

# Artificial Intelligence and Innovations in Education

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## I. Introduction

Artificial intelligence is interpreted as the ability of computer systems to perform tasks and activities of the human beings in terms of human intelligence. It is defined as the capability of a machine to imitate intelligent human behavior. It has made our world more digitized and automated processes smarter. Artificial Intelligence has now become a part of our day-to-day lives. We are surrounded by this technology from automatic parking systems, smart sensors for taking spectacular photos, and personal assistance. Among all the sectors, the educational sector also has been on the way of revamping itself with the help of the technology which has and is making the task of the teachers and the students at ease. The academic world is becoming more convenient and personalized thanks to the numerous applications of AI for education. This has changed the way people learn since educational materials are becoming accessible to all through smart devices and computers. Today, students don't need to attend physical classes to study as long as they have computers and internet connection. AI is also allowing the automation of administrative tasks, allowing institutions to minimize the time required to complete difficult tasks so that the educators can spend more time with students. In the future, visual and dynamic learning channels outside the classroom will become not only more prevalent but capable of supporting a range of learning styles, all while addressing common questions and concerns students have that cannot be readily addressed by teachers, TAs, tutors or parents. It also enhances the reliability quotient of any technology. We are in an age where the hard drive cost per gigabyte of data has been falling exponentially, to the extent that we are approaching near zero marginal cost for storing data (down from USD500,000 a gigabyte in 1980 to 2 cents a gigabyte in 2017. As per IDC forecasts, by 2025, the global data sphere is expected to grow to 163 zettabytes (that is a trillion gigabytes), or ten times the 16.1ZB of data generated in 2016.

The paper has explored the significance of AI in the educational sector and its challenges in a country like India, where the literacy rate and the poverty scenarios has not been satisfactory amidst inequalities and discriminations existing at the root levels.

## II. Methodology of Study

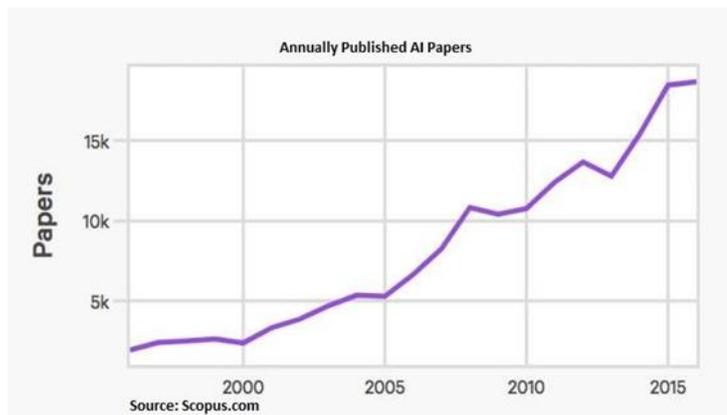
The study is conceptual in nature. It has been based on the secondary sources collected from various reports, websites and articles.

## III. Trends in the Artificial Intelligence

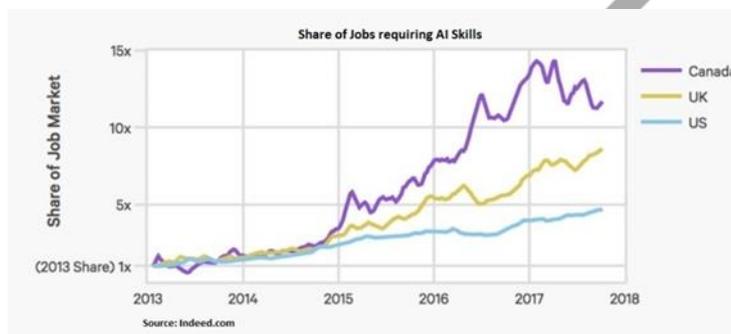
The AI systems are efficient enough to reduce human efforts in various areas. Today, most of the industries are making use of AI to perform various on a regular basis. The artificial intelligence is presumed to get the work done faster and with more efficiency and perfection in results. Error free and efficient worlds are the main motives behind artificial intelligence. In the recent years, many sectors have started using AI technology to reduce human efforts, and also to get efficient and faster results. To meet growing consumer expectations in a digitally-driven world, companies have to deal with huge amounts of real-time data and create personalized consumer experiences to stay relevant. As such, they are increasingly employing newer technologies such as artificial intelligence (AI), cognitive computing and robotics, among others (Mehta, 2017). The applications of AI range from analysing the data to mitigate market risks, enhancing customer service through virtual personal assistants, or even analysing millions of documents across a company's servers to find compliance failures.

