The 4th Industry Revolution Innovations in Engineering and Computer Science Teaching and Learning Education AI Perceptions For India Perspective

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ABSTRACT: *Artificial intelligence will play an important role in fourth industrial revolution. We study and discusses how artificial intelligence can be integrated into engineering and computer science education to develop the fourth industrial revolution in India. The paper studied how AI can be include into the engineering field to provide the required skills to engineers and computer researchers to find and solve the problems in the fourth industrial revolution will show. For achieved these skills range from online courses/classes and short courses and distance education with certification that can be hold of professionals, to degrees in AI and Computer science. Artificial intelligence can be used in the teaching and learning curriculum of engineering technology courses. The paper focus at the advantage of intelligent teaching systems and teaching professors to provide personalized classes to students, artificial intelligence is put together in learning and the use of AI methods for data analysis and analytics to classify learning difficulties. The paper also studied technique and a inventory of industry involving in engineering courses. India, is the high speed developing economy with the 2nd largest population country in the world, has a crucial support in the artificial intelligence revolution. Acknowledging artificial intelligence prospective to change economies and the need for India to strategies its attitude, Honorable Finance Minister of india, in his budget talking for 2018 – 2019, commission NITI Aayog to establish the National Program on Artificial Intelligence, with a point of view to take accompany to the research and development in new and emerging technologies industry projects for the undergraduate, Masters , Honours, and Phd levels. The paper studies the goal that artificial intelligence can play an important role in engineering courses and to bring recognize policies to evaluate the effectiveness of AI in engineering curriculum.*

KEYWORDS: *Artificial Intelligence, Artificial Intelligence Education And Literacy, Artificial Intelligence For Teaching, Industry Collaboration To Develop Artificial Intelligence Skills, 4th Industrial Revolution (4IR),Higher Education, Teaching And Learning.*

I. INTRODUCTION

1. Artificial Intelligence

AI has offering to multiple facets including manufacture, management and finance, computer security and agriculture, admit others. It is clear that AI will play an important function in the 4th industrial revolution. While AI has generally been distinguish as a computer science engineering control as we move into the 4th industrial revolution it is apparant that it becoming an interdisciplinary. This elevate the questions as to what development this will be a education. The paper studied the role that AI will play in technical and computer engineering education in preparation for the 4th industrial revolution. AI relates the work of machines that would required intelligence if working by human being. The phrase 'artificial intelligence' means 'investigating intelligent system problem-solving behavior and creates intelligent computer systems'.

There are two types of Artificial Intelligence System:

• Weak AI: The computer is simply an device for investigating cognitive processes the computer simulates intelligence.

• Strong AI: The processes in the computer are intellectual property based, self automated-learning processes. Computers can 'understanding' by means of the right software and are capable to boost their own actions on the basis of machines former behavior and experience. This includes self networking with other systems, which leading to a scaling effect. While develop the national strategy for Artificial Intelligence, that underlying trust was to identify applications with maximum social use, a consent to learn from the best of the world when it comes to the today's technology advancements in Artificial Intelligence, and support procedures that establish access to and further development of Artificial Intelligence system.

While Artificial Intelligence has the capacity to provide large maximum value to a large range of sectors, adoption till date has been driven primarily from a commercial use. Technology disruptions like Artificial Intelligence are one in a generation occurrence, and hence large-scale adoption methods, especially national methods, need to strike a balance between narrow definitions of financial effect and the greater better. Indian NITI Aayog has been decided to focus on five divisions that are intend to benefit the most from Artificial Intelligence in solving societal problems:

a) Healthcare Sector :AI is increased access and affordability of quality healthcare sector.

 b) Agriculture Sector : AI is enhanced farmers technology' income, increased farm productivity and reduction of wastage of production.

c) Education Sector: It improved the access and quality of the education sector.

d) Smart Cities and Infrastructure sector: AI uses the efficient and connectivity for the burgeoning urban population, and country.

e) Smart Mobility and Transportation Sector : smarter and safety modes of transportation and better traffic and congestion problems.

2.   Artificial Intelligence Education And Literacy

Indian undergraduate computer science engineering degree is usually span four years and computer science diploma three years. At the University of Savitribai Phule pune university artificial intelligence is included in the undergraduate engineering curriculum for these degrees in the final year of the degree. These courses range from general courses SPPU on subject artificial intelligence and machine learning to courses on specific areas such as neural networks and evolutionary algorithms. After completing an undergraduate degree majoring in computer science, students can register for an master degree in computer science. This degree focuses on specializations in computer science degree and some curriculum include one or more modules on artificial intelligence such as deep learning and machine learning. Students are required to complete last year projects in the final year of the undergraduate degree and in the master degrees, these project also include artificial intelligence domain in both engineering and computer science. However, as we can move into the 4th industrial revolution is sufficient to develop skill our engineers and computer scientists as they enter the work place. We need to look at whether it will be necessary to offer an undergraduate degree with majors in AI or machine learning. This will be done with input from industry or company to determine whether the artificial intelligence skills that our graduates possess are sufficient to meet industry requirements.

