

The Role of Artificial Intelligence in Shaping the Third Military Revolution: An Analysis of AI-Driven Military Applications in the USA, Russia, China & India

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Abstract—Since the beginning of the fourth Industrial Revolution, Artificial Intelligence (AI) has touched every aspect of today's world & is reshaping military frameworks, signalling the onset of what is being called the Third Military Revolution (TMR). This research paper explores AI's transformative role in modern warfare, focusing on the military applications & AI-driven research and development (R&D) strategies of four key global players: the United States, Russia, China and India. Building upon the historical context of the First and Second Military Revolutions, which revolutionized warfare through mechanization and nuclear technologies, the paper defines TMR as a new paradigm characterized by the integration of AI into decision-making processes, autonomous systems, and combat operations.

This research paper aims to highlight the growing reliance of latest defense establishments of the states upon the Artificial Intelligence technology, as military experts & planners in various states have begun to upgrade their existing weaponry with the assistance of AI techniques. This study provides a comparative analysis of these four nations about how they are integrating AI into their military, investments for autonomous weapons, & adoption strategies. This would be followed by giving examples of how these states are applying and approaching AI in military. The paper also highlights the challenges & risks associated with application of AI in military domain. While AI offers enhanced capabilities, it also raises ethical, security, and geopolitical concerns. The paper further explores the potential and impact of AI to disrupt traditional military hierarchies, structures, and operational tactics. For all four of the aforementioned states, the primary official documents will be analysed along with exploration of how the military officers & bureaucratic structures that work on autonomous weapons are working on integration of artificial intelligence technology. This research concludes by

assessing how AI might redefine global military power, signalling an arms race with profound implications for future warfare, security, and international stability.

Index Terms—Third Military Revolution (TMR), AI in Warfare, AI Military Applications, Civil-Military Integration, Autonomous Weapons.

I. INTRODUCTION

The First Military Revolution took place between the late 15th century and the early 17th century and it was characterized by the significant shift from medieval to early modern warfare. This period basically saw the introduction of gunpowder and the widespread use of firearms on the battlefield, which ultimately changed the military strategies and tactics. With the introduction of firearms, traditional methods of combat which is dominated by heavily armoured cavalry & feudal formations began to decline. Instead, armies began to rely upon infantry-based formations equipped with rifles and cannons, resulting in new battlefield dynamics (Parker, 1996). This revolution also witnessed government taking control of military forces and transforming them into equipped professional standing armies. The new changes brought about by this revolution laid the foundation for modern military structures & strategies.

With the emergence of Industrial Revolution and advancements in technology, including railways and telecommunications, this led to the Second Military Revolution in the 19th century, with the introduction of nuclear weapons, ultimately leading to more operational efficiency. These innovations expanded the scale and speed of our warfare and is clearly

exemplified through conflicts such as the American Civil War and the Franco-Prussian War. This period also witnessed a notable shift towards the professionalization of the military, along with the introduction of mass conscription (Strachan, 2013). As a result, soldiers were given extensive training and better organisational structures were developed within the military forces. The introduction of mass conscription helped nations to include large numbers of the populations into the military, significantly increasing the size of their armed forces. The integration and close interplay of technology, logistics and industrial capacity reshaped military strategies and the nature of warfare, laying the foundation for modern warfare.

The third revolution in military sphere basically focuses on the development and deployment of autonomous weapon systems or killer robots. It is widely accepted that advancements in artificial intelligence technology could contribute significantly in the innovation and upgradation of various types of autonomous weapons. The integration of AI technology in military has been considered as the third revolution in military, after the previous revolution of gun powder and nuclear weapons (Thornton & Miron, 2020). We generally see that the military leadership is always looking for further growth as they are persistently pursuing for better and stronger weapons having advance technological setup & this is precisely where AI delivers presently. Moreover, AI has the capability to contribute to all areas including land, sea, aerial, space, and information sector; and at all levels of warfare whether its is political, strategic, operational & tactical (Svenmarck, 2018). Currently, AI in military is used in respect of- autonomous weapons development & weapons targeting, for effective surveillance, cybersecurity enhancement, homeland security, improved logistics and autonomous vehicles (Roth, 2019).

It is now widely accepted that AI systems could play a multifaceted role in military domain and due to this many state leaders and policy makers, technology experts, academicians and researchers have considered AI to be revolutionary for defence sector. But they differ in terms of their perspective on AI, as few of them points that AI is a positive thing as it would led to effective operations, provide strategic

and tactical advantages, and help in reducing human casualties as human armed force would be replaced by the automatic working machines. However, the other side stresses that if not regulated, monitored and used properly, the incorporation of AI may result in more damage and also possess risks for civilians. Although integration of AI into military is still in its early developmental phase, it is undeniable that it has the full potential to reform the security landscape mechanism. Consequently, it will further led to transform the existing economic and military dynamics at the international level.

