Artificial Intelligence: Challenges & Opportunities for Employment in Armed Forces

Prof. Navin Varma
Department of Defence Studies
Meerut College, Meerut

Maj. Gen. Piyush Gupta (Retd.)*
Department of Defence Studies
Meerut College, Meerut
Email: maj_piyushgupta@yahoo.com

Abstract

The technological landscape is evolving very rapidly with artificial intelligence (AI) emerging as a key technology at the center stage. All militaries are facing reckoning with the evolution of AI. Indian armed forces are at nascent stage as far as usage, employment and integration of AI with existing weapons and other systems are concerned. AI not only poses challenges but also creates new opportunities. Adaptation of AI would not only improve military efficiency but will be a revolutionary step towards modernizing the Indian military. There are number of systems employed during operations thus AI applications will be able to enhance performance and synergy of weapon systems. This would be a paradigm shift as it will open up new diverse fields of recruitment and assignments such as AI skilled engineering, analysts and for maintenance of systems. There is fear that automation may lead to loss of jobs like in IT or manufacturing industries but in armed forces after recent optimization, it is unlikely there would be any further cut in manpower. There is a likelihood of some of the traditional military jobs may be reassigned to personnel with higher technical proficiency and specialisation. After recent government initiatives the private defence manufacturing industries are on the upswing and employ large number of personnel at all levels. Next generation weapon & systems would be with AI and would require personnel with cutting edge technologies including AI. Personnel with new technical skills and expertise in AI will be high demand in large number of diverse fields in private industries as well as Defence Public Sector Units. Therefore, AI not only poses challenges but also creates new opportunities and would be an enabler instead of disputer for employment and skill upgradation.

Prof. Navin Varma, Maj. Gen. Piyush Gupta

"To succeed in this new world; we need to be more creative, more curious and embrace life-long learning". Ariana Huffington.

A nation's political influence has always corelated to its strategic might and military capabilities[1]. At the same time a pre-requisite for any country to grow is security and tranquility on its borders. The current geo-political and strategic situation around the world has been chaotic with wars continuing and ongoing conflicts at some places for a fairly long time impacting and shaping the current events. Events surprise and have a habit of unpredictability. The first world war was started by a single shot fired in Sarajevo in June 1914[2]. Who could predict Doklam? clashes in Galwan? and incident like Pulwama? Which would bring two nations to the brink. Clausewitz said war is the only true chameleon because it changes its nature in some degree in each particular case[3]. Clausewitz also said that "***War is a mere continuation of policy by other means***"[4]. Therefore, war is not merely a political act, but also a real political instrument, a continuation of political commerce, carrying out of the same by other means. The issue of other means has been briefly touched upon by Henry Kissinger in his book Diplomacy, he writes – "In the Cold War, the traditional concepts of power had substantially broken down. Most of the history has displayed a synthesis of military, political, and economic strength, which in general has proved to be symmetrical". Today, wars are not restricted to armed forces only but are fought in multi domain which necessitate whole of nation approach. India faces hostile neighbours on its borders. On northern front India faces adversary's forces equipped with niche technologies.

Armed forces and technology are intertwined and no other factor has impacted the conduct of warfare over the centuries than technology. The nature of warfare continuously undergoes metamorphosis mainly due to the advancement in weapons and technology which compels the armies to evolve and readjust their warfighting strategies and tactics. Newer technologies whenever unleashed during hostilities have surprised the enemy and lead to capitulation. Frank Whittle said "A nation's ability to fight a modern war is as good as its technological ability". Innovations in computers and communications are at the center stage leading the technological revolution. War today is fought not only at the frontlines but also well to the hinter land simultaneously. Warfare in non-kinetic domains such as Cyber,

Electronic Warfare, Command, Control, Computer and Communication, Intelligence & Surveillance (C4ISR), Information Warfare which includes perception management and Network Centric Warfare have assumed equal importance. Our civil networks of various systems like railways, electricity grid or networks of government institutions and departments are under cyber-attack almost every day. During 2021 ten power generating plants along with Mumbai and Tamil Nadu ports came under a coordinated cyber-attack[5]. Cyber-attacks if successful on power grid can cause shut down as in Argentina[6].

In warfare there are three operational factors: space, time and force. The technological advancements have displaced space & time. William Lind has described conflict "…as time competitive, action cycle which is termed as Boyd Cycle or Observe, Orient, Decide, Act (OODA) loop[7]". Therefore, the increased transparency and flow of the information will compel the commanders to go through Boyd's cycle faster to gain tactical and strategic advantage over the enemy. Armed forces equipped with better and faster computing systems will be able to go through OODA loop faster impacting the outcome of the battles. New systems would be required to keep pace with the developments to ensure commanders are able to absorb the vast amount of data. Revolution in Military Affairs (RMA) happened long ago but AI is next generation RMA which will alter the nature of warfare. Drones have already altered many equations and swarms can and will pose potent threat to existing systems and warfighting. China has been focusing on developing cutting edge technologies across wide spectrum including military capabilities based on artificial intelligence (AI). The emergence of AI especially in the armed forces would be a transformative revolutionary step. According one estimate 80 per cent of emerging technologies will be based on AI[8] therefore, AI qualified industry specific specialists will be in high demand.