II. LITERATURE REVIEWS

Gupta, N.A. [1] A number of impressive documentations of established research methods and philosophy have been discussed for several years. It is a little comparison and combination across studies exists. In this article, a common understanding of AI and ML research and its variations was created. unigram based LM, which has been successful when applied to IR. Moore, A. Carnegie Mellon [2] Smart production systems require innovative solutions to increase the quality and sustainability of manufacturing activities while reducing costs. In this context, artificial intelligence is driven technologies, advantages by I4.0 Key Enabling Technologies for (e.g., IoT, advanced embedded systems, cloud computing, big data, virtual and augmented reality), are ready to generate new industrial parameters .

The McKinsey Global Institute [5] defines the 4th Industrial Revolution as the structure of cyber-physical systems that combination of computational, network and physical processes and encompass countless technologies encompassing mobile devices, the IoT, AI, robotics, cyber security, machine learning and 3D printing . So, "the effect of the development of technology such as 3Dimension printing, online sales and services such as self services, healthcare examinations, ordering the food directly from the store to the refrigerator and the like will have a significant impact on changes in medium-sized enterprises."[4]. According to Schwab's visionary work [6], the Fourth Industrial Revolution is developing at an exponential, not linear, pace that not only changes "what" and "how" to do things, but also "who" we are. The introduction of Industry 4.0 has brought and will continue to bring profound changes in the global economy to variables such as investment, consumption, growth, employment, trade and so on. Growth and employment are certainly the areas most affected by the introduction of Industry 4.0 innovation.

Nedic et al. [7] explain the necessity of intelligent monitoring systems, especially for first year engineering courses where students usually struggle to bridge the gap between secondary and tertiary education system and given the diversity of student backgrounds and hence knowledge, individualized tuition is necessary.

Yigit et al. [6] have successfully incorporated AI in a learning program for computer science engineering. More recently artificial intelligence has contributed to the development of automated teaching assistants. The first artificial intelligent teaching assistant, Jill Watson, was successfully deployed in 2016 [8]. Jill Watson was used to answer student queries in form for an online module on artificial intelligence and achieved this with a 97% accuracy.

Roman et al. [11], analyzing the German context, proposed projected expected growth at various levels through the application of industry-related innovation 4.0. According to the authors, there will be improvements and significant improvements in productivity.

In the area of research in Artificial Intelligence and related techniques, universities and research areas from the US, China and Japan have lead the publication volume on Artificial Intelligence research topics between 2011 and 2019. Universities in USA, took an early lead in Artificial Intelligence research by offering new courses, establishing a research facilities and instituting industry or company partnerships[13].

III. AI FOR TEACHING

Artificial intelligence has played a important role in teaching and learning methodologies since its inception and actions. One such a area that is continue to growth is that of intelligent tutoring systems. Intelligent tutoring systems uses artificial intelligence (AI) techniques to provide personalized tuition to students based on their current state of knowledge and problems. Every Colleges/institutes Must Do to Prepare for the 4th Industrial Revolution.

1. Define the purpose of Education System

The purpose of education system has involved based on the requirements of society during that time period. It's not different during a transition. Currently, the education system serves to prepare a person to take on the action of a job or discipline to "do" the something. As we move further into the future scope, education system will need to support students to develop the skillset and mindset to do anything in their future rather than a particular time slot of "something."

2. Improving STEM Education

STEM (Science, Technology, Engineering study, Mathematics) education needs to increase across the board regardless of income levels. Theirs is no doubt every employee in the future work will need some technical skills and improvement in education system is warranted, but it's need to note that we shouldn't adapt an mentality. We need to help students understand the values that help us to learning how to use the new technologies intellectual ethically and morally rules therefore, workers training and professionals will still be essential.

3. Develop human potential

Even so machines are perform many tasks performed by human beings, humans are still more adapt at creative endeavors, imagination, social concentration, and physical presence. The education system of the future needs to implement these inherent capabilities in human beings, so they are occupied to partner with machines in the future.

4. Adapt to lifelong learning models

Education system become a lifelong attempt, and sources for education system need to involve to provides those opportunities and challenges. Attributes such as creativity, curiosity, and design-thinking will be very important component for the future workplace. Peoples will not longer start a career path and only growth with one role, so lifelong learners becomes essential.

5. Alter educator training

Even so he lived well the beginnings of the fourth Industrial Revolution, his words are very suited today. Rather than teachers information to students that they memorize, teachers and tutors will become guides to help students facilitates their own learning tools and lines of enquiry. Failure needs to be support as an essential steps to learning process. Additionally, teaching will be much more individualized, which will be supported by bringing in technology such as Artificial Intelligence and machine learning.

