CSE 471: Machine Learning

Introduction to Machine Learning

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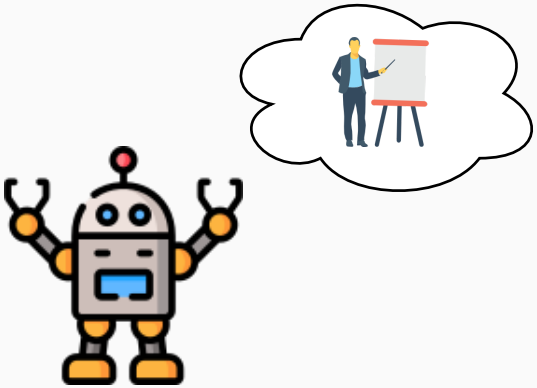
What is Machine Learning?

What is Machine Learning? i

Humans learn from past experiences



Machines follow instructions given by humans

The IDEA!

What if humans could teach machines to learn from past data and perform any task faster and more accurately than humans themselves?

What is **Machine Learning?**

What is Machine Learning? i

Definition

Machine learning is a branch of artificial intelligence (AI) and computer science which focuses on the use of data and algorithms to imitate the way that humans learn, make predictions using experiences (data) and gradually improving its accuracy.

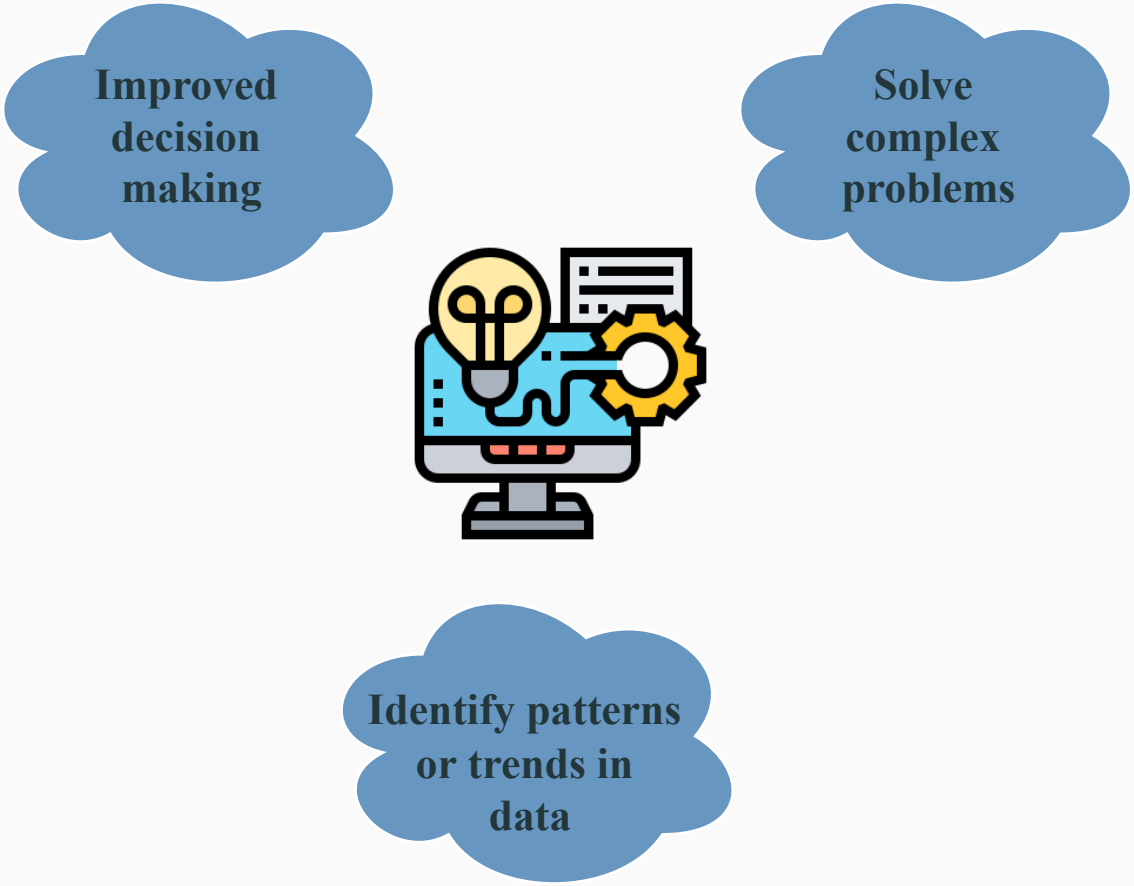
Sophia The Robot

TESLA Self Driving Car

Figure 1: Implementation of Machine Learning

Why do we need ML?

