Advanced Aerial Object Detection Using Enhanced YOLOv3 with Leaky ReLU and Dilated Convolutions

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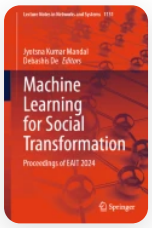

Machine Learning for Social Transformation

(EAIT 2024)

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Abstract

The work addresses deep learning model limitations in aerial target acquisition, emphasizing small object detection, crowded scenes, and complex backgrounds.

Proposing an enhanced YOLOv3 model addresses these issues, incorporating Leaky ReLU for improved non-linearity and integrating dilated convolution post-max pooling for enhanced spatial improvements and object detection accuracy. The study evaluates the model on three Aerial Image Datasets, to compare missed detection, false checks, and small target detection, showcasing its superiority in precision and recall for bridge, airport, and harbor object detection compared to YOLOv3. Precision and recall metrics allow threshold tuning for specific operational needs, addressing class imbalances in aerial datasets. Precision values improve from 80.21% to 82.37%, 81.15% to 83.87%, and 78.44% to 79.82%, while recall values increase from 70.32% to 72.91%, 74.30% to 76.02%, and 82.51% to 83.97%, respectively. These findings support Enhanced YOLOv3's advanced capability in target detection across diverse aerial objects. Incorporation of strategic dilated convolutions, residual clusters, and multi-resolution feature fusion, this research significantly enhances object detection in remote sensing image analysis, elevating accuracy and robustness in target detection with prediction.

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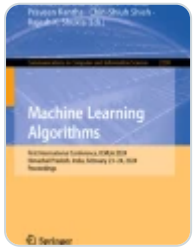

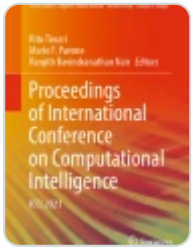

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