



**SNS COLLEGE OF ENGINEERING**

**Kurumbapalayam(Po), Coimbatore – 641 107**

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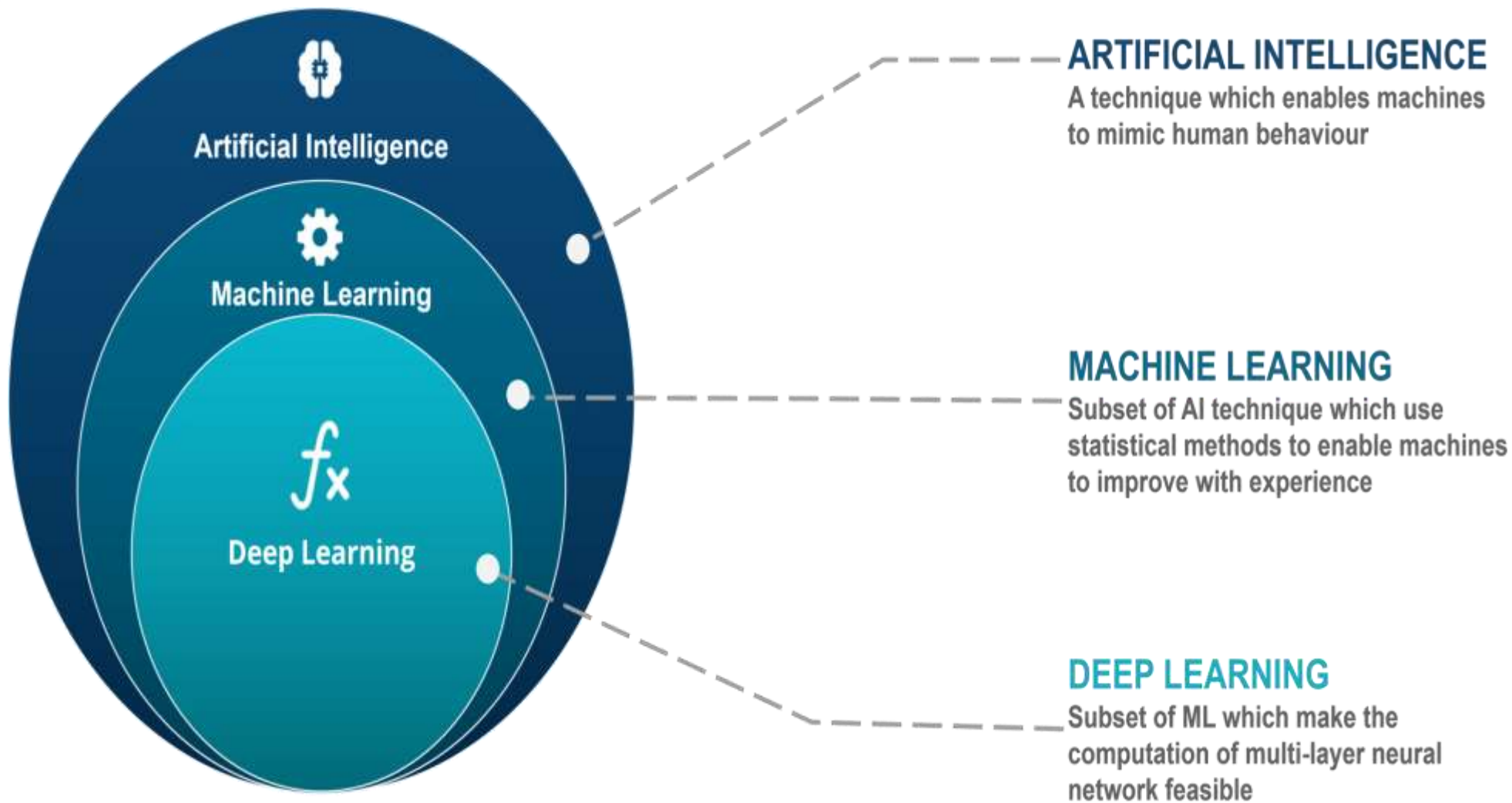
**Mrs. N.Padmashri/Assistant Professor**

