

Implementation of Machine Learning in Higher Education

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Abstract: Machine Learning (ML) is one in every of the fastest emerging technologies today. It is a sub-set of computing technology. Machine learning is employed to show machines the way to handle the information more efficiently. It's a scientific study of statistical models and algorithms to assist a computer system to accomplish designated tasks efficiently and independently by relying solely on inferences and patterns extracted from the training or acquired data [1]. The aim of this paper is to provide the probabilities of applying and using machine learning within the education area. This paper identifies and analyses suitable literature, research papers and articles so as to see their categorization within the field of education, to see this trends of using machine learning in education, and to see its current and future applications.

Keywords: Education, Machine learning, Algorithms, Student performance, Student retention.

1. Introduction

Machine learning may be considered part of computing (AI). Machine learning is, at its core, the method of granting a machine or model access to data and letting it learn for itself. In 1959, Arthur Samuel came up with the brilliant concept that we should always not need to teach computers, but rather, we could allow them to learn their own.

He coined the term "machine learning" to explain his theory, which is now a regular definition for the flexibility of computers to be told autonomously [2]. Pattern recognition, education, computer vision, bioinformatics, natural language processing, etc. are just a few of fields where machine learning is applied.

The best way to describe the potential of machine learning is to explore how people and corporations are currently taking advantage of it. Some examples could be:

A. Natural language processing

Google Translate is created from a bunch of machine learning algorithms that updates the service over time supported input from users, like new words and syntax. Siri, Alexa, Cortana, and, last, Google Assistant all rely upon natural language processing to acknowledge speech and synthesis, allowing them to grasp or pronounce words they have never encountered before.

B. Healthcare

AI increases the flexibleness for healthcare professionals to raised understand the day-to-day patterns and desires of the people they be sure of, and therewith understanding they're ready to provide better feedback, guidance and support for staying healthy. variety of the ML algorithms utilized in health care application are cardiopathy Diagnosis, Predicting Diabetes, Cancer Detection and Prediction, Robotic Surgery, Smart Electronic Health Recorder.

C. Trading

Machine Learning is one step above Algorithmic trading. The Algorithmic trading involves feeding the buy/sell rules to the computer. The financiers cannot predict all of that behavior, machine learning algorithms can - and that they answer changes within the market much faster than human.

D. Online shopping

Everything that is recommended to you depends on your search activity. The e-shopping websites deliver recommendations across platforms, devices, and apps. Machines match buyers with sellers and their products, digital content with viewers who want to figure out them - all of which improves our online experiences significantly.

2. Machine Learning Algorithms in Education Area

A. Supervised Learning Algorithm

Supervised learning is that the task of inferring a function from labeled training data. It involves supervision of human or developer. Although the system records the past operations of the students, still the programmer/teacher must train the system with new sets of information to be prepared for the subsequent level of prediction of students and will make modifications within the preferences, to teach the system for brand new possibilities of problems which students might face. the scholars are given suggested reading/study which is to guide the realm during which they need to reinforce.

B. Unsupervised Learning Algorithm

Unsupervised learning models are used once we only have the input variables (X) and no corresponding output variables. They use unlabeled training data to model the underlying structure of the data. This approach doesn't involve any data

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classifications, and also the system encompasses a more comprehensive algorithm, due to which it can evaluate the data to acknowledge a replacement set of patterns.

C. Reinforcement Learning Algorithm

Reinforcement learning could also be a range of learning which makes decisions supported which actions to need specified the tip result's more positive. This approach is that the foremost appropriate approach which could be adapted in teaching and learning. In this, the machine is about with specific goals (tasks) which must be achieved by the highest of implementation. Moreover, throughout the tactic, the machine has constant monitoring and feedback.

3. Systematic Literature Review

Until the mid-1990s, the intelligent tutoring system which is one among web based educational system is been done by some researcher which delivering domain specific knowledge. In 2005, relating [3] there been implemented the intelligent web-based tutoring system to testing the importance the system. because the result it shows, computing (AI) applications in education are on the increase and have received plenty of attention within the last few years. AI and adaptive learning technologies are prominently featured as important developments in educational technology within the 2018 Horizon report (Educause, 2018), with a time to adoption of two or 3 years. in step with the report, experts anticipate AI in education to grow by 43% within the period 2018–2022, although the Horizon Report 2019 educational activity Edition (Educause, 2019) predicts that AI applications associated with teaching and learning are projected to grow even more significantly than this.

