

Reaping Benefits of Artificial Intelligence

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Artificial Intelligence (AI) is defined as the ability of a machine to perform cognitive functions we associate with the human mind, such as perceiving, reasoning, learning, interacting with the environment, problem solving, and even exercising creativity. There are varying views on Artificial Intelligence (AI) globally – some see this as the next biggest disruptive technology that would bring accelerated growth and productivity, whereas others view it in a rather negative sense combined with huge job losses. PricewaterhouseCoopers (PwC) estimates the global AI market business opportunity of an additional \$15.7 trillion – making it the biggest commercial opportunity in today's fast changing economy. This article would provide a broad overview by demystifying some of the facts related to AI while providing some background on the evolution of this subject. The article would draw upon the announcement made during the recent budget – how India can benefit from AI and implications of the same going forward.

Let us consider the climax sequence from the 2009 popular movie "3 idiots" to demonstrate the basic concept of AI and other supporting technology. In the climax scene, the protagonist

Rancho (played by Aamir Khan) who is an engineering student with no medical training has to carry out delivery of a pregnant lady during a critical labor pain. Such a situation is quite common in villages with little medical support, especially in the tribal or remote ones. Technology comes to the rescue in this movie, where the sister of the pregnant lady Pia (played by Kareena Kapoor), a trained doctor assists Rancho over video call to successfully conduct the delivery and a healthy baby is born. Such applications of remote tele-medicine are now possible across various pockets of India through various flagship schemes of the government like BharatNet (high speed internet connectivity in villages), RECL (rural electrification) and Digital India programme.

In the movie sequence, Pia (the trained doctor) was available for the entire duration of the delivery to assist Rancho. We would need one trained doctor for every nurse (or proxy doctor) in the village location. In reality, this can be a huge bottleneck in scaling such solutions to all the villages in India. An AI based recommendation system can come to the rescue here. An AI based recommendation system can advise the nurse about the diagnosis and the next step in many common conditions faced by the patients. The Artificial

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Intelligence system can learn from huge amounts of historic data, the medication that was prescribed by doctors under similar diagnosis and symptoms that led to such diagnosis. AI combined with digital technology can play a huge role in empowering the citizen by augmenting with knowledge and actionable intelligence – in this example, empowering the nurse in the village healthcare centre is one such empowering move by AI.

History of Artificial Intelligence

AI as a research topic in computer science has been around since the mid-1950s. Foundations of AI have been laid long back with the invention of the perceptron algorithm for artificial neural network (ANN) in 1958. Around the same period in 1950, Alan Turing published a paper titled “Computing Machinery and Intelligence” – with the aim of creating a machine that can mimic human intellect and behaviour. Developing machines that match human intelligence in terms of logic, reasoning, speech, perception, reflex and interactivity has long been the aim of researchers. This theme of intelligent machines has been an idea primarily of researchers and science fiction movie makers. During 1996-97 an IBM computer by the name of “Deep Blue” defeated the reigning champion Garry Kasparov in a chess game. Though this was a great achievement in itself, the task performed by the “Deep Blue”

