

Artificial Intelligence as a Mechanism for the Arms Race

Dr. Djamel Ouali¹, Dr. Fatima Zahra Messaoudi²

¹University Abou Bekr Belkaid Tlemcen (Algeria), E-mail: Djamel.ouali@univ-tlemcen.dz

²University Abou Bekr Belkaid Tlemcen (Algeria), E-mail: Fatima-zahra.messaoudi@univ-tlemcen.dz

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Abstract:

The intrusion of artificial intelligence into all aspects of life has led to numerous benefits, including enhancing countries' economic capabilities and accelerating data processing. Artificial intelligence has become a highly debated topic in shaping the future of humanity and revolutionizing life on Earth. Alongside scientific, technological, and economic fields, AI appears to be a tool for dominance in the military sphere, potentially marking a new chapter in the Cold War where AI could be the sole controlling player.

Keywords: Artificial Intelligence, Arms Race, Technology, Hegemony.

INTRODUCTION:

Recently, the world has witnessed a frantic race to acquire artificial intelligence (AI) and apply its programs across various economic sectors and scientific and consumer applications. This comes amidst warnings from scientists that AI could become a destructive tool for humanity if it is allowed to make critical decisions, especially in military contexts and the development of autonomous weapons capable of addressing various potential threats. This concern has crystallized into the possibility of a new Cold War. This idea represents a future cornerstone in rearming with AI to ensure the perpetual superiority of nations.

Efforts by researchers over the past decade have led to significant advancements in AI and related technologies (quantum computing, big data, the Internet of Things, robotics, and autonomous systems), achieving levels beyond the expectations of experts and specialists within short timeframes.

As AI permeates all aspects of life, the military field is expected to see a major transformation in the use of cognitive solutions to enhance military capabilities and strategies at both tactical and operational levels. James Johnson, a professor at the University of Leicester in the UK and an expert in security studies, warned in a study titled "Artificial Intelligence and the Future War: Implications for International Security," published in issue 35 of *Defence & Security Analysis* in April 2019, about

the global security threats posed by the use of AI in the military and its implications for reshaping the balance of power.

PROBLEM STATEMENT:

Consequently, the integration of AI into the military domain will introduce a new variable into the military equation. Armies using this new technology will not be on par with others, leading to a series of strategic effects that could significantly destabilize security, affecting the dynamics of conflict and military escalation in the future. Hence, the question arises: What is the impact of artificial intelligence on the global arms race?

AIMS AND IMPORTANCE OF THE STUDY:

No one can ignore the change brought about by the technological revolution in all fields, especially with modern technologies and concepts in the field of artificial intelligence, such as "augmented reality," "virtual reality," "the Internet of Things," and "Internet of Everything." These concepts and technologies benefit the military field for various purposes, including more precise target identification and engagement, risk reduction, and most importantly, autonomous decision-making on the battlefield, significantly replacing human intervention with technology. In this context, the question arises: How does artificial intelligence change the nature of current and future wars?

The study initially points out the extensive role that artificial intelligence can play in enhancing both traditional and advanced military capabilities, whether operationally or tactically. It plays a role that goes beyond being a mere "weapon" in itself. At the operational level, artificial intelligence enhances military capabilities through remote sensing, real-time awareness of changes and maneuvers, and decision-making under pressure.

Study Outline: Based on the above, the study is divided into:

- Chapter One: The Dilemmas of Artificial Intelligence
 - Section One: The Concept of Intelligence - An Etymological Study
 - Section Two: The Concept of Artificial Intelligence
 - Section Three: Designing Artificial Intelligence
- Chapter Two: The Risks of Artificial Intelligence to Global Security
 - Section One: The Rapid Development of Artificial Intelligence Technology
 - Section Two: Security Threats of Artificial Intelligence
 - Section Three: The Geopolitical Dimensions of Artificial Intelligence

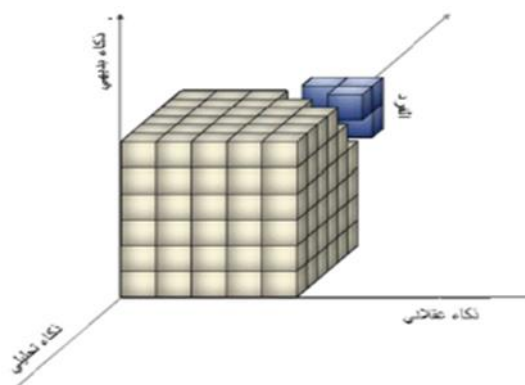
Chapter One: The Dilemmas of Artificial Intelligence Artificial intelligence has become a commonly used concept and has entered all scientific and technical

fields. While machine intelligence is not a new field, its democratization has allowed it to be discussed as a new concept.

