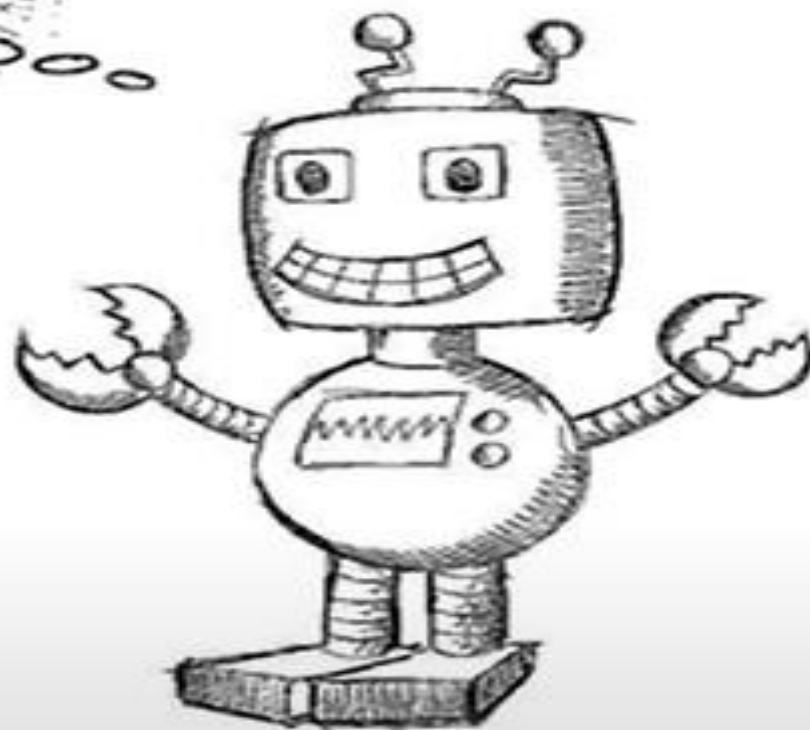


# **Machine Learning Basics**

**BCSE0105: MACHINE LEARNING**



**HUMANS LEARN FROM  
PAST EXPERIENCES**



**MACHINES FOLLOW INSTRUCTIONS  
GIVEN BY HUMANS**



**What if Humans can train the machines to learn from their past data and do what humans can do and much faster**

**This is called machine learning**

**It' s not just learning.**

**It' s also about understanding.**



Data



Cherry

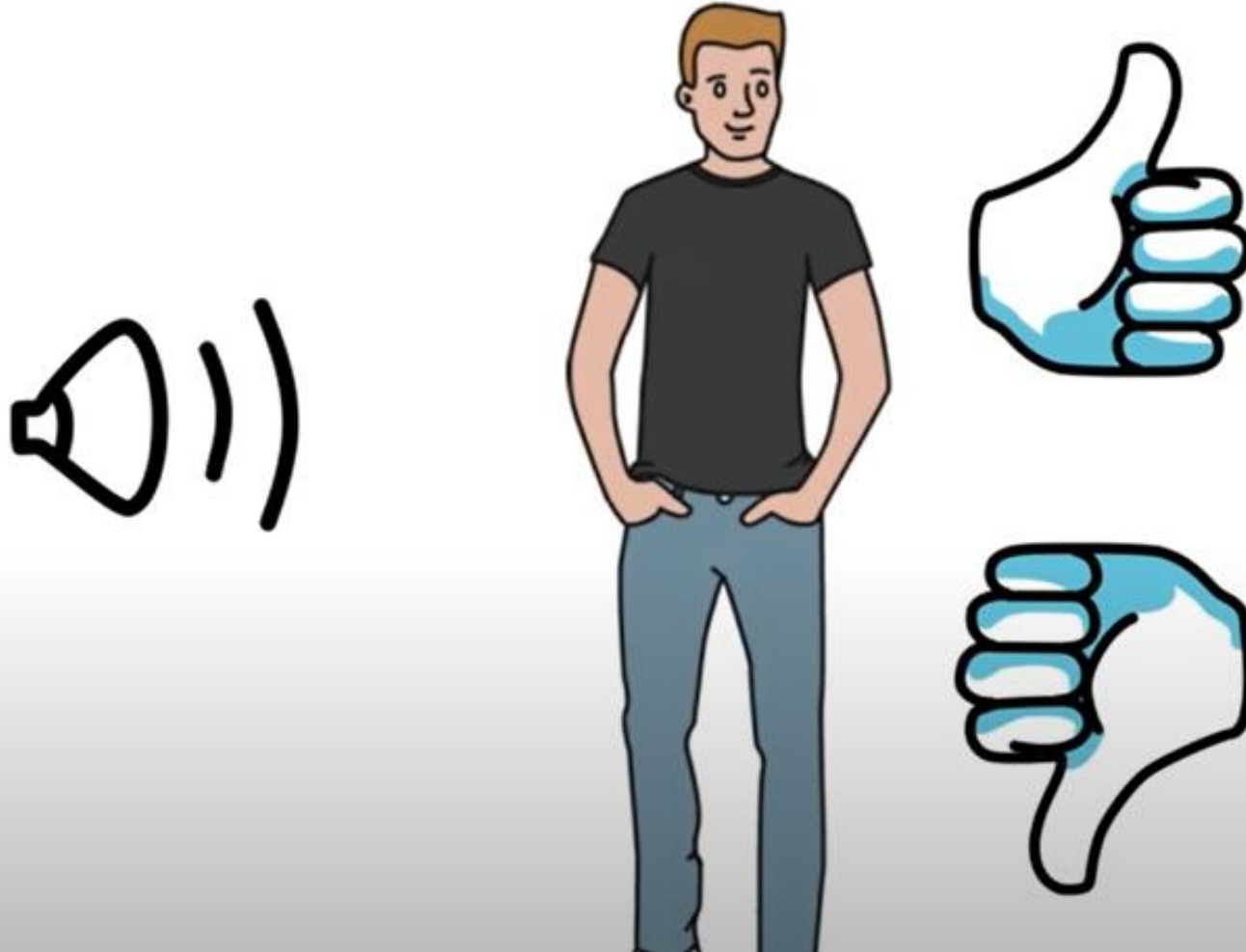


Apple

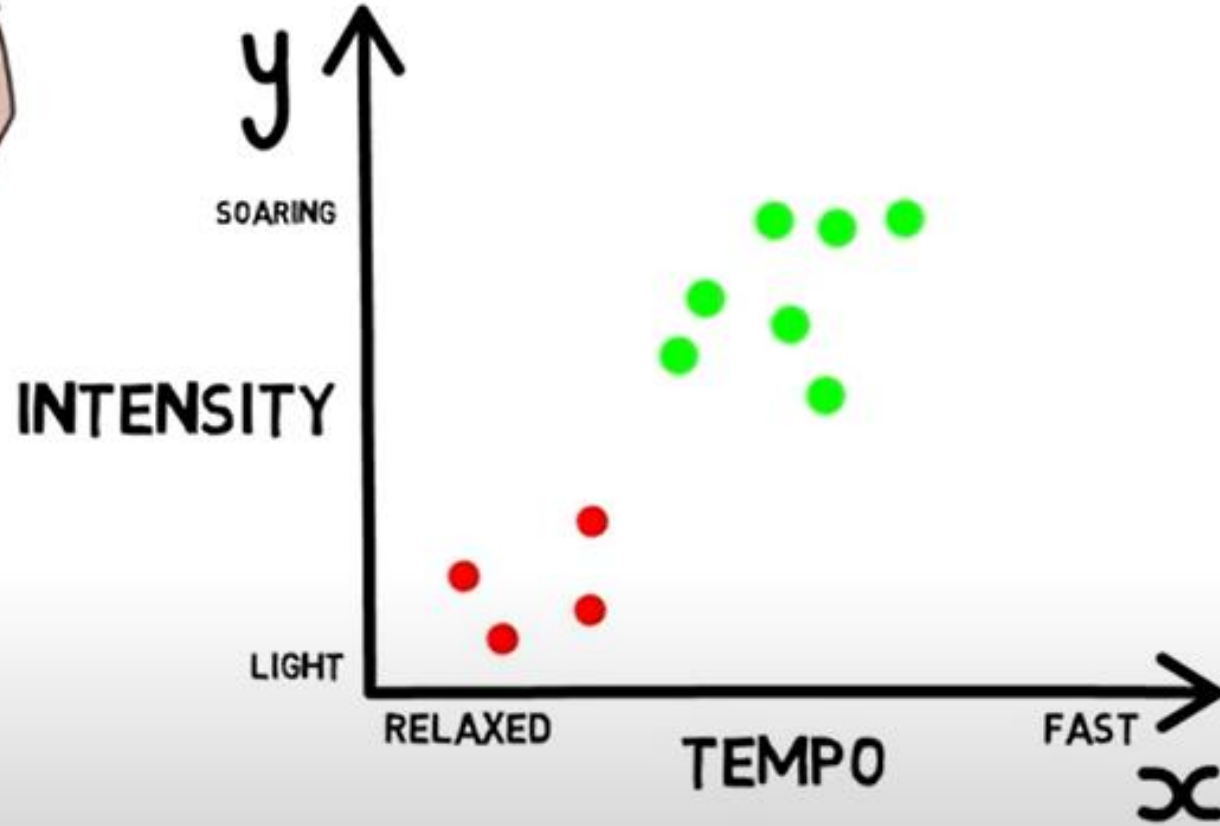


Orange

SUPPOSE PAUL IS LISTENING TO SONGS...



