ARTIFICIAL INTELLIGENCE IN INDIA

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Abstract

AI is accompanied by risk factors with long-term implications for society: risks must be vetted at this early stage. In this paper, we describe opportunities and challenges for AI in India. We de-tail opportunities that are cross-cutting (bridging India's linguistic divisions, mining public data), and also specific to one particular sector (healthcare). We list challenges that originate from existing social conditions (such as equations of caste and gender). Thereafter we distil out concrete steps and safeguards, which we believe are necessary for robust and inclusive development as India enters the AI era.

Keywords: Artificial Intelligence, India, cross-cutting

Introduction

Artificial Intelligence (AI) refers to the simulation of human intelligence in machines that are programmed to think like humans and emulate human cognitive capabilities. The term AI may also be applied to any machine that exhibits traits associated with a human mind such as learning and problem solving. AI, an approach to copy the cognitive functioning of the human mind for solving some problem or for simply learning, has potential to disrupt almost all aspects of human existence. This intelligence aspect is also very well termed as machine intelligence in which the machine is made to demonstrate contrasting natural intelligence of humans. AI is not a new phenomenon, with much of its theoretical and technological underpinning developed over the past 70 years by computer scientists such as Alan Turing, Marvin Minsky, and John McCarthy.

Alan Turing, a British mathematician developed some of the basic concepts of computer science while searching for a more efficient method of breaking coded German messages during World War II. After the war, he began thinking

about AI. "Computing Machinery and Intelligence" is a seminal paper written by Alan Turing on the topic of AI. AI is continuously evolving to benefit many different industries. Machines are wired using a cross-disciplinary approach based on mathematics, computer science, linguistics, psychology, and more.

AI has spread across various domains and sectors like the financial sector, banking sector, smart cities, mobility and transportation, healthcare, education, agriculture, and several other sectors are joining the list. AI is widely being used as a tool for solving socio-economic problems and is being considered as a candidate to solve priority actions, targets, and goals as defined in the United Nations Framework on Sustainable Development Goals (SDG).

AI is emerging as a central policy issue in several countries. The central issues for policymakers are applications of AI for the public good, regulation, economic impact, global security fairness issues, etc. Some of the things to keep in mind while formulating AI strategies are- Setting up a National Task-force, Aim High, Be Realistic, identifying the enablers, identifying the stakeholders, educating the stakeholders, meeting the different stakeholders, global stocktaking, collating the information, Ethics and Trustworthiness, launch the strategy.

AI Strategy In India:

The development, adoption, and promotion of AI have been visibly high on the list of priorities of the Indian Government, an approach that rests on the premise that AI has the potential to make lives easier and to make an inclusive society.

Niti Aayog's National Strategy For AI:

India has taken a unique approach to its national AI strategy by focusing on how India can leverage AI not only for economic growth but also for social inclusion. NITI Aayog, the government thinks tank that conceptualized and articulated the strategy, calls this approach. The strategy, as a result, aims to

i)   Enhance and empower Indians with the skills to find quality jobs;

ii)   Invest in research and sectors that can maximize economic growth and social impact; and

iii)   Scale Indian-made AI solutions to the rest of the developing world. NITI Aayog published India's strategy document on Artificial Intelligence on June 4, 2018. For the formulation of the ibid strategy, NITI Aayog has devised processes such as collaborating with experts and stakeholders, AI projects in various fields with fully explanatory proofs and designing a strategy for developing a vibrant AI ecosystem in India. NITI Aayog has identified AI as a truly transforming technology and it has coined the brand name #AIforAll for the proliferation of AI in India. This brand is introduced in India to satisfy its needs and aspirations of attaining a leadership role in AI development. The strategy is derived to use AI mainly for inclusive socio-economic growth of India and it aims to place India at the forefront of the AI technology development arena. The strategy strives to leverage AI for economic growth, social development, and inclusive growth, and finally as a "Garage" for emerging and developing economies. NITI AYOG mainly focused on 5 major areas: Healthcare, Agriculture, Education, Smart Cities and Infrastructure, and Smart Mobility and Transportation. The strategy paper systematically discusses about present eco-system of AI development in India, prospective sectors for AI proliferation, research and development capabilities, and the way forward.

AI Academia/ Institutes And Centers:

♣ Centre for Artificial Intelligence IIT Kharagpur

♣ Center for Artificial Intelligence & Robotics (CAIR), DRDO

 ♣ Robert Bosch Centre for Data Science and Artificial Intelligence, IITM

♣ The Artificial Intelligence Group (AI@IISc)

♣ Department of AI @ IITH

♣ Academia-industry Collaboration on Artificial Intelligence

♣ Laboratory of Statistical AI and Machine Learning (LSAIML), IITR

AI Standardization In India

AI and big data are driving never-seen-before innovation across various sectors such as manufacturing, healthcare, economy, security, education, and others. It therefore becomes imperative that national and international standardization is duly taken up, by multiple potential partners, to enable faster adoption of these technologies.

