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The Future of Artificial Intelligence Technology and Strategy to Defend Our Military

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***Abstract*--- Information Technology (IT) has already taken the world by storm changing the very base of conventional organizational methodologies. Artificial Intelligence (AI) is one of the classic inventions of IT believed to the next big game-changer of the world. Its various applications are already known to the world. Soon, it will show its impact on our private and public life. Society or corporate world, its benefits will be prevalent in every walk of our life. The defense and security will also be getting the benefits of AI in diverse ways. But, how will AI impact defense and security or how the traditional ways or procedures in defense and security will be replaced with AI is a much-debated question today. The current thinking of AI's impact on defense and security is mostly incremental. That is to say, researchers and scholars want to visualize the application of AI in current defense perspectives where the armed forces will look in the same way as today's arm forces with the same kinds of activities. In this report, AI- embedded, defense, and security-related R&D efforts are discussed along with the future possibility of AI in defense. The article makes it clear that AI has wide many applications that can re-engineer several aspects of today's arm forces and security activities. Here, a discussion has been made on how AI will have genuine impacts on diverse military applications for enhanced efficiency in battlefields and strategic deployment of the military in different other activities.**

***Keywords*--- Artificial intelligence, Defend, Military**

I. INTRODUCTION

Nature has given organisms the capability to defend themselves against germs, viruses, and all other types of harmful organisms scattered everywhere. Nature has also empowered the biological organisms with the ways and intelligence to develop a defense against natural hurdles and natural calamities. As far as the inter-species offense or defense are concerned, humans, i.e., homo sapiens are the most vulnerable among major species. Take any humans from any part of the world, they are much smaller in size than tigers, bears, elephants, or lions. In physical strength, humans are far behind the jungle animals and even several domestic animals like cattle or buffalos. The human body has not developed special body parts for defense or protection, even, the flexibility of the human body is far lesser than most of the animals including cats, dogs, and leopards.

Nature has created animals with a special capacity for offense or defense. With razor-sharp teeth, shard claws, spikes on the body, venom in the mouth, strong muscles, speediest movements, and changing colours with the surroundings. [4] Human babies are much more vulnerable to external threats and need all sorts of protection against those threats for a longer time than other species that we see around us. [5] The only advantage that humans have got and that has given humans an advantage over other animals is intelligence. Human intelligence has some unique features that are not present in animals. The lethal tools that humans have developed with their intelligence have compensated for their physical drawbacks. The human species is not alone in developing useful tools but the way it does this and the development of the tools that it has made in creating and improving the tools are far better than other species. [7] There is another innovative application of human intelligence that made a huge impact on the earth and virtually differentiated homo sapiens from other species millions of years ago.

Yuval Noah Harari, a prominent military historian from Israeli, researched the history of Homo Sapiens. In this research, he writes that when cognitive development was taking place in the early humans, there were more than 200 mammoths of different species starting from elephants to birds weighing more than 100 pounds were roaming around the world, still, Homo Sapiens survived.

Millions of years later, when the agricultural revolution was taking place, less than 100 of those gigantic creatures could be traced. The early humans had completely uprooted the existence of many big beasts of the world much before humans had invented wheels or iron tools. [8] Not only that, homo sapiens were ruthless to almost other much-advanced apes such as homo florensis, homo

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soloensis, and homo soloensis. [1] for survival, homo sapiens were uncompromising and their cognitive advancement was their main power.

In various spheres, the organizational processes are intellectualized. The introduction of computer technology, digitalization of organizational processes, globalization of multifarious business and non-business activities, and rapid growth of IT and ITES have been believed to have brought the fourth industrial revolution [48, pp. 19-20]. Scientific progress and technological advancements are a regular process and now natural to humans. Technological activities have touched almost every sphere of human life including human creativities. It's moulding a creative mind and making conceptualization of many toughest ideas very much possible today. Nowadays, there could be seen intense competition in bringing the best with technologies. On the other hand, contents developed with various technologies are much in demand depending on the quality of content, innovative ideas, easiness in use, and their utilities. Russian legal science emphasizes three aspects of end-to-end AI, viz. legal feasibility of robotics [1, p. 157; 7, p. 63; 10, p.19; 13, p.91], the application of robotics in the military [9], intellectual and technological perspective of AI under the current situations [20, p.14; 3, p.7]. [2]

AI is in its infant stage right now. Scientists are still years away from designing fully dependable or general AI that would work on its own. However, its potential is quite visible now, it's the right time to research and review the ethical and legal implications of AI. The initial phase of design and deployment of AI made a positive impact on society and Governments. Measures for critical supervision, control, and governance are necessary from the very beginning. The prominent researchers in this field are asking to carefully monitor and supervision of AI for defense and national security. It's unethical and ill-effects in war fronts and national security, those prominent scholars opine, need equal attention to nullify even a pinch of subverting deployments.