Why do we need ML? i



ML Life Cycle

ML Life Cycle i

Machine learning life cycle involves seven major steps

Gathering Data

- First step of ML
- Identify the different data sources: files, database, internet, or mobile devices
- Collect, integrate and create a dataset

ML Life Cycle ii

Prepare Data

- Includes two steps
- **Data Exploration:** understanding the characteristics, format, and quality of data in order to find Correlations, general trends, and outliers.
- **Data Pre-processing:** Putting our data in an appropriate location and preparing it for use in machine learning training. Split the dataset into training and testing set.

Data Wrangling

- cleaning and converting raw data into a useable format
- Use filtering techniques to clean the data: missing values, duplicate, invalid data and noise.

ML Life Cycle iii

Data Analysis

- Selecting an analytical technique
- Build a model
- Review the result

Train Model

- Train our model to improve its performance for better outcome.
- Use data-sets to train the model

Test Model

- After training the model test the model

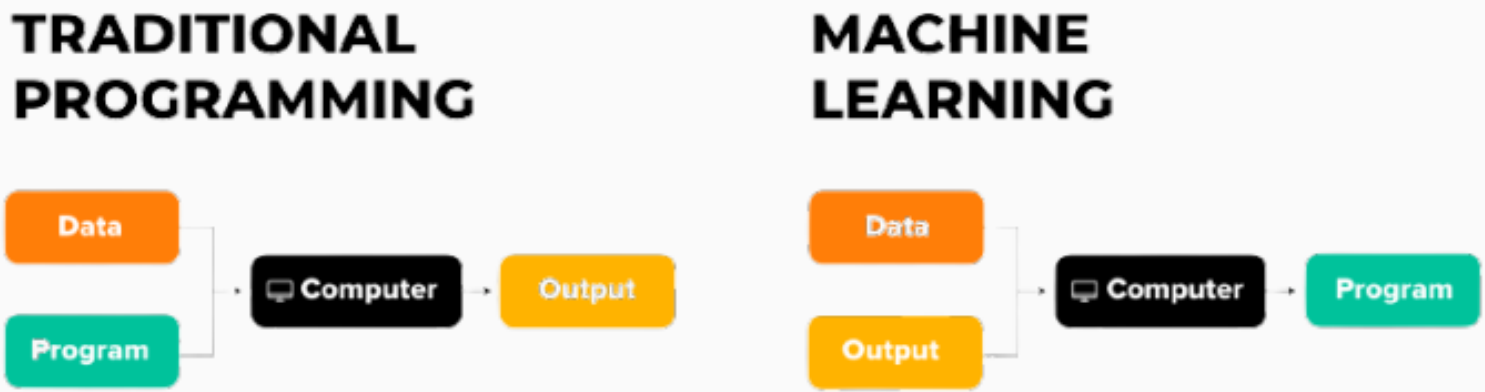
Deployment

- Deploy the model in the real-world system

Traditional Programming vs Machine Learning

Traditional Programming vs Machine Learning i

- In Traditional programming, we write down the exact steps required to solve the problem.
- Machine Learning is motivated by human learning behavior; we just show examples and let the machine figure out how to solve the problem by itself.



