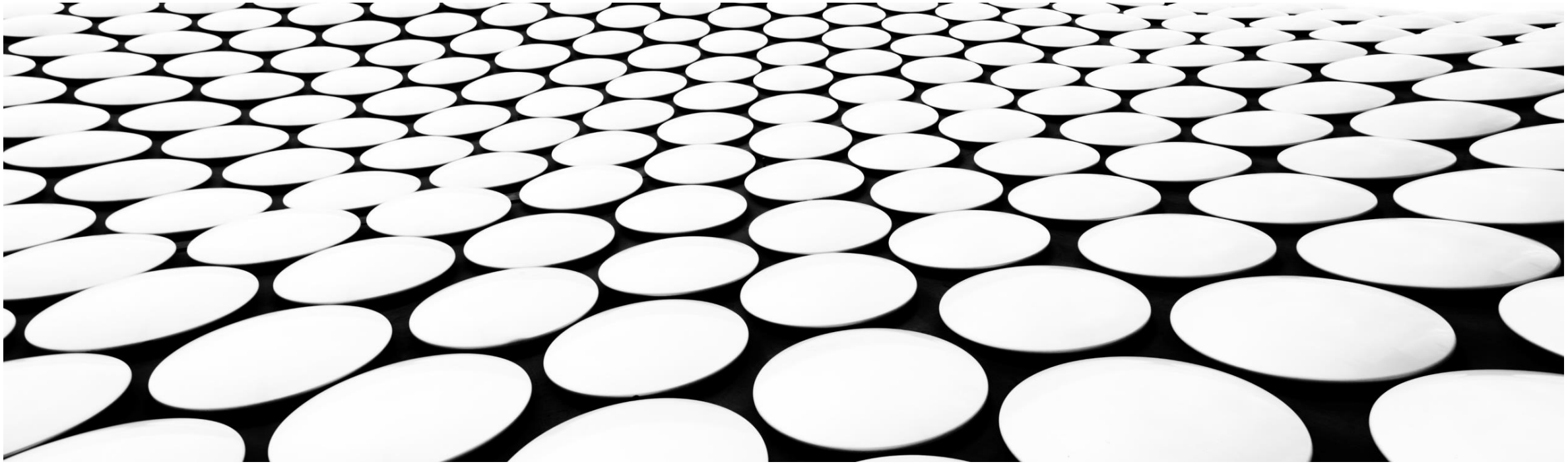
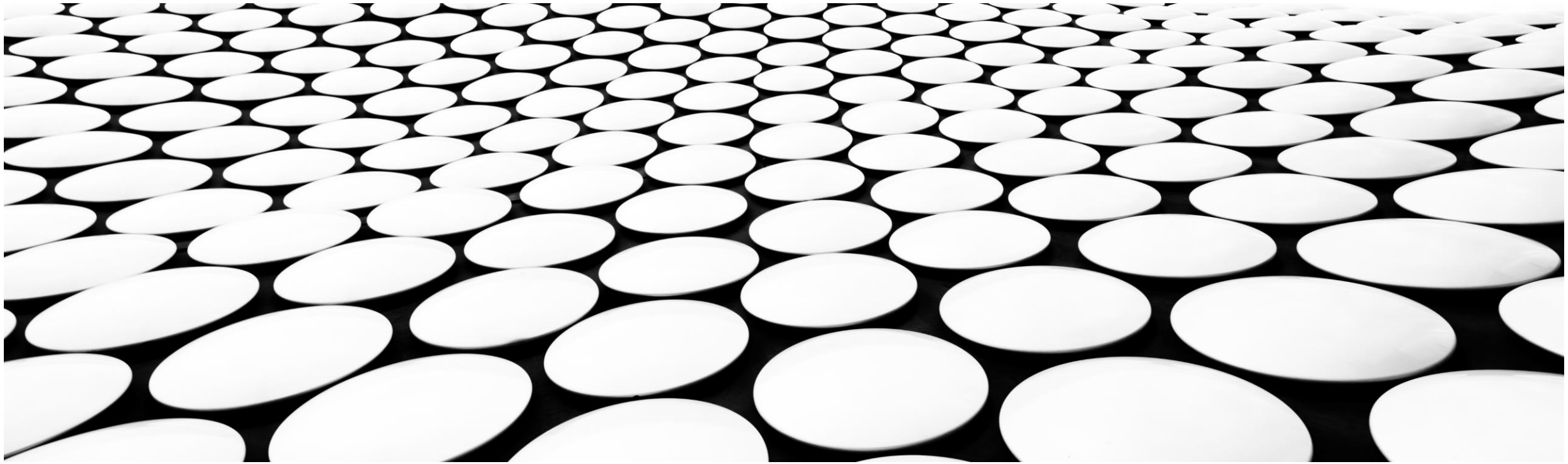
SKILLSBUILD FOR COLLEGES

EDUNET FOUNDATION



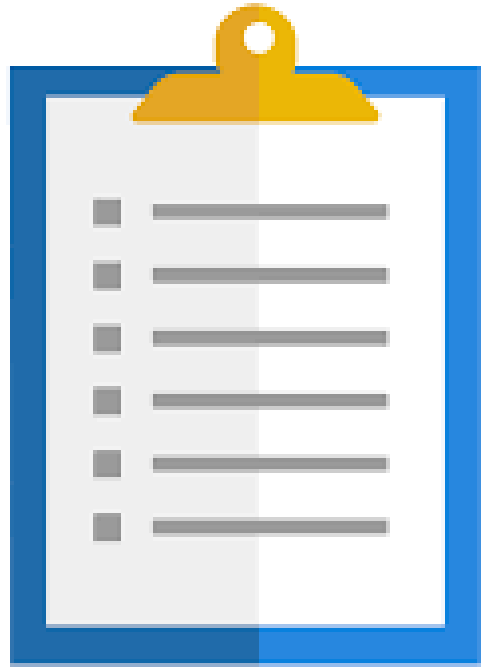
Time: 3 Hrs.

Artificial Intelligence [AI]



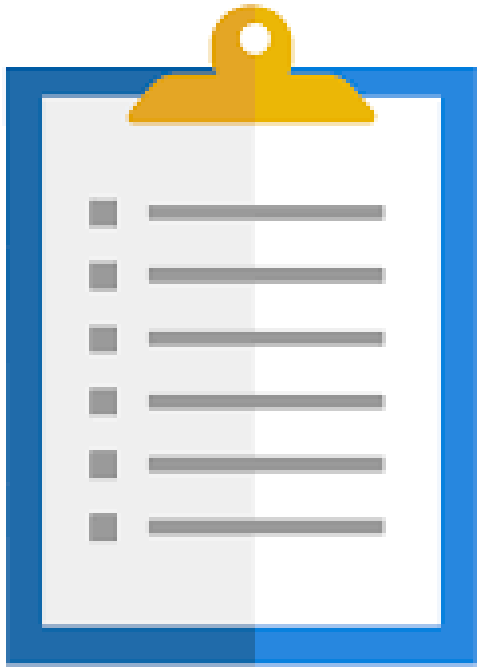
Learning Objectives

- ✓ What is Artificial Intelligence
- ✓ History Of AI
- ✓ What is Turing test
- ✓ Journey of AI from 1950 to Present
- ✓ Why we need ai right now?
- ✓ Types of AI
- ✓ Branches of AI
- ✓ Machine learning
- ✓ Supervised VS Unsupervised VS Reinforcement
- ✓ Natural Language Processing (NLP)
- ✓ Deep learning
- ✓ AI VS ML VS DL



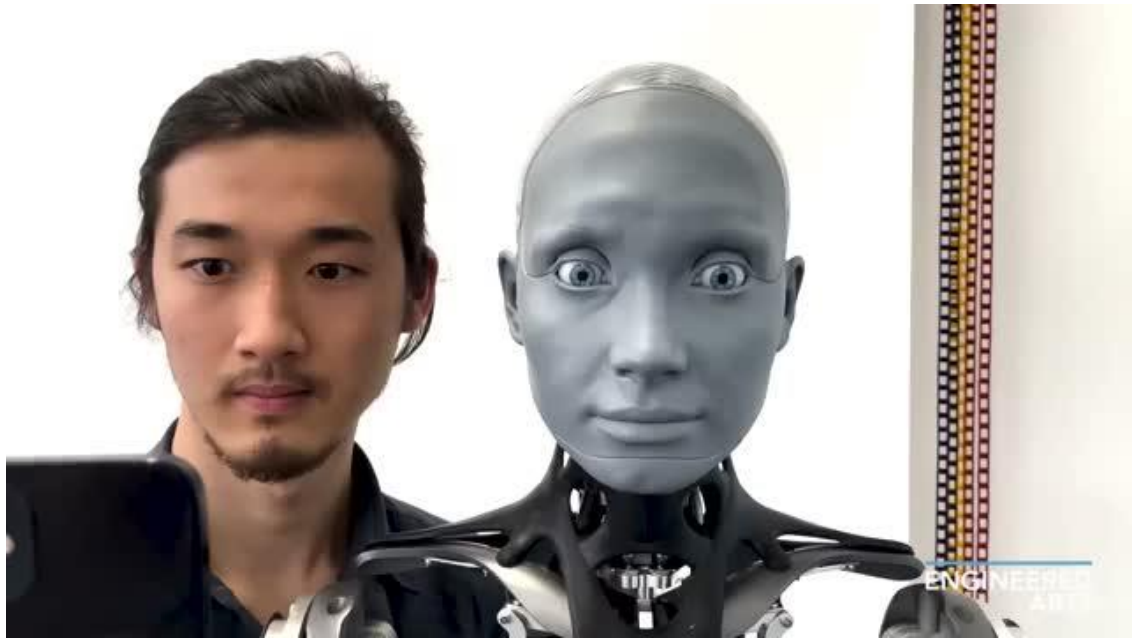
Learning Objectives

- ✓ Artificial Intelligence (AI) in Various Domains
- ✓ Real time example of AI in Agriculture – IBM agro pad
- ✓ Role of AI in Automotive domain – Autonomous vehicle
- ✓ Advantages of AI
- ✓ Disadvantages Of AI
- ✓ Top 10 career opportunities in ai
- ✓ Summary
- ✓ conclusion



What is Artificial Intelligence

- Artificial intelligence, or AI, is technology that enables computers and machines to simulate human intelligence and problem-solving capabilities.



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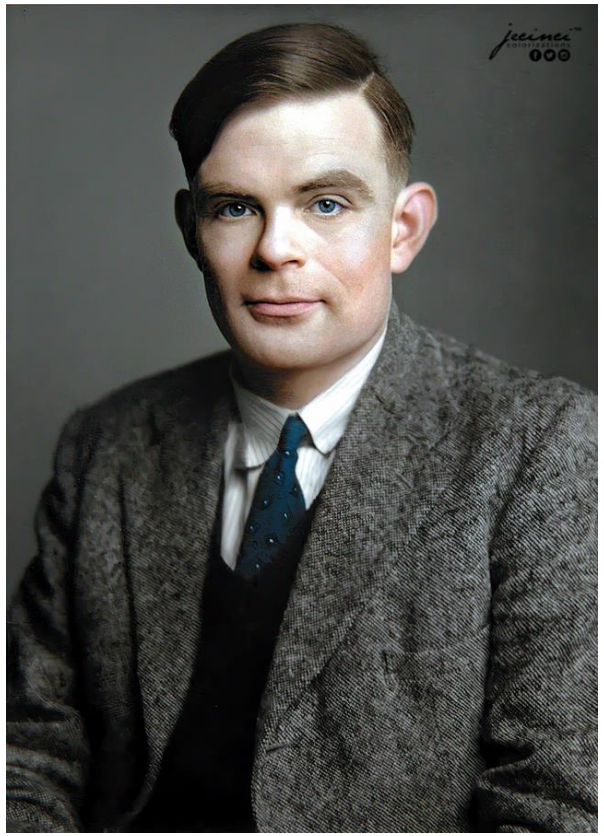
HISTORY OF AI

- **Alan Turing** published a paper in **1950**.
- In the paper, he asked if machines can think.
- He proposed a test to determine if a **machine can think like a human.**
- This test is called the **Turing Test**.
- The Turing Test remains an important concept in AI and philosophy.



