What is Machine Learning?

A Simple Introduction with Different Types of ML

How do apps know exactly what you want?

Ever wonder how your favorite apps seem to read your mind? It's not magic, it's machine learning working behind the scenes!

YouTube Recommendations

Suggesting the next video you just *have* to watch.

Gmail Spam Filter

Keeping those pesky phishing attempts out of your inbox.

Netflix Suggestions

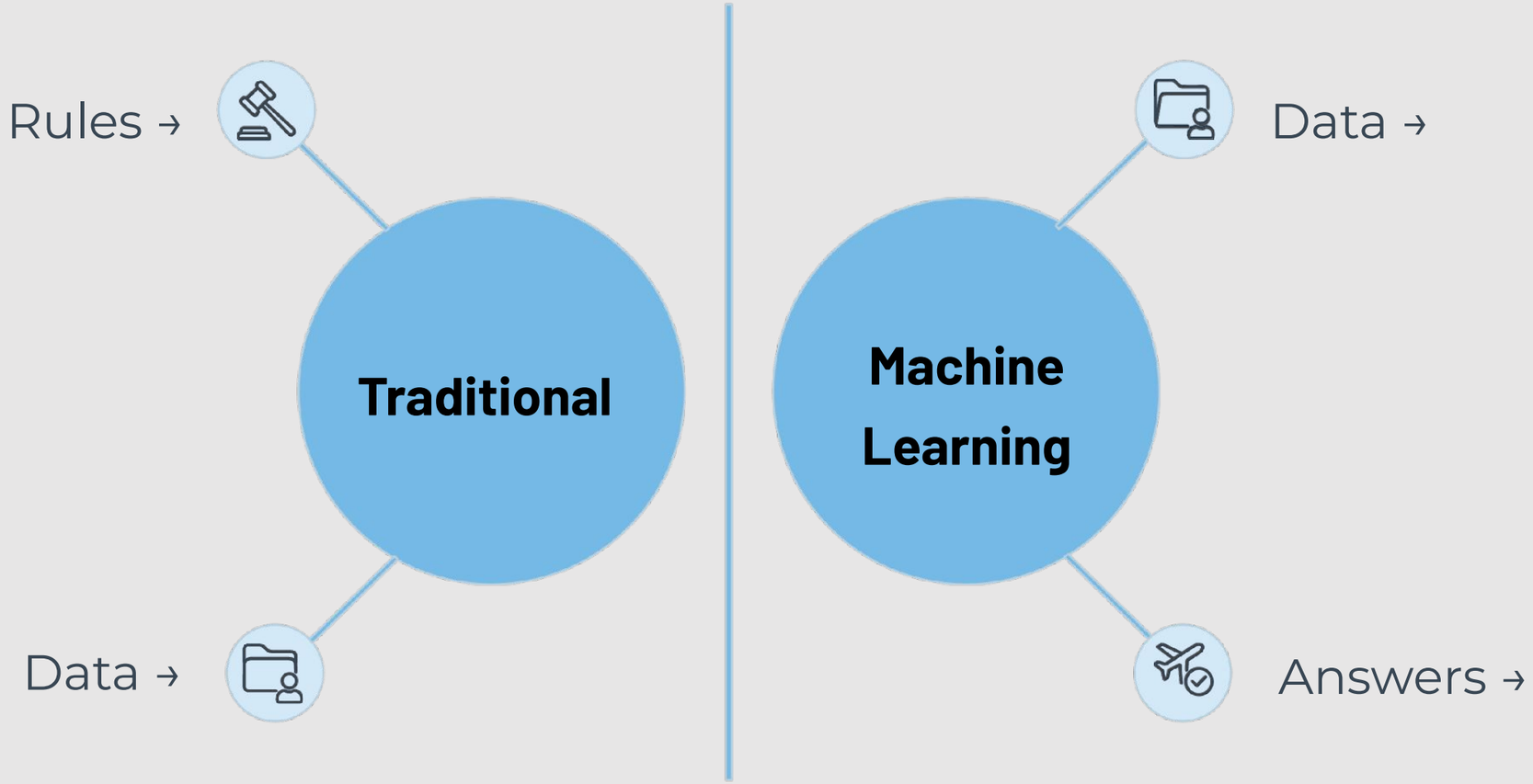
Serving up your next binge-worthy show with uncanny accuracy.

Machine Learning is when computers learn patterns from data and use them to make decisions.

> Basically, your laptop becomes slightly smarter than your annoying cousin.

Traditional Programming vs. Machine Learning

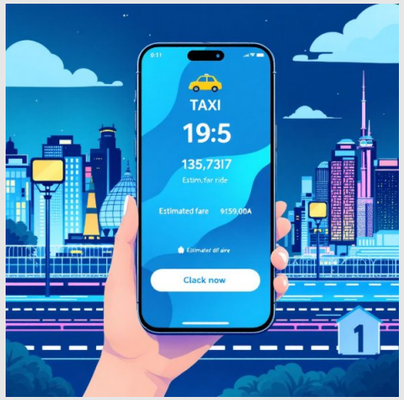
Let's look at the fundamental difference in how we instruct computers.



Real-Life Examples of ML All Around You

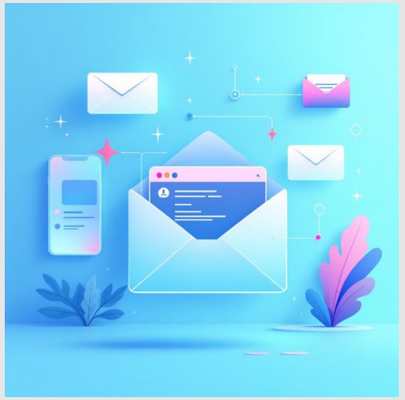
Machine Learning isn't just for tech gurus; it's integrated into your daily life.

