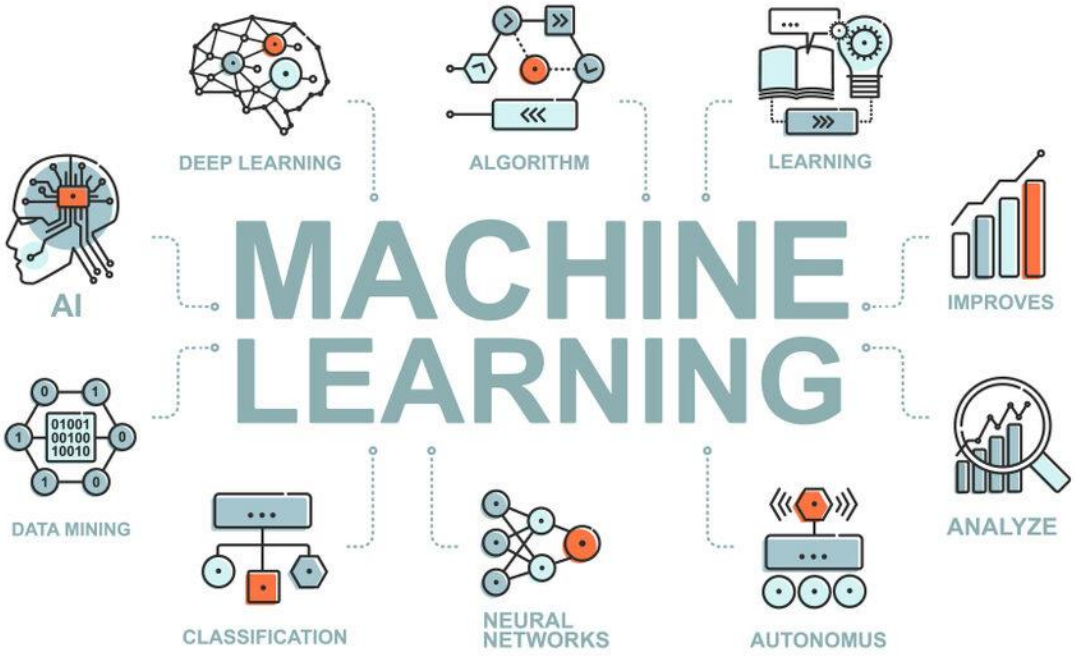
PRIOR KNOWLEDGE

Machine learning

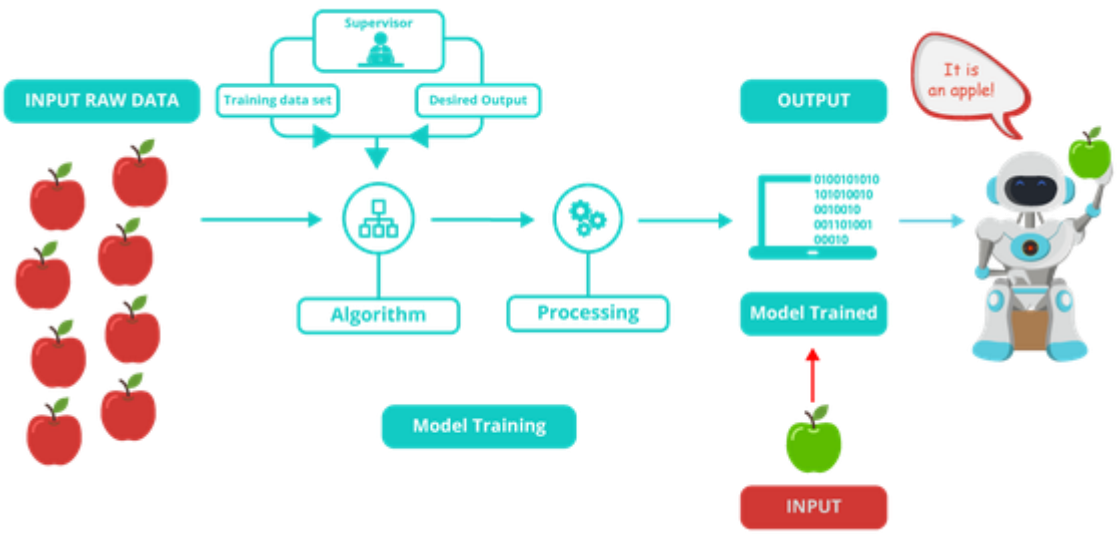
Machine learning is a subfield of artificial intelligence, which is broadly defined as **the capability of a machine to imitate intelligent human behavior**. Artificial intelligence systems are used to perform complex tasks in a way that is similar to how humans solve problems.



