

# Machine Learning Algorithms and Real World Application

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**ABSTRACT:** In the current Era of Fourth Industrial Revolution (Industry 4.0), the considerable information is in the form of digital data. To extract some useful information and intelligently analyze the information for automated applications on large scale, Integral part of AI i.e. Machine learning is used.

Machine learning (ML) is a branch of artificial intelligence (AI) that provides computer systems the ability to automatically learn and improve from experience without being explicitly programmed. ML focuses on the algorithms and uses the data to imitate the way that humans learn, gradually improving its accuracy. This paper show the brief of machine learning algorithms and the real world application of the different ML algorithm.

**KEYWORDS:** Machine Learning (ML), Supervised learning, Unsupervised Learning, Reinforcement Learning, Real world data.

## I. INTRODUCTION

Machine learning is an Integral part of artificial intelligence.i.e, all types of machine learning counts as artificial intelligence, but not all AI counts as ML. By using Machine leaning any system can have the ability to learn automatically and improve from the past experience without being explicitly programmed. The process of learning begins with observations of data, such as examples, direct experience, or instruction, in order to look for patterns in the data and make better decisions in the future based on the examples provided. The primary focus is on the development of programs which allow the computers to access data and use it to learn without any human intervention or assistance. Machine learning learns faster than human learning and the result is more accurate. A machine learning algorithm affects and benefits human life in many unnoticeable ways. Machine learning algorithms typically consume and process data to learn the related patterns about individuals, business processes, transactions, events, and so on.

In the current Era, electronic world has various kinds of Digital data, such as the Internet of Thing data, cyber security data, smart city data, business data, Smartphone data, social media data, health data, agriculture data, e-commerce data and many more To analyze these data in a particular problem domain, and to extract the useful information from the data for the real-world intelligent applications, different types of machine learning techniques can be used according to their learning capabilities.

### I. Types of Real word data

Data can be of various forms, such as structured, semi-structured or unstructured and metadata.

- **Structured:** This type of data is highly organized and easily accessed and easily used by a computer program, it has a well define structure and schemes, structured data are stored in a tabular format.

For instance, addresses, names, dates, credit card numbers, stock information, geolocation can be considered as structured data

- **Unstructured:** This type of data has no pre-defined format or pre define organization, which makes the data more difficult to capture, process, and analyze, unstructured data mostly contain text and multimedia material.

For instance, video files, audio files, sensor data, emails, blog entries, PDF files, images, presentations, web pages, and many other types of business documents can be considered as unstructured data.

- **Semi-structured:** Semi-structured data are not stored like the structured data, but it does have certain organizational properties that make it easier to analyze.

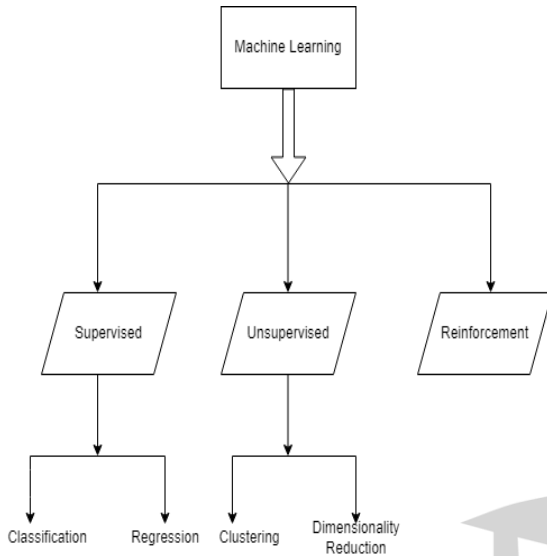
HTML, XML, JSON documents, NoSQL databases, etc., are some examples of semi-structured data.

- **Metadata:** The basic difference between data and metadata is that data are simply the material that can classify, measure, or even document something relative to an organization's data properties. On the other hand, metadata describes the relevant data information, giving it more significance for data users. A basic example of a document's metadata might be the author, file size, date generated by the document, keywords to define the document, etc.

## II. Types of Machine Learning Techniques

Machine learning algorithms are organized in different taxonomy based on the required outcome. Supervised, Unsupervised and reinforcement are the three main categories of learning.