**DEPARTMENT OF ARTIFICIAL INTELLIGENCE & DATASCIENCE**





# An Overview of ML



**Human**

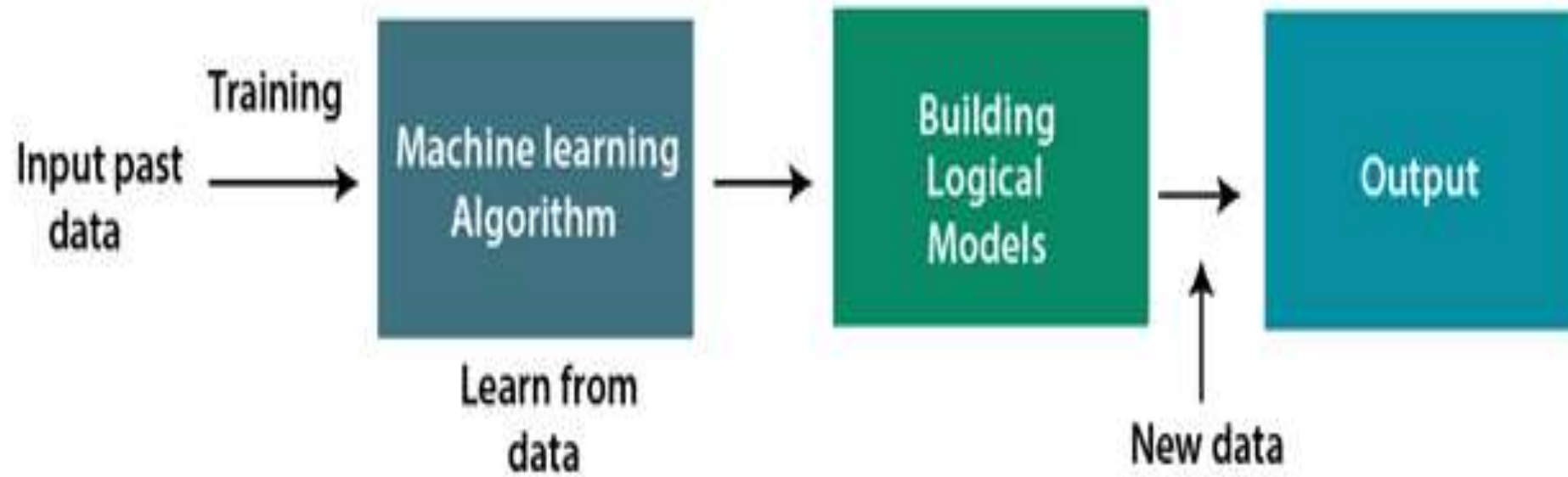


I can learn everything automatically from experiences.  
Can u learn?

**Machine**



Yes, I can also learn from past data with the help of Machine learning





## Scenario 1: Playing chess with computer



## Scenario 2: Smart Air Conditioner



**Smart Saving**  
Saves up to 63% on your electricity bill



**Smart Remote**  
Turns your mobile into a remote for convenient access



**Smart Sense**  
Senses ambient temperature & suggests the best mode

**VOLTAS** all weather™  
smart AC 



# Scenario 3: Self Driving Car





# Scenario 4: Smart Devices





## Scenario 5: Robot





# Traditional Programming





# Definitions Of Machine Learning

*Learning happens with experience....*



- **Machine learning is an application of artificial intelligence (AI) that provides systems the ability to automatically learn and improve from experience without being explicitly programmed.**
- **Machine learning focuses on the development of computer programs that can access data and use it learn for themselves.**
- **The primary aim is to allow the computers learn automatically without human intervention or assistance and adjust actions accordingly.**



## Formal Definition

### **T. Mitchell: Well posed machine learning**

**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  $E$ .**



## Example 1: A Chess Learning Problem

Task  $T$  : playing chess

Performance Measure  $P$  : percent of games won against  
opponents

Training Experience  $E$  : playing practice games against itself



## Example 2: Autonomous Vehicle Problem

- Task T** : driving on a public highway/roads using vision sensors
- Performance Measure P**: percentage of time the vehicle is involved in an accident
- Training Experience E** : a sequence of images and steering commands recorded while observing a human driver





