

A REVIEW OF MACHINE LEARNING IN EDUCATION

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Abstract: Education is first and foremost rights of every human being. It is the act of learning things around us. It helps us to easily understand and deal with any problem and makes balance throughout the whole life in every aspect. Education has undergone many changes over the past 2 decades at all levels. Many of the changes have undergone due to the increasing number of technology advancements in the ways teachers educate and the ways of that student learn. One of the landmark events in the course of evolution of technology has been the advent of artificial intelligence and machine learning. These two upgraded technology have touched every part of human life, whether it is business, banking, communication, travel, health or education. It's true that teachers and educators are irreplaceable. But technology will cause many changes to a teacher's job and to educational best practices. This review involve the general concept of machine learning in education.

Index Terms - Artificial Intelligence, Machine Learning, Digitalization, Supervised Learning, Unsupervised Learning

I. Introduction:

Currently, technology is everywhere including the education sector, where it has proven to be of great importance for realizing the learning outcomes for students. Education is moving away from traditional rows of students looking at the same textbook while a teacher lectures from the front of the room. Today's classrooms are not simply evolving to use more technology and digital resources; they are also investing in machine learning. Machine learning has become a new frontier for education. It can potentially redefine not only how education is delivered, but also foster quality learning on the students' part. Machine learning promises to deliver custom in-class teaching by providing real-time feedback based on individual student behavior and other factors. This improves the chances of better learning. Machine learning also plays an important role in assessments or evaluations by removing biases. Being one of the strongest newer technologies, machine learning plays the main rules in artificial intelligent and human interaction. Consequently, machine learning helps computers to find hidden insights without being programmed to do so. Moreover, machine learning works as a good predictive.

II. Related Work:

Tom M. Mitchell [1] in their book "Machine Learning " described the field of machine learning, the study of algorithms that allow computer programs to automatically improve through experience and that automatically infer general laws from specific data.

Ibtehal Talal Nafea [2] in their research paper "Machine learning in education technology" described the basic perspectives of machine learning in education and concluded that the future learning environments are likely to be highly personalized, with the ability to help learners realize their utmost potential in the most fulfilling way.

Ilkka Tuomi [3] in their report describes "The Impact of Artificial Intelligence on Learning, Teaching, and Education: Policies for the Future". The ambition of this review is to define the benefits and limitations of machine learning in education.

Havan Agrawal, Harshil Mavani [4] they purposed a model to predict the performance of students in an academic organization using machine learning algorithm called Neural Networks. The review is also explores the application of machine learning in education.

III. Machine Learning:

Machine Learning is a core sub-area of artificial intelligence which promotes the reality just to be able to give machines the access to data for more ease in human work and just to learn them for themselves. Learning [5] is a key hallmark of artificial intelligence. It is an ability of the machines to take real – time data and feedback and improves performance over a time and involved the development of self-learning algorithms to gain knowledge from that data in order to make predictions. Machine learning is one of the most important technical approaches to AI and the basis of many recent advances and commercial applications of AI. Modern machine learning is a statistical process that helps to define the output and future use of data [6].

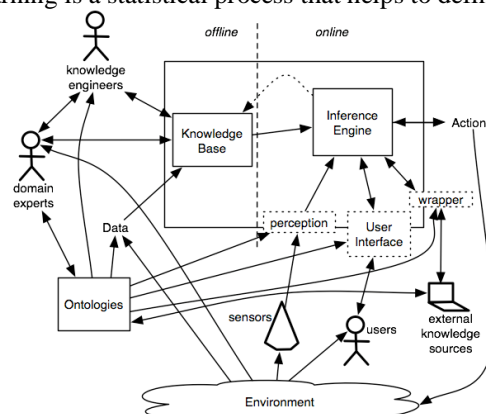


Fig. a) Machine Learning Mechanism

There are following types of learning:

1. Supervised learning.
2. Unsupervised/predictive learning.
3. Reinforcement learning.
- 3.1. **Supervised Learning:** In this process, if the researcher tells the machine what the correct answer is for a particular input. It is most common technique for training neural networks [7] and other machine learning architectures. The accuracy of prediction by the computer during training is also analyzed. It involves learning a mapping from a set of inputs to a target variable. The target is discrete and real value. It is solved by decision trees, naive trees [8], boosting and multi-layer [9] neural networks.

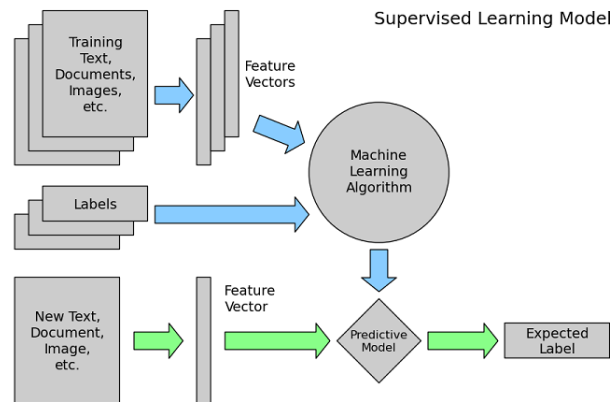


Fig. b) Supervised learning model

- 3.2. **Unsupervised/predictive learning:** In this method, no labels are given to learning algorithm, leaving it on its own to find a structure in its input. It can be a goal in itself i.e. hidden pattern [10] and data. Researchers don't know how to do at this moment, research is still going on. No target variables are provided. It is solved by grouping into K groups. Unsupervised learning is mostly applied on transactional data. It is used in more complex tasks. It uses another approach of iteration known as deep learning to arrive at some conclusions.

