ABSTRAK

KOMPARASI SKENARIO KOMPOSIT CITRA NDVI DAN PCA DARI DATA FOTO UDARA DALAM PENGAPLIKASIAN MODEL YOLOV8 TERHADAP HASIL DETEKSI POHON SAWIT

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Deteksi individu pohon sawit dapat dilakukan menggunakan data foto udara dan metode terkini seperti *deep learning* YOLOv8 yang dikenal memiliki performa baik dan stabil. Dalam deteksi pohon sawit, kinerja deteksi juga dipengaruhi oleh citra yang digunakan. Penambahan informasi spektral antara citra RGB dengan citra NIR diperkirakan akan membantu meningkatkan akurasi deteksi. Sejauh ini, penambahan informasi spektral banyak dilakukan dengan memodifikasi alur kerja model yang dikhawatirkan dapat meningkatkan beban komputasi. Sebagai alternatif, NDVI yang memiliki kelebihan dalam mempertegas objek vegetasi dan non-vegetasi serta PCA yang dapat mengurangi redundansi data berpotensi tambahkan ke dalam skenario komposit citra untuk memperkaya informasi spektral. Dengan mengkombinasikan skenario NDVI dan PCA pada komposit citra dan menerapkannya ke dalam model YOLOv8 diharapkan semakin meningkatkan kinerja deteksi pohon sawit. Oleh karena itu, penelitian ini membandingkan skenario komposit citra RGB, NIR, NDVI-*Green-Blue*, dan PCA-*Green-Blue* untuk mengetahui performa terhadap deteksi pohon sawit. Area kajian dalam penelitian ini mencakup lahan sawit di Kabupaten Kayong Utara dengan luas sekitar 31 ha. Hasil penelitian menunjukkan bahwa skenario citra RGB, NIR, NDVI-*Green-Blue*, dan PCA-*Green-Blue* menghasilkan *bounding box* yang presisi pada objek sawit meskipun dengan visualisasi citra berbeda-beda. Seluruh skenario citra menghasilkan *F1-score* > 0,94 dan selisih antar skenario relatif kecil. Modifikasi spektral dan *threshold* tidak berpengaruh signifikan terhadap akurasi deteksi pohon sawit karena keunggulan arsitektur YOLOv8 yang dilengkapi modul C2f dan pendekatan *anchor free*, sehingga dengan berbagai variasi spektral mampu menghasilkan performa deteksi yang handal.

Kata kunci: Komposit Citra, Kelapa Sawit, NDVI, PCA, YOLO.

ABSTRACT

COMPARISON OF NDVI AND PCA IMAGE COMPOSITE SCENARIOS USING AERIAL IMAGERY DATA IN THE APPLICATION OF THE YOLOV8 MODEL FOR OIL PALM DETECTION

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Oil palm tree detection can be performed using aerial imagery data and the latest methods, such as YOLOv8 deep learning, which is known for its high and stable performance. In oil palm tree detection, detection performance is also influenced by the imagery used. Adding spectral information between RGB and NIR images is expected to help improve detection accuracy. So far, the addition of spectral information has often been done by modifying the model workflow, which raises concerns about increased computational load. Alternatively, NDVI which has the advantage of distinguishing vegetation and non-vegetation objects, and PCA which can reduce data redundancy, have the potential to be incorporated into image compositing scenarios to enrich spectral information. By combining NDVI and PCA scenarios on image composite and applying them to the YOLOv8 model, it is expected to further improve the performance of oil palm tree detection. Therefore, this study compares the composite scenarios of RGB, NIR, NDVI-Green-Blue, and PCA-Green-Blue images to determine their performance in oil palm tree detection. The study area in this study covers oil palm plantations in Kayong Utara Regency with an area of approximately 31 ha. The results showed that the RGB, NIR, NDVI-Green-Blue, and PCA-Green-Blue image scenarios produced precise box boundaries for oil palm objects despite varying image visualizations. All scenarios produced F1-scores > 0.94, and the differences between scenarios were relatively small. Spectral modification and thresholding did not significantly affect the accuracy of oil palm detection. It is because the superiority of the YOLOv8 architecture which incorporates the C2f module and an anchor-free approach, so that various spectral variations can provide reliable detection performance.

Keywords: Image Composite, Oil Palm, NDVI, PCA, YOLO.