- TEMPO
- GENRE
- INTENSITY
- GENDER OF VOICE

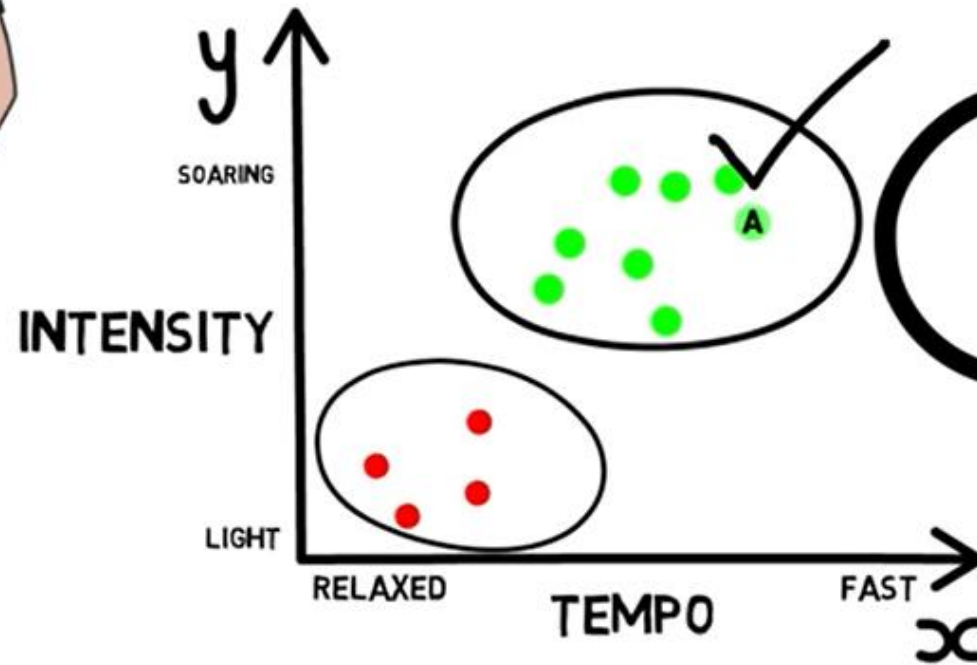




# When Paul Listens to a new song A

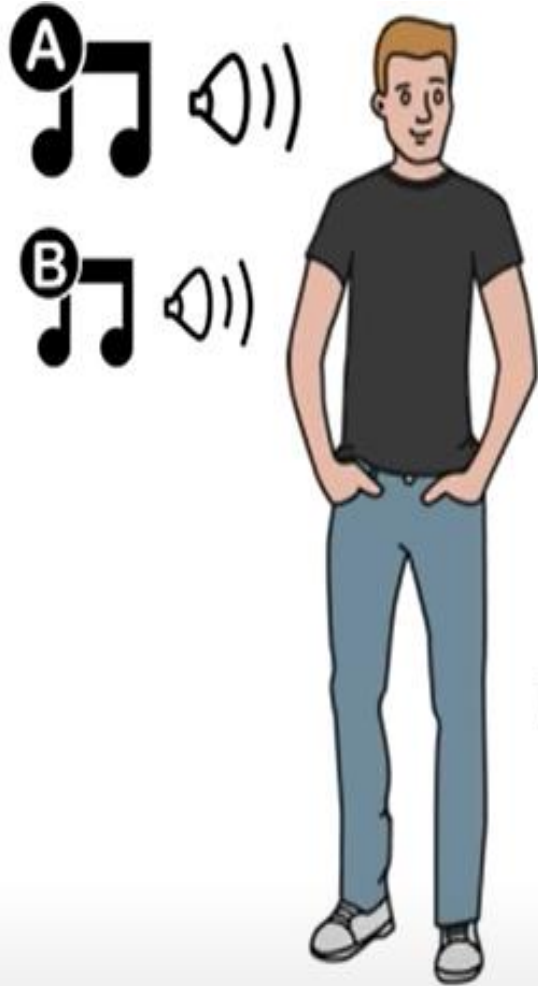


SONG A - FAST TEMPO  
SOARING INTENSITY



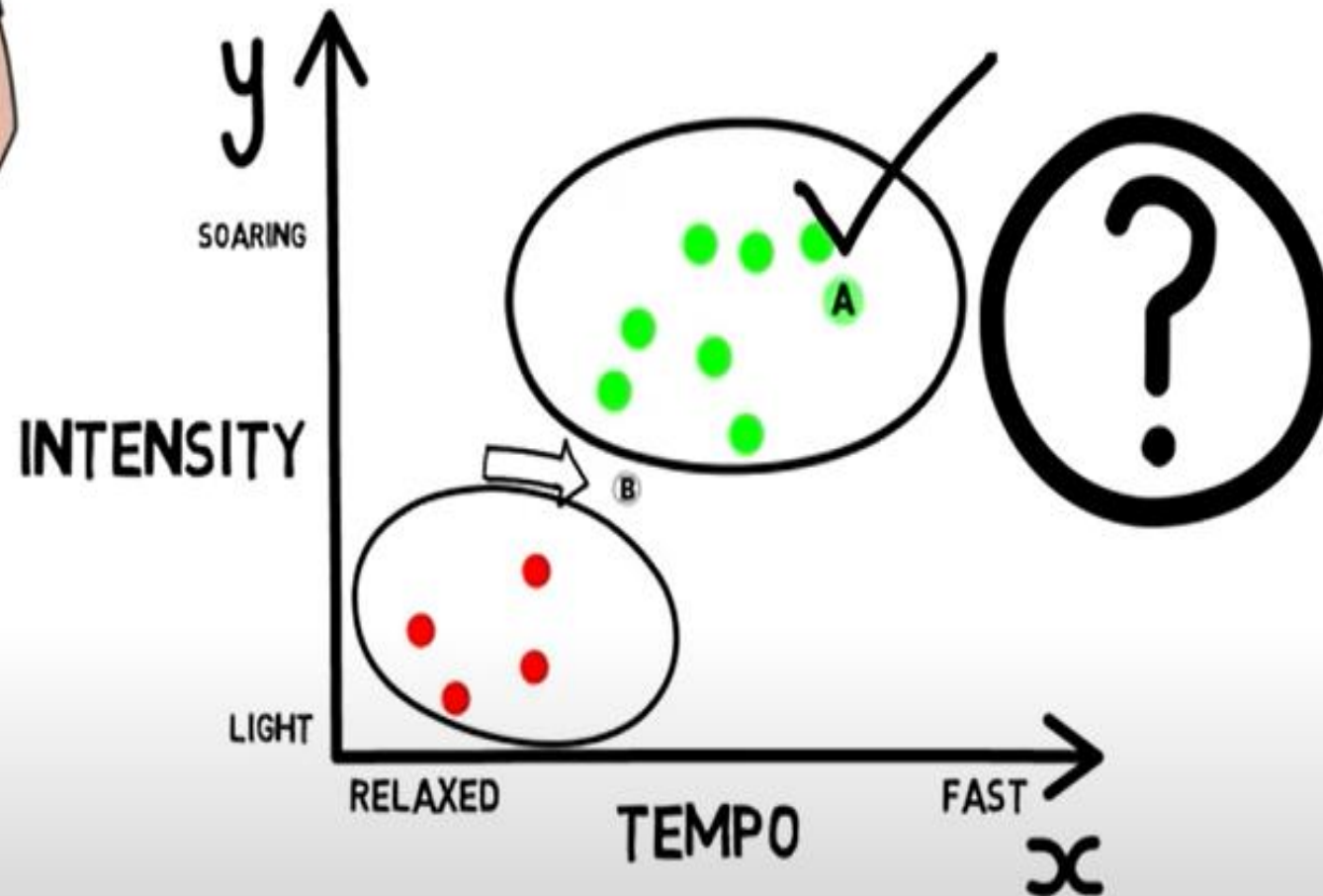
Looking at Paul's past choices we were able to classify the unknown song very easily