This research paper aims to provide an in-depth comprehensive analysis of how artificial intelligence is fuelling military innovations and advancements in the United States, Russia, China and India. By closely analysing the unique strategies and applications employed by each nation, this study aims to inform about the broader implications of integrating AI technology within the defence sector and on the future prospects of warfare. In an era where artificial intelligence tools are reshaping and redefining military operations and national security strategies, it is crucial to understand the transformative impact of this technology in order to anticipate the next phase of conflict and cooperation among states. This study therefore would help in understanding the present nature of warfare and how warfare will look like in an advanced technological age. This article also highlights various AI led innovations and technological advancements that are expected to have genuine impacts on military applications, spanning from a tactical battlefield viewpoint to the strategic level.

This paper first maps the evolving nature and characteristics of warfare due to integration of artificial intelligence. The paper then subsequently assess the impact and implications of integration of AI technology in military affairs. After this, it highlights the strengths and potential benefits of using AI within military domain. The ethical and legal implications of incorporating AI in the military are thoroughly examined, particularly in matters like autonomous weapons and the possibility of unintended harm. The paper also highlights several challenges and potential risks associated while using AI in the military.

II. THE EVOLVING NATURE AND CHARACTER OF WARFARE

Various theorists had classified changes in the way warfare is conducted over the span of time, & refer such classification into different generations of warfare (Lind, 1985). The first and initial generation of warfare is basically based upon armed manpower and proper line-of-column positioning tactics; the second moved towards machine guns and predicted fire, the third generation of warfare focused on maneuver and integrated warfare or multi-domain warfare; and the fourth generation included armed non-state actors or adversaries. The current prevailing fifth generation of warfare is characterized by non-lethal military actions including spreading of disinformation, various types of cyber-attacks, social engineering, incorporation of artificial intelligence technology and autonomous weapons (Abbott, 2021). Recent years have also unveiled that the correlation between warfighting and the attainment of political plans has become fragile. Now, cooperation and conflict are almost concurrent side-by-side as in the case of the United States & China, India & China, United States & Russia and other nations. Much of the current debates on the integration of latest technologies in military domain arguably displays the "next-frontier" technologies leading towards "discontinuous" or "disruptive" military innovation & conduct of warfare. Emerging technologies like artificial intelligence has led to a shift from the "industrial-age" towards "information-age warfare" and now moving forward for "automation-age warfare" (Raska, 2021).

The ongoing Russia-Ukraine conflict has proved that in the present days, there are two parallel ways of waging and fighting wars: 1) non-contact and 2) non-kinetic. Non-contact warfare refers to the usage of long-range vectors during the time of war and includes rockets & missiles, unmanned aerial systems (UAS) and sophisticated cyberattacks; meanwhile, non-kinetic or non-lethal operations include spreading of misinformation through social media, trade controls, various kinds of narratives & propaganda and cyber attacks. One thing is common among the two, that is, both of these use advance technological tools. (Upadhyay, 2022). It is widely accepted notion that the successful conduct of next-generation warfare will rely mostly on instant timely

accommodation, quick and perfect decision-making, concerted application of firepower without depending on physical presence of military forces, the deployment of non-kinetic tools, & rigor-targeting (Upadhyay, 2022). The key reasons for this much dependency on emerging technologies in the military structure and warfare are: 1) the exponential advancements in computing performances; 2) availability of vast amount of datasets; 3) recent developments and advancements in machine learning techniques and algorithms; and above all, 4) the swift expansion of financial interest and big investments in AI technology (Allen & Chan, 2017). Allen & Chan, further argues that now nations will wage war through algorithms, intelligence, surveillance and reconnaissance tasks to win the battle of information before the first shot is fired. The nation that best collects and makes effective use of data through the help of AI applications will increase its military power and have long term competitive advantage.

III. SCOPE & METHODOLOGY

The main purpose of this study encompasses a comprehensive analysis of AI technologies that are currently being integrated into military operations, including autonomous systems, predictive analytics, and enhanced decision-making processes. This study aims to explore about the role & implications of AI in the performance of military tasks such as various military operations, tasks related to target identification & target engagement and autonomous working of weapon systems. The study understands the close relationship between Revolution in Military Affairs (RMA) & artificial intelligence technology and how it would affect the society at large. Furthermore, the study analysis the effectiveness of emerging AI technology to detect and counter security related threats of the 21st century.

The methodology employed in this study involves a mixed method approach. Initially, a comprehensive literature review will be carried out, examining existing scholarly articles, government documents, military reports and policy papers concerning AI in military settings. This will be supplemented by case studies focusing on particular AI applications in military operations, such as drone warfare, cyber operations, and intelligence gathering. Quantitative data will also be analysed where applicable,

especially in defense expenditures on AI technologies.

