

ABSTRACT

Tea is one of the most widely consumed beverages in the world, with Indonesia being one of the largest producers and exporters of tea. Tea plants, especially orthodox black tea that undergo a fermentation process, produce various types of tea powders. One of the major companies playing a significant role in Indonesia's tea industry is PT Perkebunan Nusantara VIII, which produces orthodox black tea. However, the quality testing process for orthodox black tea is conducted manually by evaluating the tonnage, watercolor, aroma, and residue of sorted tea powder samples, with the results recorded on the quality test paper. This method is considered inefficient and prone to errors due to human error.

The proposed solution to address this issue is the development of a mobile application based on deep learning, capable of automatically classifying types of orthodox black tea powder. This application, named Rantea, utilizes Convolutional Neural Network (CNN) image processing technology to analyze images of tea powder taken using a smartphone camera. The application is developed using the Flutter programming language and employs cloud services such as Firebase and Google Cloud Platform (GCP). Rantea offers two modes: Minteas for administrators and Mantea for guests. The application also features forms, history, reports, and news articles.

This research shows that the Rantea application has an average SUS score of 82.64 from 35 respondents, placing it in the "excellent" and "grade B" categories for user acceptance. Black Box testing indicates that all features function as expected. The deep learning model is designed using two models: YOLOv8 and ResNet-50. YOLOv8 is used to detect objects in the tea powder, while ResNet-50 is used to classify black tea powder, achieving an accuracy of 98% after fine-tuning with a combination of parameters: an initial learning rate of 0.001, 10 epochs, unfreezing the last convolutional layer block, and a learning rate of 0.0001. The application was tested with 350 images across 11 classes of image the orthodox black tea powder. Performance testing with a memory specification of 4 GiB, 2 CPU, and a 120 second timeout resulted in optimal response time of 0.493 second. Based on four testing scenarios, the Rantea application is proven to be efficient, accurate, user-friendly, and reliable for tea quality testing.

Keywords: *Rantea, Convolutional neural network (CNN), Deep Learning (DL), Android Mobile Application, Cloud Computing*