Artificial intelligence (AI)—An Inflection Point In the Global History and its Significance For a National Strategy

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“AI is the new electricity”—Andrew Ng.

Andrew Ng,1 the Director of the Stanford Artificial Intelligence Laboratory, equates the age of Artificial Intelligence (AI) to the discovery of electricity for allowing inexhaustible applications into all walks of life. AI might be the single largest technology revolution of our times, and we are now living in an AI-led era already. Be it, Amazon Alexa, Apple Siri, or Google Assistant, our smartphones now are equipped with a personal assistant powered by AI with nearly 90% accuracy and dependability. From live “chatsbots,” to smart suggestions for travel, shopping, or restaurants, AI has invariably impacted our everyday lives. The buzz around this incredible technology is beguiling and poised for a paradigm shift in our lives.

Can a Machine Be Made to Think?

That question unanswered in the past has now been answered in the affirmative albeit in a limited set of circumstances. Machines can now be trained to do tasks of various complexities with a defined output of measure, known as “machine learning” (ML). This ML can handle a small quantity of data and provide a defined outcome. Going to the next level is “deep learning” (DL), which is similar to the network of neurons of the brain, with stacked layers and connecting in a random pattern. This deep neural network can handle large quantities of data, learns by itself, and makes intelligent decisions and performs complex tasks; in other words, it mimics the functions of the brain. Both machine learning and deep learning are a subset of AI. It simply means the ability of machines to perform cognitive tasks such as thinking, perception, learning, language skills, problem solving, and decision making akin to natural human intelligence. Based on their capacities, they are also called “weak AI” and “strong AI,” which are essentially machine learning and deep learning, respectively.2

The concept of AI is not new, and researcher Alan Turing, the great British code breaker in the second world war had done considerable work in this field but it was John McCarthy who coined the term AI in 1955.3 This field however remained very limited in its scope because the data was very small. Over a period of time the data has increased exponentially to the current estimate of 4.4' Zetabytes' (ZB) and is likely to rise to 44 ZB or 44 trillion Gigabytes (GB) by the year 2020. This is called “big data” and data mining is “data science.” The cost of hard drive per GB has fallen drastically from $50,000/GB in 1980 to 2 cents/GB today. AI is already in use in many industries and web applications. It is expected that 70% of enterprises will implement AI by the end of 2019.

AI technology is at an emerging and evolving juncture. India, a growing economy and the second-most populous nation, has a tremendous opportunity to carve its need-specific and robust AI ecosystem. With the inauguration of India’s first dedicated AI research institute4 in Mumbai, and the NITI Aayog the national think tank bringing out a discussion paper on AI in the year 2018, the groundwork has been laid down in order to gain an early momentum for India in the global development of AI.5 Taking this forward, the government of India has announced plans to establish a national centre for AI and a national program for AI. This year, the NITI Aayog has drawn up a plan providing Rs. 7,500 crores for creating an institutional framework for AI in the country.6 This has been a much-needed impetus for India to catch up with her international peers.

Globally, during the last two years, countries like China, the United States, Japan, the United Kingdom, and France have announced their national policy positions on AI. It is estimated that by 2030, 26% of the GDP of China and 10% of the GDP of the United Kingdom will be sourced from
AI in Health Care

With data revolution and effective data mining, the application of AI has brought the health care sector vastly on the way of the transformation. This impact is seen across the specialties, including radiology, dermatology, neurology, ophthalmology, oncology, cardiology, genetics, emergency medicine, and so on during the past few years. The medical image recognition technique by deep learning has produced predictable accuracy in interpretation, which are at par with those of trained radiologists. Despite the perceived threat of radiologists losing jobs, the near future likely to witness the increased collaboration between radiologists and the technology to significantly enhance clinical benefits in terms of accuracy, cost, speed, and also their reach to remote areas. Similarly, Google AI has developed “computer vision” technique to detect diabetic retinopathy and in the diagnosis of malignancy utilizing digital pathology. Robotics powered by AI has been in use for demanding and high-precision surgeries.