IV. INTEGRATION OF ARTIFICIAL INTELLIGENCE TECHNOLOGY IN THE DEFENCE SECTOR

The integration of AI in the defence sector has led to the development of various advance weapon systems with varied automated capabilities. States are now moving towards AI-specific way of warfare, due to the increasing admiration of the states to the military-centric AI technology (Wu, 2023). The primary concept of AI specify the functioning and operating of digital machines, to the level & as a replacement of human intelligence. A broader definition of AI includes “multiple type of technologies and ways to computing, enthralled on the competency of computers to make versatile logical and analytical decisions in response to often uncertain environmental conditions” (Tredinnick, 2017). With the help of AI technology, machines are designed to execute specific tasks in the preferred directions without human involvement. The substitution of human intelligence with AI powered computer systems, enhances the efficiency of the automated working of the machines as compared to human capabilities (MacDonald & Howell, 2020). The 'AI hype', which started from the early 2010s and still persists is due to three closely interconnected happenings: (a) the availability and accessibility of vast amount of data from multiple sources; (b) advance developed machine learning (ML) algorithms and (c) speedy computer processing capability (Hoadley & Sayler, 2020).

The integration of AI into military domain, explains a unique human-machine relationship and this relationship is of three different types: 1) human in the loop, 2) human on the loop, and 3) human out of the loop (Ozdemir, 2019). In the first case, that of human in the loop, the working of the machine is in the hands and dominion of the environment; however, it is the human who operates the machine takes the final decision and such kind of machine working is known as semi-autonomous system. The second case is of human on the loop, where the machine can decide and act on its own but it is under the observation of the human and can intervene if necessary. This is known as supervised autonomous

system working. The last third case is that of human out of the loop, where a fully autonomous machine system works by itself, without any human control or supervision, and as a matter of course remains out of the loop. It is generally observed that, currently AI can be used in military application in the following ways: (i) AI is used to process & interpret information, with the help of image-recognition algorithms. An example for this is the American Project- Maven which is used to process and simplify the information gathered from the videos recorded by drones. (ii) AI reduces the working dependency of machines on humans and now drones, planes, ships, tanks etc can control and direct their actions on their own. A perfect example of this kind of autonomous technology is the Israeli Harpy Drone, which is fully autonomous in working. (iii) Lastly, with the development and advancement of algorithms, AI may be utilized for command and control and will also help in effective battle handling, by analysing huge amount of available data and making predictions to guide and direct human action (Ozdemir, 2019)

There is much debate regarding the assimilation of the AI within military domain and experts have put forward various prophecy regarding the influence of the AI on the future warfare. In this regard, there are three prevalent generable notions: (i) minimal impact of AI on warfare, (ii) evolutionary impact of AI on warfare and (iii) revolutionary impact of AI on warfare (Sayler, 2019). Those experts who favour for the minimal or lesser impact are mainly focused on the technical aspect of AI & the military establishment approach and willingness to utilize this technology (Scharre, 2018). The second group, those who speak for the evolutionary impact, accepts that AI will play an instrumental role in warfare (Ayoub & Payne, 2015). And the last group of experts are those who propagates the concept that AI technology will have a revolutionary impact on warfare. They are of the view that the AI has the capability to transform the nature and principles of warfare (Sayler, 2019).

The usage of AI led advanced technology in the defence sector has introduced various types of sophisticated and improved military devices throughout the world. In this manner, the military integration of AI technology has enhanced the subsisting defensive capabilities of the states, where the big superpowers are the pacesetter and the promoters of contemporary advanced warfare

technologies in the realms of security, peace and defence (Johnson, 2021). The production of AI-specific weapon system has modernized and updated the prevailing war-fighting tactics of nations in five different areas, including land, water, underwater, air and space. The introduction of Automatic Weapon Systems (AWS) technology have started a race for Unmanned Systems Technology (UST) throughout the countries all over the world, because the UST has provided multiple types of semi-autonomous and completely autonomous armed weapons to the states (Rehman, 2023). Now, with the assistance and support of UST, the advance defense industries of the states have initiated manufacturing of various autonomous vehicles, such as 1) Unmanned Ground Vehicle (UGV), 2) Unmanned Combat Aerial Vehicle (UCAV), 3) Unmanned Surface Vehicle (USV), and 4) Unmanned Underwater Vehicle (UUV). The Unmanned Ground Vehicle are kind of ground vehicles which has the capacity to work under extreme & adverse environmental challenges, whereas the Unmanned Combat Aerial Vehicle are such types of drones which has multiple combating capabilities and they are specialised in performing tasks of surveillance and target identification. Moreover, the USVs refers to such naval drones which are developed to meet combat difficulties on the water surface, whereas the UUVs are recognized worldwide as underwater drones for the safety water and resources beneath the sea (Johnson, 2020). The development and deployment of semi and fully-automated weapons has transformed the combat competencies of regular armies and enabled the forces to identify, select and target the enemy with more accuracy and precise. The integration of these avant-garde technologies into the defence sector has revolutionized the weapon industries worldwide and significantly heightened commercial interest of leading weapon industries worldwide. Consequently, security related deals among various governments have begun to focus on the exchange of advanced AI-enabled weapons and advanced defence gadgets. The rising trade loads of these cosmopolitan weapon systems among nations have brought a new trend in the commercial interests of the states (Tadjdeh, 2015).

