AI and Manufacturing and Services in India: Looking Forward

Event Report

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This Report provides an overview of the proceedings of the Roundtable on Artificial Intelligence (AI) in manufacturing and services: Looking Forward (hereinafter referred to as 'the Roundtable'), conducted at The Energy Resource Institute (TERI), in Bangalore on January 19, 2018. The Roundtable comprised of participants from different sides of the AI and manufacturing and services spectrum including practitioners, representatives from multinational companies, think tanks, academicians, and researchers. The Roundtable discussed various questions regarding AI in the manufacturing and services industry in India.

The round of discussions began with initial observations from the in progress research that the Centre for Internet and Society (CIS) is undertaking, on the use of AI in manufacturing and services. Some of the uses of AI that the research had thus far identified across various sectors included AI platforms in IT services for accurate forecasting for businesses, AI driven automation of routine tasks in manufacturing and production, and AI driven analytics for forecasting in the agriculture sector. The discussion then proceeded to the benefits of using AI - including efficient and effective results, precision, and automation of repetitive maintenance tasks. The draft research also acknowledges that although the use of AI is beneficial in many ways, there are also some key concerns around job displacement, privacy, lack of awareness, and a needed capacity to fully understand and use new AI technologies. The draft research also identified a few key AI initiatives in India, such as Wipro Holmes, TCS Ignio, and G.E, that were providing solutions to help automating software maintenance tasks and helping in the smooth working of SAP (Systems, Applications & Products) operations. Innovative uses of AI in areas such as crop production (M.I.T.R.A.) and dairy optimization (StellApps) were also identified. To understand the present state of AI and impact of the same, the session was opened to discussion on the following questions:

What are the existing and potential uses of AI in manufacturing and services?

The discussion began with an assessment of the current state of research and use of AI in India in comparison to other countries. It was stated that India's competitiveness in AI is still at a nascent stage, especially when compared to countries in Europe, the United States, and China. Participants noted that there was an absence of Indians (as research organizations and startups) participating in key international AI conventions such as the NIPS (Conference on Neural Information Processing Systems).

Hurdles that India needed to overcome to catch up to other countries that were leading the AI race were also discussed. While some participants estimated that it would take India ten years to catch up, others felt that it would take a much longer time for India to catch up both in terms of AI research and adoption. It was felt that India was in part lagging behind in the AI race due to a lack of investment from the private and public sector in AI research and development. This is in contrast to countries like US and China who are e allocating large budgets for AI research.

Attention was then drawn to the example of the Centre for AI and Robotics under the DRDO which was established in 1986. Though the Centre undertakes research and development into AI and developed some solutions[1] it has yet to produce a robust set of publicly available AI research outputs. Here the comparison was drawn with DARPA (Defense Advanced Research Projects Agency) of the United States, where the famous DARPA Challenge encouraged the development of autonomous vehicles as well as technologies needed to create these vehicles, which later helped in developing and deploying these technologies in real life.

The next problem that was discussed, dealt with AI and language accessibility. It was noted that in India, there was a tendency to use IT (Information Technology) and ITES (Information

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1   **https://www.drdo.gov.in/drdo/labs1/CAIR/English/indexnew.jsp?pg=products.jsp**

Technology Enabled Services), primarily in English. This excludes a number of researchers and developers who are working in vernacular languages from making progress compared to researchers who are working in English. It was highlighted that there is a need to create IT (which would even cover technologies such as AI) that is more inclusive not only to work with but also to use. This could be achieved by working in the vernacular languages whenever possible.

Building off of this discussion, it was discussed that India could not expect foreign multinational companies or projects funded by foreign countries to create solutions that could solve India specific problems in general, and the problem of language barriers in particular. Hence there is a need for domestic companies and the government to work towards resolving challenges specific to India.

Other challenges that were discussed included the lack of data centers in India, as well as the unavailability of government data in usable digital formats for the deployment of AI. Though the government is in the process of digitizing government records, some of the data collected is still in the form of printed books, which cannot be used as data to facilitate AI development. It was noted that India could use the amount and diversity of data produced within the country as its strength, especially in cases like Aadhaar, which can be seen as a blueprint for how large quantities of data could be generated, collected, and stored.

With regard to the present use of AI, the example of HCL's DRYiCE[2], was given, which is currently being used to help enterprises with their use of AI technology, robotic process, and automation. HCL has also established a DRYiCE AI Foundation that conducts research on subjects that include autonomics, natural language processing, deep learning, machine learning, Robotic Process Automation, Predictive Analysis, Neural Networks, Process Orchestration, and Cognitive Computing.

