

ABSTRACT

The explanatory report contains 159 pages, including 12 figures, 38 tables, 2 appendixes, and 60 references.

Relevance of the topic. In modern military operations, the role of visual information is rapidly increasing. The widespread use of unmanned aerial vehicles, satellite systems, and other reconnaissance platforms leads to the generation of large volumes of imagery that require timely analysis. Manual processing of such data is extremely time-consuming and significantly slows down decision-making. Existing automated object-detection systems are often designed for civilian applications, depend on network infrastructure, and exhibit instability under degraded imaging conditions. This creates a need for an autonomous, robust, and efficient software tool for automatic recognition of military equipment.

The purpose of the research is to improve the accuracy of recognizing military equipment and enhance robustness to noise factors by applying an ensemble approach based on YOLO models and the Weighted Boxes Fusion algorithm.

Object of study: computer vision technologies for automatic object recognition.

Subject of study: models and methods for recognizing military equipment.

To achieve the stated goal, the following **research tasks were formulated:**

- analyse existing solutions in the field of military equipment detection;
- implement a component for image processing;
- train baseline models of different configurations for subsequent ensembling;
- develop and investigate an ensemble approach using a results-fusion algorithm;
- integrate the developed ensemble into a software environment;
- evaluate the effectiveness of the proposed solution.

Scientific novelty lies in improving ensemble-based detection methods for military equipment using neural networks through the integration of adaptive post-processing mechanisms, dynamic weighting of individual models, and prioritisation techniques within the ensemble.

Practical significance of the obtained results consists in the development of a software tool for automated recognition of military ground vehicles, which can be integrated into military monitoring, reconnaissance, and analytical systems, thereby enhancing the speed and accuracy of image analysis.

Relationship with scientific programs, plans, and themes. The work was carried out at the Department of Informatics and Software Engineering of the National Technical University of Ukraine “Igor Sikorsky Kyiv Polytechnic Institute”.

Approbation. The scientific results of the dissertation were presented at the IX International Scientific and Practical Conference of Young Scientists and Students «Software Engineering and Advanced Information Technologies» (SoftTech-2025), Kyiv, November 26-28, 2025.

Publications. The scientific results of the dissertation are published in:

1. Meheda D.S., Difuchyn A.Yu. Software Tool for Recognition of Military Vehicle Objects // IX International Scientific and Practical Conference of Young Scientists and Students «Software Engineering and Advanced Information Technologies» (SoftTech-2025). Conference Proceedings. December 26-28, 2025. Kyiv.

Keywords: computer vision, object detection, military equipment, YOLO, ensemble learning, Weighted Boxes Fusion, image preprocessing, autonomous recognition.