Department of Telecommunications (DoT) and its technical arm Telecommunication Engineering Center (TEC) works in close coordination with ITU-T in its standardization work on AI which includes

♣ AI for Good Global summit,

♣ Focus Group on artificial intelligence for health (FG-AI4H)

♣ Focus Group on Machine Learning for 5G

Bureau of Indian Standards (BIS) works in coordination with ISO in its standardization activities. IEC and ISO work through a joint committee (ISO/IEC JTC 1/SC 42) to carry out standardization activities for artificial intelligence.

Use Cases Of Artificial Intelligence

1.   Manufacturing Sector:

Artificial Intelligence has a good impact on manufacturing industries impact area on engineering (Artificial Intelligence for Research and Development), production (for cost reduction and efficiency increment), maintenance (maintenance via prediction and asset utilizing increment), and assurance of quality.

2.   Financial Sector: In the financial sector the use-case of AI domain starts with customer experience via increasing efficiency in engagement, customer experience managed virtually and chat-bots. When it comes to back-office operations and management in banking and financial sector there has been deployment of intelligence automation which resulted in improved processes.

When we look into the most critical part associated with the financial sector that is fraudulent, cheatings, money laundering and other malpractices, artificial intelligence has played an important factor by reactiveness in monitoring and prevention at instances.

3.   Agricultural sector: In the agricultural sector, with a lot of extremities in adoption of artificial intelligence which outweighs the economic returns from this domain as recognized by private initiatives because of which intervention by government in this agricultural sector becomes pivotal with artificial intelligence prospects. AI holds the promise of driving a food revolution and meeting the increased demand for food. It also has the potential to address challenges such as inadequate demand prediction, lack of assured irrigation, and overuse / misuse of pesticides and fertilisers. Some use cases include improvement in crop yield through real time advisory, advanced detection of pest attacks, and prediction of crop prices to inform sowing practices.

4.   Healthcare Sector: Healthcare is one of the most dynamic, yet challenging, sectors in India. There is non-uniformity in accessibility to healthcare across India. Application of AI in healthcare can help address issues of high barriers to access to healthcare facilities, particularly in rural areas that suffer from poor connectivity and limited supply of healthcare professionals. This can be achieved through implementation of use cases such as AI driven diagnostics, personalised treatment, early identification of potential pandemics, and imaging diagnostics, among others.

5.   Smart Cities and Infrastructure: To make around 100 cities as smart cities under smart city mission, there has been investment of around 2.04 Lakhs Crores INR. On a way to create a transition from smart city to intelligent city which has a primary base of large amounts of data through which predictive intelligence can be compiled to give smart cities an application of Artificial Intelligence.

6.   Smart Mobility and Transportation: Artificial Intelligence in mobility and transportation has been involved in assistive technologies that help

decisions based on the level of confidence and alerts for safe mobility. It can also be an imperative solution for scheduling public means of transportation and predicting accessibility to public means of transportation for the public. The use of AI systems helps in traffic control to reduce congestion and enhance security through improved crowd management

7.   Education: Potential use cases include augmenting and enhancing the learning experience through personalized learning, automating and expediting administrative tasks, and predicting the need for student intervention to reduce dropouts or recommend vocational training. Intelligent tutoring systems have been developed since the eighties. Several applications have been in use for quite some time. With the advances in AI techniques such as natural language processing, etc, it has become possible to develop several new applications. As education itself is crucial for growth in several domains, the net impact of AI in education would be quite high. The applications of AI in education include answering the queries of the students, asking questions and providing feedback, and assessment of narrative answers.

AI Policy Challenges

AI holds great economic, social, medical, security, and environmental promise. AI systems can help people acquire new skills and training, democratize services design and deliver faster production times and quicker iteration cycles, reduce energy usage, provide real-time environmental monitoring for pollution and air quality, enhance cyber security defences, boost national output, reduce healthcare inefficiencies, create new kinds of enjoyable experiences and interactions for people, and improve real-time translation services to connect people around the world. In the long term, we can imagine AI enabling breakthroughs in medicine, basic and applied science, managing complex systems, and creating currently unimagined products and services. For all of these reasons and many more, researchers are thrilled with the potential uses of AI systems to help manage some of the world's hardest problems and improve countless lives.

But to realize this potential, the challenges associated with AI development have to be addressed. The following topics represent particular areas of concern for the safe and beneficial development of AI, both in the near- and far-term. Addressing these topics should be a priority for policymakers seeking to harness the benefits of AI while preparing for and mitigating potential threats.