The study finds that the most recent Asilomar principles from the Conference of Beneficial AI are an excellent reference for initiating these kinds of discussions. This study recommends that the enhanced application of AI in defining resilience and preventing external threats need a more constructive debate on the different applications of AI. So far, the focus of most of the discussions and forums are autonomous artilleries and silent killer drones. AI has applications in both narrow intelligence and general intelligence. They are likely to open up many newer opportunities that have the tremendous potential to enhance individual and collective experience in almost all spheres of human life. At the same time, we should also pay attention to the opinions of many analysts who apprehend that non-human intelligence may supersede human intelligence and take control of many applications of AI ignoring human control.

The question is who will take responsibility for the human's perspective in this prolonged debate over the necessity and control of AI? Is it possible that the Governments of all major economies of the world come together to form a common forum where they can openly discuss the matter and ideate something innovative especially for the controlled application of AI without hindering the scientific advancement of this highly capable technology called AI? With AI Governments of the developed nations are highly optimistic so also the blue-chip companies having diverse activities in different fields. The development that took place in AI so far has made it clear that small and medium-sized arms and ammunition manufacturers can use AI in different ways, especially in designing more intelligent arms that would require less or no human intervention. On the other hand, countries having more hold on the technology and have progressed better than the other countries in developing AI-embedded military articles can help the comparatively backward countries to strengthen their security power. The advanced military system with its major strength in R&D having advanced know-how of AI can make this world a better world to live in.[1]

II. ARTIFICIAL INTELLIGENCE (AI)

AI has brought Industrial Revolution 4.0. With AI, scientific and technological innovations have taken a giant leap across varying fields. AI has the exclusive capability of transforming diverse public works, business activities, and military operations conducted across the globe. Until recently, a few countries like the USA, Russia, the UK, China, German, and France maintained large armed forces and invest billions of dollars in military services and in the development of more advanced military equipment including armaments.

The application of AI in designing arms and ammunition has ushered in a new era of military activities that the world had not experienced before. Ai- embedded arms or the way AI backs military strategy has narrowed the gap between strong powers and middle powers. That means, a country doesn't need to have a large army base to be powerful, instead, technically superior arms will work like thousands of soldiers. It's almost like an eCommerce market that has empowered the small farms in the market.

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In this light, India is also hard- pressed to introduce AI in defense as soon as possible. While addressing a seminar on Indian's future in military power and national security in January 2019, General Bipin Rawat, the army chief opined that India would lag behind the other developing nations if we don't embrace AI at the earliest.

Artificial Intelligence or AI has many aspects. The human task that can be accomplished with the help of computers and robots is AI. There are diverse opinions about different applications and how AI can be realized in a different environment. It's the period when data science has entered every sphere of human life applying IT in diverse ways. Data science is inherently related to AI. We also use machine learning in different environments. Machine learning is a tool that is inseparable from AI. The new target of computer and data scientists is to develop more accuracy in natural language procession (NLP), robotics, automatization of transportation, and development of other data-intensive technologies. This is high time that India takes a holistic approach to the application of AI in different spheres of national interests. It is not feasible to restrict our considerations to the development of data sciences infrastructure only. [3]

The present status of AI can be categorized into three heads:

- **Artificial Narrow Intelligence (ANI) [43]:**

There are specific areas where machine intelligence can perform a task worth equal or near equal accuracy like humans. There are some existing examples of that performance such as IBM's Deep Blue, Google Maps, Google Translation, Chatbots used by the companies in their customer services, High-Frequency Trading Algorithm, Spam Filters, etc.

- **Artificial General Intelligence (AGI)**

There are specific areas where machine intelligence has made it possible to replace human performance.