There are two types of learning in machine learning.

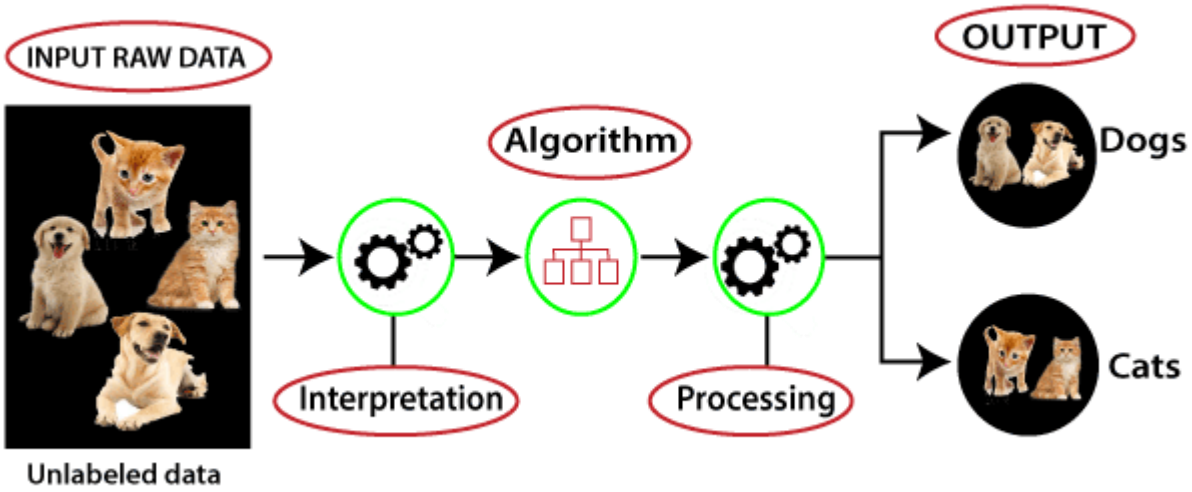
1. **Supervised learning.**
2. **Unsupervised learning.**

Supervised learning.