The number of Computer Science academic papers and studies has soared by more than 9X since 1996.

The entire Scopus database contains over 200,000 (200,237) papers in the field of Computer Science that have been indexed with the key term "Artificial Intelligence." The Scopus database contains almost 5 million (4,868,421) papers in the subject area "Computer Science." The figure clearly indicates the increasing significance of Artificial intelligence among the researchers and academicians. Further in United States, there have been a 6X increase in the annual investment levels by venture capital (VC) investors into U.S.-based Ai startups since 2000.

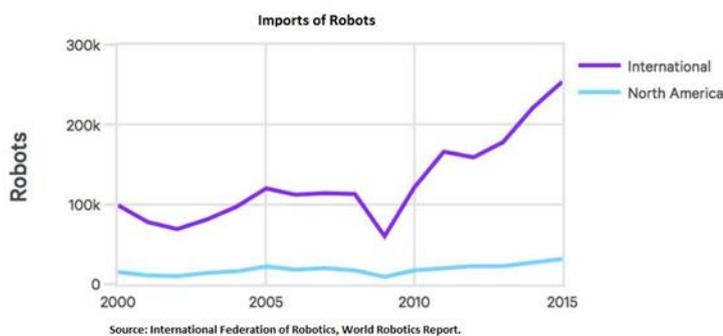


The share of jobs requiring AI skills has grown 4.5X since 2013. As per the website of Indeed.com, there has been a rise in the demand for the skills of AI in United States, UK and Canada as shown in the following figure. The study calculated the growth of the share of jobs requiring AI skills on the Indeed.com platform, by country. It should be noted that despite the rapid growth of the Canada and UK. AI job markets, Indeed.com reports they are respectively still 5% and 27% of the absolute size of the US AI job market.



The demand for robots has also been on the rise at international platforms. It has risen from around 100,000 in 2000 to around 250,000 in 2015.

The data displayed is the number of industrial robots imported each year into North America and Internationally. Industrial robots are defined by the ISO 8373:2012 standard. International Data Corporation (IDC) expects robotics spending to accelerate over the five-year forecast period, reaching \$230.7B in 2021, attaining a Compound Annual Growth Rate (CAGR) of 22.8%.



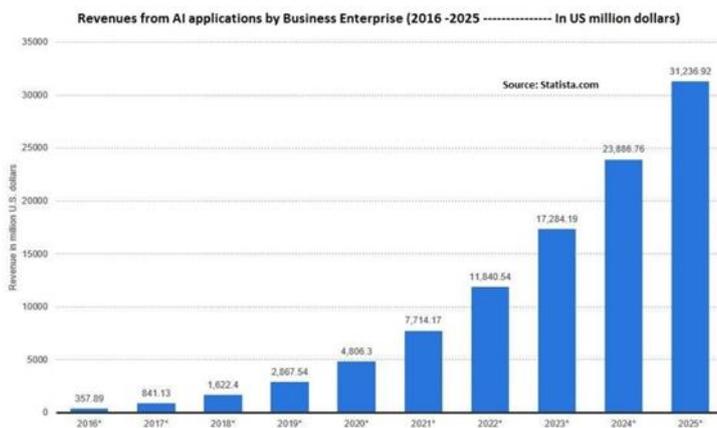
The Global revenues from AI for enterprise applications are projected to grow from \$1.62B in 2018 to \$31.2B in 2025 attaining a 52.59% CAGR in the forecast period.