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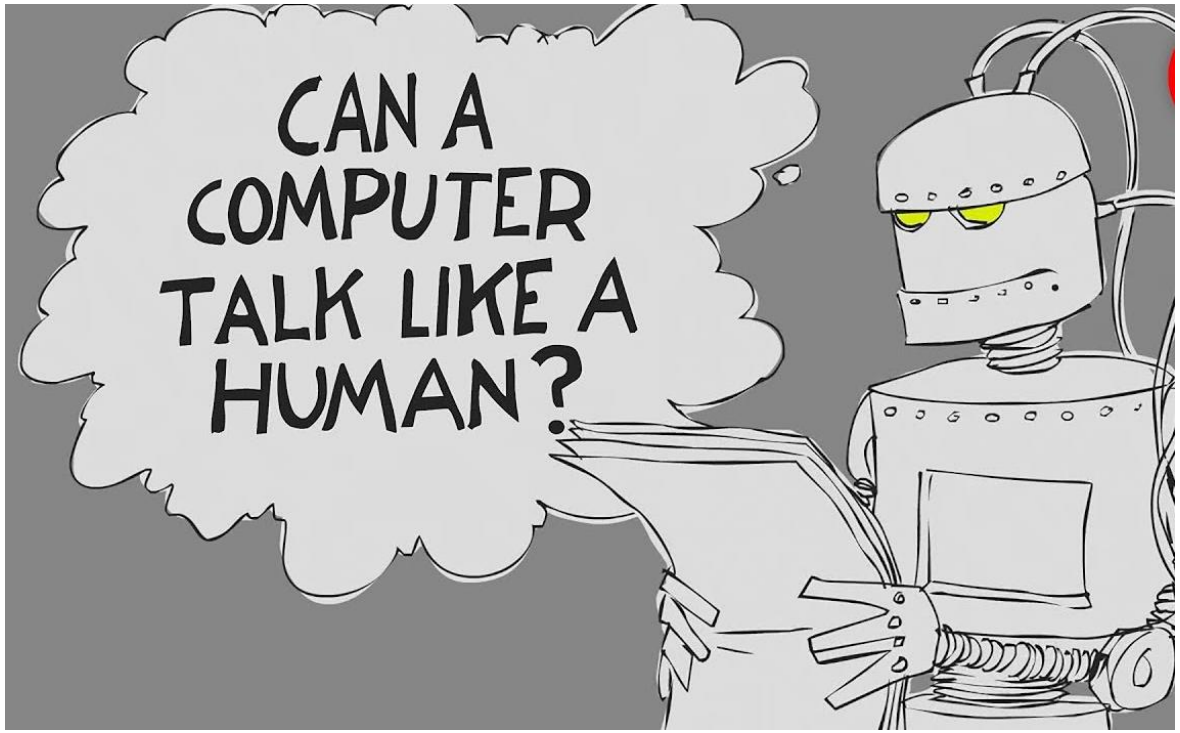
WHAT IS TURING TEST

- A Turing Test is a method to **determine if a computer can think like a human being**.
- It was proposed by **Alan Turing**, an English computer scientist and mathematician.



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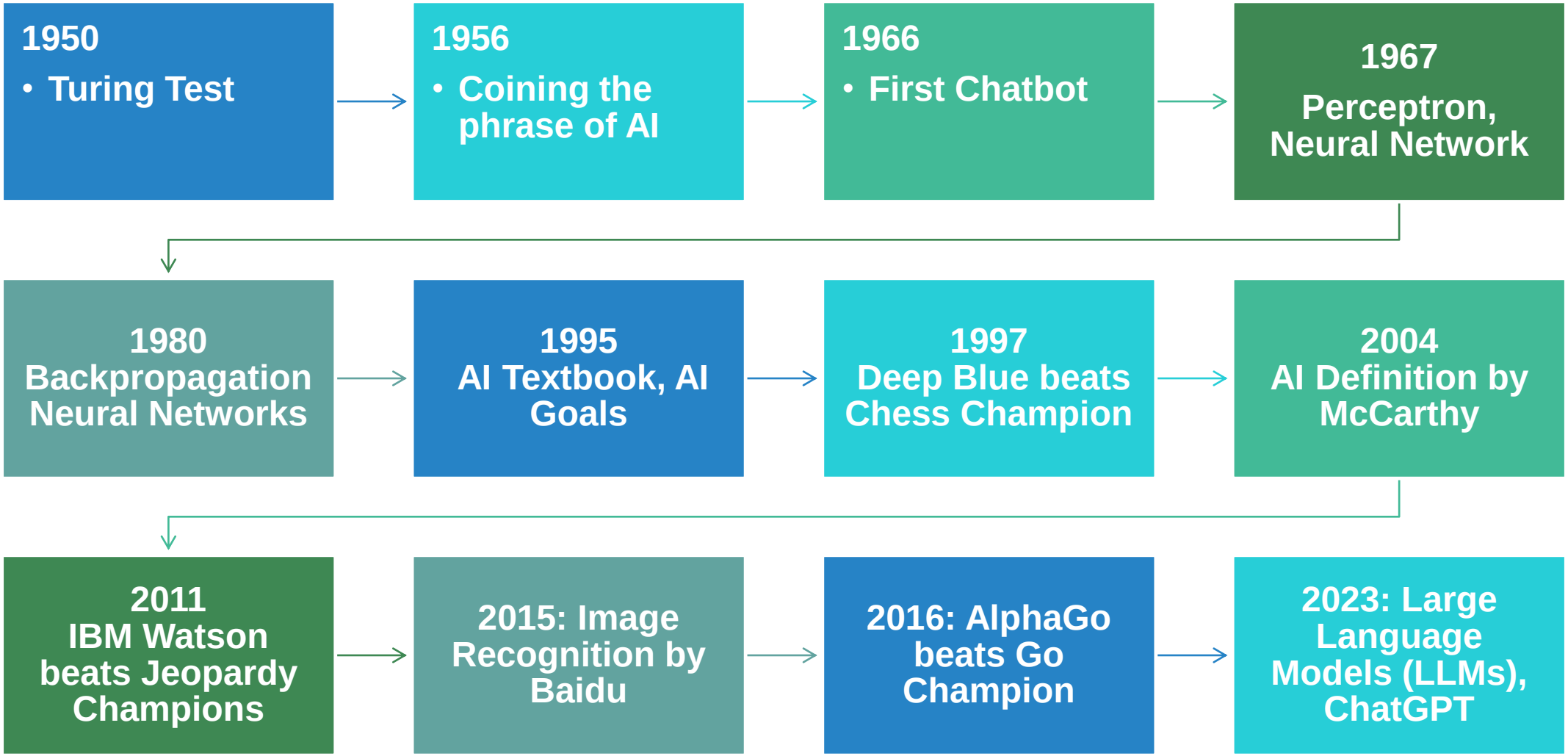
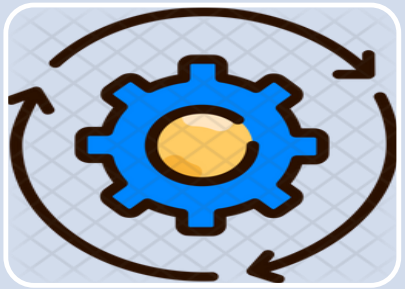
Journey of AI from 1950 to Present



Why we need AI right now?



Automation of Repetitive Tasks

Enhanced Data Analysis and Decision Making

Solving Complex Problems

Personalization and Customer Experience

Why we need AI right now? (Continued..)

Environmental Sustainability

Innovation and Competitiveness

Enhancing Human Capabilities

Driving Technological Advancement

Improving Quality of Life

Types of AI

Weak AI (Narrow AI)

It is AI focused on doing specific tasks.
It powers most AI applications we use today.

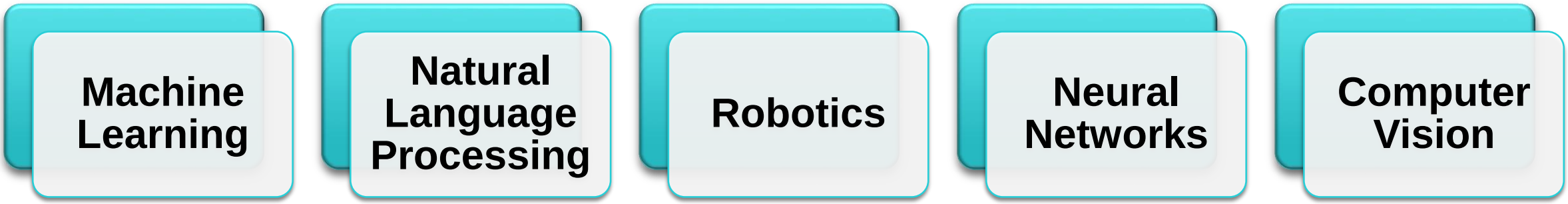
"Narrow AI" is a better name than "Weak AI" because it can do robust tasks very well.

- Examples: Siri, Alexa, Watson, self-driving cars.

Strong AI

- It has two types: Artificial General Intelligence (AGI) and Artificial Superintelligence (ASI).
- Strong AI is still a theory, not used practically yet.
- But researchers are working on developing Strong AI.
- Examples of ASI are from science fiction movies like HAL in "2001: A Space Odyssey.

Branches of AI



Machine Learning

- **Machine learning** is a subset of **artificial intelligence** that allows for optimization. When set up correctly, it helps you make predictions that minimize the errors that arise from merely guessing.

