

Artificial Intelligence and the Accelerating Tempo of War

By John Antal

A Statement by Colonel John Antal, US Army (Ret.), military analyst and best selling author of *7 Seconds to Die: A Military Analysis of the Second Nagorno-Karabakh War and the Future of Warfighting* (Casemate, 2022) and *Next War: Reimagining How We Fight* (Casemate, 2023) for the US Senate AI 'Insight Forum,' on December 6, 2023.

Four recent conflicts, two that are on-going as of this report, demonstrate the future of warfare: the Second Nagorno-Karabakh War (2020); the Israel– Hamas War (Operation Guardian of the Walls 2021); and the Russia–Ukraine War (2022–), and the current Israel-Iran-Proxies War (2023). The first was primarily won by robotic systems; the second by Artificial Intelligence (AI); the third war is the largest conflict in Europe since 1945 and the most innovative war in history. The current war in the Middle East is a further example that reinforces the power of the military application of AI.

From a deep study of these recent wars, I have developed a list of top disrupters that are changing the methods of warfare. These disrupters are the transparent battlespace; the first strike advantage; artificial intelligence and the accelerating tempo of war; top attack; the shift from semi-autonomous to fully autonomous weapons; super swarms; the transition from a kill chain to a kill web; the ability of commanders to visualize the battlespace; and decision dominance. These are the essential elements of the next war, and of these, AI is the agent accelerating everything.

In the current war in the Middle East, AI plays a central role how the Israel Defense Force (IDF) wages war. As Hamas launches rockets at Israeli cities and towns, most of these are knocked out of the sky by the AI-enabled Israeli Iron Dome anti-missile rocket system. AI makes the Iron Dome a success. The Israeli anti-missile defense is impressive but, to end the war, the IDF has to take the fight to the enemy and that is what is underway today. Hamas terrorists are hiding among the people and Israel's dilemma is to separate combatants from non-combatants in a dense urban battlespace. The IDF is using an AI-based system called Habsora (the Gospel, in English) to synchronize sensors, targets, and effects at phenomenal speed. IDF sensors have collected years of data on their enemies from all sources, centralized this information into a multidomain sensor database that is continuously updated. This information, accessed in real-time, is used to generate multidomain targeting information. Sensors input data continuously and in real-time to update a common operational picture that provided the IDF with a nearly transparent view of their opponents. The IDF also uses AI-enabled drone swarms for sensing and striking. This AI generates a super-fast kill chain that enables the IDF to eliminate terrorists and destroy Hamas rocket launchers while minimizing civilian casualties within the city of Gaza. This is the beginning of a true Kill Web (an AI-enabled Kill Chain).

In the ongoing War in Ukraine, humans control most of the current generation of Unmanned Aerial Systems (UAS) and loitering munitions via a data-transmission link, but very soon automated and artificial-intelligence systems will replace the need for a human operator. The role of the operator is shifting from controlling the system to commanding the system. Commanding the system will entail activating it to fly and strike targets inside a designated strike zone according to preset targeting priorities. The system will automatically execute its pre-

programmed mission, but a human may still be in the loop to intervene and call off, or switch, the point of attack. This shift from “control” to “command” will become possible as drone manufacturers create smarter systems. The Elbit Systems Skystriker, for instance, is a fully autonomous loitering munition that can locate, acquire, and strike operator-designated targets on its own. If desired, systems like these could hunt with minimal human interaction inside a designated battlespace. Western nations are keen to keep a human in the loop, but Russia and China may not be so reluctant to remove this aspect. This is the beginning of the development of a AI-enabled Super Swarm.

The US military is at an historic turning point. Technological convergence, in the synergy of micro-miniaturization, computing power, robotics, and sensors, is altering the methods of war. Of these, artificial intelligence (AI) is speeding up this paradigm shift. Our AI today is still “narrow,” and simple, but it enables a wide array of smart, autonomous weapons that swim, drive, and fly throughout the battlespace.

AI and the Tempo of War

The tempo of war is hyper-accelerating with every advance in AI. Tempo is the “relative speed and rhythm of military operations over time with respect to the enemy.”¹ Tempo “implies the ability to understand, decide, act, assess, and adapt ... A rapid tempo can overwhelm an enemy force’s ability to counter friendly actions, and it can enable friendly forces to exploit a short window of opportunity.” In ancient times, the tempo of operations moved at the speed of human and animal muscle power. Advances in technology increased tempo over the centuries. During World War II, the speed of the internal-combustion engine and the radio framed the tempo of operations. The pace of decision making also affected tempo as commanders could issue orders in person, by messenger, then by telegraph, and radio. Today, tempo occurs at electronic speeds as commanders issue orders using digital systems and, as evidenced in Operation Guardian of the Walls, when the Israelis decided and acted in real time, enabled by AI. To meet the demands of tempo, military leaders must have the mental agility to plan, prepare, and execute operations to set the conditions for success and adapt rapidly when changes are required. As war grows more complex, commanders need the help of AI to understand the battlespace and decide in real-time.