Face Recognition



Ride Sharing

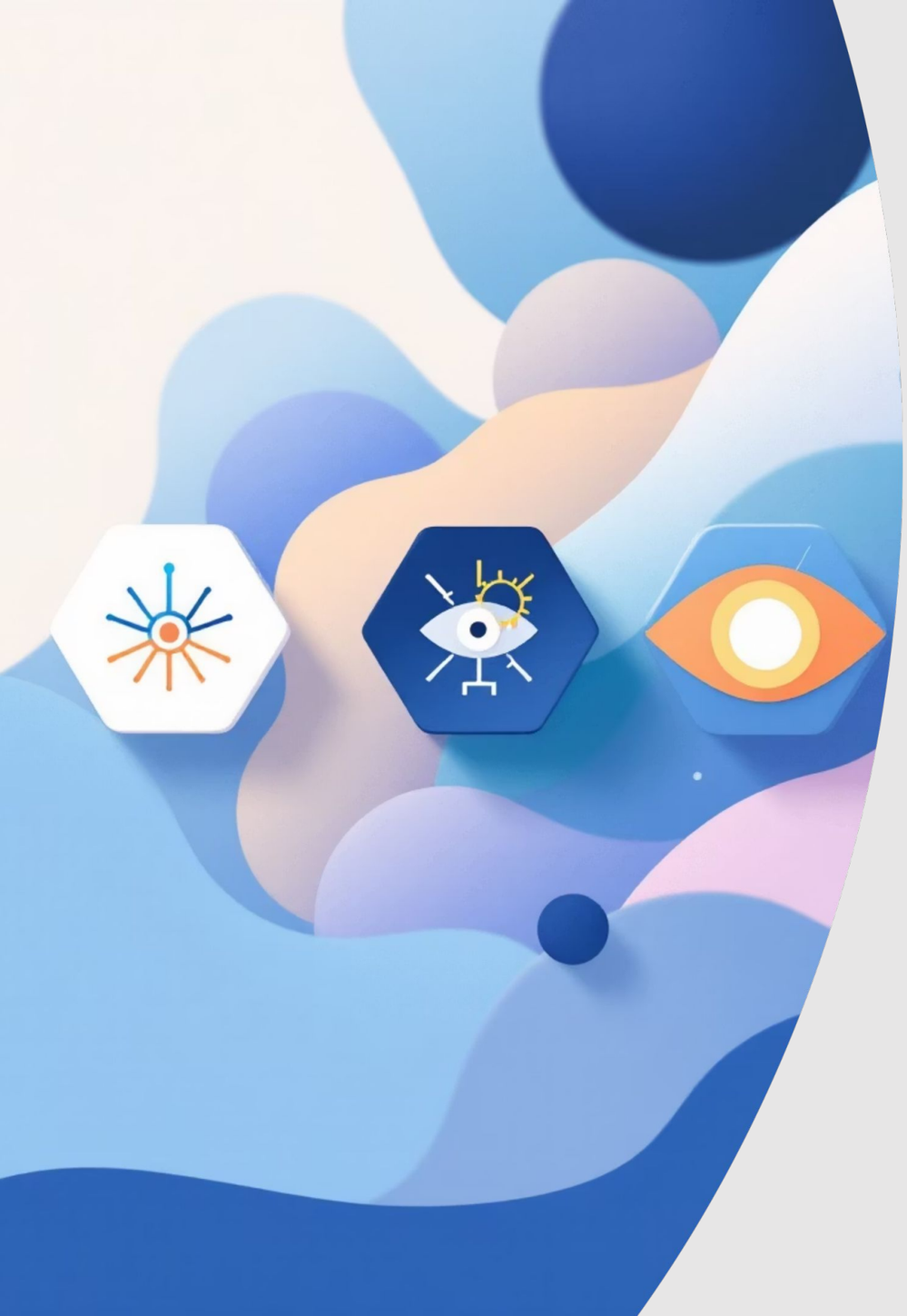
E-commerce



Email Filtering

Voice Assistants

Autonomous Vehicles



The Three Families of Machine Learning

Machine Learning can be broadly categorized into three main types, each with its own way of learning.

1

Supervised Learning

Learning from labeled data, like a student with flashcards.

2

Unsupervised Learning

Finding hidden patterns in unlabeled data, like a detective.

