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Generative Artificial Intelligence & its Military Applications by the US and China – Lessons for South Asia

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Abstract: Generative AI's (GenAI) unique characteristic of bringing innovation by creating new knowledge from existing data is visibly having wide commercial as well as military applications. Globally, military and commercial sectors are exploring GenAI to enhance their capacity, capability and attain technological superiority over others. Major developments in AI and the recent breakthroughs in generative AI models with widespread applicability in both commercial and military domains (battlefield & operational spheres) are presenting both opportunities and risks. Though it will be another revolution in military affairs, GenAI's employment in autonomous weapons systems, poses repercussions on human security and on the moral and ethical boundaries during war and limited conflicts. It is also predicted that GenAI could act as force multiplier for disinformation and false signaling while intensifying the chance miscalculation. Modern militaries are continually expanding and advancing their defense and attack capabilities with the integration of Artificial Intelligence (AI) and autonomous, precision weapon systems. Recently, the research institutes of China revealed the launch of 79 Large Language Models (LLMs). Likewise, more recently 'Task Force on GenAI (Lima)' established by Department of Defense (DoD) is set in force to explore the capability of Gen AI to uplift the national security and bring innovation in the country`s defense sector. Also, it would enable the US to analyze the position of other state`s on Gen AI as well as modify its own framework to better adopt to emerging challenges and threats. By doing so, US and China are competing in their offensive and defensive military capabilities which poses risks and challenges for the region and specifically Pakistan vis-à-vis India. This research aims to follow an exploratory approach through literature review and case examples to carry a thorough analysis of Gen AI and its application in military field. The research will focus military application of Gen AI by the leading powers; US and China. Also, this research would also jot down the impacts of GenAI on the military policies of the nuclear rivals of South Asia in future.

Keywords: Generative AI; Military Applications; Defense Sector; Machine learning; ISR capabilities.

1. Introduction

Artificial Intelligence (AI) is considered to bring the Fourth Industrial Revolution (4IR) in the world [1]. Recent years witnessed swift advancements in AI technology, leading to a range of applications in civilian as well as military domain. AI has the ability to impact the range of domains of warfare i.e. air, land, sea, and space, and transform the three levels of warfare i.e., tactical, operational and strategic [2].

Currently, major states have attached their great attention to AI and aligning their military strategies and doctrines, accordingly [3]. The world powers are exploring Generative AI (GenAI) to bolster their military capabilities and achieve technological edge over their rival states. GenAI, with the distinctive capability to produce new content and models; makes it a crucial aspect of modern security and defense mechanisms and setups. Lethal Autonomous Weapon Systems (LAWS) like attack drones, cyber weapons and AI-powered offensive designs, pose unprecedented repercussions on human security and the moral and ethical boundaries of a war and limited conflicts. Also, it is apparent now that after the integration of

AI in military field in recent decades, Gen AI can be employed to run disinformation campaigns and false signaling, which would exacerbate the overall environment especially in theatres like South Asia with India Pak rivalry and Eastern Europe (where currently we are witnessing the Ukraine war).

Where many major powers and technologically advancing countries are focusing AI and GenAI for their military objectives of no or contactless warfare, two states are in this pursuit more than others, i.e., The United States and China. The intensifying strategic competition between the US and China, with the potential to shift the global order, have led to an increased adverse US perception of China as a rival competitive state. The two powers have formulated their national strategies; the US national strategy draws its significant inspiration and lessons from the Chinese national security strategy, and likewise. The US national military strategy (NMS) declares China as the main strategic competitor which can shape the international order. [4] Currently, the US and China are in the phase of an intensified strategic competition, with the race for technology supremacy emerging as the key domain of their competition. Even though the US currently has a *first-mover advantage* in the realm of AI, the swift advancements of China have led to an increased competition between the two, which is capable of influencing the spectrum and gravity of their competition in the field of AI [5].

This intensified strategic competition poses direct threats to regional security of South Asia as both the great powers have their balancing states i.e., India and Pakistan, in the region with traditional rivalry.

