The International Journal of Engineering and Science (IJES)
|| Volume || 8 || Issue || 2 Series I|| Pages || PP 03-10 || 2019 ||
ISSN (e): 2319 – 1813 ISSN (p): 23-19 – 1805

Knowledge on Artificial Intelligence and Related Fields Among Engineering Students

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----------***ABSTRACT***----------
Artificial Intelligence and related fields (Machine Learning, Deep Learning, Natural Language Processing, Computer Vision, and Robotics) are continuously emerging out with new tremendous updates. In the context of these updates in the specific fields, we have limited resources (Public with Knowledge) to implement these modern technologies. Despite increase in computer-basedaccess and technology training, technology is not being used to support the kinds of instruction supportive. Engineering Students prefer to study a limited number of resources related to their contextual or subjective study and doesnot refer to reference material for in-depth study in a particular topic or field. This research uses data from 78 participants to come to a conclusion that students have lack or improper knowledge regarding these updates in technologies. The results show that only 6 (7.69 %) of the answered students (78) were up to the mark, which had gains of information based on current trends in these fields. The implication is deficiency of knowledge in students or resources for students.
Keywords: *Artificial Intelligence, Machine Learning, Deep Learning, Robotics, Knowledge, Survey*

Date of Submission: 24-01-2019 Date of acceptance: 08-02-2019

I. INTRODUCTION

According to Moore's Law, "The number of transistors in a dense integrated circuit doubles about every two years" so the exponential growth in computing power seemly scaling high at powers (multiples) of 10, since last nine decades.[1] The Law of Accelerating Returns as "the rate of change in a wide variety of evolutionary systems tends to increase exponentially" by Kurzweil R 1999 in the book of Age of Spiritual Machines.[2] Thus we need scalable, trained, and well erudite young scholars to work on these updates.

Artificial Intelligence (AI) and related fields are emerging with new technologies and development in technical sector. The era of AI begin in 1950's which was unknowingly elaborated by Alan Turing due to his article on "Intelligent Machinery".[3] Alan Turing developed a working model of Turing Machine on which he performed Turing Test, a test of a machine's ability to exhibit intelligent behavior similar to, or indistinguishable from, that of a human.[4] According to Musk E, these terms are going to be the top technologies in near future. Later in future, these machines using the concept of AI will democratic the change as of now. Software-Hardware based systems are used by billions of people around the world but these systems are developed and maintained by highly erudite persons which arenot distinguishable in billions. Generally, to cope with these systems one need to have skills and knowledge regarding to these systems.

The purpose of the survey, "Knowledge on Artificial Intelligence and Related Fields among Engineering Students" was to get thoughts on basic understanding and conceptual thinking of an Engineering Student.

II. METHODOLOGY

The online cross-sectional survey was conducted among Computer Engineering Students of final year (4th Year). Inclusion criteria, Engineering students belonging to the field of Computer Engineering, Computer Science and Engineering and Information Technology.

The Survey was divided in two phases. First phase was used for verified entry by asking the enrolment numbers provided by the Gujarat Technology University and their email addresses for taking part in the survey. The second phase comprises of development of the survey tool (A total of 9 questions screening tool) with the help of Google Forms (Appendix A) and conducting online survey by sending the forms through their verified email addresses.[5] The questions were based on Prior Knowledge and Logical Thinking. The survey was opened for one month (20-06-2018 to 20-07-2018) for the students of Computer Engineering, Computer Science and Engineering and Information Technology. A simple descriptive statistic was performed through Excel.

III. RESULTS AND DISCUSSION

Survey evaluates a pattern of study where an Engineering Student is testified in the field of Artificial Intelligence, Machine Learning (ML), Deep Learning, Natural Language Processing, Computer Vision, and Robotics.

Only 78 students filled the online survey form. Out of 78 people surveyed, only 6 (7.69%), were found fully aware of the AI (100% correct answers). The students while answering the survey were mostly familiar with terms are Artificial Intelligence 71 (91.02%), Machine Learning 63 (80.76%), Robotics 61 (78.20%), following by least familiar terms Deep Learning 47 (60.25%), Computer Vision 46 (58.97%), Natural Language Processing 29 (37.17%) (Fig. 1).

