AI and the Future of Canadian Defence Policy

Policy Analysts: Ginelle Alvaro, Simranjeet Singh, Claudia Velimirovic

Policy Innovation Initiative

Munk School of Global Affairs and Public Policy

18 March 2024

Introduction

The integration of Artificial Intelligence (AI) within the Canadian Armed Forces (CAF) presents a transformative opportunity to enhance military capabilities, operational effectiveness, and strategic decision-making. By leveraging AI, the CAF can maintain a competitive edge in an increasingly complex and technology-driven global security environment. This paper explores the potential applications and ethics of AI in the CAF, touching on operational efficiency, humanitarian considerations and enhanced combat and defensive capabilities.

Ethical concerns include AI's potential for escalation of conflict, mass surveillance, and misinformation, which threaten core democratic values and international stability, necessitating careful policy navigation to balance security enhancements with fundamental human rights. The United States has set a precedent in responsible AI integration within defence through the adoption of principles emphasizing responsible judgment, minimizing bias, ensuring traceability and reliability, and maintaining governability of AI systems. Canada faces challenges in AI adoption for defence, including technological brittleness, data quality and bias issues, and the need for trust and understanding of AI among military personnel, highlighting the importance of cautious and ethical AI deployment in military contexts.

Issue Statement

How can the integration of AI within the CAF navigate the delicate balance between leveraging AI to enhance military capabilities and addressing the ethical and operational risks associated with its deployment?

Applications of AI in Military Contexts

AI has myriad and diverse applications in military weapons systems with diverse utility, in everything from weapons targeting systems, cybersecurity, network communications systems, analyses of combat environments, analysis of resources to assess novel mechanisms of distribution, design of military hardware, and even maintenance of existing systems (Morgan et al., 2020). This section will explore few novel or unexpected applications of AI in military systems, mainly for the purpose of displaying the diversity of utility AI can have. A prominent example is in the application of composite materials within aerospace systems. Composites are key to materials within the construction of many future high performance military systems, most notably fighter aircraft, but also nuclear weapons, ships, and submarines (Das et al., 2021). AI

has been shown to display great potential to support composite creation and physical application for aerospace systems in mechanisms that reduce susceptibility to oxidation, fatigue, and fracturing, while simultaneously improving stiffness, weight saving ability, and formation in specialized shapes. This is directly due to AI analysis beyond the capacity of more traditional analysis tools (Das et al., 2021).

The earlier example is referring to fabrication which have much more diverse applications, such as civilian aircraft or other non-military contexts (Das et al., 2021). However, other applications of AI have less ability to be transferred to non-militaristic contexts. Electronic warfare (EW) systems are integral battlefield technologies which are key to both defending air, land and sea assets, while also being utilized to reduce the ability for enemy systems to perceive an attacking asset (Sharma et al., 2020). As a result, electronic warfare can play a central role in modifying the capabilities of radar, infrared, sonar, and other systems and thereby ensure an adversary can be engaged with less forewarning (Sharma et al., 2020). AI can be utilized to make more autonomous systems, increase the capacity for analysis of radar data to identify electronic jammers and sources of electronic emissions, while also increase target tracking capacity (Sharma et al., 2020). Overall, this reveals a very specific, military-oriented application which has little transferability to civilian systems, bringing up many questions addressed in the next section.

Key Considerations

Ethics of AI in Canadian Defence Policy

Artificial Intelligence holds immense potential to transform military operations, offering advancements in efficiency, accuracy, and strategic planning. However, the integration of AI into Canadian defence policy raises significant ethical considerations that demand careful deliberation and proactive measures. This section explores key ethical concerns surrounding the deployment of AI in military contexts, with a specific focus on the United States as a case study.

Ethical Issues in AI Implementation

The potential uses of AI in national defence span a wide spectrum, encompassing support for logistics and transportation systems, target recognition, combat simulation, training, and threat monitoring, with virtually limitless possibilities (Tadeo et al., 2021). AI software's

increasing role in military technology and planning introduces complex ethical dilemmas, particularly concerning its potential to replace human decision-makers in tasks involving lethal force (Rowe, 2022). The incentive to automate military actors is natural, given the dangers of military conflict. However, this automation must consider whether AI software can be trusted to think and act substantially as humans do. Of course, this consideration is predicated on the assumption that humans are generally more ethical than machines since humans have higher-level goals (Rowe, 2022). Therefore, this creates sub issues of whether AI systems will reason similarly to humans with the same information. Furthermore, AI's potential to escalate conflict, produce mass surveillance measures, and spread misinformation poses threats to individual rights and violations of dignity (Tadeo et al., 2021). Failure to address these ethical concerns threatens to undermine the core values of democratic societies and jeopardize international stability. Thus, it is imperative for defence policymakers to navigate these ethical complexities with diligence and foresight to ensure that AI enhances security without compromising fundamental human values.