Splitting The Dataset

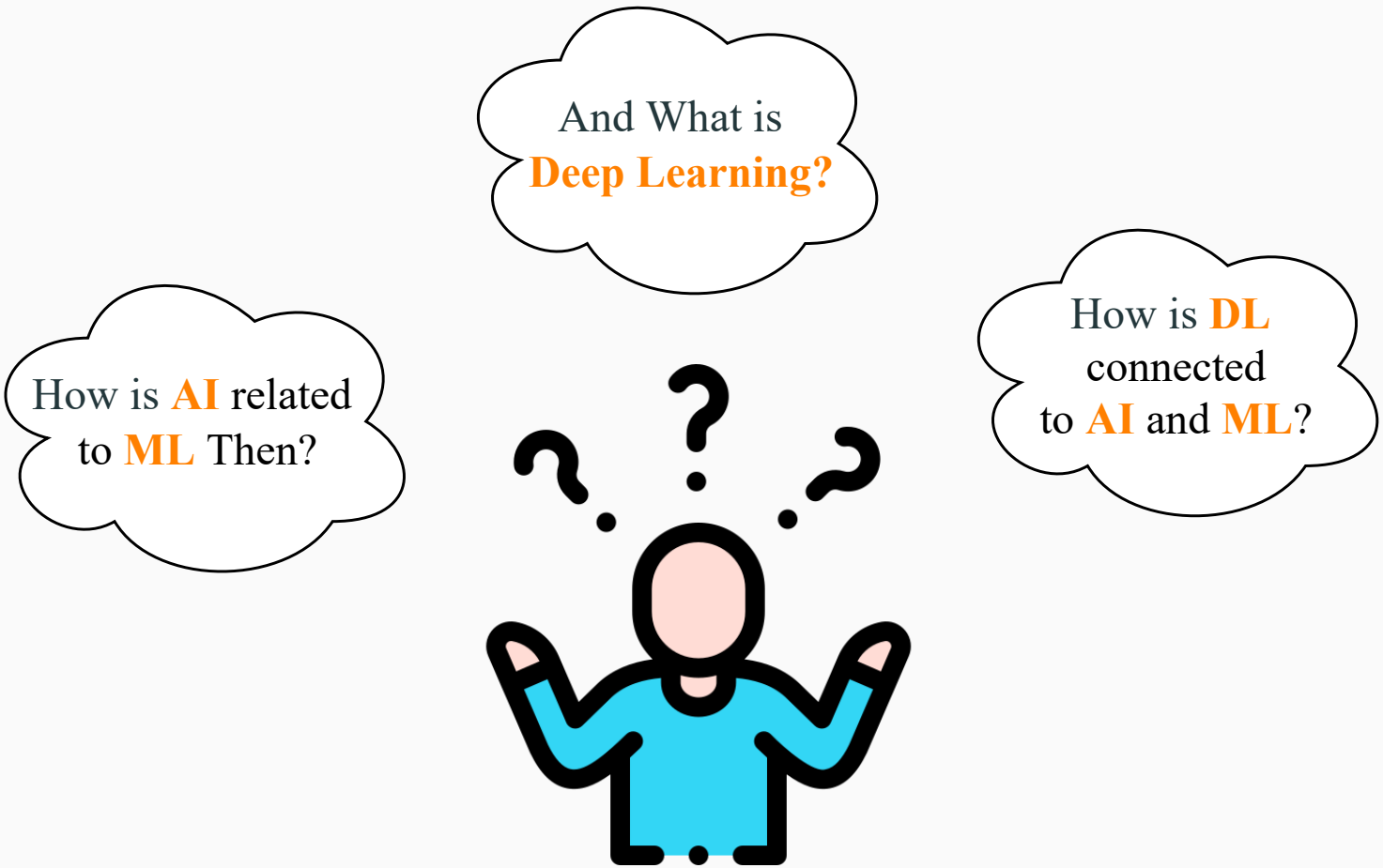
Splitting The Dataset i

Splitting The Dataset

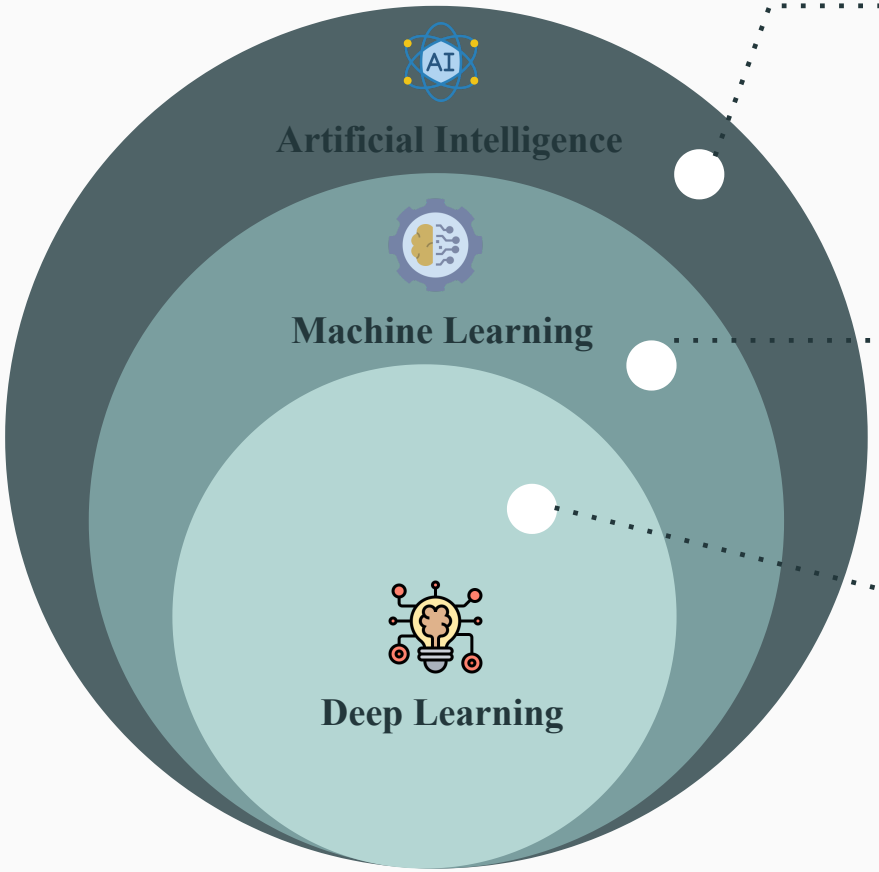
- The original dataset is divided into Two sets: Training data set and Test data set
- It is done as a part of data pre processing
- **Training Data:** the biggest subset of the original dataset, used to train or fit the ML model
- **Test Data:** another subset of original data,independent of the training dataset, used to test the model
- If it performs well with the training data, but does not perform well with the test dataset, then it is estimated that the model may be overfitted.

