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FUTURE ASPECTS OF MACHINE LEARNING IN EDUCATION SECTOR

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ABSTRACT

This paper discusses the future aspects of Machine Learning in education sector and the balance between teachers and Machine Learning . Machine Learning is expected to offer various benefits to the education sector such as personalised learning, predictive analysis, data-driven analysis and immediate feedback for assignments. However Machine Learning also falls short in many aspects such as emotional intelligence, creative thinking and its lack of ability to understand each student. Additionally, Machine Learning won't be very useful in subjective analysis and in exams related to literature and social sciences. Moreover, it cannot offer technical competency that teachers can. With concerns existing over Machine Learning replacing their jobs, teachers are confident that Machine Learning will never replace them and ML will only be used as a miscellaneous tool to aid the teachers.

To conduct the study , questionnaires on applications of Machine Learning and its balance with teachers were distributed to teachers of a university, of which most belong to the Computer Science department and are experts in Artificial Intelligence and Machine Learning . The results highlighted that teachers believe Machine Learning will not be very reliable and their jobs won't be threatened by Machine Learning ,but rather it will be used for supplements such as attendance monitoring ,personalised learning and analysing learning metrics of students. Furthermore, teachers also think they can help the development of Machine Learning by providing their teaching methodologies as well as their students' learning as samples for development of the Machine Learning algorithm.

The paper continues to exhibit some research gaps like generalisation of integration of Machine Learning . Additionally, it does not address factors such as social-economic and infrastructural backwardness in the regions that the universities are located .Furthermore, the long-term effects of Machine Learning on teachers and students have not been discussed. However, these gaps remain as scopes for further research to further develop Machine Learning. The research concludes that teachers will continue to be the primary educators in classrooms while Machine Learning will serve as a miscellaneous aid for them.

Keywords: Predictive Analysis , Data-driven Analysis , Customisable learning, Reinforcement Learning , Language Processing ,Generative Learning , Data Mining, Technical Competency

1. INTRODUCTION

Machine Learning(ML) is an application of Artificial Intelligence(AI) that builds new models and algorithms from existing algorithms, with minimal explicit programming. It uses Learning Algorithms, Generative Learning and data mining to build on the base data and create new patterns and algorithms. Machine Learning which was initially used to describe the programs in a computer of the 1950s,has a come a long way since then. It has been on an upward spiral since the 2010's and has been incorporated into many fields of research. Since COVID-19,the growth of Machine Learning has skyrocketed and has brought about a change in the traditional teaching methodologies.

Machine Learning since its introduction, has evolved multiple times and has slowly found its way into many fields including the education field. Machine Learning continues to develop through extensive research and by feeding problem statements to the computer to generate new learning algorithms. It could be very useful for educators ,saving their time in evaluation and revision processes. Data-driven Analysis which could predict each student's progress based on their results is one of the most important features in education sector could provide.

Traditional teaching methodology involves fixed learning for every student irrespective of their ability to learn. As a result, students find it hard to understand concepts and need external references, which come in the form of books or peers. The incorporation of Artificial Intelligence and Machine Learning in education sector allows personalised learning, tailored to each student's needs. Additionally, other features like predictive analysis, customisable learning and flexible timetable raises the ceiling of the student's learning capability. However, applications of Machine Learning have just started to appear in the education sector and are nowhere near its prime form. At present Machine Learning is used only as a miscellaneous tool by educators ,but in the future balance between both could be unpredictable, swinging either way.

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The rapid spread of COVID-19 meant people had to do their jobs from home. As a result , education sector started relying on technology like never before and Machine Learning in education sector has not been more relevant than now. Features like digital platforms , online applications to submit and evaluate assignment that have been relied upon heavily during the pandemic , have been established as a pivotal methodology in today's educational institutions. We could label the 2020s decade as the transition from traditional teaching methodology to AI/ML driven teaching. Teachers whose jobs have always been considered as one of the most secure ones on the planet ,could face redundancies once this transition period is over. However it is too early to say because more clarity on developments on Machine Learning is needed.

