

A close-up photograph of a person's hands, wearing a green jacket with a purple lining, forming a heart shape against the rough, dark bark of a tree trunk. The background is blurred, showing more of the tree and a hint of a person in a white shirt. A dark grey diagonal overlay covers the right side of the image, containing the title and names.

PROJECT PRESENTATION **FOREST SECURITY SYSTEM (FORCE)**

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01 Introduction

- Deforestation and forest degradation in Malaysia is a complex phenomenon with varying causes.
- Excessive growth in population and rapid urbanization have led to the encroachment of forest areas for building homes, factories, bridges etc.
- From 2002 to 2021, Malaysia lost 2.77Mha of humid primary forest, making up 33% of its total tree cover loss in the same time period. Total area of humid primary forest in Malaysia decreased by 17%.
- Malaysia is ranked ninth in the world in highest area of forest loss.
- The more common cause of deforestation is man-made. Therefore, a detection system for forest clearing activities is an initiative to better protect the forest.





02 Problem Statement

Intruders are a threat to the forests as they indulge into some illegal activities such as deforestation and illegal logging. These actions are a growing threat to all life on Earth, driving dangerous carbon emissions and exacerbating the climate crisis. Advanced technology is less incorporated in the preservation of a forest as well as prevention and control of damage to forest.

03 Objectives



01

To design a system that detect the presence of intruders.



02

To assign different type of vehicle into two classes (car or truck)



03

To compare the performance of forest security system in different testing condition





04

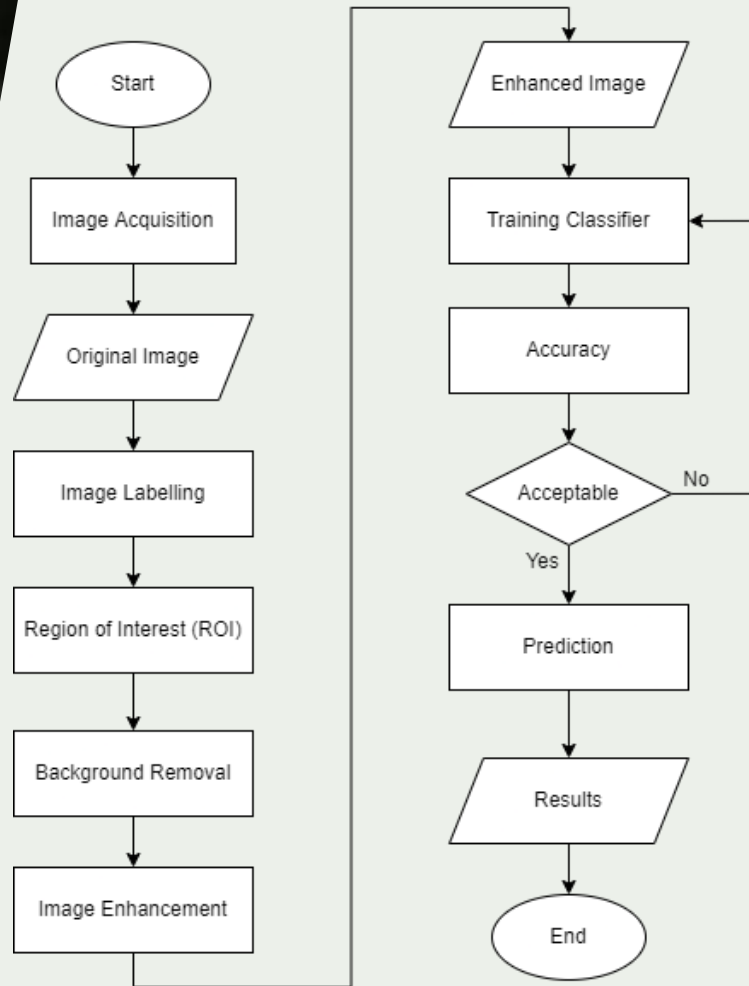
Methodology

Forest Security System (FORCE)

