

# Drone detection with the aid of convolutional neural network

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## Abstract

The increasing use of drones is noticeable in both military activities and various everyday tasks in modern societies. However, the difficulty in detecting these devices due to their low Radar Cross Section (RCS) and low electromagnetic emissions has become a concern when it comes to protecting sensitive area against unknown drone flights, which can gather location information or even cause physical damage. In addition to these detection challenges, the fact that drones can fly at the night adds an additional layer of obstacle to the surveillance and the safeguarding location information. This paper explores the use of CO<sub>2</sub> laser beam as a directed illuminator for a drone flying in a controlled environment, with the aim of capturing images in the long-wave infrared (LWIR) spectrum. The obtained images were used to train a Convolutional Neural Network (CNN) using the widely recognized YOLO architecture in the literature. As a result of this training, it was possible to validate the neural network and demonstrate the potential for utilizing this approach in drone detection when illuminated by a power source, thus enhancing detection in nighttime environment.



## Biography

Vinícius Arantes is an infantry captain of the aeronautics belonging to the ranks of the Brazilian Air Force. Held, in 2019, the specialization course in electromagnetic environment at the Technological Institute of Aeronautics (ITA), in which he had the opportunity to study and deliver an analysis of the influence of atmospheric transmittance on the detection capacity of surface-to-air missiles, of the manpads type. This course allowed the participation in the master's degree in the Graduate Program and Operational Analysis of the same ITA, now developing studies in the detection of CO<sub>2</sub> laser-illuminated drones and using the images obtained in the infrared spectrum for convolutional neural network training with the aim of providing an automatic detection of drones.

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### Biography

Kaleb Duarte is an infantry captain of the aeronautics belonging to the ranks of the Brazilian Air Force. In 2019, he took a specialization course in the electromagnetic environment at the Technological Institute of Aeronautics (ITA), in which he had the opportunity to study and deliver an Assessment of the effects of infrared countermeasures on the self-director of the IGLA-S missile. This course allowed participation in the master's program of Postgraduate and Operational Analysis of the same ITA, now developing studies on the Technical doctrinal analysis of employment of the IGLA-S.

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