

1. Introduction

1.1 Introduction

Cassava (*Manihot esculenta*) is a key carbohydrate source in Indonesia, offering benefits like serving as a rice substitute, animal feed, and industrial material. However, cassava production has decreased, particularly in Lampung Province, due to diseases caused by pests, viruses, bacteria, and fungi, which reduce plant productivity and crop quality [1][2].

Diseases such as cassava brown streak disease, cassava green mite, cassava mosaic disease, and cassava bacterial blight affect cassava leaves, damaging plant growth and yield due to their role in photosynthesis. Detecting these diseases is essential to improve cassava yields [2]. With advancements in technology, many studies have employed computer vision to detect plant diseases more efficiently than traditional methods [3]. CNN-based approaches, like the EfficientNet-B3 model used by Magadum et al. [4], achieved an accuracy of 89.01%. Similarly, Surya and Gautama [1] used MobileNetV2, which achieved 85.38% training accuracy. Methil et al. [5] used EfficientNet-B4 with transfer learning, reaching an accuracy of 85.64%, suggesting the potential for further improvements using a larger model like EfficientNet-B7.

Therefore, based on these suggestions, this research will use the EfficientNet-B7 architecture for cassava disease classification. This research aims to improve the performance of EfficientNet-B7 by incorporating attention mechanisms, particularly CBAM and Squeeze-and-Excitation (SE), to enhance feature extraction and increase the model's accuracy in classifying cassava diseases.

1.2 Problem Statement

This study focuses on designing and implementing a Convolutional Neural Network (CNN) based system utilizing the EfficientNet-B7 architecture for the classification of cassava leaf diseases. The proposed model integrates the Convolutional Block Attention Module (CBAM) and Squeeze-and-Excitation (SE) attention mechanisms to improve feature representation and enhance classification accuracy. The model is trained on a Kaggle dataset with 21,397 labeled images representing five categories of cassava leaf diseases: Cassava Brown Streak Disease (CBSD), Cassava Green Mottle (CGM), Cassava Bacterial Blight (CBB), Cassava Mosaic Disease (CMD), and healthy leaves. The study aims to evaluate the performance of EfficientNet-B7 in classifying these diseases and examine how attention mechanisms, such as CBAM and SE, contribute to better feature extraction and overall model robustness.

1.3 Purpose

The purpose of this thesis is to design and implement a cassava plant disease classification system using Convolutional Neural Networks (CNN) with the EfficientNet-B7 architecture. Additionally, the thesis aims to evaluate the performance of the EfficientNet-B7 model in classifying cassava plant diseases by measuring its accuracy, efficiency, and overall effectiveness in distinguishing between various disease categories.

1.4 Writing Organization

After the Introduction, which outlines the background and motivation for the study, the Related Works section reviews previous research on cassava leaf disease detection, CNN-based image classification, and the EfficientNet-B7 architecture. The Methodology chapter presents the system design, including data acquisition, preprocessing, model architecture, and training process. The Results and Discussion section analyzes the performance of the proposed model, evaluating it through accuracy, precision, recall, F1-score, confusion matrices, and training time, while comparing different model configurations. Finally, the Conclusion summarizes the findings, emphasizing the effectiveness of the proposed model and suggesting future research directions.