Methodology

Software & Hardware Requirement

	Software	Google Colab, Google Drive, Pycharm
	Hardware	WebCam, Laptop, Mini Car

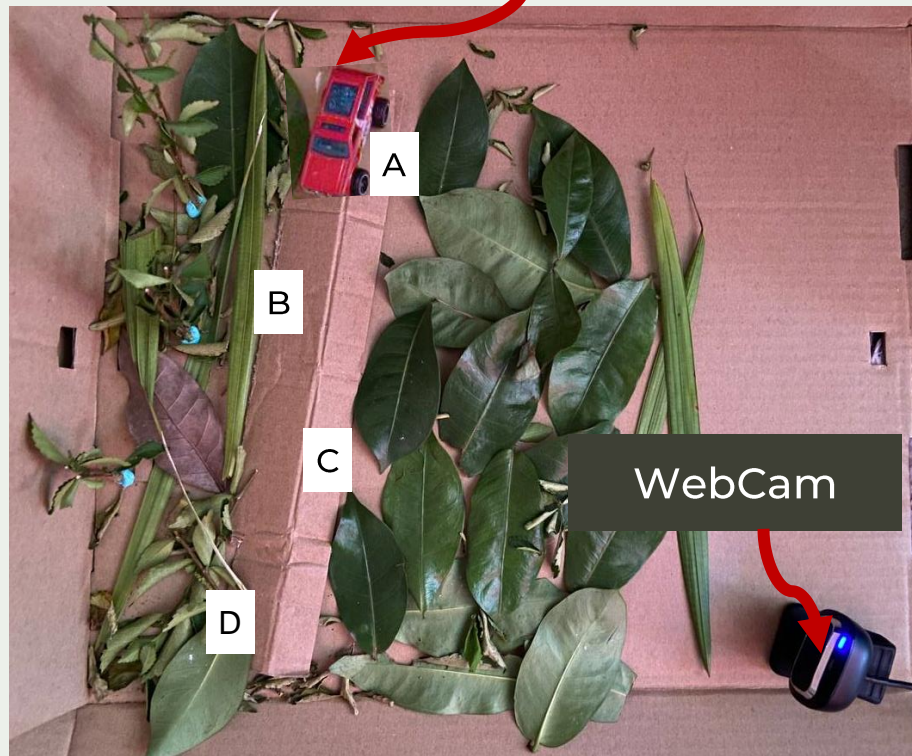


Methodology

System Flow Chart

Mini car

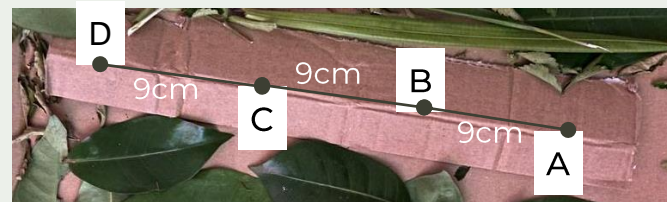
33cm



40cm

Methodology

Image Acquisition

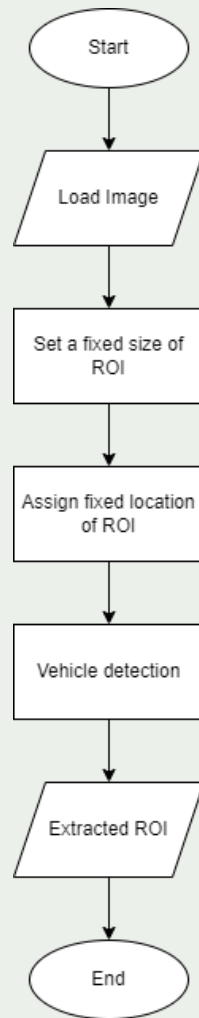


Mini model for image acquisition
Scale size 1/64

Methodology

Image Acquisition

Type of Vehicle	Car/ 4-Wheel
	Truck
Time (hours)	Morning (0700)
	Evening (1600)
	Night (2300)
Position of Vehicle	A
	B
	C
	D

