Study Paper

on

Artificial Intelligence (AI) Policies in India- A Status Paper

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ABSTRACT

Artificial Intelligence (AI) is emerging as a central policy issue in several countries. The central issues for policy makers are applications of AI for public good, regulation, economic impact, global security and fairness issues etc. Advanced and rapid developments in the field of technology in recent times has been led by the AI, which has profoundly changed development and life status around the world. This paper discusses about the worldwide initiatives on AI policies and India's current AI policy landscape, challenges in formulating AI policies, sector of relevance and challenges, AI use cases etc.

Keywords: Artificial Intelligence, Algorithms, India, Ethics, Machine Learning, Policy

1. 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 in mathematics, computer science, linguistics, psychology, and more. [1]AI has spread across various domains and sectors like 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 candidate to solve priority actions, targets and goals as defined in United Nations framework on Sustainable Development Goals (SDG).

AI is emerging as a central policy issue in several countries. The central issues for policy makers are applications of AI for public good, regulation, economic impact, global security and 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, identify the enablers, identify the stakeholders, educate the stakeholders, meet the different stakeholders, global stocktaking, collate the information, Ethics and Trustworthiness, launch the strategy.

2. AI; ETHICS AND REGULATION:

Across the AI strategies - ethical issues and regulation of AI were highlighted as key concerns that needed to be addressed while formulating AI strategies. Algorithmic transparency and explainability, clarity on liability, accountability and oversight, bias and

[1] https://www.investopedia.com/terms/a/artificial-intelligence-ai.asp

discrimination, and privacy are ethical and regulatory questions have been central issues before formulating AI strategies. Employment and the future of work is another area of focus that has been identified by policy makers of different countries. For example, the US 2016 Report reflected on if existing regulation is adequate to address risk or if adaption is needed by examining the use of AI in automated vehicles. In the policy paper - AI Sector Deal, the UK proposes four grand challenges: AI and Data Economy, Future Mobility, Clean Growth, and Ageing Society. The Pan Canadian AI Strategy focuses on developing global thought leadership on the economic, ethical, policy, and legal implications of advances in AI.

The above are important factors and trends to take into account while formulating national roadmaps for AI. Without adequate institutional planning, there is a risk of national strategies being too monolithic in nature. Without sufficient supporting mechanisms in the form of national institutions which would drive the AI research and innovation, capacity building and re-skilling of workforce to adapt to changing technological trends, building regulatory capacity to address new and emerging issues which may disrupt traditional forms of regulation and finally, creation of an environment of monetary support both from the public and private sector it becomes difficult to implement a national strategy and actualize the potentials of AI . As stated above, there is also a need for identification of key national policy problems, which can be addressed by the use of AI, and the creation of a framework with institutional actors to articulate the appropriate plan of action to address the problems using AI.

There are several ongoing global initiatives, which are in the process of trying to articulate key principles for ethical AI. These discussions also feature in some of the national strategy documents.

3. NATIONAL AND INTERNATIONAL AI STRATEGIES

In view of the importance and emerging capabilities of AI, dozens of countries and international organizations have established strategies and initiatives regarding AI. For example, China and U.K. estimate that 26% and 10% of their GDPs respectively in 2030 will be sourced from AI-related activities and businesses[2].

3.1 INTERNATIONAL STRATEGIES:

European Union	In April 2018, the EU Commission adopted the Communication on Artificial Intelligence: a 20-page document that lays out the EU's approach to AI[3].
United Nations	The United Nations Activities on Artificial Intelligence (AI)[4] a joint-effort between ITU and 32 UN agencies and bodies,

