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## **ADAPTIVE TRAINING OF MILITARY CADETS BASED ON ARTIFICIAL INTELLIGENCE ALGORITHMS**

Adaptive training of military cadets based on artificial intelligence (AI) algorithms is one of the most promising areas of transformation within the system of military education in the 21st century. The spread of digital educational platforms, progress in the field of machine learning, and the growing volumes of data on individual learning trajectories make it possible to design systems that adjust to each cadet's current level of knowledge, learning pace, and psychological state. Military education, which traditionally combines rigid training standards with the need for rapid adaptation to changing security conditions, can greatly benefit from such solutions by simultaneously improving the quality of instruction and reducing the time required to achieve operational readiness.

In simple terms, adaptive learning refers to the use of algorithms that, based on the analysis of a learner's current results and behavior, generate an optimal sequence of tasks, select an appropriate level of difficulty, and adapt the mode of presentation. In a military context, this is combined with intelligent tutoring systems, combat situation simulations, cognitive load monitoring tools, and performance analytics. Such technologies provide instructors and commanders with fast and objective feedback on the level of preparedness of individual cadets and groups. Practical examples already exist: projects of the U.S. Army Research Laboratory, which developed the GIFT platform for adaptive learning, as well as DARPA's "Digital Tutor" initiative, have demonstrated significant improvements in the rapid acquisition of complex technical

skills [1, 3]. These projects confirm that intelligent tutors can substantially increase training effectiveness in near-real environments.

A global trend can now be observed toward integrating adaptive platforms into both civilian and military educational systems. DARPA continues to finance large-scale initiatives on personalized learning for national security specialists, focusing on rapid reskilling [2, 9]. The U.S. Air Force and related institutions employ both commercial and in-house AI-driven platforms for personalized course delivery and learning analytics [5]. In the United Kingdom, the Defence Artificial Intelligence Centre and the Defence AI Strategy support responsible integration of AI in defense-related education [6]. Academic groups and research laboratories also contribute: for instance, OpenTutor is an open-source AI-powered system that enables real-time, adaptive, dialogue-based tutoring [4]. These examples illustrate that adaptive learning has become a global practice, implemented at both the research and operational levels.

The advantages of AI-based adaptive training systems in military education are clear and multifaceted. First, personalization shortens the time needed to master critical skills, reducing unnecessary repetition for fast learners while allowing slower learners more practice time. Second, these systems ensure constant and objective monitoring of progress, identifying weaknesses at an early stage and generating recommendations for instructors to adjust training programs. Third, integration with VR/AR simulations and large-scale mission trainers creates scenarios of increasing complexity tailored to individual cadet responses under physical and psychological stress, which is especially important for combat training. Empirical data from pilot programs demonstrate significant improvements in training outcomes compared with traditional methods, making adaptive approaches highly attractive for defense organizations [3, 8].

At the same time, there are serious risks and limitations that must be addressed when introducing such systems into military education. First, data security and privacy issues: adaptive platforms require large amounts of personal and educational data, and poor management of such information could create vulnerabilities for operational security. Second, algorithmic bias and modeling inaccuracies may lead to incorrect assessments of cadets' capabilities, which is dangerous in contexts where mistakes directly affect combat readiness. Third, excessive reliance on automation risks diminishing critical human skills such as leadership, creativity, and strategic thinking, unless adaptive systems are combined with pedagogical approaches that deliberately nurture these competencies. Ethical and legal aspects of AI use in education – particularly in military settings – are also highlighted in scholarly reviews [7].

To overcome these challenges, a comprehensive approach is required. First, the “human-in-the-loop” principle should be ensured – meaning instructors must retain oversight of key system decisions and have the ability to adjust adaptation or interpret analytics. Second, robust policies and technical safeguards for data protection,

including encryption and secure, isolated learning environments within defense networks, must be implemented. Third, responsible and transparent AI principles should be applied: model auditing, explainability of system decisions, and mechanisms for error correction. Fourth, training programs should be pedagogically designed to combine adaptive content delivery with live training sessions, interpersonal exercises, and team-based evaluation, preserving the development of soft skills alongside technical competence. In practice, this involves preparing instructors to interpret AI-driven analytics, auditing algorithms, and establishing certification standards for AI solutions in military education. Such recommendations already appear in policy documents and guidelines for responsible AI in defense [6].

The future of adaptive training for cadets includes several key directions. First, tighter integration of adaptive platforms with mission simulations and large-scale exercises will allow individual progress to be directly correlated with operational performance in virtual missions [10]. Second, multimodal analysis tools (speech processing, video, biometrics) will enable early detection of stress responses, allowing training adaptation based on psychological state. Third, methods of continual learning and collaborative optimization of training strategies will allow successful practices to scale across units and entire institutions [9]. These prospects make adaptive training not only an instrument for improving individual qualifications but also an element of strategic force preparation.

In conclusion, the implementation of adaptive learning systems based on AI algorithms in military education has immense potential for enhancing cadets' training. However, the success of such transformation depends on a balanced combination of technological solutions, pedagogical expertise, data protection measures, and transparent governance policies. Careful design of pilot programs, continuous algorithm auditing, instructor training, and integration into the broader training architecture will ensure that adaptive technologies serve the ultimate goal: strengthening the competence and combat readiness of future military leaders while minimizing risks and maintaining human oversight of the learning process.

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