"🔍 Cracking the Code of Machine Learning: Your Adventure Begins Here! 🚀"

🤖Machine Learning Tutorial

"All the Essential Concepts in Single Tutorial"

This being a beginner's tutorial, I will try to make it as simple as it could be.

Have you ever went for grocery shopping? What do you do before going to the market?

I always prepare a list of ingredients beforehand. Also, I make the decision according to the previous purchasing experience. Then, I go and purchase the items. But, with the rising inflation, it's not too easy to work in the budget. I have observed that my budget gets deviated a lot of times.

This happens because the shopkeeper changes the quantity and price of a product very often. Due to such factors, I have to modify my shopping list. It takes a lot of effort, research and time to update the list for every change.

This is where Machine Learning can come to your rescue. Still confused?

Don't worry! Read this DataFlair's latest Machine learning tutorial to get deep insight and understand why machine learning is trending.

What is Machine Learning?

Machine Learning is the most popular technique of predicting the future or classifying information to help people in making necessary decisions.

Machine Learning algorithms are trained over instances or examples through which they learn from past experiences and also analyze the historical data.

Therefore, as it trains over the examples, again and again, it is able to identify patterns in order to make predictions about the future.
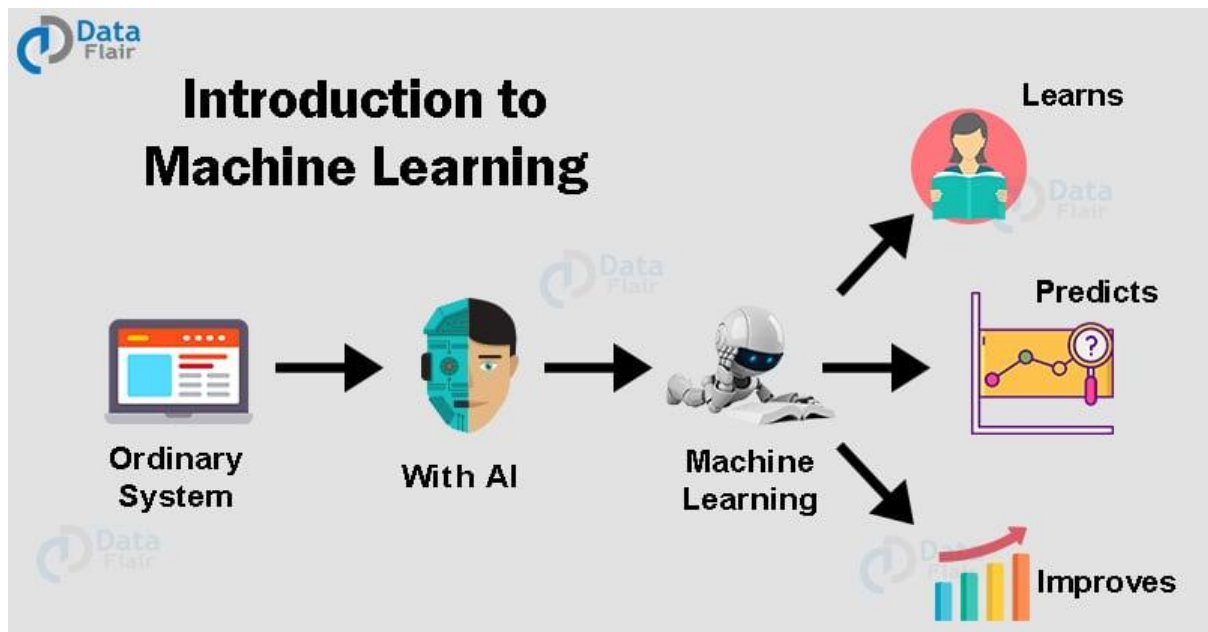
Machine Learning Tutorial: Introduction to Machine Learning

After knowing what machine learning is, let's take a quick introduction to machine learning and start the tutorial.

With the help of Machine Learning, we can develop intelligent systems that are capable of taking decisions on an autonomous basis. These algorithms learn from the past instances of data through statistical analysis and pattern matching. Then, based on the learned data, it provides us with the predicted results.

Data is the core backbone of machine learning algorithms. With the help of the historical data, we are able to create more data by training these machine learning algorithms.

For example, Generative Adversarial Networks are an advanced concept of Machine Learning that learns from the historical images through which they are capable of generating more images. This is also applied towards speech and text synthesis.