Machine learning will only continue to evolve but at present ,but it has not become a status quo in education sector . The traditional teachers are not used to applying Machine Learning in their teaching and is expected to be the case for at least the next few years.If Machine Learning ,in its present form is used,it will only be sufficient to work as a miscellaneous tool for teachers and students to gain a small advantage .With concepts like deep learning and generative learning used to develop Machine Learning,its full potential would be tapped .But this is many years of research and data mining away.More research is needed to mine the data,design more algorithms and problem sets which in turn will result in the evolution of Machine Learning into its prime form.

This paper aims to analyse the current involvement of Machine Learning in education sector ,its contributions as well as the evolution of education sector with the evolution of Machine Learning. It also discusses the balance between teachers and Machine Learning as well as their perspective on Machine Learning.

This research is done inside a specific educational institution and some of the facts could not be applicable in other institutions.Machine Learning is an area of high technical ability and it is extremely difficult to be updated with its every day development.The facts mentioned in this paper could be a bit behind the current version of Machine Learning .

PROBLEM STATEMENT:

Machine Learning has already been introduced in educational institutions and is being used as an aid to teachers. The spurt of Artificial Intelligence and Machine Learning has resulted in the evolution of educational institutions ,though it is to a smaller extent. However majority of the teachers are not familiar how to integrate machine learning into their teaching methodologies and there is not a clear understanding among the teachers how dependent they will be on ML.Some teachers are against the use of any technology in their teaching methodologies while others think Machine Learning is inevitable, not only in education sector, but in every other sector too .While there is no clear clarity on teachers' acceptance of Machine Learning , many university teachers are heavily involved in its development through research. The balance between teachers and machine learning is a point of heavy discussion and there is a huge possibility that ML could pose a threat to jobs of the teachers.

Even if teachers integrate ML in teaching, we cannot ensure that all teachers use Machine Learning to enhance the understanding and progress of students rather than using it for their convenience and saving time alone. The quality and technical understanding of teachers vary with every institution and as a result, there would be a bigger divide on the quality of learning depending on how well they would be able to integrate machine learning in their methodology. This study looks to discuss the balance between teachers and Machine Learning in the future, as well as what the consensus among teachers is about Machine Learning. It also aims to investigate the possible effects of Machine Learning on teachers and how their teaching methodologies would evolve and how they make themselves flexible in response to Machine Learning. The paper also focuses on the applications of ML that teachers would like to retain to improve their methodologies.

RESEARCH GAP:

The paper has generalised the integration of Machine Learning in education sector and has not taken into account , the factors such as economic , infrastructural deficiencies prevailing in the regions where the university is located . The results might change depending on the institution and their ability to allocate resources for the embedment of Machine Learning in their methodology. Moreover , the long term effects of Machine Learning on students and their mental health as well as interactions are not deeply explored . Additionally , there is a lack of research on the training programs for teachers to adapt to the integration of Machine Learning. However , these gaps remain as areas that have huge scope for further research.

2. LITERATURE REVIEW

Educational technology experts have never believed that their technology would suppress the need for teachers . The literature states that the incorporation of ML in education offers various benefits to the sector but that does not mean that the number of teachers would go down (Dillenbourg, 2016) . Teachers build connection and relationships with

their students, motivate them and respond to their emotional needs ,while ML lacks the empathy , emotional intelligence and adaptability to ever-changing dynamics of the education sector.*(* Sarah Hanawald, Educational Records Bureau).

The literature discusses that the ability to make a lasting impact does not lie in the delivery of content , but in the human connection. Students build genuine relationships with mentors that foster growth and not machines that don't care or have any feelings about the students' personal and emotional struggles (Kelsey Jern,2024). Instead of having concerns over if AI/ML will replace teachers and teachers getting redundant, we should focus on the fact how AI/ML provides a wide array of benefits than can help the teachers and change their roles in the classrooms such that their performance gets better. (Hrastinski et al., 2019). ML tools have the ability to enhance personalised learning and assist in administrative tools such as attendance and assignment monitoring but the creative, emotional aspects as well as the versatility of teachers will be irreplaceable by the Machine Learning algorithms ,no matter how much developments they go through . This literature urges the fact that Machine Learning can't replace the emotional aspects of teachers (Luckin et al. ,2016).