Image recognition and tagging, patient data processing, localization and mapping, predictive maintenance,

use of algorithms and machine learning to predict and thwart security threats, intelligent recruitment, and HR systems are a few of the many enterprise application use cases predicted to fuel the projected rapid growth of AI in the enterprise.

Furthermore as per the study undertaken by statista.com, 84% of enterprises believed investing in AI will lead to greater competitive advantages. 75% believed that AI will open up new businesses while also providing competitors new ways to gain access to their markets and 63% believed that the pressure to reduce costs will require the use of AI. 87% of current AI adopters said they were using or considering using AI for sales forecasting and for improving e-mail marketing. 61% of all respondents said that they currently used or were planning to use AI for sales forecasting. Thus the applications of the AI has been on the rise but needs to

be spread to many and should not result into monopoly of few countries thereby affecting the Pareto optimality of the masses across the globe.



#### IV. Significance of Artificial Intelligence in Education

Today on account of the integration of the world economy across the globe, the emerging markets have given the incentives for innovations and profiteering across the globe. The monopoly holds of many advanced nations, firms have been getting disintegrated. The artificial intelligence is one such technological innovation which has not only been swapping the markets and economics, but right from Ecommerce to healthcare to education, its intervention has increased by multi fold. Many companies are now investing in developing their own version of AI and Machine learning. Our every rational choice of today is now data driven. The best example of the same is the online recommendations that we receive while surfing retail websites such as Amazon or Flipkart. It is the Machine learning technology that recommends you products based on your previous purchases. The same logic and technology can be used to promote and improve or track the student's performance on the basis of their previous grades, participation and performances. Bill Gates through the Bill and Melinda Gates Foundation has invested more than \$120 in personalized learning. The idea is to develop software that creates individual lesson plans for students based on their performance.

#### Categories of AI

- Weak AI vs. Strong AI:** Weak AI describes "simulated" thinking. That is, a system which appears to behave intelligently, but doesn't have any kind of consciousness about what it's doing. For example, a chatbot might appear to hold a natural conversation, but it has no sense of who it is or why it's talking to you. Strong AI describes "actual" thinking. That is, behaving intelligently, thinking as human does, with a conscious, subjective mind. For example, when two humans converse, they most likely know exactly who they are, what they're doing, and why.
- Narrow AI vs. General AI:** Narrow AI describes an AI that is limited to a single task or a set number of tasks. For example, the capabilities of IBM's Deep Blue, the chess playing computer that beat world champion Gary Kasparov in 1997, were limited to playing chess. It wouldn't have been able to win a game of tic-tac-toe - or even know how to play. General AI describes an AI which can be used to complete a wide range of tasks in a wide range of environments. As such, it's much closer to human intelligence.
- Super intelligence:** The term "super intelligence" is often used to refer to general and strong AI at the point at which it surpasses human intelligence, if it ever does.

#### Streamlining Education System

The best examples of AI are voice recognition systems such as 'Cortana' by Windows, 'Siri' by Apple and 'Alexa' by Amazon etc which can imitate human intelligence. This technology is also known as machine learning which has been used in certain areas to track vital issues pertaining to education. For example, Andhra Pradesh government has conducted an experiment in 17 districts, and analyzed the data of students related to various dynamics such as academic performance, reason for school dropouts, quality and skills of teachers, social demographics, gender etc. This application has found predictive patterns such as probable students who would drop out. The state government has acquired a list of thousands of students who might drop out from the schools in the academic year of 2018-2019. Such experiments are a proof of AI working as a catalyst in streamlining the education system and helping institutions make better decisions. Implementing AI at such a large scale would definitely help us to fix the loopholes in the current system.

