

# Military AI's impacts on international strategic stability

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**Abstract:** Technological revolution brought major changes in the system framework of strategic stability. Artificial intelligence (AI) thrives internationally as a disruptive technology and is applied to many fields in the 21st century. This paper evaluates the strength, limitations, and impacts of AI-empowered military application on international strategic stability. Applications of AI technology for military purpose brings both positive and negative impact on nations' defending and offending, so the international strategic stability. However, the impact of AI on international strategic stability is mainly negative. For facing stability challenges, nations shall formulate systematic governance of military AI; the global community shall promote friendly multilateral cooperation between each other. In the end, this view offers significant implications for maintaining international strategic stability and improving AI governance capabilities in the foreseeable future.

**Keywords:** Artificial Intelligence, Strategic Stability, Arm Race.

## 1. Introduction

For clearing the definition, strategic stability in this paper refers to the potential that no offensive operations from any nation would cause irreparable consequences multilaterally and internationally. Currently, a new round of scientific and technological revolution and industrial transformation is accelerating the evolution. The global scientific and technological development pattern is reconstructed. In national strategic decision-making, almost every country regards science and technology as a core national interest. Scientific and technological innovation becomes the main field of the international strategic game, and the competition around the commanding heights of science and technology is unprecedentedly fierce. Artificial intelligence stands on the cutting-edge of the revolution, which initiates an arms race among great military powers in the global community, Artificial intelligence also becomes the forefront of the competition of great powers. However, as a rapidly-developed technology, the bursting growth of the benefits of such technology makes people eschew the negative impacts of AI technology. AI technology rewards convenience, faster speed, and broader scope for many fields, however, the uncertainty of such technology is being forgotten. Various applications of artificial intelligence have great potential, but its impact on current international security will ultimately affect global strategic stability, which will be directly related to conflicts and peace between countries. Only by recognizing the positive and negative effects of artificial intelligence on global strategic stability, and actively and effectively reducing the negative effects, can we avoid entering the "Age of Strategic Annoyance" caused by artificial intelligence. In the end, this paper focuses on the military aspect of AI

technology and analyzes the benefits and limitations of AI-empowered techniques applied in the military, as well as implications for the regulation of military AI technology.

## **2. AI application in the military and the positive impact**

Machine learning, image recognition, voice assistant, and analysis support systems are major AI technologies applied for military purposes. Based on the usage of these applications, they can be categorized as tactical usage or strategic usage in warfare.

### *2.1. Operational usage*

The operational level of war involved the execution of campaigns and operations for achieving military objectives. The following introduces how AI technology integrates with other military technology for potential operational usage in warfare.

*2.1.1. Autonomous weapon system (AWS).* Autonomous weapon systems employ AI technology to identify and select targets. In the case of a lethal autonomous weapon system, the system drones the right to decide for killing the target solely based on AI algorithms without human intervention. AWS awards the capability to identify and select a target, which is in proximity to humans. Moreover, AWS also differs from human soldiers in their expendability, as machines are not alive. Hence, AWS has the capability to perform more dangerous operations than human soldiers can. For instance, an integrated air-and-missile defense system may employ a Phalanx CIWS to automatically target and shoot down missiles that target friend objects [1]. Another example is unmanned combat aerial vehicles, which can escort bombers into adversaries' air space, machine learning autonomous drones can potentially evade and overwhelm the enemy's sophisticated defense capabilities. Overall, AI technology grants AWS faster speed and efficiency than manned conventional weapons.

*2.1.2. Intelligence analysis.* Nowadays intelligence comes with an abundant amount and in various forms, such as electric signals, images, news, and video. Such complex and abundant data hence requires analysts to fuse the data before analysis begins. The director of the National Geospatial Intelligence Agency said if trends hold, 8 million imagery analysts along are required. The nature of nowadays intelligence makes intelligence analysis suitable for the application of AI technology. Currently, intelligence organization uses AI technology to sort different types of information and to pull out important and wanted intelligence for further analysis. For instance, an AI-empowered system can screen through millions of financial transactions to discover illegal weapons smuggling. Moreover, AI can also label patterns of vehicles to identify SA-21 surface-to-air missile batteries. Overall, an AI-empowered system saves analysts time greatly in terms of nowadays' trend of intelligence analysis.

### *2.2. Strategic usage*

The strategy level of war involves national and or multinational guidance to achieve national objectives. The following introduces how AI technology integrates with other military technology for potential operational usage in warfare.

*2.2.1. Intelligence, surveillance, and reconnaissance (ISR) and command, control, communications, and intelligence (C3I).* As mentioned previously, an abundant amount of data and intelligence compiles a huge process for analysts to analyze. Therefore, AI-empowered system contributes to ISR and C3I by fastening the speed of intelligence analysis, thus shortening the time frame of decision-making by human leaders [2]. Its benefits are more prominent in complicated adversarial environments.