- **Artificial Super Intelligence (ASI)**

There are specific areas where machine intelligence has even superseded human intelligence.

India's achievement with Artificial Intelligence so far

A taskforce with multiple stakeholders was developed by the Ministry of Defence (MoD) in February 2018. The task force submitted its report in June 2018 with some vital recommendations. The MoD responded to these recommendations quickly issuing guidelines, implementing policies, and delivering the responsibility to a project team.

In February 2019, the MoD created Defence AI Council (DAIC). The Minister of Defence was elected the chairman of the council. DAIC was assigned the vital task of guiding the Government with need-based recommendations for developing news policies in the acquisition of new technologies for enhancing the military capacity and reach. DAIC further recommended the necessity of forming a sole AI project agency. Consequently, a Defence AI Project Agency (DAIPA) was formed as the central executive body for looking into different possibilities of AI in the defense and security of India.

The MoD asked DAIPA to focus on capacity building within the defense machinery through knowledge development, data collection and database management, and patents to acclimatizing human resource development as per the needs of the current military environment. It is decided that each Service Head Quarters (SHQ) will be provided Rs.100 crores backup from the MoD's annual budget for AI-specific application developments. [4]

III. LITERATURE REVIEW

Is rapid advancement in AI affecting the designing and application of military capacities?

Despite the mind-blowing development in defense technologies and application of information technology, comprehensive studies in this field or collaborative works at the international levels are severely lacking. This article addresses this issue by explaining the developments in different aspects of AI and recognizing the processes in which AI could be applied in different areas of defense services. The study especially focuses on defense and security and how the new technologies could change the very ways of defense activities in the 21st century. In this study, we argue that the implementation of AI can change the warfront strategies in a number of ways, at the same time, as the implementation of AI will bring with it a number of risk factors that the defense ecosystem is not at all habituated with. When the new technology has been transforming military strategies in a number of ways, some new challenges are also waiting for the defense intelligence as machine learning or AI may develop a completely different ecosystem where decision-making process and regular bureaucratic interactions might need a fresh consideration. The new modes of defense and combat in the warfront enable a new warfront strategy as stated earlier but the challenge to the forces in this matter would be to learn how to interact with the technology effectively. To prevent any negative outcome and redefine various aspects related to the defense system including decentralization of capacities and accountability, the system needs to be re-engineered for the new environment.

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The US has taken certain strategies in this aspect with an aim to develop a resilient and highly intelligent defense mechanism that would overpower the military base of China and Russia. This study will trace the development of US defense from Obama to Trump administrations. The study will also focus on how the defense mechanism of the US has been changing with the use of "narrow" AI for the military such as MIS, cybersecurity, command and control, logistics, situational awareness, and cloud computing technology and strategies. The study will conclude by including two caveats related to the actual introduction of AI in the US defense forces and finding its implications to the US allies.[12]

The present US-China tense on different issues has led to the exhibition of superpowers they possess. This has two basic features in the global technology scene.

First, the rapid and intense use of cutting-edge technologies. Cloud computing, Big Data analytics, robotics, and above all AI are all new but highly applied technologies in the military of superpowers like the US and China. Until now, we have seen or experienced the application of these technologies in the corporate world or public works but the application of cutting-edge technologies in defense needs comprehensive strategies and multidimensional consideration as there would be no scope for getting back.[18]

Second, with the rapidity with which defense systems across the world, especially the developed countries have been absorbing cutting-edge technologies such as cloud computing, machine learning, and AI, the future competition will take a different path that the world was not familiar with. Countries having a greater hold in these technologies will be able to get through while others will lag. The comparative ability to explore, research, and apply advanced technologies will redefine military supremacy. [13]

The National Defense Strategy (NDS, 2018) considered this technological environment to assess the future challenges and changes in military services.

Artificial Intelligent in Military Operations

The use of robotics in the warfront has already prevalent. The increasing levels of robotics applications could be seen in unmanned surveillance, reaching the toughest places for surveillance and delivery of arms and ammunitions, shipboard autonomous firefighting, multi-utility tactical support, an unmanned system to neutralize threats to forces, installation of anti-submarine and anti-tank mines, and dozens of other services.

