# UNIVERSITI TEKNOLOGI MARA

# COMPARISON BETWEEN ALEXNET, GOOGLENET AND RESNET-50 FOR BROWNSPOT, HISPA AND LEAFBLAST DISEASE CLASSIFICATION

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# ABSTRACT

Rice is a staple food for Malaysian, hence ensuring its production is essential. There is a large manufacturer of rice in Malaysia every year to contain the need of millions of Malaysians but still not sufficient. There are a number of causes for the decrease in production, such as poor management of pests and diseases, fertiliser, and shortage of specialists. In Malaysia, paddy fields are infected by diseases and pest known as brown planthopper (BPH) which could potentially reduce the yield by about 30%-50% and 15%. The conventional method, a paddy disease specialist is required to identify and diagnose the paddy leaf disease. The paddy disease expert will obtain several samples of paddy leaf images from the farmer. Afterwards, the required sample was sent to the biotech laboratory so that the affected leaf can be analysed. The process for this method was time-consuming, inconvenient for the farmer and it was very costly. Since the 1990s, the use of computers and information technology has enhanced the methods of agriculture and been beneficial in the agricultural industry. Thus, with the application of Deep Learning method the diseases can be detected at the early stage. Precaution measures can be taken to lessen the damage as soon as possible. The objective of this work is to classify the types of paddy disease such as brownspot, leafblast and hispa by using CNN model. Thus, this research conducts an analysis using several types of CNN to validate and compare the performance of proposed model in terms of precision, recall, F1 score, and robustness with AlexNet and GoogleNet. Hence, the result shows ResNet-50 is exceptional in all indexes except time by using the optimal configuration namely learning rate at 0.001 and number of epochs at 30. The time of ResNet-50 (1626s) is close to AlexNet but worse than GoogleNet. For each index, ResNet-50 above 90%. Meanwhile AlexNet and GoogleNet only obtained 94.84% and 95% for accuracy, while the rest only obtained around 88% to 89%. All indexes of ResNet-50 are the first ranked then followed by GoogleNet. In short, ResNet-50 is a more accurate and precise model than others.

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# CHAPTER ONE

# INTRODUCTION

## 1.1 Research Background

Aside from sago, cassava, corn and sweet potatoes [1], rice is a staple food in most Asian countries. Hence rice production is common in Malaysia. Asia produces a large amount of rice that is more than 80% of worldwide production [2]. About half of the world's population consumes rice on a daily basis, with Asian countries being the main consumers and producers [3]. The worldwide demand for rice is expected to rise by approximately 30% until 2050 due to population growth, high and steady rice production is crucial for worldwide sustainable development [4]. Rice supply and demand are influenced by trends, crises, and changes in Asia's rice production sectors, which are vital to the worldwide rice industry [5].

In the year 2017, Malaysians required 2.75 million tonnes of rice, but only 1.8 million tonnes were produced domestically [6]. The result of the government's attempts and other steps to promote extensive agriculture were far from adequate. To demonstrate the severity of the situation, due to a severe supply shortfall when local rice output is just 38% in 2021, Sarawak imported 145,468 metric tonnes of rice for RM387 million.

With supply shortage about a million tonnes, the Malaysian government needs to import rice from neighbouring countries such as Thailand, Vietnam, Cambodia, Pakistan, and India to make up for the shortage in rice supplies [7]. Thailand and Vietnam are the main rice exporters to Malaysia [8]. Malaysia's excessive reliance on rice imports has harmed the country in the past, as evidenced by the worldwide rice and cereal crisis in 2008. This may be proven when the price of Thai White Rice (TWR) increased by 5% during the global food crisis in 2008, reaching a peak of USD 1,000/metric ton, compared to average prices of USD 300/metric ton from 2004 to 2006 [9].

The rice industry is expected to expand to satisfy the demands of a growing global population, particularly in rice-consuming countries, but the paddy production has been declining [10] as a result of disease outbreaks on paddy leaves [11]. The warm, humid climate of Malaysia attracts variety of pests and diseases that