# For song B

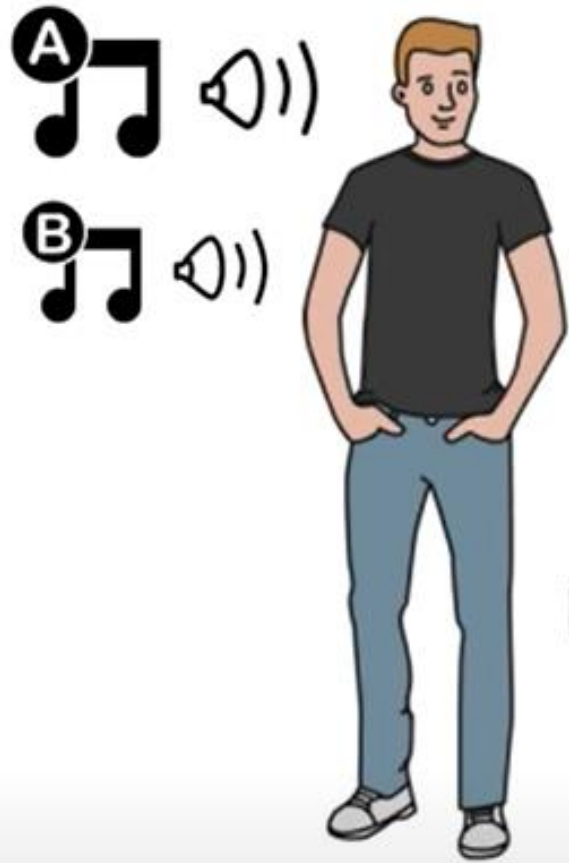


SONG A - FAST TEMPO  
SOARING INTENSITY

SONG B - MEDIUM TEMPO  
MEDIUM INTENSITY

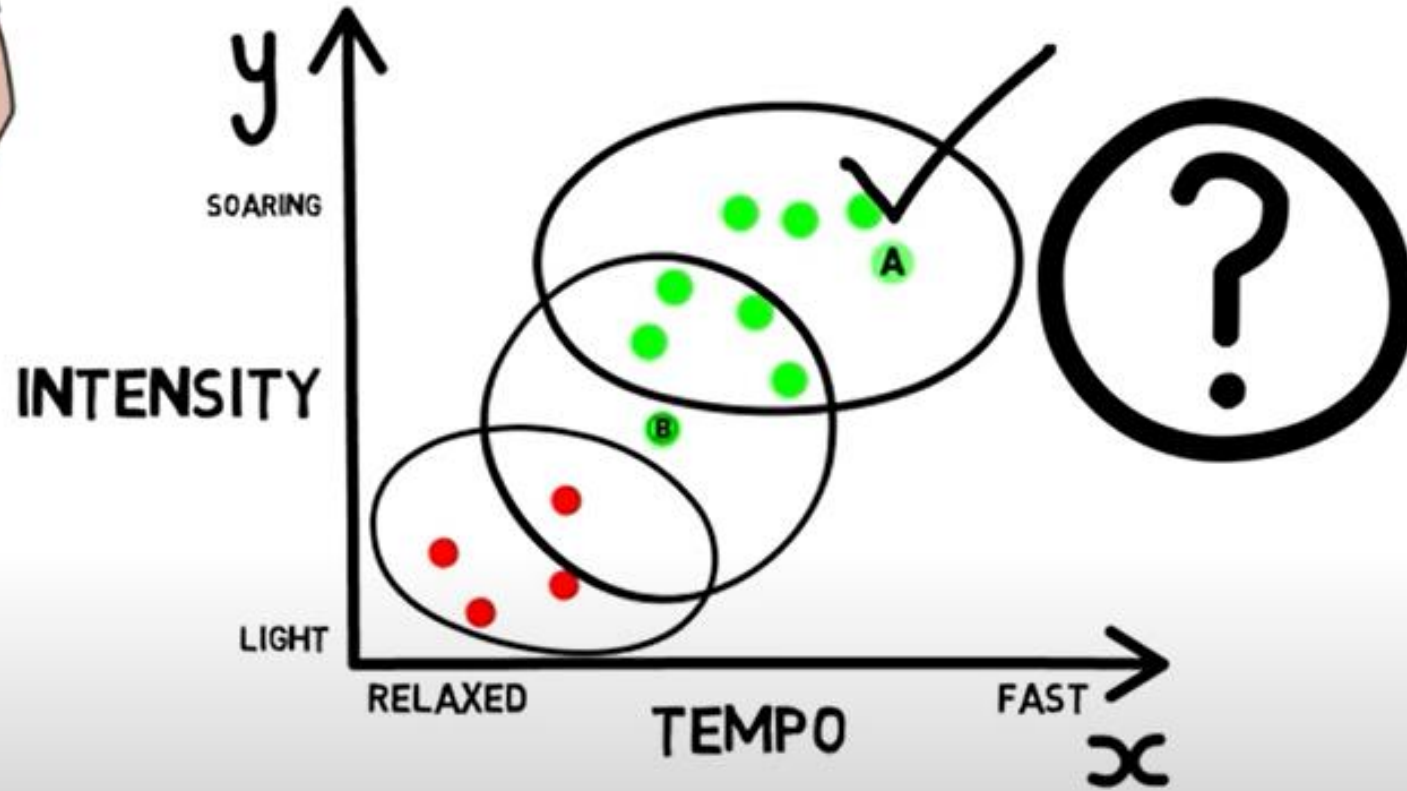


**THATS WHERE MACHINE LEARNING COMES IN...**



SONG A - FAST TEMPO  
SOARING INTENSITY

SONG B - MEDIUM TEMPO  
MEDIUM INTENSITY



K-NEAREST NEIGHBORS ALGORITHM

# Algorithm

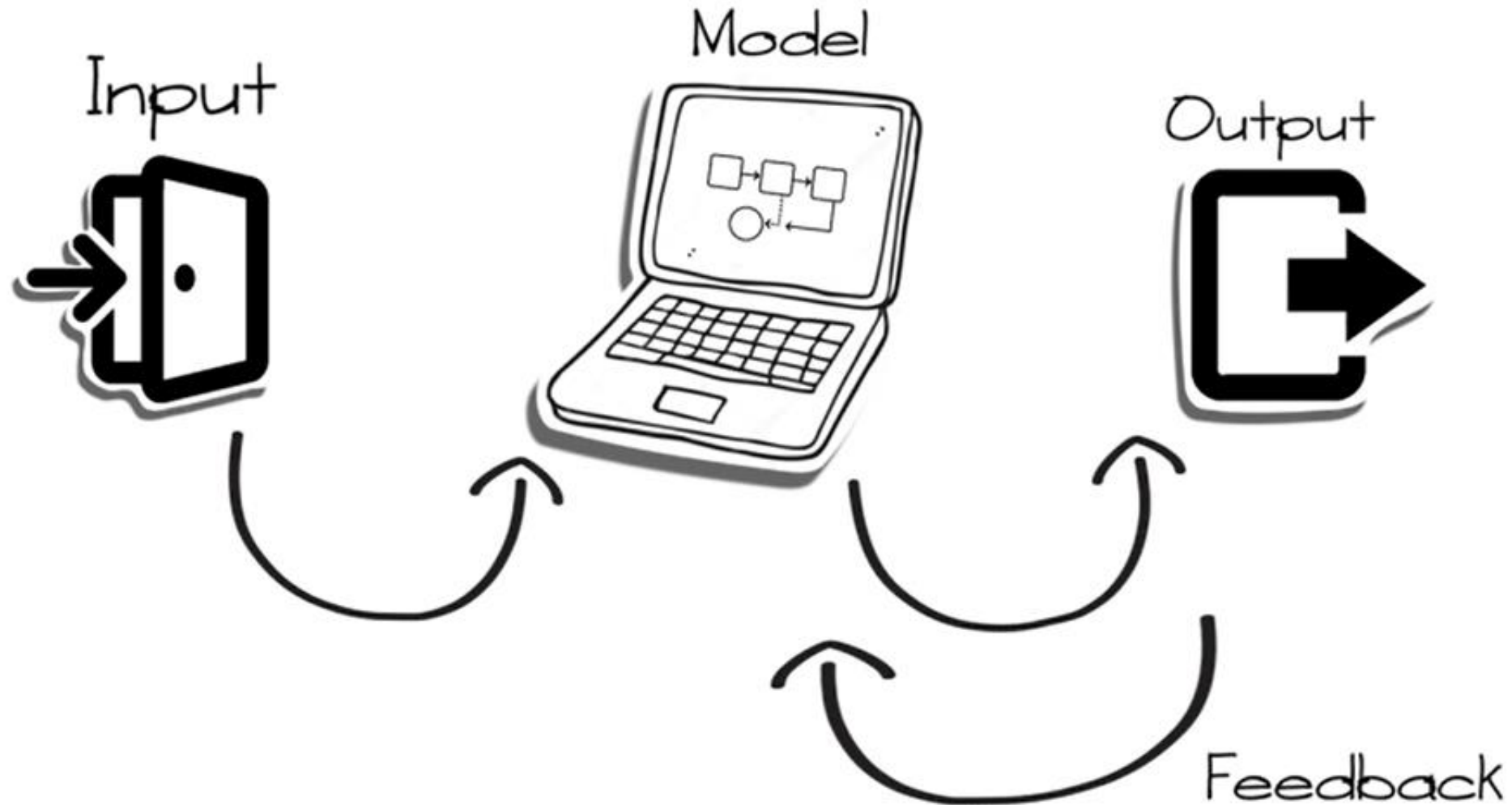
learns the data

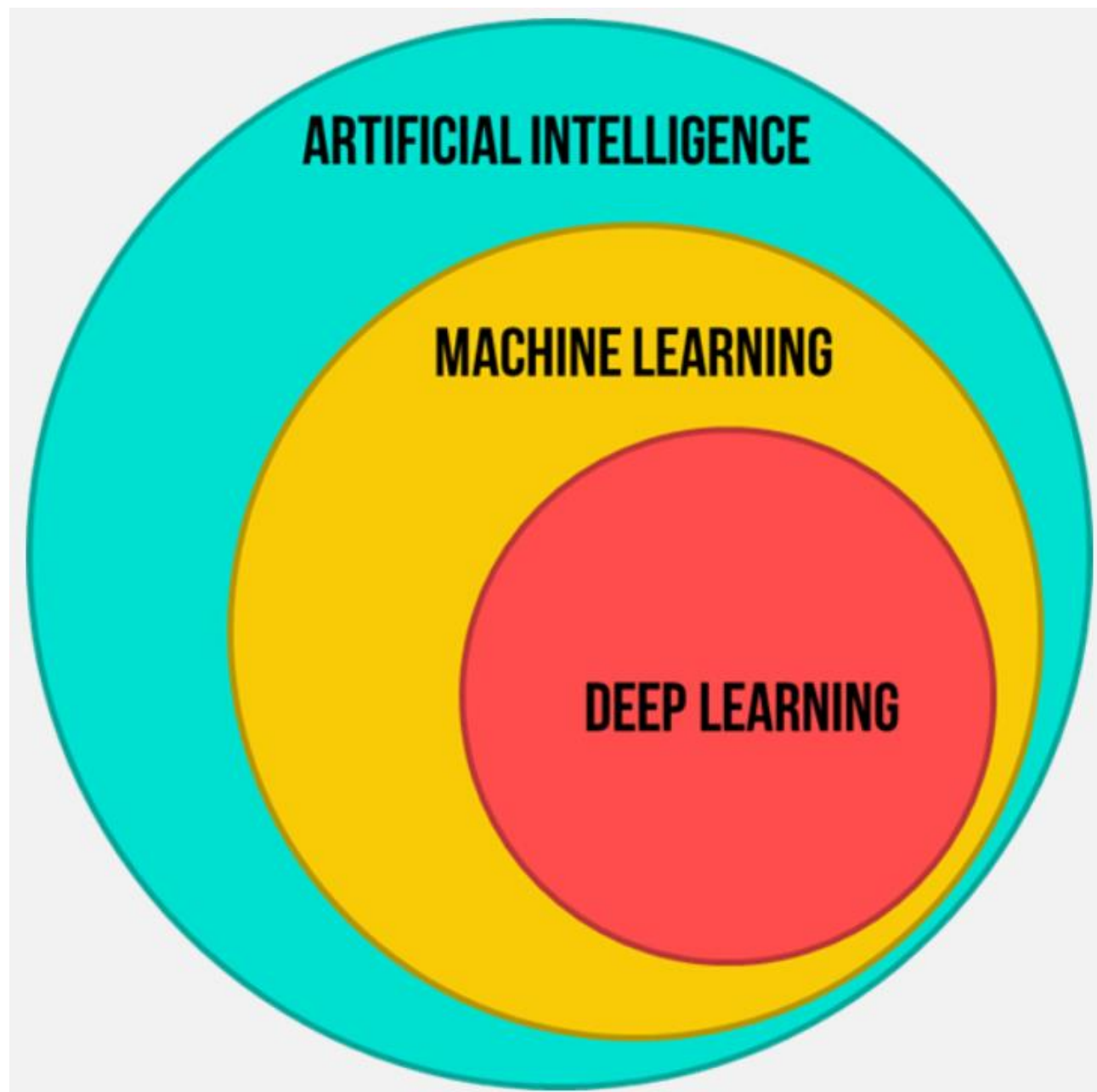
builds the prediction model

when new data comes it will predict for it

**MORE DATA > BETTER MODEL > HIGHER ACCURACY**

# MACHINE LEARNING MODEL







# Artificial Intelligence

Concept of creating intelligent machines that simulates human behaviour

# Machine learning

Subset of **Artificial intelligence** that allows machine to learn from previous data without being explicitly programmed.

# Deep Learning

- Subset of **machine learning** that attempt to simulate the behavior of the human brain—although far from matching its ability—allowing it to “learn” from large amounts of data.
- Deep learning is about computers learning to think using **structures** modeled on the human brain.

