REVIEW OF MACHINE LEARNING IN THE INDIAN EDUCATION SYSTEM

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Abstract: Over the last two eras, education has undergone many changes at all levels. Many changes are taking place due to the increasing technological advances in the way teachers are taught and the way their students learn. One of the milestones in the growth of technology is the emergence of artificial intelligence and machine learning. Today, machine learning (ML) is one of the most promising application areas in the field of information technology, with almost unlimited application scope. The application of machine learning in the field of education is currently of great interest to researchers and scientists, which is the main focus of our research. The main purpose of this paper is how machine learning has changed the education system compared to the past. Machine learning has changed the education sector by improving efficiency, learning analytics, predictive analytics, adaptive learning, individual learning, and implementing different methods of evaluation. This review contains general concepts of machine learning in education.

Index Terms - Education, Machine Learning, Information Technology, Learning.

I. INTRODUCTION

Today, technology is global, including in the education sector, and has proven to be of great importance in achieving student learning outcomes. Education is moving away from the traditional line of students looking at the same textbook while the teacher lectures from the front of the room. Today's classrooms are not only evolving to use more technology and digital resources, they are also investing in machine learning. Machine learning has become a new frontier in education. Not only does it redefine how education is delivered, it also has the potential to promote quality learning for students. Machine learning is committed to providing personalized classroom instruction by providing real-time feedback based on individual student behavior and other factors. This increases the chances to improved learning. Machine learning also plays an important role in evaluation and evaluation by removing bias [1].

With the help of machine learning, it is possible to develop intelligent systems that allow you to make your own decisions based on scenarios. Data is very important in machine learning because it acts as a primary reference. With the help of machine learning algorithms, it is possible to use previously stored data to create the necessary data.

II. MACHINE LEARNING

Machine learning is a core sub-area of artificial intelligence that gives machines access to data to make human work easier and makes reality easier only to let them learn the data for themselves. Learning [7] is an important feature of artificial intelligence. This is a machine feature that captures data and feedback in real time and improves performance over time, developing self-learning algorithms to gain insight from that data to make predictions. Machine learning algorithms use computational methods to study information directly from data, without relying on a predetermined equation as a model. Machine learning is one of the most important technological approaches to AI and underpins many recent advances in AI and business applications. Modern machine learning is a statistical process that helps define the output and future use of data [8]. Machine learning architectures are currently of the utmost interest in the industry as they seek to optimize the resources and output available to each process based on the available historical data. Machine learning has significant advantages in data prediction and analysis combined with data science technology. The machine learning architecture defines the various levels involved in the machine learning cycle and contains the basic steps to take when transforming raw data into training datasets that enable decision making in the system. Machine learning architectures shows in Fig 1.
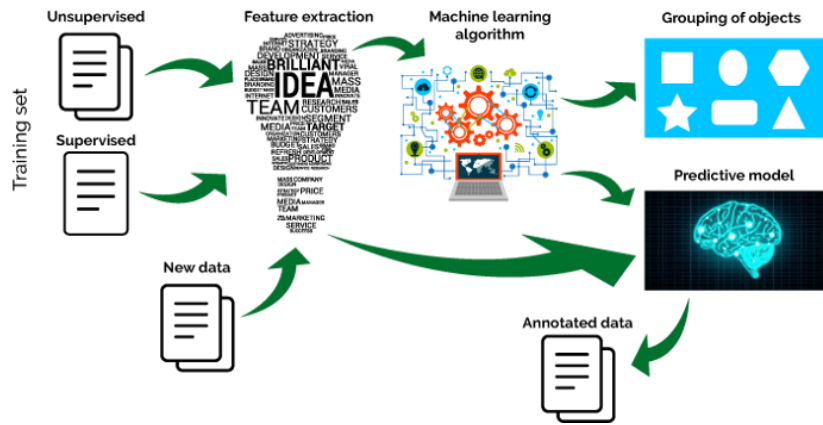
Figure 1 Architecture of Machine Learning [17]