Section One: The Concept of Intelligence - An Etymological Study

A group of American researchers published a scientific article in 2006 highlighting the significant discrepancy between the effort involved in thinking and complex situations, which results in seemingly lower intelligence when decisions are made spontaneously. The study challenged existing definitions of intelligence models.

Figure 1: Division of Human Intelligence



Source: Friedman, N.P., Miyake, A., Corley, R.P., Young, J., Hewitt, J.K. (2006). Not All Executive Functions Are Related to Intelligence. *Psychological Science*, 17, 172.

Etymology: The term "intelligence" in Latin means *INTELLIGENTIA*¹, which refers to the ability to understand. In the scientific arena, there are various branches and specialties, and academically, intelligence refers to functions of the human brain. Despite this, some primitive creatures can perform highly complex tasks without having biological brains, such as what occurred with Hans and von Osten in Germany and Edward Chase Tolman's experiments with American rats in 1964,² where the rats were trained to explore a complex maze.

Section Two: The Concept of Artificial Intelligence

Artificial Intelligence (AI) refers to behaviors and characteristics of computer programs that mimic human cognitive abilities and patterns of operation. One of its most important features is the ability to learn.

The response and reaction to situations not programmed into the machine are still a subject of debate due to the lack of a precise definition of intelligence.

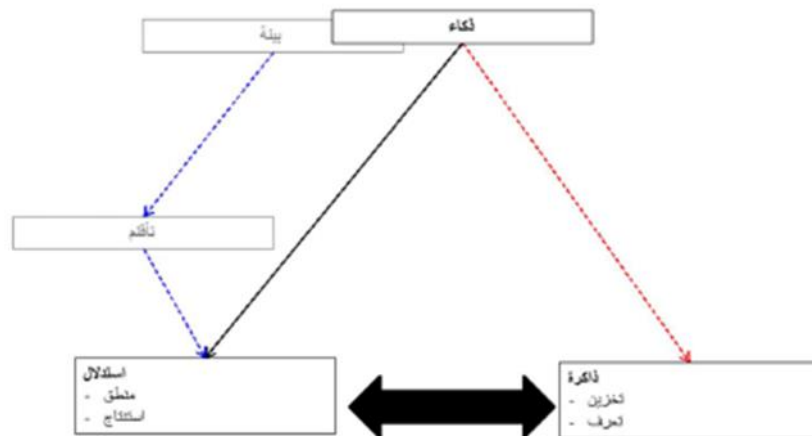
¹ Friedman,N.P,Miyake A, Corley,RP,Young,Hewitt j.k 2006 .NOT ALL EXECUTIVE FUNCTIONS ARE RELATED TO INTELEGENCE .PSYCHOLOGICAL SCIENCE,17 ,172-179

² Friedman,N.P,Miyake A, Corley,RP,Young,Hewitt j.k OP CIT P174.

Intelligence comprises two concepts that are integrated but theoretically separate and develop in an environment to adapt behavior:

- Memory: Represents storage and is a form of intelligence also known as passive intelligence.
- Inference: The ability to analyze and understand relationships between objects and concepts to comprehend facts.

Figure 2 illustrates the components of artificial intelligence in its conceptualization.



Source: Lu H, Li Y, Chen M, Kim & Serikawa (2018). Brain Intelligence: Go Beyond Artificial Intelligence. Mobile Networks and Applications, 23, 368.

Types of Artificial Intelligence:¹

The Narrow Artificial Intelligence: This type of AI specializes in a single area. For example, there are AI systems that can defeat a world chess champion, but that is the only task they perform.

General Artificial Intelligence: This type refers to computers with human-level intelligence across all domains². It can perform any intellectual task that a human can do. Creating this type of AI is much more challenging than the narrow type, and we have not yet reached this level³.

Superintelligent Artificial Intelligence: Philosopher Nick Bostrom of Oxford defines superintelligent AI as “an intellect that is much smarter than the best human brains in virtually every field, including scientific creativity, general wisdom, and social skills.” Due to this, superintelligent AI is a fascinating area for deep exploration.

