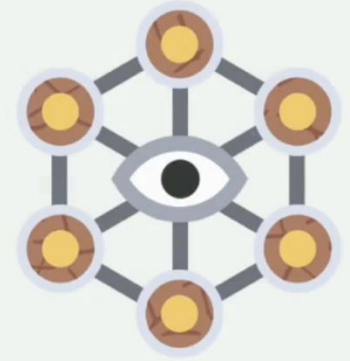# Introduction to AI and Machine Learning

Generative AI and Prompt Engineering

Ram N Sangwan

What is Artificial Intelligence?

Ability of machines to mimic the cognitive abilities and problem-solving capabilities of human intelligence.

Human Intelligence

Learn new skills through observation
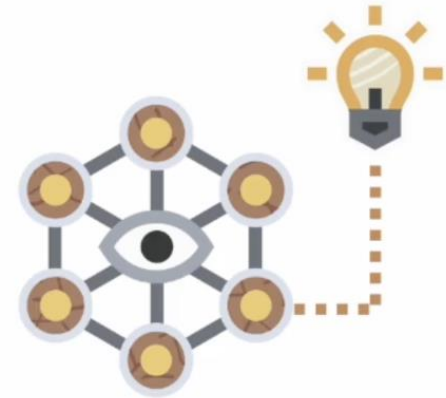
Thinks abstractly and reasons

Communicates using a language and non-verbal cues

Handles complex situations in real time

Plans short and long term

Creates art, music and inventions

If you can replicate any of these capabilities in machines, that is **Artificial General Intelligence (AGI)**

When we apply AGI to solve problems with specific, narrow objectives, we call it **Artificial Intelligence (AI)**

AI Use Cases

Automation and Decision Making

Approve a credit card or loan.

Process insurance claims.

Recommend products to customers.

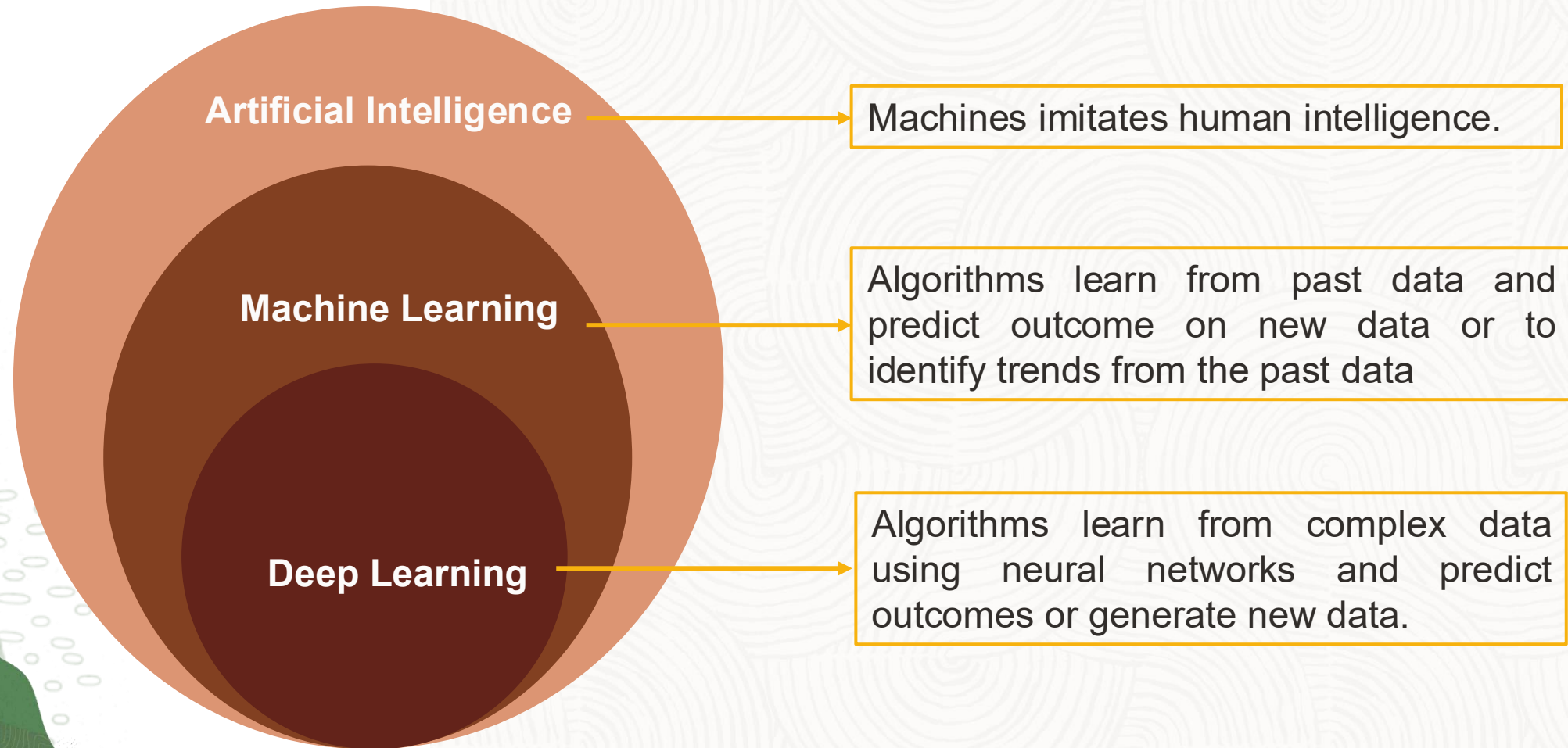Detect fraudulent transactions.