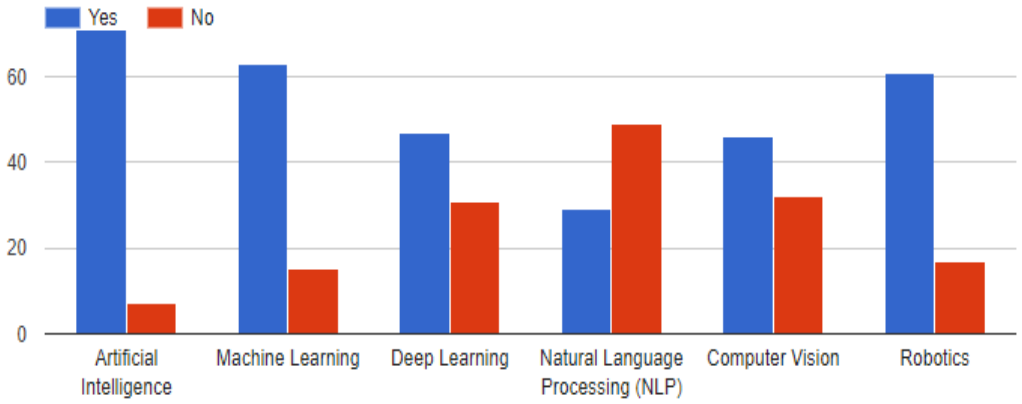

Fig. 1

Only 56 (71.8%) correctly answer the question 2 (Who is the father of AI?) The father of AI is John McCarthy **(**Fig. 2).[6] Alan Turing firstly declared about the topic of 'Intelligent Machinery', but it was all about Theory of Computation.[7] To that context Alan Turing is known as the father of Theoretical Computer Science. The term 'Artificial Intelligence' was first coined by John McCarthy in 1956 when he held the first academic conference on the subject. And Marvin Minsky was a researcher who worked with John McCarthy in the same field and was a followerof Artificial Intelligence.

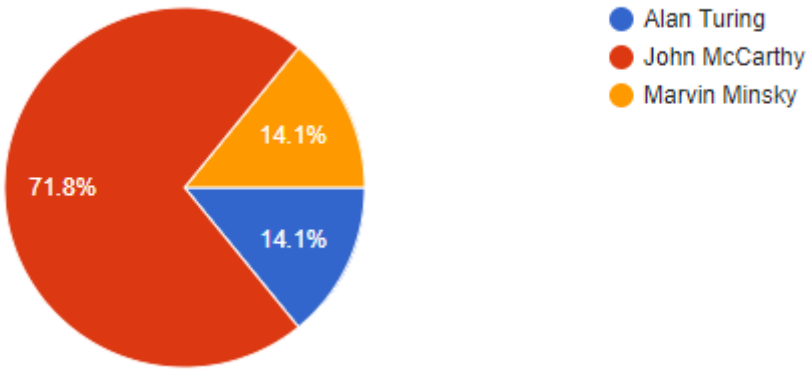

Fig. 2

When it was asked about **'**intelligence' only 67 (85.9 %) were able to choose the correct option, i.e. "Self Learning and Problem Solving". Only 8 (10.3 %) thought that Intelligence is "Automation For Machines", but were wrong because human also possesses intelligence, wiz. known as Human Intelligence. Unknowingly, 3 (3.8 %) opted Science Fiction, the reason for this is "Deficiency of Knowledge" among these students, (Fig. 3). Intelligence has been defined in many ways to include the capacity for logic, understanding, self-awareness, learning, emotional knowledge, reasoning, planning, creativity, and problem solving. Turing had the right idea

in identifying intelligence as being indicated by behavior which is indistinguishable from behavior which is attributed to intelligence where it was exhibited by a human being.