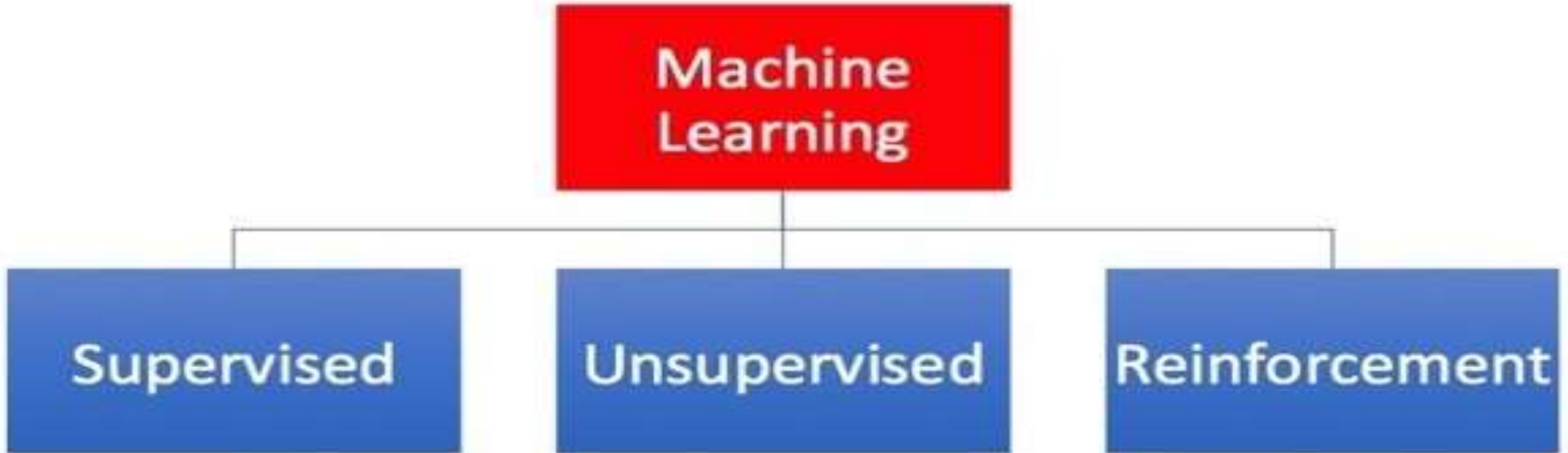
## Example 3: A Handwriting Recognition Learning Problem:

**Task T** : recognizing and classifying handwritten words within images

**Performance measure P** : percent of words correctly classified

**Training experience E** : a database of handwritten words with given classifications

# Types of Machine Learning



Task Driven  
(Predict next value)



Data Driven  
(Identify Clusters)



Learn from  
Mistakes



# Types of Machine Learning

## Supervised Learning



### Classification

- Fraud detection
- Email Spam Detection
- Diagnostics
- Image Classification

### Regression

- Risk Assessment
- Score Prediction

## Unsupervised Learning



### Dimensionality Reduction

- Text Mining
- Face Recognition
- Big Data Visualization
- Image Recognition

### Clustering

- Biology
- City Planning
- Targetted Marketing

## Reinforcement Learning



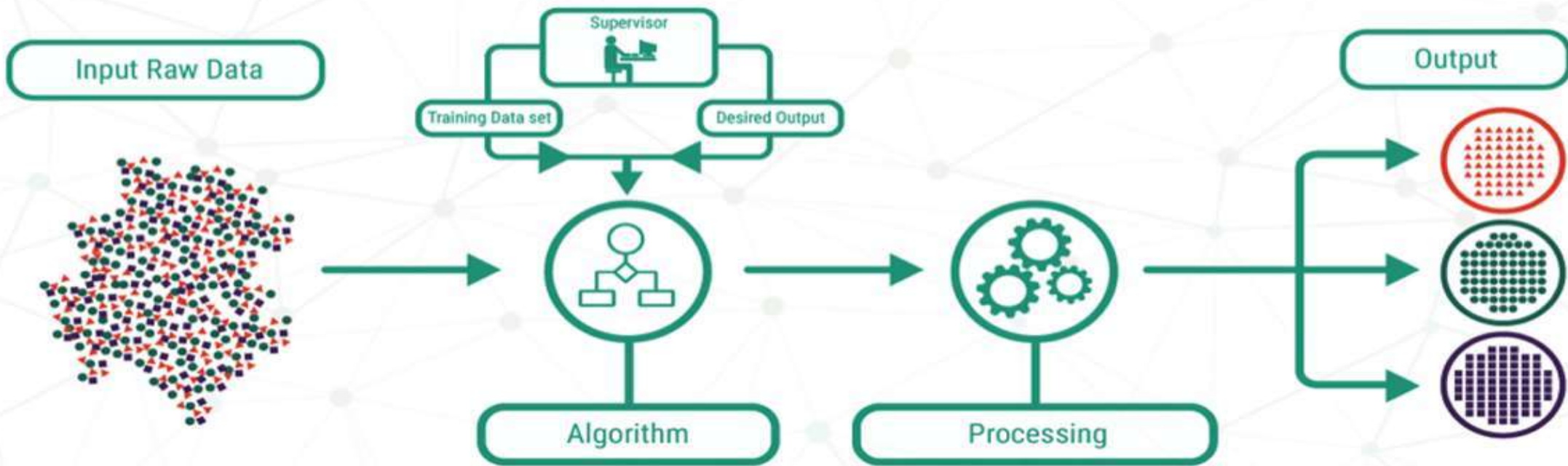
- Gaming
- Finance Sector
- Manufacturing
- Inventory Management
- Robot Navigation



