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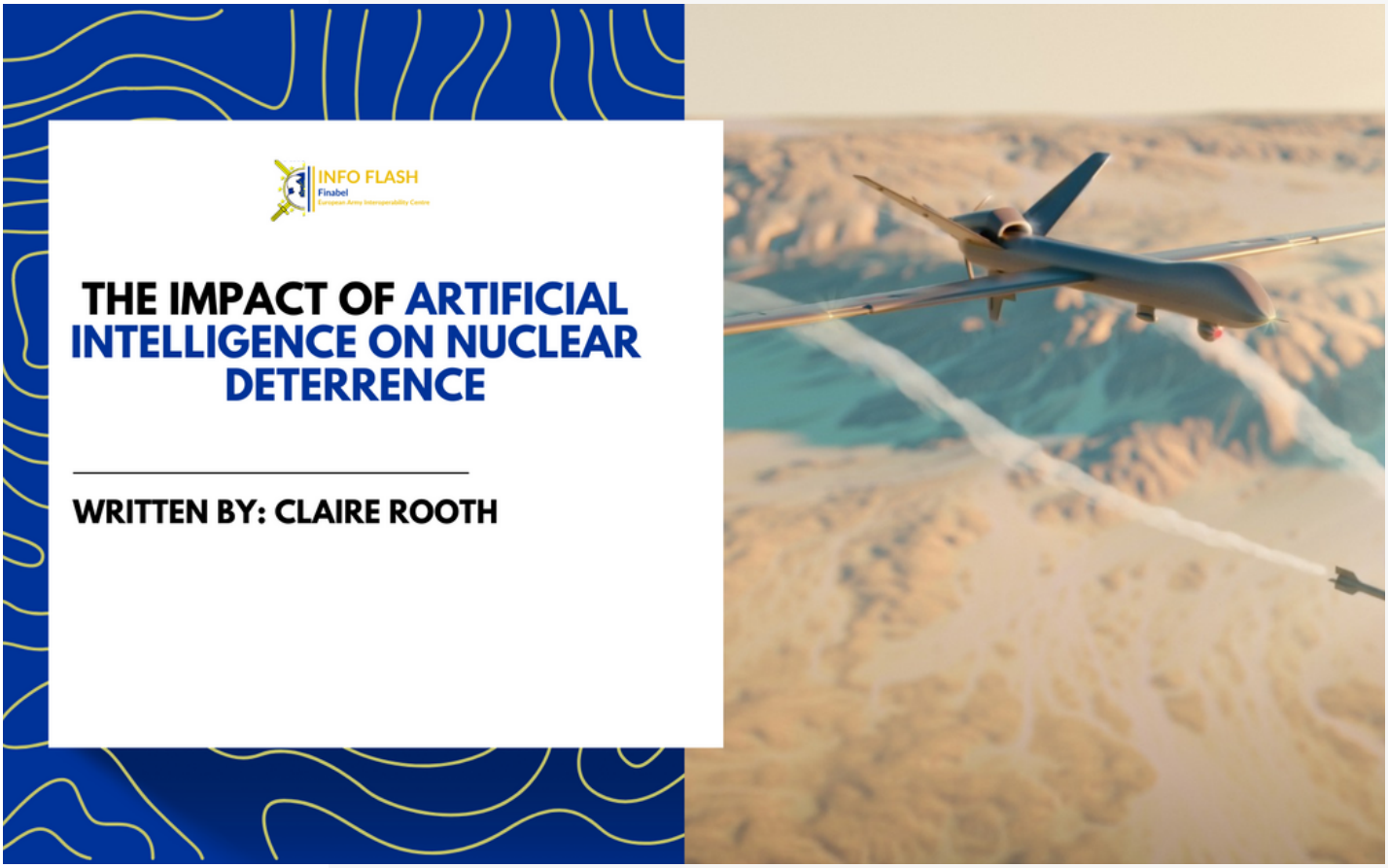
THE IMPACT OF ARTIFICIAL INTELLIGENCE ON NUCLEAR DETERRENCE



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Introduction

The world is experiencing the fourth industrial revolution. Significant progress in computing power is facilitating the development of many new and ground-breaking technologies (Kroenig, 2021, p. 59). Artificial intelligence (AI) is one of these technologies that increasingly impacts society, as well as military operations. In the next quarter century, AI and other emerging technologies are also expected to have a massive effect on international security and strategic stability (Geist & Lohn, 2018, p. 1). They are already reshaping the global nuclear order and our understanding of nuclear strategy and deterrence (Futter, 2020, p. 27).