The forces are engaged from strategic employment of forces, conflicts such as insurgencies, internal security, during cyclones, floods, avalanches to logistics, training, health care, veterans' management post-retirement. The armed forces undertake myriad tasks unlike industries which engages in production of one or similar type of products. The inventory of weapon and other supporting systems is not only diverse but also very large which requires specialists to man, maintain and repair. To understand the diversity and range, Indian army is equipped with a small pistol to artillery gun, missiles of five kilometers to thousands of kilometers and from battle field surveillance radar of five kilometers to air defence radars of hundreds

of kilometers. According to a report, Ministry of Defence in India is the biggest employer with 2.92 million people which includes active service personnel, reservists and civilian staff[9].

The canvas of personnel employed in the armed forces is very wide with engineers and technicians from computers, electronics, electrical, mechanical, automobile, information technology, communication and civil field engaged in multifarious activities to support the operations. Therefore, AI has number of uses which would act as a catalyst for employment generation. AI application would be mandatory in almost all areas permitting security in times to come. Personnel who could combine traditional military knowledge with AI will be force multiplier and would be in a niche area of employment. There will be demand for the professionals to develop AI based systems for defence applications. Some of the areas which would need professionals are discussed in subsequent paragraphs.

AI can assist military intelligent analysts in processing vast amounts of intelligence data thus generating insights, and making better informed decisions. This creates demand for professionals skilled in AI powered decision support systems. Thousands of radios and other electro-magnetic emitters are employed by the armed forces during the wars. AI can optimize the use of electromagnetic spectrum to avoid interference and enhance communication security. As robots, drones and AI powered weapon systems are going to be reality, there will be an increased need for specialized personnel to develop, maintain and repair these systems.

Indian army runs thousands of training programs for various personnel of all ranks. AI could be used to make these programs more insightful and would help in imparting training. At the same time the armed forces will also require skill upgradation of the personnel involved in the operation of these AI based systems. A next big thing in the army in the simulation to save costs of field training. Simulation combined with AI will not only save costs but will also make training more interesting and efficient thus enhancing learning levels. AI can be used to develop more sophisticated learning programs. Personnel would be required to train and guide the army instructors for their usage and day to day maintenance guidance. A well synchronized logistic system is the back bone of all armed forces. All militaries require humongous amounts of supplies of equipment, spares, stores and rations which are stored at many places for operational and security reasons. These depots are of different levels and store all kind of equipment which translates to a very

large inventory. AI could revolutionise the supply management with predictive automated deliveries. In future military equipment may be embedded with sensors due to which AI could facilitate the predictive maintenance of the complex systems such a tanks, large ships, electronic systems, and other equipment[10]. The diagnosis of the faults would also ensure mean time between repair to reduce considerably. It would mean personnel with knowledge of military logistics combined with AI would be required to ensure uninterrupted supply chains across length and breadth of the country. Another niche area where militaries would need expertise is robotics which would open new opportunities in the evolving technological developments.

AI can help in development of autonomous weapon systems. Modern armies are pursuing precision and with AI the autonomous weapon systems would be able to engage with precision thus avoiding costly mistakes and human misery. Drones controlled and coordinated by AI will be able to carry out complex and multiple missions faster. The AI adapted drones would be more efficient in surveillance, reconnaissance, and for targeting enemy at multiple locations simultaneously. If digital usage increases so will be the vulnerabilities of our systems. Cyber threats are evolving and manifests in newer and different ways. AI powered systems would not only be able to monitor, detect, prevent developing threats but would also be used to carry out offensive cyber operations by targeting enemy systems. Therefore, the armed forces would need more of cyber security experts to deny and protect our systems.

The resources used in intelligence, surveillance and reconnaissance range from humans, aircrafts, vehicles including drones, sensors and satellites. All these activities produce large number of reports, imagery, photographs and videos, which amount to very large amount of data. These resources when combined with AI will enhance its operational efficiency and would ensure greater surveillance[11]. There would be demand for data analysts, satellite imagery and video analysts of satellite and drone footage to synthesize and evolve an intelligence picture. It would make faster, efficient and make it real time especially related to enemy movements. It would also help in predictive analysis of enemy like courses of action and likely potential future threats by analysing the past data with real time inputs.

At heart of any decision support system is Command Information decision support system and integrated battlefield management by integrating data from multiple sources to evolve a coherent picture of the battlefield thus helping commanders to make informed decisions. AI when combined with other systems

will be able to process very large amount of data in a very short period of time for the decision support systems. It would provide real time analysis and recommendations to the field commanders to arrive at the decision. However, the challenge is that AI needs extremely large amount of data base which would pertain to enemy weapons, systems and stores for analysis and recognition. Another issue pertaining to AI is the high development and maintenance cost, and requires regular updates which adds to the cost.