# Supervised Learning

- **Most popular paradigm for machine learning.**
- **Easiest to understand and the simplest to implement.**
- **Example : Teaching a child with the use of flash cards**
  
- **In Supervised Learning, the dataset on which we train our model is labeled. There is a clear and distinct mapping of input and output. Based on the example inputs, the model is able to get trained in the instances**
  
- **Task-oriented as highly focused on a singular task.**
  
- **Feeding more and more examples to the algorithm until it can accurately perform on that task.**

# Supervised Learning





# TYPES OF SUPERVISED LEARNING

- Supervised learning can be grouped further in to two categories of algorithms:
  - Classification
  - Regression
- The main goal of the supervised learning technique is to map the input variable( $x$ ) with the output variable( $y$ ).
- Classification
  - Classification algorithms are used to solve the classification problems in which the output variable is categorical, such as "Yes" or No, Male or Female, Red or Blue, etc.



# Classification algorithms

➤ The classification algorithms predict the categories present in the dataset. Some real-world examples of classification algorithms are Spam Detection, Email filtering, etc.

Some popular classification algorithms are given below:

- Random Forest Algorithm
- Decision Tree Algorithm
- Logistic Regression Algorithm
- Support Vector Machine Algorithm



## Regression algorithms

- Regression
  - Regression algorithms are used to solve regression problems in which there is a linear relationship between input and output variables.
  - These are used to predict continuous output variables, such as market trends, weather prediction, etc.

Some popular Regression algorithms are given below:

- Simple Linear Regression Algorithm
- Multivariate Regression Algorithm
- Decision Tree Algorithm
- Lasso Regression