# Introduction

- Machine learning is an application of artificial intelligence that involves algorithms and data that automatically analyze and make decision by itself without human intervention.
- It describes how computer perform tasks on their own by previous experiences.

# Introduction

- Machine Learning is defined as a technology that is used to train machines to perform various actions such as predictions, recommendations, estimations, etc., based on historical data or past experience.
- Machine Learning enables computers to behave like human beings by training them with the help of past experience and predicted data.

# Popular Definition

“The field of study that gives computers the ability to learn without being explicitly programmed”. (Arthur Samuel–1959)

“A computer program is said to **learn** from experience  $E$  with respect to some class of tasks  $T$  and performance measure  $P$ , if its performance at tasks in  $T$ , as measured by  $P$ , improves with experience  $E$ .” (Tom Mitchell–1998)

Suppose your email program watches which emails you do or do not mark as spam, and based on that learns how to better filter spam. What is the task  $T$  in this setting?

- ☐ Classifying emails as spam or not spam.
- ☐ Watching you label emails as spam or not spam.
- ☐ The number (or fraction) of emails correctly classified as spam/not spam.
- ☐ None of the above—this is not a machine learning problem.

There are many ways in which the machine learn

Three yellow sticky notes are arranged horizontally. Each note has a black rectangular border and contains text in a handwritten style. The first note on the left says 'Supervised Learning', the middle note says 'Unsupervised Learning', and the third note on the right says 'Reinforcement Learning'.

Supervised  
Learning

Unsupervised  
Learning

Reinforcement  
Learning



# Supervised Learning

*Supervised learning is a method in which we teach the machine using labelled data*



# Problem types in Supervised learning

- Classification (predicting a class or label)

Eg. Spam mails



- Regression (predicting a continuous quantity)

Eg. Height and weight

Eg. Housing Price Prediction



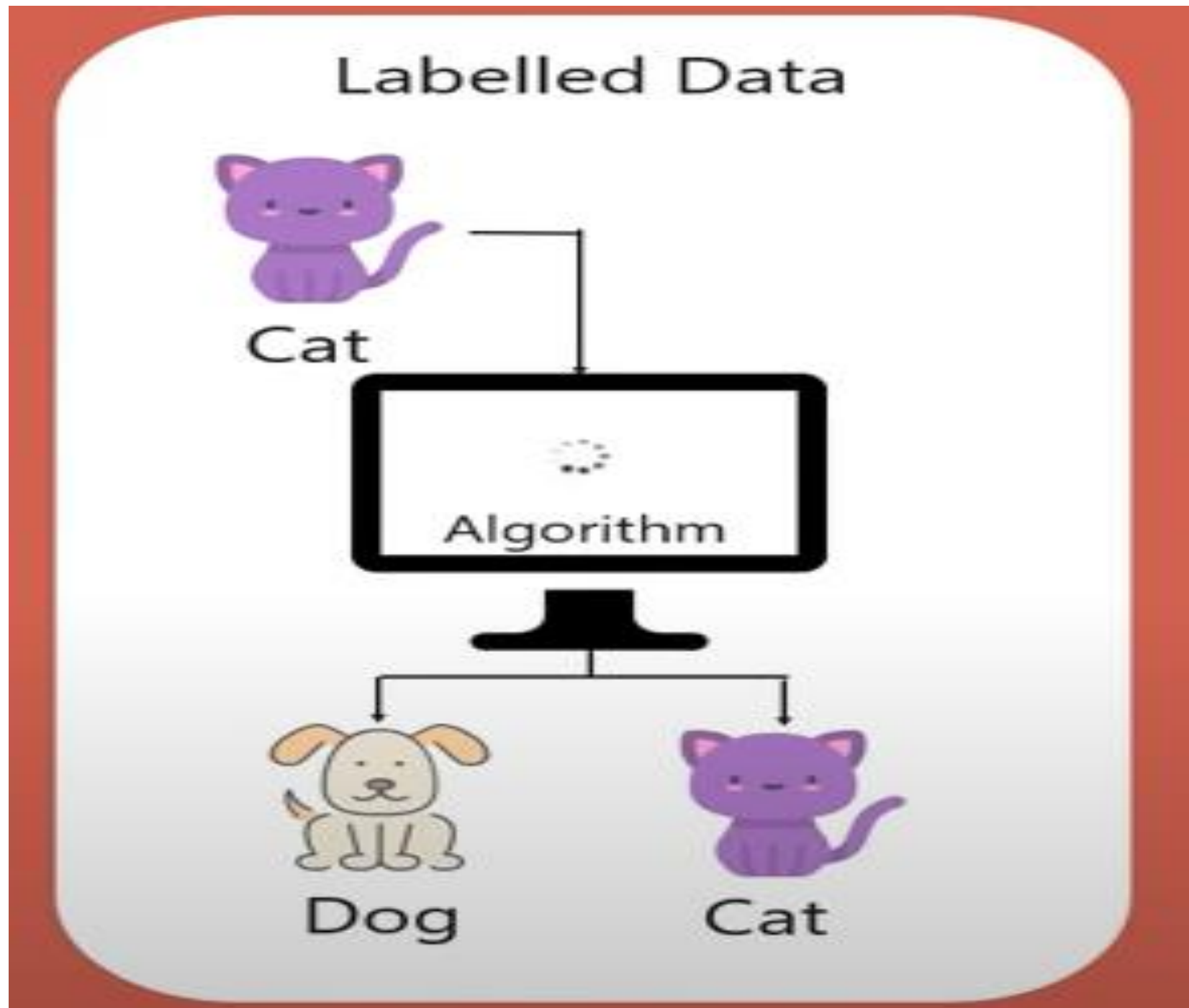
Problem 1: You have a large inventory of identical items. You want to predict how many of these items will sell over the next 3 months.