GenAI can undeniably possess the capability to revolutionize the security framework and influence the current military landscape and capabilities. Realizing the potentials of AI, there are several countries that have declared their national AI strategies. Also, a number of states and non-state actors are increasingly engaged in conclusive actions in the sector of AI research and development (R&D).[6] The US and China are the leading countries in AI technology. The US is trying to retain its position in this domain, while China is making efforts to overtake the US and become global leader in AI technology by year 2030 [7]. GenAI would enable the smaller militaries to gain edge in predictive and proactive measures against larger and sophisticated militaries.

Against this backdrop, this research aims to follow an exploratory approach to carry a thorough analysis and literature review of GenAI and its application in the military field that is anticipated to bring improvements in areas such as communication, intelligence, surveillance, operational planning, prompt decision-making, adversary's course of action and target-selection. The research aims to focus on military application of Gen AI by the US and China. Considering US-China competition in the region, South Asia becomes the center point of friction with the existence of two rival nuclear weapon states. It is imperative in the current global order to ensure the pursuit of responsible behavior and ensure regulation and governing framework against the consequences of unbridled development and employment of such technologies. Also, this research explores the implications of GenAI on the military policies of the nuclear armed states in South Asia as India pursues the offensive design against Pakistan and creates a security dilemma. The current debate and advancements in AI and GenAI use in the military necessarily draws some conclusions and lessons for South Asia in future where the competition is replicated automatically. First the paper explores GenAI status in the military domain, its use by major powers and prospects of its use in the South Asian military framework.

2. Current Status GenAI in Military and Defense Sector

Even though technological advancements are presenting opportunities in various fields, scholars have raised deep concerns regarding their usage for military purposes, specifically its capability to influence warfare. It has become a reality that in the coming years, AI will deeply influence the military field. Logistic, intelligence, surveillance and weapon design are areas in which AI is going to play a crucial role in future [8]. One step ahead in the direction is the inception of Generative Artificial Intelligence in the defense sector. GenAI's ability of altering the course by creating new content from the existing data seemingly has greater applicability in commercial and military domains. Today, military and defense sectors are exploring GenAI to boost their systems and attain technological superiority. Inception of GenAI in defense is driven by the primary factors like increased defense expenditure, modernization with AI-integrated weapon systems, increased demand for training and simulation for human resource, cyberspace measures, and collaborative R&D efforts among governments, defense organizations, and leading tech-masters around the globe [9].

GenAI's demand in the defense sector could be assessed with its annually expanding share in defense market that is expected to grow around US$ 2912Mn till 2032 from US$ 454 Mn (present statistics- 2022). This is growing at a Compound Annual Growth Rate (CAGR) of 21% from 2023 to 2032 as predicted.[10] Basically, GenAI in the defense domain is evident to provide advanced algorithms and sensory neural networks to generate synthetic data from present knowledge. This is turn, provides better simulation methods with greater extent of predicting and analyzing realistic scenarios, while assisting in complex and time-sensitive decision-making and taking processes. It is widely accepted to enable the user to improve situational awareness, optimize resource allocation with effective security measures.

In terms of end users, governments and militaries are primary end-users of GenAI in defense. They orient and drive the demand/supply line for such revolutionary technologies to force multiply their defense capabilities, project their power and make optimal decisions. Thus, these entities invest in R&D and collaborate with the providers of technology in this regard. Figure 1 shows the End user share of Gen AI around the world in 2022.

Going down to region wise analysis, North America, precisely the United States, shows the biggest share of about 44% in the GenAI Defense Market in 2022. US being at the forefront of AI integrated technologies. The US Department of Defense (DoD) actively pursues the GenAI applications in its defense policies and mechanisms, which includes training, simulation, support systems for decision and cybersecurity imperatives. In this race, European defense organizations came second. They are also in exploratory stage for GenAI's capability for increased autonomy and enhanced simulation and intelligence. Subsequently, the Asia Pacific region is seeing significant upheaval in states' defense spending and pursuit of the latest military tech. China, Japan and India are evident to be the leading states in Asia Pacific to pursue and employ GenAI in their defense and security. Map 1 shows the region wise focus on GenAI in the defense market in 2022.

