

## PRIOR KNOWLEDGE

### Machine learning

Machine learning is defined as 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, gradually improving its accuracy.

### What is Machine Learning?

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Machine Learning is the science of making computers learn and act like humans by feeding data and information without being explicitly programmed!



There are two types of learning in machine learning.

1. **Supervised learning.**
  2. **Unsupervised learning.**
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### Supervised Learning

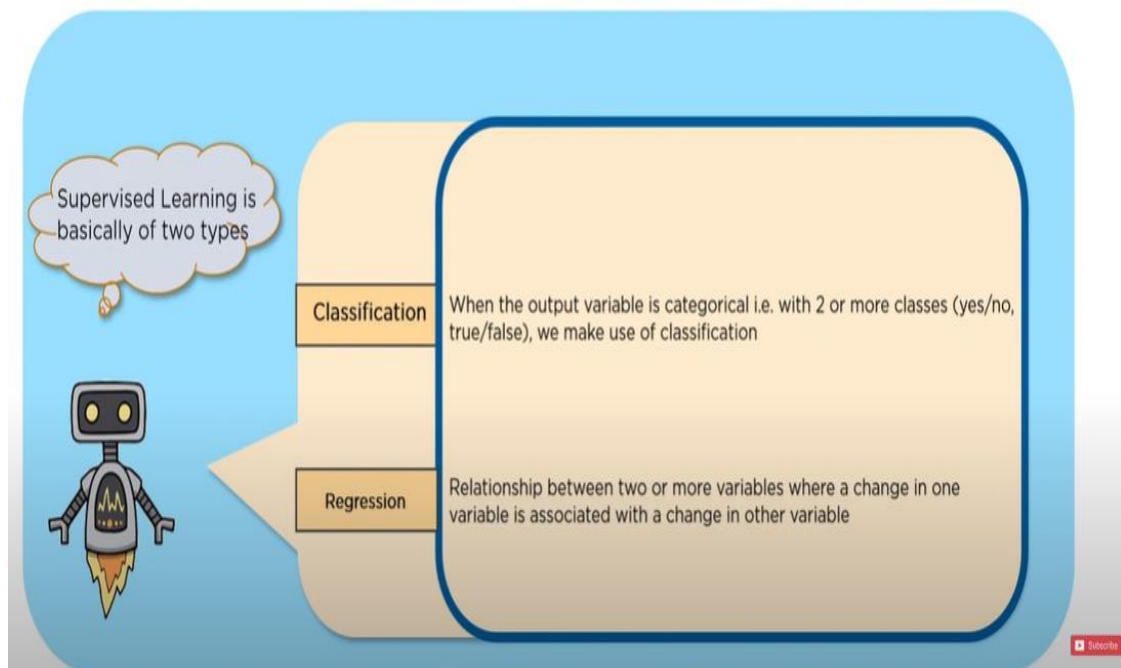
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It is defined by its use of labelled datasets to train algorithms that to classify data or predict outcomes accurately. As input data is fed into the model, it adjusts its weights until the model has been fitted appropriately, which occurs as part of the cross-validation process. Supervised learning helps organizations solve for a variety of real-world problems at scale, such as classifying spam in a separate folder from your inbox.

## Two types of supervised learning

### Types of Supervised Learning



#### 1. Classification

## Classification Problem

**Goal:** predict category of new observation



# Classification Applications

- Medical Diagnosis
- Animal Recognition

## Important:

- Qualitative Output
- Predefined Classes

## 2. Regression

# Regression

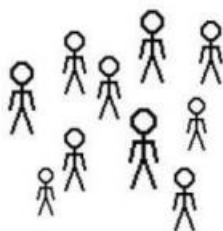
PREDICTORS



REGRESSION  
FUNCTION



RESPONSE



- Relationship: **Height - Weight?**
- Linear?
- Predict: **Weight** → **Height**

## Regression Model

Fitting a **linear** function

$$\text{Height} \approx \beta_0 + \beta_1 \times \text{Weight}$$

- **Predictor:** Weight
- **Response:** Height
- **Coefficients:**  $\beta_0, \beta_1$