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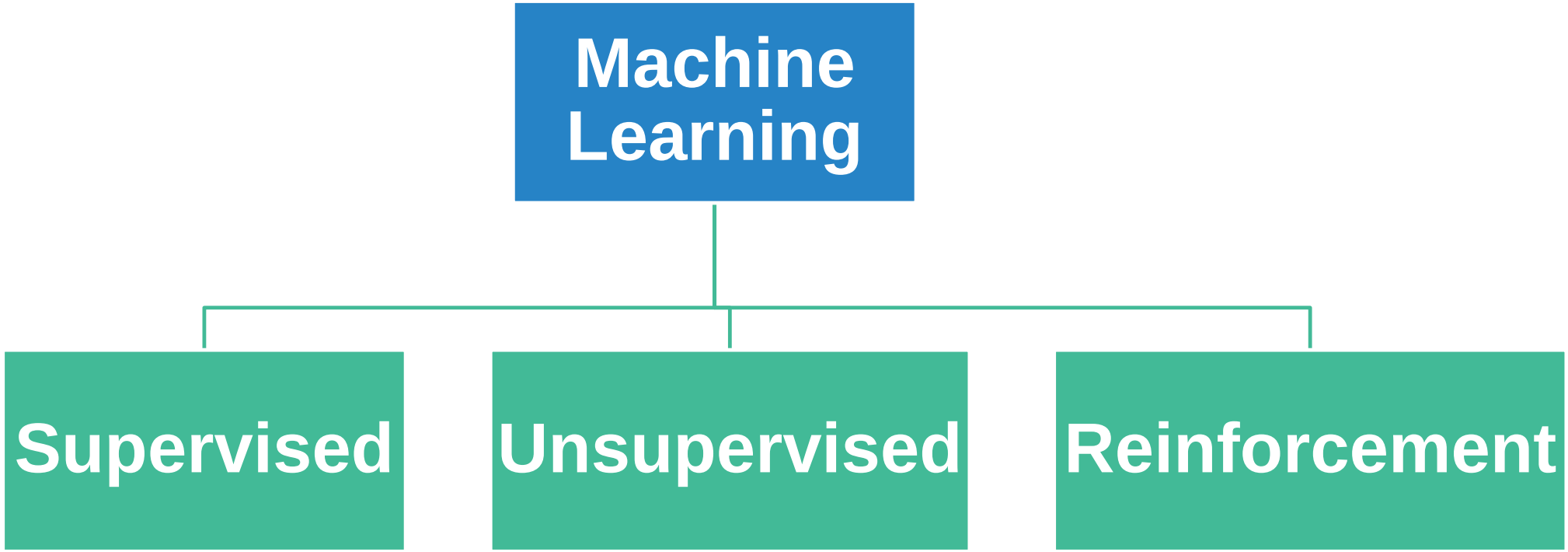
How does Machine Learning work?

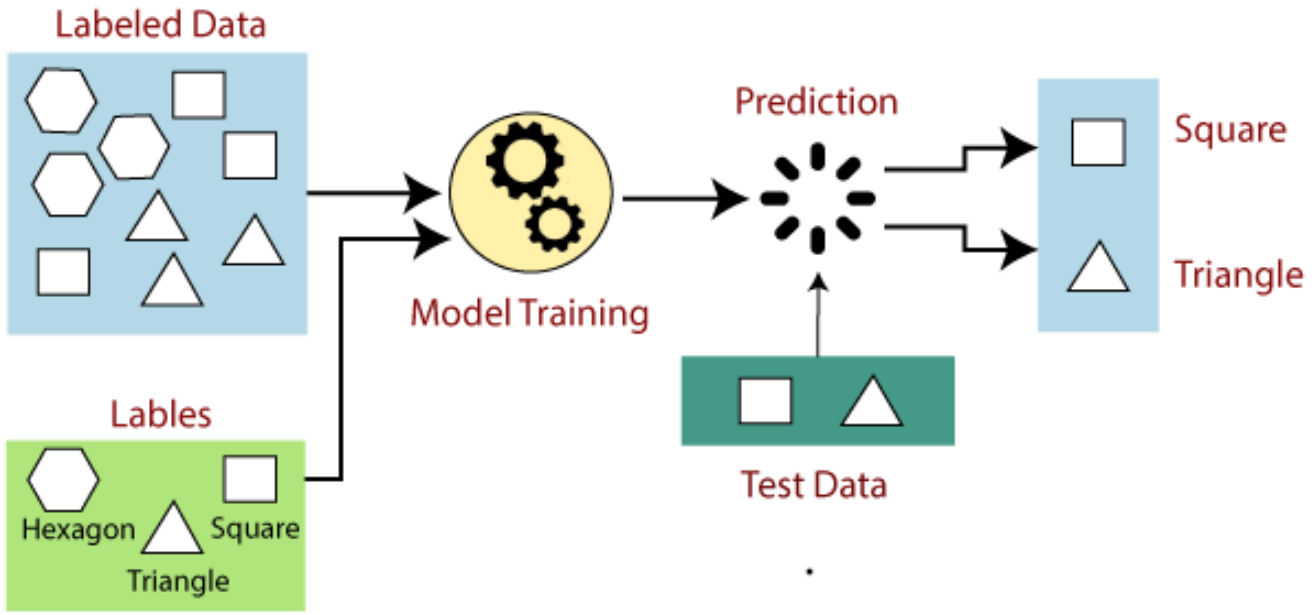
- Decision Process
- An Error Function
- A Model Optimization Process

Types of Machine Learning



Supervised Machine Learning

- Supervised learning is a machine learning approach that's defined by its use of labeled datasets.
- These datasets are designed to train or "supervise" algorithms into classifying data or predicting outcomes accurately.
- Using labeled inputs and outputs, the model can measure its accuracy and learn over time



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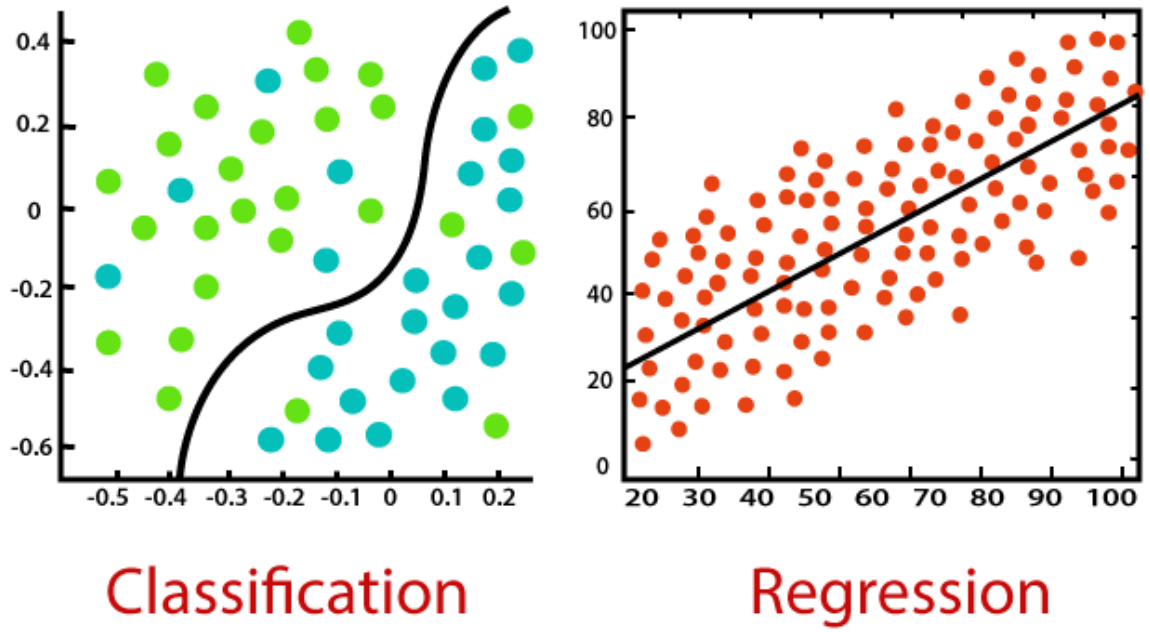
Supervised Machine Learning (Continued…)

Supervised learning can be separated into two types of problems when data mining

1. **Classification**
2. **Regression**



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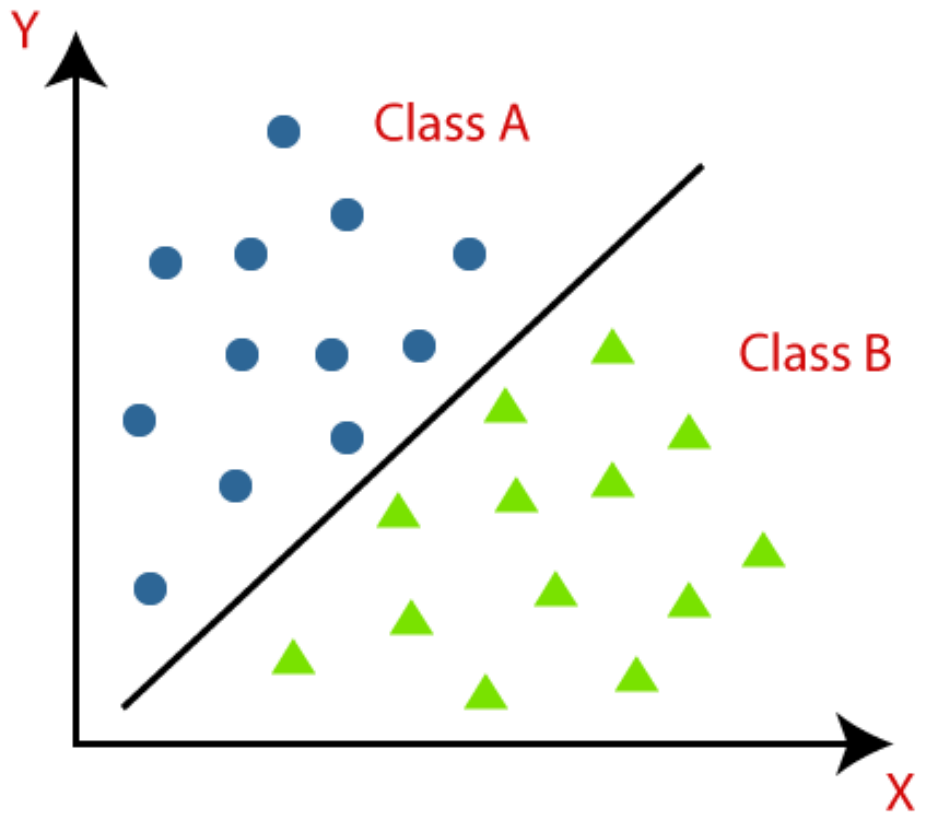
Supervised Machine Learning (Continued…)

1.Classification

- In these problems, the goal is to put data into different **categories or classes.**
- For example, looking at an image and deciding if it shows a **dog or a cat**. The data (images) is classified into the categories "**dog" or "cat".**
- Other examples are email **spam detection** (spam or not spam), **fraud detection** (fraudulent or not), and **medical diagnosis** (healthy or sick).



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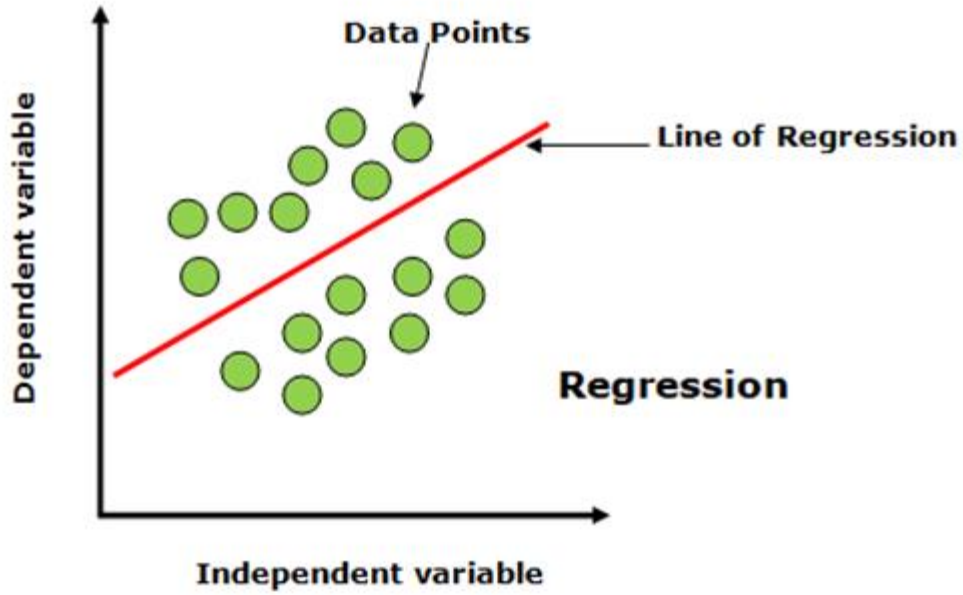
Supervised Machine Learning (Continued…)

2.Regression

- The goal is to predict a numerical value based on the data.
- For example, predicting a house's price based on its size, location, and other factors.
- Other examples are forecasting sales numbers, estimating product ratings, and predicting temperatures.