Similarly, the Research Market Analysis says that GenAI in security market size will grow to about US$ 2654 Mn by 2032 from US$ 533Mn in 2022. It is a growth of 17.9% at CAGR during the period, 2023 to 2032 [11].

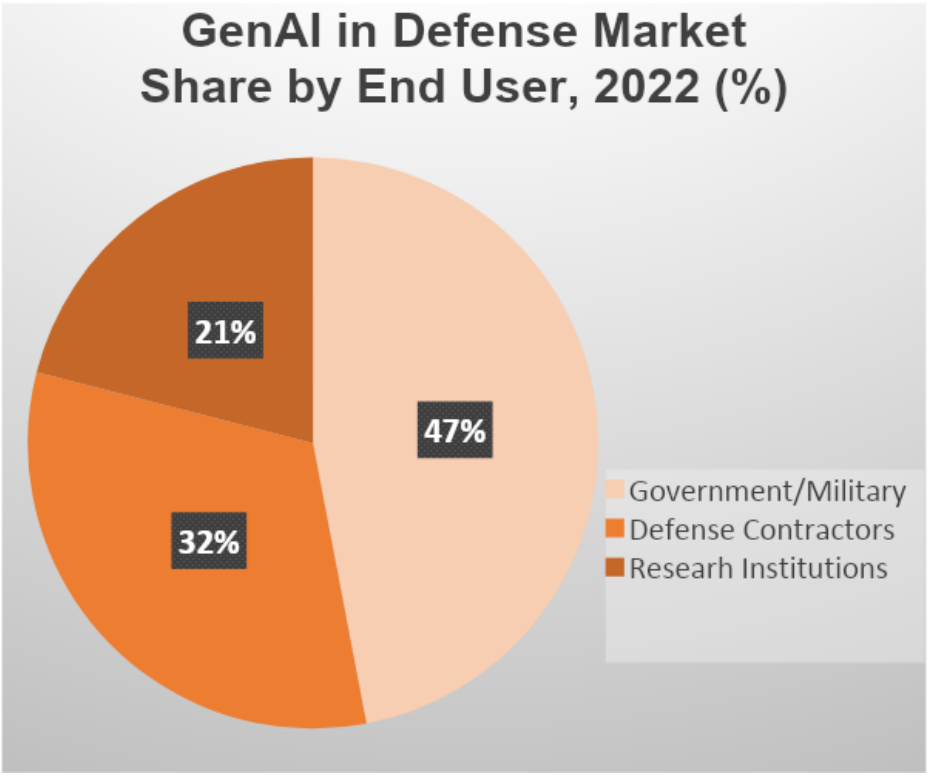

Figure 1. GenAI in Defense Market Share by End User (Source: Report Generative AI in Defense Market)

Figure 2. Map-1 GenAI in Defense Market Share by Region (Source: Report Generative AI in Defense Market)

3. Potential Military Applications of GenAI

Initially, GenAI is understood to be having its applicability at strategic and operational levels in all domains of military i.e., land, air, sea and now outer space. Depending on its capability, GenAI could act as a medium transitioner between these domains too. At a strategic level, it will play its role in enhancing situational awareness and decision-making while addressing the threats in cybersecurity. It will assist in high maintenance of equipment, facilitation in research and collaboration as well as language translation and innovation. At operational level, GenAI would transform and enhance the propaganda campaigns, false flag operations, operational planning, precision, intelligent Command and Control Systems and performing predictive maintenance.