Fig: 1 Types of Machine Learning

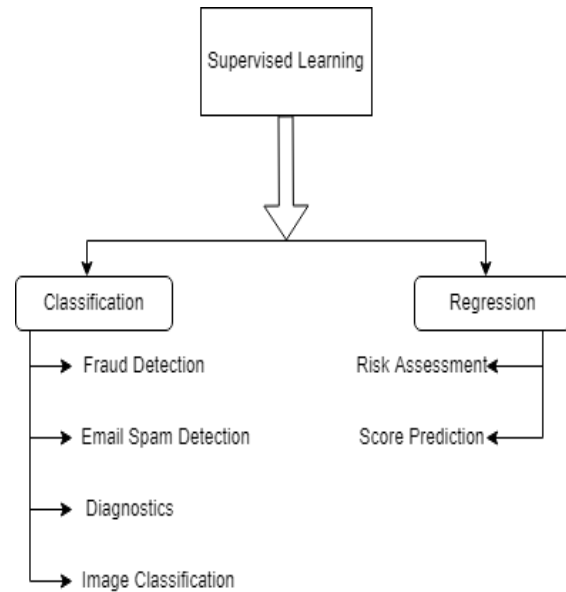


**II.1 Supervised learning:** Supervised learning is typically the task of machine learning to learn from the two sets of data i.e. a training set and a test set. It uses labeled training data and a collection of training examples to infer a function. Supervised learning is carried out when certain goals are identified to be accomplished from a certain set of inputs.

The most common supervised tasks are “classification” and “regression”

- Classification (separates the data): This type of supervised learning method uses an algorithm to accurately assign test data into specific categories. For example by using this learning algorithms system can classify that email is spam or not.
- Regression (Fits the data): is another type of supervised learning method that uses an algorithm to understand the relationship between dependent and independent variables. Regression models are helpful for predicting numerical values based on different data points, like sales revenue projections for a given business.

Fig: 2 Supervised Learning



### Applications of Supervised Learning

- Image- and object-recognition: Supervised learning algorithms can be used to locate, isolate, and categorize objects out of videos or images, making them useful when applied to various computer vision techniques and imagery analysis.
- Predictive analytics: A widespread use case for supervised learning models is in creating predictive analytics systems to provide deep insights into various business data points.
- Customer sentiment analysis: Using supervised machine learning algorithms, organizations can extract and classify important pieces of informative data from large volumes of data—including context, emotion, and intent—with little human intervention. This can be incredibly useful when gaining a far better understanding of customer interactions and can be used to improve brand engagement efforts.
- Spam detection: By using supervised classification algorithms database will be train for recognize patterns in new data to classify spam or non spam related correspondences.

**II.2 Unsupervised learning** uses machine learning algorithms to analyze and cluster unlabeled data sets. These algorithms discover hidden patterns in data without the need for human interference, i.e., a *data-driven process*

Unsupervised learning is widely used for extracting generative features, identifying meaningful trends and structures, groupings in results, and exploratory purposes. The most common unsupervised learning tasks are clustering, density estimation, feature learning, dimensionality reduction, finding association rules, anomaly detection, etc.

Unsupervised learning models are used for three main tasks: clustering, association and dimensionality reduction:

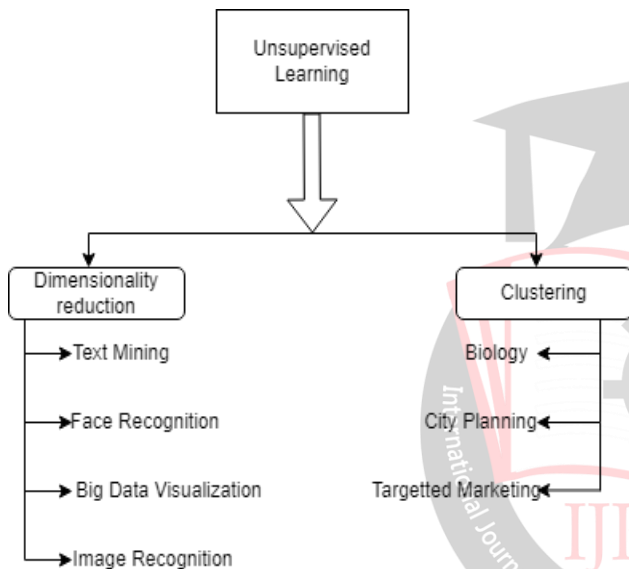
- **Clustering** is a data mining technique for grouping unlabeled data based on their similarities or differences.

This technique is useful for market segmentation, image compression, etc.

- **Dimensionality reduction** is a learning technique used when the number of dimensions in a given dataset is too high. It reduces the number of data inputs to a manageable size while also preserving the data integrity.

Often, this technique is used in the preprocessing data stage, such as when auto encoders remove noise from visual data to improve picture quality.

