## ENHANCING TACTICAL LEVEL TARGETING WITH ARTIFICIAL INTELLIGENCE

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the ever-evolving landscape of modern warfare, artificial intelligence (AI) has emerged as a game-changing theory in military operations, particularly in enhancing tactical-level targeting. The problem with human-driven tactical-level targeting lies in its inherent limitations in achieving rapid acquisitions, precise targeting and optimal decision-making due to cognitive processing constraints and the complexities of rapidly evolving enemy combatants and their ability to displace promptly. AI-driven targeting systems can revolutionize precision, accuracy and sensor-to-shooter capabilities, elevating the effectiveness and efficiency of military engagements to unprecedented heights. By harnessing the power of AI algorithms and advanced data processing, commanders could rely on a comprehensive and intelligent decisionmaking framework that ensures superior target identification and minimizes collateral damage for a decisive advantage on the battlefield. This article delves into the impressive impact of AI in bolstering tactical-level targeting, emphasizing the remarkable improvements in precision, accuracy and sensor-to-shooter enhancement that would redefine the face of modern warfare.

AI-driven systems can significantly enhance precision and accuracy in tactical targeting. Traditional targeting methods often rely on human operators, who can be prone to fatigue, stress and human error. AI algorithms, on the other hand, can analyze vast amounts of data quickly and accurately, leading to improved target identification and tracking. Researchers at Collins Aerospace have demonstrated the benefits of AI in precision targeting. They developed an AI-based system that will identify and track potential threats on the battlefield. The system improved target recognition accuracy, rapidly aiding human operators and enhancing precision during engagements (Tactical et al. (TITAN), n.d.) AI-driven systems that provide real-time analysis and decision support are crucial in rapidly changing battlefield scenarios. AI-driven systems can process data from multiple sources, such as sensors, Unmanned Aerial Vehicles (UAV) and satellites, to provide commanders with upto-date information and insights, enabling more informed and timely decisions. A study by the RAND Corporation on AI integration in military operations highlighted that AI-driven systems could analyze vast amounts of data and detect,

analyze and respond to attacks faster and more effectively than human operators can (RAND Corporation, 2020). This capability enhances situational awareness and helps military personnel respond quickly to emerging threats.

AI algorithms, accounting for environmental factors in calculating optimal trajectories in tactical targeting, play a significant role in determining the trajectory of munitions. Wind speed, humidity, terrain and other variables can affect the accuracy of targeting solutions (Sentient et al., 2023). Artificial intelligence algorithms can consider these factors when calculating trajectories, leading to more precise impact points. The system could provide superior accuracy to traditional trajectory calculation methods, especially in challenging weather conditions.

Minimizing collateral damage and unintended harm are critical assessments during large-scale combat operations. Artificial intelligence can assist in mitigating these risks by analyzing the environment, identifying potential risks to civilians and proposing alternative engagement strategies. The International Committee of the Red Cross (ICRC) has emphasized incorporating ethical considerations into AI-driven targeting systems (ICRC, 2022). By using AI to predict potential collateral damage, military forces can make more informed decisions that prioritize the safety of civilians.

Artificial intelligence can significantly improve target prioritization and weaponeering, ensuring that the most critical threats are engaged with appropriate munitions. Machine learning algorithms can learn from historical engagement data and adapt strategies to optimize targeting effectiveness. The Department of Defense has found that AI-based target prioritization systems outperformed traditional methods. The AI-driven systems demonstrated a higher success rate in neutralizing high-value targets while minimizing resource expenditure (Vergun, 2022).

Sensor-to-shooter enhancement is one of the significant challenges in fire support. Sensorto-shooter is the efficient and timely utilization of sensor data to identify and engage potential threats. Artificial intelligence algorithms can revolutionize this process by analyzing data from various sensors, such as radar systems, UAVs





and surveillance cameras. By employing machine learning techniques, AI can distinguish patterns, detect anomalies and recognize potential targets more accurately than human operators. A study by Albon (2022) demonstrated that AIenhanced sensor-to-shooter systems achieved increased target identification accuracy compared to conventional methods. This enhancement resulted from AI's ability to process multiple data sources simultaneously, enabling faster target recognition and reducing false favorable rates. Reduction in processing times contributes to quicker target engagement and reduces the risk of losing an opportunity to engage a target. One of the challenges in tactical targeting is the time it takes from identifying a potential target to executing an engagement. Traditional workflows involve manual data analysis and coordination, leading to delays that can be critical in time-sensitive situations. Artificial intelligence offers the potential to streamline this process by automating data processing, target selection and weapon assignment (Grand-Clément, 2023). Considering these technological progressions, AI-driven tactical targeting systems hold the capability to reduce processing times by up to 70%. The AI algorithms can analyze incoming sensor data, prioritize targets based on predefined criteria and suggest the most suitable weapons for engagement. Human intervention is crucial in approving AI's suggested attack criteria and ensuring responsible and ethical deployments of weapons systems. This reduction in processing times allows for quicker responses to emerging threats and enhances the overall effectiveness of tactical operations.