The level to which AI integrates into the military domain is significantly influenced by level of sophistication. The more evolved and improved an

AI system is, the more profoundly it is able to dominate the military and the way in which warfare took place. The micro level refers to the prevailing level of pervasion in the military, and it is supported by Artificial Intelligence. At this level, the advancements brought by AI helps already operating systems to work more accurately, & not necessarily revolutionize and upgrade the way things are done. Currently, AI models are superior than human beings in skill based and systematic tasks; but in order to deal with situations that have high level of skepticism and requires judgement and knowledge, they are incapable to level up to human intelligence (Cummings, 2017). At the meso level, AI works more effectively and exerts a greater degree of control and it is expected to match the human mind level. At this level, advance weapon systems can perform the tasks without human involvement and capable of wielding lethal force without any control (Marchant et al, 2011). The macro level is the highest stage, where permeation is much possible and at this level robots or machines engage each other, totally free from human support or supervision.

V. ADVANTAGES & OPPORTUNITIES OF AI TECHNOLOGY FOR DEFENCE SECTOR

It is widely anticipated that integration of AI in defence sector would play a prominent role in the upgradation of military structure, increasing effectiveness of weapons and the conduct of warfare. Since AI is appreciated for its speed and accuracy, its integration into military domain will enrich data sorting and data analysis. This can led to planning accuracy, timely situational awareness, more rational decision-making, and casualty reduction (Saylor, 2020). Enhanced ability to process and analyse vast data would improve accuracy while doing assessments, thereby minimizing the likelihood of unintended outcomes. By leveraging advanced data process techniques, military organisations can extract deeper insights, recognise patterns, and make more informed decisions. Also, the integration of AI can facilitate quicker data assessment compared to manual processing, thereby accelerating the analysis process and enhancing the speed of decision-making. AI also facilitates speedy communication along the hierarchical structures including chain of command. This would further help in improved information-

sharing and exchange between different entities or branches, & further contributes to better coordination and collaboration.

The potential of AI and the role it could play to enhance cybersecurity and combat cyber threats further strengthens the military and security sector. AI facilitates better control over the data and due to this, usage of AI for cybersecurity could downgrade the risk of data poisoning or interference. This improves the whole structure and further helps in cyber and data security. AI could play a crucial role in intensifying physical safety and security, upto the extend beyond the reach of human or non-AI augmented means as it would facilitate in better training and simulation, proper analysis of equipment wear and tear, preventative reconnaissance as well as personnel health. Moreover, by utilising big data, AI can aid in evaluating the connections between digital and physical assets, that must be safeguarded or could be compromised (Grand-Clement, 2023).

Experts believe that the integration of AI could decrease the cost of logistics, due to lower human errors. Additionally, experts pointed out that AI would reduce reliance and burden over human labour, thereby assisting task optimisation for personnel away from ancillary task. Furthermore, AI's role in assisting in tactical planning, may facilitate smaller staff at the battalion and brigade level.

Another significant reason for the global race surrounding the research and development of artificial intelligence is the considerable commercial incentives that comes with successful AI systems, alongside their military applications. Many AI technologies have dual-use potential and they can be effectively utilised in both defense and civilian sectors. This move towards civil-military integration emphasizes the significance of collaborative efforts between public and private sector in developing AI technologies. The successful integration of AI across these domains serves immediate economic and strategic interests.

VI. ETHICAL & LEGAL IMPLICATIONS OF AI IN WARFARE

Since artificial intelligence has the ability to reach upto the level of human intelligence, therefore there has been a debate & apprehension regarding its

further progress and the means of controlling it. The particular concern is relating to when AI goes beyond human intelligence and develops further. With the development of numerous AI tools, the fundamental issue is about human safety and now it has become a political as well as ethical issue. In an open letter addressed to the UN and signed by 116 AI experts, they advocated for a prohibition on usage of autonomous weapons. They are of the opinion that: "Once developed and deployed, these lethal autonomous weapons will facilitate armed conflict to be fought at such a level and extent higher than ever, and at timescales faster than humans can grasp. Such autonomous weapons could become weapons of mass destruction, weapons that dictates, and weapons hacked to behave in unacceptable ways" (Guardian, 2017).