3. RESULT ANALYSIS

Role of Educators in the age of Machine Learning and the potential threat to their jobs:

The consensus among teachers is that they don't feel threatened by the possible incorporation of Machine Learning in education sector. Even though Machine Learning can offer revolutionary features like Predictive Analysis, Data-driven Analysis, Reinforcement Learning, it cannot replicate the human touch in education, which involves addressing the emotional and social needs of the students. Human educators offer technical competency while Machine Learning can only offer what is bounded in its algorithm. Teachers have unique qualities to provide like mentorship ,adaptability, ethical and moral guidance that machines can never do.Moreover,social and interactive skills which are one of the, if not the most important skills in a human being, will see a huge downgrade if students are asked to carry out their learning tasks on a computer. Learning experts strongly believe even though use of Machine Learning in education is inevitable, it will only be used to assist teachers and fears that ML will replace teachers are baseless. The development of Machine Learning will remain static if teachers are completely replaced and it will result in ML being behind teachers in terms of quality and therefore ML cannot exist for a long time without human educators.

If ML ever poses a threat to the jobs of educators, they are still not willing to move from their jobs to others that don't need ML or the ones that work towards developing ML.Instead they believe learning and raising their ceiling as a teacher will be enough to ward off threats to their jobs. Machine Learning ,owing to the lack of its originality is not expected to be the priority in education sectors for a long time if it is used in the place of teachers and not alongside them. Educators are willing to embed ML in their methodologies ,so they can continue to offer their unique abilities as well as ML's revolutionary features, which strives to be the ideal case.

Educators' learning techniques and their dependency on Machine Learning:

Educators prefer learning on internet than from their colleagues or AI/ML.Internet has a wide array of resources ,that they can navigate through , choose the source that they find is the most apt and suit their needs. Internet also offers flexibility by offering resources in many forms including videos,podcasts,articles and online courses. Moreover, Internet offers reliability, as one can get the source of information as well as verify with a number of sources before taking in the information as the fact .On the contrary, AI/ML cannot offer these qualities at the current stage.AI tools aren't seen as a reliable source of education yet and it will take a few years and lots of developments before it is considered so.

While teachers believe they cannot use ML for learning things on a large scale, they believe it can be used for the personalised learning of students, which works on the principle of Data-driven Analysis and Customisable Learning. Data-driven analysis has the ability to predict the progress of students based on their performances in the previous tests. Customisable Learning aids the student in learning through methodologies and intervals of their choice. Educators believe monitoring progress of the students using Machine Learning is one of the best features it could offer, along with Personalised Learning. Moreover, data analysis could help indicate any potential threat of learning disability of the student at the very initial stages, which could enable immediate diagnosis .This would result in the student getting help as soon as possible and the condition not getting any worse as the disability would be addressed before it could affect the student. These features could make the job easier for the teachers and the students too would be heavily benefitted by teachers' mentorship and ML's prediction of the students' trajectory. However, at this stage of ML development, these features are not very reliable and researchers are working hard towards achieving these features

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The inevitable incorporation of Machine Learning applications in education sector and evaluation of papers:

Machine Learning offers various applications in education like paper evaluation ,training platforms, automation of attendance and assessments. Teachers think training platforms would be the biggest benefit of ML in the education sector and these training platforms would help the progress of the students massively. In addition to the curriculum of universities and schools, students can learn additional concepts ,expand their domains and improve their skills. ML's algorithm will continue to suggest more related topics and contents so students have a clear clarity on what to learn next and how to apply the learning. Additionally, ML enables customised learning methods like videos, audios or articles, based on the student's preference. The training platforms can also make the learning experience entertaining by including graphics and gamification of the content. Teachers believe they could use ML to analyse knowledge of students by using data-driven analysis to pinpoint the areas of their learning gaps.ML could play a huge role in aiding a student's progress by analysing the student's performance and creating a radar chart, indicating the areas of strengths and weaknesses of each student, that the teachers can refer to and address the issues.