Problem 2: You'd like software to examine individual customer accounts, and for each account decide if it has been hacked/compromised.

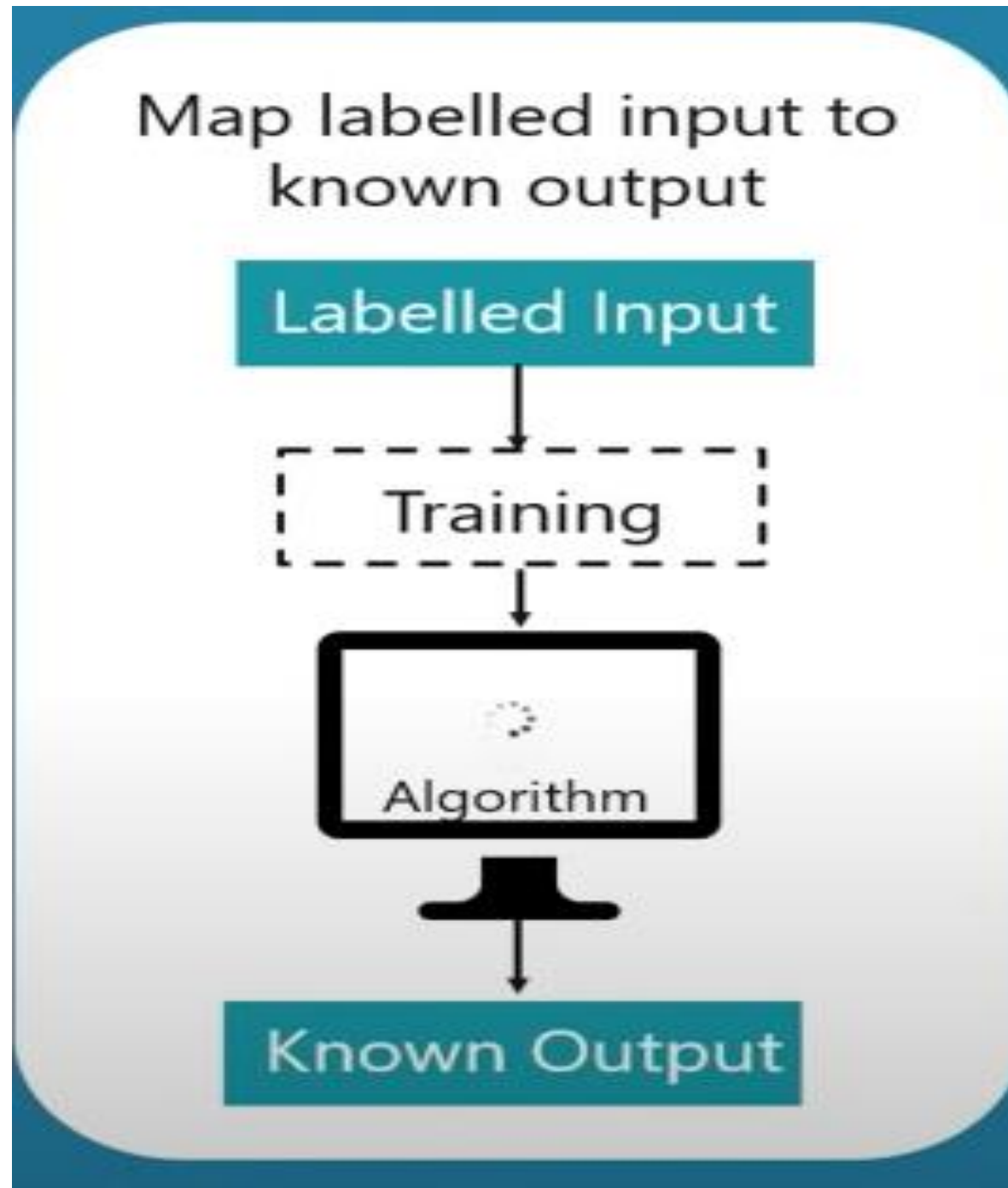
Should you treat these as classification or as regression problems?

- ☐ Treat both as classification problems.
- ☐ Treat problem 1 as a classification problem, problem 2 as a regression problem.
- ☐ Treat problem 1 as a regression problem, problem 2 as a classification problem.
- ☐ Treat both as regression problems.

# Type of data in Supervised Learning



# Approach for Supervised Learning



# Popular Supervised Learning Algorithms

Linear Regression

Logistic Regression

Support Vector  
Machine

K Nearest  
Neighbour

Random Forest



# Unsupervised Learning

*In unsupervised learning  
the machine is trained on  
unlabelled data without  
any guidance*



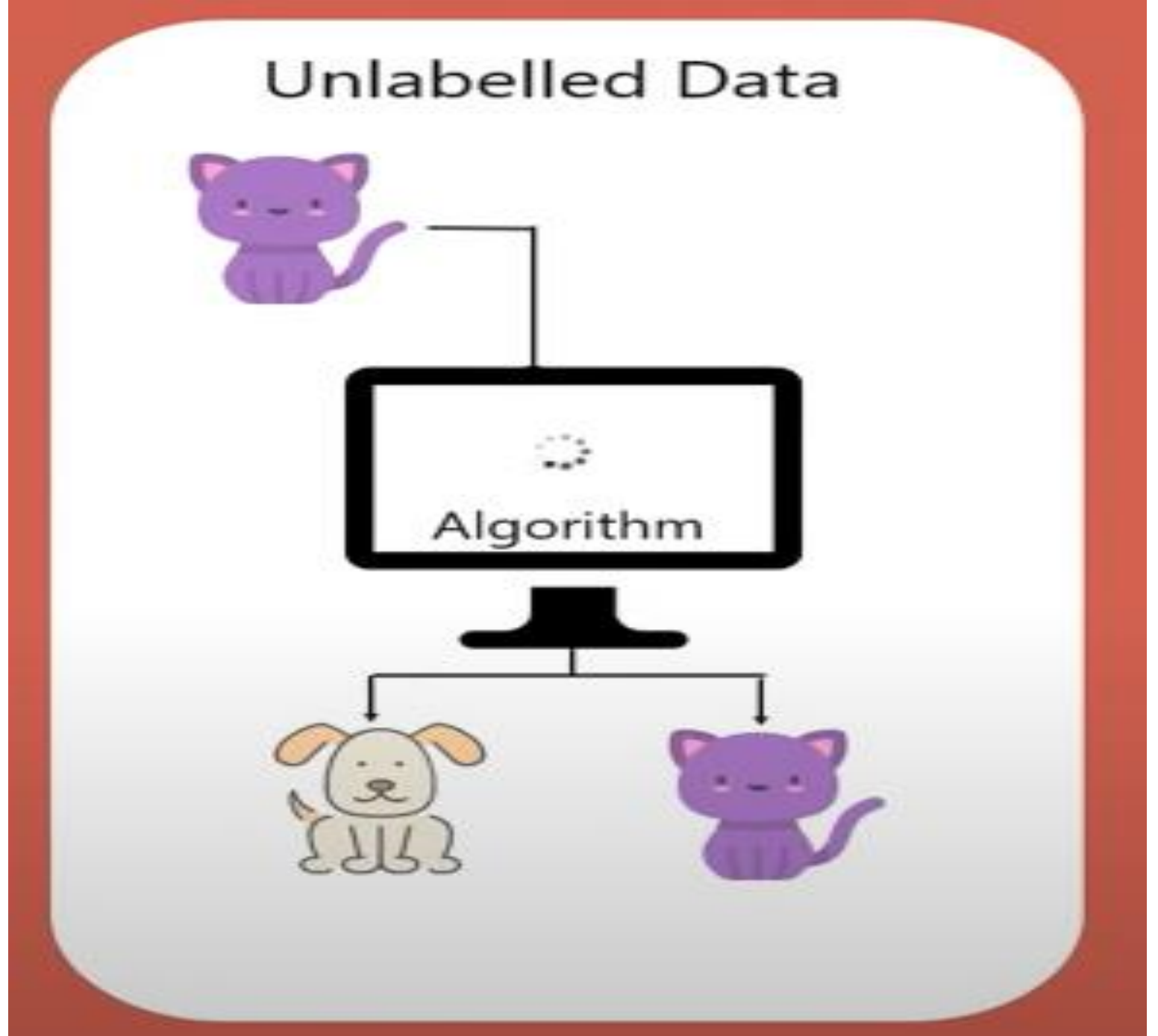
# Problem types in Unsupervised learning