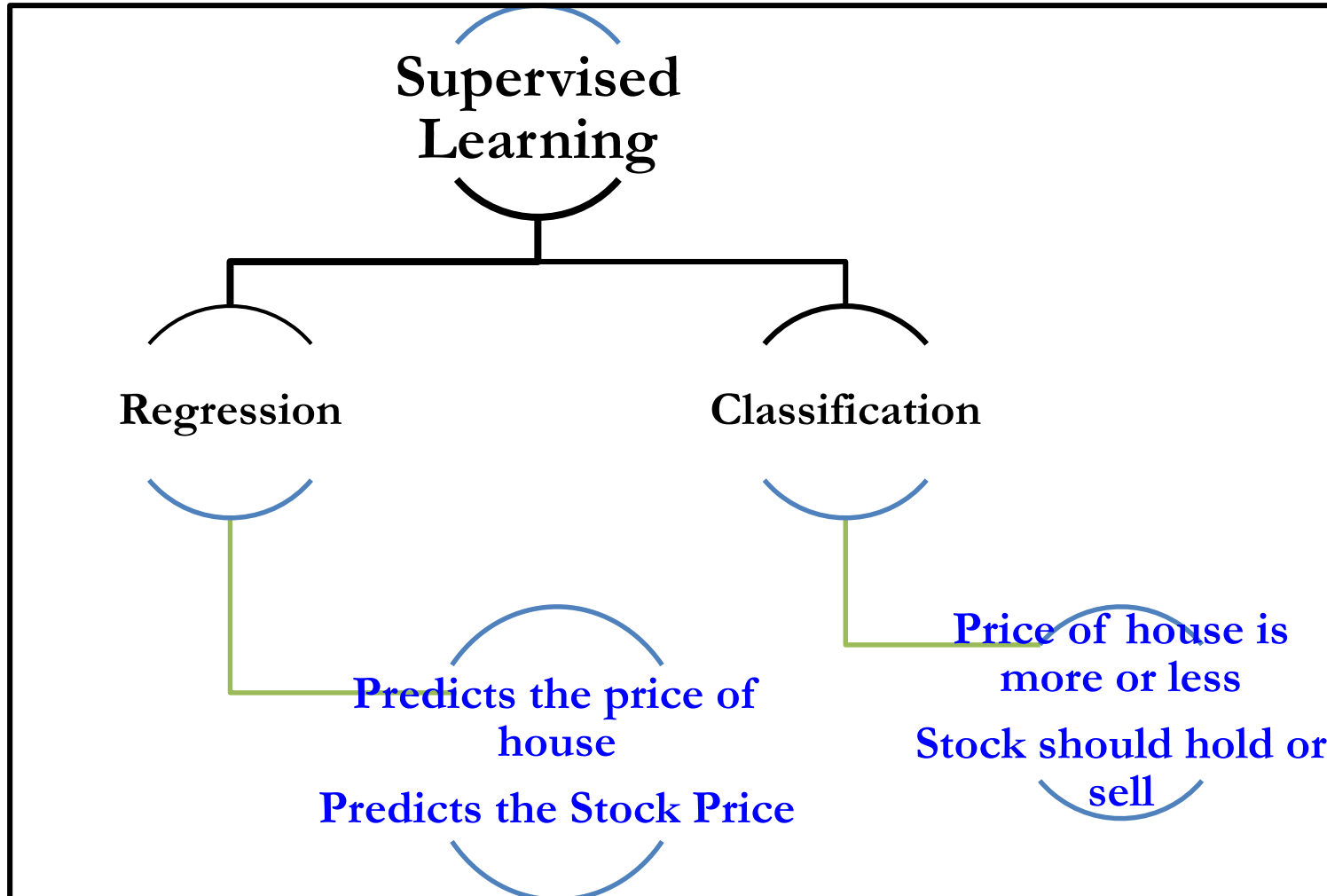


# Supervised Learning Examples

- ✓ Predicting price of a stock
- ✓ Predicting performance of a sportsman
- ✓ Image Segmentation
- ✓ Medical Diagnosis
- ✓ Fraud Detection
- ✓ Spam detection
- ✓ Speech Recognition