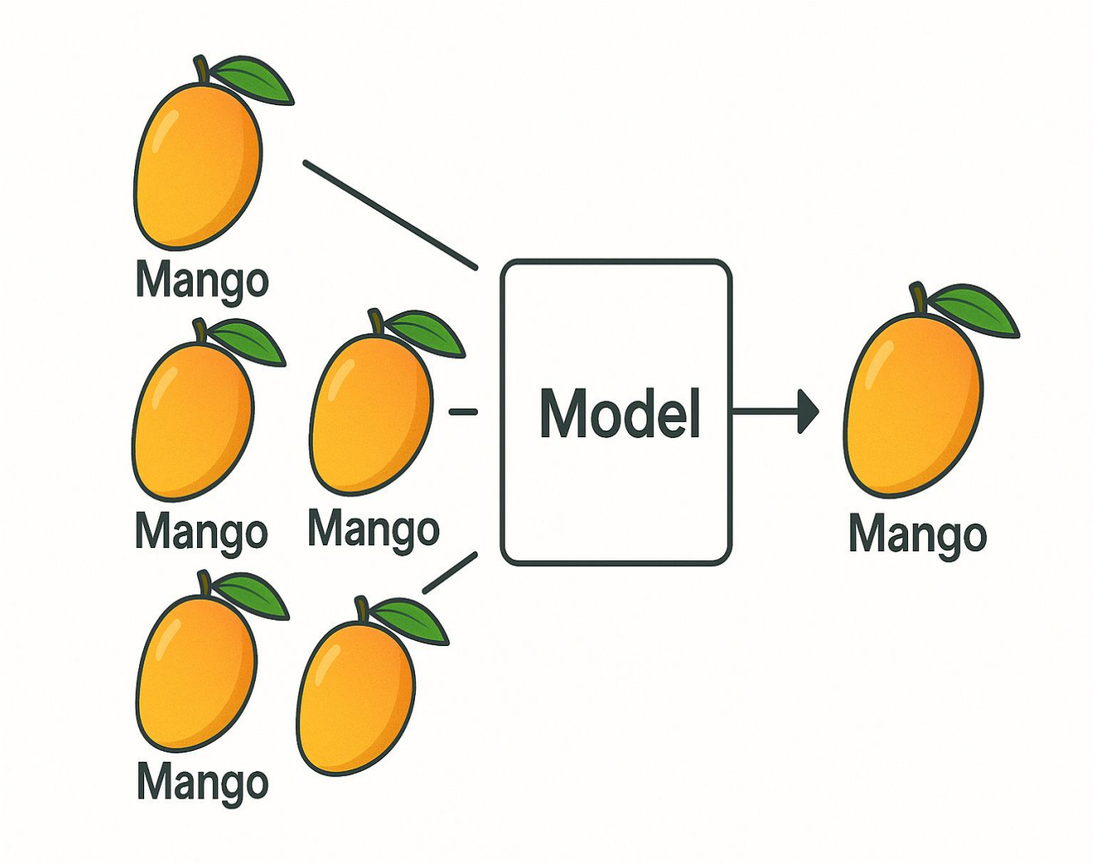
3

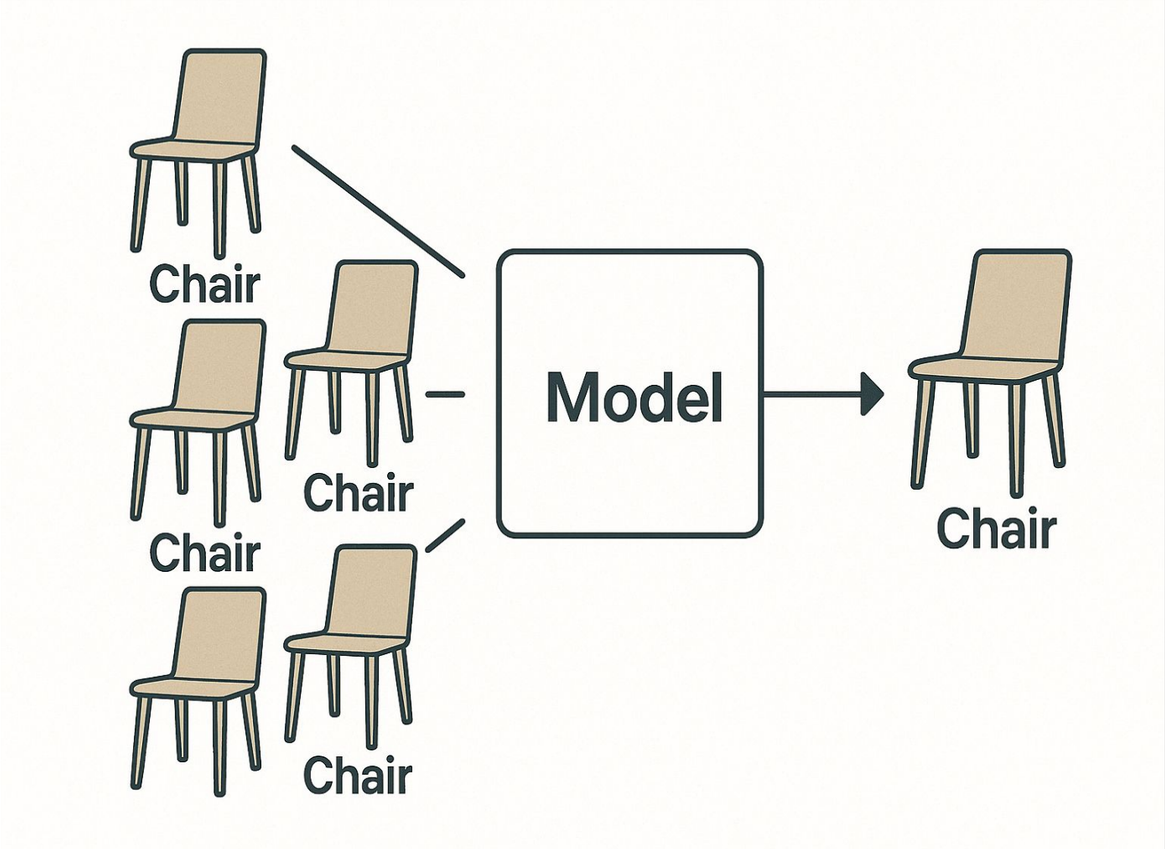
Reinforcement Learning

Learning through trial and error, like training a new puppy.

Supervised Learning: Learning with Answers

This type of ML is like having a really good teacher who provides all the answers during practice.





The model learns to identify a mango because it's been shown many pictures of mangoes, each clearly labeled "Mango."

Similarly, it learns to recognize a chair from countless labeled examples of chair.