3.1. Information Domain and Decision-making

The potential role of AI in the decision-making process and information domain has a significant chance of increasing the strategic risks in military engagements. For instance, it reduces the time available for policy makers to take crucial decisions, heightens the chance of producing erroneous inputs for decision-making process, and can create disruptions in state`s deliberations through an extensive information processing. In the initial stage, aligning AI into the decision-making process can autonomously accelerate the unfolding events and lessen the timeframe in which decision-makers are required to respond to adverse and critical situations. In addition, the use of AI-enabled systems implicates upgrading the set national security procedures that handle the evolving scenarios, articulate options, and make a decision on the threat of or use of force. This can assist a state in providing additional time for decision-makers and allow rather precise and well-informed alternatives.

Predictively, the result of more states reducing their decision-making timelines may lead to crises escalation and lessen the overall time limitations. If the AI-enabled systems outperform human capabilities in such crucial tasks, it may lead to engagement of states in shortening decision-making to respond to adversary's actions. As a result, such a scenario can instigate or intensify crises, leading to war. Additionally, the GenAI incorporation in decision-making can result in the risk of generating erroneous information which can steer decision-makers to inaccurate decisions. Thus, it can be misleading in an inscrutable and erratic way.

Additionally, the wide range assistance of GenAI such as generating new content, text, audio, images, or video can be used for conducting disinformation and misinformation campaigns against adversarial and competitive networks. Hence, it can be used strategically to erode the politico-military cohesion within

an adversary's leadership, influence its decisions, and disrupt its alliance network. The information dissemination would largely be altered and impacted with GenAI use in the military. This would shift the operational domain of war more towards info-operations. It would have both, defense and offense application.

3.2. Unscrewed/Unmanned Autonomous Systems (UASs)

The autonomy of uncrewed systems, commonly known as drone technology, is another instance of military application of AI which has already been relied upon by US, China, Russia, Ukraine and other states like Azerbaijan. The term `robotic` is employed to signify the capability of executing their missions with minimal human input. The emergence of advanced robots in the military field has presented an increased risk of premeditated, unintentional, or accidental escalation, in particular during the period of crisis. Currently, the US and China are increasingly engaged in developing such Al-enabled systems which includes the aircraft, submersibles, and the most advanced systems such as swarms of small robots known as swarm technology. The Gen AI models are used for stimulation of various military scenarios, with careful consideration of the terrain, weather, the presence of adversaries and their potential targeting. Also, accurate information helps military leaders and strategic decision makers to recognize the optimal tactics and actions with concentrated output. It presents the predictions and insights about the possible actions of adversary, thus helping decision makers and planners to make preparations for a range of possibilities.

3.3. Intelligence, Surveillance, and Reconnaissance (ISR)

Militaries across the globe are engaged in efforts to enhance their capabilities in critical areas such as intelligence, surveillance, and reconnaissance (ISR) capabilities. In the military field, aligning existing technologies provides opportunities for achieving new tasks and enhancing efficiency that too at a lower cost. For instance, the fusion of AI with space balloons or micro-satellite constellations for surveillance in *near space* and the use of swarming of ISR drones. There may be an increased risk of escalation without well established and robust norms and governance systems. For instance, challenges arose when a high-altitude aircraft and satellite ISR was introduced during the 1950s, and 1960s, despite the US efforts to promote understanding and make negotiations on these developments with the former USSR. It was merely during the last years of the Cold-War that Washington redefined the concept of international agreement on mechanism of aerial reconnaissance, culminating in the adoption of the Open Skies treaty (1992) [12].

The developments of AI and its incorporation in the military field can lead to the introduction of capabilities that bring a shift in the fundamental aspects of the military-technological landscape. The alignment of AI systems, especially when brought into line with the emerging technologies such quantum sensors, could help in facilitating large amounts of data processing from diverse points. Furthermore, there has been an increase in cyber-attacks and cyber threats across the globe with potential threats to critical military infrastructure. Gen AI has the capability to recognize cyber vulnerabilities to assist bolster cybersecurity of critical military infrastructure such as Command, Control, Communications, Computers, Information and Intelligence, Surveillance and Reconnaissance (C4I2SR).