## Personalized Learning

According to the statistics given by the Human Resource & Development (HRD) Ministry of India in 2016, there is a shortage of 1 million teachers across the country. In case of Universities and Colleges, there is a chronic shortage of faculty and the problem of finding qualified people to fill this gap has become even more complicated. In such a scenario, how can India, a country which has the second largest population in the world would cope-up with the challenges of providing quality education to all? AI can be an alternative to provide quality education for the same and can adapt to an Individual student learning and grasping abilities. It can also find out his or her strengths and weaknesses. The ratio of teacher student of 1:60 cannot simply fulfill the requirement of all the students in specific. In this situation, enabling students with AI systems in schools and classrooms or at their homes might be the solution to solve the problem of low quality and inaccessibility at one stroke. The distributed, networked, virtual reality classroom is both enormously exciting, and, at the same time, frightening for its potential. However there are major challenges to measuring success in an AI-based educational process. For instance, if our students can become more deeply involved in the pathways of their own learning through AI, measurement will occur moment to moment, as well as the success of remediation. In a best-case scenario, we will know at the end of each student's day if she/he is meeting requirements and quickly correct deficiencies as necessary to stay on track. Worst-case—students already falling behind will be left behind entirely by this new AI-based reality. In any case, there are profound moral questions to consider with a system such as this, and policymakers must understand the underlying dynamics of the technologies

## Assistance to Teachers

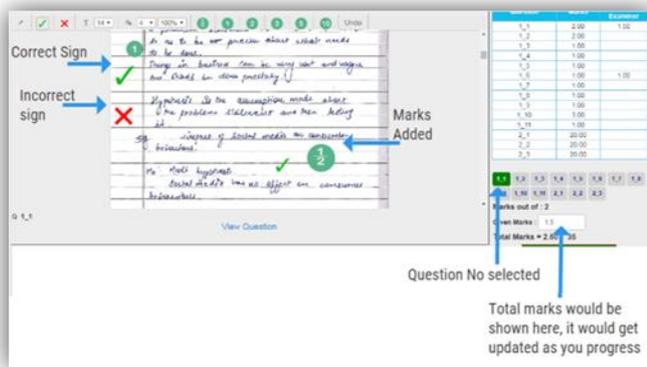
Teachers have to handle multiple responsibilities such as evaluation, grading, paper setting, creating mark sheets, attendance and tracking performance of every student. If these tasks are made easy for them, then they would focus more on course development, teaching quality and skill development. AI systems can assist teachers in all these tasks, making these tasks not only automated but also intelligent. With AI systems in place, it will be easier for teachers to focus on students rather than mundane administrative tasks. But then, the very term “teacher” may be insufficient to adequately capture the role of this key individual in the educational experience. Teaching and learning requirements may be substantially re-ordered and the dynamic of learning versus teaching in an AI-based system of education will be very different. This will raise important questions about requirements for teaching degrees and related certificates in this new environment, and the necessary adaptation of the science of pedagogy to these changes. Ultimately, the key question will be “are the teachers of today ready to develop the leaders we will need tomorrow?” A difficult question, to be sure, and the answer today is no.

## Inclusive and Accessible

Accessible and Inclusive Education.: The educational policies of the central government like that of Right to education, SSA, RUSA etc has been trying to make education inclusive rather than the option for those who can afford it. India has over 600 million young people. All of them deserve good education, skills and jobs. With AI education can become more accessible and inclusive at the same time. Various tutoring programmes, learning applications with skill-based curriculum are being developed across the globe. These AI enabled systems will bring global classrooms at fingertips. It will not only empower students but also teachers in upgrading themselves with current trends. Such systems could be a boon for the rural education that would be able to learn the way it is learned in an urban setting.

**Remote Proctoring** is the new technology which can help to simplify exam invigilation process. Students can appear for exam from any location classroom/home. System is able to invigilate such exam remotely using remote Proctoring. It uses web camera attached to computer system to authorize remote students. Many education institutes, corporates, universities have started using this technology to simplify examination process with artificial intelligence of Remote Proctoring.