Another example discussed, dealt with AI technology and its use in crop management. It was noted that the front-runner in India in this field is TartanSense[3], which uses drones to capture and analyse aerial imagery to increase precision in agriculture. Another sector where AI, and automation and prediction through AI could be used in India was in mining (coal or minerals etc.) where the loss of life is a daily concern. In this sector, it was shared that AI is being used in other countries to make mining safer, by using AI powered machines to work in places too dangerous for human miners. The healthcare sector was another sector where it was noted that there is great potential for AI as it can make healthcare increasingly personalised and customer-centric. It was also stated that AI could be used in the field of chemical engineering to customise manufacturing processes and in software maintenance. It was noted that, especially in the field of software, patching and updating tasks continued to pile up and that machine learning and AI could potentially help with and even eliminate the existing backlog of IT work.

Key Takeaways

This session concluded with the suggestion that India needed to be more competitive especially in the race for innovation and the longer this takes, the harder it be to catch up. In order to be at par, India would need to understand its strengths and utilise them accordingly. Another problem that was noted is that in India there is a tendency to divorce academia from industry. Thus, there is a need for greater collaboration between the two, to harness the potential of AI, while also enabling an increase in its application.

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2   HCLDRYice **https://www.hcltech.com/autonomics-and-orchestration**

3   Tartansense **http://www.tartansense.com/**

What is the impact of deploying AI?

This session began with a discussion on the impact of deploying AI, especially its effects on labour. It was noted that although there is a lot of talk about the benefits of deploying AI, there is also the fear that application of AI will result in large scale loss of jobs. However, it was noted that it is more likely that the application of AI will in fact bring about new jobs. One of the participants quoted Andrew Ng's statement that, "AI is the new electricity",[4] as a comment, on how just as electricity transformed manufacturing, transportation, agriculture and healthcare, AI will transform these industries again.

Though there is concern about the potential impact of AI, it was noted that fear of the potential long term consequences of AI should not make industries and the government slow down the growth and uptake of AI technologies. To understand the situation better, the example of mobile phones was used. Mobile phones have brought about a revolution in India, and instead of taking away existing jobs, they have enabled workers across all sectors to operate with much more efficiency. AI could potentially have a similar effect across sectors.

Continuing the discussion on AI's impact on the job market, the way in which the increasing application of AI within industries could fundamentally change how they work as AI will create the need for a labour force with an updated skill set, was discussed. The growing gap between the skills possessed by an average engineering graduate and the skills required for a professional to operate in an industry that utilises AI space could result in a situation where there is a deficiency of qualified people who could work with new technologies. It was agreed that there is an important need for capacity building by providing sufficient training to graduates and prepare them for work in an AI-utilising industry. A possible solution to this was suggested to be the addition of subjects such as AI and machine learning in the curriculum taught at engineering and other colleges.

Other points made during this discussion included the observation that delegation of work to AI would potentially allow humans to do more productive and creative work, by reducing the amount of mechanical, and repetitive work. Another example discussed was the emergence of network transportation system companies (Uber and Ola), and how they have developed business models around issues related to transportation in India. In the process, the companies have created new forms of jobs for people in what is known as the gig economy (a labour market characterized by the prevalence of short-term contracts or freelance work as opposed to permanent jobs). It was also emphasised that as the gig economy becomes more prevalent, jobs leveraging AI could also increase, especially with the dissolution of geographic constraints.

An additional topic of discussion had to do with the AI based products and services designed to cater to a large number of individuals. It was stated that these products/services would have to be optimised to the needs of the large user group. This would first require the democratisation of the product/service so that it is uniformly accessible.

Furthermore, it was pointed out that there must be parity among the manufacturers and service providers. It was mentioned that presently, groundbreaking work in AI is more commonly seen in corporations that are large scale, or multinational companies, than in smaller companies and startups. This was felt to be predominantly due to the fact that these technology giants collected and stored an immense amount of data that was then used to develop their AI research. There would be more small scale, and startup companies doing similar groundbreaking work on AI if they were also provided access to the same data.

It was suggested that, as real data is expensive and difficult to access, smaller companies could use synthetic data to train their AI. Reinforcement learning could also be used in

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situations where training data is unavailable, and the AI could learn from experience. Additionally, these techniques could also in turn help reduce biases that may creep into any given system that uses only real data.

To illustrate the importance of the need for transparency in algorithmic decision making, the example of the US case *Houston Teachers Federation et.al v. Houston Independent School District*[5] was shared, where an algorithm was used to decide on the employment and promotion of teachers. However, the algorithm and the system used were not made accessible to the public and it was thus not possible to understand how the system was assessing each individual.

The discussion then moved to the problems of data hoarding (collecting large amounts of data and not opening it to other stakeholders) and vendor lock-in (the situation where the customers/companies e are forced to be dependent on a single provider) which can arise due to the practice of large companies monopolising AI technologies and solutions. While there was no acknowledgment of Indian companies involved in these practices, the impact of foreign corporation indulging in data hoarding and vendor lock-in was recognised to be felt on a global scale, and this made it a relevant issue for the Indian AI industry as well.