Even though most of the above-mentioned AI applications in the military field might be theoretical yet, it could be conceivable in the near future given the efforts of countries for employing GenAI for military modernization, especially the US and China which are the leading countries in technological domain. These advancements and their integration in the military field can lead to fundamental shifts in military strategies in the era of AI.

3.4. Equipment Maintenance and Upgradation

Many of the military's successful operations depend on backstage management and planning which involves the efficacy of equipment. For instance, ensuring military equipment performance is crucial for the success of missions and tasks. Without well-maintained equipment, strategic and technological advantages cannot be realized, and systems begin to break down or lose their efficiency. GenAI would help in predictive maintenance while providing accurate information to the personnel for its upgradation. This predictive maintenance is the art to using heavy amount of data to assess and address the potential issues prior of causing breakdowns in operations, processes, services, or systems. Availability of robust predictive maintenance tools would make any military maintain and upgrade its weapon systems and avoid potential breakdowns and interruptions.

4.The Race of Technological Supremacy between the US and China

Given the significant opportunities AI has presented in the military field, major powers deem AI a key component of their military strategies. With an extensive role and its capability to influence the domain of warfare, AI is emerging as another domain of competition for military superiority. It has become a battlefield between the US and China which are engaged in efforts for technological edge. The two powers have declared it key to achieving their strategic objectives. They are engaged in efforts to promote AI development and gain technological advantage. In this context, Gen AI has emerged as another domain of strategic competition between Washington and Beijing.

China has a calculated and understanding approach in pursuance of all military technologies given its primary objective economic expansion. Given China's national strategy of Military-Civil Fusion (MCF),[13] which aims to ensure that innovations in civilian research and commercial sectors promote China's military as well as economic objectives, intensifies competition with the US [14]. Washington and Beijing are taking steps to utilize the opportunities presented by Gen AI. At present, the US and China have made remarkable progress in the technological domain and achieved significant strides in Al technology. The US and China are now aligning AI technology into their military capabilities, thus shaping the conduct of modern warfare. In addition, the two powers, while recognizing the crucial role of AI-enabled systems, are making efforts to integrate the AI-enabled systems such as intelligent and autonomous vehicles into their military capabilities. Recent years have seen an increased focus and massive investment by these two global powers in the field of AI technology [15].

In 2007, the US Defense Advanced Research Projects Agency (DARPA) launched its "Deep Green Project" aimed at assisting the US army commanders. The purpose was to assist the military commanders in decision-making through predictions about scenarios and analyzing the contemporary situation [16]. In addition, the US initiated the Third Offset Strategy in 2014 that also aimed to enhance the US supremacy in the technology domain. The strategy recognized the crucial role of AI for achieving the goal of achieving technological primacy, predominantly centering on robotics and autonomy [17]. Being the leading country in AI technology, the US has already initiated the technology's integration in its military capabilities. The US Office of Science and Technology Policy (OSTP) released two reports in 2016, titled as Preparing for the Future of Artificial Intelligence and Networking and Information Technology Research and Development Subcommittee to bolster the development and research of AI [13].

The US National Security Strategy (NSS) Report, in 2017, stated that 'the United States will prioritize emerging technologies which are critical to economic growth and security, such as data science, encryption, autonomy, gene editing, inclusion of new materials, nanotechnology, advanced computing technologies, and artificial intelligence.'[19] In addition, the US DoD, in June 2018, announced to establish the Joint Artificial Intelligence Center (JAIC), responsible for implementing the operational field capabilities. More recently, the US DoD established the GenAI Task Force (LIMA) that aims to explore GenAI's capability in enhancing national security alongside innovation in the defense and security sector. It will enable the US to analyze the position of other states in the realm of GenAI and also its own framework to adopt Gen AI in its defense sector as the pioneer.[20] In the meantime, tens of billions of dollars are being poured into the American AI ecosystem by venture capital firms. In the year 2022, over $14 billion has been invested in American AI companies.[21] Congress and the Biden administration have increased the capacity of US' semiconductor manufacturing and drawn in over $200 billion in private capital expenditures for semiconductor manufacture through the Chips and Science Act- related efforts. The US continues to pursue its leading role in acquisition and use of the latest technology.