The most exciting a part of the Report, the time to adoption section, is additionally the foremost problematic. The 2019 Report forecasts one year for mobile learning and analytics technologies, 2 to 3 years for mixed reality and computer science, and 4 to 5 years' time horizons for the adoption of blockchain and virtual assistants.

The databases used were IEEE Xplore Digital Library (IEEE), Scopus database, Web of Science database (WoS), ScienceDirect, et al. (Google Scholar and similar). The search term was ("Machine Learning" AND "Education").

Education is changing on daily basis. There aren't just students in classroom anymore, staring at the notebook, while a tutor lectures. Today's classrooms use digital resources and are investing in machine learning. In education, as an example, machine learning may be applied to support teachers, predict student performance, test students, etc.

There are many other business implementations of machine learning, lot of them are in education area [4]. Some of interesting areas are:

A. Predict Student Performance

An excellent application of machine learning is predicting student performance. By "learning" about each student, the machine learning model can be told weaknesses and suggests ways to enhance, like additional lectures or study additional

literature [5].

B. Test Students & Grade Students

Machine learning helps teachers and students to achieve their goals by providing instant feedback of the adaptive virtual sessions. The teachers able to track the performance of the students and the students are very interested to complete their works in the adaptive learning systems [6].

C. Improve Retention

Machine learning, like learning analytics, will help improve retention rates. By identifying "at risk" students, institutions and reach bent on those students and procure them the help they need to realize success.

D. Support Teachers and Institution Staff:

Machine learning based algorithms can help with classification of students handwritten assessment papers [7].

E. Customized Learning

Machine learning also makes it possible to customize learning for each student within the classroom. Teachers are visiting be able to use the data to figure out which students need additional assistance, and so the technology may suggest meaningful learning tools for each student.

The current research studies that specialize in:

- Predicting student performance.
- Improving student retention.
- Machine Learning in Automated Assessment.
- Machine Learning in Virtual Learning.

4. Results

A. Predicting Student Performance

Probably a significant good thing about machine learning (regarding number of studies in scientific databases) is its ability to predict student performance. By "learning" about each student, the technology can identify weaknesses and suggests ways to enhance, like additional practice tests. This seems to be highly regarded research trend; there are lot of studies in recent years during this area, as we said before. As an example, study [8] employs the machine learning approach called the recursive clustering technique to group the students of the programming course into groups supported their performance within the prerequisite courses, co-requisite and current course work result. Students present within the lower groups are going to be taken into consideration since they're highly at risk of fail. In another interesting study during this category, authors have proposed a brand new model to categorize students into three categories to work out their learning capabilities and to assist them to enhance their studying techniques. The authors chosen the state of the art of machine learning approach to classify student's nature of study by selecting prominent features of their activity in their academic field. The authors chosen information driven approach where key factors that determines the underside of student and classify them into high, medium and low ranks.

B. Improving Student Retention

As we said before, by identifying “at risk” students early, schools can detect and make contact with those students and help them to be more successful. Student retention is a necessary a part of many enrolment systems. It affects most segments of university or school metrics: reputation, financials, ranking. Specially, student retention has become one in every of the foremost important things for managers in instruction institutions. As an example, study [9] employs the machine learning for flipped teaching in instruction with the advancement in cloud-based services, to observe the activities on learning management system using coupling machine learning algorithm. There are few studies, which developed models to predict and to introduce the reasons behind student’s number decreasing.

C. Machine Learning in Automated Assessment

Assessment could be a powerful learning tool that may enhance learning and education. Assessment tools are evaluated in keeping with four main characteristics: relevance, feasibility, validity, and reliability. Based on the evidence presented within the literature, the employment of a range of assessment tools is usually recommended to match diverse domains and learning styles. The assessment cycle concludes with the evaluation of the results. The different kinds of machine learning applications utilized for the automated assessment are: neural network, NLP, fuzzy logic, genetic algorithm. Neural Network: These are the layered network. they need input layer, hidden layers and output layers. For the assessment, weights are allocated to every questions and on the idea of the correctness of the solution. Natural Language processing: It’s been used for the generation of multiple choice questions where labels are extracted from given sentence. These labels are extracted from Semantic Role labeler. Fuzzy Logic: It’s popular in many applications now due to it reasoning and computation capabilities. This ability of those systems has been exploited in setting of the question paper because the framing of a question paper counts variety of parameters. These parameters include difficulty level, numerical and theoretical content, weightage of the marks for particular questions etc. Genetic Algorithm: Genetic Algorithms are good at taking large, potentially huge search spaces and navigating them, trying to find optimal combinations of things. Genetic Algorithm is ready to supply a particular solution that has been designed so as to see the problem level of open questions in an automatic and objective way.