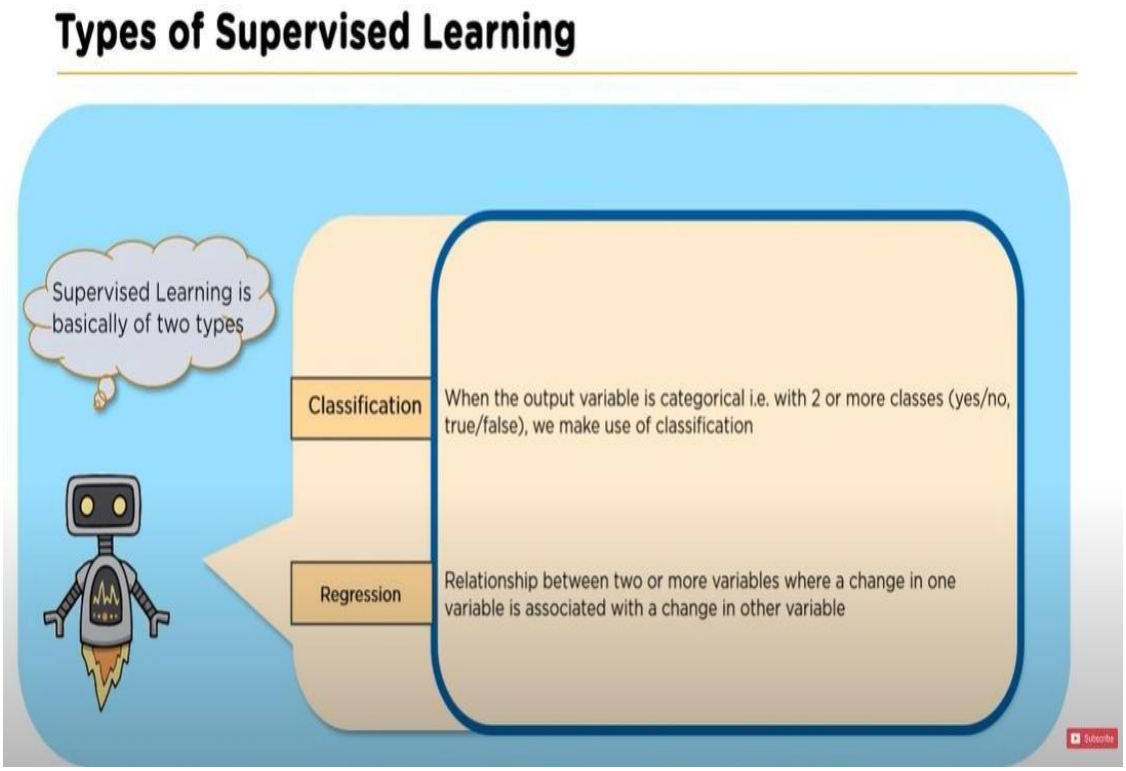
It is defined by its use of labelled datasets to train algorithms that to classify data or predict outcomesaccurately. As input data is fed into the model, it adjusts its weights until the model has been fitted appropriately, which occurs as part of the cross-validation process. Supervised learning helps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