6. Make schools maker spaces

To school allows student to practices their curiosity, problem-solving techniques, investigation and the iterations of failure, schools need to provides learning environment that will enable students to be creators using a large variety of physical ,logical and digital tools. This can help combine children with the love of learning that will allows them to make sense of their world through hands-on experiences that increases emphasize collaboration and a creativity.

7. International mindfulness

In a digital tools, interconnected worlds, workers of the future will need to have a globally mindset. Schools and educators must adapt learning tools to take this into account. For examples, history will might not be taught from the perspective of one country but rather with examples from around the world; and instead of teaching the same languages that have been taught, teaching in a schools should look at international demand and the languages of emerging market places.

8. Change higher education

How long degree take to stronger ties between institutions of higher education learning and industry, changes will be need to made to a technical and post-secondary education learning to prepare students for the fourth Industrial Revolution. During the fourth industrial revolution, college qualifications will be become shorter and more focused on the study, and colleges will provide

more life-long education with post graduation qualifications throughout the working lives of personalized. This will also effect how earlier education system levels will need to modify their college level classes.

IV. INDUSTRY COLLABORATION TO DEVELOP ARTIFICIAL INTELLIGENCE SKILLS

In order to engineering and computer science graduate students to implement the necessary skills to face the challenges posed by the 4th industrial revolution in the workforce, it is essential to include industry collaboration in engineering education to provide students with the experience of solving real-world problems and difficulties. The Faculty of Engineering, Built Environment and Information Technology at the University of SPPU has established research chairs in collaboration with industry to facilitate this.

One such initiative is the Multiple choice machine learning researcher which is sponsored by Multiple choice, a broadcasting company in India. This is a joint chair including the Department of Electrical engineering, Electronic and Telecommunication Engineering and the Department of Computer Science. The co chairs from both departments supervised computer engineering and computer science students in applying machine learning techniques to solving problems in the broadcasting industry posed by Multiple choice. The projects require the use of machine learning in to solve the problem at handed. Depending on the problems complexity these range from the final year engineering projects, master projects, Masters projects to Phd projects. The projects are assessed using the standard assessment criteria for the particular degree.

V. FOURTH INDUSTRIAL REVOLUTION (4IR)

The 4th Industrial Revolution is a concept largely discussed at areas such as the World Economic Forum at Davos and within business leadership and leaders. Now adays white papers describe how the 4th Industrial Revolution will "shape the future of education system, and work" .

Industry 1.0: (1784): Industry 1.0 is Building on machineries for water and steam production.

Industry 2.0: (1870): It is Building on mass production system possible by dividing workers and using electricity system.

Industry 3.0 (1969): It is Building on electronic usage of the system and information technology and computer science to make more automated.

Industry 4.0 (Today): It is used a cyber-physical system.

VI. RESULT AND DISCUSSION

The paper goal here is to enable students to develop skills necessary to apply artificial intelligence(AI) techniques to solve the real-world problems from industry posed by the 4th industrial revolution. The projects and research completed by the students will be passed using the standard rules for the particular degrees. In additional to this the project/research papers are conducted must have been provided a solution that is usable by the industry posing the problems. In projects where relevant to the students, how the principles of engineering students were adhered to must be documented and reported. The effect of artificial intelligence(AI) in these era can be certained through the multispread successfully use of these systems for sector engineering. To support this it will be necessary to put in place working groups, comprised of engineers, computer researchers and educationalists, to drive the development and implementation of these systems to design.

VI. CONCLUSIONS

Artificial intelligence will plays a important role in the 4th industrial revolution. This paper examines the implications of this for engineering and computer science education. This paper firstly looks at the incorporation of AI into the engineering and computer science course to sufficiently prepared to our graduates for the 4th industrial revolution. The paper also looks at the mechanisms for general artificial intelligence literature in the industry and mechanisms to enable the existing workplace to implement or upgrade their artificial intelligence skills. The role that AI can play important role in the teaching of engineering and computer science is highlighted in terms of the intelligent teaching systems, self teaching assists and educational data mining and data analytics. In order to implement the skill sets of our raduates to study with the challenges posed by the 4th industrial revolution it is necessary for collaboration with industry in engineering education system. The paper explained research chairs as an option for achieving the automated task for teacher tutoring system. The paper also studied the role that artificial intelligence can play in role the awareness of era of engineering. The areas, namely, intelligent tutoring systems and automated teaching assistants, artificial intelligence systems to predict violations of era piece of engineering, intelligent decision support systems and online chatboxes for cultural literacy have been identified and unified. The paper concludes by suggesting rules to assess the effect of artificial intelligence in engineering education system as we move into the 4th industrial revolution.

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