ABSTRACT

Monitoring livestock in the farming industry is an important but challenging aspect. Computer Vision technology offers a solution by facilitating the detection process, yet various conditions such as overlapping objects, lighting variations, and others add to the detection difficulties. Overlapping objects often cause multiple animals to be detected within a single bounding box, obscuring individual identification. This overlapping region is known as the occlusion area. In previous research, efficient and accurate object detection solutions have been developed. Kurniadi et al. (2023) used the YOLO model on UAVs for cattle detection, while Hongke Zhao et al. (2023) focused on instance segmentation of sheep.

In this study the Mask R-CNN model is trained on three classes of objects: cattle, sheep, and horses, which are verified through model implementation on selected images. The class selection is based on the commonality of these animals in modern farming. The implementation is tested on livestock both within a single class and across different classes in a single image frame, and tested under occlusion conditions to demonstrate detection and segmentation results in occlusion areas.

In this study, the resulting model shows a total training loss of 0.822, with an object detection accuracy of 94.73% and segmentation accuracy of 90.1%. To identify the quality of the model, an evaluation process was conducted by comparing the prediction results. Performance testing shows a Mean Average Precision (MAP) value of 0.427 for object detection and 0.364 for segmentation. The implementation results also indicate minimal detection errors, with approximately 2 out of 5 objects being incorrectly detected.

Kata Kunci: Occlusion, Mask R-CNN, instance segmentation, COCO Dataset