♣ Enabling Beneficial AI Research and Development system

♣ Economic and social impact

♣ Accountability, Transparency, and Explainability

♣ Privacy issues ♣ Fairness and Ethical issues

♣ AI Safety ♣ Security and Cyber Security

♣ Catastrophic and Existential Risk

♣ Unattractive Intellectual Property regime to incentivize research and adoption of AI

Enabling Beneficial AI R & D system:

There are a lot of opportunities for beneficial AI research that go beyond what is necessary for effectiveness. There are also numerous challenges associated with enabling flourishing research and development programs for beneficial AI. First, AI relies on the collection and analysis of data. However, existing data sets in India, whether for labour markets or health systems, are fragmented, unrepresentative, or outdated. Further, there are large digital divides, for example between urban and rural areas and between men and women. Second is access to high-quality and standardized datasets; another is being able to find and hire people with the right combination of skills to build reliable, high-quality products. Additionally, it is important to enable the right conditions for research and researchers to flourish, including government support and safe, inclusive work environments.

Economic and social impact:

 The deployment of AI solutions in industry will disrupt labour markets in India, to the detriment of a bulk of the labour force. The reduction in the cost of intelligent automation is already resulting in the re-shoring of numerous industries to industrialized economies in the global north. This will make it increasingly difficult for India to generate employment through an export-oriented manufacturing strategy. This may result in significant job losses, but will also augment the workflow of many jobs. There will be a need for improved retraining programs as well as updated social security measures. Some popular proposals include redistributive economic policies like universal basic income and the "robot tax" to offset some of the likely increases in inequality and resulting social and political tensions.

Privacy issues:

AI systems are capable of making meaningful inferences, classifications, and categorizations, and their use is carried out across sectors, from advertising to law enforcement. AI system application raises the issue of data privacy. India has yet to put in place a data protection framework; existing drafts rest on the idea of informed consent, but this seems far from adequate given the low levels of literacy and education of much of the population. AI expands surveillance possibilities because it enables real-time monitoring and analysis of video and other data streams, including features such as live facial recognition. These uses raise questions about privacy, justice, and civil liberties, particularly in the policing and law enforcement context. There is also increasing pressure on AI companies and institutions to be more transparent about their data and privacy policies.

Fairness and Ethical issues:

The field of AI ethics is growing rapidly, with the topics of discrimination, fairness, algorithmic bias, and human rights among the primary areas of concern. Challenges are related to access and inclusion, as well as the perpetuation of inequity through sociotechnical design. The increasing use of

machine learning systems to make crucial decisions gives rise to concerns about the ability of models to be fair and non-discriminatory. AI ethics also encompasses the issues of value systems and goals encoded into machines, design ethics, and systemic impacts of AI on social, political, and economic structures. Some have also called to more explicitly include justice as a goal of Fair, Accountable, and Transparent "FAT" AI development. AI has the potential to have profound social justice implications if it enables divergent access, disparate systemic impacts, or the exasperation of discrimination and inequities.

Misuse of social media:

AI amplifies the power of information wars, enabling the rise of highly personalized and targeted computational propaganda. Many recent events around the world have highlighted the proliferation of fake news and social media bots that tailor messages for political ends, for example by inciting fear, anger, and social discord. Improvements in the creation of fake videos will make this challenge even greater. Many worry that key tenets of democracy could be undermined through this proliferation of AI, for example by manipulating the information people see and their ability to make informed decisions.

Security and Cyber security

AI impacts the landscape of national and global security in numerous ways, from generating new modes of informational warfare to expanding the threat landscape, and contributing to destabilization and weaponization. Moreover, AI will increasingly be used as a tool to help carry out cyber-attacks. This will both amplify existing threats and pose novel threats, as it will enable attacks at a greater scale, and with greater complexity and sophistication, potentially even from non-sophisticated actors. AI systems also have vulnerabilities of various kinds. AI software can be hacked, and the data it relies upon can be tweaked or manipulated. Adversarial machine learning refers to the scenario in which data

inputs are used to confuse an AI system and cause a mistake; it is also used defensively to test the robustness of one's design.

Conclusion:

Artificial intelligence (AI) is an emerging focus area of policy development in India. In AI India has a unique opportunity to apply the technology to solve some of its biggest problems such as shortage of healthcare facility, low quality of education, financial system etc. It is not possible to meet the target of providing good healthcare or quality education using conventional methods. For instance, the number of doctors needed to provide good quality healthcare is so large that it cannot be achieved in several years. AI technology provides an alternative to achieve the same.

Based on the world experience on AI, it has suggested a way forward for India, which involves infrastructure development, policy & regulations, research & development, and human resource development. All the stakeholders need to come together to discuss these issues. The government has a major role to play in infrastructure development, applications in the public sector, policy & regulations, and technology development.

India is among the top 3 largest start-up hubs in the world. A national program on AI shall catalyze these innovative minds to co-create solutions and contribute to the building of a new India governed by technology. Invest India shall become the executing partner and provide R&D support to implement the Government of India's vision of creating an Artificial Intelligence-focused Centre of Excellence across the country. Low research capability and lack of data ecosystems in India are identified as challenges to realize the full potential of AI. India should create two-tiered research institutes (for both basic and applied research). It needs to set up learning platforms for the current workforce. The country should also create targeted data sets and incubation hubs for start-ups. Finally, it should establish a regulatory framework for data protection and cyber security.

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