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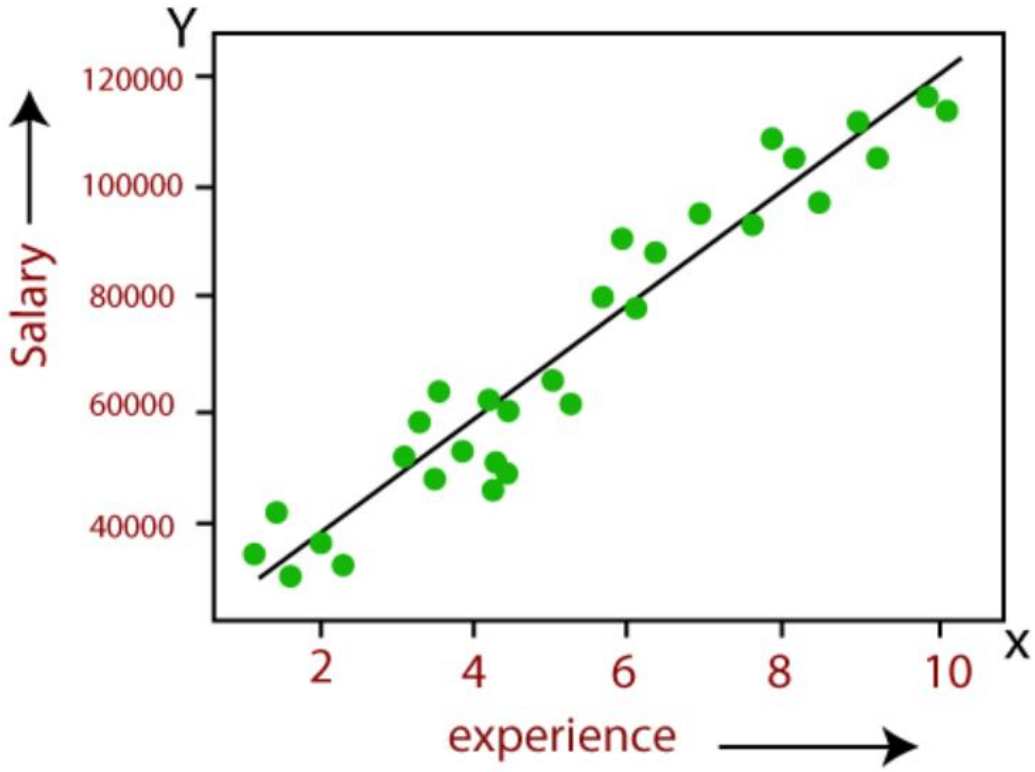
Supervised Machine Learning algorithms

Linear Regression

Finding Relationships: Linear regression helps find the relationship between one variable (dependent) and one or more other variables (independent). It tries to find the best straight line that describes how the variables are related.

Making Predictions: Once the relationship is known, linear regression can be used to predict the value of the dependent variable based on the values of the independent variables.



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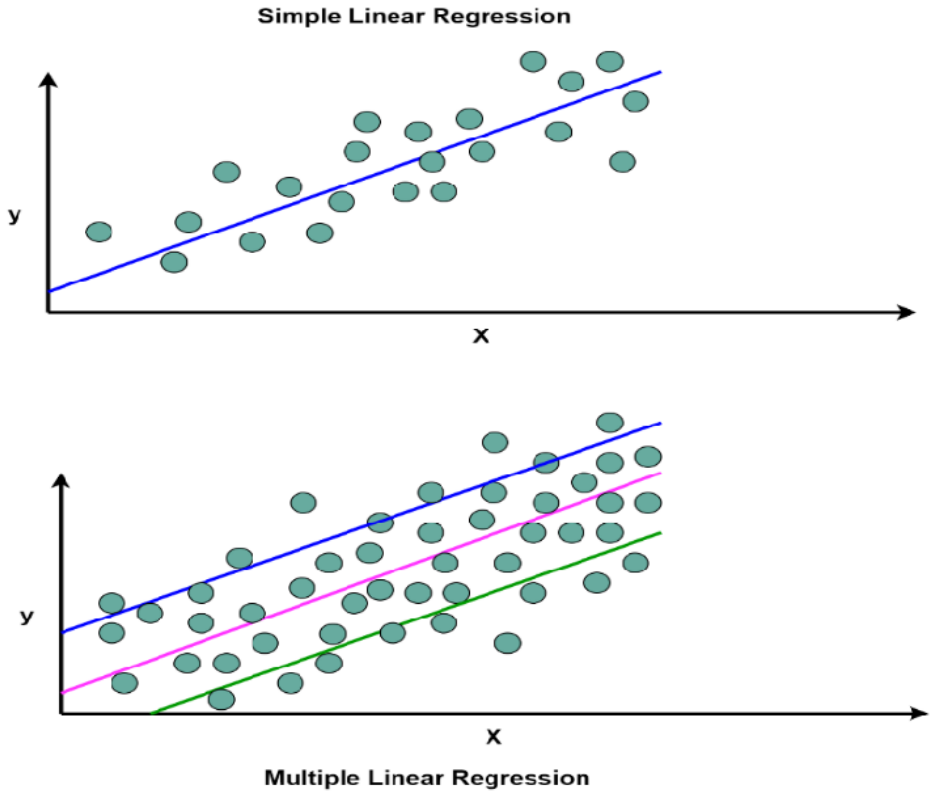
Supervised Machine Learning algorithms (continued ..)

Linear Regression

Simple linear regression: When there is only one independent variable.

Multiple linear regression: When there are two or more independent variables. The goal is to find the best-fitting straight line that represents the relationship between the variables.



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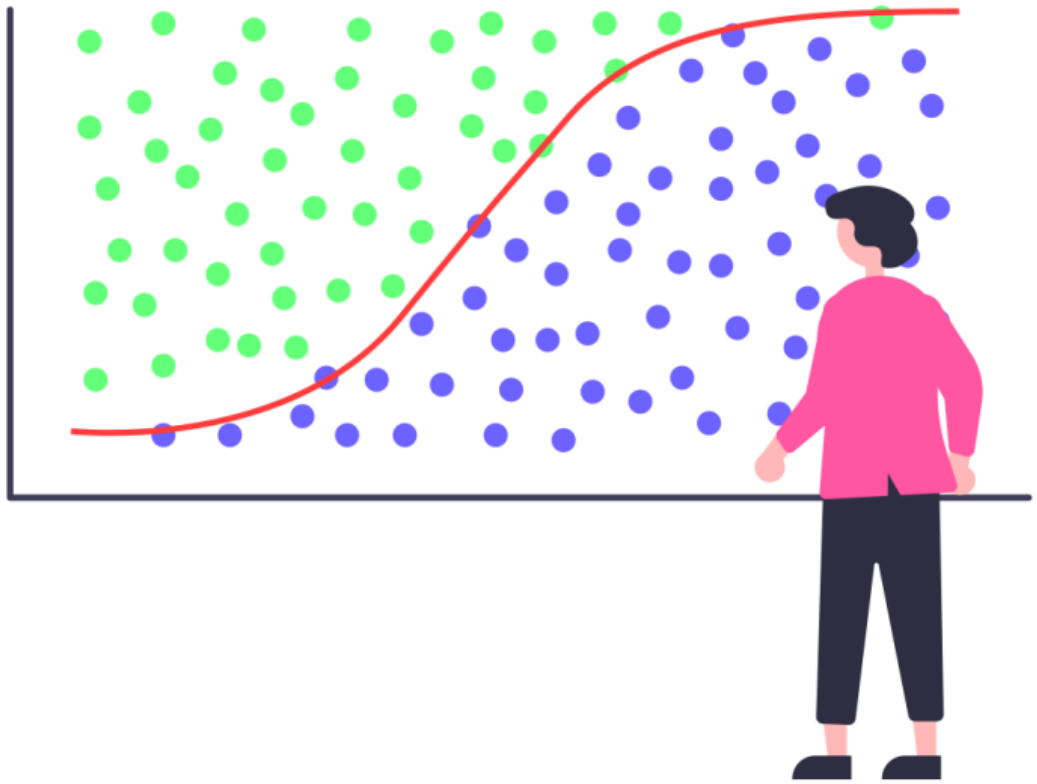
Supervised Machine Learning algorithms (continued ..)

Logistic regression:

- While linear regression is leveraged when dependent variables are continuous, **logistic regression** is selected when the **dependent variable is categorical**, meaning they have binary outputs, such as "**true" and "false" or "yes" and "no.“**
- While both regression models seek to understand relationships between data inputs, logistic regression is mainly used to solve binary classification problems, such as spam identification.



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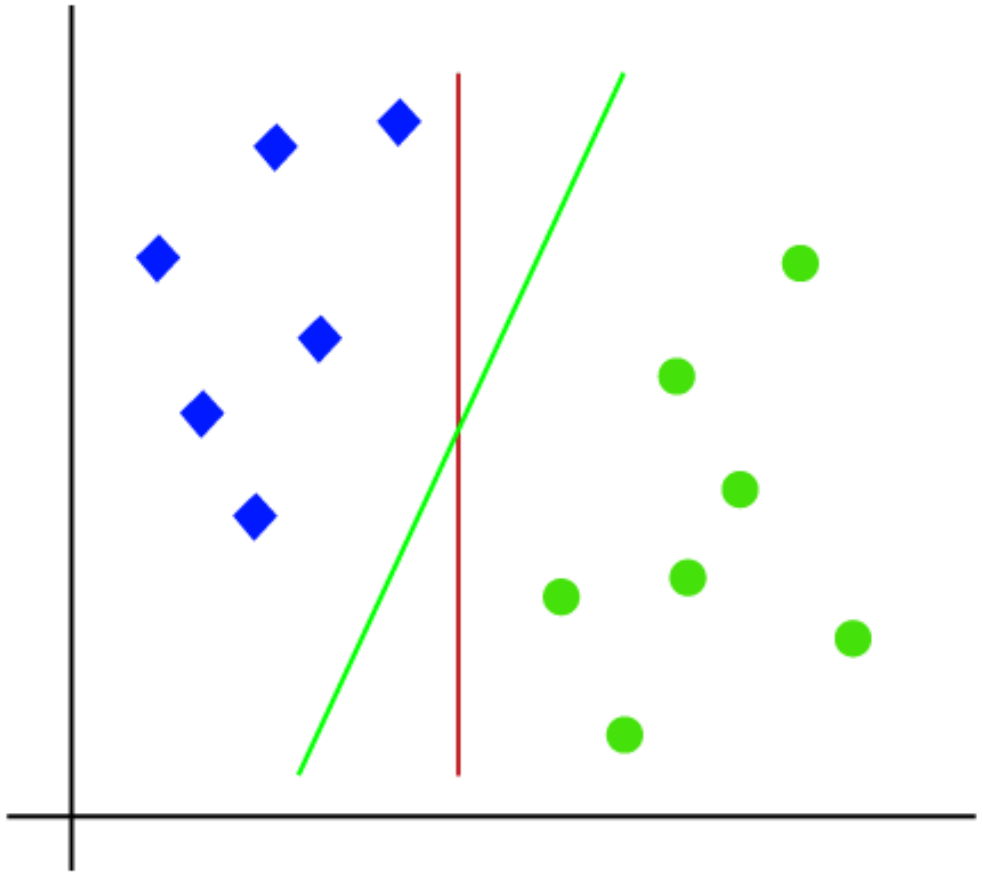
Supervised Machine Learning algorithms (Continued ..)