¹LU H LI Y CHEN M KIM & SERIKAWA 2018 BRIAN INTELLIGENCE : GO BEYOND ERTIFICIAL INTELLIGENCE . MOBILE NETWORKS AND APPLICATION ,23 ;368

²R. Sun, L. Bookman (Eds.), Computational Buildings: Integrating Neural and Symbolic Processes. Clover Academic Publishing, Needham, Massachusetts, 1994.

³Margaret Boden, The Mind as Machine. Oxford University Press, 2006.



Source: https://twitter.com/HCC_ksa/status/

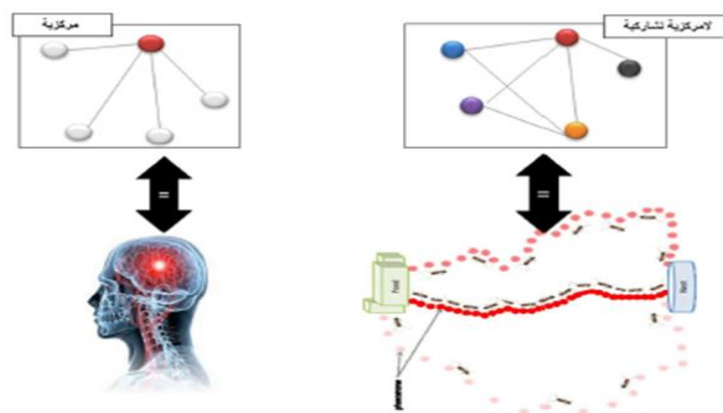
Section Three: Designing Artificial Intelligence

There are two main approaches to designing artificial intelligence¹:

1. Centralized Form Inspired by Human Brain Neurons (Neuromimetism)²: In this design approach, the algorithm's task is to find the optimal solution. For example, the form of artificial intelligence here is artificial neural networks, with deep learning networks being the most prominent. These networks faced challenges for years due to the limited computational capabilities of machines, which did not keep pace with technological advancements. However, developments accelerated with the creation of vast information storage centers.

2. Decentralized Form: Inspired by Biological Nature (Bio-Inspired Intelligence): This approach draws inspiration from simple living organisms that can exhibit intelligence without complex brains. Intelligence in these systems results from interactions between participating molecules rather than from complex computations. An example of this is Multi-Agent Systems (MAS), where intelligence emerges from the collaboration and interaction among agents.³

1. Figure 3: Methods of Designing Artificial Intelligence



Source: <https://www.pngwing.com/>

¹ Schmidhuber, Jürgen. "Deep learning in neural networks: An overview." Neural Networks 61 (2015): 85-117.

² Gartner Data & Analytics Summit (2017). Great networking event with real-world examples and expectations.

³ Schmidhuber, Jürgen. "Deep learning in neural networks: An overview." Neural networks 61 (2015): 85-117.

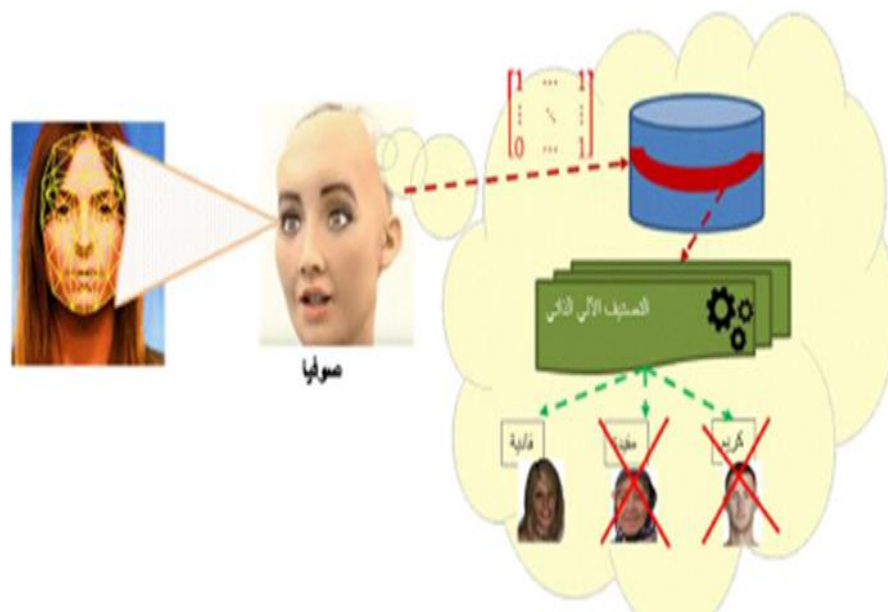
Key Field Cases:

