Research Report

The First General Assembly

Combating the militarization of Artificial Intelligence

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INTRODUCTION

In an era defined by technological innovation, the intersection of artificial intelligence (AI) and militarization has emerged as a critical global concern. As the international community grapples with the ethical implications and potential risks associated with the militarization of AI, this research report delves into the multifaceted dimensions of this complex issue. This report seeks to provide a comprehensive understanding of the challenges and opportunities inherent in combating the militarization of artificial intelligence.

As probably most readers won't be able to tell, the paragraph above was written by AI. Since antiquities, myths, stories and rumors have existed about artificial beings possessing or being endowed with human intelligence or conscience. After the introduction of the first programmable computer in the 1940's, the field of AI research was founded in the summer of 1956 at a workshop at Dartmouth college.

Since the founding of this research group, the members have been the leading experts on the field of AI. The researchers were given millions of dollars to make sure that their beliefs, that a computer as smart or smarter than a human would exist within a generation, would come true.

As most might imagine, making a computer smarter than a human was a task easier said than done, let alone in the 1950's, when the rise in research on computers had spiked incredibly during world war II. However, with the turn of the centuries, the field of computers has made drastic improvements. IBM introduced their first PC, the PC 5150, in 1981. The 5150 was the first PC that functioned mostly like PC's would function in the current age of computers.

In the first decades of the 21st century, including past years, investment and curiosities in AI research boomed incredibly. The computational power available has increased almost exponentially, and new methods of machine learning and collecting and processing data have made it possible to successfully attack many problems in the research field.

Training AI is not as difficult as it once was. In an era littered with war, it almost seems unthinkable that no one would use an AI operated machine to win a war. The militarization of AI has been, and currently is, a growing problem in the world, even if most wouldn't even recognize it. The use of AI in anything more than the research of computational posibilities of AI raises ethical questions almost instantly. One of the scary things being the fact that no one knows how an AI thinks, just like no one knows how a human thinks. AI's can be trained in many ways, in both good and malicious intents. Next to this, AI evolves on its own, making it possible for it to evolve itself beyond human understanding and possibly making choices, if provided, that would be beyond human reasoning.

Definitions of Key Terms

AI:

”AI stands for "Artificial Intelligence." It refers to the simulation of human intelligence in machines that are programmed to think and learn like humans. AI encompasses a broad range of technologies and techniques that enable machines to perform tasks that typically require human intelligence. These tasks include problem-solving, understanding natural language, recognizing patterns, speech recognition, image recognition, and decision-making.”
ChatGPT’s definition of AI

An AI system has a neural network close to that of a human. It has learned through different ways of machine learning to complete a task that is given, or even has the ability to start making links to extend its knowledge to other domains.

Neural network

A neural network is close to a human brain, mimicking the neurons that a human brain has. A neural network consists of an input layer, one or more processing layers and an output layer. Just like the human brain, the processing layers are a black box to outside viewers. The outside viewers of a brain, or a neural network, provide an input or see an input being provided and then observe the output provided by the person or the network. What goes on inside the processing layer(s) of a neural network is a mystery.

Machine learning

Machine learning is a way to teach an AI to function in specific taks. There are different ways of machine learning, which can be categorized into supervized, unsupervised, semi-supervized and reinforcement learning.

Supervised learning deals with straightforward tasks and is easy to implement. It focuses on logical patterns to teach a neural network to recognize those patterns when later provided with new information. Like learning with an answerbooklet to all of your tests, to later be able to put one and one together to make two.

Unsupervised learning lets the neural network learn by itself. It analyses the data it consumes by itself to see what works best. It then tries to find a structure in the raw data through this analysis and interpretation. A classic example of screw around and find out.

Semi-supervized learning uses labeled data to ground predictions. It then provides the young neural network with unlabeled data to learn it to process and learn the shape of larger data distribution. Semi-supervized learning provides the neural network a basic ‘explanation’ to complete the task that the neural network will eventually be used to do, it then gives it some trickier data to improve the AI’s ability to process data outside the data that it got as a basis. This one is seemingly the closest to the school system, where classes provide you with the data a student needs, and the student applies this data to new questions found in homework assignments.