Therefore, Machine Learning has opened up a vast potential for data science applications. Machine Learning combines computer science, mathematics, and statistics. Statistics is essential for drawing inferences from the data.

Mathematics is useful for developing machine learning models and finally, computer science is used for implementing algorithms.

However, simply building models is not enough. You must also optimize and tune the model appropriately so that it provides you with accurate results. Optimization techniques involve tuning the hyperparameters to reach an optimum result.

Machine Learning is used in every domain. It is being used to impart intelligence to static systems. With the knowledge acquired from the data, it is used to build intelligent products.

Why Machine Learning?

The world today is evolving and so are the needs and requirements of people. Furthermore, we are witnessing a fourth industrial revolution of data.

In order to derive meaningful insights from this data and learn from the way in which people and the system interface with the data, we need

computational algorithms that can churn the data and provide us with results that would benefit us in various ways.

Machine Learning has revolutionized industries like medicine, healthcare, manufacturing, banking, and several other industries. Therefore, Machine Learning has become an essential part of modern industry.

Data is powerful and in order to harness the power of this data, added by the massive increase in computation power, Machine Learning has added another dimension to the way we perceive information.

Machine Learning is being utilized everywhere.

The electronic devices you use, the applications that are part of your everyday life are powered by powerful machine learning algorithms.

Machine Learning example – Google is able to provide you with appropriate search results based on browsing habits.

Similarly, Netflix is capable of recommending the films or shows that you would want to watch based on the machine learning algorithms that perform predictions based on your watch history.

Furthermore, machine learning has facilitated the automation of redundant tasks that have taken away the need for manual labor. All of this is possible due to the massive amount of data that you generate on a daily basis.

Machine Learning facilitates several methodologies to make sense of this data and provide you with steadfast and accurate results.

How does Machine Learning Work?

With an exponential increase in data, there is a need for having a system that can handle this massive load of data.

Machine Learning models like Deep Learning allow the vast majority of data to be handled with an accurate generation of predictions.Machine Learning has revolutionized the way we perceive information and the various insights we can gain out of it.
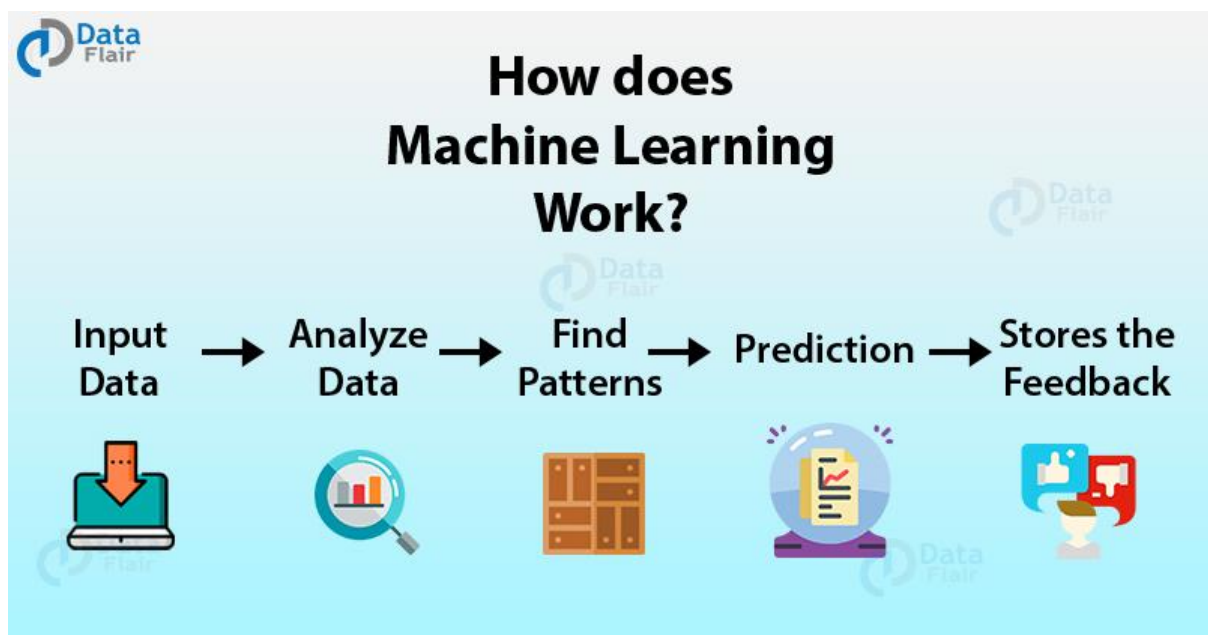

These machine learning algorithms use the patterns contained in the training data to perform classification and future predictions. Whenever any new input is introduced to the ML model, it applies its learned patterns over the new data to make future predictions. Based on the final accuracy, one can optimize their models using various standardized approaches.