The AI in healthcare can help to address issues such as poor connectivity and limited supply of healthcare professionals in rural areas which at present constitute significant barriers. This can be achieved through the implementation of cases such as AI-driven image diagnostics, clinical decision support, personalized treatment, predictive population risk stratification, early identification of potential pandemics, and tools for patients to manage their own illnesses.

AI in Plastic Surgery

Currently, the impact on the field of plastic surgery is limited to specific tasks such as quantification of burn wound size, monitoring of vascular perfusion following microvascular surgery, and to facilitate accurate diagnosis of craniofacial anomalies based on computed tomography (CT) images (with 98% specificity and 92% sensitivity). It has been found useful in orthognathic surgery due to improved diagnostics, therapeutic planning, computer-assisted appliances, intraoperative navigations, and follow up of patients. The potential for use in aesthetic surgery, the results of which are largely subjective is also being explored with predictive tools for patient-perceived beauty. Intraoperative assessment of symmetry and precise anatomical position can be made out using an optical “head-mounted” display, and a higher degree of objectivity can be achieved. AI has powered bio-mechanical neuropsychosis to help in precise finger and wrist movements to provide a better grip.

AI technology has loomed over the horizon and it is here to stay. At this inflection point, it is a remarkable opportunity for all of us to be aware, and adapt to this change to supplement our technical capacity as well as self-empowerment. Lastly, no nation can now neglect this tool if it wants to keep pace with others and if it does so, it will be at its own peril.

Conflict of Interest
None.
References

1. Wikipedia. Andrew Ng. https://en.wikipedia.org/wiki/Andrew_Ng. Accessed July 10, 2019
2. TechTarget. Special report: artificial intelligence apps come of age. https://searchenterpriseai.techtarget.com/definition/AI-Artificial-Intelligence. Accessed July 3, 2019
3. Artificial intelligence, the history and future—with Chris Bishop [video online]. https://youtu.be/8FHBBh_OmdsM. Accessed July 16, 2019
4. Wadhwani AI website. https://www.wadhwaniai.org/. Accessed July 8, 2019
5. NITI Aayog. National strategy on artificial intelligence. https://www.niti.gov.in/national-strategy-artificial-intelligence. Accessed August 12, 2019
6. Yogima Sharma. Niti Aayog proposes Rs 7,500-crore plan for artificial intelligence push. https://economictimes.indiatimes.com/news/economy/policy/niti-aayog-proposes-rs-7500-crore-plan-for-artificial-intelligence-push/articleshow/69403255.cms?from=mdr. Accessed July 16, 2019
7. Neha Dewan. In the race for AI supremacy, has India missed the bus? https://economictimes.indiatimes.com/small-biz/startups/features/in-the-race-for-ai-supremacy-has-india-missed-the-bus/articleshow/69836362.cms?from=mdr. Accessed July 29, 2019
8. Leaders League. GAFA vs BATX: to rule them all. https://www.leadersleague.com/en/news/gafa-vs-batx-to-rule-them-all. Accessed August 2, 2019
9. Shubham Singh. 10 artificial intelligence (AI) startups in India you should know. https://www.analyticsvidhya.com/blog/2019/07/10-ai-startups-india/. Published July 2, 2019. Accessed Aug 5, 2019
10. Google AI website. https://ai.google/healthcare. Accessed August 16, 2019
11. Kim YJ, Kelley BP, Nasser JS, Chung KC. Implementing precision medicine and artificial intelligence in plastic surgery: concepts and future prospects. Plast Reconstr Surg Glob Open 2019; 7(3):e2113
12. Kanevsky J, Corban J, Gaster R, Kanevsky A, Lin S, Gilardino M. Big data and machine learning in plastic surgery: a new frontier in surgical innovation. Plast Reconstr Surg 2016; 137(5):890e–897e
13. Bouletreau P, Makaremi M, Ibrahim B, Louvrier A, Sigaux N. Artificial intelligence: applications in orthognathic surgery. J Stomatol Oral Maxillofac Surg 2019; 120(4):347–354