

Object Detection In Low Spatial Resolution Aerial Imagery Using Convolutional

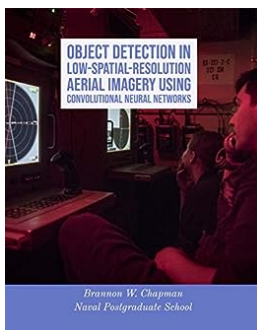
Advancements in remote sensing technologies have allowed us to capture aerial imagery with increasing spatial resolutions. Higher-quality imagery provides more detailed information and enables effective object detection and classification. However, there are cases where low spatial resolution aerial imagery is encountered due to various limitations such as equipment capabilities, cost constraints, or data transmission limitations.

The Challenge of Low Spatial Resolution

Low spatial resolution imagery presents unique challenges when it comes to object detection. The limited number of pixels available makes it difficult to accurately identify and locate objects with precision. Traditional object detection algorithms often struggle to achieve satisfactory results with these limitations.

Convolutional Neural Networks (CNNs) for Object Detection

Convolutional Neural Networks (CNNs) have shown great promise in the field of computer vision, particularly in object detection tasks. CNNs are capable of automatically extracting relevant features from images, making them well-suited for object detection tasks.



Object Detection in Low-spatial-resolution Aerial Imagery Using Convolutional Neural Networks

by Baron Arthur Ponsonby Ponsonby, (Kindle Edition)

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The Role of CNNs in Low Spatial Resolution Aerial Imagery

In the case of low spatial resolution aerial imagery, CNNs can be utilized to overcome the limitations posed by the image quality. By applying convolutional filters to the images, CNNs can identify and highlight relevant features, enabling the detection of objects despite the limited available pixels.

Improving Object Detection Accuracy

To improve object detection accuracy in low spatial resolution aerial imagery, several techniques can be applied. Pre-processing steps such as image enhancement and denoising can help to improve the overall quality of the image. Additionally, data augmentation techniques can be used to generate additional training samples, ensuring that the model is exposed to a diverse range of objects.

Training a Convolutional Neural Network

Training a CNN for object detection in low spatial resolution aerial imagery requires an annotated dataset. The dataset should consist of images with ground truth labels, indicating the exact location of objects. By using this annotated data, the CNN can learn to detect objects based on the provided examples and labeled information.

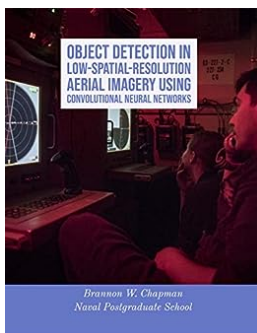
Performance Evaluation

Once the CNN model is trained, it is important to evaluate its performance. This can be done by measuring metrics such as precision, recall, and F1-score. These metrics provide an overall assessment of how well the model performs in detecting objects in low spatial resolution aerial imagery.

Applications and Benefits

The ability to detect objects in low spatial resolution aerial imagery using convolutional neural networks opens up a wide range of applications. This technology can be utilized for urban planning, disaster response, environmental monitoring, and agricultural analysis, among others. By being able to identify and locate objects, valuable insights can be gained and important decisions can be made.

In , object detection in low spatial resolution aerial imagery presents a unique challenge that can be overcome with the application of convolutional neural networks. By utilizing CNNs, it is possible to identify and locate objects in imagery with limited available pixels. The advancements in this field have significant potential for numerous applications and can greatly benefit areas such as urban planning, disaster response, and environmental monitoring.



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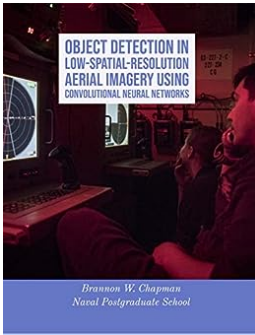


Supervised machine learning by convolutional neural networks has proven effective for regional object detection in digital imagery. However, when applied to low-spatial-resolution aerial imagery, such networks are generally less effective because of the low object-to-image size ratio, the unconstrained orientation of objects, and a shortage of labeled data. The purpose of this research is to assess whether a deep learning technique can be optimized for regional detection and classification of ships, aircraft, or similar platforms in aerial imagery. During tests, we sought and observed improvements in detection precision resulting from adaptations to the region proposal technique of the Faster Regional Convolutional Neural Network (R-CNN) model while using a shallower, fourteen-layer network. Specifically, we found that both k-means clustering and a segmented least-squares fitting technique reveal object orientation patterns in training data that can be used as the basis for the dimensions of Faster R-CNN region proposals. Detection precision was most notably improved for objects not tightly bound by a rectangular region due to their orientation in the image plane.



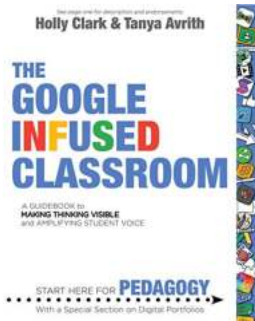
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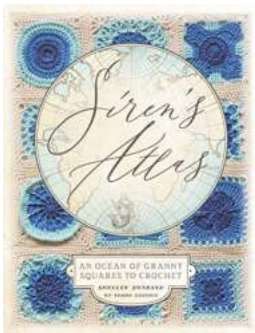
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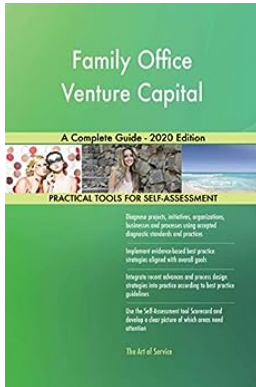
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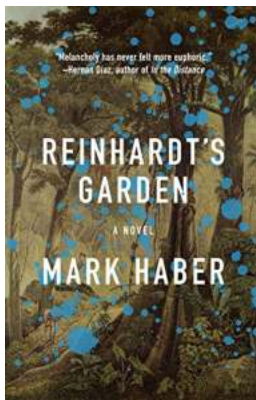
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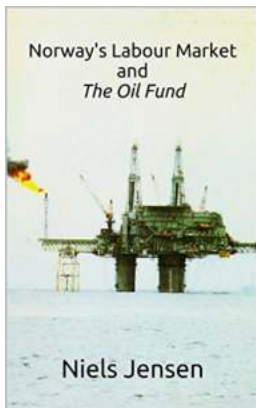
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