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# Automated Feature Extraction and Object-Based Detection from High-Resolution Aerial Photos Based on Machine Learning and Artificial Intelligence

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**Abstract :** With the development of Remote Sensing technology, the resolution of optical Remote Sensing images has greatly improved, and images have become largely available. Numerous detectors have been developed for detecting different types of objects. In the past few years, Remote Sensing has benefited a lot from deep learning, particularly Deep Convolution Neural Networks (CNNs). Deep learning holds great promise to fulfill the challenging needs of Remote Sensing and solving various problems within different fields and applications. The use of Unmanned Aerial Systems in acquiring Aerial Photos has become highly used and preferred by most organizations to support their activities because of their high resolution and accuracy, which make the identification and detection of very small features much easier than Satellite Images. And this has opened an extreme era of Deep Learning in different applications not only in feature extraction and prediction but also in analysis. This work addresses the capacity of Machine Learning and Deep Learning in detecting and extracting Oil Leaks from Flowlines (Onshore) using High-Resolution Aerial Photos which have been acquired by UAS fixed with RGB Sensor to support early detection of these leaks and prevent the company from the leak's losses and the most important thing environmental damage. Here, there are two different approaches and different methods of DL have been demonstrated. The first approach focuses on detecting the Oil Leaks from the RAW Aerial Photos (not processed) using a Deep Learning called Single Shoot Detector (SSD). The model draws bounding boxes around the leaks, and the results were extremely good. The second approach focuses on detecting the Oil Leaks from the Ortho-mosaiced Images (Georeferenced Images) by developing three Deep Learning Models using (MaskRCNN, U-Net and PSP-Net Classifier). Then, post-processing is performed to combine the results of these three Deep Learning Models to achieve a better detection result and improved accuracy. Although there is a relatively small amount of datasets available for training purposes, the Trained DL Models have shown good results in extracting the extent of the Oil Leaks and obtaining excellent and accurate detection.

**Keywords :** GIS, remote sensing, oil leak detection, machine learning, aerial photos, unmanned aerial systems
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