Support Vector Machine (SVM)

- SVM is a machine learning model used to classify data into different groups.
- It finds the best line (or plane in higher dimensions) that separates the different groups of data points with the maximum possible distance.
- This separating line is called the decision boundary, and it helps classify new data points into the correct groups.



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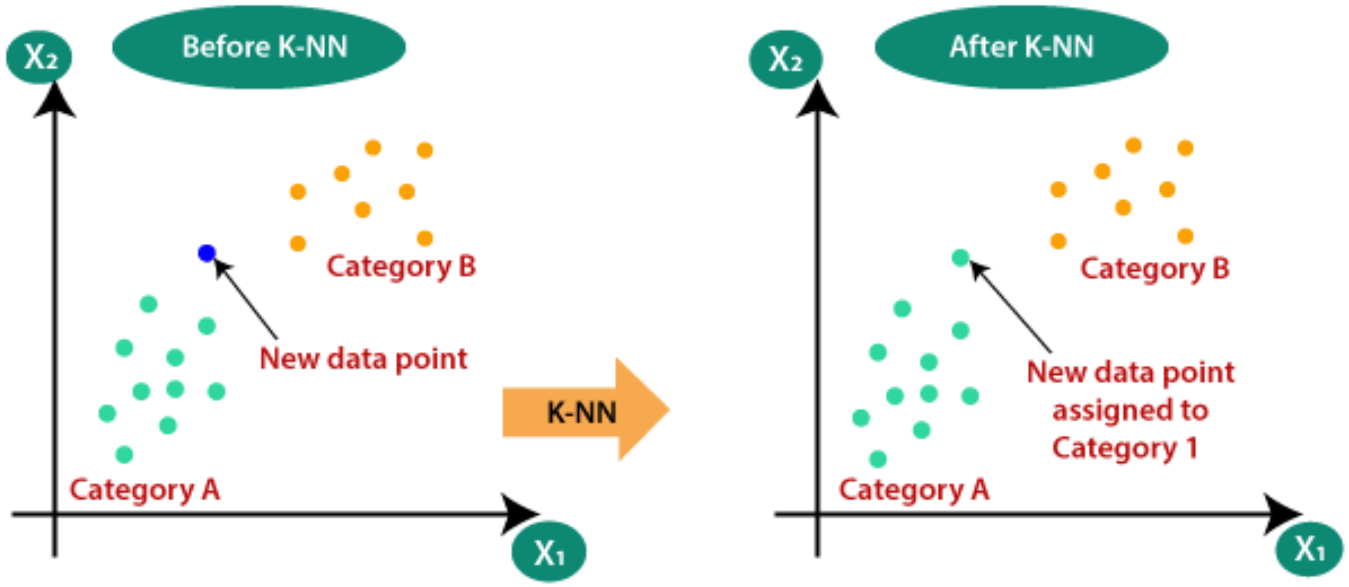
Supervised Machine Learning algorithms (continued ..)

KNN

KNN is a simple algorithm: K-nearest neighbor, or KNN, is a straightforward method used to classify data. It looks at how close data points are to each other and groups them based on similarity.

It's good for small datasets: Since KNN doesn't need to learn complex patterns, it's easy to implement and fast for small sets of data. This makes it popular among data scientists for quick classification tasks.



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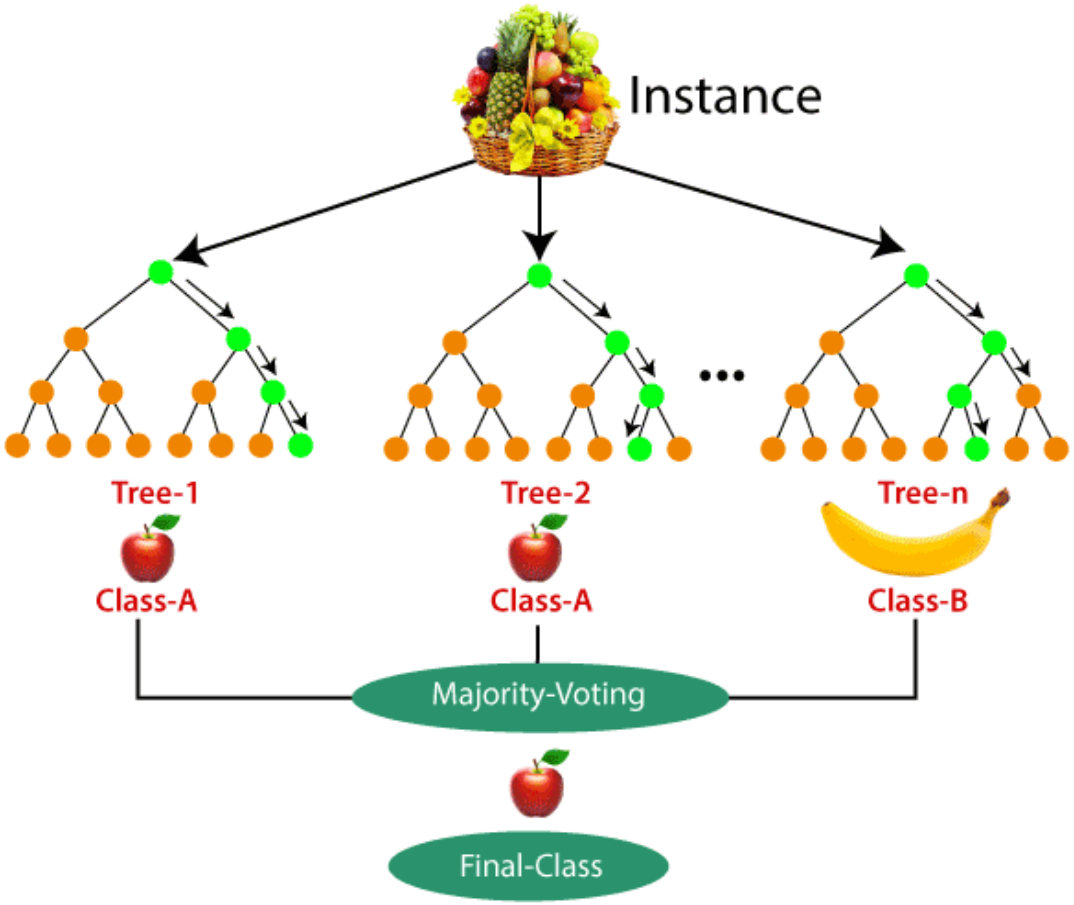
Supervised Machine Learning algorithms (continued ..)

Random forest

- Random forest is another flexible supervised machine learning algorithm used for both classification and regression purposes. The "forest" references a collection of uncorrelated decision trees, which are then merged together to reduce variance and create more accurate data predictions.



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Supervised Learning examples

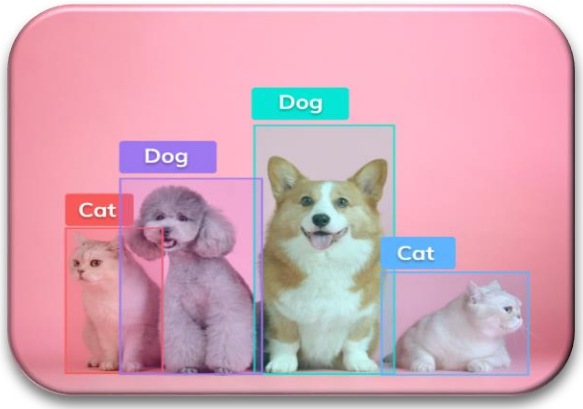
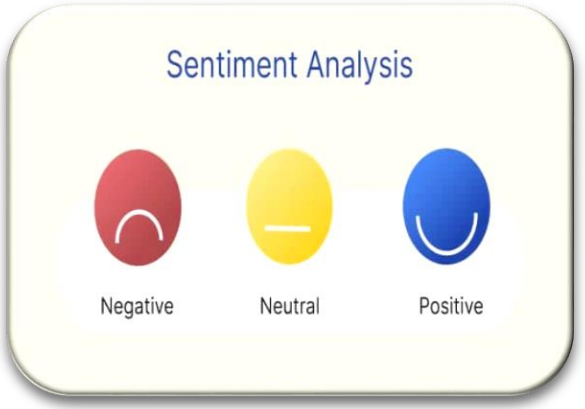
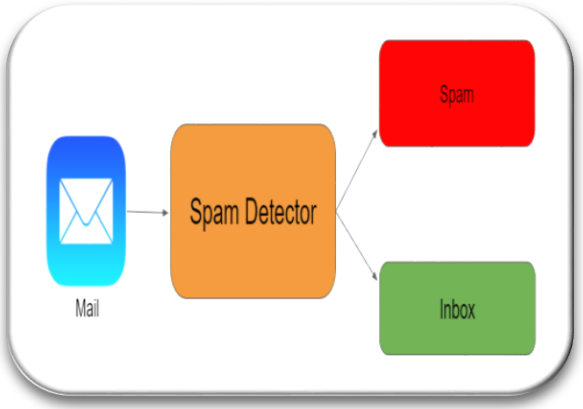


Image- and object-recognition

Predictive analytics



Customer sentiment analysis



Spam detection

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Challenges of Supervised Learning

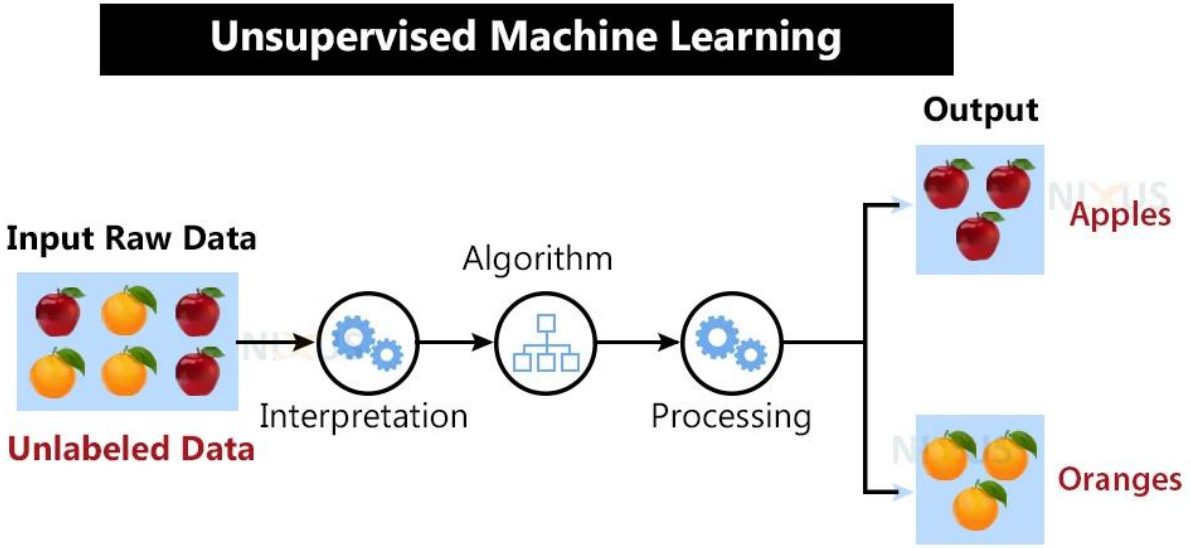
Expertise needed

Time-consuming training

Human errors in data

Unsupervised Machine Learning

- Unsupervised learning, also known as unsupervised machine learning, uses machine learning (ML) algorithms to analyze and cluster unlabeled data sets.
- These algorithms discover hidden patterns or data groupings without the need for human intervention.