[2] https://www.taxmanagementindia.com/visitor/detail_article.asp?ArticleID=8851
[3] https://ec.europa.eu/digital-single-market/en/news/communication-artificial-intelligence-europe
[4] http://www.itu.int/pub/S-GEN-UNACT-2018-1

	all partners of 2018's AI for Good Global Summit, this report provides information about the diverse and innovative activities related to AI across the UN system. The UN has numerous ongoing initiatives related to AI including providing guidance on data privacy and on autonomous weapons.
Nordic-Baltic Region	Ministers from the Nordic-Baltic region (Denmark, Estonia, Finland, the Faroe Islands, Iceland, Latvia, Lithuania, Norway, Sweden, and the Åland Islands) issued a declaration of collaboration on AI, in May 2018[5].
AI Agreement between UAE and India	In July 2018, The UAE Minister for AI and Invest India signed a MoU to establish a partnership for both countries to grow their artificial intelligence economies[6]
International Study Group of AI	France and Canada are developing a task force to make recommendations on the scope and implementation of the international study group[7].
Charlevoix Common Vision for the Future of AI	Leaders of the G7 agreed to a shared set of commitments for AI in Charlevoix, Canada[8].

3.2 NATIONAL STRATEGIES:

Argentina	The Argentinian ministry of education, culture, science and technology is developing a national AI plan. The plan will support Argentina's 2030 Digital Agenda
Australia	Australia has dedicated four year $29.9 million in the country's annual budget in year 2018–2019 to promote and guide the development of AI. The government decided to create a Technology Roadmap, a Standards Framework, and a national AI Ethics Framework to support the responsible development of AI.
Austria	Austria has an advisory Robot Council that is developing a national AI strategy.
Brazil	Brazil is creating eight AI laboratories and has adopted the OECD AI Principles.
Canada	Canada was the first country to release a national AI strategy. Detailed in the 2017 federal budget, the *Pan-Canadian Artificial Intelligence Strategy* is a five-year, C$125 million plan to invest in AI research and talent.
Chile	Chile created an expert committee that is developing a National AI Policy.
China	China announced its ambition to lead the world in AI theories, technologies, and applications in its July 2017 plan, *A Next Generation Artificial Intelligence Development Plan*. The plan is the most comprehensive of all national AI strategies, with

[5] https://www.norden.org/en/declaration/ai-nordic-baltic-region
[6] http://wam.ae/en/details/1395302701104
[7] https://www.international.gc.ca/world-monde/international_relations-relations_internationales/europe/2018-06-07-france_ai-ia_france.aspx?lang=eng
[8] https://www.international.gc.ca/world-monde/international_relations-relations_internationales/g7/documents/2018-06-09-summit-communique-sommet.aspx?lang=eng

	initiatives and goals for R&D, industrialization, talent development, education and skills acquisition, standard setting and regulations, ethical norms, and security.
Denmark	Denmark's *Strategy for Denmark's Digital Growth*, released January 2018, aims to make Denmark a leader in the digital revolution and to create growth and wealth for all Danish people.
Estonia	Estonia is developing a legal framework for the use of AI in its country, including a bill on AI liability.
Finland	Finland has an AI Programme guided by a steering group under the Ministry of Economic Affairs and Employment.
France	France has a national strategy for AI called *"AI for Humanity"* which is outlined in the "Villani Report". France unveiled €1.5 billion plan to transform France into a global leader in AI research, training, and industry
Germany	The German Government adopted its Artificial Intelligence Strategy in November 2018.
India	India defined a national policy on AI in a working paper titled, *"National Strategy for Artificial Intelligence #AIforAll"*.
Ireland	The Irish government has hosted AI workshops and launched a national AI Masters program.
Italy	Italy has an interdisciplinary AI Task Force launched by the Agency for Digital Italy, in March 2018, which focuses on R & D and development or private sector uptake, how the government can facilitate the adoption of AI technologies in the public administration.
Japan	Japan was the second country to develop a national AI strategy. Japan has an *"Artificial Intelligence Technology Strategy"* released in March 2017 and has included AI in its "integrated innovation strategy".
Kenya	The Kenyan government created a Block chain & Artificial Intelligence task force in January 2018.
Lithuania	The Lithuanian AI Strategy was released April 2019.
Malaysia	The Malaysian government is developing a *National AI Framework*, and establishing Digital Transformation Labs.
Mexico	The Mexican government supported the creation of the white paper, *"Towards an AI Strategy in Mexico: Harnessing the AI Revolution"*, released in June 2018
Netherlands	The Netherlands launched the Strategic Action Plan for Artificial Intelligence in October 2019.
New Zealand	New Zealand has an AI Forum to connect and advance the country's AI ecosystem.
Norway	Norway published a National Strategy for Artificial Intelligence in January 2020.
Poland	Poland launched the Artificial Intelligence Development Policy in Poland for 2019–2027.
Russia	The President of the Russian Federation released a national AI strategy in October 2019.
Saudi Arabia	Saudi Arabia established a government agency called the Saudi Data and Artificial Intelligence Authority in August 2019.