# Supervised Learning: Sub Classification

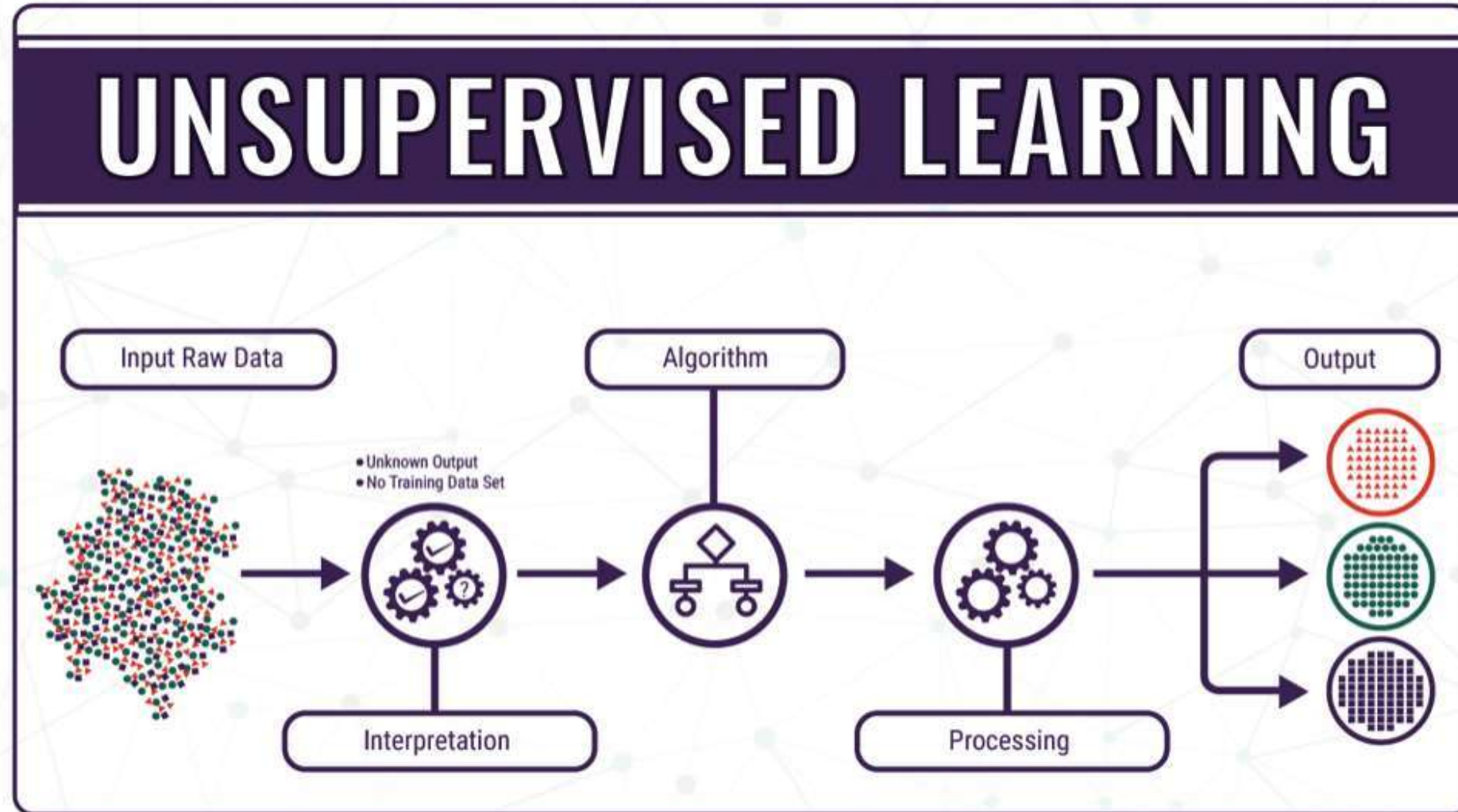




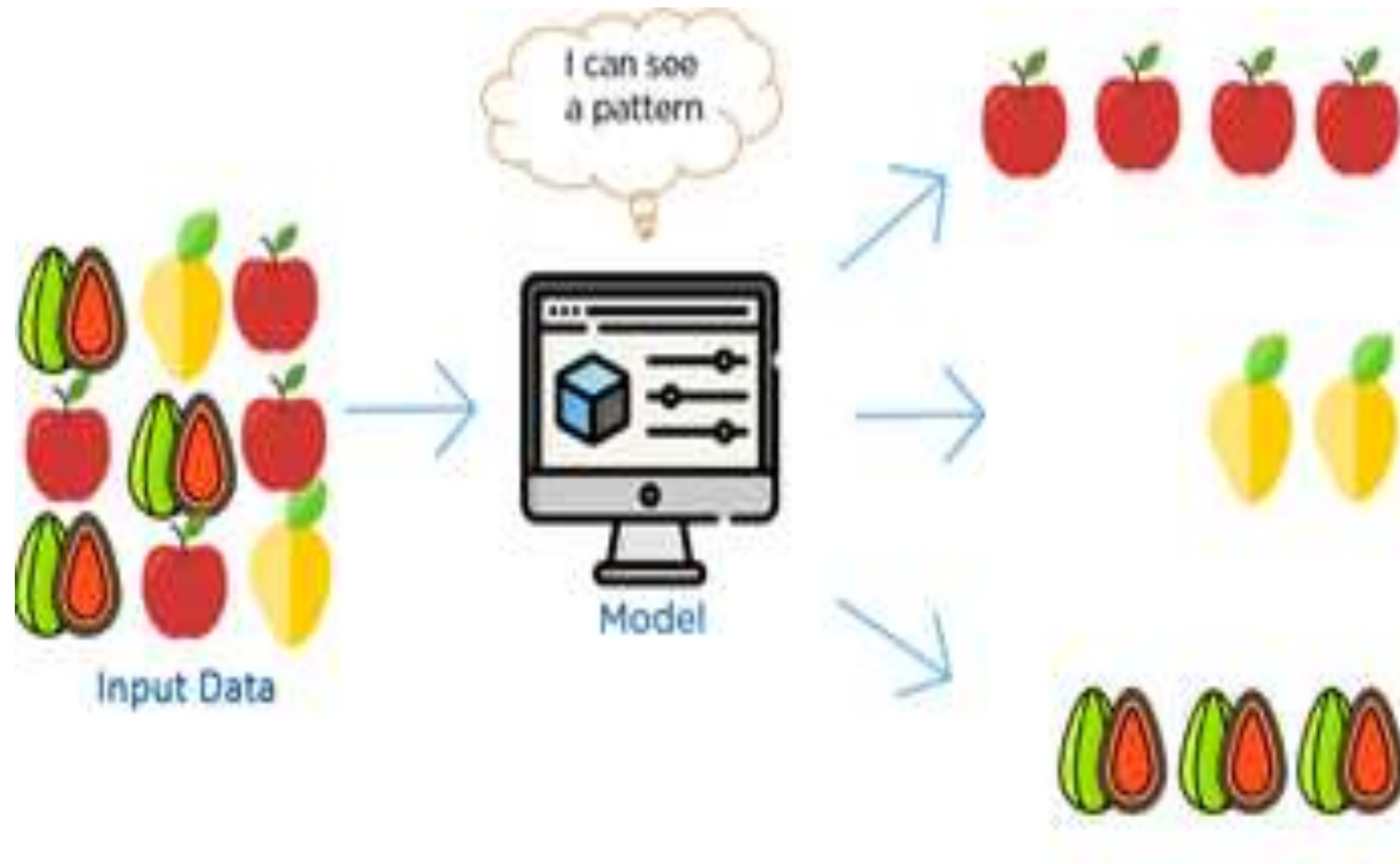
# UnSupervised Learning

- The machine is trained using the **unlabeled dataset**, and the machine predicts the output without any supervision.
- In unsupervised learning, the models are trained with the data that is neither classified nor labelled, and the model acts on that data **without any supervision**.
- The main aim of the unsupervised learning algorithm is to group or categories the **unsorted dataset according to the similarities, patterns, and differences**.
- Machines are instructed to find the hidden patterns from the input dataset.