Teachers believe using ML to evaluate papers is not effective because no algorithm can top the manual checking by teachers. Teachers are capable of interpreting and assessing subjective responses which include open-minded questions where creativity and critical thinking are required. Even though, evaluating using keywords is faster,ML algorithms won't be able to fully grasp the quality of the answers.Moreover,ML lacks the ability to interpret the ambiguous or partially correct answers.However,a small percentage of teachers believe using ML to evaluate the papers would remove the bias of teachers to provide a fairer evaluation.While teachers could have emotional biases and time constraints,ML is incapable of ever having them and as a result no single student would be favoured more than the next one. Regardless of these benefits of ML in paper evaluation,ML lacks the ability to evaluate philosophical and literature papers.Additionally,the curriculum and answers for questions might get updated ,resulting in ML's algorithm being far off of the answers that are considered as the right ones.Most importantly,ML cannot offer accountability for any disputes in evaluation and reviewing the paper is not of much use because the evaluation algorithm is not going to change . On the other hand, teachers can review the paper as many times as needed and can hear the justification of answers from the students.ML will continue to fall behind teachers when it comes to paper evaluation because it needs lots of research,extensive training and high quality datasets to correct the paper accurately.However ML is the better option to correct objective questions like true or false type ones as it would save the teachers' time and no review is needed.

Downsides of Machine Learning as well as what it can offer over teachers:

According to teachers,high levels of plagiarism and misinformation are the biggest disadvantages of Machine Learning in education. As ML becomes more widespread in various sectors concerns about plagiarism are rising. AI and ML tools like GPT have attained the capability to mimic the existing work that would otherwise take years of hard work for a human to come up with. The years of collective resilience and efforts put in by researchers and other contributors are plagiarised without any credit or citation.Even if the goal of the student is not to use plagiarised content,ML works on the principle of learning from existing algorithms and data ; As a result , one's work might include lots of plagiarism and might even mimic an exist work without the person's realization which we could term as unintended plagiarism . In an era of teachers using plagiarism checkers to evaluate assessments and assignments, paraphrasing and other AI tools can seem to lower the plagiarism levels and academic dishonest might go unnoticed.Moreover,teachers will be unable to tell when the student has actually used AI tools and when he/she has not.Using Machine Learning tools to learn for purposes regarding research would be of no big use because using these lessons in the paper might sometimes be very close to an actual existing paper and might result in academic misconduct and even ban from publishing any more work.

Moreover, misinformation persists when using an AI/ML tool and one cannot always rely on these tools to learn from.The answers provided by these tools contain a lot of inconsistencies and eliminates ML from being a valid source of information at this stage of its development.Again,using ML tools to refer for research purposes would be of a huge disadvantage because including a single unverified piece of information on the paper would result in the whole paper being rejected out of hand.ML tools should have to be trained with lot more algorithms and data until it is considered as a verified source of information

On the contrary , teachers think Machine Learning could be of a huge aid when it comes to predicting progress of each student. ML can track, analyse, and visualize patterns in student performance, attendance, participation, and behaviour over time. This data analysis provides deep insights that can help teachers make decisions about curriculum adjustments or intervention strategies . By analysing past performance and engagement data, ML can predict which students are at risk of falling behind or dropping out. Teachers often rely on intuition and experience to tackle these issues, but ML can provide data-driven , early warnings. ML also has the capability to predict their academic

trajectory as well as their career path.Moreover,ML has the capability to analyse a student over different subjects and come up with the common learning gaps that teachers can't because of different teachers handling different subjects . This offers a more holistic view of the student's progress.

