

ABSTRACT

This final project aims to develop a coffee bean classification system based on the level of maturity and quality using the *Convolutional Neural Network* (CNN) method with the VGG16 architecture. Classification of coffee beans into five classes, namely super good ripe, good ripe, bad ripe, good raw and bad raw, aims to assist in sorting and processing coffee beans automatically.

The CNN method with the VGG16 architecture was chosen because of its ability to extract complex features from images and its good generalization ability. The dataset contains pictures of coffee beans from the five classes that have been collected and processed beforehand. The pre-processing process involves normalization, data augmentation, and division of the dataset into training, validation, and testing subsets.

At the training stage, the CNN model with the VGG16 architecture is initialized and adapted to the training dataset. The training process is carried out in several *epochs* with optimization using the stochastic gradient derivative (SGD) algorithm and the *categorical cross-entropy* loss function. After reaching convergence, the model is evaluated using a validation dataset to optimize parameters and prevent *overfitting*.

The experimental results show that the CNN model with the VGG16 architecture is able to classify coffee beans into five classes with significant accuracy. The use of the VGG16 architecture helps in extracting important features from coffee bean images, thereby increasing the quality of classification. The dataset used is 500 and the accuracy obtained is 96%.

This final project succeeded in implementing the CNN method with the VGG16 architecture to classify coffee beans into five classes based on maturity and quality levels. The results achieved show the potential use of this technology to support the coffee industry in processing coffee beans automatically and accurately. However, further development is still needed to improve the model's resistance to variations in lighting conditions and different viewing angles.

Keywords: classification, coffee beans, *Convolutional Neural Network* (CNN), VGG16