**Estimate** on previous input-output

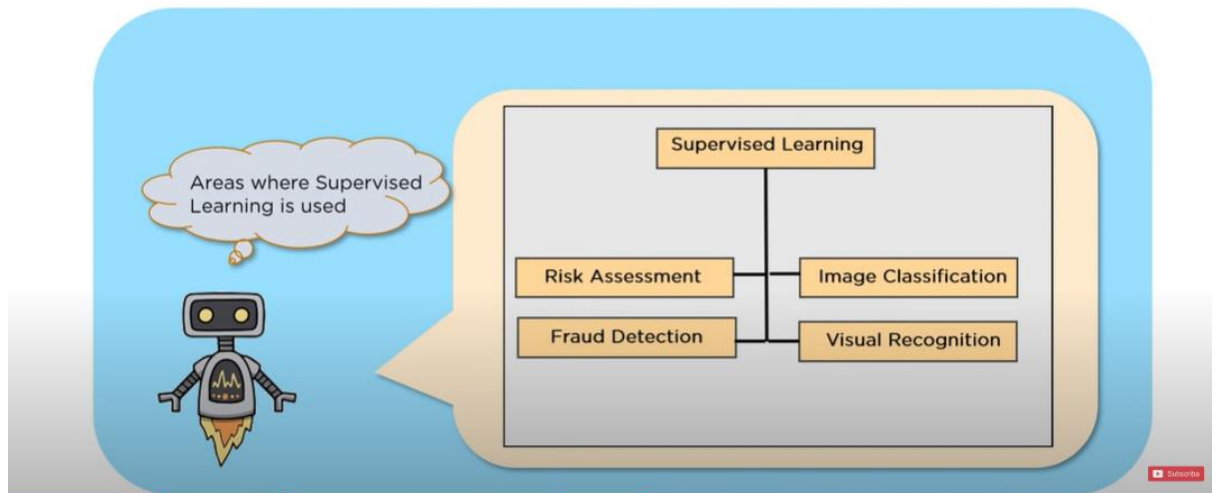
```
> lm(response ~ predictor)
```

## Regression Applications

- Payments → Credit Scores
- Time → Subscriptions
- Grades → Landing a Job
- Quantitative Output
- Previous **input-output** observations

### Applications of Supervised Learning

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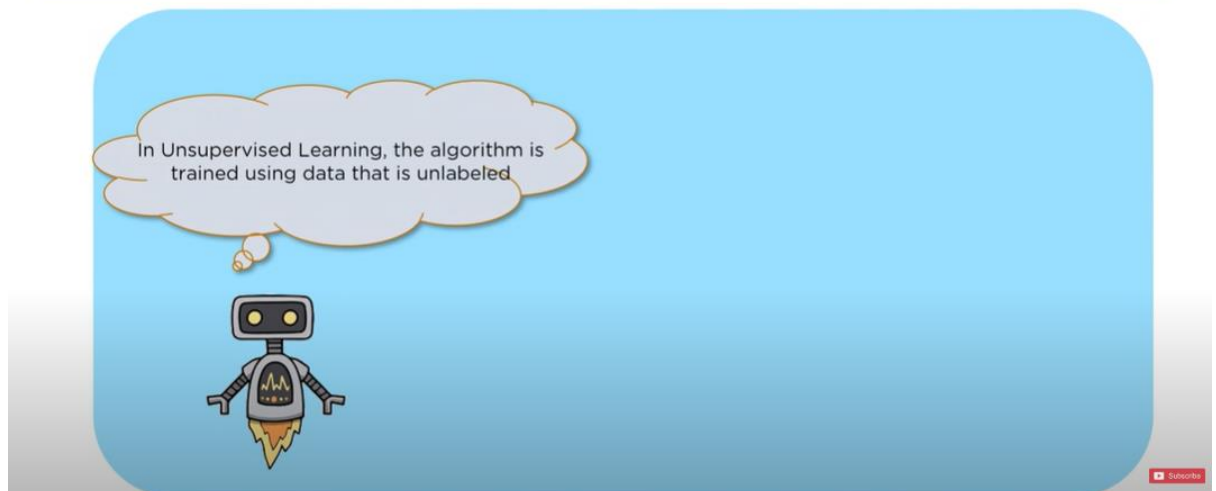
### 3. Unsupervised learning

In unsupervised learning, an algorithm separates the data in a data set in which the data is unlabelled based on some hidden features in the data.

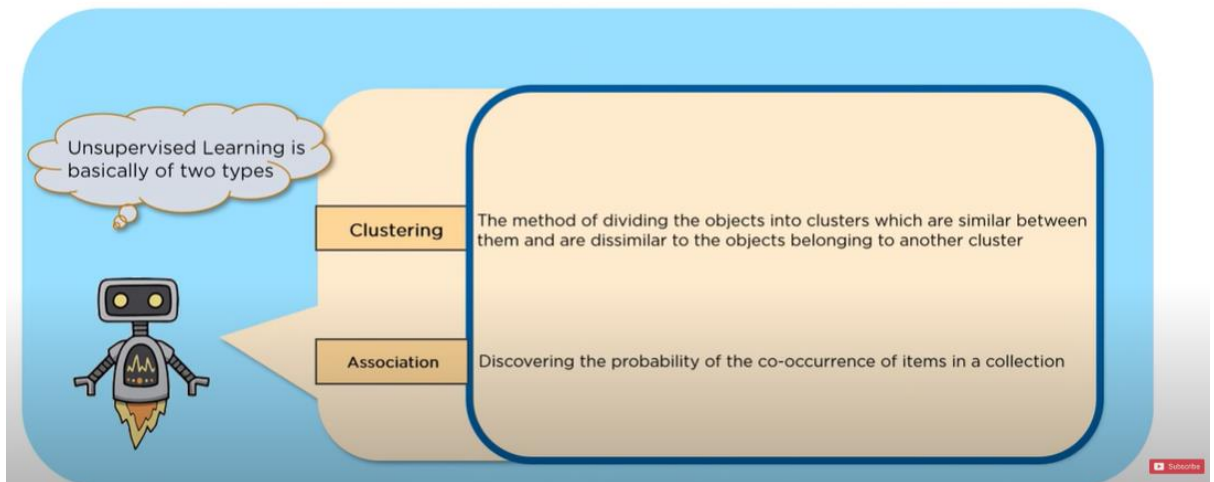
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### Unsupervised Learning