D. Machine Learning in Virtual Learning

The Greek philosopher Aristotle, proved through his research that “Every student has an individual learning style and having the different types of experiences”. The understanding and the participation of each student differ according to their listening, interest on the topic, the remembrance of the content, etc. The teachers also have a unique teaching style and the students also have the unique learning methods [10].

The 4 common types of learners are:

- Visual Learners
- Auditory Learners
- Kinesthetic Learners
- Linguistic Learners

1) Visual Learners

The visual learners, had the observation proficiency form the picture, charts, graphs, maps, flow chart, table, etc. This types of learners, pick the information from any of these forms and connect them for the easy understanding and learning.

2) Auditory Learners

The auditory learners, prefer the learning in type of hearing the interactive sessions, group discussions and the presentation. The student will remember the content, in the form of sounds receive from the teacher. The students will deeply listen to the unique pronunciations of unique biological names, theoretical concepts and the complicated words.

3) Kinesthetic Learners

The kinesthetic learners, apply the concept they learned. This type of learners, gets satisfied only by doing the activities of the concepts they learned and they are one of the toughest learners

4) Linguistic Learners

The linguistic learners, prefer reading and writing methodology of concepts for their understanding. They make notes during the session of the classroom and relate the idea with their concepts and write the elaborate content of the concepts. The different types of techniques that have been developed for research and development in the education System are grouped like Adaptive Learning Systems, Intelligent Tutor Systems, Cognitive Systems and recommender Systems.

Table 1
Types of virtual learning methods

E-learning Types	Learning styles
Computer Assisted Instruction (CAI)	Traditional teaching with computers
Adaptive E-Learning	Individual student centric learning with the available e-learning study materials
Collaborative Virtual Learning	Group learning and teamwork to achieve the objectives
Interactive Virtual Learning	Communication between students and teachers
Computer Managed Learning (CML)	Communication between students and computers
Synchronous Virtual Learning	Group of students learning at an same time
Asynchronous Virtual Learning	Group of students learning at an individual time
Individual Virtual Learning	Modern approach to achieve the learning goal independently
Fixed E-Learning	Fixed virtual courses for all students

5. Advantages and Challenges

There are numerous advantages of implementing machine learning within the classroom (McGuinness 2018). Apart from reducing the workload of an educator, in performing some routine operations, it can assist in multiple ways like organizing the eLearning content in an exceedingly very more personalized manner, better resource allocation and lots of more. Machine learning is essentially mining data. The teachers had to rely on

detailed grade books are gone. With machine learning, teachers have access to any or all their student's data in one place. Additionally, to carrying variety of the executive weight, machine learning also helps teachers improve their lessons by identifying where clusters of students are struggling. The identification of the weaknesses in machine learning can organize content more effectively. As an example, as students learn one skill, they accomplish the following skill continually building upon knowledge.

The main challenge is knowledge of programming. Complete un-supervised learning contains a risk of undesirable outcomes. Everyone accepts that implementation of machine learning is a major enhancement in teaching and learning process.

6. Conclusion

The aim of this study was to gauge the current state of the art within the applying of machine learning in education area. the quantity of studies (papers and articles) was large, so some of studies, which we found nearly as good representatives, were mentioned in results this study. This study shows that there are companion ways to benefit from machine learning application in education area.

The machine learning implementation may well be helpful, if the teacher uses a supervised and reinforcement variety of machine learning. Because with this, the teacher can confirm that students have gotten the right content at the right time and right place. Not only in teaching and learning process, but machine learning may assist the teachers in assessment evaluations where an outsized number of students have registered for the subject and thus minimizes the efforts of teaching and maximizes the accuracy.

In future, machine learning prediction by using different implementation of algorithms, education will show significant

growth and great efficiency. Teachers and students will find it easier to work in ways during which make them happy and comfortable with education. This will make them improve their love and participation within the tutorial process. Hence teachers' supervision is must so on require the assistance of such advanced technologies in improving teaching and learning practices in educational activity.

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