AI is the means by which humans program machines to accomplish tasks. Encyclopedia Britannica defines AI as “the ability of a computer or a robot controlled by a computer to do tasks that are usually done by humans because they require human intelligence and discernment. Although there is no AI that can perform the wide variety of tasks an ordinary human can, some AI can match humans in specific tasks. There are three general categories of AI: Artificial Narrow Intelligence (ANI), Artificial General Intelligence (AGI), and Artificial Super Intelligence (ASI).

ANI, or weak AI, is what we use today in our smart and intelligent systems. ANI is merely the application of computer code to sort, prioritize, and label information. We use ANI in modern military systems for a myriad of tasks including intelligence, surveillance, and reconnaissance,

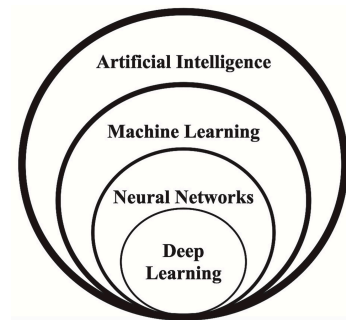
¹ US Army, Field Manual 3-0, Operations (Washington D.C.: Headquarters Department of the Army, 2022), 3-3.

targeting, early warning, logistics, command and control, and to operate robotic systems. ANI can take care of the dull and dangerous work of war to change data into useful warfighting information and remove humans from dangerous tasks. For the rest of this report, ANI will simply be called AI.

AGI is another matter. We do not have AGI today, but we are getting very close. AGI is the hypothetical ability of a computer to operate at the cognitive level of a human mind. There is much debate in the scientific computer world on the possibility and wisdom of creating AGI. When you think AGI, you are edging toward “Terminator”-like abilities, from the classic 1984 movie of the same name. No nation has yet produced AGI, but many are working to develop it. The development of AGI will be the most monumental event in human history.

Artificial Super Intelligence (ASI), the third category of AI, where AGIs combine to create their successor and is a transcendent capability.

The AI that we have today has three subsets: machine learning (ML), neural networks, and deep learning (DL). ML is the science of applying AI to provide machines with data and then allowing them to learn for themselves. A neural network is a subset of ML and is defined as a “series of algorithms that endeavors to recognize underlying relationships in a set of data through a process that mimics the way the human brain operates.”² You must have a neural network to generate DL. Microsoft defines DL as: ... a type of machine learning that uses artificial neural networks to enable digital systems to learn and make decisions based on unstructured, unlabeled data. In general, machine learning trains AI systems to learn from acquired experiences with data, recognize patterns, make recommendations, and adapt. With DL in particular, instead of just responding to sets of rules, digital systems build knowledge from examples and then use that knowledge to react, behave, and perform like humans.



Machine learning (ML), neural networks, and deep learning (DL) are the three main subgroups of artificial intelligence (AI). (Author's image)

AI is changing the way we live, work, and fight. AI can intelligently sort through large amounts of data to discover optimal targeting parameters much faster than any human. As a result, advances in AI, ML, neural networks, and DL are creating new military capabilities that are disrupting the methods of warfare. An everyday example of AI is the generative AI app ChatGPT (Chat Generative Pre-trained Transformer). Available for free on the internet, ChatGPT is a complex machine-learning model, developed by OpenAI. Generative AI is “a broad label that’s used to describe any type of artificial intelligence (AI) that can create new text, images, video, audio, code or synthetic data.”³ I asked ChatGPT the following question: “How is China using AI for its military?”

² James Chen, “What Is a Neural Network?” Investopedia, September 21, 2022, at <https://www.investopedia.com/terms/n/neuralnetwork.asp>.

³ Margaret Rouse, “Definition of Generative AI,” Technopedia, February 1, 2023, at <https://www.techopedia.com/definition/34633/generative-ai>.

Here is the detailed answer generated by ChatGPT: China has been investing heavily in AI technology for its military in recent years, with the aim of creating a world-class military that can compete with other major powers. Here are some ways in which China is using AI for its military: 1. Autonomous Weapons: China is investing in developing autonomous weapons, such as unmanned aerial vehicles (UAVs) and ground-based robots, that can operate without human intervention. These weapons are equipped with AI algorithms that allow them to analyze data and make decisions in real-time. 2. Command and Control: China is using AI to improve its command and control systems, which allow commanders to make better decisions on the battlefield. These systems use AI algorithms to analyze large amounts of data and provide real-time recommendations to commanders. 3. Cybersecurity: China is using AI to enhance its cybersecurity capabilities. AI algorithms are used to monitor network traffic.