Seeing these diverse uses of robotics, experts and scholars now conceive that AI has the ability to develop a new RMA. The Lethal Autonomous Weapon Systems (LAWS) has been getting more capability and multi-level applications.

There is a continuing debate over the term "Autonomous" as used in Lethal Autonomous Weapon Systems (LAWS). There is no consensus yet on what should be the features of the term "fully autonomous". Two definitions closely relate to the matter:

The US Department of Defence (DoD) defines an autonomous weapon system as the weapons that "Once activated, can select and engage targets without further intervention by a human operator." The DoD has also defined the semi-automated weapons as the weapons "once activated keep engaged with the human-selected targeted as long as human operators want." The definitions have separated the systems a little bit. A weapon system programmed to target a point and reaches the target autonomously but whenever it is reloaded needs permission for autopiloting is still a "semi-autonomous" system. [4]

Definitions from Human Rights Watch (HRW): According to HRW, "A fully automated weapon are those that are once installed will be able to operate without any human intervention or Meaningful Human Control (MHC)." A fully automated weapon will select the target and destroy it on its own. However, what is MHC is a highly debatable topic in international forums. HRW opines that there is a serious lack of clarity of the definition of LAWS. [5]

Narrow Artificial Intelligence

Narrow AI is considered a remarkable approach in this field. This approach asks not to focus on the autonomous system alone rather leveraging the AI for enhancing the combat power of the force available right now. This is known as

"Narrow" artificial intelligent, sometimes also called "weak" artificial intelligence.

Narrow AI has several benefits:

- Image recognition capacity with possible threat identification
- Quickly spot the supply bottlenecks in a given environment
- Systematizing administrative functions and rectifying or indicating the issues from time to time

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Thus, Narrow AI helps in force restructuring and the right usage of human resources. Defense gets a scope to ameliorate their teeth-to-tail ratio. It also helps to reduce risks and threats to lives.[7]

Human-Machine Teaming

This is another vital aspect of Human-Machine teaming. When a machine like a robot or a computer becomes an inherent part of a project, humans related to the project develop a symbiotic relationship with the machine. Like a centaur or mermaid, a combined effort of man and machine creates utmost speed while the mission is accomplished flawlessly. If the machine has been autonomized, human and machine interaction becomes highly flexible and robust. This is known as "Cognitive teaming". Some functions like cybersecurity missile launching work impeccably with the lowest possible risks when automated.

However, most of the AI-embedded military applications are human-machine team works. Processing data about opponents, fixing the target, launching missiles, jamming the signals, or reading the sensors, AI provides necessary instructions or recommendations to the military personnel. AI helps in making informed decisions at the right moments. [8]

India's stance at the United Nations

India is a strong voice at the UN. Over the years, India has been asking for a balance of power in the Indian subcontinent before any design and development of automated weapons. At an informal meeting in Geneva on LAWS, India had taken that stance. In that meeting, the permanent representative of India at the UN, Mr. DB Venkatesh Verma stated that LAWS should be made stronger in a manner that could take all necessary steps in case of any flaws.

India's overall strategy

China is already making robotics and AI-based weapons and training the military for the best use of those highly empowered weapons. On the other hand, China is helping Pakistan in developing the latter's military strength with the help of their knowledge and innovations. These two nations are inducing India to take all urgent steps to be prepared for any kinds of threats from other sides of the borders. India needs intensive public-private partnerships for arms and ammunitions designing and development for keeping a balance in this region. The challenge to the Government right now is to include private and public players having experience and infrastructure in designing intelligent military equipment. At the same time, strong backup from the research bodies like Defence Research and Development Organization (DRDO) and friendly countries having a strategic partnership with India like France and the USA can leverage the initiative of the Government of India and Ministry of Defence. [9]

As the new technologies are available and their applications in developing automated military equipment are quite feasible, the present competition in developing highly effective missiles, bombs, or fighter planes is different from the competition's pervasive yesteryears. [20]

In January 2018, William Carter said during a hearing before the House of Arms Services Subcommittee on Emerging Threats and Capabilities, "[t]he success of previous offsets was based on investing in winning a race our adversaries didn't even know they were in while allowing them to focus their resources on an area of advantage that we could overcome through innovation. But today, even as we are pursuing our 'third offset,' China is pursuing a 'first offset' of its own, and is investing in the same technologies to challenge us that we are investing in to maintain our strategic edge." [21] Samuel Bendett and Elsa Kania have cautioned that "[a]s China and Russia seek to keep pace with and overtake US defense innovation initiatives, their approaches are mimicking, perhaps even copycatting, and converging with certain elements of the traditional US approach … If successful, these overtures towards Chinese and Russian defense innovation with American characteristics could enhance their respective capabilities to experiment with and operationalize new capabilities." [22]

China spends a huge amount on military research and development every year. As per the 2015 report, in this matter, the country is second to the USA only.

