Machine Learning

Topics Covered

- What is Machine Learning?
- How does Machine Learning work?
- Different type of Machine Learning

What is Machine Learning?

- Machine learning is the core of much futuristic technological advancement in our world, today you can see various examples or implementation of machine learning around us such as Apple series, Tesla's self-driving car, Sophia AI robot and many more are there.
- "Machine Learning is a subset of artificial intelligence. It focuses mainly on the designing of systems, thereby allowing them to learn and make predictions based on some set of matrices in machines".

Types of Machine Learning

- Supervised Learning
- Unsupervised Learning
- Reinforcement Learning

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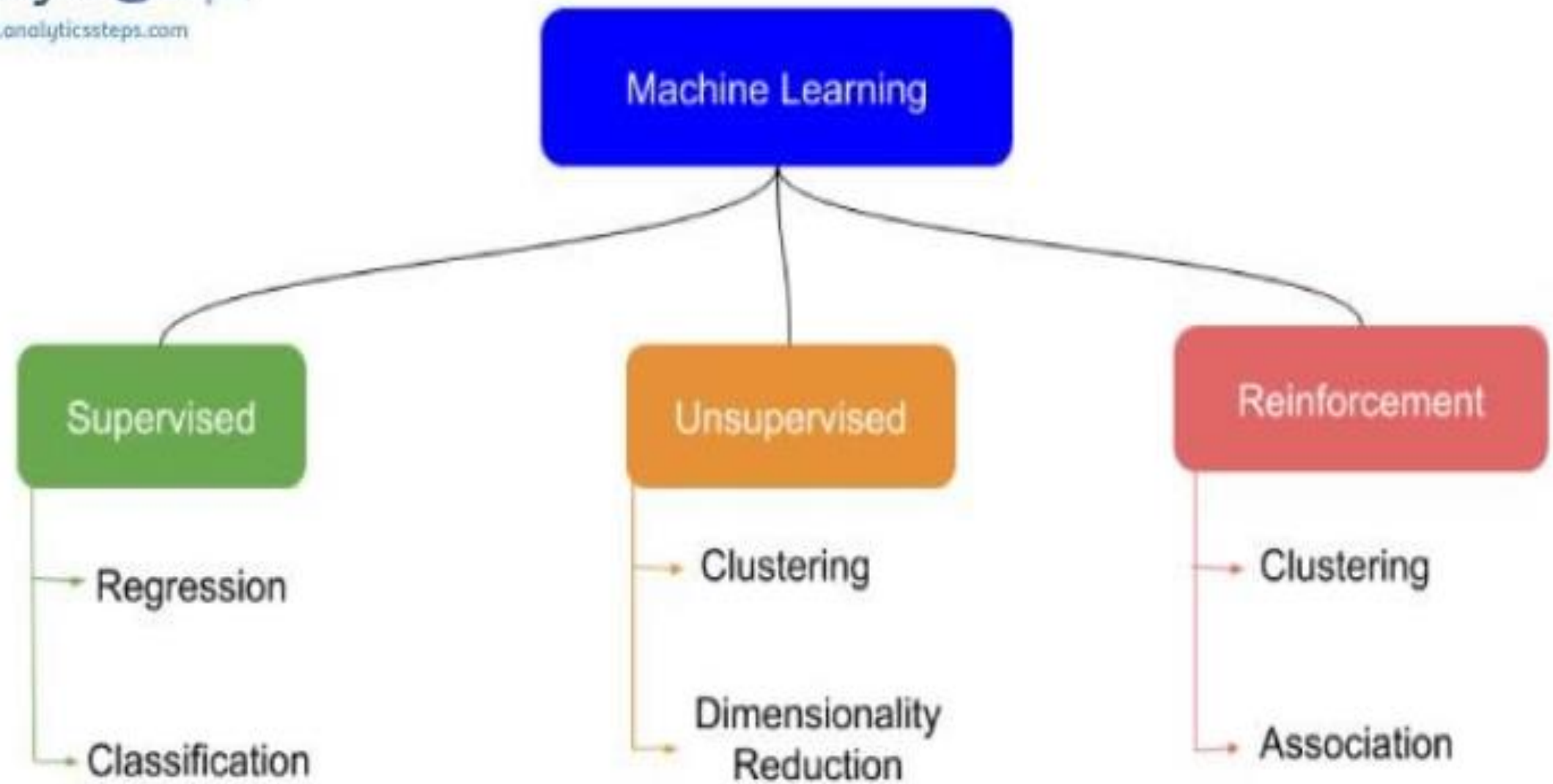
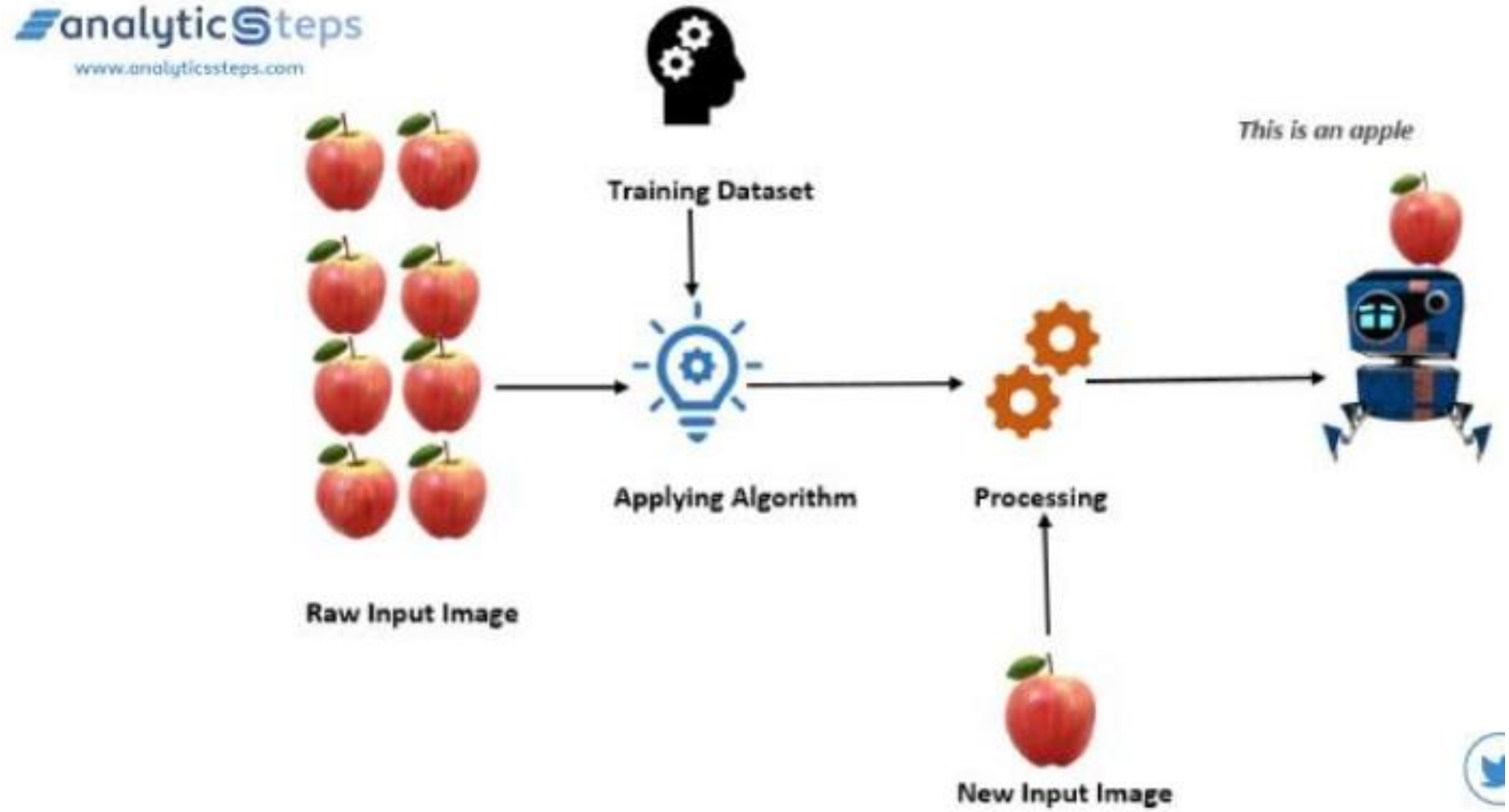