These are three types of machine learning: supervised learning, unsupervised learning, and reinforcement learning shown in Fig 2.
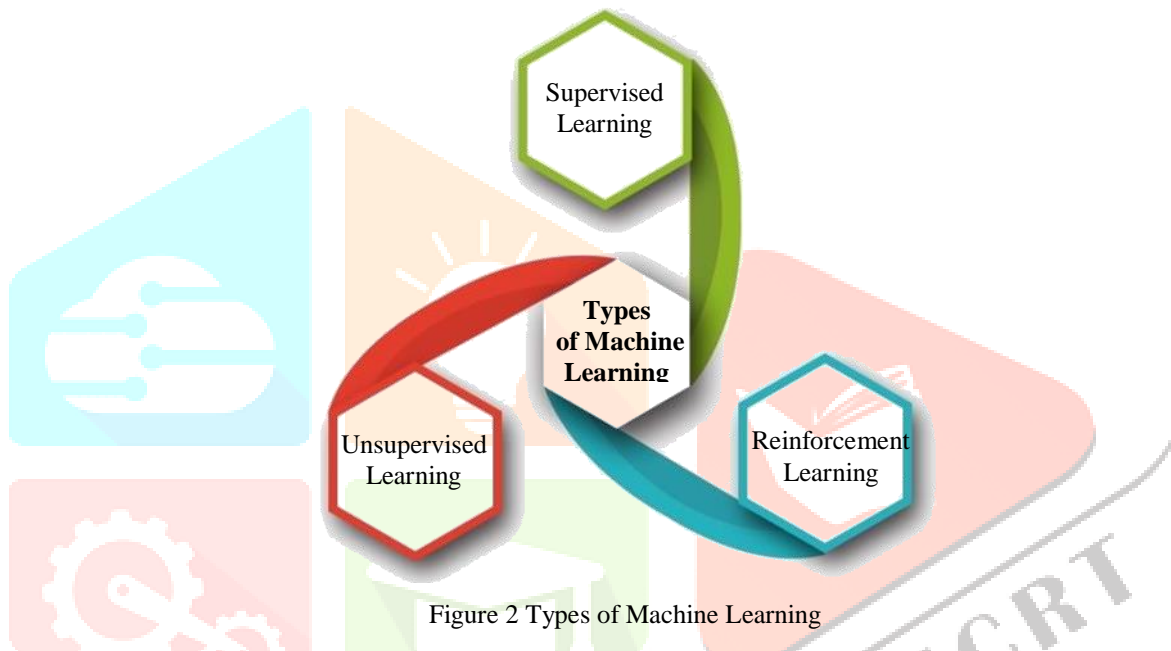

Figure 2 Types of Machine Learning

Supervised Learning: Supervised learning is a type of machine learning that trains a machine with suitably "labeled" training data and then predicts the output of the machine based on that data. Marked data means that some input data is already marked with the correct output. During supervised learning, the learning data provided to the machine acts as a supervisor who teaches the machine to correctly predict results. It applies the same concepts that students learn under the supervision of a teacher. Supervised learning is the process of providing input and correct output data to a machine learning model shown in Fig 3. The purpose of the supervised learning algorithm is to find a mapping function that maps the input variable (x) to the output variable (y).
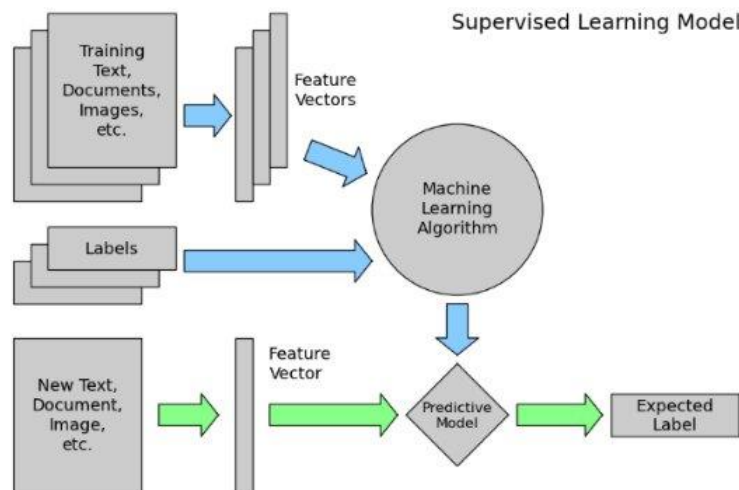

Figure 3 Supervised Learning Model [1]

Unsupervised/predictive learning: Unsupervised learning is a machine learning technique that does not monitor the model using training datasets. Instead, the model itself finds hidden patterns and insights from the specified data. It can be compared to the learning that takes place in the human brain while learning new things. This can be defined as: Unsupervised learning is a type of machine learning in which a model is trained on an unlabeled dataset and can act on that data without supervision shown in Fig 4.