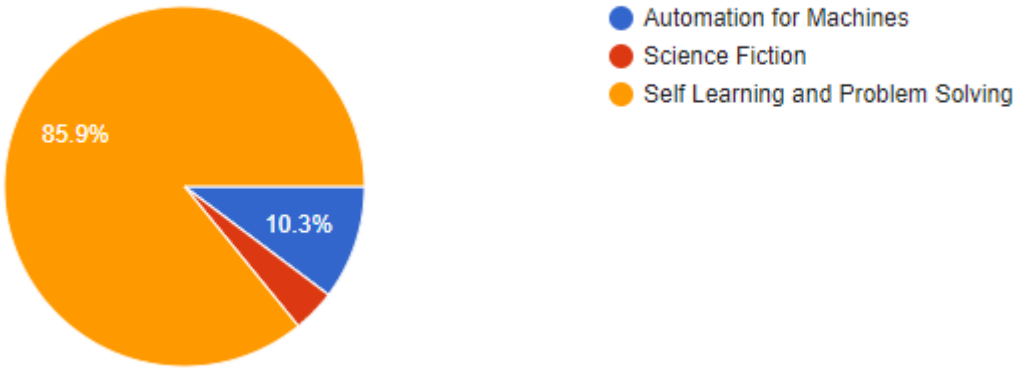

Fig. 3

Deep Learning "is a technique for implementing Machine Learning". Here the participants were not clear between definitions of Machine Learning and Deep Learning, and chose the wrong option in majority. (Fig. 4) In the first question "Choose the terms you are familiar with!", there was an option for selecting Deep Learning as Yes/No. The tabulation below is the summary point of an Engineering Student, selecting "Yes/No" in Q1 and selecting "is a technique for implementing Machine Learning" and other options in Q4 of the Survey. (Refer Appendix A, Section 2: Q1, Q4) (Table 1).

Table1

Q1. Option Selected for Familiar with the term "Deep Learning" [Appendix A. Q1]	**Q4. Option Selected for Deep Learning Means… [Appendix A. Q4.]**	**Count from 78**	**Count Percentage (%)**
Yes	is a technique for implementing Machine Learning	19	24.35 %
No	is a technique for implementing Machine Learning	18	23.07 %
Yes	Theability to learn withoutbeing Explicitly Programmed	26	33.33 %
No	The ability to learn withoutbeing Explicitly Programmed	12	15.38 %
Yes	Another name for Machine Learning	2	2.56 %
No	Another name for Machine Learning	1	1.28 %

From the tabulation summary the Students, who have opted out "Yes" in Q1, and have selected "is a technique for implementing Machine Learning" does possess proper knowledge on Deep Learning where the count is of 19 (24.35 %) out of 78 students who took part in the survey. Further students donot know the difference between Machine Learning and Deep Learning and due to this majority of them 26 (33.33 %)out of 78have selected the definition of Machine Learning in context of Deep Learning. This results to the meaningless ability of the students use to tackle out the problems.

A question of interest: At what point do you agree the most that Machine is "Intelligent"? (Fig. 5), Machines require a back-end power or logic to do a front-end task. Machine is always pre-programmed to perform a particular task, likewise Dish-washer Machine is used to wash dishes and can-not be used for washing

clothes when pre-programmed, but if we add the concept of Artificial Intelligence or Machine Learning to that machine, Dish-washer may work as Clothes Washing Machine. Only 19 (24.35 %) students have selected the below options as correct to the point:

1. When Machine is Pre-programmed - Not at all
2. When Machine is made up to Reinforcement Learning - Likely, Very Likely
3. When Machine has got features of Supervised or Unsupervised Learning - Likely, Very Likely