Supervised Machine Learning

- In supervised learning, you train your model on a labelled dataset that means we have both raw input data as well as its results. We split our data into a training dataset and test dataset where the training dataset is used to train our network whereas the test dataset acts as new data for predicting results or to see the accuracy of our model.

- Hence, in supervised learning, our model learns from seen results the same as a teacher teaches his students because the teacher already knows the results. Accuracy is what we achieve in supervised learning as model perfection is usually high.

Supervised Machine Learning



Some algorithms for supervised learning

- **Linear Regression**
- **Random Forest**
- **Support Vector Machines (SVM)**

Applications of Supervised Learning

- **Sentiment Analysis:** It is a natural language processing technique in which we analyze and categorize some meaning out of the given text data. For example, if we are analyzing tweets of people and want to predict whether a tweet is a query, complaint, suggestion, opinion or news, we will simply use sentiment analysis.
- **Recommendations:** Every e-Commerce site or media, all of them use the recommendation system to recommend their products and new releases to their customers or users on the basis of their activities. Netflix, Amazon, Youtube, Flipkart are earning huge profits with the help of their recommendation system.
- **Spam Filtration:** Detecting spam emails is indeed a very helpful tool, this filtration techniques can easily detect any sort of virus, malware or even harmful URLs. In recent studies, it was found that about 56.87 per cent of all emails revolving around the internet were spam in March 2017 which was a major drop from April 2014's 71.1 percent spam share.

Unsupervised Learning

- In unsupervised learning, the information used to train is neither classified nor labelled in the dataset. Unsupervised learning studies on how systems can infer a function to describe a hidden structure from unlabelled data. The main task of unsupervised learning is to find patterns in the data.
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- Once a model learns to develop patterns, it can easily predict patterns for any new dataset in the form of clusters. The system doesn’t figure out the right output, but it explores the data and can draw inferences from datasets to describe hidden structures from unlabeled data.