AI vs ML vs Deep Learning

AI vs ML vs Deep Learning i



AI vs ML vs Deep Learning i



Artificial Intelligence
A technique that enables machine to mimic human behavior

Machine Learning
Subset of AI, gives machine the ability to learn from experiences without being explicitly programmed

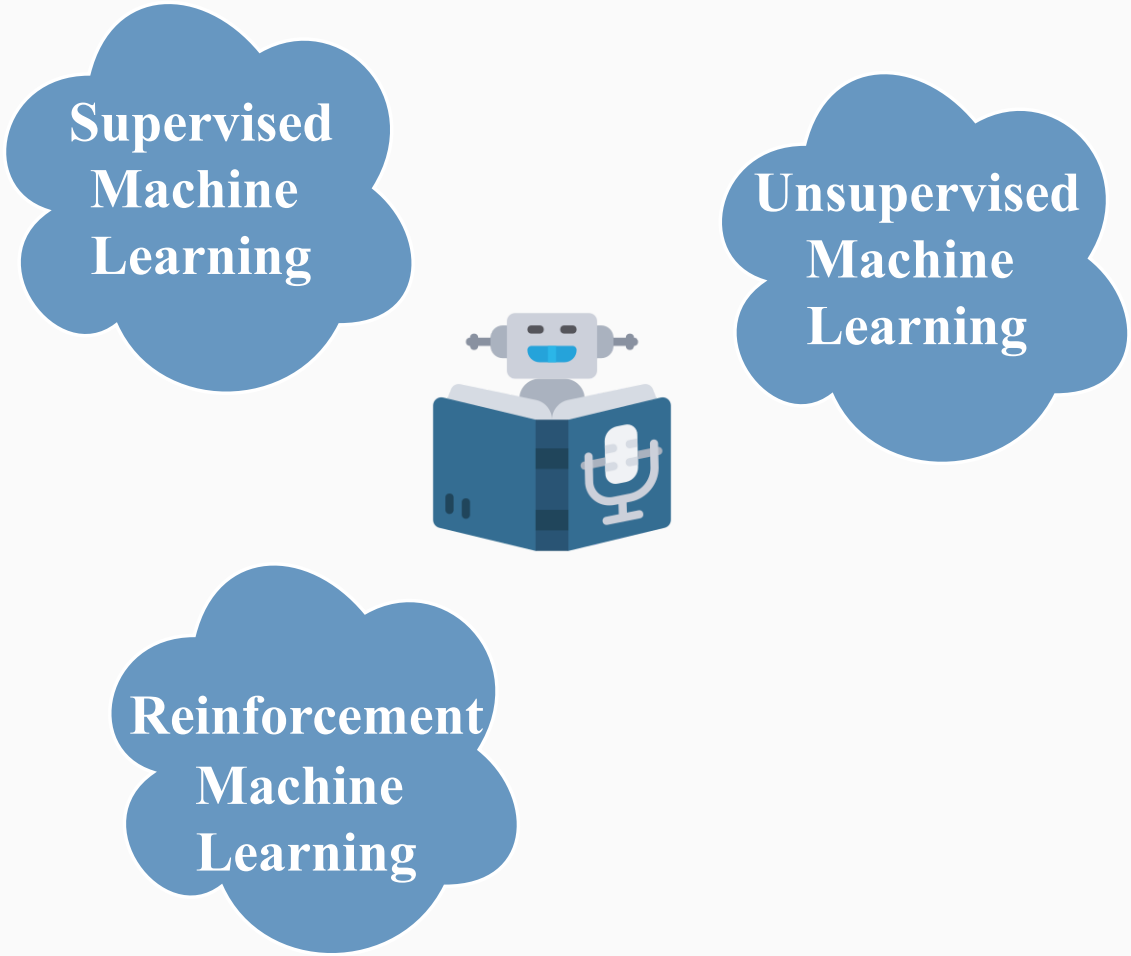
Machine Learning
Subset of ML, teaches computers to do what comes naturally to humans

