ABSTRACT

The palm oil industry plays a significant role in the global economy, yet efficient classification of palm fruit ripeness remains a challenge. Manual classification requires substantial time and resources, while accuracy levels are often inadequate. Therefore, a more advanced approach is needed to address this issue. In this context, Convolutional Neural Network (CNN) emerges as a promising solution. This method leverages the ability of artificial neural networks to understand complex features in images, enabling more accurate and efficient automatic classification. This research proposes the application of CNN for classifying palm fruit ripeness. First, a dataset of images showing fruits at various ripeness levels was collected and prepared. The dataset was divided into three parts: training (70%, 152 data points), validation (15%, 32 data points), and testing (15%, 32 data points), with a total of 216 data points. This division ensures the model can be trained, validated, and tested in a balanced way for accurate performance evaluation. It is expected that the application of CNN for palm fruit ripeness classification will produce a model capable of identifying and categorizing palm fruits into the correct ripeness categories. Based on model testing results, during epochs 1-20, training accuracy reached 100%, and loss dropped to 2.24%, indicating excellent prediction results, while validation accuracy remained stable at around 95.00%. The best epoch was recorded at epoch 20, with 100% accuracy and 2.24% loss for training, and 12.04% loss for validation, though the best validation loss was achieved at epoch 32 with a value of 2.94%. The confusion matrix showed 13 correct classifications for ripe fruits and 16 for unripe fruits, with 3 false negatives and no false positives. The model's accuracy was 90.63%, with 100% precision and 81.25% recall.

Keywords : *Convolutional Neural Network, oil palm, classification*