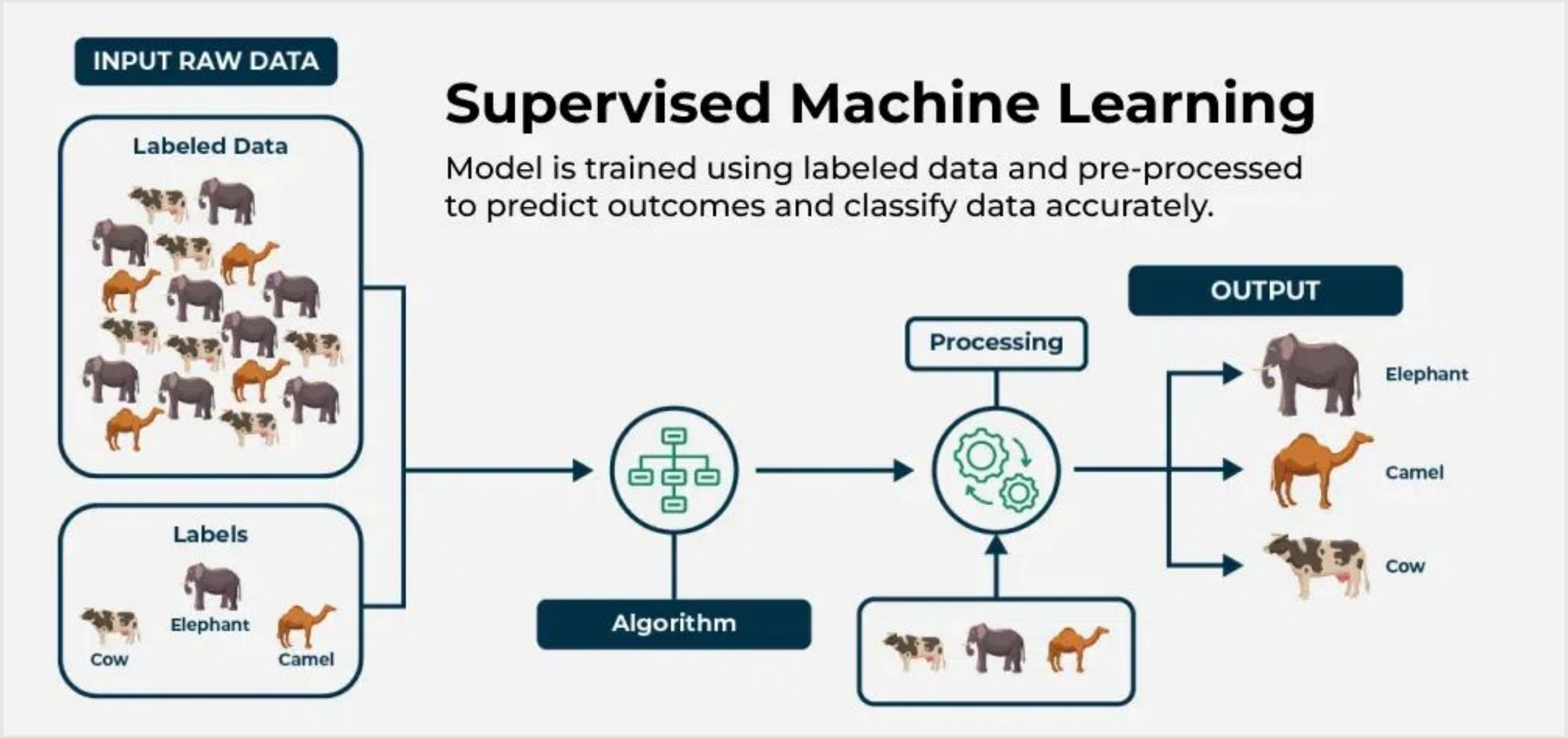
> It's like studying from question banks with answers provided!