Serbia	The Government of the Republic of Serbia adopted the Strategy for the Development of AI in the Republic of Serbia.
Singapore	Singapore launched a National AI Strategy in November 2019 and has a national AI program called AI Singapore, a five-year, S$150 million national program launched in May 2017, to enhance Singapore's capabilities in AI
South Korea	South Korea has an Artificial Intelligence Information Industry Development Strategy.
Spain	Spain published an AI RDI strategy March 2019.
Sweden	The Swedish government has released a "*National Approach for Artificial Intelligence",* in May 2018.
Tunisia	Tunisia has created an AI Task Force and Steering Committee to develop a national AI strategy, launched in April 2018.
United Arab Emirates	The UAE has a national strategy for AI launched in October 2017 and was the first country to name an AI Minister.
United States of America	The US launched the *American AI Initiative* February 2019.
United Kingdom	The UK government launched a *Sector Deal* in April 2018, for AI to advance the UK's ambitions in AI consistent with its Industrial Strategy, and taking into account the advice of the Parliament's Select Committee on AI.
Uruguay	Uruguay's industry, mining and energy ministry launched a public consultation of Artificial Intelligence for the Digital Government in April 2019 and is developing a strategy based upon its findings.

4. 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 inclusive society.

4.1 NITI AAYOG'S NATIONAL STRATEGY FOR AI: #AIFORALL[9]

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 think tank that conceptualised and articulated the strategy, calls this approach **#AIforAll**. 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 formulation of ibid strategy, NITI Aayog has devised processes such as

[9] https://niti.gov.in/national-strategy-artificial-intelligence

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 a brand name *#AIforAll* for 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 forefront of 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 way forward.

NITI Aayog provides over 30 policy recommendations to invest in scientific research, encourage reskilling and training, accelerate the adoption of AI across the value chain, and promote ethics, privacy, and security in AI. Its flagship initiative is a two-tiered integrated strategy to boost research in AI. First, new Centres of Research Excellence in AI (COREs) will focus on fundamental research. Second, the COREs will act as technology feeders for the International Centres for Transformational AI (ICTAIs), which will focus on creating AI-based applications in domains of societal importance. In the said report, NITI Aayog identifies healthcare, agriculture, education, smart cities, and smart mobility as the priority sectors. The report also recommends setting up a consortium of Ethics Councils at each CORE and ICTAI, developing sector specific guidelines on privacy, security, and ethics, creating a National AI Marketplace to increase market discovery and reduce time and cost of collecting data, and a number of initiatives to help the overall workforce acquire skills.

4.2 AI INTITATIVES BY MINISTRY OF ELECTRONICS AND IT (MEITY)[10]:

In the view of the possible impact of AI on the economy and society and to come out with a policy framework on AI, MeitY constituted the following four committees on AI. The four-committee reports were released in July2019 and published in December 2019.

Committee A on platforms and data on Artificial Intelligence

Committee B on leveraging AI for identifying national missions in key sectors

Committee C on mapping technological capabilities, key policy enablers required across sectors, skilling and reskill

Committee D on Cyber security, safety, legal and ethical issues.