China's investment in AI technologies and its application in the military domain are motivated by the global trend in military technology as well as its competition with the US [22] China emphasizes the role of AI in international competition as it compliments its economic and soft power expansion. China is employing AI technology not only for domestic surveillance but also intends to overtake the US and western AI research and development by 2025 and plans to become leader in AI domain by year 2030 [23]. In order to achieve these objectives, China is investing massive amount in AI research and development lying the intellectual groundwork for a generational edge in this field. In 2017, the state council of China released a document *A New Generation Artificial Intelligence Development Plan*, reflecting the country`s aspiration for developing AI technologies and applications by 2030.[24] China is successfully narrowing the gap with the US in the field of AI technology. It is developing the unmanned military systems and has

significantly explored the air, ground, surface, and undersea autonomous unmanned vehicles (AUV). For instance, in case of air AUVs, China has achieved incredible progress, specifically when it comes to the development of swarm drone's capability. In 2017, China reached new heights, setting latest record of operating a swarm of 119 drones and breaking the record of 103 drones by the US. Each drone was well-equipped with communication system capable of drone to drone coordination. From facial recognition, to fintech to drones and 5G, China is quickly moving ahead. The Chinese military and defense industry are investing immensely in robotics, swarming and autonomous weapons systems and AI-enabled weaponry systems.

In employing GenAI, military scientists in China are purportedly offering the training facility to whole Military Artificial Intelligence (MAI) with a ChatGPT-like application to make it capable of predicting what potential its adversaries can. To achieve this goal, the People's Liberation Army's (PLA) Strategic Support Force, reportedly took Baidu's Ernie and iFlyTek's Spark on board. These are basically the large language models (LLM) alike OpenAI and precisely the ChatGPT.[25] China has taken up Interim Measures for the Management of Generative Artificial Intelligence Services under the ambit of Cyberspace Administration of China with six other regulators.[26] This is one positive development to monitor, regulate and control the use of GenAI in military. The Interim Measures regulate the provision of generative AI services in China and have been substantially amended from the Draft Measures.

On the other hand, Russian President Vladimir Putin, in 2017, stated that the country that leads in AI will rule the globe. Since 2022, the Russian military is said to have utilized AI-based drones in their recent invasion of Ukraine and subsequent attacks. Considering the US and China's focus on GenAI, Russia will definitely follow in their footsteps.

5. Major Implications of Using GenAI for Military Purposes

GenAI's technical complexity presents serious implementation issues when it comes to military and security mechanisms. Adopting and utilizing it in the military requires both, technical expertise and resources (economic and technological). This may cause limitations for organizations and governments with nascent and limited capabilities or budgetary constraints, specifically smaller militaries. Second, like AI and cyber, GenAI also faces concerns over data privacy/security and ethical boundaries in cross border operations. This creates high risk for militaries having critical infrastructure and sensitive weapon systems which require strict control over accidents and miscalculations for e.g., militaries with nuclear weapons. Third, GenAI systems access the large stocks of personal information and data. Ensuring the secrecy and limiting the access is vital to prevent unauthorized or misuse that could lead to legal and ethical risks. These factors make it crucial to understand the technology before its implementation.

Standard existing military regulations may not support the regulation and governing of GenAI due to its distinct nature of operation and range of applications. Use of GenAI needs a legal internationally accepted framework that comply with ethical boundaries and prevent the escalation of conflict or low-scale battle. There is a need to go step by step. First, it is necessary to develop individual government policies on AI & GenAI and an international legal framework with consensus to ensure transparency.