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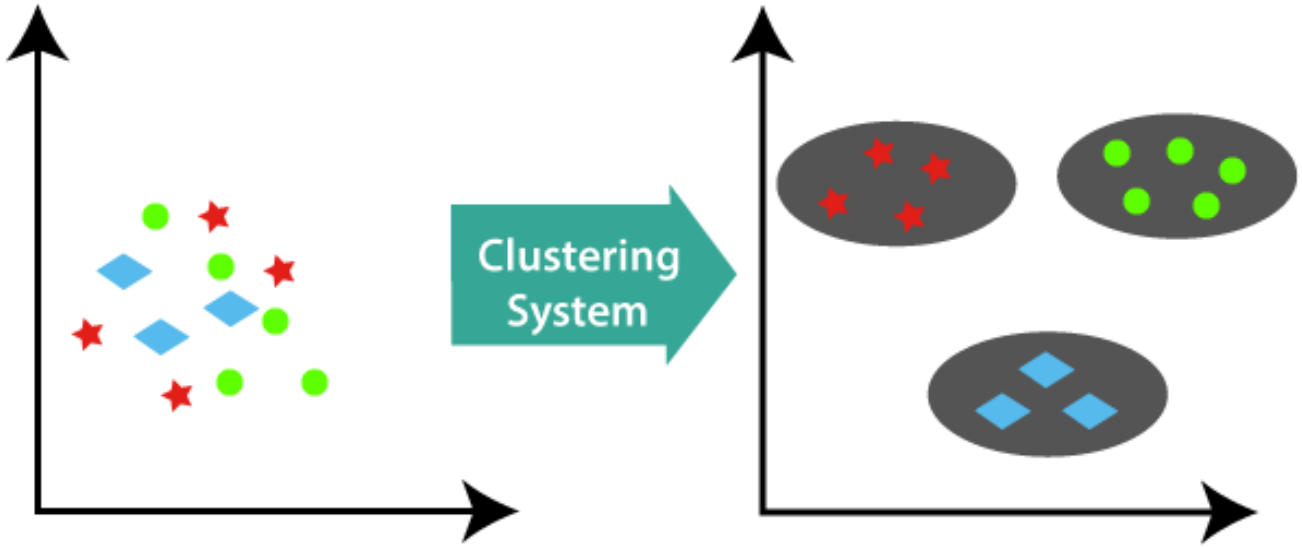
Common Unsupervised Learning approaches

Clustering

Clustering is a data mining technique which groups unlabeled data based on their similarities or differences. Clustering algorithms are used to process raw, unclassified data objects into groups represented by structures or patterns in the information.



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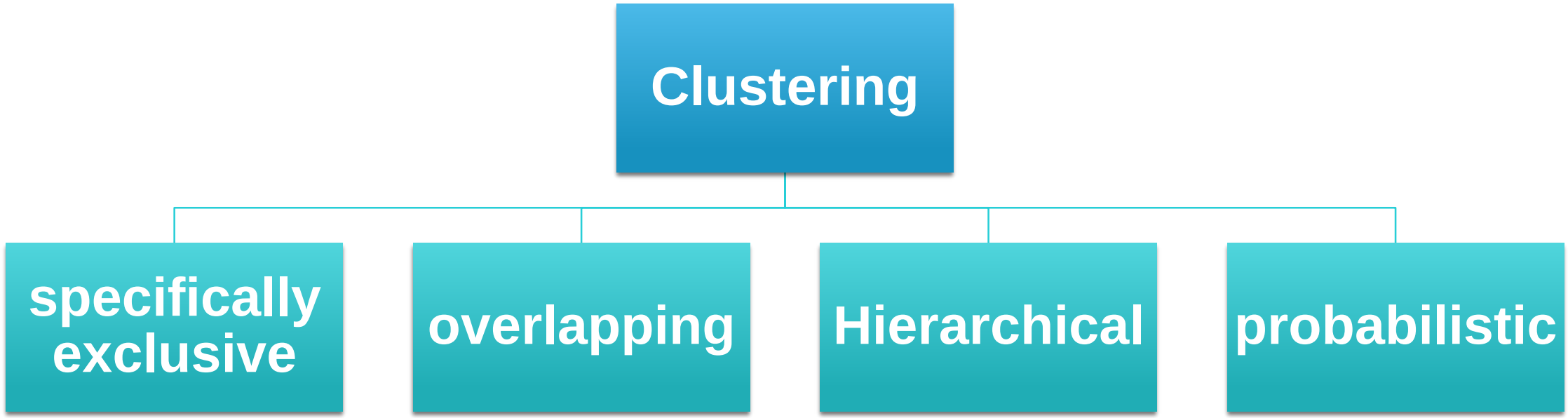
Common Unsupervised Learning approaches (continued..)

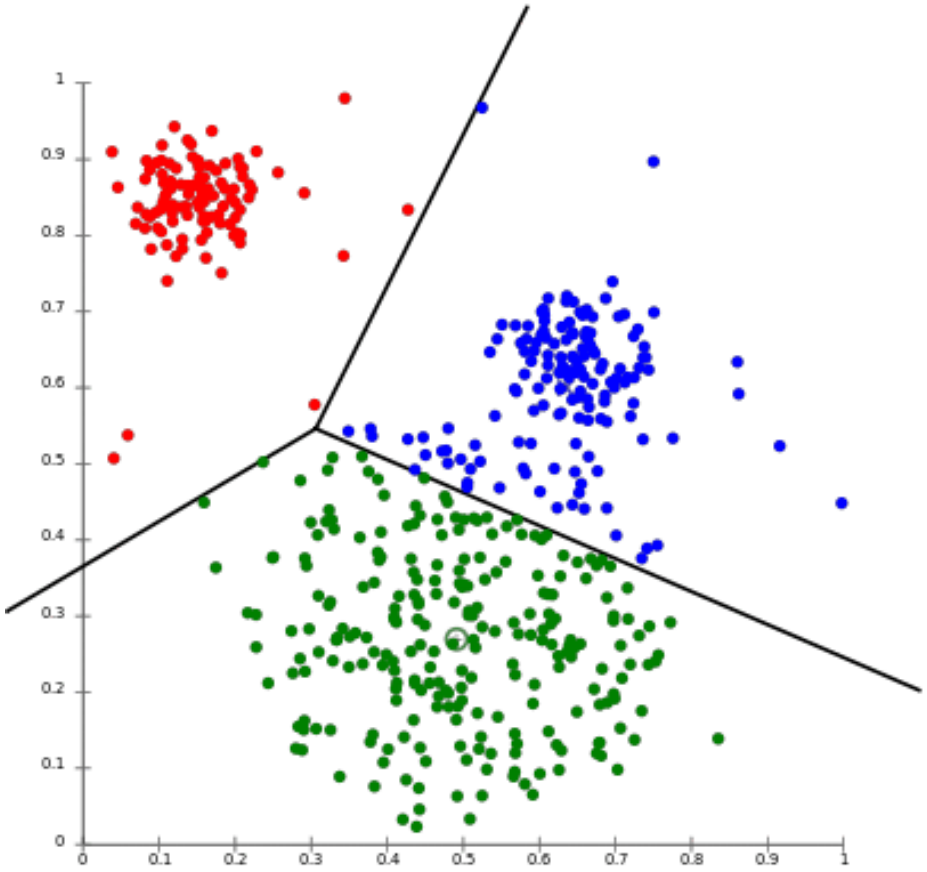
Clustering types



Common Unsupervised Learning approaches (continued..)

K-means clustering

- K-means clustering is a common example of an exclusive clustering method where data points are assigned into K groups, where K represents the number of clusters based on the distance from each group's centroid.
- The data points closest to a given centroid will be clustered under the same category.



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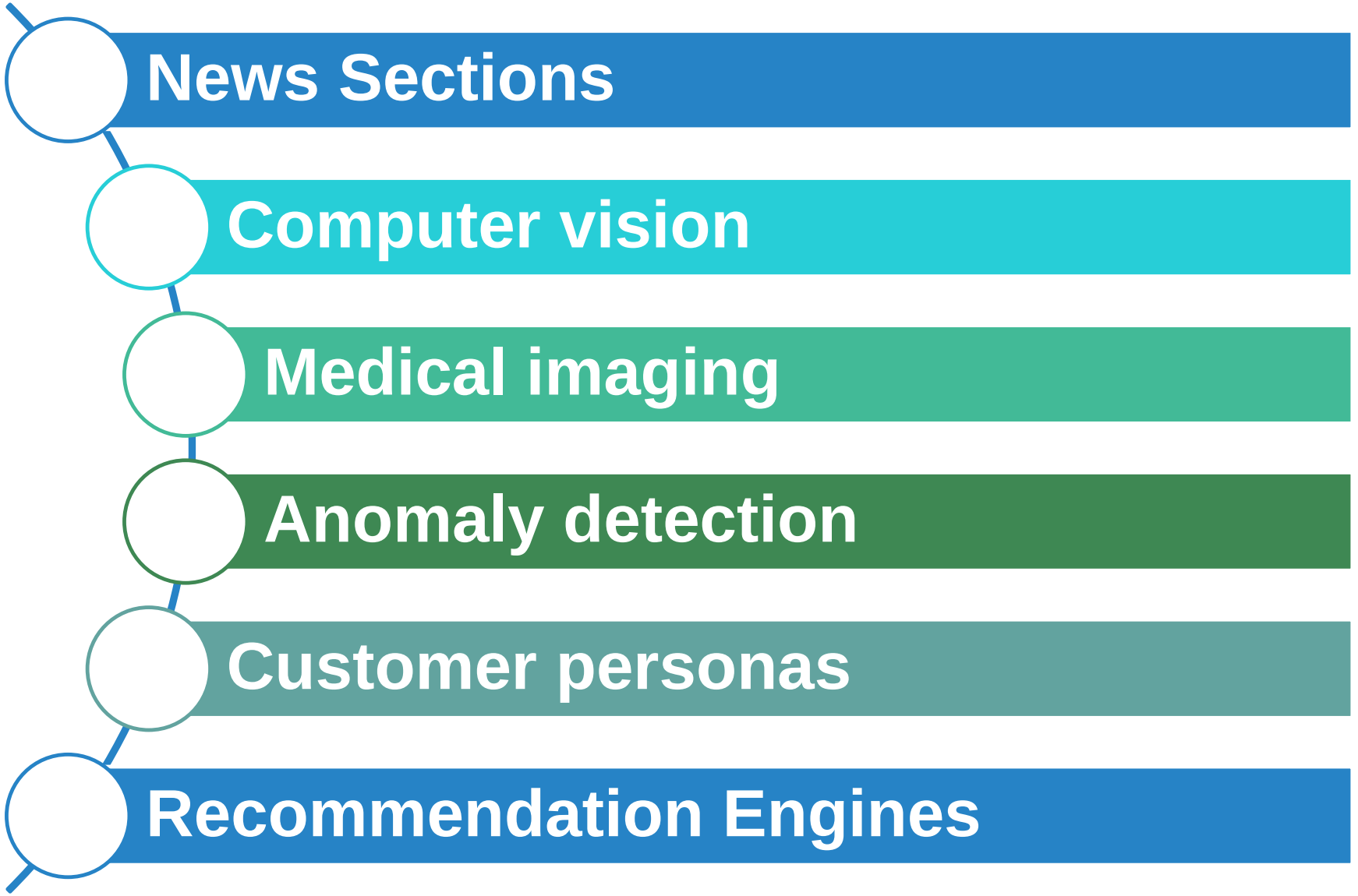
Applications of Unsupervised Learning