In this way, Machine Learning model learns to adapt to new examples and produce better results. Next in Machine Learning tutorial is its types. Have a look –

Types of Machine Learning

Machine Learning Algorithms can be classified into 3 types as follows –

- Supervised Learning
- Unsupervised Learning
- Reinforcement Learning
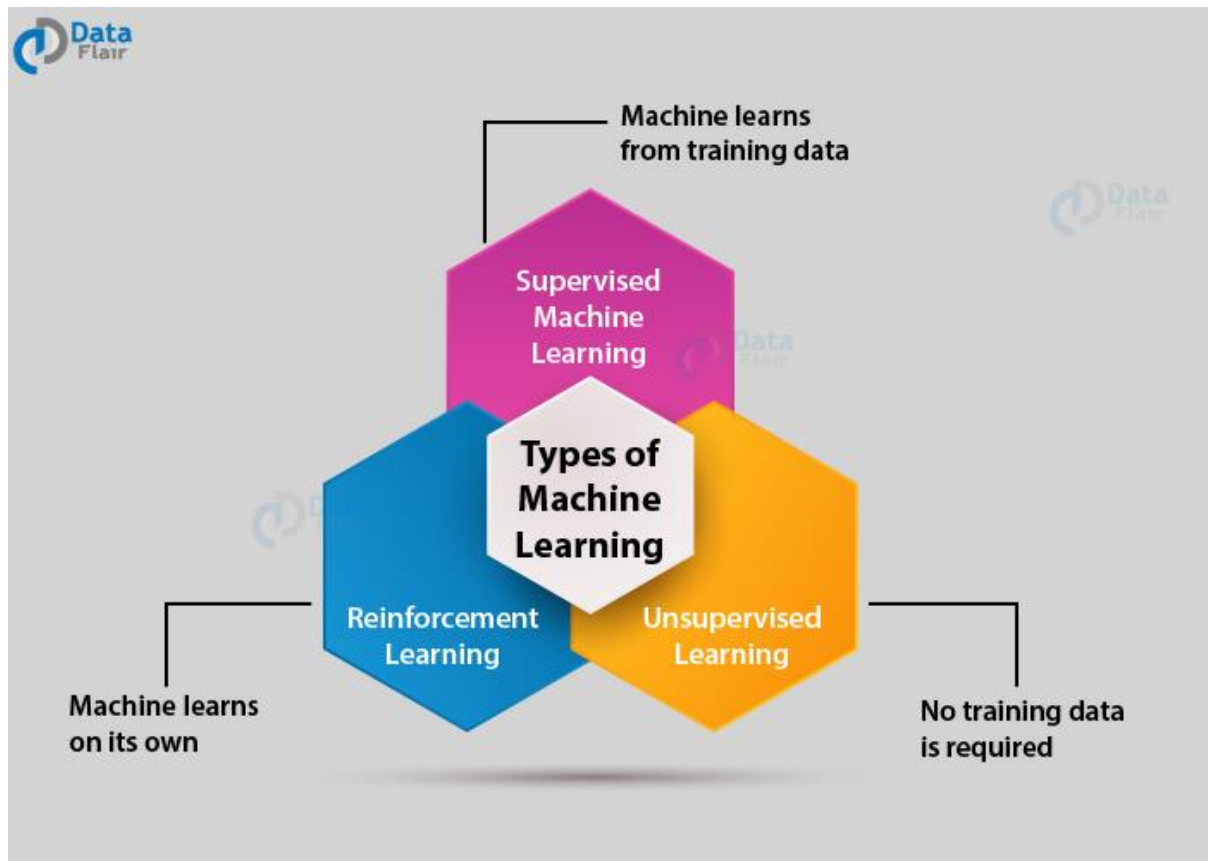
Supervised learning

Supervised learning is that the machine learning task of learning a function that maps an input to an output supported example input-output pairs.