Despite the potential ethical considerations associated with AI use, Canada should still work to integrate AI into their defence policy, or risk falling behind. The latest national defence and innovation strategies of several governments, including the US, UK, China, Singapore, Japan, and Australia, prominently feature AI capabilities (Tadeo et al., 2021). These nations have already begun deploying AI to bolster the security of critical national infrastructure, such as transportation networks, hospitals, energy facilities, and water supply systems (Tadeo et al., 2021). Moreover, NATO has identified AI as a pivotal technology in maintaining strategic superiority over adversaries, as highlighted in its 2022 report on the future of the alliance (NATO, 2022).

Case Study: The United States

The United States Department of Defense (DOD) has taken decisive steps to address the ethical considerations surrounding the integration of AI capabilities into military operations (U.S. Department of Defense, 2018). The DOD's five principles, meticulously crafted over a 15-month period by the Defense Innovation Board, in consultation with leading AI experts, technical professionals, current and former DOD leaders, and the American public, underscore

the department's dedication to responsible AI implementation (U.S. Department of Defense, 2019).

1. Responsible: DOD personnel will ensure responsible judgment and care throughout the entire AI lifecycle, ensuring accountability and ethical decision-making
2. Equitable: The DOD will work deliberately to minimize unintended bias in AI capabilities
3. Traceable: The department ensures that personnel possess comprehensive knowledge of AI technology and operational methodologies, supported by transparent and auditable procedures.
4. Reliable: AI capabilities will have explicit, well-defined uses that consider safety, security, and effectiveness through testing
5. Governable: The DOD is committed to designing AI systems capable of fulfilling their intended functions while possessing the flexibility to identify and rectify unintended consequences promptly

Ultimately, the adoption of these principles reflects the United States' proactive approach to integrating AI ethically into defence policy, setting a precedent for responsible AI governance that can inform Canada's own AI defence policy considerations.

Challenges Canada Must Overcome for Successful AI Adoption

Technological Brittleness and Adaptability Limiting Use

The current state of AI technology presents challenges regarding its adaptability and generalization beyond a narrow scope of assumptions. This inherent brittleness poses particular concerns in military contexts where encounters with unpredictable and diverse scenarios are commonplace. Consequently, caution is warranted in employing AI within the kill chain, which encompasses the critical steps leading to the decision to execute a lethal attack.

Data

The effective utilization of AI in military operations hinges on the accessibility and quality of data. Challenges arise in acquiring sufficient quantities of high-quality training data,

compounded by the risks of data bias, which could compromise the reliability and ethical integrity of AI-generated outcomes. Additionally, the reliance on extensive training data raises questions about Canada's potential dependence on data sharing or acquisition from other nations to ensure the optimal functioning of AI systems.

Trust and Understanding of AI

The opacity of AI decision-making processes presents obstacles to building trust and reliance among commanders and operators, particularly in situations involving life-and-death decisions. Addressing this challenge necessitates comprehensive training for personnel on the operation of AI systems. Moreover, efforts must be directed towards designing AI systems with transparent decision-making mechanisms to enhance understanding and confidence in their capabilities.

Recommendations & Implementation

There is a pressing need for comprehensive policies and frameworks that govern the development, deployment, and use of AI within the CAF to ensure alignment with Canadian values and international norms. When considering the integration of Artificial Intelligence (AI) into the Canadian Armed Forces (CAF), a strategic approach that balances innovation with security and ethics is essential. The following three recommended policies explore different facets of AI integration:

1. Hybrid Development Approach: Balancing Internal Expertise and Private Sector Innovation

Policy Recommendation: The CAF could adopt a hybrid development approach to AI integration that leverages both internal expertise and private sector innovation. This approach involves building internal AI capabilities by hiring AI experts and creating specialized AI roles within the forces, while simultaneously partnering with leading private sector companies for cutting-edge technologies and solutions.

Internal Development: By investing in the recruitment and training of AI experts within the military and the Department of National Defence (DND), the CAF can develop bespoke AI

solutions tailored to specific operational needs. This approach ensures that AI applications are closely aligned with military ethics, security protocols, and operational requirements.

Private Sector Collaboration: Engaging with private sector entities through procurement, partnerships, and initiatives like the Mobilizing Insights in Defence and Security (MINDS) program can accelerate AI innovation and access to advanced technologies (National Defence, 2023). Collaborations with companies like Palantir could provide the CAF with sophisticated AI tools for data analytics, intelligence gathering, and decision support (Palantir, n.d.).

2. **Phased Integration Priority: From Administration to Operational Domains**

Policy Recommendation: Implement a cautious, phased approach to AI integration, beginning with administrative and support functions before progressing to more critical areas such as intelligence and combat operations. This strategy allows for the evaluation of AI technologies in lower-risk environments, facilitating gradual adaptation and risk assessment.

Administrative Applications: Initial AI integration efforts could focus on administrative domains, including logistics, supply chain management, and personnel administration. AI can streamline these processes, reducing overhead and freeing up resources for operational use.

Intelligence and Reconnaissance: As confidence in AI systems grows, their application can extend to intelligence gathering and analysis, enhancing the accuracy and timeliness of information provided to decision-makers.

Combat and High-Risk Operations: The final phase of AI integration could consider high-stakes areas such as autonomous systems in combat and defensive operations, ensuring thorough testing, ethical considerations, and compliance with international laws are addressed.