*2.2.2. Automatic target recognition (ATR).* The purpose of ATR is to develop a sensor system that has the ability to identify and detect an interested target in an operational condition. Such technology

applies widely in the air force, as it reduces the number of information pilots required to analyze. For making the results of ATR more accurate, machine learning techniques are applied. ATR in synthetic aperture radar images contains a high degree of noise, which provides challenges for ATR. In this case, the machine learning-based method proposes for detecting various stationary and or moving targets with synthetic aperture radar images. Obtained results showed that GLCM + SVM algorithm is the best model with 95.26% accuracy [3].

*2.2.3. Other applications.* Besides the previously discussed applications of AI technology in the military, there are also other applications. For instance, with increasing the speed and scope of observation, orientation, decision, and action (OODA), by AI-empowered algorithm, augments air defense, especially in area-denial environments [2]. Machine learning techniques that can uncover network vulnerability and even destroy these networks enhance nations' both defensive and offensive cyber capability.

### **3. Negative impact of ai technology: from a technical point of view**

Despite the fast speed of AI, there are also drawbacks of this technology introduced previously, machine learning-based algorithms and image recognition constitute a considerable number of applications of AI technology in the military. Hence, this section focuses on the technical limitations of machine learning. These drawbacks and limitations play a significant role in influencing the reliability, accuracy, and safety of the weapon and system used for military purposes.

#### *3.1. Low explainability of machine learning algorithms*

AlphaGo is a computer program designed to play the board game Go. AlphaGo uses machine learning algorithms to help it to learn from past games. It defeated the European champion, the top-rated world Go player Ke Jie, and many other human players. The gaming results show that AlphaGo has a sophisticated algorithm for playing the board game. However, a limitation of its system is that the system is not explainable. Even though the algorithm is well-performed, there exists a black box as its designer does not have any knowledge of the reasoning behind the model's operation and decision-making process [4]. The black box shows not only in AlphaGo's system. But the whole entire machine learning-based algorithms. The existence of the black box in machine learning algorithms brings a higher degree of uncertainty in the running of machine learning-based systems.

#### *3.2. Algorithmic bias*

The algorithms used are trained with selected data, which means, algorithms trained with biased and erroneous data produces inaccurate results and or decision. An evident of algorithmic bias is the currently-in-use facial recognition technology by the United States police. Collected data shows only 34% of women with dark skin are under accurate identification, while the identification accuracy of Caucasian men reaches 99% [5]. The results of this system are unreliable in the case of identifying individuals with a dark complexion because the algorithm is trained based on subject-data inputs, which prevalently are men with light color skin [5]. If such a biased choice of data inputs applies to the training of military AI technology, the result erroneous decision has the potential of causing irreversible consequences regarding strategic stability.

Overall, the limitation and uncertainty of AI technology have the potential to result in inaccurate intelligence analysis; and wrong decisions due to biased algorithms trained with erroneous data inputs. These can all generate irreversible consequences on the battlefield and the maintenance of strategic stability. Moreover, false intelligence analysis due to the uncertainty of AI technology may also result in an inadvertent escalation of strategic or arm conflict.

### **4. Potential risk of relying on AI technology in the military: from a strategic point of view**

Limitations of AI technologies have the potential to cause catastrophic consequences on both the strategic level of national and international security and strategic stability; and operational level on the

battlefield. Before further discussion, it is important to point out that, the impact of artificial intelligence on strategic stability lies mainly in the combination of AI technology and conventional weapons, rather than its combination with nuclear capabilities.

#### *4.1. Nuclear capability under the emergence of ai technology*

The emergence of artificial intelligence has less impact on the inherent strategic stability of nuclear weapons at its core. At present, there are still limitations in data analysis in environmental reconnaissance, target positioning, and early warning technology for nuclear weapons [6]. In the foreseeable future, nuclear weapons used for a second strike still can survive a first nuclear strike under the information age, and then break through missile defenses for retaliatory strikes on a specified region [6]. This means that nuclear deterrence based on the second-strike capability remains effective. Therefore, there will be no significant changes in the survival ability of storage, transportation equipment, and nuclear weapons due to the emergence of AI-empowered ISR. The great powers, hence, will not change their nuclear strategies due to the application of AI technology.

#### *4.2. Impact of autonomous weapon system (AWS) in relation to arm race*

Currently, countries race to launch an arms race to develop and apply AWS. In recent years, Russia focuses its development of AWS on land-based robots. The Russian army is developing ground-armed robotic units that can perform tasks such as urban warfare and the protection of critical infrastructure. The unit includes robot infantry formations and even robotic tanks. As of June 2017, more than 100 countries in the world mastered drone technology, including non-traditional military great powers, such as Emirates, Iran, Kazakhstan, Myanmar, South Korea, Turkmenistan, and United Arabs[7]. The rapid global proliferation of AWS increases the difficulty of arms control. In general, the number of countries involved in arms control is proportional to arms race instability. From a technical point of view, the core component of AWS lies in the autonomous control system, that is, in software rather than hardware. Moreover, the technical threshold of AWS equipped with simple control systems is not high[7]. There is no complex research, and the cost is relatively low. Therefore, such nature of AWS also makes it more difficult to regulate. At the same time, the development of AWS is opaque. This makes the arms race for AWS easier to escalate. Historically, the security dilemma caused by opacity has been an important cause of the arms race. During the Cold War, the United States and the Soviet Union had the ability to measure each other's nuclear capabilities, but they were unable to judge each other's intentions[8]. Therefore, they can only maintain the strategic "balance" by expanding a protracted nuclear arms race[9]. For the development of AWS technology, it is difficult for each country to gain insight into each other's capabilities to develop autonomous weapons. The superposition of the two uncertainties makes it easier for countries to fall into a security dilemma, which further increases the instability of the arms race for autonomous weapons.