About 21% of the world's total spending on military research and development was done by China. It seems China will soon surpass the USA soon [23] China is constantly working on AI, cloud computing, and Big Data analysis for leveraging their arm force. [24]

China is strengthening the following two areas (1) Military-Civil partnership and (2) "going out" strategy that backs the transfer of technology from other countries.

Military-civil interactions strategically absorb useful and proven technologies to the military. The Government has appointed several agencies for this purpose.

There is the Central Military Commission (CMC)whose Science and technology department is working in this field. Another department of CMC, viz, Military Scientific Research Committee is also overseeing

the matter. Then, there is the Chinese Communist Party's Military-Civil Fusion Development Center dedicated to military-civilian fusion initiatives. The Premier of Chine himself is the director of the Military-Civil Fusion Development Centre.

In this context, Elsa Kania said that PLA used to procure from the defense as private enterprises were not meeting the standards and were not always cooperative with the military force in China. However, PLA is trying to overcome its hindrances through a new mission that believed in "shared construction, shared enjoyment, and shared use" that is "a state-driven approach to leverage the synergies in this dual-use technology through the efforts of multiple, interrelated policy mechanisms." Elsa Kania explains that the situation has changed now. For instance, Baidu is partnering with CETC through the Joint Laboratory for Intelligent Command and Control Technologies. CETC is a major state-owned defense corporation. This company is working on Big Data, AI, and cloud computing for military command and information systems.[25] [12]

AI technologies are costly. Investors are occupied with seeking mechanisms to protect their developments in the field of artificial intelligence technology. The report of the World Intellectual Property Organization 'Technology trends 2019: artificial intelligence' underlined that since the 1950s, when the first AI systems appeared, there were filed about 340,000 applications for related inventions and more than 1.6 million scientific publications of patent information were issued. Currently, machine learning is the dominant artificial intelligence technology, which is disclosed in patents and included in more than a third of all patented inventions [60, pp. 15, 17]. In some countries, legislators and society are ready to recognize the claims of interested parties. Sometimes it is about supporting companies that invest in smart robots by providing tax and other benefits, as in South Korea1 and China. In other cases, it is the recognition of related rights to the results of the activities of artificial intelligence systems since they do not meet the criteria for the protection of a work created exclusively by human creativity. At the same time, many developers of sophisticated intelligent systems and their owners are interested in commercializing not only the computer program itself, created with the application of their developments but also the results of using the corresponding software. Thus, the developers of AI systems demonstrate an interest in the legal possibility to protect the results of artificial intelligence systems activity. [13]

IV. CONCLUSION

India is sharing its borders with several countries including China and Pakistan. Since independence, political relationships with these two countries have never remained smooth sailing mainly due to border issues. In the way, the neghbouring countries are strengthening their military capabilities especially with the help of AI and robotics, India should make the effort to keep updated its military strength as well. The 21st century has already witnessed some of the remarkable inventions in IT. These inventions like Big data, Cloud Computing, Robotics, IoT, and above all AI have made a huge impact in the commercial arena. Naturally, Governments across the globe are now interested in introducing the same technologies in military force. It's already changing the face of warfronts and soon will make the whole scenario in armed forces different. Irrespective of the UN's concern over the ethical and responsible use of AI and on the development of LAWS from ethical and legal viewpoints, countries are in no mood to stop their research and development in this field.

Given India's military landscape, the use of AI/robotics will yield a tremendous advantage. The results are already coming from these efforts and that is quite optimistic. There will be a requirement for a drastic change in the entire system. That is no easy task as some age-old aspects need to be re-engineered from the current perspectives. Strong determination, with experienced and specialized people on board, and due push being given from the top level, is expected to produce the desired outcomes.

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