Reinforcement learning is maybe the kindest and harshest way of teaching a neural network. It lets the neural network learn on its own, but after every learning cycle it punishes the neural network for things it did wrong and praises it for all things it did correct. Basically, in encoding the neural network, the writer of the code whips the neural network every time it does something wrong and gives it a piece of candy every time it does something right.

Computational power

Computational power refers to the ability of a computer to run a large amount of operations or calculations in a short amount of time, often measured in the amount of operations a system can complete in a second. The more computational power a computer has, the faster it will be in completing calculations and other tasks.

Militarization

Militarization is the simple process of providing something or someone with the means necessary to become a military threat, providing military resources or giving it a military character.

General overview

The concept of AI has been around since ancient antiquities. One of the first stories of artificial intelligence was the giant Talos. Talos was a bronze giant, crafted by the god Hephaestus, who protected the island of Crete by throwing boulders at ships and unwanted visitors and walking around the coast of the island 3 times a day.

Automata have been crafted ever since the ancient times of Egypt and Greece. Automata are humanoid figurines that are able to move on their own, following a sequence of operations, or made to respond to certain predetermined instructions. A moving statue of someone riding a bike or playing the piano would be great examples of automata.

The first mechanical computers marked the start of computer sciences. The Analytical Engine, created by English inventor Charles Babbage is widely considered as the first computer. The Analytical Engine was able to perform any calculation that was put before it.

In the second world war, the investment in research on computers spiked. Both the Allied troops and Axis powers wanted to create the strongest computers, the Enigma machine a result of this research on the German side.

When computers became a bit more standard, people began writing relatively simple programs that would mark the start of machine learning and AI in games. The first few being checkers and chess programmes.

In 1956, Dartmouth College held a workshop on Artificial Intelligence. The workshop was organized by Marvin Minsky, John McCarthy and two other senior scientists: Claude Shannon and Nathan Rochester of IBM. The workshop was attended by Ray Solomonoff, Oliver Selfridge, Trenchard More, Arthur Samuel, Allen Newell and Herbert A. Simon, who would all become notable names in the research and programming of AI in the next decade. After the workshop at Dartmouth, AI got its name, its purpose, its first successes and major researchers, marking the beginning of the era of AI.

The subject of AI started making some progress, but the progress was less than expected. Research endured the first AI winter, in which more problems than solutions arose, and funding was mostly cut off. After a boom due to the rise of expert systems around the 1980’s, the research field endured a second AI winter. Many fundings were cut and the research on the field of AI staggered.

In the 1990’s, research in the field of AI started to bear the fruits of its labour. Better computers made for better computational power which created many new possibilities in research and application of AI. AI was being put to work in a lot of different fields of work, such as data mining, industrial robotics, logistics, speech recognition, banking software, medical diagnosis and Google's search engine.

Around 2011, AI evolved into its current research state. Machine learning became a part of training a neural network, teaching a computer system to think and act like a human would

think and act. The research into AI and neural networks is expanding daily, combining the fields of computer sciences, psychology and neurobiology. AI's are becoming a bigger and bigger part of our life, with many forms of AI providing help for us every day. Things such as Google home, Alexa or Siri are simple examples of AI tools. More sophisticated AI systems, such as ChatGPT, are also known to most people.

Because AI is such a versatile tool, many people are willing to use AI for malicious purposes. The militarization of AI systems seems like a logical consequence of the research, but an AI can never get to malicious thought without it being taught those thoughts.

After the first two revolutionary inventions in military affairs, gunpowder and nuclear weaponry, AI is the third. Military powers have been investing resources in the research of emerging technologies, including AI. A digital arms race has manifested itself, as military powers are rushing to adopt AI into their arsenal. Autonomous weapons are being researched and created to be implemented into daily warfare.

Not much information can be found in the public domain on how far military organizations are in their research on Autonomous Weapon Systems. AWS's are developed and improved daily, without new restrictions put in place for the new technologies, making for a scary guessing game as to the power that military organisations may possess.

Currently, AI-powered Unmanned Arial Vehicles (UAV's), Ground Vehicles and Submarines are already used in reconnaissance, surveillance and combat operations and will be used more and more in the near future. It is not yet being implemented widely, but military conflict can change drastically when AI is implemented for autonomous decision making. AI systems distance human participants from the battlefield, and is slowly learning to process data to transform into command and control systems.