Classify documents and images.

Creative Support

Create content.

Write stories and poems.

Provide designs.

Share code.

Generate ideas.

Relationship Between AI, ML and DL

Artificial Intelligence

Machines imitates human intelligence.

Machine Learning

Algorithms learn from past data and predict outcome on new data or to identify trends from the past data

Deep Learning

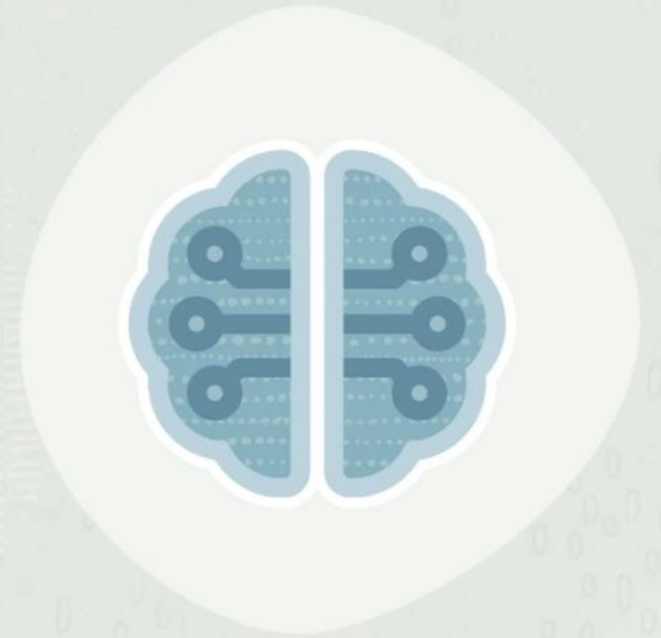Algorithms learn from complex data using neural networks and predict outcomes or generate new data.

What is Machine Learning?

- A subset of artificial intelligence that focuses on creating computer system that can learn and improve from experience.

- Powered by algorithms that incorporate intelligence into machines.

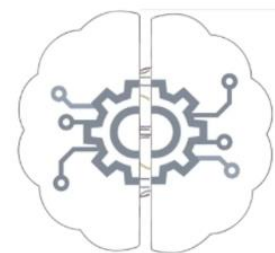**Training**
Learning capability from existing data

Inference
Applying this capacity to new data

Training Dataset

"cat"

"dog"

"dog"

Data   **Labels**

ML Algorithm
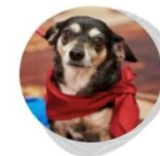
Input Data
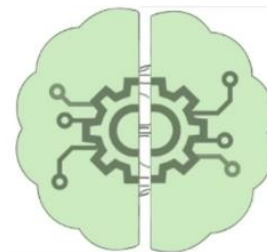
Trained Model
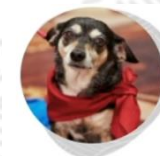
Predicted Label
"dog"

Machine Learning and it Use Cases

Supervised

Classify data or make predictions
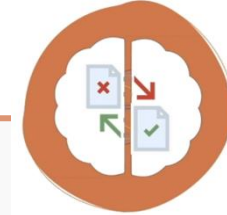
- Disease detection
- Weather forecasting
- Stock price prediction
- Spam detection
- Credit scoring

Unsupervised

Understand relationships with datasets

- Fraudulent transactions detection
- Customer segmentation
- Outlier detection
- Targeted marketing campaigns