Sooner or later, these AI enabled autonomous weapons will go wrong and result in damages and injuries to the civilians, highlighting the issue of who is responsible for them (Vestner and Rossi, 2021). Although it is broadly accepted that, International Humanitarian Law (IHL) is fully applicable to the AI-enabled technology, the question of accountability for crimes under the IHL due to the deployment of such technologies continues to be a highly debated issue (GGE Guiding Principle). A significant portion of the debate has focused on the difficulties of putting individuals liable for war crimes executed through AI (Bo, 2021). According to few scholars, that the working of fully autonomous weapon systems could not be linked to that particular state unless there is direct and effective oversight of their behaviour (Castel and Castel, 2016), while some differed & put forward the opposite and different conclusion (Crotoft, 2016).

In the detailed report of its 2022 session held at Geneva, the Group of Governmental Experts on Emerging Technologies on LAWS focused on the role of state and reported that "every internationally unlawful act on the part of a state, including those positively involving weapon systems based on emerging technologies in the domain of LAWS encompass international liability of that state, in accordance with international law.....Humans responsible for the planning and conducting of such attacks must accede and subscribe to international humanitarian law". (Group of Governmental Experts on Emerging Technologies Report, 2022).

Given the excitement around AI technology and the global competition to develop and deploy the best AI system, it is crucial for decision makers and developers to secure that ethics and security component are not compromised or neglected. The push to enhance AI tools should not be made such a primacy that the impact of such technical tools on individuals are no longer weighed. Similarly, ethical norms & guidelines should be timely framed and put in action to regulate and oversee the functioning of these emerging technological systems.

The integration and use of Automatic Weapon Systems (AWS) in warfare has been much debated and has sparked considerable debate. It is quit suitable to discuss, whether in favour or against the development and use of AWS in warfare, from the perspective of International Humanitarian Law (IHL). IHL primary focus is on the protection of individuals and their well being. If the protection of people is the main object, then the responsibility of states to adhere to IHL, for protection of 'people', cannot be solely assigned to robots or AWS because of multiple reasons. Fundamental compliance with IHL principles requires some degree of human involvement in contemporary battlefields (Mcmohan, 2020). It is unclear whether the AWS would have that level of intelligence to distinguish between lawful and unlawful targets (Russel, 2021). These weapons do not posses the human qualities that can help then in making such determinations, particularly in battlefields where the soldiers or employed personnel often hide their identities. This relates to the IHL principals of 'distinction' and 'precautions' (Desai Associates Report, 2023). Therefore, any inclusion or integration of AI into current weapon systems or weapon development programmes, will be required to undergo a full weapon review mechanism. However, this obligation has its own limitations, as only a limited number of states have adopted mechanism for the legal review of new advanced weapons (Prado, 2015).

VII. COMPARATIVE ANALYSIS OF AI MILITARY APPLICATIONS- USA, CHINA, RUSSIA & INDIA

USA

The United States Defence Department considers Artificial Intelligence (AI) technology as a key

component of its Third Offset Strategy. The then Secretary of Defence Chuck Hagel launched the Third Offset Strategy in 2014 with the key objective to restore the country's military technological superiority (U.S. Department of Defense, 2014). In this context, the strategy primarily emphasizes on the development of robotics and autonomy, in which AI plays a crucial role (Ellman, Samp & Coll, 2017). Thereafter in 2017, US National Security Strategy included AI technology for the very first time. The primary emphasis of this was to deploy AI for information statecraft, weaponization, and surveillance so as to upgrade the existing defence structure (The White House, 2017). In the FY2019 budget, AI was considered for the first time as a governmental priority & the government official statement highlighted that the “budget's key area of focus included artificial intelligence, autonomous systems, and hypersonics” (Office of Management and Budget, 2019).

But, despite many official statements & documents released by the US Administration, in the initial years, they do not have a clear funding for the same and no proper bureaucratic structure to implement the plans (Davenport, 2019). In order to overcome this shortcoming and to properly facilitate the integration of AI into military domain, a bureaucratic structure was created by the US Administration. For this, the Department of Defence was made the main responsible institution. In June 2018, Joint Artificial Intelligence Centre (JAIC) was formed by Pentagon, which was entrusted with the task of transitioning from research & development to implementing capabilities in the field (Mitchell, 2019). In the same year, to advise the White House regarding AI research and development, a Select Committee on Artificial Intelligence was established under the National Science & Technology Council (White House Summit on AI, 2018). This select committee also overlooks and facilitates US government's collaboration with industry & academia regarding AI research and development.