All nations endeavour to equip its armed forces with war fighting equipment of advance technologies to maintain dominance over adversaries. The ever-increasing list of number of approvals by Defence Acquisition Council of Ministry of Defence (MoD) for ships, aircrafts or land systems is a pointer towards the same. Indian defence expenditure of Rs 68,1210 crore, equivalent to US $ 77.4 billion is fourth largest in the world[12]. India's defence needs were fulfilled by erstwhile Defence Public Sector Units and imports. The government of India has embarked upon 'Make in India' to ensure self-reliant in defence requirements. Department of defence production has published five positive indigenization list of sub systems/assemblies/sub-assemblies/ components for indigenization[13]. Defence industry is now open to private enterprise. Ministry of Defence has issued 606 industrial licenses to 369 companies operating in defence manufacturing sector[14]. Indian army has established Army Design Bureau as an interface between the industry and the Army for a comprehensive understanding of user requirements.

India's defence exports rose to Rs 21083 crore out of which approximately sixty per cent is by private industries[15]. The government has set export target of Rs 50,000 crore in next five years[16]. Government had earmarked Rs one lakh crore for 'Deep Tech' to encourage innovative solutions for the defence needs[17]. The defence industry is growing at a rapid pace with two defence industrial corridors in Uttar Pradesh and Tamil Nadu. Hundreds of private industries of all size and kind are engaged in fulfilling the need of armed forces. There are 194 startups, more than 350 major manufacturers and 10,000 MSME in defence sector[18]. India is set to spend $138 bn on defence modernisation over decade according to a 'India Defence' report of Nomura which would act as a catalyst for employment generation[19]. The private industries engaged in defence manufacturing are already employing thousands of people. The vast potential of defence orders will act as a fuel for private defence industry for employment generation[20].

Mark Zuckerberg had predicted that by 2025 AI will be able to do coding of mid-level engineers[21]. However, as far as India is concerned it is still at least a decade away from such a situation[22] of large-scale jobs replacement by AI. According to the MIT study AI cannot replace majority of occupations in a cost-effective manner as of now[23]. Automation doesn't mean being devoid of humans because a balance is always needed. It is not the technology but the right way to exploit and embrace that gives multiplier and exponential affect. In the military it is always the man behind the machine therefore, technological innovations cannot be panacea for successful war fighting. It is the integration of man and the machine that leads to success and mission accomplishment. Therefore, personnel with expertise ensures the weapons and systems are exploited to the fullest and put to best use. AI would complement the human capabilities rather than replacing them.

References:

1. Kissinger H, Schmidt E, Hutten Locher D, (2021) John Murray Publisher.
2. Clark C, (2013), First Shot of world war I, https://www.historynet.com?first-shot-started-world-war-1/
3. Clausewitz C, (2013) Natraj Publishers.
4. http://www.clausewitz.com/readings/OnWar1873/BK1ch01.html para 24.
5. Dutta S, 10 Power assets, Mumbai, Tamil Nadu ports came under Red Echo cyberattack, Times of India, Mar 5, 2021.
6. Singh V, (2025) India's assertiveness in widening spectrum of modern warfare, Issue Brief, No 422, CLAWS.
7. Lind, W, (2005) Maneuver Warfare Handbook, Natraj Publishers.
8. Stanford, CT, (2023, October 11). Gartner Says More Than 80% of Enterprises Will Have Used Generative AI APIs or Deployed Generative AI-Enabled Applications by 2026. https:// gartner.com/en/newsroom/press-release.
9. Statista:(2022, Oct 29). With 2.92 million people, Indian defence ministry is world's biggest employer: Report India News - Times of India, https:// timesofindia.indiatimes.com
10. Tuli, M, Col, (2024) AI and the potential to create digital twins to transform military logistics, CLAWS
11. Mallick, PK, Major General, (2018) AI in armed forces: an analysis, CLAWS.

12. Hooda, DS, Lt Gen. (2025, February 12). https:// www.delhipolicygroup.org

13. 5th Positive Indigenisation list. https://www.mod.gov.in

14. https://www.ibef.org/industry/defence-manufacturing

15. Ibid.

16. Ibid.

17. Ibid.

18. https://www.investindia.gov.in

19. 2024, May 11. India's defence sector has opportunities for $ 138 billion over next ten years. https://economictimes.indiatimes.com.

20. Jayakumar, PB, (2025, March 3) India's defence sector is transforming as the private sector storms in, driving modernisation. https:// www.fortuneindia.com

21. Zuckerberg M, (2025, Jan 17), Mark Zuckerberg predicts AI might replace mid-level engineers in 2025 and completely reshape coding. https:// wccftech.com

22. https://analyticsindiamag.com/global-tech/ai-to replace-engineers by 2025-but-not-in-india/

23. Mohmad P, (2024, Jan 3). AI too costly to replace jobs: MIT study. https www.analyticsinsight.net