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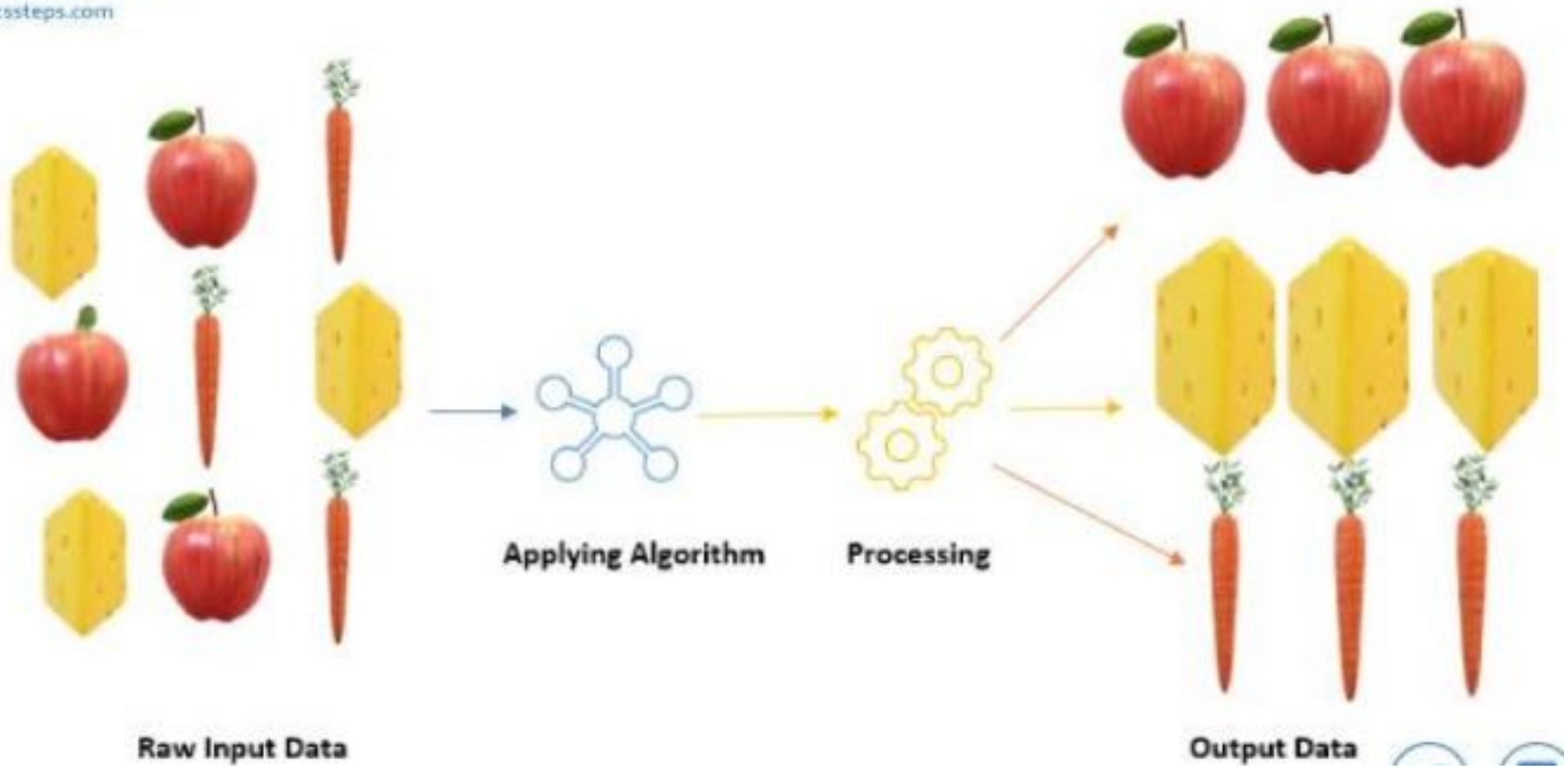