1. Automation Rates in Various AI Applications:¹

Applications existing	Automation rate
	Complete
Computers	75%
Self-driving cars that adapt to road conditions and traffic	65%
Computers that can recognize faces and criminals, and video surveillance cameras	80%
Computer programs that display websites in browsers	95%
Computers analyzing medical records and diagnosing patients	45%
Robots capable of decision-making, used by armed forces	35%
Robots caring for the elderly	32%
Computers investing in stocks and financial markets	65%

2. **Smart Marketing**
3. **Smart Self-Directed Drones**
4. **Waymo Self-Driving Vehicles**
5. **Augmented Reality**
6. **Sophia Humanoid Robot**

A Typical model of the social robot Sophia’s Operation:



Source: Liu, Hu-Chen, et al. Fuzzy Petri nets for knowledge representation and reasoning: A literature review. Engineering Applications of Artificial Intelligence 60 (2017): 45-56.

¹ Gartner Data & Analytics Summit (2017). Great networking event with real world examples and expectations www.psychologyandeducation.net

Chapter Two: The Risks of Artificial Intelligence to Global Security

The arms race continues as artificial intelligence becomes the fast track to achieving global dominance in the 21st century. Countries view AI technology as a support for power and a key to achieving hegemony. In the 21st century, this technology will control information, people, commerce, and future warfare. It is our responsibility to steer and shape our future as AI joins the battlefield, especially as these technologies are still under discussion in the context of just war theories¹.

Section One: The Rapid Development of Artificial Intelligence Technology

This surge in government investments has coincided with a larger wave of private investments directed towards research and development in AI, led by major tech companies such as Amazon, IBM, Google, and Microsoft.

Overall, these investments from governments, investors, and technology companies are expected to will lead to significant leaps in artificial intelligence, adding more capabilities to algorithms that combine human creativity with computational power.

The increasing role of artificial intelligence in the digital environment refers to the degree to which AI increasingly intersects with the digital information ecosystem. Observers note that the most significant changes in information technology during the last quarter of the 20th century occurred largely outside the realm of artificial intelligence.

Similarly, technology that uses deep learning methodologies, which is a component of AI, aims to create a simulated situation or person that appears real but is entirely fake. The term "deep" comes from the concept of learning, and "fake" comes from the idea of deception and forgery².

This happens through a deep learning system studying the personality to be simulated or faked using large amounts of images and videos that mimic all angles of the desired personality. For example, the system studies the way the personality speaks by analyzing facial, mouth, eye movements, hand gestures, and involuntary movements. It then simulates the specific voice tone of the personality using large amounts of voice recordings, allowing the AI system to fabricate an entire conversation that the personality has never had³.

Ian Goodfellow named this model "Generative Adversarial Network" or GAN, which has been considered a revolution in machine learning and artificial intelligence

¹ Definitely a must for any in the 'data' business.. Hilton Sydney, Report, 20 – 21 February, 2017

² John Villasenor, "Artificial intelligence, geopolitics, and information integrity", in: Fabio Rugge, ed., *The Global Race for Technological Superiority: Discover the Security Implications*, (Milano: ISPI and Brookings, November 2019), PP. 131-142.

³ Schmidhuber, Jürgen. "Deep learning in neural networks: An overview." OP CIT P30

systems. It has moved AI from the stage of recognizing objects to creating these objects. Ian Goodfellow currently works with the Google Brain team, responsible for developing AI systems at Google's headquarters in Mountain View, California.

Section Two: Security Threats of Artificial Intelligence

Studies indicate that integrating AI into autonomous weapons systems and robots will lead to their expanded use in both defense and attack, which will reduce the effectiveness of existing multi-layered deterrent systems.

