



UTM
UNIVERSITI TEKNOLOGI MALAYSIA

SCHOOL OF COMPUTING
Faculty of Engineering

Project Proposal Form MCST1043
Sem: 2 Session: 2024/25

SECTION A: Project Information.

Program Name: **Masters of Science (Data Science)**

Subject Name: **Project 1 (MCST1043)**

Student Name: CHANG ZI YIN

Metric Number: MCS241049

Student Email & Phone: changziyin@graduate.utm.my 011-19879781

Project Title: Microscopic Timber Species Classification Using Deep Learning Approach

Supervisor 1: -

Supervisor 2 / Industry Advisor(if any): -

SECTION B: Project Proposal

Introduction:

The treat to the forest growth is increased due to high wood demand. Increases in demand in land extraction for the urbanizations and commercialized demands for timber products, either legal or illegal. Hence, in order for biodiversity conversation it is necessary for the forestry to understanding the anatomic characteristic of the different tress species to make informed decision in reforestation strategy and timber harvesting. However, recognition of timber species requires professional and experience expertise as even though timber of same species, its visible features is slightly differed due to regions and environmental condition which may cause human Error. Besides, it is time consuming and resource intensive for knowledgeable personnel to physically identify and harvest the sample from the field for lab examination. Moreover, even though there is significant research in wood species detection however there is lack of tropical microscopic wood species automated detection. Thereby, this project is aim to implement deep learning approach to train a model that able to detect the tropical wood species.

Problem Background:

Timber species identification is crucial in forestry research and sustainable forest management. Conventionally it was relying on the macroscopic features of the cross-sectional surface. However, this method is time consuming, required expertise and prone to human error. Recently significant research focused on automating wood classification based on macroscopic images, yet there remains a limited availability of labelled digital datasets, especially for tropical wood species. Furthermore, there regions which lack in digital identification tools still relying on physical wood sample collection for identification, causes difficulty in identification of woods in field and supply chain context. Meanwhile, microscopic wood features, which provide more reliable anatomical features information is often not underutilized in automated classification research.

Problem Statement:

Despite the rich biodiversity found in tropical forests and the promising capabilities of deep learning in species recognition, most existing studies have concentrated on analyzing macroscopic images. However, due to the publicly lack of labelled tropical species microscopic image datasets availability thereby the is also lack of deep learning models to classify timber species based on microscopic anatomic structures.

Aim of the Project:

To develop a deep learning-based classification model that can identify tropical timber species using microscopic images and improve accuracy and efficiency in wood identification process.

Objectives of the Project:

1. To preprocess and extract the features of microscopic wood image
2. To implement and compare deep learning classifier in determining the macroscopic timber species
3. To test and evaluate the classification of timber species using accuracy and confusion matrix

Scopes of the Project:

The project scope is conducted on microscopic image of eleven tropical timber species.
Used images in RGB format and from timber cross section with a resolution of 640 x 480 pixels. Python programming will be implemented to develop this project model.

Expected Contribution of the Project:

1. Develop a deep learning model that can identify timber species
2. Support for forestry and environmental research by providing a faster and more reliable method for tree species detection.
3. Foundation for practical digital wood identification tools such as mobile application used for timber species verification in work field, academic or timber supply chain when lacking of species expert

Project Requirements:

Software: Jupyter Notebook

Hardware: Processor = Intel i5-1155G7 , Operating system = 64-bit window 11

Technology/Technique/
Methodology/Algorithm: Deep Learning

Type of Project (Focusing on Data Science):

- ☐ / ☐ Data Preparation and Modeling
- ☐ Data Analysis and Visualization
- ☐ Business Intelligence and Analytics
- ☐ / ☐ Machine Learning and Prediction
- ☐ Data Science Application in Business Domain

Status of Project:

- ☐ / ☐ New
- ☐ Continued

If continued, what is
the previous title?

SECTION C: Declaration

I declare that this project is proposed by:

- ☐ / ☐ Myself
- ☐ Supervisor/Industry Advisor ()

Student Name: CHANG ZI YIN

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April 7, 2025

Signature _____

Date _____

SECTION D: Supervisor Acknowledgement

The Supervisor(s) shall complete this section.

I/We agree to become the supervisor(s) for this student under aforesaid proposed title.

Name of Supervisor 1:

Signature _____

Date _____

Name of Supervisor 2 (if any):

Signature

Date _____

SECTION E: Evaluation Panel Approval

The Evaluator(s) shall complete this section.

Result:

[] FULL APPROVAL

[] CONDITIONAL APPROVAL (Major)*

[] CONDITIONAL APPROVAL (Minor)

[] FAIL*

* Student has to submit new proposal form considering the evaluators' comments.

Comments:

Name of Evaluator 1:

Signature

.....
Date

Name of Evaluator 2:

Signature

.....
Date