3. **Innovation Versus Risk Management: Navigating the Path Forward**

Policy Recommendation: Striking a balance between fostering innovation and managing risk is crucial for the successful integration of AI in the CAF. This requires a dual-focus policy that encourages innovative AI applications while implementing stringent risk management protocols.

Innovation Incubation: Establish dedicated units or centers within the CAF and DND focused on AI research and innovation. These units can explore cutting-edge applications of AI in military contexts, pushing the boundaries of current technology while remaining insulated from operational risks.

Risk Management Frameworks: Develop comprehensive risk management frameworks that assess the security, ethical, and operational implications of AI technologies. These frameworks should include rigorous testing, validation, and ethical review processes, ensuring that AI systems are deployed responsibly and safely.

Conclusion

The integration of AI into the Canadian Armed Forces necessitates a nuanced approach that balances the drive for innovation with the imperatives of security, ethics, and operational integrity. By adopting a hybrid development model, prioritizing AI integration areas, and carefully navigating the innovation-risk nexus, the CAF can harness the transformative potential of AI to enhance its capabilities while upholding its commitments to responsible and ethical military conduct.

However, AI also presents complex ethical and operational challenges that necessitate a nuanced approach to ensure alignment with democratic values and international stability. Drawing inspiration from global best practices, particularly the United States' commitment to responsible AI implementation, Canada must navigate the balance between technological innovation and ethical integrity. The adoption of a strategic framework that emphasizes a phased integration of AI, from administrative functions to critical operational domains, combined with a strong focus on internal expertise development and external collaborations, will be key in realizing the benefits of AI in defense while mitigating associated risks.

References

Aican: The impact of the Pan-Canadian AI strategy – CIFAR. (n.d.). https://cifar.ca/ai/impact/

AI's implications for Defence and national security. Carleton Newsroom. (2020, February 20). https://newsroom.carleton.ca/story/artificial-intelligence-implications-defence/

Das, M., Sahu, S., & Parhi, D. R. (2021). Composite materials and their damage detection using AI techniques for aerospace application: A brief review. Materials Today: Proceedings, 44, 955-960.

Dmanson. (2023, August 17). *How modern militaries are leveraging AI*. Atlantic Council. https://www.atlanticcouncil.org/in-depth-research-reports/report/how-modern-militaries-are-leveraging-ai/

Morgan, F. E., Boudreaux, B., Lohn, A. J., Ashby, M., Curriden, C., Klima, K., & Grossman, D. (2020). Military applications of artificial intelligence. Santa Monica: RAND Corporation.

National Defence. (2023, June 1). *Government of Canada*. Canada.ca. https://www.canada.ca/en/department-national-defence/programs/minds.html

NATO. (2022). The Secretary General's Annual Report. https://www.nato.int/nato_static_fl2014/assets/pdf/2023/3/pdf/sgar22-en.pdf

Palantir. (n.d.). *Palantir*. https://www.palantir.com/

Priems, & Gizewski, P. (2023, January 11). *Leveraging Artificial Intelligence for Canada's Army*. Leveraging Artificial Intelligence for Canada's Army - Canada.ca. https://www.canada.ca/en/army/services/line-sight/articles/2022/05/leveraging-artificial-intelligence-for-canadas-army.html

Rogin, A., & Zahn, H. (2023, July 9). *How militaries are using artificial intelligence on and off the battlefield*. PBS. https://www.pbs.org/newshour/show/how-militaries-are-using-artificial-intelligence-on-and-off-the-battlefield

Rowe N. C. (2022). The comparative ethics of artificial-intelligence methods for military applications. Frontiers in big data, 5, 991759. https://doi.org/10.3389/fdata.2022.991759

Sharma, P., Sarma, K. K., & Mastorakis, N. E. (2020). Artificial intelligence aided electronic warfare systems-recent trends and evolving applications. IEEE Access, 8, 224761-224780.

Taddeo, M., McNeish, D., Blanchard, A. et al. Ethical Principles for Artificial Intelligence in National Defence. Philos. Technol. 34, 1707–1729 (2021). https://doi.org/10.1007/s13347-021-00482-3

U.S. Department of Defense. (2018, October 29). DOD committed to ethical use of artificial intelligence. defence.gov. https://www.defence.gov/News/News-Stories/Article/Article/3429864/dod-committed-to-ethical-use-of-artificial-intelligence/

U.S. Department of Defense. (2019, February 26). DOD adopts 5 principles of artificial intelligence ethics. defence.gov. https://www.defence.gov/News/News-Stories/article/article/2094085/dod-adopts-5-principles-of-artificial-intelligence-ethics/

U.S. Department of Defense. (n.d.). U.S. endorses responsible AI measures for global militaries. U.S. Department of defence. https://www.defence.gov/News/News-Stories/Article/Article/3597093/us-endorses-responsible-ai-measures-for-global-militaries/#:~:text=Military%20AI%20capabilities%20includes%20not,the%20recruiting%2C%20retention%2C%20and%20promotion