Reinforcement

Make decisions or choices

- Automated robots
- Autonomous cars
- Video games
- Healthcare

Supervised Learning

House price prediction

Disease detection

Machine learning model that learns from labeled data
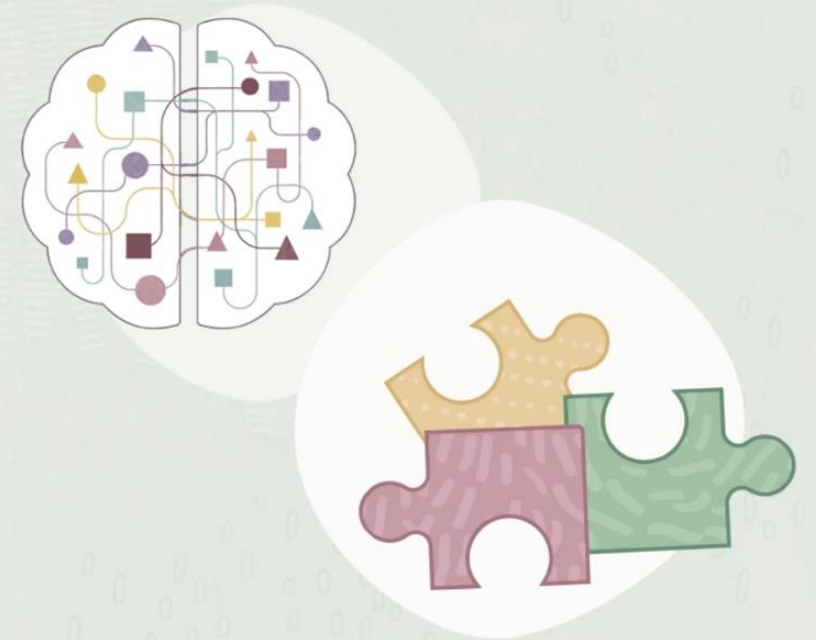
Sentiment analysis

Stock price prediction

Unsupervised Learning

- A type of Machine Learning where there are no labeled outputs

- Algorithms learns the patterns in the data and group similar data items

Use Cases

Market Segmentation

Action:
- Input purchasing details
- Identify similar customers based on purchasing behavior.

Output:
- Target advertisements

Outlier Analysis

Action:
- Inputs credit card purchase details
- Identify fraudulent transactions.

Output:
- Anomaly detection

Recommendation Systems

Action:
- Inputs are user's movie viewing history
- Identify Users based on genre of movies watched

Output:
- Personalized movie recommendations
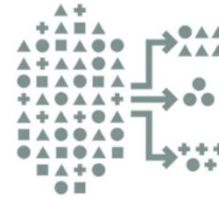
Unsupervised Workflow

Prepare the Data

Remove missing values, normalize the data and perform feature scaling

Create similarity matrix

Choose a similarity metric based on nature of data and clustering algorithm used

Run clustering algorithm

Use the chosen similarity metric to cluster the data
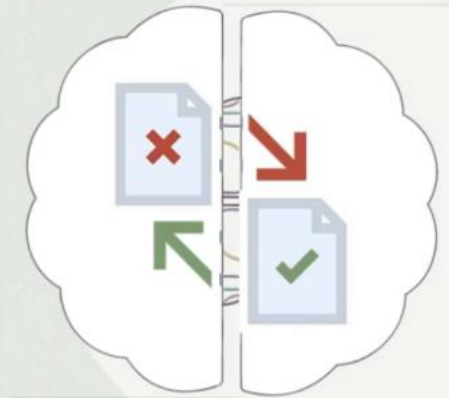
Interpret results & adjust clustering

Check the quality of your clustering output by verifying against expectations iteratively

Reinforcement Learning

A Type of Machine Learning that enables an agent to learn from its interactions with the environment.

Receives feedback in the form of rewards or penalties, without any labeled dataset.

Terminology in RL

Agent
Interacts with environment, takes actions, learns from feedback

Environment
External system with which the agent interacts

State
Representation of the current situation of the environment at a particular time

Action
Possible moves or decisions that the agent can take in each state

Policy
Mapping that the agent uses to decide which action to take in a given state

Train a Robotic Arm Using RL

Step 1	Step 2	Step 3	Step 4	Step 5
Environmental Setup	**State Representation**	**Action Space**	**Rewards and Penalties**	**Training and Iterative Improvement**
Set the robotic arm, warehouse layout, goods, and target locations.	State includes position and orientation of arm, items to be picked, and target locations.	Define the possible actions the robotic arm can take in each state	It learns by rewards and punishments.	It starts in a random state and takes actions in the environment.

Through multiple training iterations, the robotic arm learns better strategies for picking up and placing items in the warehouse

Thank You