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IMPLEMENTATION OF OBJECT DETECTION ALGORITHMS IN THE INVENTORY OF TECHNICAL INFRASTRUCTURE, CASE STUDY OF UTILITY POLES DETECTION.

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Roads, bridges, railways, poles, and power lines are a key elements of technical infrastructure. Their proper condition is essential for ensuring people, goods, and electricity transportation. Inventory is a crucial process for maintaining the health of technical infrastructure. Conducting inventory with traditional surveying techniques, such as GNSS or trigonometry, is both time and money consuming. In recent years, modern measurement techniques like LIDAR (Light Detection and Ranging) and aerial and ground based imaging have been employed for inventory purposes. These methods allow for the data collection over large areas, reducing both the time and cost of measurement processes. Data from these devices is often processed in conjunction with artificial intelligence algorithms that assist in processing large data sets. This paper aims to introduce deep learning (DL) algorithms for inventory purposes using object detection with utility poles as a case study. The research was conducted using empirical data. A key element in training a DL model is the optimal selection of hyperparameters. During the study, several models were trained, and their performance was compared based on selected metrics. For this study, a dataset of 1,736 original utility pole images was used. To augment the data, new images were created through rotation and mirroring. The best model achieved the following results: Precision = 98.82%, Recall = 97.29%, F1-score = 98.05%, mAP50 = 97.92%, mAP75 = 89.93%. The performance of the model gives a solid base for further implementation of DL object detection techniques for inventory of technical infrastructure.