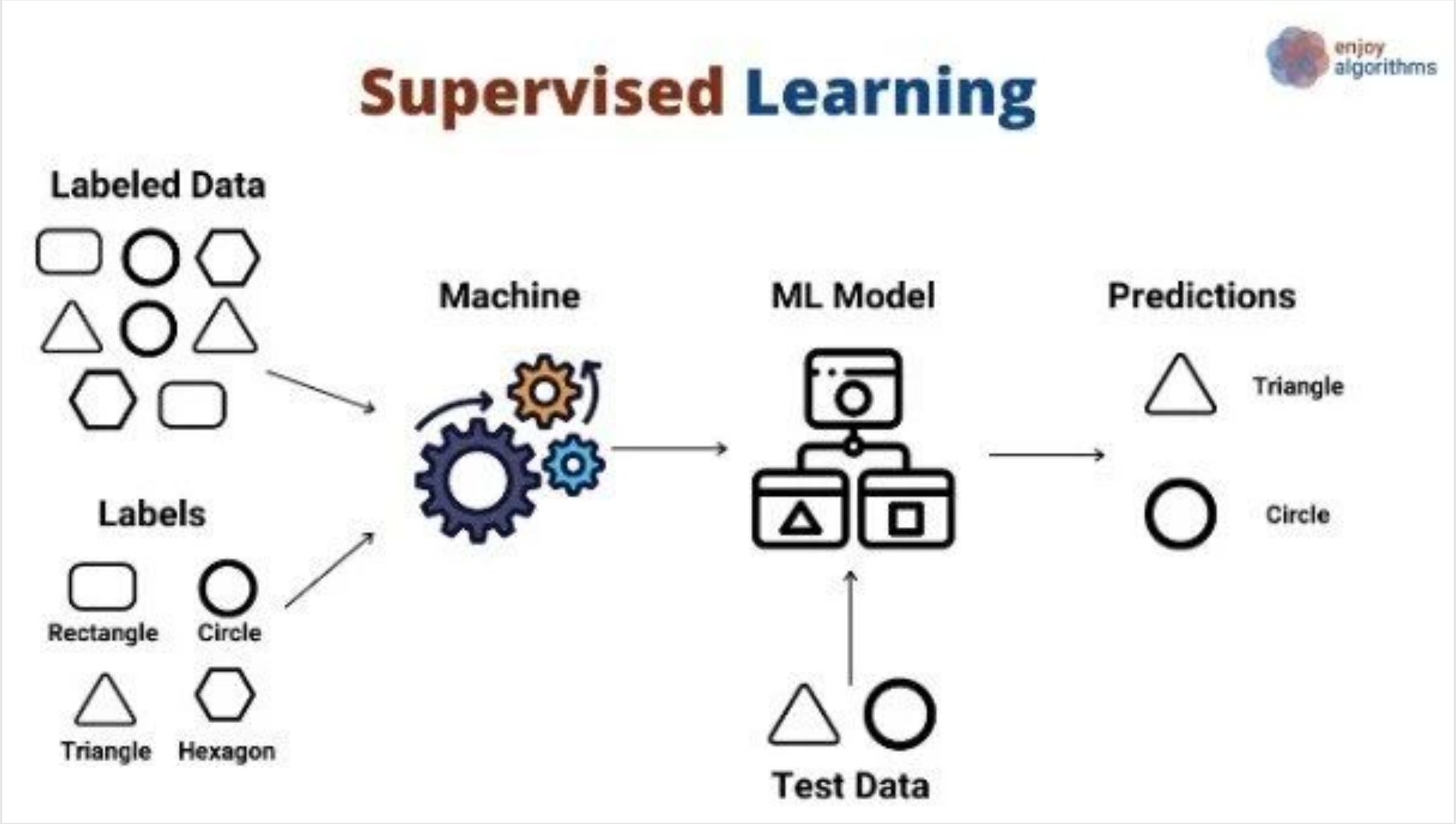
Supervised Learning: Example

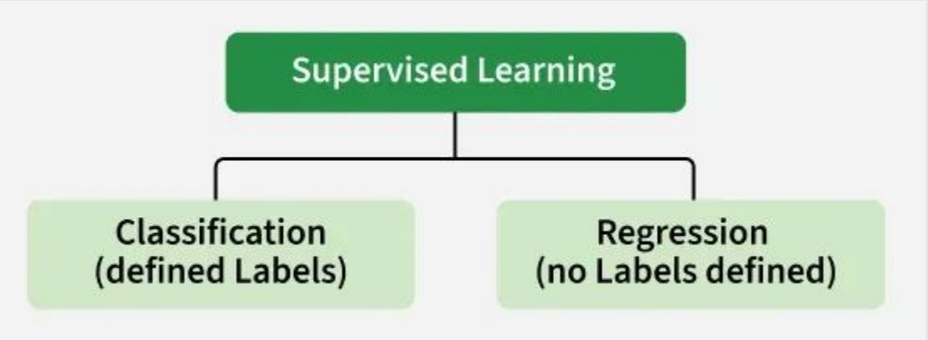
Example: Consider the following data regarding patients entering a clinic. The data consists of the gender and age of the patients and each patient is labeled as "healthy" or "sick".

Gender	Age	Label
M	48	sick
M	67	sick
F	53	healthy
M	49	sick
F	32	healthy
M	34	healthy
M	21	healthy

In this example, supervised learning is to use this labeled data to train a model that can predict the label ("healthy" or "sick") for new patients based on their gender and age. For example if a new patient i.e Male with 50 years old visits the clinic, model can classify whether the patient is "healthy" or "sick" based on the patterns it learned during training.


INPUT RAW DATA
Supervised Machine Learning
Model is trained using labeled data and pre-processed to predict outcomes and classify data accurately.
Labeled Data
Labels
Cow
Elephant
Camel
Algorithm
Processing
OUTPUT
Elephant
Camel
Cow


Supervised Learning
enjoy algorithms
Labeled Data
Labels
Rectangle
Circle
Triangle
Hexagon
Machine
ML Model
Predictions
Triangle
Circle
Test Data



User ID	Gender	Age	Salary	Purchased
15624510	Male	19	19000	0
15810944	Male	35	20000	1
15668575	Female	26	43000	0
15603246	Female	27	57000	0
15804002	Male	19	76000	1
15728773	Male	27	58000	1
15598044	Female	27	84000	0
15694829	Female	32	150000	1
15600575	Male	25	33000	1
15727311	Female	35	65000	0
15570769	Female	26	80000	1
15606274	Female	26	52000	0
15746139	Male	20	86000	1
15704987	Male	32	18000	0
15628972	Male	18	82000	0
15697686	Male	29	80000	0
15733883	Male	47	25000	1

Figure A: CLASSIFICATION

Temperature	Pressure	Relative Humidity	Wind Direction	Wind Speed
10.69261758	986.882019	54.19337313	195.7150879	3.278597116
13.59184184	987.8729248	48.0648859	189.2951202	2.909167767
17.70494885	988.1119385	39.11965597	192.9273834	2.973036289
20.95430404	987.8500366	30.66273218	202.0752869	2.965289593
22.9278274	987.2833862	26.06723423	210.6589203	2.798230886
24.04233986	986.2907104	23.46918024	221.1188507	2.627005816
24.41475295	985.2338867	22.25082295	233.7911987	2.448749781
23.93361956	984.8914795	22.35178837	244.3504333	2.454271793
22.68800023	984.8461304	23.7538641	253.0864716	2.418341875
20.56425726	984.8380737	27.07867944	264.5071106	2.318677425
17.76400389	985.4262085	33.54900114	280.7827454	2.343950987
11.25680746	988.9386597	53.74139903	68.15406036	1.650191426
14.37810685	989.6819458	40.70884681	72.62069702	1.553469896
18.45114201	990.2960205	30.85038484	71.70604706	1.005017161
22.54895853	989.9562988	22.81738811	44.66042709	0.264133632
24.23155922	988.796875	19.74790765	318.3214111	0.329656571

Figure B: REGRESSION

Unsupervised Learning: Learning Without Answers

Imagine walking into a room full of strangers and trying to figure out who belongs in which group without any prior information.