As you can see, this is an impressive answer for a weak AI language program. ChatGPT created this answer in less than a minute. Imagine how improved versions of applications like ChatGPT will allow us to talk with our machines and will aid military decision makers in the years to come.

The Race Goes to the Swift

Time is essential in war. Winning time wins battle. Observing and acting too late is a sure recipe for defeat. Admiral Lord Nelson, the victor of the epic naval battle of Trafalgar on October 21, 1805, that established British naval supremacy for more than a century, once said, "Time is everything; five minutes make the difference between victory and defeat." Today we calculate this margin in seconds and nanoseconds. A case in point is what Operation Guardian of the Walls achieved in 2021 and the current fighting in Gaza. Speeding up the ability to sort, prioritize, recognize patterns, and act on this accumulated information in seconds, rather than hours, makes AI an essential tool of modern warfare. As we connect more military systems in AI-enabled networks where weapons systems transmit and share information, AI will sort through thousands of data points, correlating their significance, recognizing the patterns, and providing battle commanders with actionable courses of action. The military that uses AI to synchronize multidomain kinetic and non-kinetic effects at machine speeds will gain a significant advantage over those who do not. This is the essence of war in the 21st century.

Data is now a weapon. Turning data into information and leveraging information at scale in near real-time requires robust AI. Connecting AI with networked weapons will accelerate the orient, observe, decide, and act loop, and generate speed in decision making and execution. The goal is for AI to think and act faster than any adversary. AI can synchronize the effects of loitering munitions, long-range precision fires, sensors, and a host of robotic vehicles. AI is the greatest disrupter of our time and will have a dramatic effect on the conduct of war.

The US military has not faced a peer in combat since World War II. Although it faced a peer enemy in Soviet Russia during the 54 years of the Cold War, the US was not put to the ultimate test. During World War II, the greatest technological race was to develop the atomic bomb. The challenge we face with AI is similar today. In 1942, the US began the Manhattan Project, the codename for the effort to develop an atomic device. Then, there were many skeptics that said it could not be done. Germany was working on a similar project, but did not invest the focus,

talent, energy, and capital to succeed. The US invested about twenty billion dollars (in 1996 dollars) and won the race. This decision helped to make the US a superpower and set the course for the next 80 years. America's standing in the world today derives from the World War II generation's efforts to do what needed to be done, no matter the risks or cost.

Today, China is determined to become a technological superpower and believes AI is the strategic technology leading the future. Central to this effort is the New Generation Artificial Intelligence Development Plan. This 28-page document is an effort that is like the Manhattan Project and is driven by China's Ministry of Science and Technology. The goal of the plan is to make China the dominant AI power before 2030. This goal should concern every US and Western leader.

China has the world's largest military, the second largest economy, and its technology industry is rapidly advancing. AI development is at the center of China leads the world in AI patents and publications, AI-empowered speech and image recognition, 5G, and drone manufacturing. In 2023, only 60 percent of China's population used the internet, compared to 89% in the US, but "its sheer scale means there are three times more internet users than in the United States—over 800 million. Nearly all of China's internet users access the web through mobile devices from the country's biggest smartphone companies, Huawei, Oppo, and Vivo."⁴ Most critically, according to the Australian Strategic Policy Institute (ASPI), an independent technology think tank, China leads the world in 37 out of 44 critical technologies. The US leads in only seven technologies on ASPI's list—vaccines, semiconductors, high-performance computing, advanced integrated circuit design, natural language processing, quantum computing, and space launch systems—and comes in second in most of the other critical technology development areas. "A key area in which China excels is defense and space-related technologies. China's strides in nuclear-capable hypersonic missiles reportedly took US intelligence by surprise in August 2021 ... These findings should be a wake-up call for democratic nations, who must rapidly pursue a strategic critical technology step-up."⁵ The Chinese have advanced their understanding and development of AI in a very short amount of time. The US military recognizes AI is the key to the future of warfare, but so does Russia and China. Soon, they may put us to the test. Clearly, the AI race is to the swift and the US and the West cannot afford to fall behind.

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December 6, 2023

⁴ Deloitte Development LLC, "China Emerges as Global Tech, Innovation Leader," Wall Street Journal, 2019, at <https://deloitte.wsj.com/articles/china-emerges-as-global-tech-innovation-leader-01572483727>.

⁵ Jamie Gaida, Jennifer Wong-Leung, Stephan Robin and Danielle Cave, "ASPI's Critical Technology Tracker: The Global Race for Future Power," The Australian Strategic Policy Institute Limited, 2023, at https://ad-aspi.s3.ap-southeast-2.amazonaws.com/2023-03/ASPIs%20Critical%20Technology%20Tracker_0.pdf?VersionId=ndm5v4DRMfpLv.u.x69Bi_VUdMVLp07jw, 1–2.