

ABSTRACT

Indonesia's sugar industry faces a significant challenge in meeting domestic demand due to low productivity and sugarcane quality. As one of the largest sugar mills, PT. SGN PG. Jatiroto encounters a critical issue: the manual classification process of sugarcane quality often results in subjectivity and raises trust concerns among farmers and transportation partners, potentially leading to additional operational costs. This study aims to develop a deep learning-based classification model using the YOLOv10 algorithm to enhance objectivity and efficiency in sugarcane quality evaluation at PT. SGN PG. Jatiroto. The methodology follows the Knowledge Discovery in Database (KDD) process, comprising: (1) Data collection of sugarcane stalk images with varying quality levels; (2) Data preprocessing, including annotation and dataset splitting; (3) Data transformation via standardization and augmentation; (4) Data mining using YOLOv10 training implemented in PyTorch; and (5) Model evaluation using a confusion matrix. The model was trained under three dataset split scenarios (70:30, 80:20, 90:10), with the 80:20 configuration yielding the best performance: mAP50 of 0.931, mAP50-95 of 0.812, accuracy of 0.812, precision of 0.871, recall of 0.887, and F1-score of 0.880. The best model simulation using videos demonstrated a 99% classification accuracy with average confidence scores above 90% for classes D and E. These results indicate that YOLOv10 has strong potential for supporting real-time, consistent, and objective sugarcane quality classification, laying the groundwork for automation in agro-industrial quality assessment processes.

Keywords—*agriculture, CNN, dataset, deep learning, evaluation, image annotation, sugarcane quality classification, YOLO*