AI vs ML vs Deep Learning i

- Deep Learning works with large amount of data, ML can not handle large volume of data
- In ML, model is trained with object features but DL learns the feature from the object
- Less human intervention in DL than ML
- Neural network acts as the base of Deep Learning

Types of Machine Learning

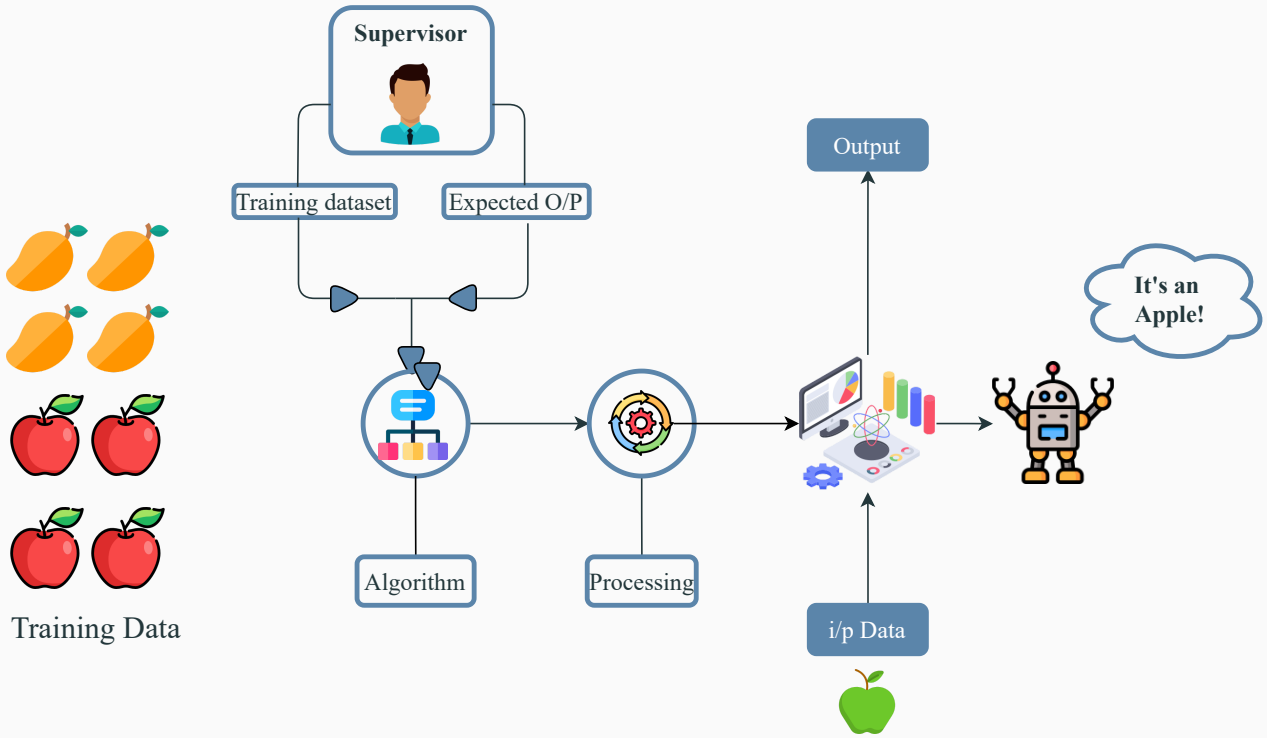
Types of Machine Learning i



Supervised Machine Learning i

Supervised Machine Learning

- Machines are trained using well "labelled" training data
- Labelled data: Input data is already tagged with the correct output



