Modified VGG-19 for Potato Leaf Disease Detection

Bataliran, Michael John Ben

Merindo, Leny M.

Recaido, Jehu U.

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College of Communication and Information Technology
Iba, Zambales

APPROVAL SHEET

This, study entitled **"Modified VGG-19 for Potato Leaf Disease Detection"** prepared and submitted by Michael John Ben Bataliran, Leny M. Merindo and Jehu U. Recaido in partial fulfillment of the requirements for the degree of **BACHELOR OF SCIENCE IN COMPUTER SCIENCE** are hereby recommended for oral examination.

CARL ANGELO S. PAMPLONA, MSCS
Thesis Instructor

DARYL JOHN C. RAGADIO, MSCS
Thesis Adviser

Approved by the Panel of the Oral Examiners on May 2024 with a grade of _____.

JOHN LENON E. AGATEP, Ed.D.
Chairman

MELOJEAN C. MARAVE, MSIT
Member

DARWIN M. MORAÑA
Member

Accepted and approved in partial fulfillment of the requirements for the degree of
BACHELOR OF SCIENCE IN COMPUTER SCIENCE.

29 JUN 2024
Date Signed

MENCHIE A. DELA CRUZ, Ph.D.
Dean, CCIT

EXECUTIVE SUMMARY

Potatoes are a staple food crop in the Philippines and play a crucial role in addressing food security challenges. While potato farming serves as a significant source of income for many Filipino farmers, the industry faces challenges such as potato diseases.

The objective of this study is to improve a convolutional neural network based on the VGG-19 architecture to accurately detect and classify potato leaf diseases with the aim of revolutionizing precision agriculture practices

The modified VGG-19 algorithm presented in this study incorporates global average pooling and restructuring the fully connected layers of the base VGG-19 architecture to smaller sizes.

The data gathered in this study are images of healthy, early blight and late blight potato leaf. The images used for training and validation dataset in this study were gathered from an online data source, Kaggle, while the testing data were gathered from Atok, Benguet, Philippines and was annotated and validated by three experts in agriculture.

The Modified VGG-19 model demonstrated exceptional performance that achieves remarkable results across various evaluation metrics. The model recorded an accuracy of 99.69%, precision and recall of 100%, F1-Score of 100% and low Categorical Cross Entropy value of 0.18. This means that the model exhibits high efficacy in accurately classifying potato leaf diseases.

Furthermore, a comparative analysis with existing state-of-the-art CNN models highlighted the superiority of the Modified VGG-19 model as it surpasses the performance of previous studies. Additionally, the researchers developed a mobile application that integrates the modified VGG-19 model to show its practical usage and help to revolutionize precision agriculture.

The results and findings in this study provided recommendations that includes enhancing the potato leaf dataset, implementing effective segmentation algorithms, exploring IoT-based real-time monitoring systems, broadening disease classification, and integrating multimodal data sources for improved disease detection and monitoring accuracy.