Machine Learning has a lot to offer when it comes to aiding the education of differently challenged students . ML tools such as text-to-speech can be used to assist visually challenged students by reading out texts or web-content in a natural voice. It can also provide descriptions about objects and make it easier for the students to learn about the real world. Furthermore, braille translators too can be embedded to ease the interactive process with their peers. ML can use the applications of Language Processing to convert speech to text as well as the translation of sign language for the easier learning of auditory challenged kids

Teachers and Machine Learning aiding each other's growth:

Teachers strongly believe those who want to integrate Machine Learning in their teaching methodologies,would be benefited the most by the embedment of ML in education. ML based training systems can provide assistance to students with subject-specific questions or problem-solving challenges. Teachers can integrate these systems into their methodology to help students get extra help even when the teacher is unavailable.Teachers can assign homework or quizzes on ML based platforms, which provide feedback, step-by-step solutions , ensuring that students learn efficiently and rectify their mistakes. Other ML-based platforms like discussion forums and learning assistants can engage students in discussions and answer their questions which make the total learning more interactive and students could learn from each other . ML can recommend relevant reading materials, videos, exercises, and articles based on the student's needs and interests.Additionally,teachers who are not very strong in communication,can use ML tools to paraphrase or use Natural Language Processing to get the message to students without any interference . Language barriers can be broken by using ML translation tools .Incorporation of these tools in teaching would make the learning process easier and more interesting for everyone involved. Inexperienced teachers are not expected to benefit largely from it ,due to factors like plagiarism and unverified answers.

While ML could be used as a aid to teachers, teachers too can contribute a lot towards the development of ML.The consensus among the teachers is that they could be of huge help when it comes to developing ML.Not only ML expert teachers can be useful,even social sciences teachers can be very useful.ML learns from algorithms and creates new ones.Teachers believe providing their teaching methodologies as samples would be their biggest contribution to ML.The collection of datasets and algorithms input by millions of teachers around the world would give ML a new form which would make it way more reliable and efficient.It could learn from the teaching patterns and handling of students by each teacher.Moreover,Teachers can input their patterns for providing feedback and corrections to help the ML improve its suggestions to students when they make mistakes. Educators also think ML's handling and learning patterns of students too can be fed as samples so ML could have a better understanding of students' thought processes and their shortcomings to address these gaps effectively.

4. DISCUSSION ON THE RESULTS

Machine Learning has already started to revolutionise the education sector and even though there is no clarity on to what extent education sector would depend on Machine Learning in the future, teachers are very confident that their jobs would be very secure and that Machine Learning would not pose a threat to their jobs. Teachers believe they provide technical competency to the students which Machine Learning can't.Moreover,they feel that Machine Learning does not have the capability to replace or mimic teachers to act as the sole learning guide and education sector will collapse without human teachers.This major result points to the fact that teachers think they will continue to do a better job than ML as they have the ability to understand and empathize with each student's emotions while ML lacks the ability to detect or care about the student's personal challenges and struggles.Additionally, teachers can provide motivation,support and increase the morale among students and create a positive learning atmosphere while ML cannot provide anything more than purely academics.ML lacks dynamism and can't alter to each student's needs to a large extent.Furthermore, teachers provide socialization, without which students would struggle to gain social skills and become socially awkward. Teachers not being present to teach moral values and ethics would result in the students becoming bad social beings.

Additionally,each teacher has a unique way of teaching and flexibility that Machine Learning won't be able to provide.The findings confirm various previous research works and consistently align with the affirmation that the role of ML in education would be to help the teachers and not to replace them.

There have been no deviations in the paper as the research has continued to focus on exploring the balance between teachers and ML as well as how ML can be used to assist teachers . Moreover, the paper has also addressed the research gaps including how ML has to go through more stages of development before it could be incorporated on a

large scale in education sector. Also, the benefits of ML and what it could offer have been discussed and the paper could serve as a contribution to the field of Machine Learning in Education .On the contrary, the limitations of ML and how it cannot replace teachers have also been a clear area of focus. Furthermore, the findings have been backed by various research work and show consistency with facts .

5. UNEXPECTED FINDING

The most surprising result of the research is that teachers believe ML can predict the progress of students and analyse strengths of weaknesses of a student more accurately than their own assessments.Contrarily,they also remain sceptical about ML's accuracy and have expressed concerns over how unreliable it could be. The duality of results reflects the teachers' vision of the potential of Machine Learning ,but at the same time they are cautious about fully embracing it.This points to the fact that teachers think ML should be developed and upgraded through continuous research until it could be effectively integrated into the education sector , even so , they want it to be used only for out-of-classroom or administrative purposes.