Supervised ML Application i

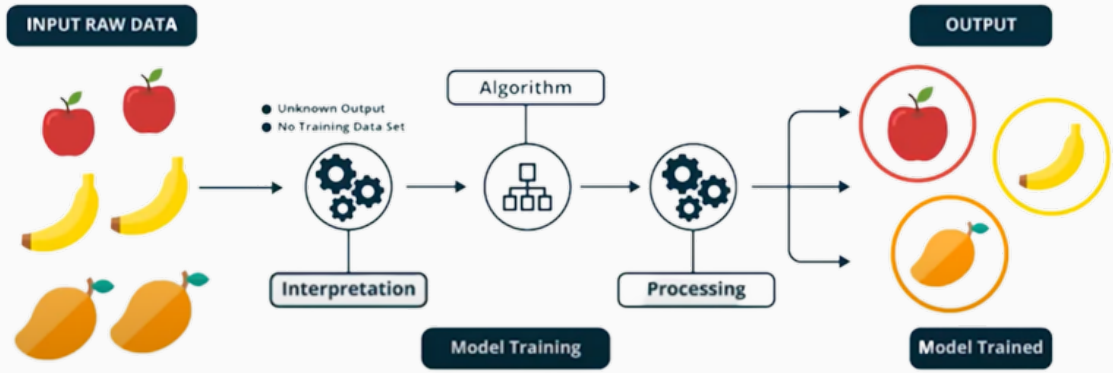
Supervised ML Application

- E-mail SPAM filtering
- Text classification
- Netflix Recommendation System

Unsupervised Machine Learning i

Unsupervised Machine Learning

- Models are not supervised using training dataset rather trained using unlabeled data
- The task is to find hidden patterns and trends



Unsupervised ML Application i

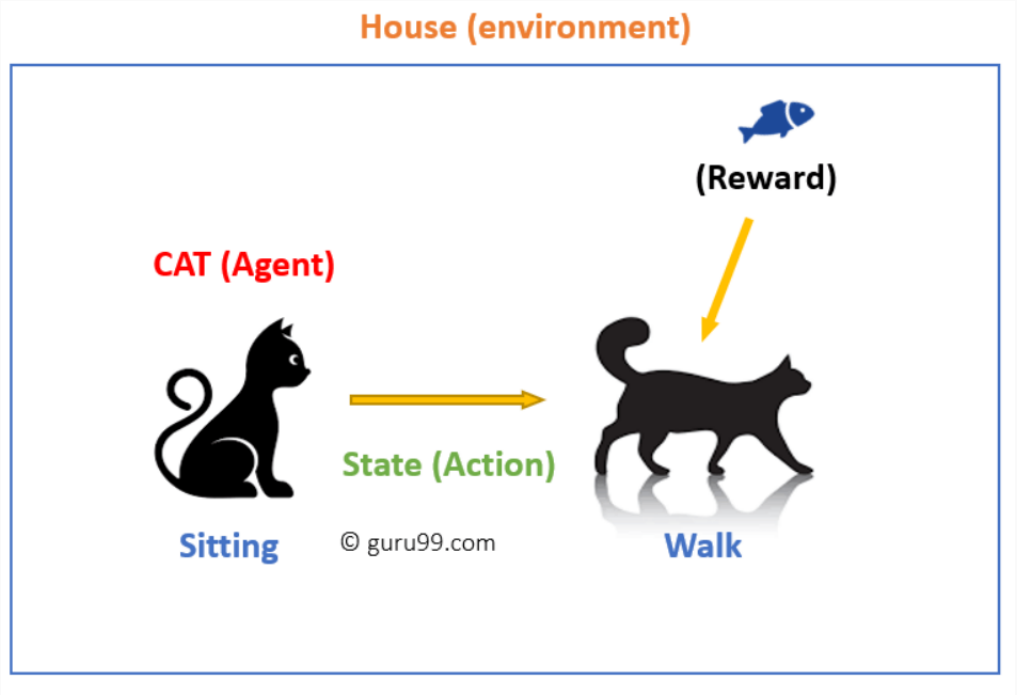
Unsupervised ML Application

- Baby with family dog
- Market basket analysis

Reinforcement Machine Learning i

Reinforcement Machine Learning

- Intelligent agents ought to take actions in an environment in order to maximize the notion of cumulative reward.
- Learns with the process of hit and trial, and based on the experience



Reinforcement ML Application i

Reinforcement ML Application

- Maze or Chess Game

Thank
YOU!