This is all happening at a time when the issue has regained relevance due to Russia's recent war of aggression against Ukraine and subsequent deteriorating relations with the West. France and the United Kingdom are the only other countries with nuclear weapons in Europe, although the United States also has nuclear warheads across the continent (Euronews, 2022). Besides, most European countries are members of NATO, putting them under the United States' nuclear umbrella (NATO, 2023). Since ensuring nuclear security remains vital to the EU., this Info Flash will look to the future and evaluate the potential impact of artificial intelligence on nuclear deterrence. Both the stabilising and destabilising effects of AI will be discussed.

Second Strike Capabilities

Artificial intelligence has the potential to undermine nuclear deterrence by posing a threat to the second-strike capabilities of nuclear states. Nuclear arsenals intended for deterrence must be capable of surviving an adversary's first strike and retaliating so that unacceptable damage is inflicted on that adversary (Lieber & Press, 2017, p. 9). Throughout most of the nuclear age, attacks to destroy the nuclear forces of another state appeared impossible due to these forces' hardening and concealment. However, AI may undermine these foundations and increase their vulnerability (Onderco & Zutt, 2021, p. 288). More specifically, AI can enhance and enable capabilities that make tracing nuclear forces easier, faster and more effective (Johnson, 2020b, p. 430). The ability to disarm an adversary can provide a state with a first-mover advantage, which threatens crisis stability since it could motivate a state to strike first in a crisis situation (Chyba, 2020, p. 151).

There is a multitude of ways in which artificial intelligence can threaten a state's second-strike capabilities. Most importantly, the ability of AI to process large volumes of data in minimal time makes it valuable for Automated Target Recognition (ATR) and Intelligence, Surveillance and Reconnaissance (ISR). Consequently, detecting and locating nuclear forces becomes much easier (Geist & Lohn, 2018, p. 9). Even nuclear-armed and nuclear-powered ballistic missile submarines (SSBNs), long considered the cornerstone of deterrence because of their elusive nature, face challenges from AI-strengthened underwater sensing technology (Futter, 2020, p. 29). Similarly, these developments are anticipated to undermine the vulnerability of mobile intercontinental ballistic missiles (ICBMs) (Geist & Lohn, 2018, p. 10).

Artificial intelligence may also enable Autonomous Weapon Systems (AWS), especially swarm drones, which are well-suited for various strategic operations (Johnson, 2020a, p. 19). Firstly, these swarms can perform nuclear ISR missions, enabling them to speedily and effectively locate and track SSBNs and ICBMs, as well as the associated infrastructure, including command, control, communications, and intelligence (C3I) systems, early warning systems, sensors, and antennas (Johnson, 2020b, p. 432). Secondly, AI applications in these swarms could enhance the delivery systems of conventional and nuclear weapons and improve the survivability of drone swarms (Johnson, 2020a, p. 23). If the swarm is big enough, it could overwhelm an adversary's military targets (Kroenig, 2021, p. 65). Finally, swarming tactics could boost the capacity to suppress or neutralise an adversary's defences, creating favourable conditions for a disarming attack. For instance, swarm drones could be armed with cyber capabilities that can disrupt or eliminate C3I and early warning detection systems (Johnson, 2020a, p. 23).

Perception

Besides the actual ability to harm a state's second strike capabilities, the impact of artificial intelligence on nuclear deterrence is also determined by a country's perception of an adversary's capabilities through the application of AI (Wilner & Babb, 2020, p. 413). The mere illusion that an opponent can locate and destroy one's nuclear arsenals could motivate countries to use their forces more rapidly in a crisis. Particularly the more vulnerable states could be inclined to strike first as they face a 'use it or lose it' situation (Kroenig, 2021, p. 61). Hence, the uncertainty and potential danger of losing second-strike capabilities alone could be enough to pressure some states into striking pre-emptively, thereby increasing the risk of nuclear escalation (Davis, 2019, p. 125). Another aspect that adds to this uncertainty is the lack of visibility around the development of AI. In contrast with nuclear weapons, which require testing that adversaries can witness, advances in AI will likely remain unknown to other states until they are used (Chyba, 2020, p. 154).

