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AI in Education: Challenges and Solutions

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ABSTRACT

Artificial Intelligence and its application is now present in every aspect of our life. One such area is teaching and learning environment. This paper is an attempt to find the implication and emergence of AI and how the student should learn in this era, same as how an institution can teach and evolve. I have pinpointed some challenges faced by the higher educational institutions and student's learning approach in light of these technologies for teaching. Although we have started incorporating artificial intelligence in certain aspect of education, we are still a long way from developing a fully functional AI which has all the qualities of a teacher and can transform the education in way we can only dream of.

Keywords: Artificial Intelligence, Teacherbots, Machine Learning, Teaching, Higher Education, Smart Learning

1. INTRODUCTION

The future of advanced education is coupled with developments on new technologies and computing capacities of the new intelligent machines. In this field, advancement in AI opens new prospects and challenges for teaching and learning in educational activity, with the potential to essentially amendment governance and also the internal architecture of institutions of higher education. The entire scientific community is still to come to an agreement on a universal definition of 'artificial intelligence' shaped by philosophical positions taken since Aristotle. Alan Turing proposed an answer to the question of when a system designed by a human is 'intelligent' in the 1950s. Turing proposed the imitation game, which is a test that involves the ability of a human listener to point out the differences of a conversation with a machine or another human.If this distinction is wiped out, we can admit that we have an intelligent system or artificial intelligence i.e. AI. It is also noteworthy to mention that the focus on AI solutions goes back to 1950s; in 1956 John McCarthy presented one of the first and most important definitions: "The study [of artificial intelligence] is to proceed on the basis of the conjecture that every aspect of learning or any other feature of intelligence can in principle be so precisely described that a machine can be made to simulate it." (Russell and Norvig 2010).

Artificial intelligence is currently developing at an exponential rate, and this has already impacted the profound nature of services of higher education. For example, Indus International School in Bengaluru (India) has introduced humanoid robots as teacher assistants for classes 7, 8 and 9 for physics, chemistry, biology and geography. They work along with teachers in delivering lessons. This enables the teacher to focus on the child rather than prepare and deliver content from google, textbook etc. With the humanoid robot taking over the delivering of content, the teacher can focus on the task that google or robot can't. The teacher can mentor the kids, teach them how to learn, provides motivation and curates a mind-set where they can develop entrepreneurship. This is changing the quality of services, the time-dynamics within the school, and the structure of its workforce. In this context, it is also noteworthy that 'machine learning' is a promising field of artificial intelligence. While some AI solutions depends on programming, some have an inbuilt ability to learn patterns and make predictions based on their learning. Software developed by DeepMind, the AI branch of Google's-AlphaGo is an example—that was able to defeat the world's best player at Go, a very complex board game (Gibney 2017). We define 'machine learning' as a type of artificial intelligence that uses software to be able to recognize patterns, make predictions, and apply the newly discovered patterns to the situations that were not included or covered previously.

2. POSSIBILITIES AND CHALLENGES TO AI SOLUTION

There is a gap between the way we teach and the way we learn; the way the brain understands things. The relationship between teaching and learning follow a U-shaped curve.

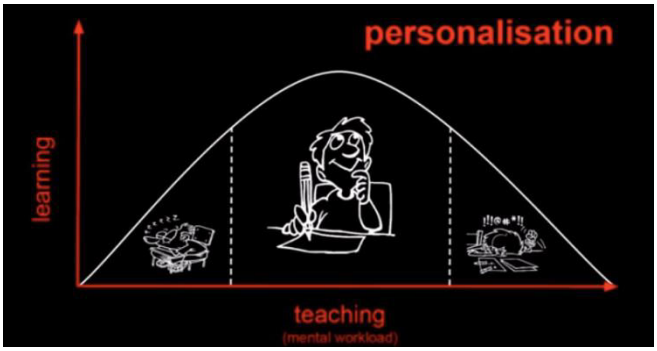

Figure 1: Teaching Vs Learning

There are some students who are bored in class and hence have lower understanding. Some students perceive instruction material as complex and hence they don't give much attention to the learning. And there are some students who enjoy a class and for these students learning is highest.

That means the current educational system based on standardization, is not really working. One fits all solutions do not work anymore. We need to have personalization. What about education today? Do we really need a reformation? No, we need a transformation. So why don't we use what we are good at in narrow artificial intelligence to actually empower education? I want to answer this with a hype cycle. On the X-axis we have a timeline and on the y-line we have visibility of these technologies and the expectation we put on them. This is not a scientific cycle in nature. It is my understanding, interpretation of the present and my vision of the future. So here we have artificial intelligence which is a trigger of innovation for education. We have optimization and distributed computing.