Unsupervised learning

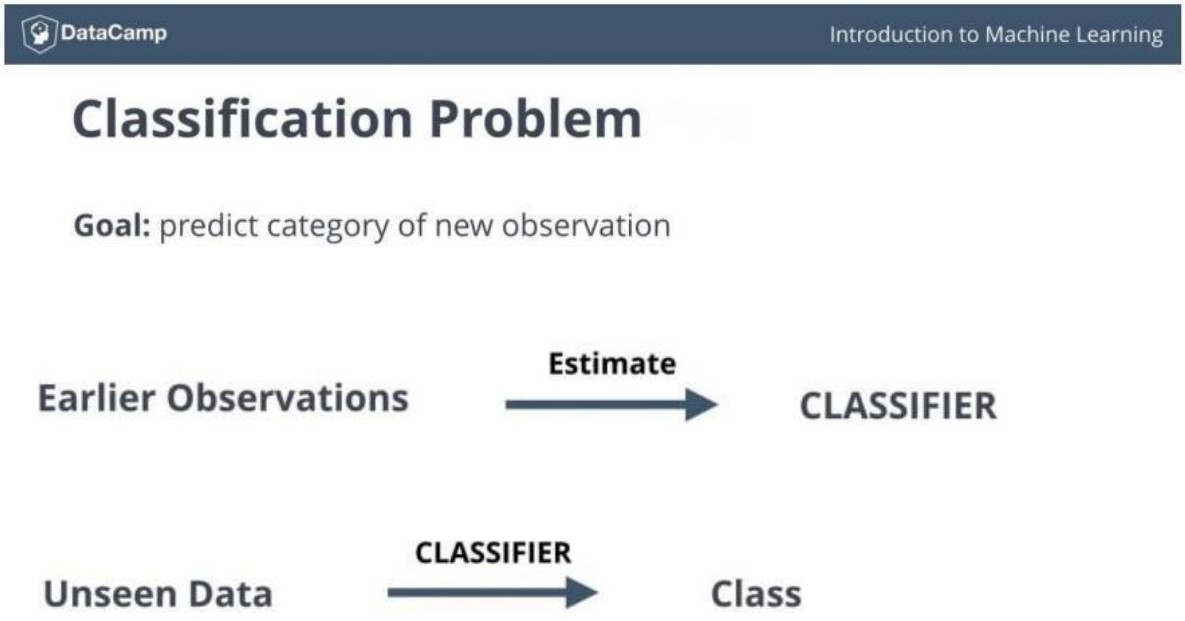


Unsupervised learning is when it can provide a set of unlabelled data, which it is required to analyze and find patterns inside.

Two types of supervised learning



1. **Classification**



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Classification Applications

- **Medical Diagnosis**
- **Animal Recognition**

Important:

- Qualitative Output
- Predefined Classes

2. Regression

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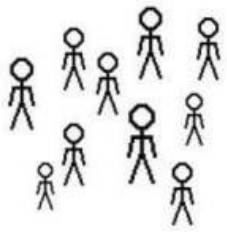
Regression

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:** β_0, β_1

Estimate on previous input-output

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

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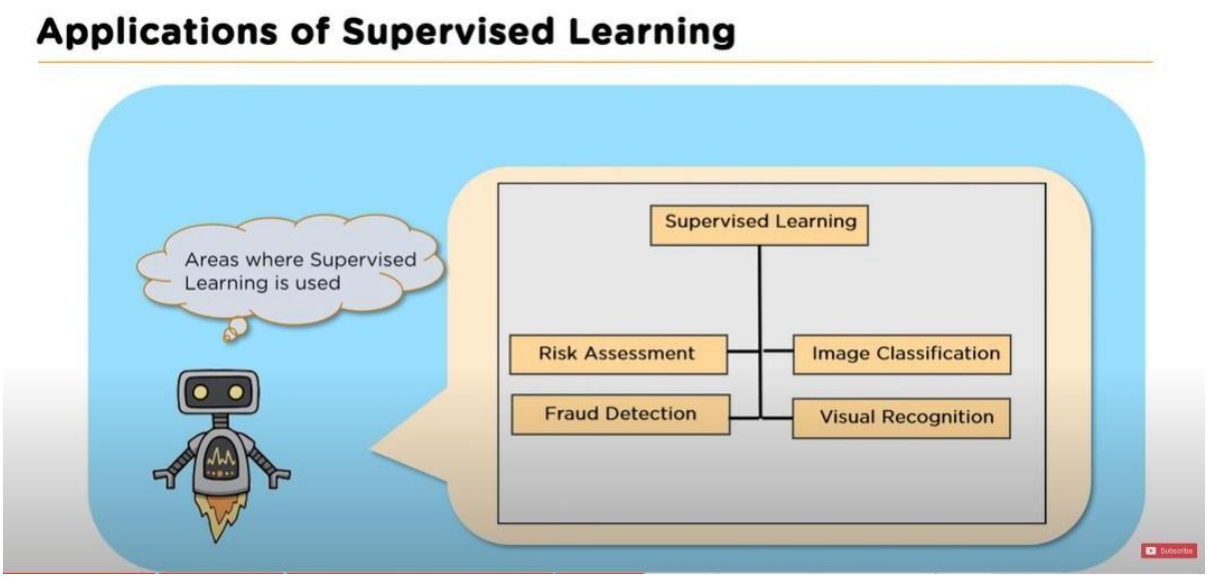
Regression Applications