Generally, artificial intelligence also increases the speed of conflict (ICAN, 2020, p. 3). If both sides of a conflict rely on AI for insights, these insights are only relevant for a short period of time, as the technologies respond to each other's actions at a pace that surpasses human capacity and control. Consequently, the windows of opportunity are short and the logic of launching a first strike may prevail (Wilner & Babb, 2020, p. 405). The increased time pressure around nuclear decision-making becomes even more dangerous due to the dual-use nature of many technologies, including AI. This can create uncertainty and mistrust between states, resulting in a 'dual-use security dilemma'. As these technologies have multiple possible applications, a state may struggle to discern whether an adversary uses them for military or civil purposes. Due to the limited reaction time, states may assume the worst and adopt a more dangerous and perhaps nuclear posture (Onderco & Zutt, 2021, pp. 288-289).

Misplaced Fears

Conversely, some experts argue that the fears surrounding artificial intelligence are overblown and nuclear deterrence will likely remain stable. The chance of destroying all nuclear warheads of an adversary in one attack is low since states may also deceive their adversaries using decoys or other tactics. Still, even a small number of strategically positioned nuclear warheads could already cause significant and unacceptable damage so an entire nuclear force can be considered invulnerable if one part of that force is invulnerable (Coetzee, 2021, p. 45).

Hence, whereas uncertainty in conventional warfare could motivate states to initiate conflict, uncertainty in the nuclear world rather creates hesitation (Coetzee, 2021, p. 43). In times of crisis, the available options are not limited to initiating a nuclear attack or suffering from one, and a nuclear war will remain the most risky and costly option (Kroenig 2021, p. 61). Changes in technology do not automatically lead to changes in actors. Therefore, states could be presumed to maintain rationality and perceive nuclear conflict as the least desirable option (Coetzee, 2021, p. 44).

Decision Support System

Artificial intelligence not only transforms the demand side of nuclear deterrence, referring to the type of threats that must be deterred, but also impacts the supply side of nuclear deterrence, namely the capabilities that assist in dissuading other states (Futter, 2020, p. 27). For instance, AI has the potential to enhance nuclear decision-making, reducing the likelihood of human error and bolstering nuclear deterrence. Target identification can be made more precise to improve early warning and detection, or command-and-control systems can be optimised to strengthen the infrastructure around nuclear weapons (Onderco & Zutt, 2021, p. 289). Again, perception plays a crucial role, as a state might be discouraged from initiating an attack if it believes other states can anticipate its behaviour by using sophisticated AI technology (Wilner & Babb, 2020, p. 404).

On the other hand, experts warn about the dangers of overreliance on artificial intelligence. No technology is completely immune to failure. Some actions could be misperceived by technologies on the other end. Therefore, human deliberation is sometimes required to make ethical judgements in ways that machines cannot (Onderco & Zutt, 2021, p. 290). Moreover, every AI system is vulnerable to flawed data inputs, and misleading data can fool those systems. In combination with the fact that AI algorithms sometimes distort reality, this could lead to incorrect, unjust and catastrophic decisions (Davis, 2019, p. 121). Adversaries could also corrupt data or hack computers that use AI. Manipulations of the training or input data may lead the AI system to settle on the rival's preferred conclusion (Geist & Lohn, 2018, p. 19).

Conclusion

There are multiple ways in which artificial intelligence may impact the future of nuclear deterrence. Some experts argue that it will have a destabilising effect, as AI has different applications that can threaten a state's second-strike capabilities. Moreover, the mere perception that adversaries can destroy their second-strike capabilities could pressure a state into striking pre-emptively in crisis situations. Others believe that these fears are overstated since the essence of nuclear deterrence stays the same: nuclear conflict will remain the most risky and costly option, and 'the only way to win is not to play' (Davis, 2019, p. 125).

Besides, AI could bolster nuclear deterrence by acting as a decision support system, although experts caution against overreliance on AI systems. The only use of nuclear weapons in armed conflict ultimately occurred during World War II, and since then, nuclear deterrence has successfully prevented great power conflict. Thus, fears about emerging technologies such as AI changing the foundations of nuclear deterrence are not entirely misplaced. However, the exact impact remains uncertain and to be seen

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