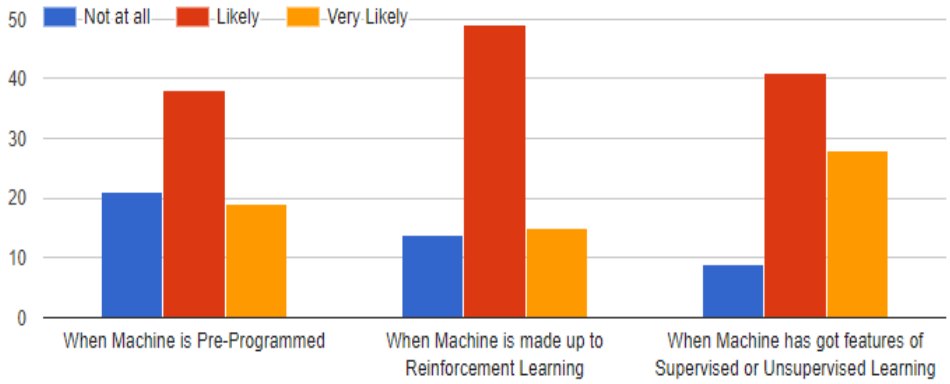

Fig. 5

Based on logical thinking ability a question was in the survey, "If a Robot Dog is pre-programmed for walking, Do you think this dog can play Football?" As specified in the earlier question that if a machine is preprogrammed then the machine will perform the task specified in the program. While if on adding the concepts of AI or ML makes the machine Intelligent. The answer is 'No', as Robot Dog was pre-programmed for walking, the Robot Dog cannot play Football due to pre-programmed and AI or ML integrating limitations. Almost 39 (50 %) of the students, got it correct by selecting 'No' and 26 (33.3 %) People werenot clear about the difference between Pre-Programmed Machine versus AI or ML. Only 13 (16.7 %) students responded'Yes' due to limitation of Logical Thinking Ability (Fig. 6). In comparison to the previous question, if all the options selected are right then 12 (15.38 %) people have clear idea of what was this question about?

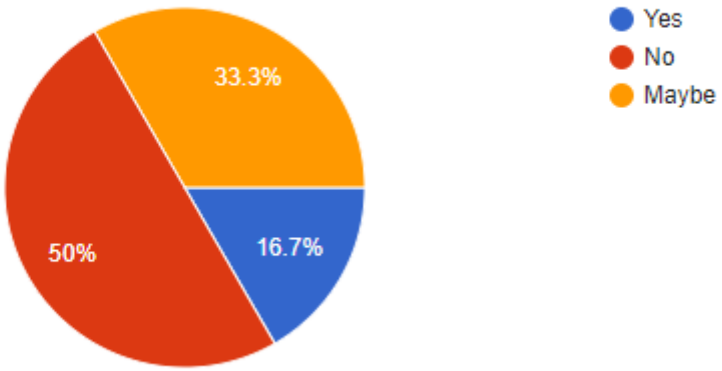

Fig. 6

Under the subject of understanding questions were asked in the survey based on Prior Knowledge and Logical Thinking as, Is Human Intelligence and Machine Intelligence the "Same", and can a Machine have Intelligence, comparable to human? Human intelligence is natural. No one feeds a human with algorithm to behave in a certain way or say or do certain things. It is entirely a natural process. We react to things according to our nature. Machine intelligence or artificial intelligence, as the name suggests, is artificial. However, it is based on the neural network of human brain. It is yet man-made. Humans use content memory and thinking whereas, smart systems are using the built-in instructions, designed by engineers.

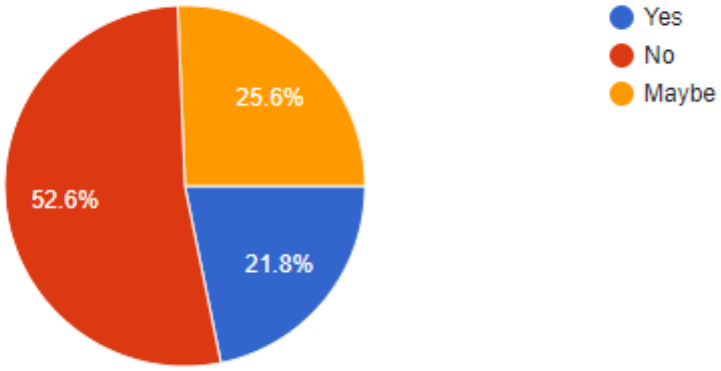

Fig. 7

Currently the right answer is 'No' as the graph for Rapid Growth of AI supports to the answer that in 2015, AI has surpassed brainpower of the mouse, and may achieve brainpower of human in 2023. Later on, in 2045, it is estimated that AI will have brain power equivalent to that of all human brains combined. The chart is based on Ray Kurzweil's the Law of Accelerating Returns. [8] Approximately 95% were correct.