The algorithm identifies inherent structures or groupings within the data on its own. For example, it might group customers based on their buying habits, even if nobody told it what those groups should be.

> It’s like walking into a party and spotting friend groups based on who talks to whom.

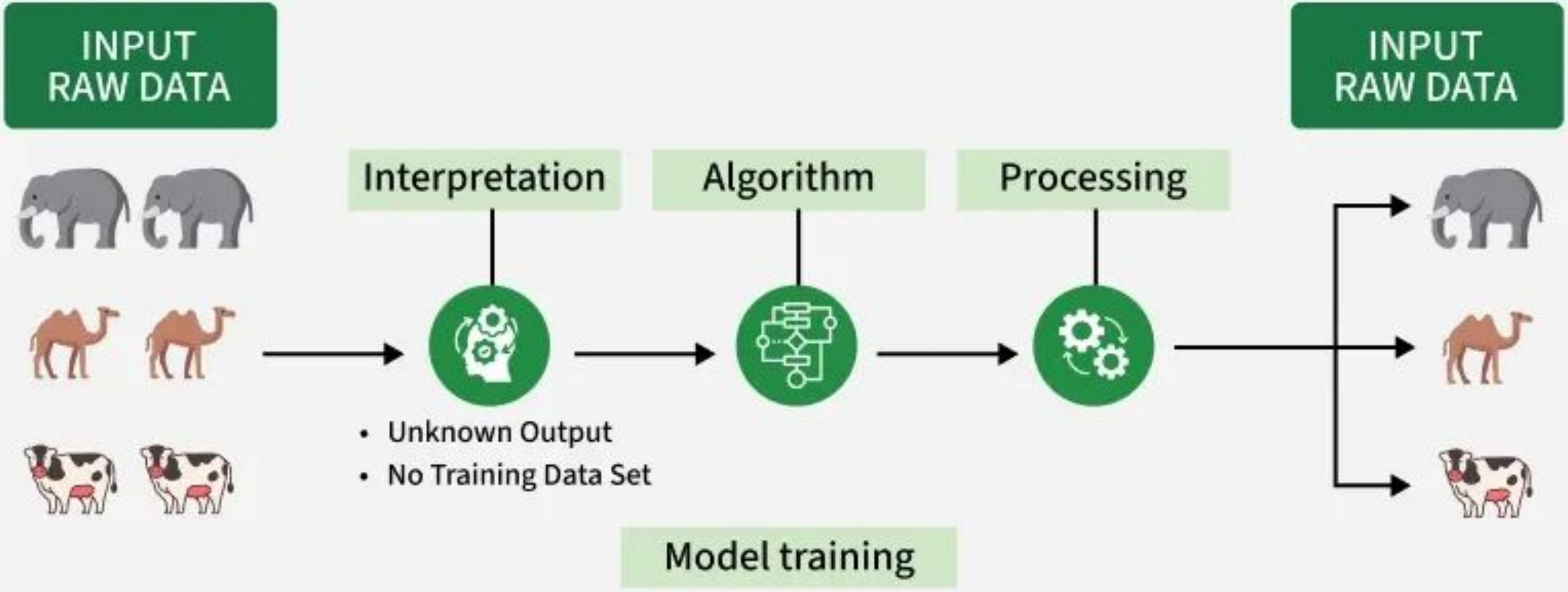
Unsupervised Learning: Example

Example: Consider the following data regarding patients. The dataset has a unlabeled data where only the gender and age of the patients are available with no health status labels.

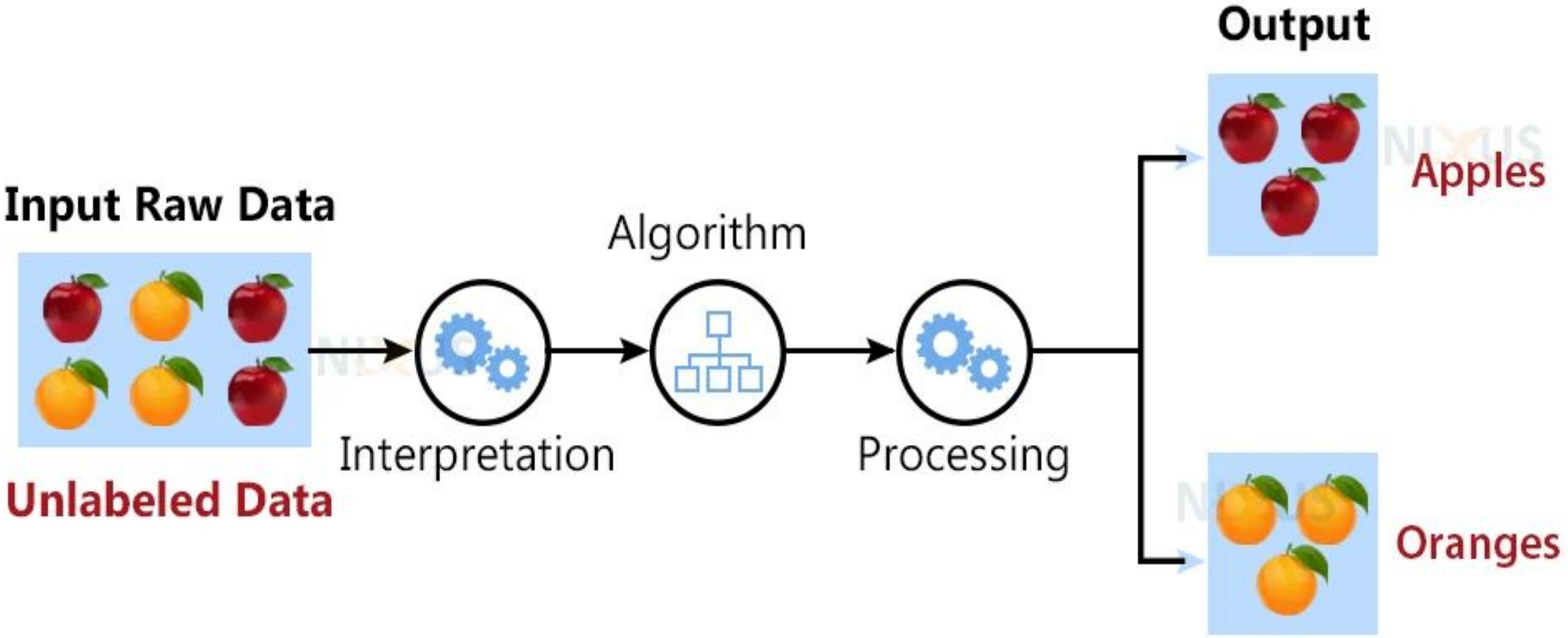
Gender	Age
M	48
M	67
F	53
M	49
F	34
M	21