[10] https://www.meity.gov.in/artificial-intelligence-committees-reports

4.3 AI INITIATIVE BY MINISTRY OF COMMERCE AND INDUSTRY:

ATRIFICIAL INTELLIGENCE TASK FORCE[11]: The Union Ministry of Commerce and Industry set up an Artificial Intelligence Task Force in August 2017 with a view to 'embed AI in our Economic, Political and Legal thought processes so that there is systemic capability to support the goal of India becoming one of the leaders of AI-rich economies'. With the overarching view of AI being a socio-economic problem solver at scale, the domains of focus as sectors of relevance for AI in India includes manufacturing, financial technology or FinTech, agriculture, health, education, technology for the differently abled, national security, environment, public utility services, retail and customer relationships etc. The report specifically sought to understand what the role of the government should be, and how AI can solve problems at scale. It recommends, inter alia, the establishment of a nodal agency, the National Artificial Intelligence Mission that would coordinate AI-related activities in India. The Task Force's work intends to shed light on the direction in which AI policy in India should develop. Its focus on accessibility technology is perhaps its biggest strength.

4.4 NATIONAL ARTIFICIAL INTELLIGENCE PORTAL[12]

The Indian Government launched National Artificial Intelligence Portal called www.ai.gov.in on 30 May 2020. The portal will work as a one-stop digital platform for AI-related developments in India, sharing of resources such as articles, start-ups, investment funds in AI, resources, companies and educational institutions related to AI in India. The portal will also share documents, case studies, research reports etc. It also has a section about learning and new job roles related to AI.

The government has also launched a national programme for youth named 'Responsible AI for Youth'. It aims at empowering the young students of the country with an appropriate new-age tech mindset, access to required AI toolset and relevant AI skill sets to make the youth digitally ready for the future.

4.5 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

[11] https://www.aitf.org.in/
[12] https://pib.gov.in/PressReleasePage.aspx?PRID=1627950

5. 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.

5.1 DEPARTMENT OF TELECOM (DOT) AND AI STANDARDIZATION:

A committee has been formed under the Department of Telecommunications in September 2019 for the standardisation of Artificial Intelligence technology by utilizing the expertise of diverse stakeholders. The Committee has invited papers on Artificial Intelligence to take on board all concerned stakeholders. These original papers intended to address different aspects of AI such as – functional network architecture, AI architecture, data structures required, etc. As the proliferation of AI increases, there is a need to develop an Indian AI stack so as to bring interoperability, among other things. Papers have been invited from academia, research, and technical industries, telecom service providers, application service providers, covering the following-

i) Standardisation of the functional architecture, AI architecture and data structures (Working Group-1)
ii) Standardisation of the type of interfaces and protocols, technologies employed, systems deployed, benchmarking practices (Working Group-2)
iii) Standardisation in Trustworthiness; digital rights and ethical standards in AI; preserving algorithm openness; Security and compliance aspects (Working Group-3)
iv) Standardisation in Interoperability Standards; technological mapping and leveraging AI for national missions (Working Group-4)
v) Development of Indian AI Stack (Working Group-5)

5.2 BIS COMMITTEE FOR AI STANDARDIZATION:

A new committee for standardisation in the area AI and Big Data, set up by the Bureau of Indian Standards (BIS) in December 2017, which constitutes experts from leading research institutions, academia, government bodies and technology organizations to drive standardization in the area of artificial intelligence and big data. The committee would focus on standardisation of projects that revolve around cyber security, legal and ethical issues in the IT sector, technological mapping and leveraging AI for national mission.
Leading technology organizations that are part of the committee include Amazon India, Google India, IBM India, Intel India Technology, Microsoft (India), Qualcomm India and more. The committee would focus on standardisation of projects that revolve around cyber security, legal and ethical issues in the IT sector, technological mapping and leveraging AI for national missions, among others.

6. USE CASES OF ARTIFICIAL INTILLEGENCE:

Manufacturing Sector: Artificial Intelligence has good impact on manufacturing industries like 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.