Fig: 3 Unsupervised Learning



**Applications of unsupervised learning are:**

- **News Sections:** Google News uses unsupervised learning to categorize articles on the same story from various online news outlets.  
For example, the results of a presidential election could be categorized under their label for “US” news.
- **Computer vision:** Unsupervised learning algorithms are used for visual perception tasks, such as object recognition.
- **Medical imaging:** Unsupervised machine learning provides essential features to medical imaging devices, such as image detection, classification and segmentation, used in radiology and pathology to diagnose patients quickly and accurately.
- **Anomaly detection:** Unsupervised learning models can comb through large amounts of data

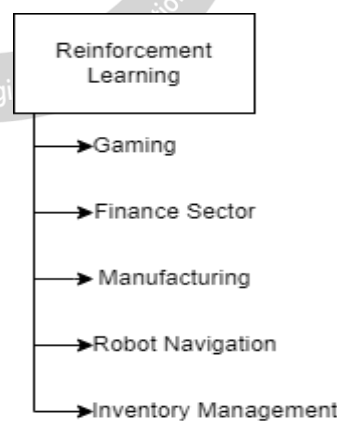
and discover atypical data points within a dataset. These anomalies can raise awareness around faulty equipment, human error, or breaches in security.

- **Customer personas:** Defining customer personas makes it easier to know common traits and business clients' purchasing habits. Unsupervised learning allows businesses to create better buyer persona profiles, enabling organizations to align their product messaging more appropriately.
- **Recommendation Engines:** Using past purchase behavior data, unsupervised learning can help to discover data trends that can be used to develop more effective cross-selling strategies. This is used to make relevant add-on recommendations to customers during the checkout process for online retailers

**II.3 Reinforcement Learning:** Reinforcement learning is a type of machine learning algorithm that enables software agents and machines to automatically evaluate the optimal behavior in a particular context or environment to improve its efficiency. In reinforcement learning software agent learns automatically using feedbacks without any labeled data. i.e, an environment-driven approach.

This type of learning is based on reward or penalty, for each good action, the agent gets positive feedback, and for each bad action, the agent gets negative feedback or penalty. The primary goal of a software agent is to improve the performance by getting the maximum positive rewards.

Fig: 4 Reinforcement Learning



**Applications of Reinforcement Learning are:**

- Reinforcement Learning solves a specific type of problem where decision making is sequential, and the goal is long-term, such as game-playing, etc.
- Reinforcement learning algorithm enhance robot for learning, improve, adapt and reproduce different tasks.
- In health care by using reinforcement performance of existing care can improve, by observing how the

patient responds to the treatment and based on the feedback the process repeated.

## II. CONCLUSION

This paper illustrates the brief study of machine learning, algorithms, tasks and its application in real world. The paper has offered the different features and algorithm of Machine learning and also highlights the various types of real world data and machine learning such as supervised learning, unsupervised learning and reinforcement learning. And based on their advantages these techniques can be used in different domains. These techniques have been widely used in marketing, finance, telecommunications and network analysis. In addition, machine learning is also applied in the field of data mining combination with other applications, the typical methods are based on the neural network initialization.

## REFERENCES

- [1] Kotsiantis, S. B., Zaharakis, I., & Pintelas, P. (2007). Supervised machine learning: A review of classification techniques. *Emerging artificial intelligence applications in computer engineering*, 160(1), 3-24.
- [2] Mohammed, M., Khan, M. B., & Bashier, E. B. M. (2016). *Machine learning: algorithms and applications*. Crc Press.
- [3] Bonaccorso, G. (2018). *Machine Learning Algorithms: Popular algorithms for data science and machine learning*. Packt Publishing Ltd.
- [4] Singh, Y., Bhatia, P. K., & Sangwan, O. (2007). A review of studies on machine learning techniques. *International Journal of Computer Science and Security*, 1(1), 70-84.
- [5] Qiu, J., Wu, Q., Ding, G., Xu, Y., & Feng, S. (2016). A survey of machine learning for big data processing. *EURASIP Journal on Advances in Signal Processing*, 2016(1), 1-16.
- [6] Devi, I., Karpagam, G. R., & Kumar, B. V. (2017). A survey of machine learning techniques. *International Journal of Computational Systems Engineering*, 3(4), 203-212.
- [7] Sarker, I.H. Machine Learning: Algorithms, Real-World Applications and Research Directions. *SN COMPUT. SCI.* 2, 160 (2021).
- [8] [ibm.com/cloud/blog/supervised-vs-unsupervised-learning](https://ibm.com/cloud/blog/supervised-vs-unsupervised-learning)
- [9] Lade P, Ghosh R, Srinivasan S. Manufacturing analytics and industrial internet of things. *IEEE Intell Syst.* 2017
- [10] Wang, H., Ma, C., & Zhou, L. (2009, December). A brief review of machine learning and its application. In *2009 international conference on information engineering and computer science* (pp. 1-4). IEEE.
- [11] AN Zeng-bo, ZHANG Yan. The Application Study of Machine Learning[J]. *Journal of Changzhi University*, April 2007, 24(2):21-24.