- Payments → Credit Scores
- Time → Subscriptions
- Grades → Landing a Job

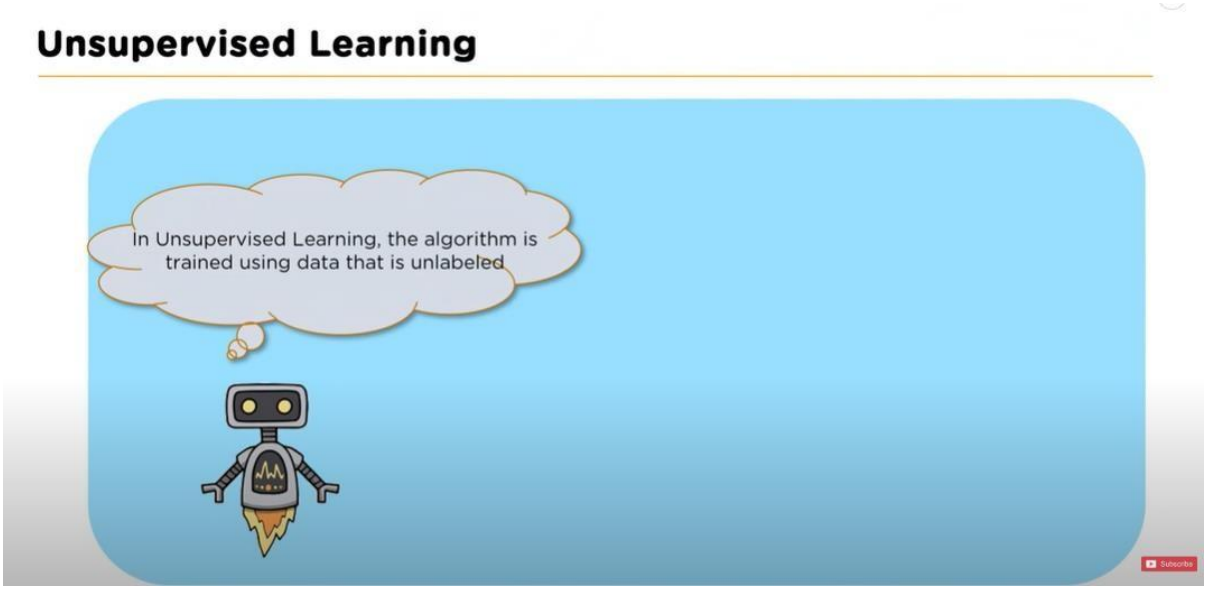
- Quantitative Output
- Previous **input-output** observations