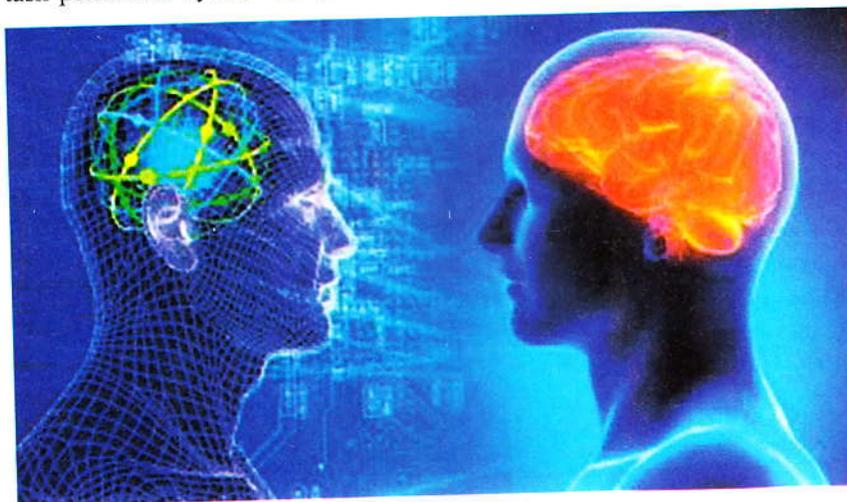


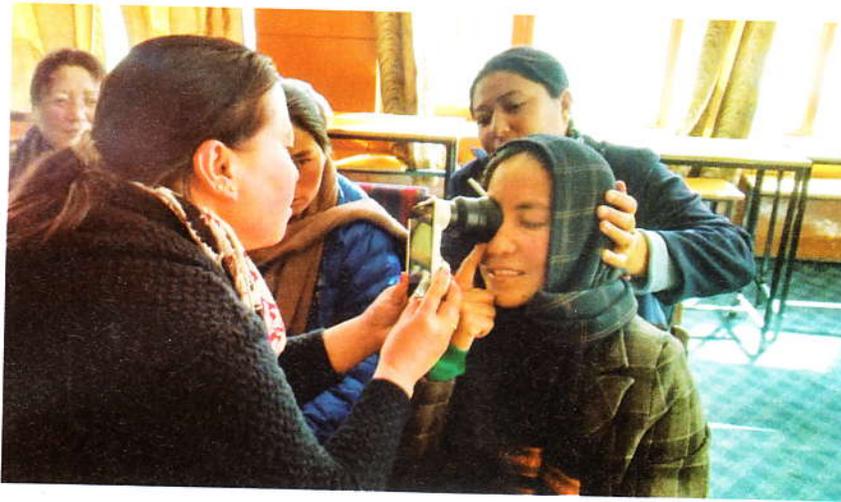
machine was fairly logical in nature and did not involve deep human perceptions related to sight and speech.

The last few decades have seen a range of digital technology transformation that have brought back the relevance of Artificial Intelligence backed with Big Data. Round 1960-70 saw the rapid phase of digitization globally; all sorts of businesses from banking, insurance to retail were moving from paper to electronic mode of operation. This led to the creation of huge amounts of data combined with the huge scale of computing power and massive data storage at reasonable cost. This led to the development of the term of “Big Data” which allowed processing and analysis of huge amounts of data. Big Data along with enormous increase

in computation and low-cost storage gave a new lease of life to the field of artificial intelligence.

Some believe the invention of the deep learning algorithm is responsible for the new emergence of AI. The theoretical foundations of “deep learning” algorithm supervised multilayer artificial neural networks (ANNs) was discovered in 1965. During that age, there was no availability of massive scale computation systems or gigabytes and terabytes of data to train massive AI systems. Aspects related to human speech, like understanding human conversation and framing an appropriate reply, were considered a very complex task for the humans to perform. IBM’s question answering system, “Watson”, defeated the two greatest “Jeopardy!” game players in 2011. “Jeopardy!” is a classic game show on American television with a twist, in which the answers are given first, and the contestants have to frame the questions based on clues supplied. The other complex task performed by humans is that of sight based on which objects are recognized and perceived. An AI based system won the ImageNet’s image-classification competition by a large margin in 2012. The “AI Index” by the Stanford University measures the performance of AI systems against humans – tasks like speech recognition/comprehension and image recognition from objects have reached at par performance of the best AI systems.





How can AI help India?

Let us consider the same example of health-care – India has less than one (0.725) physician per thousand persons and the number is even worse for the number of specialists per thousand persons. Given the rate at which new physicians or doctors are entering the system, this figure is unlikely to change in the near future. Hence, a large number of rural healthcare centres face a shortage of doctors and function with only nurses on the ground – the condition can be even worse in remote and tribal areas. The shortage of trained medical staff is even more acute for clinical specialists like radiologists or pathologists – professionals who spend most of the time looking at images to determine whether the patient had a certain disease. We have just seen the excellent performance of the AI based systems in tasks like image recognition. Here big data based artificial intelligence can help in bridging the skills gap and empowering the medical staff on the ground. The AI based system can save the time of the radiologists/pathologists by providing recommendations based on the underlying images – they may simply review the cases requiring much lesser time than carrying out detailed investigation. The clinical specialists on the ground can concentrate their efforts on the complex cases which require expert intervention and in the process empowering them and making them more productive.

While attending to the patient, the nurse can enter the key patient symptoms and measurements into a hand-held device powered with AI. Based on the information about the patient symptoms and measurements the device recommends the likely diagnosis and prescribes suitable medication – this may be further augmented with detailed explanation for prescribing these medication. In this case, the nurse can administer a prescription that an experienced doctor would have prescribed. The nurse would also have the option not to accept the recommendation if it doesn't seem most suitable for the current patient condition. Again these recommendations are provided based on big data based artificial intelligence algorithms running at the backend – which analyses large amount of historic anonymous patient records with similar symptoms and prescribed medications. India faces large skill gap in sectors like health-care and such AI based technologies can help in bridging that gap by empowering the citizens and making them more productive in their daily functioning.