- **Association**
  - Eg. Bread and Jam
- **Clustering**
  - Eg. Anomaly Detection

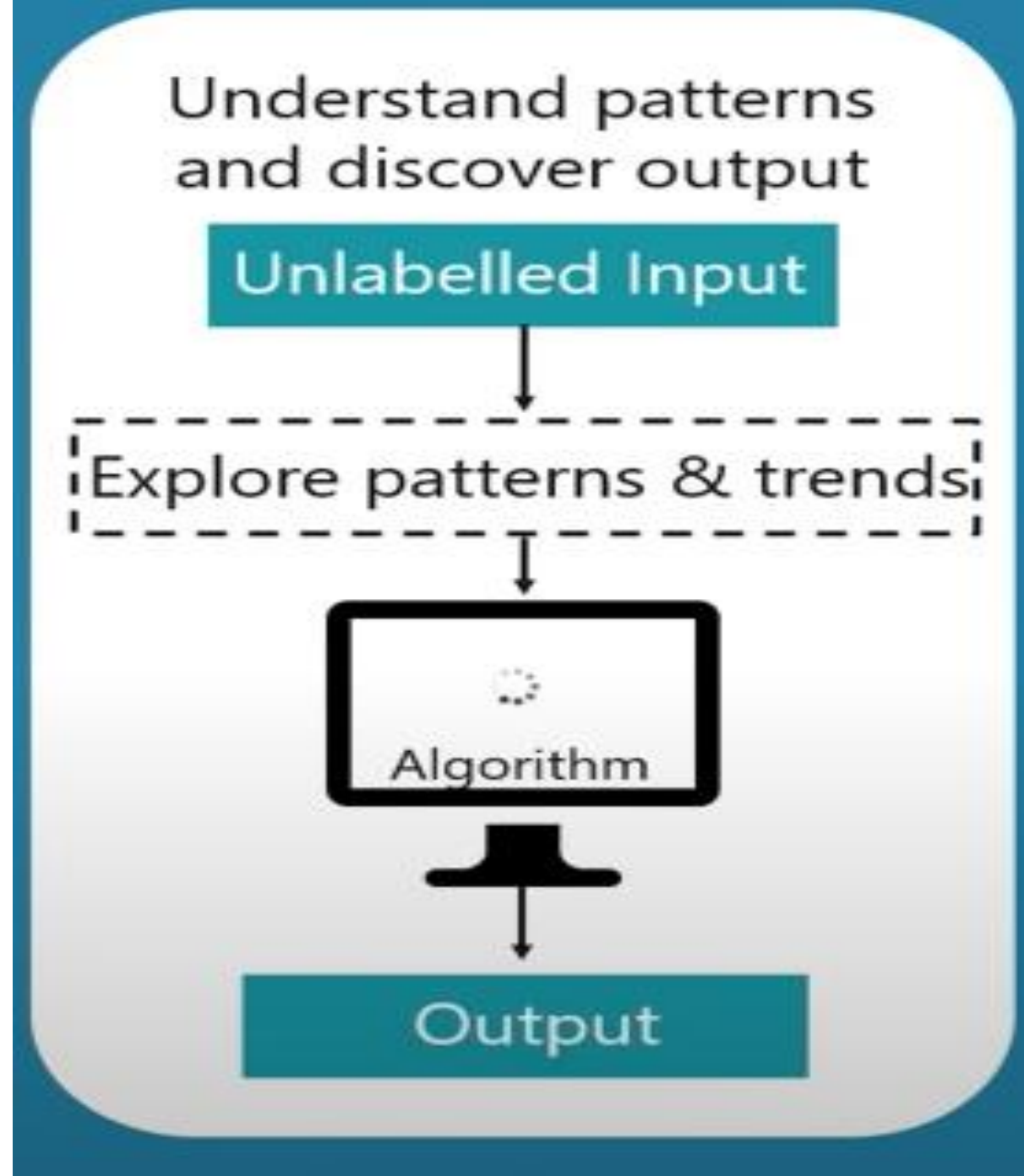




Type of  
data in  
**Unsupervised  
Learning**



# Approach for Unsupervised Learning



# Popular Unsupervised Algorithm

K- Means

Apriori

C- Means

# Find supervised and unsupervised

- ☐ Given email labeled as spam/not spam, learn a spam filter.
- ☐ Given a set of news articles found on the web, group them into set of articles about the same story.
- ☐ Given a database of customer data, automatically discover market segments and group customers into different market segments.
- ☐ Given a dataset of patients diagnosed as either having diabetes or not, learn to classify new patients as having diabetes or not.

# Machine Learning Applications

- Traffic prediction
- Online Transportation
- Social media services
- Virtual Personal Assistant
- Product Recommendation
- Email spam and malware filtering
- Natural language processing
- Biometrics