6. Lessons for South Asia

South Asia remains a sensitive and crucial theater of bilateral rivalry between India and Pakistan with strategic competition between the US and China. Since pivot to Asia and containment of China policies, the region has become more sensitive with the existence of India as a counterweight to China. Resurgence of Russia remains another challenge in the backyard. That is why any intensified military competition or modernization is to be assessed in the lens of South Asian dynamics. There exists an ever-growing competition of acquisition of emerging military technologies and weapon systems to address the threats emerging from the offender. Some lessons as whole and for the South Asia are:

1- There is a need to create a general understanding and learning of GenAI's use and potential applications. There need to define its scope and necessary regulatory mechanisms.
2- It is the responsibility of US and China (states leading the exploration of GenAI) to establish joint task force while taking the international stakeholders on board to study the implementation, merits and limitations of GenAI tools for military purposes and draft an international legal-binding for it for the

states aspiring for the same. The task force must focus R&D for GenAI tools and their operations within the ethical and legal constraints.

3- One crucial aspect is to control and limit the integration and entanglement of such multi-faceted technology with the systems of Command and Control of sophisticated and crucial weapons systems like nuclear weapons. India, being an offensive and irresponsible nuclear weapon state has a history of loose ends and provocative actions. US and other stakeholders must understand that India's uncontrolled pursuance of military power and hegemony is creating more space for miscalculations, accidental and suicidal incidents, posing risks for the region. India's military policies and doctrines are offense-driven and warmongering, as evident from recent past. For India, acquisition of such technologies is less for R&D and collaboration purposes while more for conducting offensive operations and campaigns against its rivals Pakistan and China. Considering GenAI's military applications, India is needed to get under international obligation and legal binding to prevent another arms race and escalation in the region.

4- Inducting the right people for the right job is a necessity. Inducting and taking on board the graduates and experts in Robotics, IT, Software engineering & Computer Science in the security and defense industry is a must. Similarly, training of technical staff of armed forces in Large Language Models (LLM) and machine learning (ML) is mandatory in order to safe-handle the technology and prevent accidental use and malfunction.

Development of simulation centers for GenAI assisted military operations and tasks where simulation exercises could take place would be one of the best applications of GenAI in the military.

7. Conclusion

Once a technology is industrialized, there is no way for the markets to stay behind in acquiring it. AI and related technologies are the future and a necessary evil for the existing modern world. For the past 4-5 years, GenAI has taken over the debate on innovation and efficacy of multiple commercial and now military industries. Use of GenAI is a breakthrough for the military and defense sector and could be taken advantage of in improving the technology in terms of preventing accidental wars with enhanced precision in decision-making at all levels: strategic, operational and tactical. It is predominantly affecting the information domain, decision-making, ISR capabilities and introducing the phenomenon of advanced uncrewed aerial vehicles. Consequently, its complexity and technical requirements make it a sensitive technology with unprecedented challenges. With the current pace of integration of AI and GenAI, modern militaries are evident to be more unmanned and unpredictable. Robotic wars would be more lethal. Where major powers like US and China have already created a dedicated GenAI task force and are using LLMs and quantum mechanics, it generates an urge in other competing powers too, to acquire, use and abuse the technology as usual. GenAI needs expert handling as any other crucial system. The US and China are engaged in an intensified strategic competition in the arena of emerging technologies -now the GenAI- which is crucial to the future of warfare and modern military capabilities and makes it a necessity to develop an international framework of control measures. Following the course, India is likely to get into the race soon. This makes South Asia a theater of race in GenAI along with already existing challenges of outer space weaponization and issues related to other emerging military technologies (Cyber, advanced drones, hypersonic systems, quantum computing).

Lack of AI governance and a consensus-based internal regulatory body is already an existing challenge. Integration of such technologies (with uncontrollable aspects, speed and capacity of overriding human intelligence) with Lethal conventional weapon systems and risk of entanglement with nuclear weapons, must be taken in careful consideration to avoid misuse and any accidental scenario. GenAI needs to be assessed carefully for its potential merits and demerits and must only be used as enabling technology for purposes like predictive maintenance, simulation and effective decision-making with minimum error.

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