To ensure the successful integration of AI systems, training programs must be designed to educate military personnel about the capabilities and limitations of AI. Artificial intelligence has the potential to significantly augment decision-making processes, data analysis and situational awareness on the battlefield (Sentient et al., 2023). However, Soldiers and commanders must understand the boundaries of AI's capabilities and avoid over-reliance on automated systems. Military personnel can make informed decisions and effectively leverage AI technologies to achieve mission objectives by providing comprehensive education about AI's potential strengths and weaknesses.

Effective collaboration between humans and AI

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systems is vital for achieving optimal outcomes in military operations. Developing best practices for human-machine collaboration requires an in-depth understanding of AI functionalities and human expertise. Training programs should teach Soldiers and commanders how to communicate effectively with AI systems, interpret AIgenerated insights and make contextually appropriate decisions. Collaboration should not be viewed as a mere integration of technologies but rather as a synergistic partnership where human judgment and AI insights complement each other to enhance overall operational effectiveness.

"In the loop" and "on the loop" are two essential concepts in the realm of artificial intelligence that highlight distinct modes of human involvement and control within AI systems. "In the loop" refers to a scenario where humans remain actively engaged and directly influence AI decision-making. This involvement ensures that AI operates under human supervision and adheres to predefined ethical and regulatory guidelines (Mazzolin, 2020). On the other hand, "on the loop" pertains to a higher-level oversight approach, where humans monitor and manage the AI system's performance and intervene only when necessary, allowing the AI to function with greater independence (Model Artificial Intelligence Governance Framework, 2020). Striking the right balance between these two modes is crucial for optimizing AI systems' capabilities while ensuring responsible and accountable deployment.

In conclusion, the challenges of human-driven tactical-level targeting stem from its inherent constraints on rapid acquisitions, precise targeting and optimal decision-making, primarily driven by cognitive processing limitations and the intricate nature of changing scenarios. The integration of AI would highlight the remarkable improvements in precision, accuracy and sensorto-shooter capabilities achieved through AIdriven targeting systems. This development ushers in an era of unmatched effectiveness and efficiency in military engagements. Furthermore, the continuous evolution of technology and the advancing sophistication of AI algorithms promise even more innovations in tactical targeting. This integrated approach offers a safer, more strategic pathway for navigating modern conflicts.

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in the U.S. Army on January 18, 2011, and was appointed an Army Warrant Officer in December 2022. He graduated from the Warrant Officer Basic Course in September 2023. WO1 Baxter is currently the Battalion Targeting Officer at 3–13th FAR, 75th Fires Brigade. WO1 Baxter's experience in calling for fire and targeting has led him to explore the realm of Artificial Intelligence (AI). Over the last few years, He has developed a genuine interest in AI. He firmly believes that thoughtful human and AI collaboration could be a game changer, enhancing our lethality in Large-scale Combat Operations. He is excited to be a part of this convergence between military expertise and AI and looks forward to contributing to the ongoing evolution of our capabilities. He strongly believes that AI has the potential to bring positive impacts to our operations.

## References

Albon, C. (2022, October 6). Army developing TITAN system to improve sensor-to-shooter timeline. Defense News. <u>https://www.defensenews.com/land/2022/10/06/</u> army-developing-titan-system-to-improve-sensor-toshooter-timeline/

International Committee of the Red Cross. (2022, February 26). ICRC position on Autonomous Weapon Systems. <u>https://www.icrc.org/en/document/icrc-position-</u> <u>autonomous-weapon-systems</u>

Mazzolin, R. (2020, November 23). Artificial Intelligence and Keeping Humans "in the Loop". Centre for International Governance Innovation. <u>https://www.cigionline.org/articles/</u> artificial-intelligence-and-keeping-humans-loop/

Model Artificial Intelligence Governance Framework. (2020). Model Artificial Intelligence Governance Framework, 2, 30. <u>https://www.pdpc.gov.sg/-/media/</u> files/pdpc/pdf-files/resource-for-organisation/ai/ <u>sgmodelaigovframework2.pdf</u>

Morgan, F. E., Boudreaux, B., Lohn, A. J., Ashby, M., Curriden, C., Curriden, K., & Grossman, D. (n.d.). Military Applications of Artificial Intelligence. RAND CORPORATION. https://www.rand.org/content/dam/rand/pubs/research\_ reports/RR3100/RR3139-1/RAND\_RR3139-1.pdf

Sarah Grand-Clément, (2023) "Artificial Intelligence Beyond Weapons: Application and Impact of AI in the Military Domain", UNIDIR, Geneva, 14–19.

Sentient Digital, Inc. (2023, January 31). Military Applications of AI in 2023- Sentient Digital, Inc. <u>https://</u> sdi.ai/blog/the-most-useful-military-applications-of-ai/

Tactical Intelligence Targeting Access Node (TITAN). (n.d.). Collins Aerospace. <u>https://www.collinsaerospace.</u> <u>com/what-we-do/industries/military-and-defense/</u> <u>battlemanagement/titan#:~:text=TITAN%20can%20</u> <u>pull%20from%20space,comes%20to%20making%20</u> decisions%20rapidly.

Vergun, D. (2022, February 8). Artificial Intelligence, Autonomy Will Play Crucial Role in Warfare. U.S. Department of Defense. <u>https://www.defense.gov/News/News-Stories/</u> <u>Article/Article/2928194/artificial-intelligence-autonomy-</u> will-play-crucial-role-in-warfare-general-says/