Here are the reasons AI-enhanced systems pose a threat to global security

- The dominance of a false sense of certainty regarding the full capabilities of these systems, given the unknown error rates, as they have not yet undergone rigorous testing, which could lead to severe and unforeseen threats.
- The push towards escalation due to absolute confidence in AI-enhanced military capabilities for confrontation and deterrence of adversaries. This might lead to avoiding peaceful means of resolving conflicts and could push countries towards preemptive strikes to achieve deterrence.
- The tendency to use AI-enhanced systems frequently to test the capabilities of others and assess the level of technological advancement achieved for capability development¹.

Geopolitical determinants and technological advancements have become central factors in reshaping the security environment, which is reflected in defining the nature and extent of strategic competition between the United States and China.

Given the competition between the United States and China to localize innovations in artificial intelligence in distinct ways, the integration of these innovations into military strategic systems is expected to differ between them. This exacerbates the uncertainty between the two nations and affects global security stability and strategic balance among countries.

China is expected to have the upper hand in integrating AI into its military system and strategy through the development of technical standards and AI governance mechanisms to enhance the competitiveness and capability of the Chinese military. It will follow the centralized methodology of the People's Liberation Army (PLA) in integrating AI across all units and operations.

In contrast, the arms race in AI shows that both China and Russia are moving towards full integration and reliance on AI technologies in their military systems. There is evidence of incorporating AI enhancements into their nuclear and ballistic missiles, making them

¹ James Johnson, "Artificial intelligence & future warfare: Implications for International Security", *Defense & Security Analysis*, Vol. 35, no. 2, (2019), PP. 147-169.

capable of launching and destroying pre-defined targets upon detecting any threat or attack. This poses destructive implications for humanity as a whole¹.

On the other hand, it is noted that the United States follows a different, more ethical approach, as removing the human element from the system could exacerbate the consequences of any future crisis and lead to uncontrollable escalation.

Section Three: Geopolitical Dimensions of Artificial Intelligence

Given the significant and rapid developments expected in artificial intelligence over the coming years and the increasing role it will play in shaping the informational environment, the paper anticipates a surge in AI-integrated technologies and their impact on various geopolitical dimensions as follows:

- **Information Control and Surveillance:** Authoritarian systems not only use AI to disseminate content that aligns with their policies on the widest possible scale and block content that contradicts them but can also control and monitor posts on social media. This is achieved not only through individuals but also collectively by identifying trends among individuals and groups, and subsequently using this information to serve their geopolitical objectives.
- **Interference Through Information Manipulation:** AI-supported misinformation can systematically and deliberately influence user perceptions and responses, making it difficult to counteract. An example of this is the influence of foreign governments through social media in the 2016 U.S. elections. Misinformation campaigns backed by AI technology can affect users' perceptions and responses in a way that requires integrated efforts from both the public and private sectors to address, as some forms of misinformation are so subtle that they are extremely difficult to detect.
- **Impact on Geopolitical Elements and Dimensions:** AI influences various aspects of geopolitics, including legislation, trade and economic policies, defense policies, and major merger and acquisition decisions, among others
- **Commercial Impacts:** Countries may manipulate information to enhance positive perceptions of companies headquartered within their borders, thereby boosting the global competitiveness of these companies and reaping economic benefits.
- **Military Impacts:** Future extended military conflicts will rely on information manipulation based on AI mechanisms. This manipulation will not only attempt to influence and shape public opinion but also undermine efforts to

¹ Arabic Translation of The Risks of Artificial Intelligence to Security and the Future of Work PE-237/1-RC (2017)
www.psychologyandeducation.net

provide reliable information to decision-makers and military leaders, thereby weakening its accuracy and credibility¹.

Conclusion:

This paper attempts to address a crucial question about how societies, especially democratic ones, can confront AI-based external misinformation campaigns. The paper concludes that the solution may lie in a triad of technology, policies, and awareness. Just as AI is used to fuel misinformation campaigns, it can also be employed to detect and mitigate these campaigns by integrating AI as a cybersecurity tool. The same applies to policies: while policies may impose stricter controls on informational content shared on social media, they can also mobilize efforts from both the public and private sectors, primarily social media companies, to create more comprehensive informational integration and ensure the integrity of shared information. Information-sharing arrangements and legislative frameworks could play a crucial role in achieving this goal.

The final tool is increasing awareness. Although it cannot completely halt misinformation, it is a key factor in slowing the spread of fabricated or manipulated content, which is expected to become more prevalent in the coming years. It also helps to bolster public trust in the information provided by democratic governments, acting as a bridge between the two sides.

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