US has also developed significant number of advanced weapons with the help of AI keeping in mind the national security of the country. In 2013, the US Navy created history by successfully completing the autonomous landing of X-47B prototype drone (Jalabi & Ackerman, 2013). Later in 2015, the same drone performed autonomous aerial refuelling. In

both instances, the action were executed by the software. Another most well-known and widely discussed case involving the US government is Project Maven, which assimilates AI technology for intelligence surveillance, and reconnaissance purposes (Prigg, 2017). Additionally, the US military is prioritizing the integration of artificial intelligence into semi-autonomous and autonomous military vehicles, such as combat aircraft, surveillance drones, ground vehicles, and naval ships.

But despite all this, the U.S. encounters both internal and external challenges while deploying AI to defence sector and in becoming the global leader in AI. Internal challenges arise because, unlike the case of nuclear weapons, this AI technology is primarily being developed by non-governmental institutions or private entities like Google and Microsoft. Dealing with these private entities is a tough task for government as these entities are not always inclined to collaborate, which hinders the integration of AI into military applications. While on the other hand, external challenges are those that are posed by other nations particularly by China and Russia, to the US in artificial intelligence. Both the countries seek to challenge American military superiority by leveraging AI to develop weapons that are more advanced than those currently used by the U.S. (Carter, Kinnucan and Elliot, 2018).

China

China has aimed to become and is moving forward with the goal of becoming the global leader in AI by 2030, and has also declared its intention to surpass the West in AI research and development by 2025 (Robles, 2018). Xi Jinping has repeatedly mentioned that leading in AI technology is “necessary for future competition in global military and economic power competitions” (Allen, 2019). He further stated, “In an environment of intensifying international military competition, only those who innovate will win” (Xinhua, 2014). Chinese military thinkers and strategists foresee a shift in the nature and conduct of conflict, transitioning from the current “informative” warfare to a future characterized by “intelligentized” warfare (Hongliang, 2016). For China, prioritizing the use of science and technology to enhance its military domain is vital to the Chinese Communist Party’s “powerful military objective” in the present new age (Xinhua, 2019). With the aim to fully utilize

the overall capacity of AI technology, the PLA’s official dictionary mentioned and has a defined definition of “AI weapon”, as early in the year 2011. In 2017, Chinese companies attracted 48% of the worldwide funding for AI start-ups, and in between 2013 to year 2018, country’s AI sector received 60% of total global AI funding (Nouwens, 2018). Due to this development, Chinese leaders & the tech industry people believe that the present gap between China and the U.S. in AI has significantly narrowed & therefore they see “AI as a race of two tech giants”, between the two nations.

There are many factors which brings systematic & strategic advantage to China, as it had the potential needed human talent & the huge amount of relevant data. But the most important thing is the relation between the government & AI private sector. This brings the Chinese government & AI private sector closer & facilitates an easy integration of AI technologies within the military and this is particularly known as Civil-Military Integration (CMI). This implies that advancements in science & technology within the civilian sector should contribute to innovation & development for the military (Congressional Research Service, 2019). China’s success in the commercial market significantly improves its national security, as it not only diminishes the U.S. government’s capacity to exert diplomatic & economic pressure on China but also enhances the technological capabilities accessible to China’s military & intelligence community (Abadicio, 2019). Therefore, expertise in civilian technology & science is fostering military innovation. This civil-military integration in China is a unique strategy & brings more advantage.

In contrast to the US, the national AI strategies and plans in China are released by the China’s State Council. China had released many strategies regarding AI like “Internet Plus” Artificial Intelligence Three Year Action Plan which was released in 2016, Next Generation Artificial Intelligence Development Plan released in 2017, 13th Five-Year Science & Technology Military- Civil Fusion Special Plan released in 2017, Robotic Industry Development Plan released in 2016 etc. (He, 2017). In July 2017, China’s State Council officially unveiled a plan naming it “New Generation Artificial Intelligence Development Plan”, which delineates three stages for AI development: 1) Creating a new

competitive edge in AI; 2) facilitating the development of new industries; and 3) enhancing and strengthening national security (Bommakanti, 2020). This phased development approach supports a three-step strategy aimed at developing & integrating AI across all sectors, from the civilian to the military (Kania, 2019).

As a one-party state, China's technological developments are overseen & controlled by the Central Committee of the Chinese Communist Party. Policy-making & coordination related to technological developments are entrusted to two main institutions: 1) National Science, Technology & Education Leading Small Group, which focuses on civilian application of technology, and the other is, 2) Chinese Communist Party Central Military Commission, which is responsible for military technology applications. The People's Liberation Army leading & pioneer research institutions for military science such as- the Academy of Military Science and National University of Defense Technology, are at the forefront of China's efforts to advance artificial intelligence technology in the military. However, it is widely anticipated that the China's military use of AI is not at a very high or advanced stage. This is primarily due to the fact that, contrary to the U.S. military, Chinese military does not have genuine on ground experience of the battlefield operations (Ozdemir, 2019). It is noteworthy that due to China's lack of combat experience, it places a greater emphasis on war-games & simulations using augmented reality (Kania, 2019). People's Liberation Army (PLA) views war gaming as a method to enhance the integration and application of AI into military applications, which they believe will aid China in achieving victory in future conflicts.