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.

An example of supervised learning is spam filtering.

Based on the labeled data, the model is able to determine if the data is spam or ham. This is an easier form of training.

Spam filtering is an example of this type of machine learning algorithm.

Unsupervised Learning

Unsupervised Learning may be a machine learning technique during which the users don't got to supervise the model. Instead, it allows the model to figure on its own to get patterns and knowledge that was previously undetected. It mainly deals with the unlabeled data.

In Unsupervised Learning, there is no labeled data. The algorithm identifies the patterns within the dataset and learns them. The algorithm groups the data into various clusters based on their density. Using it, one can perform visualization on high dimensional data.

One example of this type of Machine learning algorithm is the Principle Component Analysis.

Furthermore, K-Means Clustering is another type of Unsupervised Learning where the data is clustered in groups of a similar order. The learning process in Unsupervised Learning is solely on the basis of finding patterns in the data.

After learning the patterns, the model then makes conclusions.

Reinforcement Learning

Reinforcement learning is one among three basic machine learning paradigms, alongside supervised learning and unsupervised learning.

Reinforcement Learning is an emerging and most popular type of Machine Learning Algorithm. It is used in various autonomous systems like cars and industrial robotics. The aim of this algorithm is to reach a goal in a dynamic environment. It can reach this goal based on several rewards that are provided to it by the system.

It is most heavily used in programming robots to perform autonomous actions. It is also used in making intelligent self-driving cars.

Let us consider the case of robotic navigation.

Furthermore, the efficiency can be improved with further experimentation with the agent in its environment. This the main principle behind reinforcement learning.

There are similar sequences of action in a reinforcement learning model.

Machine Learning Algorithms

Let us see some most common machine learning approaches:

1. Regression

Regression models are used extensively to predict values based on the variables that are dependent on several factors.

The most common example of regression is Linear Regression where there is a linear relationship or correlation between the predictor variable and the response variable.

There are also other types of regression such as ARIMA regression that makes use an auto-correlation regression model to forecast continuous values provided by the time-series data.

They are used in forecasting the stock prices and other values that are based on time.

2. Decision Tree Learning

Decision Trees are a supervised type of machine learning algorithms. These trees are mainly used for predictive modeling. We create a decision tree that is able to take decisions based on user input.

Decision Trees can be used for both regressions as well as classification. These trees are used to provide graphical outputs to the user based on several independent variables.

3. Support Vector Machines

Support Vector Machines or SVMs are machine learning algorithms that are used to classify data into two categories or classes.

It is a type of supervised learning algorithms that makes use of several types of kernels to classify the data. Based on the prediction performed, it can categorize whether it falls into one class or any other class.

With the help of SVMs, one can perform both linear as well as non-linear classification. An SVM classifier divides the data into two classes using a hyperplane.

4. Association Rule Learning

Association Rule Mining is used for finding relationships between several variables that are present in the database. It is a type of data mining technique through which you can discover association between several items. It applied in sale industries mostly to predict if the customer will buy item Y if he has purchased the item X.

5. Artificial Neural Networks (ANN)

An Artificial Neural Network is an advanced form of machine learning technique. These neural networks are modeled after the human nervous system and are therefore called neural networks.

There is a connection of several neurons which compute the information. These neurons capture the statistical structure and are therefore able to create a joint probability distribution over the input variables. These neural networks are apt at finding patterns over large datasets.

Neural Networks can perform classification as well as regression tasks with high accuracy.

Furthermore, they eliminate the requirement for doing heavy statistical tasks in pre-processing as they are quite adequate in realizing patterns on their own.

6. Inductive Logic Programming

In this, logic programming forms the core part to produce a rule-like learning model.

Inductive Logic Programming or ILP presents the input information, hypothesis as well as the background contextual knowledge in the form of several rules that have to be followed with logic.

It makes use of functional programs to carry out inductive programming to process hypothesis in part rules.

Training models are quite often used for developing this model which is then used to forge relationships between several variables.

7. Reinforcement Learning

The aim of Reinforcement Learning is to direct the agent towards maximizing rewards and reach its goal. This takes place in a dynamic environment where the agent has to chart its way to the goal through a series of trials and errors. Each time it takes a correct route, its profit is maximized and when it encounters a wrong approach, its profit is minimized.

Reinforcement Learning is widely used in self-driving cars and autonomous robotics that require self-decision making capability.