AI can also be implemented for (predictive) maintenance. AI systems can be used to process data on how often and when maintenance is done to predict when maintenance should be provided in the future.

Weaponized AI systems may have many advantages, by not putting friendly lives in danger when implemented, but have as much if not more disadvantages if not regulated strictly. AI systems are trained to make choices that would otherwise have to be made by overseeing officers. This raises many ethical questions, as no one knows if the AI won't stick to implemented or trained biases.

Depending on the way the AI is trained, human input has a different value in the AI's output. As two Facebook AI chatbots have shown before, after a while, if let loose, AI systems can go their own way and abandon all that is comprehensible to a human being. The Facebook bots were instructed to create the most effective way to negotiate, and ended up with creating a language that only the two of them understood, after which they were shut down.

Militarization of AI is a definite current world problem. It is not yet very visible in implementation, but research shows that the dangers are very much present. Without strict ruling on the research and use of AI in military operations and situations, AI and the use of AI systems can get drastically out of hand. As many movies and TV-shows have shown - Ultron in the Avengers, humans vs AI in the Creator and many more - possibilities of an AI system going its own way is a very reasonable, although maybe dystopian, threat.

Major parties involved

Leading the AI arms race in militarization

The USA, China, Russia and India are leading an arms race in the field of the militarization of AI systems and the pursuing of Autonomous weapon systems.

USA

The U.S. Department of Defense has just recently - November 2nd 2023 - released its strategy to enhance the rate at which AI systems and other advanced AI capabilities can be adopted into the military. This strategy has been put in place to ensure that U.S. warfighters have decision superiority in this age and many more to come. The U.S. is aiming to create an easier and faster way of decision making to ensure quality and accuracy of those decisions.

China

The Chinese military and China's defense industry have been pursuing significant investments in robotics, swarming, and other applications of artificial intelligence and machine learning. Advances in multiple weapon systems have been made, including autonomous, intelligentized and unmanned systems and missile technology. It is difficult to tell the extent of these developments, there are indicators of progress in weapons systems that may possess a range of levels of autonomy.

Russia

Russia's AI development lags behind China and the USA. However, progress is already evident. The Russian government and military are investing heavily in setting up both the intellectual and physical infrastructures to provide all means necessary to facilitate AI development in civilian and weapons platforms. Efforts are currently at early stages. The government's drive for broadening discussions, conversions, and collaboration has significantly boosted the interaction between the country's blooming high-tech private sector and the extensive military-academic infrastructure.

India

India has a vast and extensive application of AI-based technology in the defense sector, covering many functions such as training, surveillance, logistics, cybersecurity, UAV, advanced military weaponry like LAWS, autonomous combat vehicles & robots. These applications make sure that India has a strong footing in modern day warfare. India currently has many practical uses for AI systems, ranging from civilian industry uses to border patrol. India is also using UAV's and Lethal Autonomous Weapon Systems (LAWS). Next to this, India makes use of Autonomous Combat Vehicles and robots, highlighting the robust armoured solutions that increase the protection of the soldiers and staff.
Military readiness in India is currently undergoing a major digital growth by harnessing the power of advanced technologies like Artificial Intelligence, drone system and autonomous weaponry to optimize defense capabilities.

Timeline of Key Events

AI timeline

1920: Charles Babbage invents the Analytical Engine

English inventor Charles Babbage invented his Analytical Engine, widely known as the first computer.

1940's: World War II makes for a race in computer development

During the second world war, both the Allied forces and the Axis Powers were enhancing research on computer systems. Germany presented one of the most complicated systems of that time, the Enigma Machine, a system to encode military and/or diplomatic messages.

1956: Workshop on AI on the campus of Dartmouth College

In 1956, the first workshop on the field of AI was given. After this workshop, in the summer of 1956, the first research group on the field of AI was created, consisting of some of the most prominent names in the field of AI for the next decade.

1956-1974: Simple AI systems were created

Early AI programs started using the same basic algorithms. Algorithms were made to approach problems step by step, as if going through a maze, backtracking when they got to a dead end.