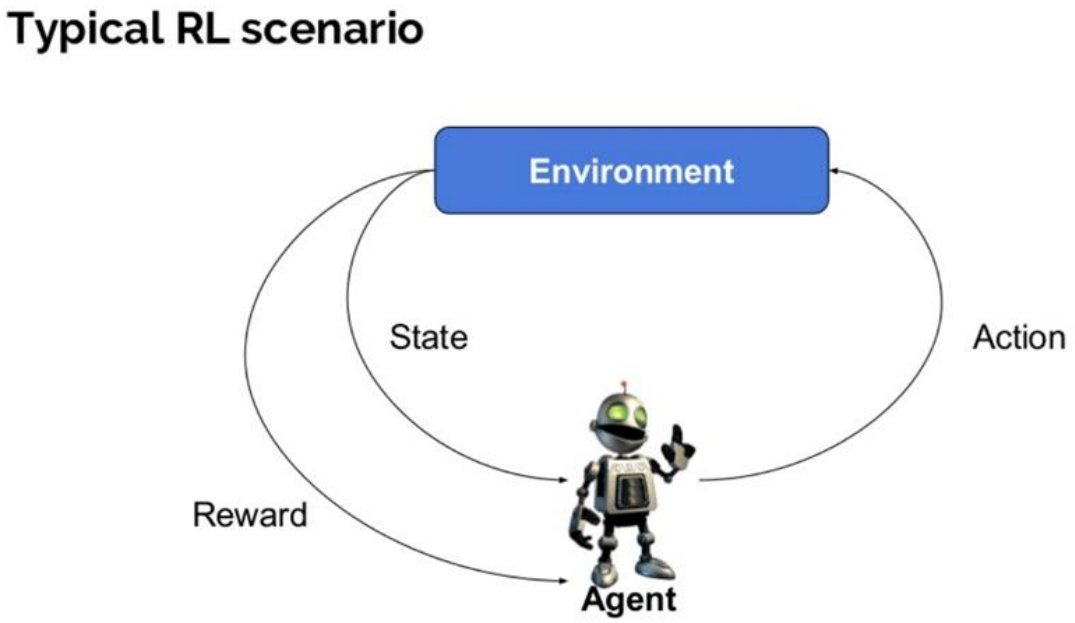


Challenges of Unsupervised Learning

- Computational complexity due to a high volume of training data
- Longer training times
- Higher risk of inaccurate results
- Human intervention to validate output variables
- Lack of transparency into the basis on which data was clustered

Reinforcement Learning

Reinforcement learning is a subfield of machine learning that you can use to train a software agent to behave rationally in an environment. The agent is rewarded based on the actions it takes within the environment. One example of learning comes from **1992, when IBM's Gerry Tesauro** used reinforcement learning to build a self-learning backgammon player



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Supervised VS Unsupervised VS Reinforcement

Supervised Learning

- In supervised learning, the algorithm learns from labeled data, where each input example is associated with a corresponding target label or output.
- The algorithm aims to learn the mapping between inputs and outputs.

Unsupervised Learning

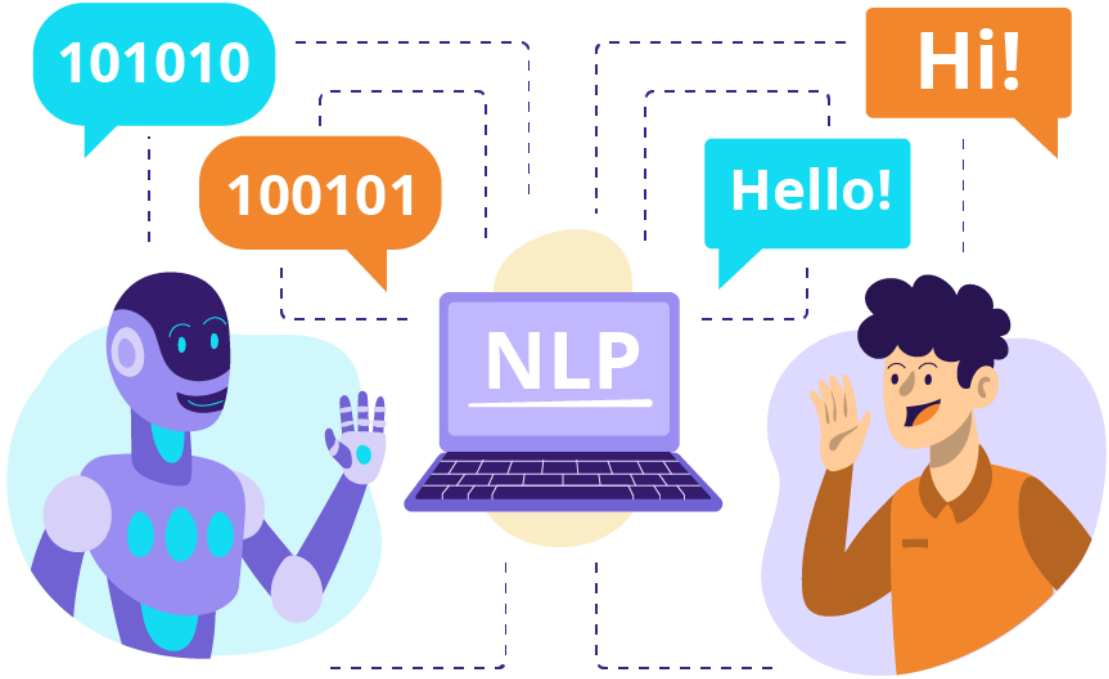
- Unsupervised learning involves learning from unlabeled data. The algorithm explores the structure or patterns present in the data without explicit guidance on what to look for. It typically involves tasks such as clustering, dimensionality reduction, and density estimation

Reinforcement Learning:

- Reinforcement learning involves learning how to make decisions or take actions in an environment to maximize some notion of cumulative reward. The agent learns through trial and error, receiving feedback from the environment in the form of rewards or penalties.

Natural Language Processing (NLP)

Natural language processing, or NLP, combines computational linguistics—rule-based modeling of human language—with statistical and machine learning models to enable computers and digital devices to recognize, understand and generate text and speech



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NLP tasks

Speech recognition

- also called speech-to-text, is the task of reliably converting voice data into text data.

Part of speech tagging

- also called grammatical tagging, is the process of determining the part of speech of a particular word or piece of text based on its use and context.

Word sense disambiguation

- The selection of the meaning of a word with multiple meanings through a process of semantic analysis that determine the word that makes the most sense in the given context.

NLP tasks (Continued..)

Named entity recognition

- NEM, identifies words or phrases as useful entities. NEM identifies ‘Kentucky’ as a location or ‘Fred’ as a man's name.

Sentiment analysis

- to extract subjective qualities—attitudes, emotions, sarcasm, confusion, suspicion—from text.

Natural language generation

- **Natural language generation** is sometimes described as the opposite of speech recognition or speech-to-text; it's the task of putting structured information into human language.

Why we use NLP?

- translate text from one language to another
- respond to typed or spoken commands
- recognize or authenticate users based on voice
- summarize large volumes of text
- assess the intent or sentiment of text or speech
- generate text or graphics or other content on demand

NLP tools and approaches

Python and the Natural Language Toolkit (NLTK)

- The Python programing language provides a wide range of tools and libraries for attacking specific NLP tasks. Many of these are found in the Natural Language Toolkit, or NLTK, an open source collection of libraries, programs, and education resources for building NLP programs.

Statistical NLP, machine learning, and deep learning

- The earliest NLP applications were hand-coded, rules-based systems that could perform certain NLP tasks, but couldn't easily scale to accommodate a seemingly endless stream of exceptions or the increasing volumes of text and voice data.

NLP use cases

Spam detection

Machine translation

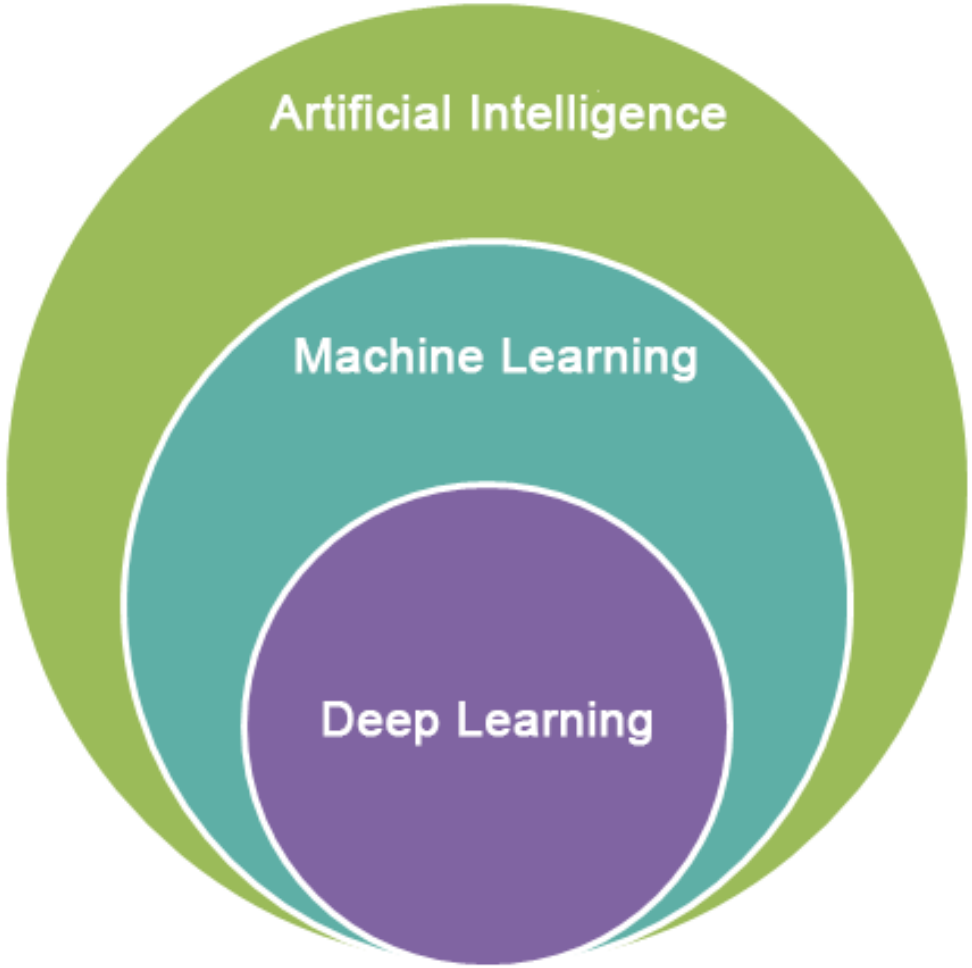
Virtual agents and chatbots

Social media sentiment analysis

Text summarization

Deep Learning

- Deep learning is a subset of **machine learning** that uses multi-layered **neural networks**, called deep neural networks, to simulate the complex decision-making power of the human brain. Some form of deep learning powers most of the **artificial intelligence** (AI) in our lives today



