**Machine Learning (ML)** –Machine Learning is the scientific study of algorithms and statistical models that computer systems use to perform a specific task without using explicit instructions, relying on patterns and inference instead. It is seen as an application of artificial intelligence that provides the systems the ability to automatically learn and improve from experience without being explicitly programmed. Machine Learning focuses on the development of computer programs that can access data and use it to learn for themselves.

Machine Learning algorithms build a mathematical model based on the sample data, known as “training data”, in order to make predictions or decisions without being explicitly programmed to perform task. Machine Learning algorithms are used in a wide variety of applications, such as email filtering and computer vision, where it is difficult or infeasible to develop a conventional algorithm for effectively performing the task.

Machine learning is closely related to computational statistics, which focuses on making predictions using computers. The study of mathematical optimization delivers methods, theory and application domains to the field of machine learning. Data Mining is a field of study within machine learning ,and focuses on exploratory data analysis through unsupervised learning. In its application across business problems, machine learning is also referred to as predictive analytics.

The computational analysis of machine learning algorithms and their performance is a branch of theoretical computer science known as computational learning theory. Because training sets are finite and the future is uncertain, learning theory usually does not yield guarantees of the performance of the algorithms. Instead, probabilistic bounds on the performance are quite common. The bias-variance decomposition is one way to quality generalization error.

Although machine learning has been transformative in some fields, machine learning programs often fail to deliver expected results. Reasons for this are numerous: lack of (suitable) data, lack of access to the data, data bias, privacy problems badly chosen tasks and algorithms, **wrong** tools and **people**, **lack of resources**, and evaluation problems.

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