Russia

While Western nations and their military organizations primarily view AI as an enabler for the tactical level operations, the Russian top military leadership perceives its AI's greatest applicability for the strategic level. The Russian Armed Forces has emphasized more on tailoring strategic landscape rather than achieving success at the tactical level. In Russia, unlike in other countries where AI development is primarily driven by civilian sectors, the Russian military is ostensibly at the forefront of

AI research and development (Dougherty & Jay, 2018). First Deputy Minister of Defense Ruslan Tsalikov has stated that "the military is currently spearheading nearly all technological advancements related to AI" (Dougherty & Jay, 2018). In November 2019, speaking at a significant Russian Forum related to AI, President Putin emphasized the critical importance of AI for both the military and the nation as a whole. He stated that, "AI is the most significant topic in Russia in the current times, and military has been entrusted with the primary responsibility for its development" (Kolesnikov, 2019). The Russian Armed Forces are aiming to leverage AI to enhance the capabilities of its missiles, as well as its electronic warfare, air defense, and command-and-control systems (McDermott, 2018). Alina Polyakova in her report, mentions that "Russia sees itself engrossed in direct geopolitical competition with the world's big super powers, and AI is the currency that Russia is betting on" (Polyakova, 2018).

India

The objective of India to maintain and upgrade its conventional armed forces to a modern and advanced stage is officially recognised in the Land Warfare Doctrine of 2018 (LWD-2018). The Government's LWD-2018 officially mentions the increasing focus of the Indian Army on artificial intelligence technology, outlying various potential applications of new AI technology in the defence sector (Rehman, 2023). The Land Warfare Doctrine-2018 outlines the course and structure for India's defense strategy and security planning, and also aims to equip Indian Armed Forces for future challenges through the adoption of advanced technologies like AI. This document undermines the importance of utilizing emerging technologies to address possible challenges regarding the future warfare. The LWD-2018 outlines the government's aim to establish a nationwide technology-driven environment, focusing that the defense establishment will consistently enhance its techno-centric combat skills and capabilities by improving the nation's IT skills. In the declassified version of the document, artificial intelligence is highlighted as a crucial element in New Delhi's strategic planning, in order to face the high-tech threats posed by modern weapons, as well as the dissemination of false information (Joshi, 2013).

Additionally, LWD-2018 highlights the critical integration of personnel, artificial intelligence, robotics and drones into the core combat capabilities of the state.

India's increasing dependency on advanced technologies has resulted in a strong bond between the IT sector and the rapidly evolving defense sector. This connection is driven by the need for innovative solutions in national security, where advancements in IT enhances military capabilities, data analysis and cyber defense. Due to necessity of the present times, collaboration between the IT and defense sector has become crucial for developing cutting edge technologies that ensure strategic superiority and modernize the armed forces (Geraci, 2022).

Published in July 2022, a report titled "AI in Defence (AiDef)- The New Age of Defense" provides a comprehensive overview of significant transformations achieved by the Indian defense sector in the sphere of artificial intelligence. The report highlights a compilation of seventy-five AI enabled weapons, referring to these accomplishments as an intrinsic part of the Azadi ka Amrit Mahotsav celebrations. DRDO has established a particular Centre for Artificial Intelligence and Robotics (CAIR), so as to focus especially on artificial intelligence based robotics, autonomous command and control, and advanced information and communication security. The Indian government has launched an online database called *Indiaai* to provide information about New Delhi's vision for AI technology and its socio-political impacts throughout the country (Kim & Ethics, 2021).

In order to enhance conventional warfare capabilities, the Indian government signed various bilateral strategic partnership agreements with multiple countries. While forging these strategic alliances with different countries, the Indian government has endorsed collaboration with nations that possess advance defence industries. The discourse surrounding indian government's growing strategic cooperation with foreign nations has led to a rise in India's bilateral collaborations particularly for artificial intelligence technology. In order to enhance greater access to emerging warfare technologies, India has incorporated AI technology into the broader framework of Indo-US strategic partnership. In March 2021, representatives of both countries signed the US-India Artificial Intelligence (USIAI) under

the patronage of the Indo-US Science and Technology Forum (IUSSTF) (Almamatovna, 2022). Along with US, for AI related research and development, Indian government had also signed bilateral relationships with the Russia and China. Further, India has signed an economic agreement with the British government with a concentrated focus on AI technology, and british government has recognised India as a immediate and close strategic partner in the AI field (Ryan, Al-Rubaye & Braithwate, 2022).