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How Deep Learning works

- Deep Learning Neural Networks
- Structure of Deep Neural Networks
- Visible Layers
- Backpropagation
- Complexity and Types

Deep Learning applications

Law enforcement

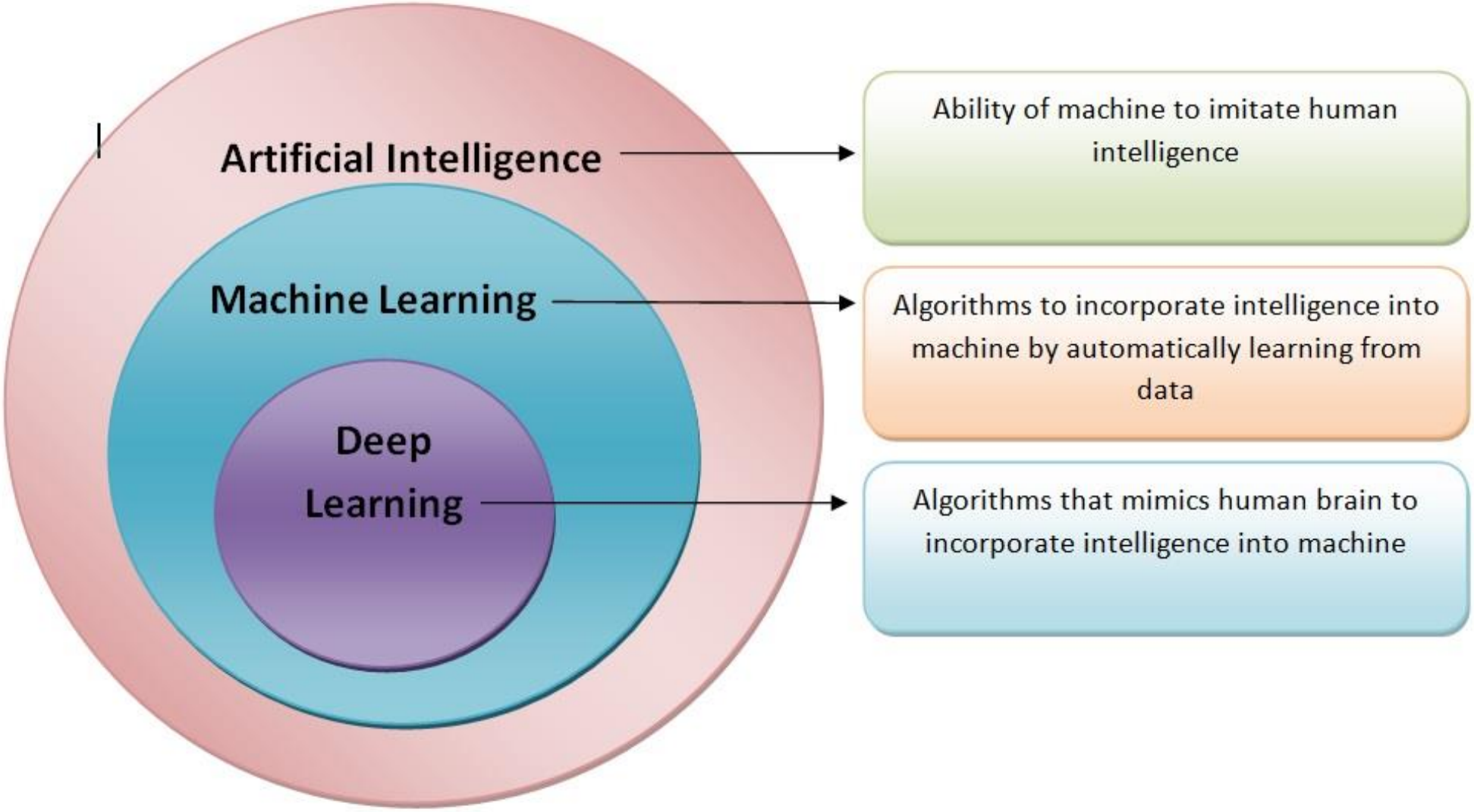
FINANCIAL SERVICES

Financial services

Healthcare

Customer service

AI VS ML VS DL



Artificial Intelligence (AI) in various domains

Health care

Agriculture

Transport

Education

E-Commerce

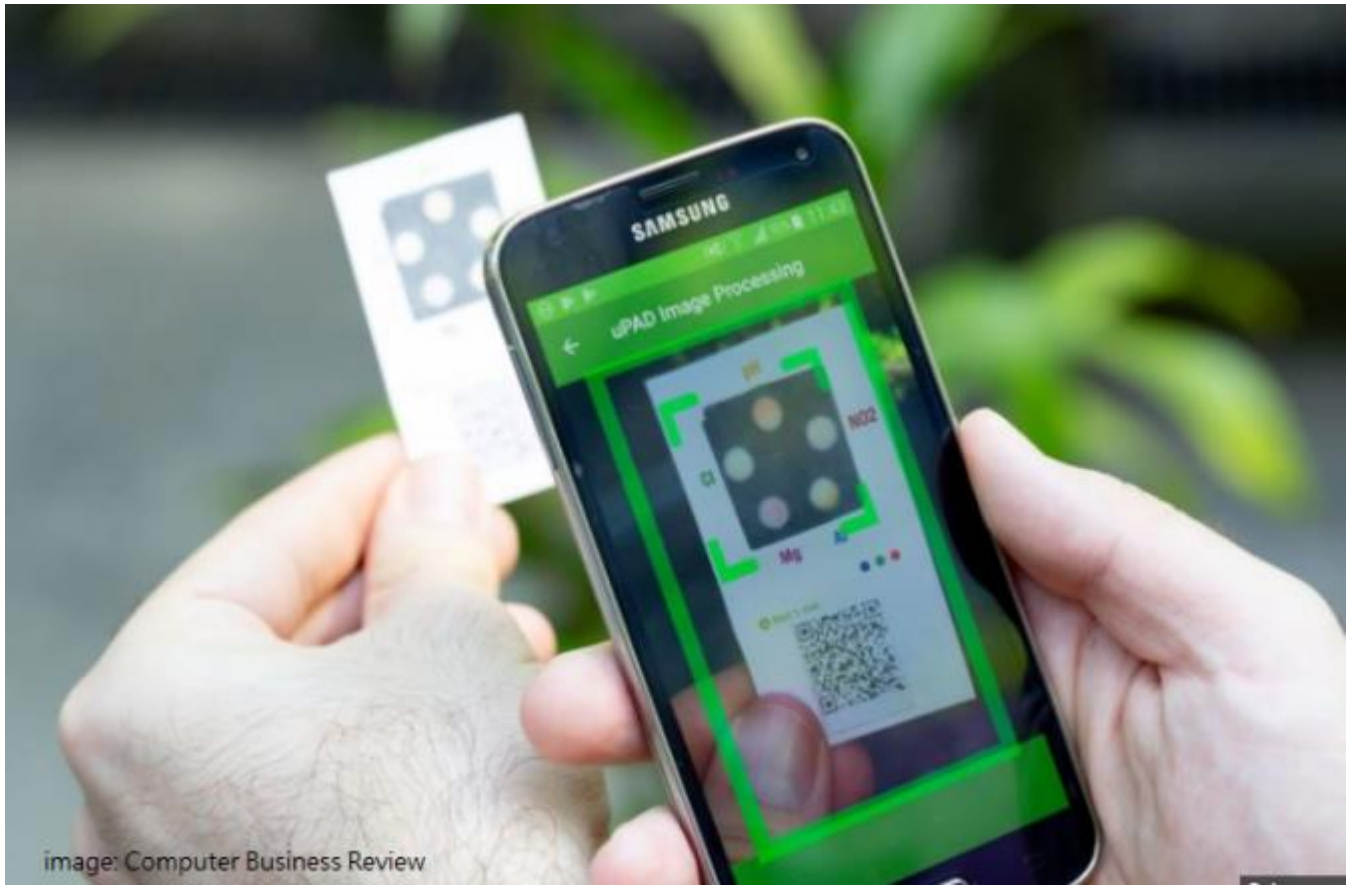
Entertainment

Social Media

Automotive

Real time example of AI in Agriculture – IBM agro pad

- IBM Agro Pad is an AI-powered prototype device designed to assist farmers in analyzing the chemical makeup of their soil and water.
- It offers a quick and affordable solution compared to traditional lab tests which can be expensive and time-consuming, especially for smallholder farmers



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Real time example of AI in Agriculture – IBM agro pad (Continued..)

Source: https://www.youtube.com/watch?v=UYVc0TeuK-w

Role of AI in Automotive domain – Autonomous vehicle

Advantages of AI

- Automation
- Decision Making
- Personalization
- Improved Efficiency
- 24/7 Availability
- Medical Diagnosis and Treatment
- Innovation and Research

Disadvantages Of AI

- Job Displacement
- Bias and Discrimination
- Privacy Concerns
- Ethical Dilemmas
- Lack of Transparency
- Dependency on Technology
- Economic Inequality

Top 10 career opportunities in AI

- Data scientist
- Machine Learning Engineer
- AI Research Scientist
- Robotics Engineer
- Computer vision Engineer
- AI Project Manager
- Data Engineer
- NLP Engineer
- AI Architect
- AI Ethicist

Summary

- The goal of AI is to create intelligent systems capable of understanding, reasoning, learning, and interacting with humans in natural ways.
- ML is a subset of AI that focuses on developing algorithms and statistical models that enable computers to learn from and make predictions or decisions based on data, without being explicitly programmed
- NLP is a subfield of AI focused on enabling computers to understand, interpret, and generate human language in a natural and meaningful way.
- DL is a subset of ML that utilizes artificial neural networks with multiple layers (deep architectures) to learn complex patterns and representations from data.

Conclusion

- AI, ML, NLP, and DL represent rapidly advancing fields with transformative potential across various industries. Their ability to learn from data and understand human language opens up new possibilities for innovation and problem-solving.
- These technologies intersect and complement each other, leading to synergistic effects and novel applications. Collaboration across disciplines such as computer science, linguistics, and cognitive psychology drives further progress and innovation.

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Thank You

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