Answer sheet Evaluation:



Physical Answer sheet evaluation is one of the pain areas for university or education institution. Many entities are moving towards onscreen evaluation system as it is intelligent and auto calculates the score.

It also ensures that examiner has truly verified all pages of the answer sheet. It also saves logistical cost of handling physical answer sheets. It can help you to automate result processing.

## V Challenges

With humans and machines joining forces now more than ever before, AI is no longer confined to innovation labs and is being hailed for its immense transformational possibilities. It has become a source of a source of both enthusiasm and skepticism in a technologically driven world.

### Need for Effective Coordination

Local governments, schools, and especially the private sector will need to routinely intersect to create synergy and symbiosis to enhance the educational processes. Through the AI-powered digital space, “opportunity for all” may become a reality for those who previously had little means of achieving their own piece but the connectivity needs to be addressed and should be affordable in a country like India which is still struggling with her poverty at the global level. Thus the least developed countries are at risk of suffering new technological, economic and social divides with the development of AI. Some main obstacles such as basic technological infrastructure must be faced to establish the basic conditions for implementing new strategies that take advantage of AI to improve learning.

It is based on the collection of data and interpreting of the same. But this requires the state capabilities to improve data collection and systematization. Further, AI opens many ethical concerns regarding access to education system, recommendations to individual students, and personal data concentration, and liability, impact on work, data privacy and ownership of data feeding algorithms. AI regulation will require public discussion on ethics, accountability, transparency and security.

Most AI applications rely on huge volumes of data to learn and make intelligent decisions. Machine Learning systems feast on data – often sensitive and personal in nature – to learn from them and enhance them. This makes it vulnerable to serious issues like data breach and identity theft. Here is some good news; the increasing awareness among consumers about the growing number of machine-made decisions using their own personal data, has prompted the European Union (EU) to implement the General Data Protection Regulation (GDPR), designed to ensure the protection of personal data. Besides, an emerging method – ‘Federated Learning’ – is all set to disrupt the AI paradigm. It will empower data scientists to develop AI without compromising users’ data security and confidentiality.

### Algorithm bias

An inherent problem with AI systems is that they are only as good – or as bad – as the data they are trained on. Bad data is often laced with racial, gender, communal or ethnic biases. Proprietary algorithms are used to determine who’s called for a job interview, who’s granted bail, or whose loan is sanctioned. If the bias lurking in the algorithms that make vital decisions goes unrecognized, it could lead to unethical and unfair consequences. For instance, Google Photos service uses AI to identify people, objects and scenes. But there’s a risk of it displaying wrong results, such as when a camera missed the mark on racial sensitivity, or when software used to predict future criminals showed bias against black people.

In the future, such biases will probably be more accentuated, as many AI systems will continue to be trained using bad data. Hence, the need of the hour is to train these systems with unbiased data and develop algorithms that can be easily explained. Microsoft is developing a tool that can automatically identify bias in a series of AI algorithms. It's a significant step towards automating the detection of unfairness that may find their way into Machine Learning. It's a great opportunity for businesses to leverage AI without inadvertently discriminating against a specific group of people.

AI/ET promise to usher in a bold new era of human history, one where the machines we create will oftentimes be smarter, faster, and more powerful than those who created them. This reality has profound implications for the field of education and introduces complex ethical, legal, and societal implications that academics, policymakers, and average citizens alike will need to contend with as every aspect of society reshapes around them. A study published by eSchool News indicates that by 2021, the application of AI in education and learning will be increased by 47.5%. The impact of this technology will be felt from the lowest education levels through higher learning institutions. This will create adaptive learning techniques with customized tools for improving the learning experiences. Artificial Intelligence might inform the students how their career paths look like depending on their goals thus assisting them beyond academics. Only time can tell the ultimate impact of AI in the education industry. The future will belong to the organizations that will blend the predicting capabilities of AI-driven machines with the prowess of human intuition and judgment.

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