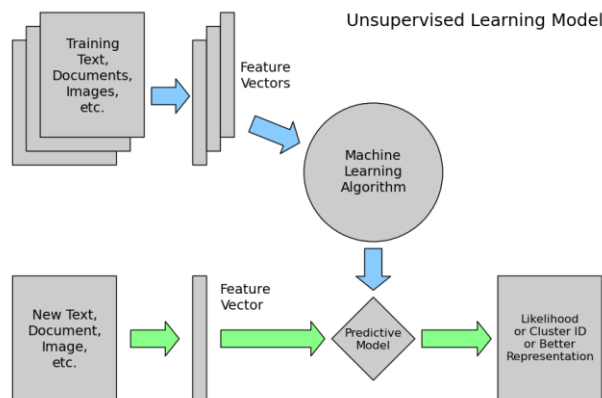


Fig. c) Unsupervised learning model

- 3.3. **Reinforcement Learning:** In this algorithm, The AI, Agent [10] decides how to behave in order to get most of the work is done. A computer interacts with dynamic environment in which it must perform a certain task to win against opponent. The program gives feedback in terms of punishment or reward. The machine itself selects actions to be performed for better output. The main goal in reinforcement learning is to find the best possible policy.

IV. Application of machine learning in education:

Artificial intelligence and Machine Learning can significantly impact the future of our education. With machine learning, we are moving away from the one-size-fits-all methodology. It is an effective teaching tool because of its ability to adapt and offer customized curricula. Machine Learning enabled tools help assess an individual's current level of understanding, identify gaps in the learnings 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. Here are some advantages of ML that shows it become a game changer in the field of education

- 4.1. **Predict Student Performance:** A major benefit of machine learning is its ability to predict student performance. By "learning" about each student, the technology can identify weaknesses and suggests meaningful learning tools for each student, such as additional practice tests.
- 4.2. **Grade Students Fairly:** Machine learning can also grade students fairly by removing human biases. While grading is now already being completed by AI for multiple choice exams, we are beginning to see machine learning also starting to assess writing with tools like Grammarly.
- 4.3. **Organize Content Effectively:** Through identifying weaknesses, machine learning can organize content more effectively. For example, as students learn one skill, they move on to the next skill continually building upon knowledge.
- 4.4. **Suggested learning path:** Once the software analyzes students' performance, it might suggest a better way to learn new material. It starts with the analysis of the existing knowledge of the curriculum. And once weak spots are identified, students receive suggestions regarding materials and further learning methodology.

- 4.5. **Career Path Prediction:** Machine learning applications for career path prediction are able to track student interest, aptitudes and dislikes. It analyzes student behavior and reactions. Based on the analysis, it can fairly predict interest areas in which the student can excel.
- 4.6. **Group Students and Teachers:** Another way machine learning will improve education is by grouping students and teachers according to their needs and availability.

V. Benefits and Limitations of Machine Learning:

It's hard to overlook personalized education as the most prominent advantage [12] of machine learning. Students can work on material that suits their unique capabilities and advance to more difficult content when they are ready. Not only do students benefit from this unique approach to learning, but teachers can save a great deal of time. They no longer have to create lesson plans that cater to students of all abilities and grade levels. The advantage of machine learning also shows up in the automatic grading system. This presents the opportunity for completely unbiased grading that can't be influenced by the teacher's relationship with any student. It saves teachers time and gives a more realistic overview of a child's achievements in school. Machine learning can also help educators to look toward the future. By analyzing their data in the system, patterns will quickly emerge that show where the student's primary weakness is and if they will need more help. If the issue is academic, the computers can provide a form of virtual tutoring. However, it can also indicate if a student is at risk of dropping out or receiving greater disciplinary action.

The major downside to machine learning is that we are taking personal interaction away from the students. This can dramatically impact their ability to make friends and present themselves well in the workplace over the years ahead. Social skills still need to be emphasized even while using machine learning. As helpful as it can be to allow the computer to grade student papers, it isn't always going to be effective. Educators will still need to plan to grade essays and other items the old-fashioned way. Computers lack the ability to assess items that don't have a specific technical requirement associated with them. They can easily grade multiple choice but struggle with the more time-consuming essay assignments. Of course, many schools are evaluating the advantages of machine learning due to the inherent cost. It can be quite expensive to purchase all new equipment and programs to make personalized learning an effective solution for educators and students. This can be one of the biggest limitations to machine learning.

V. Conclusion:

The entire world is on the way of Digitalization and for that purpose the artificial intelligence and machine learning concepts play an important role. Our research paper is totally based upon, how the intelligence and new machine technologies get invented in education system. Today's machines are ready to give the knowledge-based education and are responsible for improving the intelligence. In future, we don't think and imagine about the progress of education technology due to only Machine Learning. Artificial intelligence and machine learning in education will be a game changer in the coming future. It will also bring many new opportunities to maintain the management, reduce the effort and learning gaps between the student and teachers. In the near future, machine learning will be more efficient and produce even better results.

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