The purpose of unsupervised learning is to find the basic structure of the data set, group the data according to similarity and present the data set in a summarized format.
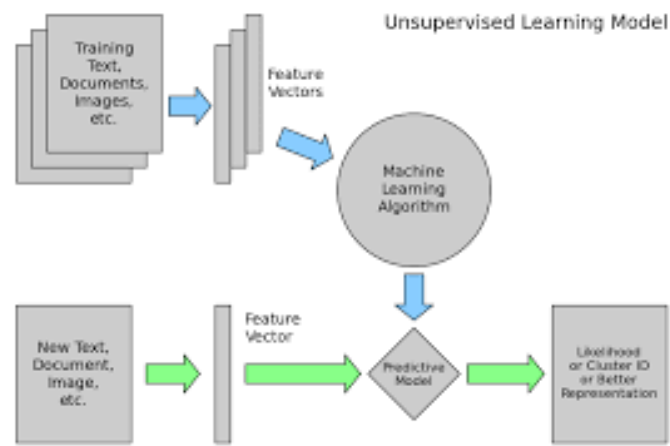

Figure 4 Unsupervised Learning Model [1]

Reinforcement Learning: Reinforcement learning is a feedback-based machine learning method in which agents learn to behave in an environment by performing actions and seeing the results of the actions. For every good deed, the agent receives a positive response, and for every bad deed, the agent receives a negative response or fine.
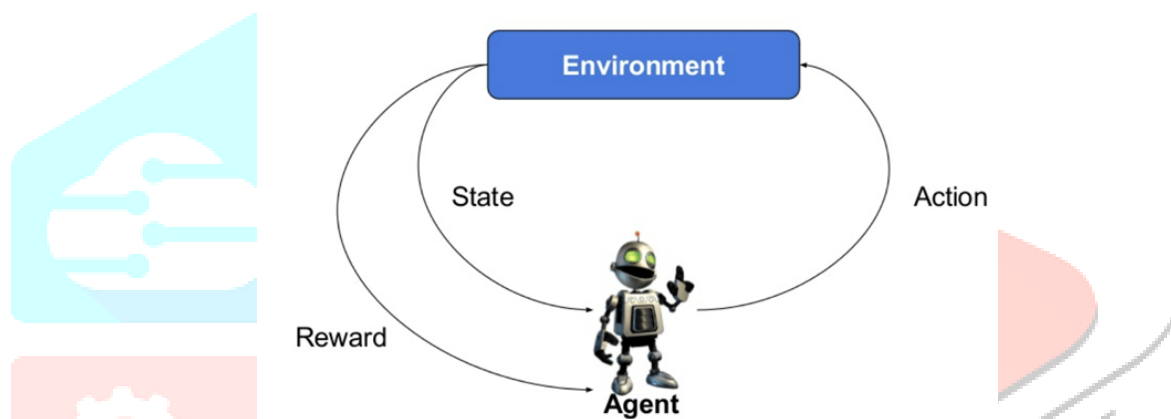

Figure 5 Reinforcement Learning

III. LITERATURE REVIEW

Tom M. Mitchell [3] in their book "Machine Learning " In the field of machine learning, he described the study of algorithms that allow computer programs to improve automatically through experience and to automatically assume general laws from particular data. Ibtehal Talal Nafea [4] in their research paper "Machine learning in education technology" explains the basic perspectives of machine learning in education and concludes that future learning environments are likely to be highly personalized so that learners can realize their full potential in the most satisfying techniques.

Ilkka Tuomi [5] in their report describes "The Impact of Artificial Intelligence on Learning, Teaching, and Education: Policies for the Future". He has defined the advantages and limitations of machine learning in education. Havan Agrawal, Harshil Mavani [6] they designed a model that used a machine learning algorithm called a neural network to predict the performance of students in an academic institution. This review also describes the application of machine learning in education.