Some algorithms available for unsupervised learning are

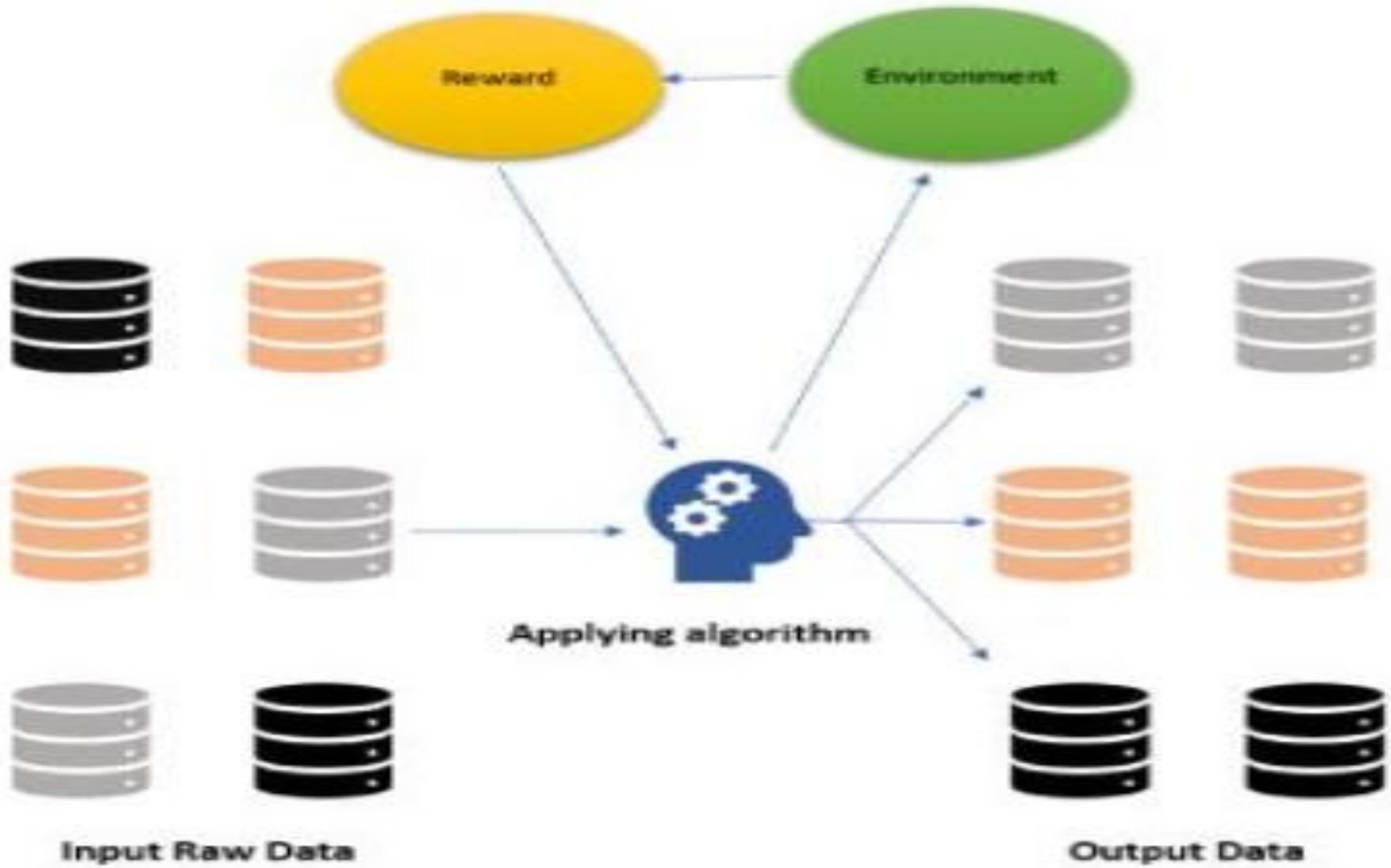
- Principal Component Analysis Algorithm
- K-means Algorithm

Applications of Unsupervised Learning

- **Document Clustering:** In order to retrieve some information out of a text document we use techniques like K-means, it is also used to organize the document, topic extraction as well as filtering.
- **Data Reduction:** visualizing and analyzing data with thousands of dimensions is a hectic task for machine learning models as they break down sometimes after a while, and after that data does not correlate with each other. In order to prevent dimension related problems, we use unsupervised algorithms such as singular value decomposition or principal component analysis.
- Unsupervised learning is used for Anomaly Detection where it can help in the detection of any sort of fraud by observing unusual data points in the dataset. It is also used for outliers detection in which we differentiate all the outliers in the available dataset.

Reinforcement Learning

- It is a Machine Learning algorithm that allows software agents and machines to automatically determine the ideal behaviour within a specific context to maximize its performance. It does not have a labelled dataset or results associated with data so the only way to perform a given task is to learn from experience.
- For every correct action or decision of an algorithm, it is rewarded with positive reinforcement whereas, for every incorrect action, it is rewarded with negative reinforcement. In this way, it learns which actions are needed to perform and which are not. Reinforcement learning can, therefore, help in industrial automation as well as the gaming sector primarily.



Reinforcement Machine Learning

Applications of Reinforcement Learning

- **Robotics:** Reinforcement learning is used in the advancement of robotics. These models are used to train robots so that they can learn from their experience which is a belief of reinforcement learning.
- **Traffic Light Management System:** Reinforcement Learning model that was applied to the traffic management system provided better results in comparison to the traditional method for the congestion problem.
- **Personalized Recommendation:** Deep Reinforcement learning can perform better results in personalized recommendation than other ML models, it performed greatly on news recommendation which consisted of the challenges like dynamic news, click-through rate and more.