In 2021, The Indian Army showcased the Rustom drone developed by the DRDO, which utilized satellite navigation system. Rustom marks India's first Remotely Piloted Aircraft System (RPAS) and it is equipped with efficient automatic take-off and landing features (Rajagopalan & Krishna, 2019). DRDO had also developed an indigenously designed Unmanned Combat Aerial Vehicle- Ghatak, which is capable of carrying precision-guided missiles & small bombs. But despite all this, the armed services and more generally the Indian defense establishment's investment in fully autonomous systems powered by artificial intelligence have significantly lagged behind those of other nations like the USA, Japan, Europe and China (Panwar, 2018).

VIII. LIMITATIONS AND CHALLENGES TO INTEGRATION OF AI INTO DEFENCE SECTOR

Since, data plays a very instrumental role in the development of AI algorithms therefore data-related problems could hinder the effectiveness and precision of these AI algorithms from their training to their application in real-world scenarios. Moreover, if data collection methods fails to adapt itself to rapid changes or latest developments happening on the ground therefore, in such situations, important latest information might be overlooked or delayed, and may led to incorrect evaluations or a lack of complete understanding of the situation. Poor data management or poor data hygiene also acts as a major challenge in the best development of AI algorithms and their integration to defence sector.

The lack of transparency of AI decision-making process is another challenge while applying this technology to military, particularly while using it to autonomous weapons systems (Svenmarck et al., 2020). The 'black box' issue of AI makes it difficult

to ascertain the reasons for particular decision made by AI as it cannot provide explanations, resulting in either distrust or excessive dependence on the technology (Boggust & Satyanarayan, 2022). This lack of understanding of AI decision-making process, significantly affects discussions about using AI for target identification, collateral damage estimation, or even performing preventive maintenance of military equipment.

There is also a question about how to analyse the necessity for meaningful human control over the AI developed weapons as it is very difficult to identify, for which task human oversight is needed, and for which tasks such control hinder the effectiveness of AI. While AI can enhance cybersecurity domain, it is also anticipated that it can also introduce vulnerabilities. Particularly, AI can fall prey to manipulation via adversarial attacks and may be unintentionally or intentionally provided with false or contaminated data. Additionally, hackers could subvert its functionality. The integration of AI weapons can also increase the chance for adversaries to exploit vulnerabilities (Sayler, 2020). Feeding misleading information or analysis can affect the effectiveness of military operations- for example, by hindering logistical processes or influencing critical life-or-death decision-making.

Excessive reliance on AI can result in overlooking or dismissing the potential shortcomings of the technology, such as overestimating its capabilities or attempting to apply it to problems beyond its scope. Overreliance on AI technology in defence could also lead to a loss of context and nuance due to over-synthesis of information by AI, and in such culture, emotions, and unwritten social norms may not be completely taken into consideration. While at this moment we can only speculate about the limitations & vulnerabilities that AI may bring in defence sector, the fact is that the extent and reality of its present and future applications in defence sector, and thereafter its impact, still remains unknown.

IX. CONCLUSION

The integration of artificial intelligence into military marks a pivotal transformation in global defence structures and strategies, heralding the onset of what can be termed the Third Military Revolution. This paper highlights the strategic approaches adopted by

the United States, Russia, China, & India, each showcasing various degrees of commitment and innovation in harnessing AI technologies to upgrade military capabilities. The U.S. prioritises advance research and development frameworks, aiming to maintain technological superiority. Russian military focuses on integrating AI at the strategic level and emphasizes more on shaping strategic landscape rather than achieving success at the tactical level. In Russia, AI development is primarily driven by military and it is military which is at the forefront of AI research & development. Meanwhile, China's ambitious agenda aims to achieve global leadership in military AI by 2030, reflecting its comprehensive approach to integrating latest technologies across diverse military domains. China also provides a perfect example of civil-military integration as government and private sector focuses on close and collaborative mutual working with respect to development and application of AI technology to the defence sector. This shows China's 'whole-of-government' working mechanism, indicating that it employs a top to down approach where the government oversees and directly influences AI research and development. Whereas India's efforts, driven by a mix of bilateral collaboration and self-reliance, indicate a growing recognition of AI's potential in enhancing military setup and national security structure.

However, the integration of AI in military contexts also puts forward significant ethical, strategic, and regulatory challenges that must be addressed to mitigate risks associated with autonomy in defense section. As nations move forward towards AI capabilities, international discussions regarding norms, accountability and the potential for arms races will become increasingly critical. Therefore, the role of AI in shaping military structures needs a balanced approach- one that fosters innovation and also ensures ethical considerations and global peace & stability. The convergence of AI and military strategy not only impacts the future wars but will also reshape international power relations in the upcoming years.

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