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### Types of Unsupervised Learning

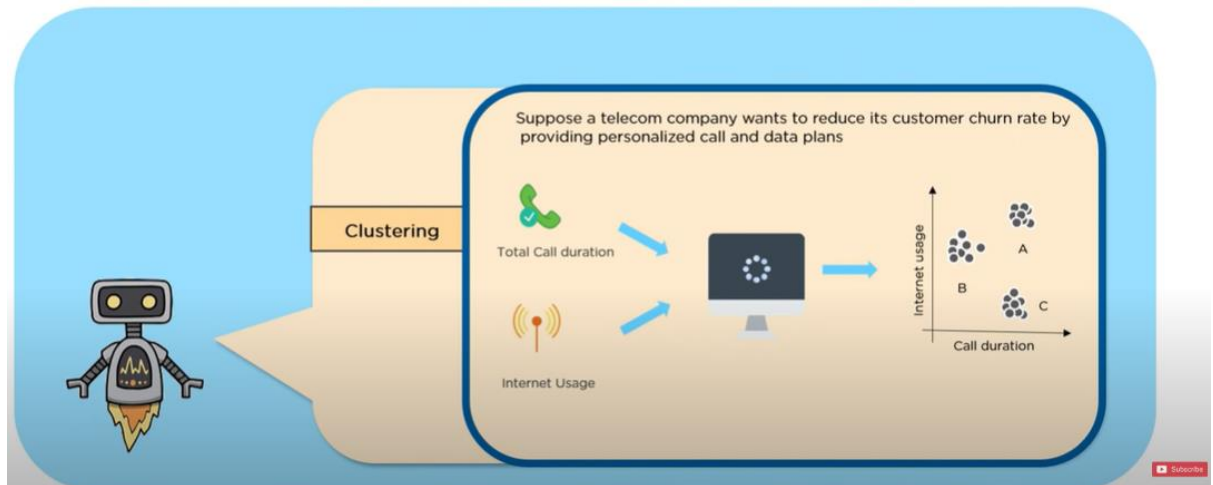


#### a) Clustering

## Clustering

- **Clustering:** grouping objects in clusters
  - *Similar* within cluster
  - *Dissimilar* between clusters
- **Example:** Grouping similar animal photos
  - No labels
  - No **right** or **wrong**
  - Plenty possible clusterings

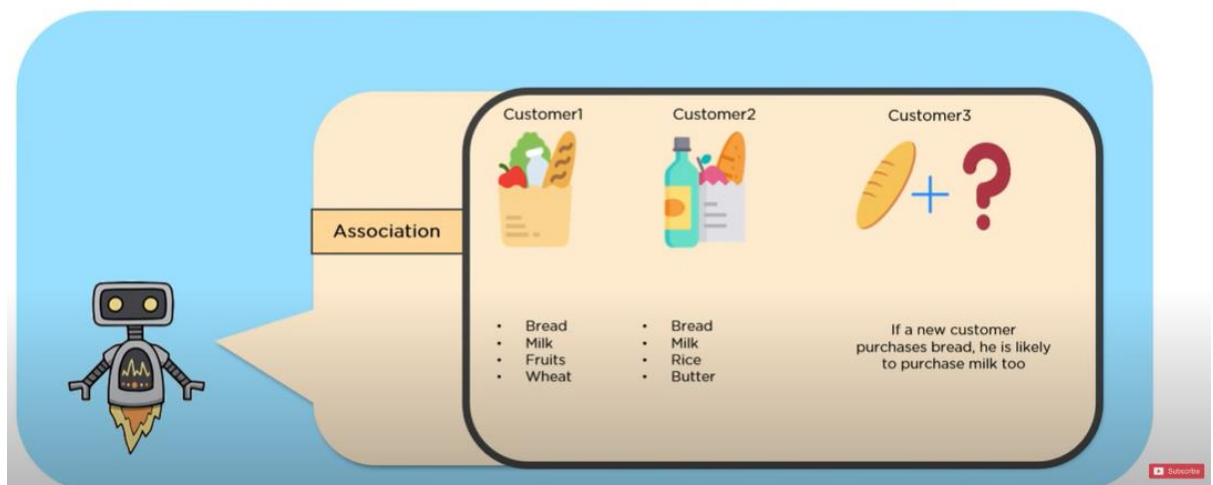
## Types of Unsupervised Learning



### b) Association

Association learning is a rule-based machine learning and data mining technique that finds important relations between variables or features in a data set.

## Types of Unsupervised Learning



## Applications of Unsupervised Learning

