CHAPTER 1. INTRODUCTION

1.1 Project Background of the Study

Indonesia is one of the countries experiencing economic growth. The highest digital growth in Southeast Asia. This becomes one of the important strategies. Indonesia seeks to encourage the realization of economic transformation while aims to encourage economic revitalization after the Covid-19 pandemic. This rapid economic development should be able to transform and reduce the number of individuals facing nutrition problems. Figures Global undernutrition has increased significantly from 8% in 2019 to 9.3% in 2020. 2019, then reaching 9.3% in 2020 and continuing to grow at a lower at a slower pace, reaching 9.8% in 2021, after the onset of the pandemic.

Based on reports from the Food and Agriculture Organization of the United Nations Countries (FAO), the Global Fund for Agricultural Development (IFAD), United Nations Children's Fund (UNICEF), World Food Programme (WFP) and World Health Organization (WHO), by 2022, Indonesia will be among the countries with the highest levels of nutritional deficiencies in the region (6.5% of the national population). Southeast Asia (6.5% of the overall national population). Based on survey findings according to the Indonesian Ministry of Health, the underweight rate in Indonesia shows an increase of 0.1%, reaching 17.1% in 2022. The Wasting rate has also increased by 0.6%, so that in 2022 it will be 7.7%. In addition, the stunting rate in Indonesia reached 21.6% in 2022. 2022. The high prevalence of stunting and wasting occurs together with Increasing numbers of overweight and obese people. Diseases such as obesity and heart disease are on the rise due to the lack of a clear a clear understanding of the number of calories in the food consumed. By 2022, in Indonesia, the number of people with obesity will reach 3.5%. Almost onequarter of the increase in the number of individuals who are obese come from the age range above 15 years. This malnutrition problem, of course, has certain contributing factors. Poor diet is one of the causes of health problems.This problem has even reached the corners of the world. Many individuals only rely on food that is easily obtained outside the home to full fill their daily needs, such as ready-to-

eat foods, packaged foods, processed foods, and others. However, consuming such types of food often cannot full fill the daily calorie needs required by the body, and are not even good for the body (Mukhiddinov et al., 2022).

1.2 Problem Statement

1 How to build a model using Convolutional Neural Network

(CNN) algorithm for vegetable image classification. This research focuses on developing a CNN-based machine learning model to identify vegetable types from images and calculate their calorie content. (Mukhiddinov et al., 2022)

2 What is the performance or accuracy of the model in detecting vegetable images. Evaluation is conducted to determine the extent to which the model can accurately recognize food in various classes, as well as measure the prediction error rate. (Mukhiddinov et al., 2022)

3 How to improve the accuracy of vegetable image classification using a larger dataset and a better variety of classes. This problem arises because the model often mispredicts certain classes, indicating the need to improve the dataset as well as the data augmentation method. (Mukhiddinov et al., 2022)

1.3 Research Objectives

1. To develop and improve CNN models, the first step is to optimize the model architecture.
2. To improve the quality and quantity of the dataset, the first step is to increase the amount of data used in model training.
3. To improve model testing and evaluation strategies, a key step is to apply cross-validation techniques, such as k-fold cross-validation, to ensure that models are tested more robustly on different data.

1.4 Project Scope

1 Implement a Convolutional Neural Network (CNN) based system to classify vegetables by type and, if required, by variety.

2 Utilize Kaggle's vegetable dataset to train and validate the system on diverse vegetable images, taking into account variations in shape and colour.

3 Applied image segmentation to partition the images, making feature extraction and subsequent analysis more effective.

4 It allows users to upload vegetable images and receive real-time classification and maturity feedback, with results displayed clearly and accurately

1.5 Project Significane

The importance of this project lies in its potential to transform the agricultural sector by integrating advanced computer vision and deep learning technologies. As the global population grows, ensuring stable levels of highly nutritious vegetables is critical. By automating tasks such as vegetable classification, this system increases accuracy and minimizes human error. These innovations not only support food security, but also drive efficiency and sustainability in the agricultural industry, making them valuable tools to meet current and future needs. Recent advances in computer vision have increased interest in automated image-based recognition and classification for vegetables. Various deep learning approaches, such as Convolutional Neural Networks (CNN), have been applied to effectively classify vegetables, utilizing their ability to learn complex features without the need for manually engineered descriptors. Accurate classification of fruits helps in efficiently providing information on the nutritional content of the vegetables.1.6 Chapter Summary This chapter introduces the project, emphasizing the importance of classifying vegetables by their nutritional value, the challenges posed by current methods, and how neural networks (**CNNs**) offer an automated solution to these challenges. The project aims to create a robust classification system using CNNs and feature extraction techniques to automate the identification process and improve accuracy. The scope outlines the focus on visual features like color, texture, and shape, while the significance highlights the potential benefits for the food industry and public health sector.

1.6 Chapter Summary

This chapter introduces a project that focuses on classifying vegetables based on their nutritional value, as well as the challenges faced by conventional methods in doing so. Emphasizing the importance of automated analysis, this chapter explains how Convolutional Neural Networks (CNNs) can be an effective solution to overcome the limitations of manual methods. This project aims to develop a robust classification system using CNNs and feature extraction techniques such as color extraction using HSV method, texture analysis using GLCM, and shape detection using Canny edge detection.

The scope of the project includes the application of the CNN model to classify different types of vegetables, validation using image datasets from Kaggle, and the use of image segmentation to improve the accuracy of feature extraction. The system is designed to accept image input from the user and provide classification results and ripeness information in real-time.

The significance of this project lies in its potential to revolutionize the agricultural sector by integrating computer vision and deep learning technologies. This system not only improves accuracy and reduces human error, but also contributes to the food security and sustainability of the food industry in the future. With this technology, vegetable nutritional information can be accessed more efficiently, thereby supporting the agriculture sector, food industry and public health.