

**DEVELOPMENT OF PEST DETECTION SYSTEM USING CONVOLUTIONAL
NEURAL NETWORK IN MUNG BEAN PRODUCTION**

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An Undergraduate Thesis Submitted to the Faculty of the Department of Agricultural and
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Fulfillment of the Requirements for the Degree of

**BACHELOR OF SCIENCE IN AGRICULTURAL AND BIOSYSTEMS
ENGINEERING
(AB Machinery and Power Engineering)**

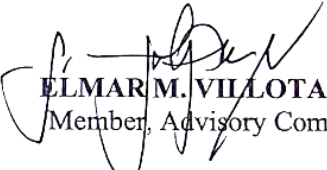
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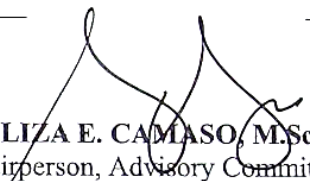
This undergraduate thesis entitled **“DEVELOPMENT OF PEST DETECTION SYSTEM USING CONVOLUTIONAL NEURAL NETWORK IN MUNG BEAN PRODUCTION,”** prepared and submitted by **HAROLD P. EJES** and **ROGELIO JOSHUA C. MINER III**, in partial fulfillment of the requirements for the degree of **BACHELOR OF SCIENCE IN AGRICULTURAL AND BIOSYSTEMS ENGINEERING (AB MACHINERY AND POWER ENGINEERING)** is hereby accepted:


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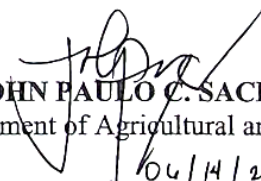

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BIOGRAPHICAL SKETCH

Harold P. Ejes, born on July 01, 2002, in Tapuac, Masinloc, Zambales, is the eldest in his family. His academic journey commenced at Sta—Rita Elementary School, where he laid the foundation for his education from 2012 to 2013. Transitioning to San Andres School of Masinloc for secondary education from 2018 to 2019, Harold demonstrated a remarkable commitment to learning despite encountering challenges. While not naturally adept at learning quickly, his persistence and eagerness for knowledge illuminated his path, showcasing an unwavering dedication to personal growth and the determination to overcome obstacles in pursuit of his goals.

Currently enrolled at Central Luzon State University, Harold is pursuing a Bachelor of Science in Agricultural and Biosystems Engineering. This field resonates with his passion for understanding and enhancing agricultural processes. As he navigates his academic journey, Harold remains focused on honing his skills and knowledge, driven by the desire to make a meaningful contribution to his field and society.

Standing at the threshold of his future, Harold P. Ejes is armed with determination, perseverance, and a thirst for knowledge. Despite the challenges he may encounter, Harold remains steadfast in his pursuit of academic and personal growth, propelled by his ambition to effect positive change in society. As he continues his studies at Central Luzon State University, Harold's journey is a testament to persistence and dedication, illustrating that success is not solely determined by innate talent but by the willingness to work hard and overcome obstacles to achieve one's goals.

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HAROLD P. EJES

BIOGRAPHICAL SKETCH

Rogelio Joshua C. Miner III was born on August 20, 2002, in Santiago City, Isabela, the first child of Mr. Rogelio A. Miner Jr. and Mrs. Edna C. Miner, and having one younger sister.

RJ's academic journey commenced at Santiago West Central School, where he demonstrated exceptional aptitude. He completed his elementary education in the academic year 2011-2012. Continuing his quest for knowledge, RJ transitioned to Santiago City National High School for his secondary education. He achieved another milestone in his academic journey, finishing his secondary education in the school year 2019-2020.

RJ is a young man with a vision. He aspires to become a licensed Agricultural and Biosystems Engineer and make a substantial contribution to the development of the agricultural sector in the Philippines. He aims to use his knowledge and skills to design and implement innovative solutions addressing the challenges of farmers and rural communities.

Looking ahead, RJ harbors dreams of pursuing further studies and research in the field of agricultural and biosystems engineering. He believes that with hard work, passion, and dedication, he can achieve his goals and positively impact society. The journey of Rogelio Joshua C. Miner III is not merely a chronological progression but a narrative of dedication, achievement, and a future poised for meaningful contributions to her chosen field and society.

ROGELIO JOSHUA C. MINER III

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ABSTRACT

EJES, HAROLD P. and MINER, ROGELIO JOSHUA III C., Department of Agricultural and Biosystems Engineering, Central Luzon State University, Science City of Muñoz, Nueva Ecija, Philippines, **APRIL 2024, DEVELOPMENT OF PEST DETECTION SYSTEM USING CONVOLUTIONAL NEURAL NETWORK IN MUNG BEAN PRODUCTION.**

Adviser: ELIZA E. CAMASO, M.Sc.

Mung bean (*Vigna radiata* L.) is a nutritious legume traditionally cultivated in the Philippines, but its production faces challenges like low yields, pest infestations, and limited market opportunities.

This study uses Convolutional Neural Networks (CNN) to develop a system for detecting pests in mung beans, evaluate CNN's performance in pest detection, and compare the accuracy of pictures taken with 8MP and 12MP cameras.

The system is coded in Visual Studio using YOLOv5 and Python. It is trained with pictures of pest professionally taken by the photographers of BPI and tested with pictures of the pest from the field where pest infested naturally. Accuracy is determined using precision, recall, and F1 score. Additionally, the accuracy comparison between 8MP and 12MP camera images is analyzed using a confusion matrix and T-test as its statistical tools. The result shows the overall accuracy of the developed system and is recorded at 98%, indicating that the model performs well in general.

The accuracy is justified by the model's result of Precision, Recall, and F-1 Score, which are 1.00, 1.00, and 0.98, respectively. A confusion matrix resulted in 97.67% and 98.83% for Android and iPhone images, respectively.

Moreover, the T-test showed no significant difference, with a 0.61924 T-value and a critical T-value 2.05. This implies that the model maintains high accuracy regardless of the phone used for capturing pest images.

Keywords: Mung bean; Computer Vision; CNN, Pest Detection.

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