Applications of supervised learning

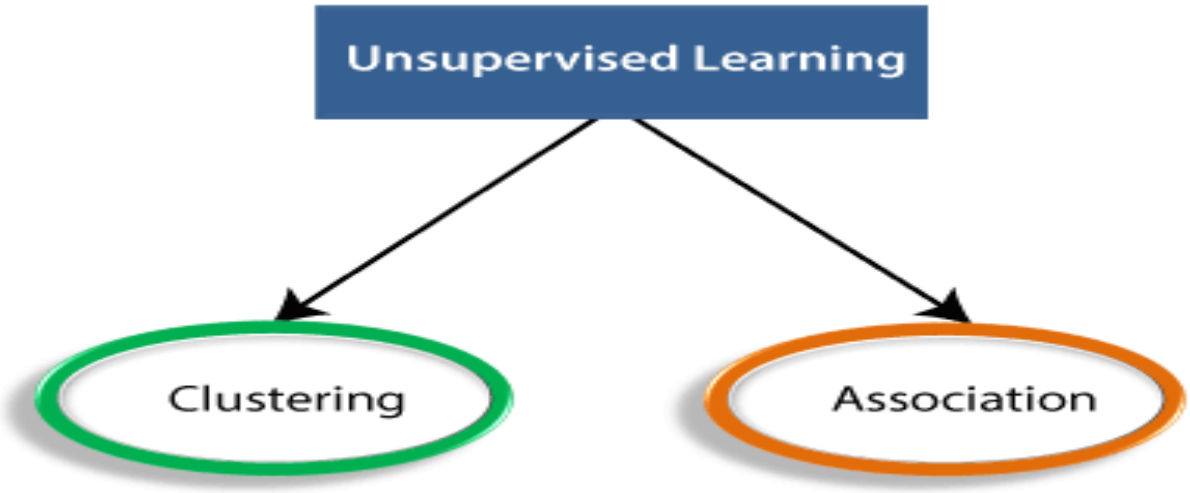


3. Unsupervised learning

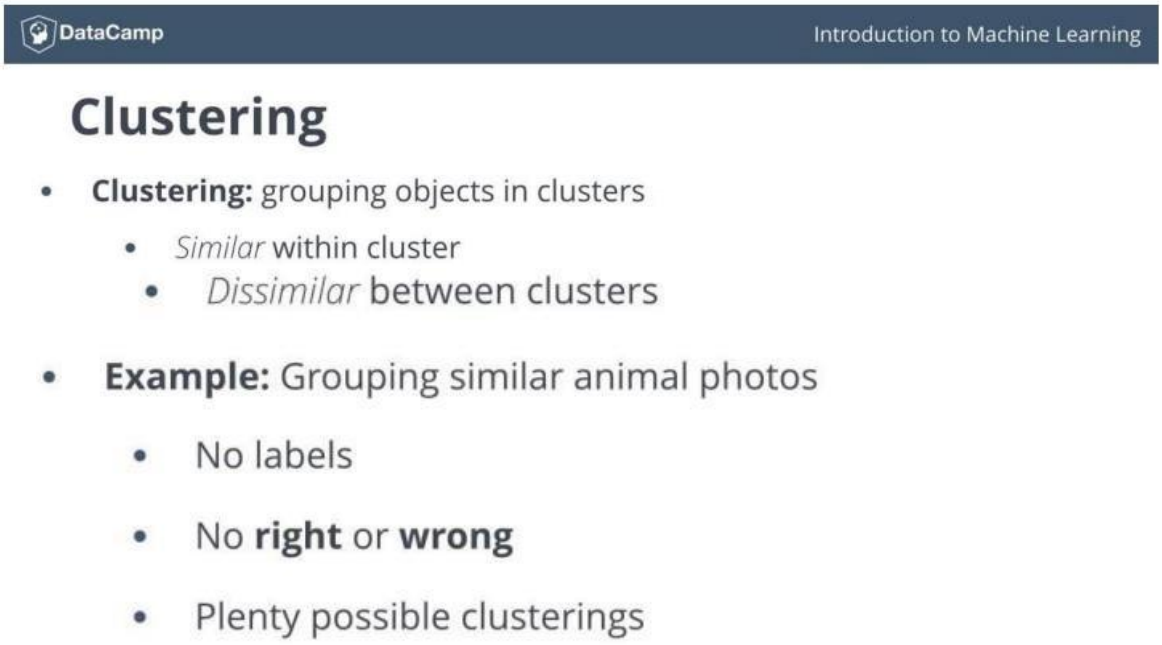
In unsupervised learning, an algorithm separates the data in a data set in which the data is unlabelled based on some hidden features in the data.

