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A DEEP LEARNING CNN MODEL FOR NUTRIENT DEFICIENCY DETECTION IN LETTUCE CULTIVARS

AHMAD IRFAN HUSAINI BIN ROZAIMI

BACHELOR OF ENGINEERING (HONS) ELECTRICAL AND ELECTRONIC ENGINEERING

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AUTHOR'S DECLARATION

I declare that the work in this thesis was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the results of my own work, unless otherwise indicated or acknowledged as referenced work.

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Name of Student	:	Ahmad Irfan Husaini Bin Rozaimi
Student I.D. No.	:	202198
Programme	:	Bachelor of Engineering (Hons.) Electric and Electronic Engineering - CEEE200
Faculty	:	Electrical Engineering
Thesis	:	A Deep Learning CNN Model for Nutrient Deficiency Detection in Lettuce Cultivars
Signature of Student	:	…………………………………
Date	:	February 2025

ABSTRACT

The growing global population has led to a significant increase in food demand, necessitating higher agricultural production for human consumption, animal feed, and food processing. In agricultural countries like Malaysia, vegetable farmers often struggle with identifying nutrient deficiencies in lettuce, particularly deficiencies in nitrogen, phosphorus, and potassium (NPK). This issue poses a major challenge, as traditional manual detection methods are time-consuming, prone to errors, and can damage the lettuce, rendering them inefficient. This paper aims to address this challenge by designing deep neural network models capable of accurately detecting nutrient deficiencies in lettuce. Specifically, the Convolutional Neural Network (CNN) technique is implemented to classify nutrient levels effectively. The study involved training 200 lettuce samples using four CNN models—VGG16, AlexNet, VGG19, and a newly proposed CNN architecture. The samples were categorized based on three nutrient deficiency types, utilizing colour values in the RGB colour space. The models were trained iteratively for 60 loops, achieving a detection accuracy of 94.53%. This demonstrates the potential of CNNs in addressing nutrient deficiencies in crops. Future work could focus on enhancing the model's performance through the use of advanced network architectures, further solidifying its applicability in precision agriculture.

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