ABSTRAK

Sepanjang sejarah, perang terus mendorong perkembangan teknologi militer, termasuk *drone* yang sejak 2010 digunakan untuk pengintaian dan serangan. Dalam perang Ukraina–Rusia, *drone* komersial lebih dipilih karena murah, sulit terdeteksi, dan efektif untuk misi pengintaian, koreksi artileri, hingga serangan kamikaze, sekaligus meningkatkan keamanan personel. Kini *drone* dipadukan dengan kecerdasan buatan untuk melampaui kinerja tim pengintaian, meski *drone* komersial masih bergantung pada pemrosesan eksternal karena tidak dilengkapi AI bawaan. Penelitian ini menggunakan algoritma YOLOv11s, yang merupakan versi terbaru dari YOLO. Penelitian ini bertujuan untuk mengetahui performa YOLOv11 dalam mendeteksi objek tempur berbasis citra *drone* di medan pertempuran.

Dataset didapatkan dari Roboflow Universe dan *scrapping* dari video Youtube yang terdiri dari 7.594 gambar dengan detail yaitu 2.753 untuk kendaraan lapis baja ringan(*light*), 5.228 untuk kendaraan lapis baja berat(tank) dan 387 terdapat gambar kendaraan lapis baja ringan dan tank. *Dataset* dilatih menggunakan model YOLOv11s sebanyak 200 *epoch* kemudian hasil pelatihan digunakan pada sistem.

Hasil pengujian terhadap data validasi menunjukan bahwa model YOLOv11s mencapai nilai presisi sebesar 0.7484, *recall* sebesar 0.6911, dan F1-score sebesar 0.7185 untuk *class light* sedangkan untuk *class* tank 0.8365 untuk presisi, 0.7824 untuk *recall*, dan 0.8084 untuk F1-score. Model mampu mendeteksi objek tempur berbasis citra *drone* meskipun terdapat beberapa kesalahan seperti salah deteksi pada objek yang disebabkan bentuk yang mirip atau warna yang sama dengan *background*.

Kata Kunci : YOLOv11, *Deep Learning,* Deteksi Objek Tempur

ABSTRACT

Throughout history, war has continuously driven the development of military technology, including drones, which have been used for reconnaissance and attack since 2010. In the Ukraine-Russia war, commercial drones were preferred because they were inexpensive, difficult to detect, and effective for reconnaissance missions, artillery corrections, and kamikaze attacks, while also improving personnel safety. Now, drones are being combined with artificial intelligence to surpass the performance of reconnaissance teams, although commercial drones still rely on external processing because they lack built-in AI. This research used the YOLOv11s algorithm, the latest version of YOLO. This study aimed to determine the performance of YOLOv11 in detecting combat objects based on drone imagery on the battlefield.

The dataset was obtained from Roboflow Universe and scraped from YouTube videos. It consisted of 7,594 images with details: 2,753 for light armored vehicles, 5,228 for heavy armored vehicles (tanks), and 387 for light armored vehicles and tanks. The dataset was trained using the YOLOv11s model for 200 epochs, and the training results were then used in the system.

Test results on validation data show that the YOLOv11s model achieved a precision of 0.7484, a recall of 0.6911, and an F1-score of 0.7185 for the light class, while for the tank class, the precision was 0.8365, the recall was 0.7824, and the F1-score was 0.8084. The model was able to detect combat objects based on drone imagery, although it encountered several errors, such as false detections of objects due to similar shapes or colors to the background.

***Keywords**: YOLOv11, Deep Learning, Combat Object Detection*