> Here unsupervised learning looks for patterns or groups within the data on its own. For example it might cluster patients by age or gender and grouping them into categories like "younger healthy patients" or "older patients" without knowing their health status.

Unsupervised Learning



Unsupervised Machine Learning

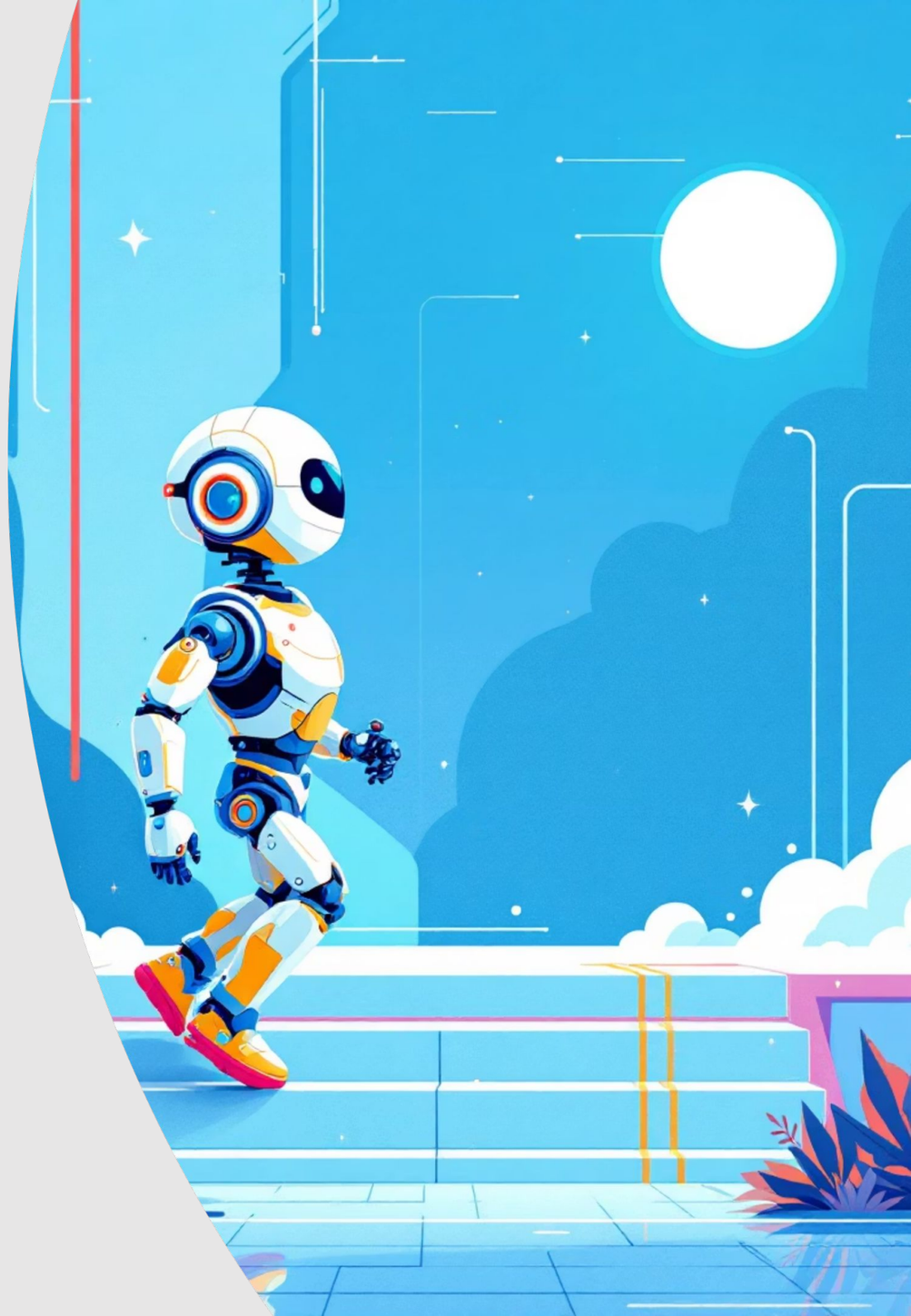


Reinforcement Learning: Learning by Trial and Error

This is how agents learn to make decisions by performing actions in an environment and receiving rewards or penalties.

The robot tries different moves, gets a "reward" for moving forward, and a "penalty" for falling. Over many attempts, it learns the best way to walk.

> It's like training a pet with treats and scolds until they learn a trick!