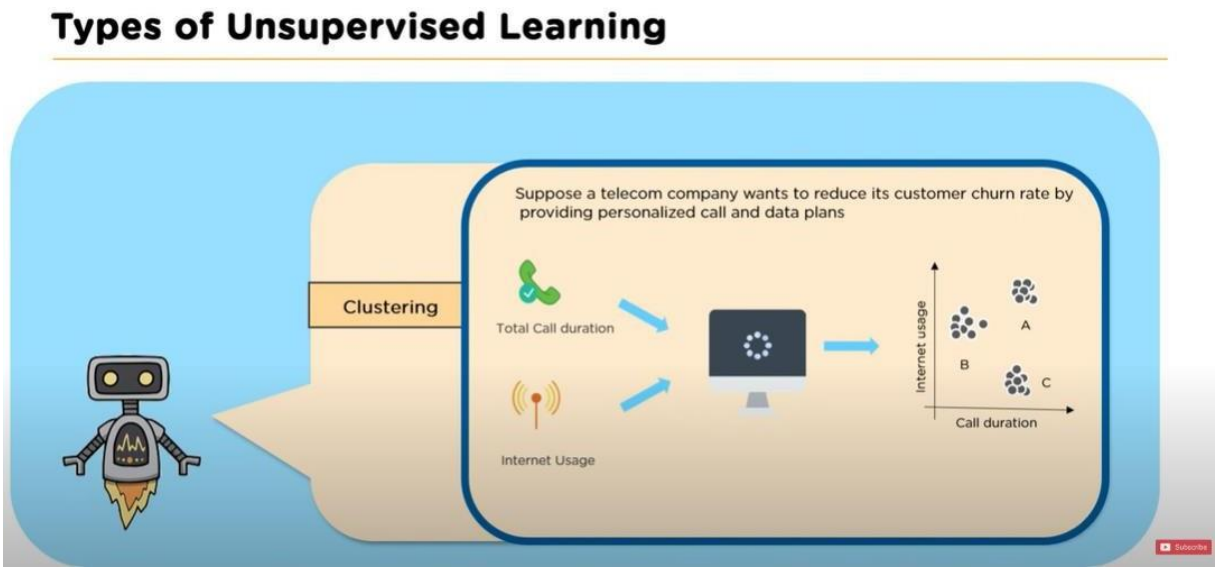


Types of unsupervised learning



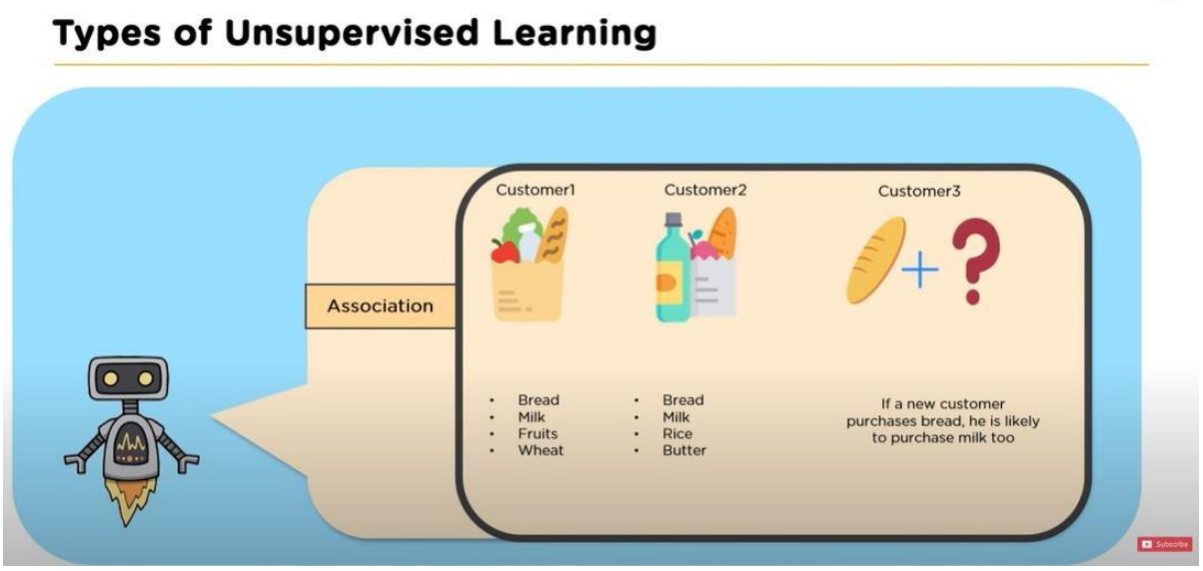
a) Clustering





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.



Applications of unsupervised learning