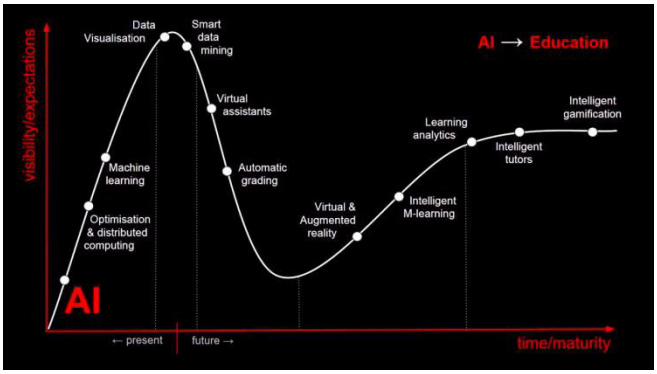

Figure 2: Hype Cycle

This is what we call nowadays cloud computing, free textbooks, free online content, we can play with software online and just pay a small amount of fees. Machine learning is a subfield of Artificial intelligence. Giving a set of data, we can induce a model, and we can use this model for prediction and informed decision making. We go up to the hype, we reach a peak: data visualization. We have many visualization techniques online that cluster data and these are informed by data mining. Data mining is basically a technique borrowed from artificial intelligence that mine data from different sources and put them together, and we are becoming good at data mining. We are at the peak of inflated expectations and then we go into the future and we enter another period, a period of disillusionment. Here we realize that things that we thought can be good for empowering education are not feasible. For example virtual assistant, chatbot, automatic grading, these technologies nowadays are difficult to be implemented due to the limitations of artificial intelligence, at tasks like natural language processing. Then we will enter another period in which we are enlightened: the slope of enlightenment and here we have technologies such as virtual and augmented reality. Virtual Reality is that technology that allows us to interact with the artificial system and artificial content with headset. Augmented reality is another technology from artificial intelligence that allows us to explore real world with augmented objects that can actually enhance our learning. We go up to the curve and we encounter mobile learning. We can learn from our devices when we want where we want and how we want. And we will be able to create intelligent machines that will deliver content relevant to our devices, to our level of understanding of topic. Then we will have another period of time in which we finally focus on the narrow task of artificial intelligence that can actually empower education, and we will reach a period of the plateau of productivity. Here we have learning analytics, metrics related to how we behave during problem solving. How we perceive the underlying learning task, how we react to this task and metrics about the context. With these metrics we will be able to create intelligent tutors- the pieces of software that using these metrics, can deliver relevant content to us according to our understanding of the topic, our expertise, our level. And finally we will have gamification. Gamification is a technique that applies game principle to non-game contexts. And we will be able to create intelligent machines, intelligent agents, that actually get the content from different sources, and turns them into a game. I would like to focus on the last part of the hype cycle: the slope of enlightenment and the plateau of productivity. With virtual and augmented reality, we can actually self-explore things, we can play with our curiosity, creativity. With intelligent mobile learning we have the freedom of choice: we can learn what we want to learn, how, where, and we can follow our passion. With learning analytics and intelligent tutors, we can actually personalize content to each single learner. And eventually with intelligent gamification, we can nurture our talent and experience joy & happiness. So with Artificial intelligence we can really unlock the power and the potential from each single learner.

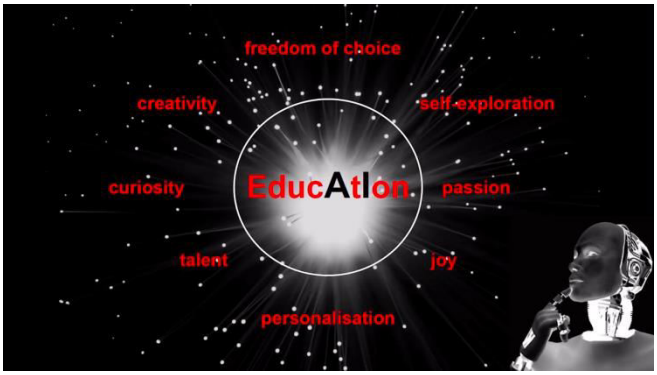

Figure 3: Components of AI in Education

3. RESULTS AND DISCUSSION

We operate and learn socially in our daily life, for example a person who is not very good at maths in his early childhood can go on to become a great businessman. This happens due to the persons other skill sets like solving the problems by logic or interacting with people. The contexts are reduced to what we can measure in the digital world.

The most amazing thinkers and philosophers will not be identified if we were to identify such persons using some sort of machines or AI. These people do not think inside the box and to a machine that might seem that the person is not able to understand the subject or a particular concept at least. In AI also, we have mainly multiple choice questions. Because currently a computer cannot identify the answers to open ended questions. We even cannot define that if a person is getting the answers to a question right he understands the concept. A person might be trained to get the answer of a certain type of questions, without understanding the concept.

A lot of things in artificial intelligence is being done without causal understanding. We have a program that makes 95% of the time correct predictions, and hence we accept it, but these parameters are only fine unless we are using in a scenarios where nobody is going to hurt, like which products should be bundled together, which movie should I watch next on Netflix etc. We cannot use the same program on an evaluation to find the best suited students for scholarship test, as the error margin of 5% can definitely hamper some deserving candidates' ambitions.