Andrew Ng, Professor at Stanford University and co-founder of Coursera, terms AI as the new electricity in his famous quote: “Just as electricity transformed almost everything 100 years ago, today I actually have a hard time thinking of an industry that I don't think AI would transform in the next several years.” The applications

of AI are unlimited in the Indian context – judiciary can use AI based systems to reduce pendency in court cases, education can develop learning modules which are in sync with the pace of the student's learning or in agriculture AI based systems based analysis of satellite imagery can provide early estimates of crop yields.

Like other disruptive technologies, AI would bring in a shift of paradigm in the way people live and work today. The last big disruption occurred when computers were first introduced in banks and other institutions across India – even leading to widespread protests. The computers brought in the information technology (IT) revolution, which made India the global leader in IT space – where home grown Indian firms are competing globally with the best IT companies of the world and India as the leader with the highest volumes of software exports. When computers were introduced, there were no IT skilled people in India and now India has the largest talent pool of IT professionals. Similarly, a disruptive technology like AI would bring in a large disruption in the jobs – new skills would emerge and government has to play a pivotal role in re-skilling those people. In the manufacturing sector, AI can lead to automation moving people from low productivity jobs to high productivity roles.

Adoption of any new technology, including the use of big data based AI to empower the nurse in a rural health centre (as in the example quoted earlier) involves change management. This change management is an important aspect of any new technology adoption program and can be the thin defining line between the success and failure of this change initiative. The nurse needs to equip herself towards the use of the digital platform which is intended to empower them – this might involve a bit of new skill development. Lack of appropriate skilling along with new technology adoption often leads to the failure of such programs and the new technology. This, in, turn is made responsible for the job loss due to this

re-skilling gap. For example, a nurse might be well trained in handling the patient and taking observations but might not be well versed in using a handheld device, its various options, etc. In such a case, the nurse who is an expert in her medical domain needs to be augmented with appropriate digital skills which would empower her in her function with the help of artificial intelligence.

AI Ecosystem in India

The current budget made the following announcement: “Global economy is transforming into a digital economy thanks to the development of cutting edge technologies in digital space – machine learning, artificial intelligence, internet of things, 3D printing and the like. Initiatives such as Digital India, Start Up India, Make in India would help India establish itself as a knowledge and digital society. NITI Aayog will initiate a national program to direct our efforts in the area of artificial intelligence, including research and development of its applications.”

Today, AI is viewed as a strategic technology that would lead to accelerated economic growth and development of nations. Few countries have already come up with policies for accelerated growth in the AI sector. The impact of AI can go beyond nations to corporate enterprises in both private and public sector. Currently, India is not considered as a leader in the AI space, in spite of having leadership position in IT services and services around AI/Big Data. There are fabulous examples of AI research and early demonstration across pockets in research labs, academia, start-ups or private players. Also, the practitioners working on the ground have little technology knowledge for AI adoption. One major stumbling block towards accelerated AI adoption is the lack of long term sustainable collaboration between these players. What are the key ingredients to establish India as a leader in the AI space globally?

According to Accenture Research, the key pillars for developing a vibrant



ecosystem in India are Universities, Start-ups, Large companies, Policy Makers and multi-stakeholder partnerships – India has strong potential across many of the pillars. Universities and research labs in India have been involved in cutting edge AI research for the last 40 years. India is home to some of the largest IT companies of the world along with all the global MNCs having their development or research centres already based in India. India has a very vibrant start-up ecosystem with a large number of venture capital funds based in India and the government is very supportive of start-up initiatives in the country. The policy making body NITI Aayog, has already embarked upon the mission of accelerating the innovation ecosystem in India. Through the flagship Atal Innovation Mission (AIM) program it promotes tinkering labs in schools and incubation centres to help start-ups. There is a fair amount of partnership between the start-ups and the venture capital funds – but the information on the same is quite fragmented.

The AI ecosystem in India can see tremendous growth through partnerships and collaborations. Start-ups provide an agile and lean approach towards developing new solution prototypes but often do not have enough bandwidth for in-depth

research – here access to researchers in that domain would be really helpful. Government has to play a pivotal role in enabling these partnerships at various levels. Advancement of research in AI can be promoted through partnership between the academia/ researchers with the industry and start-ups using the research findings. Similarly accelerated adoption of AI can happen by partnership between industry and academia with the sectors – healthcare, agriculture, education, etc. Commercialization of AI based technologies as services, applications or embedded hardware can be promoted by connecting the industry players with the venture capitals and trade bodies.

Artificial Intelligence is the technology that has the potential to drive India's growth over the next few decades. This growth would primarily be driven by private players in the AI ecosystem and government would play a pivotal role in enabling accelerated partnerships between the various players in the AI ecosystem. There is also a need to look at re-skilling people as this disruptive technology would create many new jobs while displacing some existing ones. Early identification of those new roles based on AI and re-skilling people on those roles would be crucial to reap benefits of this AI revolution. 

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