Reinforcement Learnings are experimental in nature and through a series of trials are able to reach their goals with maximum accuracy (or rewards).

8. Clustering

In clustering, the observations are divided into groups or clusters. These clusters are formed based on similar data and have similar criteria. These criteria can be density or similar structure of the data.

There are several clustering techniques that make use of different criteria to cluster the data.

For instance, the distance between the data, the density of the data and graph connectivity are some of the criteria that define techniques for clustering in machine learning.

Since there are no labeled data or input-output mapping, this type of technique is an unsupervised machine learning procedure.

9. Similarity and Metric Learning

Similarity determination is one of the key functions of machine learning. In this form of learning, the ML model is provided a mix of similar as well as dissimilar data objects.

The machine learning model learns to map similar objects together and learns a similarity function that allows it to group similar objects together in the future.

10. Bayesian Networks

A Bayesian Network is an acyclic directed graphical model. This model is also called DAG which represents the probability of several independent conditioned variables.

One can illustrate the relationship between disease and symptoms. It can be used to compute the probabilities of various diseases. They can be used to find the diagnosis of several diseases through a calculated approach of

listing probabilities of various factors that could have contributed towards it.

More advanced forms of Bayesian Networks are Deep Bayesian Networks.

The basic principle behind the Bayesian Network is the Bayes theorem which is the most important part of the probability theory. With the help of Bayes Theorem, we determine the conditional probability of an event. This conditional probability is of a known event.

The conditional probability itself is the hypothesis. And, we calculate this probability based on the previous evidence.

$$P\ (A/B) = P\ (B/A)*P\ (A)/P\ (B)$$

Using a well-defined network of a connected graph, a user can make a DAG to model conditional dependencies

11. Representation Learning

In order to represent the data in a more structured format, we make use of representation learning. This formats the data efficiently so that the model can train better to provide accurate results.

The representation of data is one of the key factors that can affect the performance of the machine learning method. This allows the algorithm to learn better from the data.

Using representation learning, algorithms are able to preserve the input data and essential information.

Therefore, a model is able to capture most of the information during pre-processing.

Furthermore, the inputs present in pre-processing are able to gather data generating a defined distribution.

12. Sparse Dictionary Learning

In the method of Sparse Dictionary, a linear combination of basis functions as well as sparse coefficients are assumed.

The elements of a sparse dictionary are called atoms. These atoms altogether compose a dictionary. It is an extension of representation learning. It is used most widely in compressed sensing and signal recovery.

In this method, we represent a datum as a linear combination of basis functions and then assume the coefficients to be sparse.

So, this was all in the latest Machine learning tutorial for beginners. Many of you might find the umbrella terms Machine learning, Deep learning, and AI confusing.

So, here is some additional help; below is the difference between machine learning, deep learning, and AI in simple terms.

Machine Learning vs Deep Learning vs AI

Machine Learning

Machine learning may be a method of knowledge analysis that automates analytical model building. It's a branch of AI supported the thought that

systems can learn from data, identify patterns and make decisions with minimal human intervention.

Machine Learning is a part of Artificial Intelligence that involves implementing algorithms that are able to learn from the data or previous instances and are able to perform tasks without explicit instructions.

The procedure for learning from the data involves statistical recognition of patterns and fitting the model so as to evaluate the data more accurately and provide us with precise results.

Deep Learning

Deep learning is a component of a broader family of machine learning methods supported artificial neural networks with representation learning.

Learning is often supervised, semi-supervised or unsupervised. Deep Learning is a part of Machine Learning that involves the usage of artificial neural networks.

Deep Learning machine learning algorithms are the most popular choice in many industries due to the ability of neural networks to learn from large data more accurately and provide steadfast results to the user.

Artificial Intelligence

AI is the greater pool that contains an amalgamation of all the above-discussed technologies. Artificial Intelligence is still under research and involves imparting sentient intelligence to the machines.

However, Artificial General Intelligence is still far fetched and will require years of research before we can have even a basic version of it.

Summary

In this machine learning tutorial, we went through the basics of machine learning and how computing power has evolved over time to accommodate advanced machine learning algorithms.

Computers are gaining intelligence owing to the data that is generated in a vast amount.

We went through the different types of machine learning algorithms and further took a brief look at some of the popular ML algorithms.

We hope that you are now well acquainted with machine learning.

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