1974-1980: First AI winter

Research in the field of AI came to a halt. Limited computational power, along with other problems made for a drop in investments into research. The enormous amount of computational power needed to process the huge amount of information about the world to complete calculations or operations was simply too big for the computers of that era.

1980-1987: A boom in research

A rise in expert systems based on the knowledge of experts on specific domains made for systems that could easily be implemented. The most important view on AI systems was that commonsense knowledge could only be taught directly to the systems.

1987-1993: Second AI winter

A drop in the market of specialized AI hardware in 1987 indicated the start of a second AI winter. By the end of this second winter, over 300 AI companies had shut down or gone bankrupt.

1993-2011: AI started achieving its goals

AI systems were started to get used in the technological industry. The increase in computational power of new computers was to thank for a rise in the use of AI systems. Some advancements were achieved by focusing on specific isolated problems and pursuing them with the highest standards of scientific accountability. The reputation of AI was less than pristine, making AI both more cautious and successful than ever before.

2011-present: Current development years of AI

AI systems are currently being experimented with and researched. The world of AI is a vastly growing and continuously evolving field of research, bringing new and interesting revolutions to the fields of computational sciences, psychology and neurobiology.

2017: Facebook shuts down 2 chatbots

Facebook shuts down 2 of their chatbots created to negotiate as effectively as possible. The two AI chatbots started to talk in their own language, which only they understood. Facebook decided to shut the bots down to prevent any further deranging from happening.

Military AI timeline

1940's-1950's: Alan Turing cracked the German's Enigma Machine

Mathematician Alan Turing cracks the code to the German Enigma Machine. Turing states that computer programs could be taught to think like humans. After this, he develops the 'Turing Test' to put a computer's behaviour to the test, determining the range of 'human intelligence.'

1958: The U.S. Department of Defense forms the DARPA

The United States Department of Defense forms the Advanced Research Projects Agency (later renamed DARPA) to facilitate research and development of military industrial strengths.

1960's: The U.S. Department of Defense began training computers to mimic basic human reasoning

1970's-1980's: Researchers develop more expert systems with applications in the military.

1991: The U.S. military first uses the DARPA-funded DART

The U.S. military first uses the DARPA-funded Dynamic Analysis and Replanning Tool, an AI program, to schedule the transportation of supplies or personnel and to solve other logistical problems. It uses intelligent agents to aid decision support systems located at the U.S. Transportation and European Commands and saved the military millions of dollars right after its launch.

2007: AI professor Noel Sharkey warns for an arms race

AI Professor Noel Sharkey warns of an "emerging arms race among high-tech nations to develop autonomous submarines, fighter jets, battleships, and tanks that can find their own targets and apply violent force without the involvement of meaningful human decisions."

2010: China becomes a main player in AI research

2013: Boston Dynamics builds Atlas

Boston Dynamics unveils Atlas, their advanced humanoid robot, which was designed for various search and rescue tasks.

2014: U.S. Department of Defense unveils 'Third Offset Strategy'

The U.S. Department of Defense unveils their 'Third Offset Strategy,' which posits that rapid advances in AI will define the next generation of warfare.

2015: Multiple bans are requested

Steven Hawking, Elon Musk, and Steve Wozniak, and 3,000 researchers in AI and robotics write an open letter calling for a ban of the development of autonomous weapons.

The U.K. government opposed a ban on lethal autonomous weapons, but stipulated that all weapons by its armed forces must be "under human oversight and control."

2016: More AI applications in defense

The U.S. Department of Defense increases its budget for investment in AI, big data, and cloud computing from $5.6 billion in 2011 to $7.4 billion in 2016.

Sea Hunter, an autonomous U.S. warship, is designed to operate for extended periods of time at sea—without any crew. A 2017 Department of Defense directive, however, requires a human operator to be in the loop when taking a human life by autonomous weapons systems.

2017: More defense applications and conventions

At the United Nations' Convention on Conventional Weapons, after a discussion of a potential ban on "killer robots," twenty-two countries call for an outright ban on lethal automated weapons.

A report from Harvard's Belfer Center predicts that AI has the potential to be as transformative as nuclear weapons.

China's "Next Generation Artificial Intelligence Development Plan" states a goal of "world domination in AI by 2030."