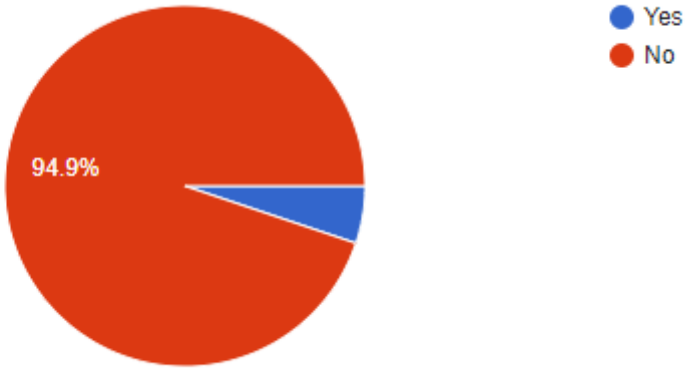

Fig. 8

At last, a question was asked about emerging of Artificial Intelligence in the fields of Agriculture, Manufacturing, Energy, Smart Cities Development, Education and Skilling, Finance and Marketing, Hospitals and Medicines/Healthcare, Media, and Transportation. To this, most of the positive readings generated in the fields as Manufacturing (59%-), Smart Cities Development (72%), Education and Skilling (68%), Hospitals and Medicines/Healthcare (62%), and Transportation (55%) (Fig 9).

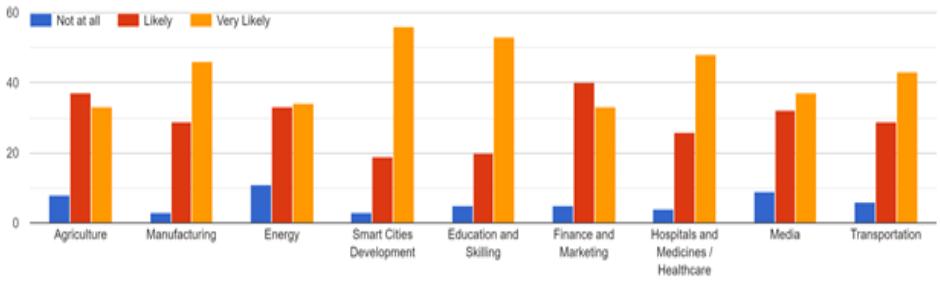

Fig. 9

IV. CONCLUSION

The survey revealed that there is a very poor knowledge on AI and its related fields. Every human has its own point and level of understanding, calling as intelligence. But to cope with this, the mind needs to be trained and updated daily with problems and solutions to these problems. This survey shows engineering students belonging to the field of Computer Studies (i.e. Computer Engineering, Computer Science and Engineering and Information Technology) has low correspondence to growth of technologies. Students are limited to book and need to enhance their skills in these factors eventually by using the technology.

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Appendix A: Survey Questionnaire

Section 1 of 2:

1. **Email id:_____**
2. **Enrolment No.:_____**

Section 2 of 2:

1. **Choose the terms you are familiar with!**

	Yes	No
Artificial Intelligence	◯	◯
Machine Learning	◯	◯
Deep	◯	◯
Natural Language Processing	◯	◯
Computer Vision	◯	◯
Robotics	◯	◯

2. **Who is the "Father" of AI?**

◯ Alan Turing

◯ John McCarthy

◯ Marvin Minsky

3. **What do you think about "intelligence"?**

◯ Automation for Machines

◯ Science Fiction

◯ Self Learning and Problem Solving

4. Deep Learning means…

- ◯ Is a technique for implementing Machine Learning
- ◯ Another name for Machine Learning
- ◯ The ability to learn without being Explicitly Programmed

5. At what point do you agree most that Machine is Intelligent?

	Not at all	Likely	Very Likely
When Machine is Pre-Programmed	◯	◯	◯
When Machine is made up to Reinforcement Learning	◯	◯	◯
When Machine has got features of Supervised or Unsupervised Learning	◯	◯	◯

6. If a Robot Dog is pre-programmed for walking, do you think this dog can play Football?

- ◯ Yes
- ◯ No
- ◯ Maybe

7. Can a machine have Intelligence, comparable to human?

- ◯ Yes
- ◯ No
- ◯ Maybe

8. Does Human Intelligence and Machine Intelligence the "Same"?

- ◯ Yes
- ◯ No

9. In which field, Artificial Intelligence will be helpful in near future.

	Not at all	Likely	Very Likely
Agriculture	◯	◯	◯
Manufacturing	◯	◯	◯
Energy	◯	◯	◯
Smart Cities Development	◯	◯	◯
Education and Skilling	◯	◯	◯
Finance and Marketing	◯	◯	◯

Hospitals and Medicines	◯	◯	◯
Media	◯	◯	◯
Transportation	◯	◯	◯

Dishant S. Rathi" Knowledge on Artificial Intelligence and Related Fields among Engineering Students"The International Journal of Engineering and Science (IJES), 8.2 (2019): 03-10