IV. APPLICATION OF MACHINE LEARNING IN EDUCATION

Machine Learning can significantly impact the future of our education. It is an effective teaching tool because of its ability to adapt and offer customized curricula. Machine Learning enabled tools help assesses an individual's current level of understanding, identify gaps in the learning of the student and provide real-time solutions. The technology can also identify areas where teachers are outnumbered by students and create optimized learning programs that impact the largest number of students.

4.1 Adaptive Learning:

Machine learning allows us to analyze the performance of each student in real time, and then change the teaching methods and curriculum based on the analyzed data. The software helps to suggest ways of learning that a student should go through. Students receive suggestions on materials and other teaching methodologies in software.

4.2 Improving the Efficiency:

Machine learning makes it much easier for schools and colleges to better organize and manage their content and curriculum. It also helps to understand the potential of everyone in the system and then distributes the work accordingly. It easily determines which work is best for individual teachers and which is best for students. Because machine learning greatly facilitates learning for both teachers and students, it improves engagement and interest in learning and participation. Needless to say, this helps to increase the efficiency of the education system.

4.3 Learning Analytics:

Teaching materials can often confuse teachers. When they get stuck in teaching, students cannot properly master the ideas and essence of the lesson. ML-based learning analytics can help teachers gain insight into data and enable them to better understand data. As teachers review countless materials, analyze, interpret, make connections, and draw conclusions, it improves the overall teaching and learning process. Learning analytics also tells you which path of learning an individual student should take. In fact, it also offers many benefits to students by providing suggestions on materials and other teaching methodologies for software.

4.4 Predictive Analytics:

Predictive analytics in education is about knowing the thoughts and needs of students. This helps to draw conclusions about what may happen in the future. With class tests and results in six months it was possible to understand which students will do well in the exam, and who will have a hard time. This helps teachers and parents to be alert and take action. Thanks to this, the student can be better helped and work on his weak subjects.

4.5 Personalized Learning:

Machine learning has also made a scope for personalized learning, where students have the freedom to choose the subjects they are interested in, the teacher they want to study with, and the curriculum, standards, and models they want to follow. In simple words, students can now experience a learning environment that meets their needs and preferences.

4.6 Assessment Evaluation:

Machine learning also changes the way we evaluate. IT has the ability to assess tasks and exams more accurately than a person. As you can see, checking OMR response forms has been a tough process. And there were also chances to make a mistake when evaluating the works. With ML the estimate may be more accurate.
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V. THE BENEFITS AND LIMITATIONS OF MACHINE LEARNING IN EDUCATION

It is difficult not to notice personalized education as the most noticeable advantage of machine learning. Students can work on material that meets their unique capabilities and move on to more complex content when they are ready. This unique approach to learning not only benefits students, but also teachers can save a lot of time. They no longer need to create lesson plans that serve students of all abilities and levels of the class. The advantage of machine learning is also manifested in the system of automatic assessment. This allows for completely unbiased assessment, which cannot be influenced by the teacher's relationship with any student. This saves teachers time and gives a more realistic overview of the child's achievements in school.

Machine learning can also help educators look to the future. By analyzing their data in the system, patterns will quickly emerge that show where the student's main weakness is and whether they need extra help. If the problem is academic, computers can provide a form of virtual learning. However, it may also indicate whether a student risks leaving school or receiving more disciplinary action. The main disadvantage of machine learning [18] is that social skills still need to be emphasized even when using machine learning.

No matter how useful it is to allow a computer to evaluate student work, it will not always be effective. Educators will still have to plan the assessment of essays and other subjects in the old-fashioned way.
Of course, many schools appreciate the benefits of machine learning because of its inherent cost. Buying all the new equipment and software to make personalized learning an effective solution for teachers and students can be quite expensive. This can be one of the major boundaries of machine learning.

CONCLUSION

The whole world is on the path to digitalization, and for this purpose the concepts of machine learning plays an important role. Our research is based entirely on how new machine technologies are emerging invented in the education system. Modern machines are ready to provide knowledge-based education and are responsible for it improving intelligence. In the future, we do not think and imagine the progress of educational technology due to Machine learning. It will also provide many new opportunities to support management, reduce effort and learning gaps between student and teachers. In the near future, machine learning will become more effective and give even better results. All schools and colleges will need some time to get used to the functions of machine learning. It is obvious that the full implementation of such technologies in education requires a lot of work.

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