The U.S. Department of Defense's Project Maven uses computer vision, which is a combination of machine- and deep-learning (neural networks), to autonomously find objects of interest within massive amounts of video or still imagery from drones; it's expected to be in use within war zones by the end of 2018.

Vladimir Putin declares that "whoever reaches a breakthrough in developing AI will dominate the world," and predicts that future wars will be fought by drones.

The Russian military unveils a "robot army" with guns.

Previous attempts to solve the issue

The United States of America has set up the Political Declaration on Responsible Military Use of Artificial Intelligence and Autonomy. The Declaration was launched at the Responsible AI in the Military Domain Summit in The Hague in February 2023. The declaration aims for a general consensus around responsible behaviour with and use of the development and deployment of AI Systems and Autonomous Weapon Systems.
The Declaration provides a basis for exchanging best practices and building states' capacities, which will allow endorsing states to share experience and ideas. The United States will convene a regular dialogue among endorsing states to further promote international support for and implementation of these responsible practices. The endorsing states are set to meet in the first quarter of 2024.

The endorsing states of this Declaration as of the 1st of November 2023 are the following:

Albania	Germany	Morocco
Australia	Hungary	North Macedonia
Austria	Iceland	Portugal
Belgium	Ireland	Romania
Bulgaria	Italy	Singapore
Canada	Japan	Slovenia
Czech Republic	Kosovo	Spain
Denmark	Latvia	South Korea
Estonia	Liberia	Sweden
Finland	Libya	The Netherlands
France	Malawi	The United Kingdom
Georgia	Montenegro	The United States

Next to the USA's Declaration, not many efforts have been made in combating the militarization of AI systems. Since AI is still a new world technology, there are only speculations as to what AI systems can be capable of and to what extent they can be militarized.

Possible solutions

A good start for combatting the militarization of AI systems is more research. Since the use of AI systems and neural networks is still being researched in all fields, not just the military, knowledge on the capabilities of AI is limited.

Since knowledge is limited, only speculations can be made as to what AI systems will be capable of in the near and far future. A good research into the possibilities with AI systems and neural networks seems of the utmost necessity.

Not only should this research be invested in, it should be carefully supervised. We don't know what AI can be capable of, and it would have dramatic consequences if researchable prototypes turn rebellious and start creating minds of their own. Next to supervising the behaviour of the systems, the researchers should be supervised. Researchers are not to show any malicious intents when creating AI systems, because the systems will take over these biases.

Another option is to shut down and abandon the topic of AI and neural networks as a whole. AI systems can be used to the most dangerous extent, taking away the risks of friendly human lives. However, AI will, in the near future at least, not be able to deal with human emotion in its calculations. The topic of war and militarization is not one of many cold calculations. Human emotion takes a great part in military decision making. There are three main parts in the overlap of human emotion and military decision making: the character of war and emotional stimuli, emotional influence on strategic choices, and the relationship between emotional manipulation and the pursuit of victory. AI is currently incapable of human emotions in completing calculations, and should not be allowed to make military decisions without human intervention.

It would be smart to set up guidelines when research passes a certain point. When AI is researched enough, and implications of militarization are set to be made, clear and strict guidelines should be set up to monitor and limit the use of AI in war situations. Since AI is considered as the third big breakthrough in military warfare, after gunpowder and nuclear weapons, the dangers can be easily imagined, and any and all member states should be suggested to not let AI systems get out of control.

Further Readings

https://www.youtube.com/@CodeBullet
For those interested in different ways of how an AI system or neural network can learn.

https://unu.edu/article/militarization-ai-has-severe-implications-global-security-and-warfare
The severe implications of the militarization of AI

https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3452323
A paper looking into the current extent of the militarization of AI systems

https://thelawbrigade.com/wp-content/uploads/2023/06/Kiruthika-Shankar-Raman-AJMRR.pdf
A paper looking into AI's difficulties in mimicking human behaviour

https://www.sciencedirect.com/science/article/pii/S2351978915009774
A paper looking into the importance of human emotion in military environments

https://ai100.stanford.edu/gathering-strength-gathering-storms-one-hundred-year-study-artificial-intelligence-ai100-2021-1/sq2
A list of some of the most important advances in AI research

https://www.sciencedaily.com/news/computers_math/artificial_intelligence/
Some headlines on the field of AI and machine learning

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