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.

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.

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.

Smart Cities and Infrastructure: With an objective of making 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.

Smart Mobility and transportation: Artificial Intelligence in mobility and transportation have been involved in assistive technologies that help is decisions based on level of confidence and alerts for safe mobility. It can also be an imperative solution for scheduling public means of transportation and also predicting accessibility to public means of transportation for the public. Use of AI system helps in traffic control to reduce congestion and enhanced security through improved crowd management

Education: Potential use cases include augmenting and enhancing the learning experience through personalised 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 a number of 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, assessment of narrative answers.

7. AI POLICY CHALLENGES

AI holds great economic, social, and 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 in order 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 incentivise 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" in order to offset some of the likely increases in inequality and resulting social and political tensions.

Accountability, Transparency, and Explainability:

The lack of transparency and explainability, associated with machine learning in particular, means it can be hard or impossible to know why an algorithm made a particular decision. There is also a question of who has access to key algorithms and how understandable they are, a problem exacerbated by the use of proprietary algorithms. As decision-making is

ceded to AI systems, there are not clear guidelines about who would be held accountable for undesirable effects. The EU General Data Protection Regulation (GDPR) is one effort to help remedy that situation, for example with the provision to the "right to explanation" about how an automated decision was made.

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 issue of data privacy. India is 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 the information wars, enabling the rise of highly personalized and targeted computational propaganda. Many recent events around 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 own design.

Catastrophic and Existential Risk:

Key strategists, AI researchers, and business leaders believe that advanced AI poses one of the greatest threats to human survival, including catastrophic and existential risks to humanity in the long-term. AI experts seeing the recent 'COVID-19' pandemic as a result of misuse of AI system. The combination of AI with cyber, nuclear, robotic/drone, or Biological Weapons could additionally be devastating for enormous numbers of people. There are very few robust protections in place today if weapons become "cognified" in this way.

Intellectual Property Regime and AI issues:

Going forward with AI policy formulations, it will be important for the government to develop an intellectual property framework that encourages innovation. AI systems are trained by reading, viewing, and listening to copies of human-created works. These resources such as books, articles, photographs, films, videos, and audio recordings are all key subjects of copyright protection. Copyright law grants exclusive rights to copyright owners, including the right to reproduce their works in copies, and one who violates one of those exclusive rights "is an infringer of copyright.

8. 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.

The paper has reviewed international as well as national status of adoption of artificial intelligence technology. While the technology has potential to increase the economic growth rate considerably, it is likely to impact the job opportunity adversely. The challenge

before any country is to make the best use of opportunity while dealing with the job loss issue, simultaneously.

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 on these issues. Government has a major role to play in infrastructure development, applications in public sector, policy & regulations, technology development and HRD. However, these can be successfully done with the support from industry.

India is amongst the top 3 largest start up hubs of the world. A national program on AI shall catalyse these innovative minds to co-create solutions and contribute to the building of 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 in creating Artificial Intelligence focused Centre of Excellence across the country. Low research capability and lack of data ecosystems in India are identified as challenges to realise 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.

ABBREVIATIONs:

AI	Artificial Intelligence
SDG	Sustainable Development Goals
NITI	National Institution for Transforming India
DoT	Department of Telecommunications
BIS	Bureau of Indian Standards
R & D	Research & Development
IIT	Indian Institute of Technology
COREs	Centres of Research Excellence
UN	United Nations
ISO	International Organization for Standardizations
IEC	International Electrotechnical Commission
ITU	International Telecommunications Union

REFERENCES:

[1] https://niti.gov.in/national-strategy-artificial-intelligence

[2] https://meity.gov.in/artificial-intelligence-committees-reports

[3] https://www.aitf.org.in/

[4] https://medium.com/politics-ai/an-overview-of-national-ai-strategies-2a70ec6edfd

[5] https://futureoflife.org/ai-policy-challenges-and-recommendations/