- So, now the machine will discover its patterns and differences, such as colour difference, shape difference, and predict the output when it is tested with the test dataset.







# UNSUPERVISED LEARNING



# Unsupervised Learning



Input	Current Clusters	New clusters	Parameter/ Criteria
	<p>{ }</p>		<p>Color=Green</p>

Input	Current Clusters	New clusters	Parameter/ Criteria
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		 	<p>color</p>

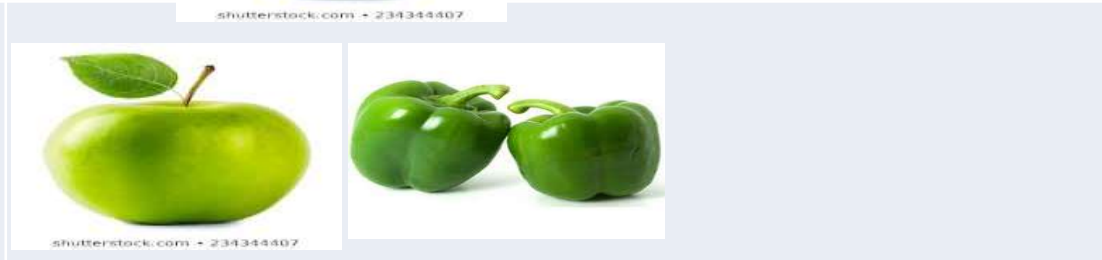
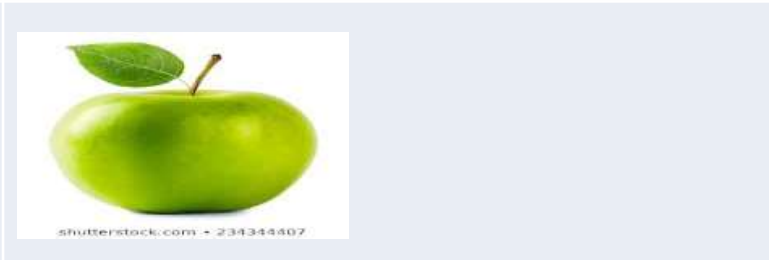
Input	Current Clusters	New clusters	Parameter/ Criteria
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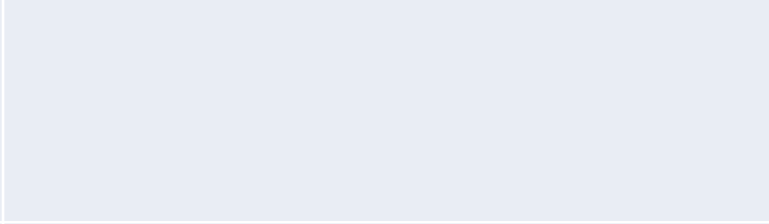
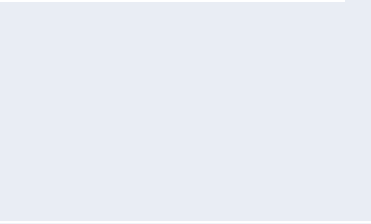
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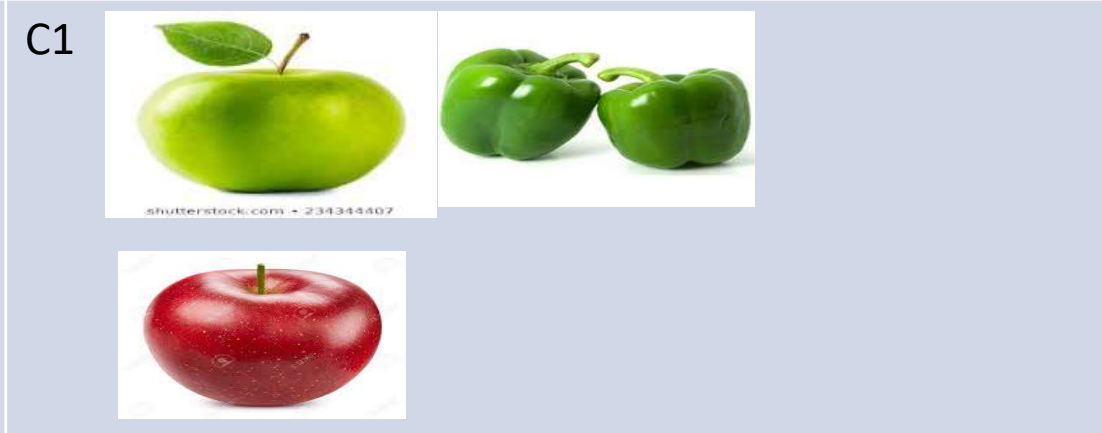