**HEALTHCARE**



**SENTIMENT  
ANALYSIS**



**FRAUD  
DETECTION**



**E-COMMERCE**



# Natural Language Processing

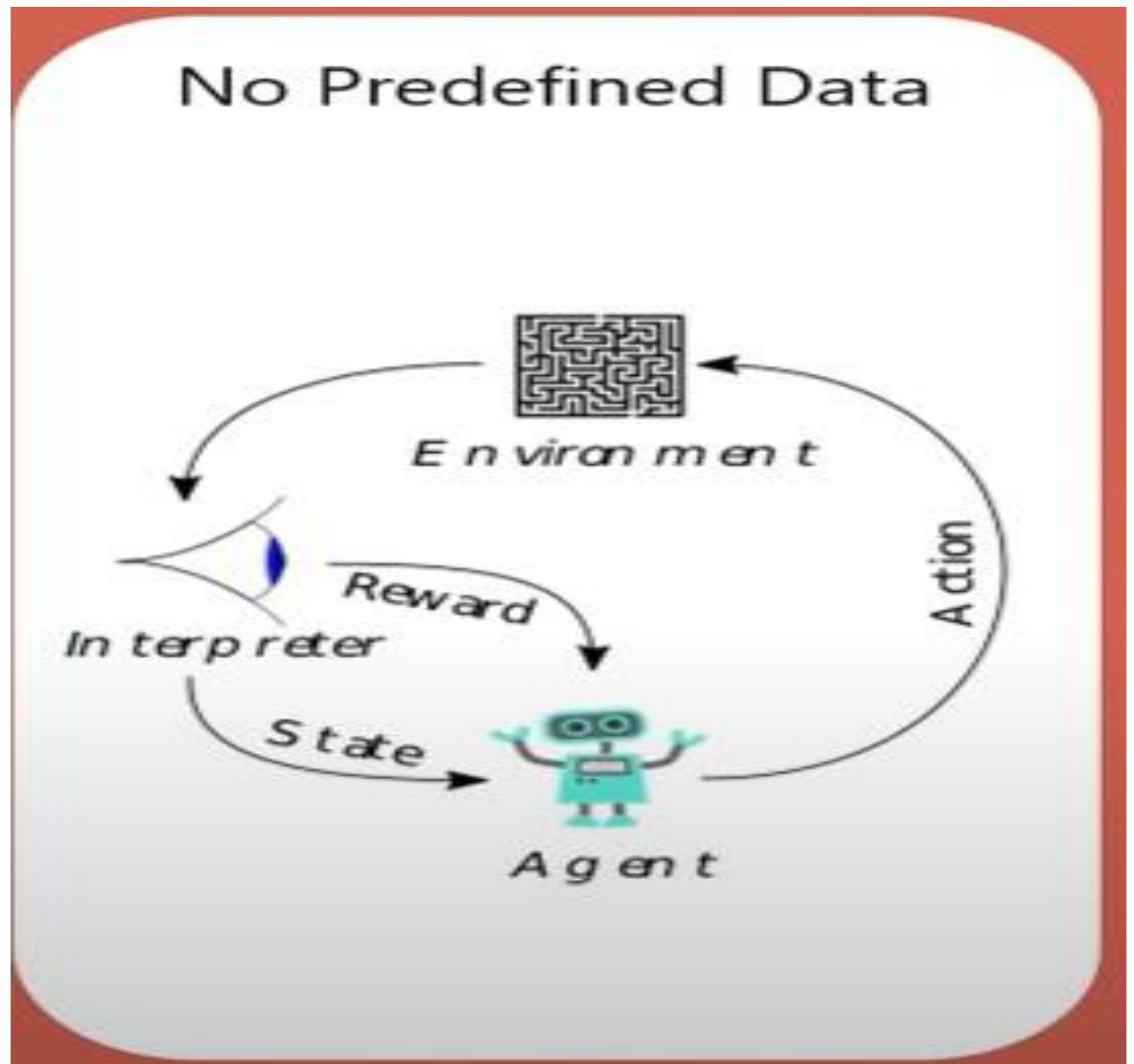


# Reinforcement Learning

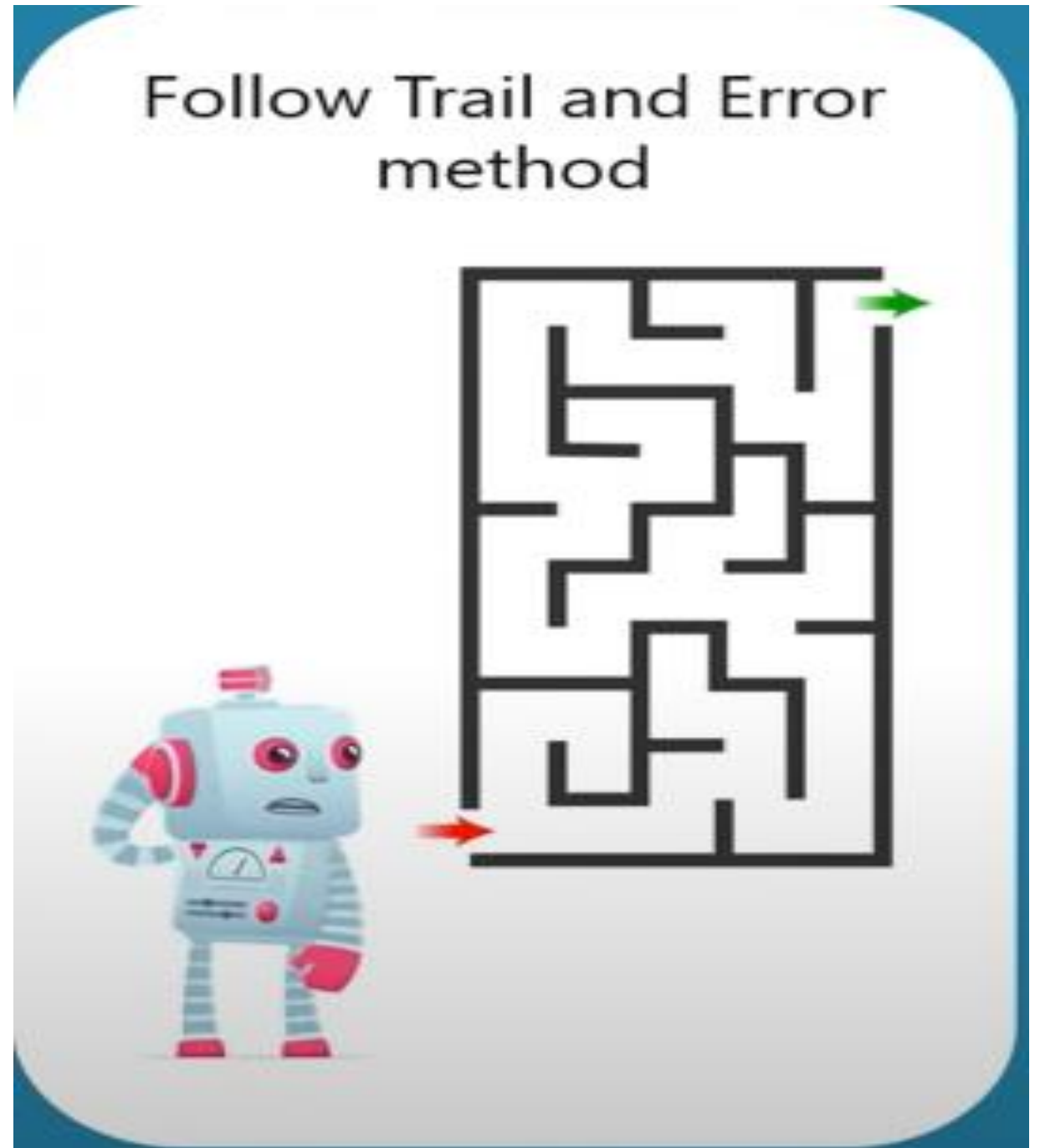
*In Reinforcement learning  
an agent interacts with its  
environment by producing  
actions & discovers errors  
or rewards*



Type of  
data in  
**Reinforcement  
Learning**



# Approach for Reinforcement Learning



# Applications of Reinforcement Learning

- trading and finance
- self-driving cars
- gaming

# Popular Reinforcement Learning

Q- Learning

SARSA

# Advantages of ML

- Fast, Accurate, Efficient.
- Automation of most applications.
- Wide range of real life applications.
- Enhanced cyber security and spam detection.
- No human Intervention is needed.
- Handling multi dimensional data.

# Disadvantages of ML

- Data Acquisition.
- Interpretation of results requires more time and space.
- Difficult to identify and rectify the errors.