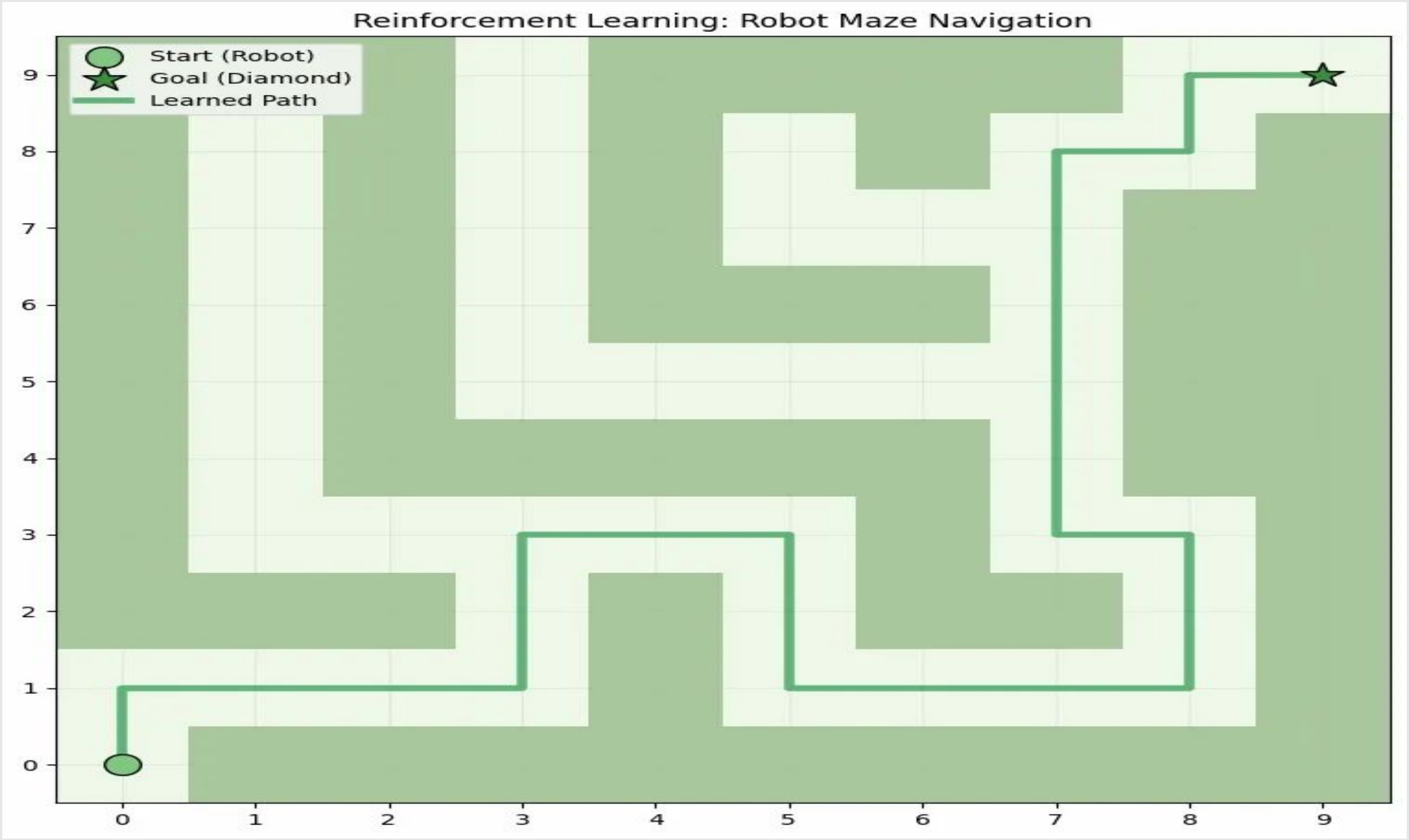


Reinforcement Learning: Example

Example: While Identifying a Fruit, system receives an input for example an apple and initially makes an incorrect prediction like "It's a mango". Feedback is provided to correct the error "Wrong! It's an apple" and the system updates its model based on this feedback.

Over time it learns to respond correctly that "It's an apple" when getting similar inputs and also improves accuracy.

Besides these three main types, modern machine learning also includes two other important approaches: Self-Supervised Learning and Semi-Supervised Learning.


Reinforcement Learning: Robot Maze Navigation
Start (Robot)
Goal (Diamond)
Learned Path
0
1
2
3
4
5
6
7
8
9

1.Before Conditioning

Food

Unconditioned Stimulus

Response

Salivation

Unconditioned Response

2.Before Conditioning

Bell

Neutral stimulus

Response

No Salivation

No Conditioned Response

3.During Conditioning

Bell

+

Food

Response

Salivation

Unconditioned Response

4.After Conditioning

Bell

Conditioned Stimulus

Response

Salivation

Conditioned Response

Quick ML Family Comparison

Here's a concise overview of our three ML families.

Supervised	From labeled examples	Image classification
Unsupervised	Finds patterns in unlabeled data	Customer segmentation
Reinforcement	Through rewards and penalties	Game playing AI

How Netflix Uses ML

A Real Application Story

Supervised Learning

Predicts personalized movie ratings based on your past viewing history and explicit feedback, helping to surface content you'll love.

Unsupervised Learning

Clusters users with similar tastes and viewing patterns, allowing Netflix to identify groups of people who enjoy similar types of content.

Reinforcement Learning

Decides which recommendations to present to keep you engaged, learning from your interactions to optimize the sequence and selection of titles shown.

Key Takeaways

1. ML learns from data to make decisions
2. Three main types: Supervised, Unsupervised, and Reinforcement Learning
3. Used in daily life all the time - from Netflix to voice assistants