Key Takeaways

This session concluded with the idea that the development and use of AI should be for the e purpose of assisting humans and not for the purpose of taking their place. The panic concerning AI causing large scale unemployment is potentially being exaggerated. It was however acknowledged that there exists a need to train and reskill the future workforce to ensure that they remain competent in a landscape that utilises AI.

What can we do about ethical concerns and specific regulatory responses?

The discussion began by addressing the need for a proper policy framework defining appropriate uses of data which was particularly true given the present day scenario, with large companies possessing vast amounts of data. It was also discussed how datasets could be biased towards a particular category of people, as in the case of cosmetics manufacturers focusing advertisements for skin whitening products to consumers who had dark skin, or how a software used to predict future criminals was biased against a particular race.

The next question that came up was that of the inherent biases of the programmer that could be encoded into the AI. An interesting insight that came out of this discussion was that in large companies where a number of people (from different backgrounds) were working on the same AI technology or solution, it was less likely that personal bias would creep into the AI.

It was also pointed out that with respect to the question of ethics and AI technology, there is a disparity between the importance industry professionals presently give to questions of technology and questions of ethics. This has led to AI-based technology being developed in "black boxes". Black boxes allow for development without the requirement of transparency around the AI's decision making process, and without disclosing details about the data that influences these decisions. This creates a scenario where consumers and sometimes manufacturers experience the consequences of an AI's decision, but are unaware of how the AI arrived at this decision. A possible solution discussed to address this issue was to make AI

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5   *Houston Teachers Federation et.al v. Houston Independent School District* US District Court Judgment, case 4:14 cv 01189, May 2017, **https://www.courthousenews.com/wp-content/ uploads/2017/05/HoustonTeachers.pdf**

"explainable", thereby allowing the scientists and academics to be able to understand how the AI made the decision and in a way look inside the black box. The disparity could also be effectively bridged by the promotion of partnerships between academics interested in ethics, and industry professionals interested in pure technology developments, who collaborate during the development process of AI.

The need to build into AI a set of moral standards was also discussed.. This suggestion was also pertinent as globally there is research and discussion going on the topic of whether AI should be programmed to be autonomous. By making AI understand human concepts such as ethics and morality, AI could be made safer, and more trusted for working alongside humans, resulting in greater uptake of AI in manufacturing. Another global debate that has surfaced around AI and safety is the use of the "kill switch". This debate has emerged as a topic of discussion in the EU with respect to the deployment of AI, especially in manufacturing industries where there is a high chance of human and AI working together.

Finally on the question of displacement of labour a possible suggestion to reduce loss of jobs en masse was the imposition of a "Robot Tax", a policy where companies using AI and robots instead of humans, had to pay higher taxes. This system would act as a disincentive for companies to completely replace their human workforce with machines/AI.

Key Takeaways

This session concluded with the understanding that there was a need to work on how algorithms and AI could overcome bias. It was also stated that there was a need to develop and implement a system that takes into account technological and social norms while creating AI.

What should the above mentioned policy frameworks look like?

Discussion on an appropriate policy framework for AI in India brought about a number of suggestions:

1. The government could promote competitiveness allowing a challenging atmosphere for startups or provide equal incentives to all startups.

2. The government could include more technocrats, researchers and civil society organizations into policy development with regard to AI and new technologies.

3. The government could increase the promotion of AI and machine learning research by providing adequate funding. In this context, the example of Canada was given, where the government was funding 125 million dollars for a Pan-Canadian AI strategy[6].

4. The government could include AI and ethical questions concerning AI in university curriculums to sensitise the future generations on the concerns that could arise out of the use of AI.

Key Takeaways

This session concluded with the understanding that there was no 'one size fits all' policy for questions dealing with AI. It was also understood that there was a need to address AI-associated issues like consumer protection, product liability and data protection separately, rather than through a single AI policy.

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6   **https://www.cifar.ca/assets/pan-canadian-artificial-intelligence-strategy-overview/**

Conclusion

The Roundtable concluded with the essential point that there needed to be an understanding of the difference between AI and automation, as these terms were often being used synonymously. In terms of the companies and startups that promote themselves as using AI, there was a need to look into whether they were actually using AI or masking automation under the guise of the word AI. Towards making this distinction, a test to resolve the ambiguity between AI and automation was to think of it in the following way - the AI system replaces the brain whereas automation replaces the muscles. To explain further, if a tool was being used to do a repetitive task, or a repetitive decision, it would be automation, while tasks requiring intelligent decision making would be done by AI.