Color



C1

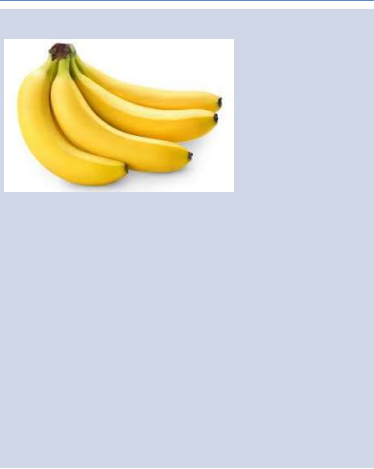
color





Input	Current Clusters	New clusters	Parameter/ Criteria
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		 	<p>Color</p>
	 	<p>C1</p>   	<p>Color</p>
	  	   	

Input	Current Clusters	New clusters	Parameter/ Criteria
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# Final Cluster



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## Categories of Unsupervised Machine Learning

### Categories of Unsupervised Machine Learning

Unsupervised Learning can be further classified into two types

- Clustering
- Association

#### Clustering:

- The clustering technique is used when we want to find the **inherent groups from the data.**
- It is a way to group the objects in to a cluster such that the objects with most similarities remain in one group and have fewer or no similarities with the objects of other groups.
- An example of the clustering algorithm is **grouping the customers by their purchasing behavior.**



## Clustering algorithms

- K-Means Clustering algorithm
- Mean-shift algorithm
- DBSCAN Algorithm
- Principal Component Analysis
- Independent Component Analysis

### Association:

- Association rule learning is an **unsupervised learning technique**, which finds interesting relations among variables within a large dataset.
- The main aim of this learning algorithm is to **find the dependency of one data item on another data item** and map those variables accordingly so that it can generate maximum profit.
- This algorithm is mainly applied in Market Basket analysis, Web usage mining, continuous production, etc.

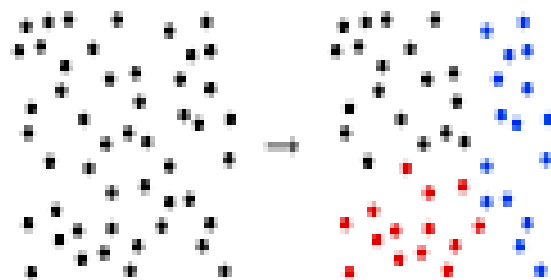


# Association algorithms

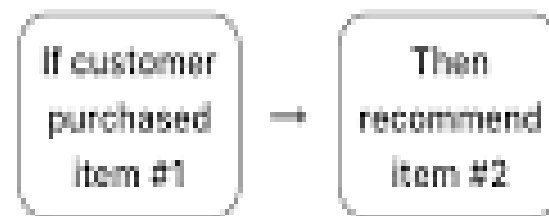
- Apriori Algorithm,
- Eclat,
- FP-growth algorithm.

## UNSUPERVISED LEARNING

### Clustering



### Association





# Unsupervised Learning: Applications



- ✓ Buying Habit
- ✓ Grouping user logs
- ✓ Network Analysis
- ✓ Recommendation Systems
- ✓ Anomaly Detection
- ✓ Singular Value Decomposition