MINOR FINDINGS:

The paper has some minor findings that offer wider implications of the future aspects of Machine Learning in the education sector. The consensus among teachers is that they would not be willing to move to other jobs even if their jobs are threatened by the integration of ML. It is found that they would rather keep learning and raising their ceiling as teachers to displace ML or integrate ML in their teaching methodologies and use its applications to give the best results.This result points to the fact that teachers are confident that even if Machine Learning poses a threat to their jobs , ML won't stay as the standalone source of learning without them and that the dependency of ML on teachers would be higher than vice-versa . Furthermore,there is a belief among teachers that they have a huge role in developing ML by providing their methodologies and their students' metrics as samples for the ML algorithm to learn and evolve from.Teachers also believe that most of their traditional work like teaching and evaluating papers can be done by themselves while they also regard that some teachers would be willing to use ML to get learning metrics of each student and provide them with miscellaneous learning tools .

SCOPE FOR FURTHER STUDY:

The scope for further study in the paper includes several areas that offer potential for deeper research and exploration. Firstly,there is already a gargantuan amount of research going on to develop and test ML algorithms ,as well as how it can be integrated into various sectors. Furthermore, the ability of educational institutions to integrate ML should be addressed by further research . Assessing how ML could be integrated universally amid challenges like lack of economic and structural resources in underprivileged places as well as tackling these problems to provide ML for every learner in the world is a huge step towards removing inequalities in education.Additionally,investigating the long term effects of ML education tools on students' mental health , engagement and overall academic performance would provide insights on the effectiveness of Machine Learning and the algorithms could be tweaked to make it more effective .

Studying how ML can be used to assess and develop skills like creative thinking , aptitude and soft skills would help fix one of the biggest downsides of ML of it not being very useful in non-academic courses . Additionally , studies to improve ML's interactivity by integrating them with other technologies like Virtual Reality and Augmented Reality would make the learning process more enjoyable for the student. Similarly , studies to develop and integrate emotional intelligence in ML to enhance its understanding of students' needs and emotions would improve ML's interaction with students as well as make the job easier for teachers to further understand the students' individual needs. Further research on Language Processing must be done to aid visually and hearing challenged students in their education.

6. CONCLUSION

Machine Learning will continue to evolve and its applications will be used in education sector . Machine Learning will be used to assist teachers to make their jobs easier by providing applications such as personalised learning , data-driven and predictive analysis . Teachers will always be a necessity and their jobs will not be under threat due to incorporation of Machine Learning. Teachers see ML as a tool for providing support for students outside classroom hours as it can help in personalised learning and in giving instant feedback . However, teachers are sceptical about ML's reliability and don't trust it completely.Moreover, there are concerns regarding its emotional intelligence and technical competency ,which are pivotal in education.

One limitation of the study is that ,the educational institutions have been generalised and constraints like socio-economic factors and ability to allocate resources for ML have not been addressed properly .Additionally the long-term relationship between teachers and students due to introduction of ML has not been explored . However ,they will

be a part of scope for further research. On the contrary, the research has various strengths including literature review , to which many Machine Learning experts contributed. Furthermore , the paper addresses the gaps in the current research of ML as well as provides recommendations for further study. The limitations ,benefits of ML have been discussed along with the practical potential of Machine Learning in the future. Moreover ,the balance between teachers and Machine Learning has been discussed to a great extent . Even though various research works point otherwise, in the case of Machine Learning replacing teachers,they should enrol in teacher-training programs, keep learning and expanding their domains to raise their ceiling so they can displace ML, because it needs data to grow and evolve,without which it will remain static .As a result the more flexible option, the teachers ,will eventually get back their jobs . Alternatively ,teachers could also get into research work and predict ML trends in their respective domains or can research on troubleshooting ,both of which would be huge contributions to their fields .

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