### **5. Implication for maintaining strategic stability**

There are trade-offs between the powerful AI-empowered capabilities and national security, and international security. However, the powerful capabilities always make countries eschew the potential danger of relying on AI. Therefore, regulating AI-empowered capabilities becomes crucial for maintaining global strategic stability. The following are a few implications for regulating AI technology applied in the military.

#### *5.1. Countries shall set up and improve the management mechanism of military AI*

From a bottom-to-up direction, countries shall improve and advance the management mechanism of military AI, in order to cooperate internationally with each other along with a deeper insight into the challenge. In 2018, the United States government established the National Artificial Intelligence Security Committee, which response to designing the overall development plan in the field of artificial intelligence and reviewing and evaluating progress and application prospects of AI technology. In the same year, the United States Department of Defense (DoD) established Urban Joint Artificial

Intelligence Center, which responded by connecting with AI technology incubators such as the Defense Advanced Research Projects Agency (DARPA) and passing the military needs to the R&D department. Great military powers shall learn from the United States experience in the organized and systematic control of AI development. A more systematic mechanism of military AI-technology regulation provides deeper, and more sensible insight into the strategic stability and international security challenge caused by AI. Hence, more consensus can be built potentially among great military powers, which benefits the global regulation of military AI technology.

### *5.2. Formulate and promulgate management and regulatory guidelines in the field of military artificial intelligence*

Countries shall use AI technology legally and ethically. Therefore, countries shall introduce ethical and legislative governance standards for the use and development of AI technology. Improving the morality and legality of military AI applications on a country-by-country basis, so that the international community can reach a consensus on the common governance of AI based on ethical and legislative standards. The United States Department of Defense proposed the concept of responsible AI development in the 2018 DoD Artificial Intelligence Development Strategy. The DoD will increase the legitimacy, stability, reliability, security, and transparency of AI system development through increased investment from funding and an increased-elite perspective. This provides constructive solutions for the technical limitation of AI algorithms proposed in this paper.

### *5.3. Cooperation between great powers is required*

Major powers should develop AI technology on the basis of cooperation and play an exemplary role in AI-related arms control. Since 2014, the UN Convention on Certain Conventional Weapons negotiating committee has held several informal expert meetings and formal governmental expert group meetings. Although some breakthroughs have been made in the establishment of international tact and international norms, the parties involved in the discussion have serious differences in the applicable definition of LAWS, and there are contradictions in the existing rules for applicable weapons [10]. In addition, the Trump administration's US foreign policy shows a partial "decoupling" trend. According to literature statistics, the number of papers jointly published by scholars in China and the United States increased by 55.7% between 2014 and 2018[10]. This proves that division is not the only way between major powers in the development of AI militarization, and AI is not a zero-sum game. Artificial intelligence is a development project that can promote national cooperation and promote the well-being of all mankind.

## **6. Conclusion**

AI technology greatly increases the probability of preemptive attacks, aggravating the risk of crisis outbreak and (inadvertent) conflict escalation, which then impacts the existing international arms control system. Hence, the emergence of AI technology fundamentally poses serious challenges to global strategic stability. The arms race instability caused by AI technology makes countries face difficulties when developing AI-empowered weapon systems. The paradox of the powerful capabilities and vulnerabilities of military AI-empowered systems becomes the highlight. In the face of security risks and challenges, the global community shall strengthen the friendly cooperation between countries in the world, and works on the building of strategic mutual trust among great powers to jointly promote the security governance of AI militarization. Ultimately, the limitation of this paper is that it takes great powers in the international community as examples to explore the impact of artificial intelligence technology on global strategic stability. Furthermore, this paper only discusses the implications of arms control based on the status quo and capabilities of great military powers but does not explore in depth how other countries should respond when facing challenges to global strategic stability caused by AI technology. Corresponding measures taken by various countries to treat advanced military technology are closely related to global strategic stability. Therefore, it becomes crucial to further explore the

implications for arms control and the corresponding policy of relative countries besides great powers in the international community.

### **Acknowledgment**

On the occasion of the completion of this paper, I would like to express my heartfelt thanks to all the teachers who helped me, and my special thanks to my supervisor Ms. Qiu, Kexin for her warm care and ardent guidance. At the same time, I would also like to thank my father for his active discussion with me during the preliminary preparation, which greatly inspired my research direction and the formulation of my personal views.

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