Hence, we should also want to know why an algorithm made a certain decision, not just the decision itself. One such example is in medicine field also, where AI can help detect the pattern in the image, but not make decisions based on it. The computer support the doctor in making a decision.

AI pays attention to its goal, typically to minimize any error. Hence an algorithm may be continually improving students' performance on some metrics, but it may be simultaneously damaging other metrics which is not measured by AI. As an example, while a student is improving in answering the questions, but he might start to hate maths as it get difficult or as the pattern of questions repeats again and again.

Recently on Youtube Kids, some of the children were exposed to videos which were graphic and violent (The New York Times, 2017). Youtube said that it is a needle in a haystack situation, they are continuously improving their algorithm etc, but it is clear that the AI is far from perfect. And to be perfect it needs to train one increasing number of data. But the problem arises "whose kid will train the algorithms?" so that it is perfect for every kid out there.

4. CONCLUSION

Despite everything Artificial Intelligence faces significant obstacles and challenges that should be overcome before the full potentialcan be accomplished. Many see meeting those challengesas a task of most extreme need for the tech industry at thepresent time. Al - specifically the machine learning and deep learningprocedures which demonstrate the most guarantee, requirea colossal number of calculations to be made rapidly. Thisimplies they use a ton of processing power.Stephen Brobst, CTO at Teradata, said that "Untilabout two years ago there was a brick wall - Al has beenaround in theory for a long time, but had been in this kindof Al winter because everyone has good ideas but theywere all theory and there wasn't enough compute powerto implement them, so who cares?"Cloud figure and massively-parallel processing systems arewhat have given the appropriate response temporarily.But as data volumes continue to develop, and deep learningdrive the automatic creation of increasingly complexalgorithms, the bottleneck will continue to moderateprogress.This implies there have been comparatively couple oforganizations willing to place money into development ofthese aptitudes, and the subject was not well representedto in industry-focused education and training educationalprogram.With the explosion of interest in the last couple of years,this has changed. Data science courses focusing on the coreabilities required for Al development - mathematics,computer science and statistics - have turned out to becommon and are usually over-subscribed.But there are as yet insufficient people to empower eachbusiness or organization to unleash their vision ofmachine-controlled development on the world. Similarlyas in different areas of science and technology there is anaptitudes lack - basically insufficient people who knowhow to operate machines which think and learn forthemselves.

Afew forces are at work which should act to cure thissituation, given time. One is the emergence of what is oftendepicted as the "citizen data scientist". There areprofessionals who, although not formally trained orbasically utilized as data specialists, develop practicalcompetency at working with data and analytics, usuallyto advance their work in their own particular specific field.Although this revolt will probably appear as web-basedsocial media campaigning and blacklists, than smashingmachines and burning down assembly plants, it's anobstacle which could wreck attempts to drive

development.Legislation, which has so far flopped pitiably to stay awareof the speed of technological progress, is likely to have aninfluence in this. Growing consumer attention to thegrowing number of decisions made by machines, using ourvery own data, has incited legislators to handle the problemfrom our (the consumer's) point-of-see. One illustration isthe GDPR, which has come into force across the EU a yearago, and influences anyone dealing with the privatedata of EU nationals, wherever they are on the world.Particular AI, often alluded to as "applied AI", is created tocomplete one specific task and figure out how to end upplainly better and better at it. It does this by simulatingwhat might happen given each combination of input values,and measuring the outcomes, until the best output isaccomplished.Generalized AI-, for example, that powering robots likeStar Trek's Data, fit for turning their hand to any tasksimilarly as a human can, will in any case be a sciencefiction dream for some time yet.There is no neural network on the planet, and no strategyat the present time that can be trained to identify questionsand pictures, play space invaders and tune in to music.The problem here is that "naturally" intelligent organismslike people are skilful for taking into consideration learningand data from tasks other than the one we are right nowworking on.This capacity to draw on assets other than those whichare immediately obvious, for handle a problem, is referredto by clichés, for example, "out-of-the-box" or "blue-sky"thinking and is a component of human problem-solvingand ingenuity that today's focused, single-minded andoften over the top A.I. are unlikely to emulate in the nearfuture.This implies A.I. must be educated to guarantee that theirsolutions don't cause different problems, sometime later,in areas beyond those which they are intended to consider.This includes learning not to advance on the toes of differentA.I. For instance, in a smart city, it's easy to imagine theimpact of one Al system - managing security lighting,say - conflicting with another, for example, regulatingpower use.These four key challenges which I should overcome in thenear future are certainly not insurmountable. But solutionsshould be actualized before Al will satisfy it without adoubt gigantic potential. In the case of the greater part ofthem - by and large those which will be tackled by theprogress of technology-that work is well underway.Others, though, will require human minds to meet up andset up workable principles and sets of accepted rules, aprocedure which could take somewhat more time.

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