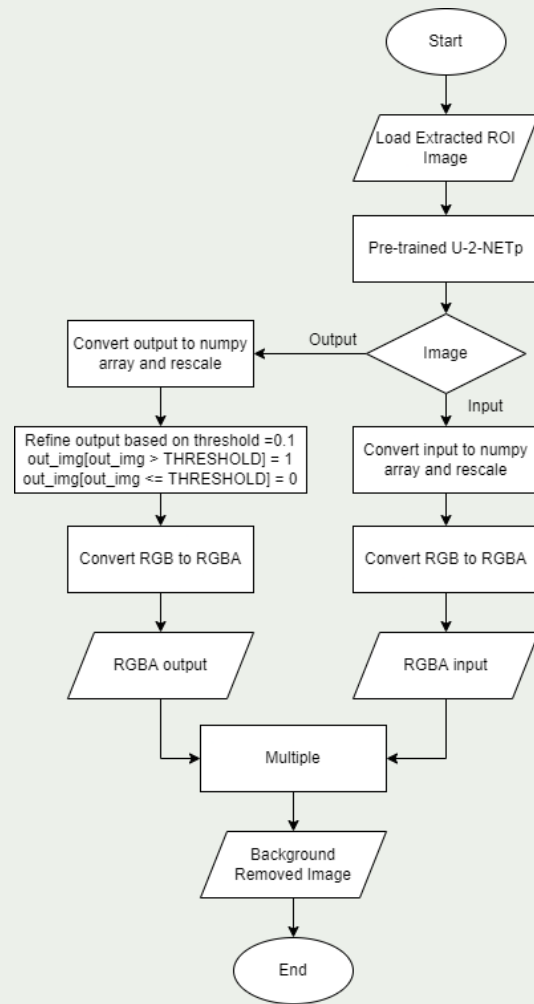


Methodology

Region of Interest (ROI)

Size of ROI

400 x 600

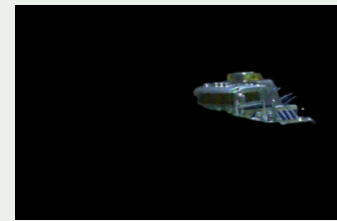
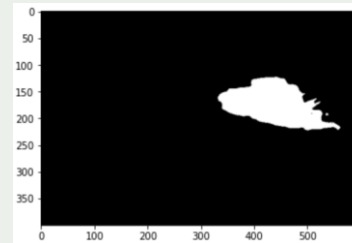
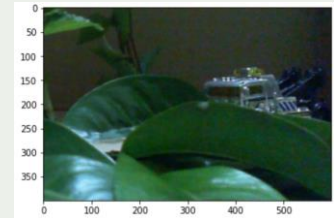


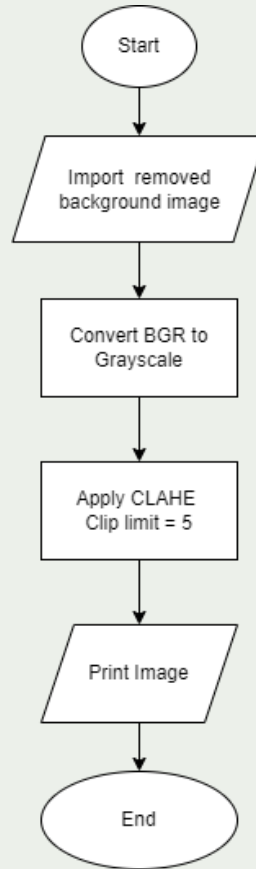
Methodology

Background Removal

Model

Pre-Train U-2-NETp





Methodology

Image Enhancement

Model

CLAHE

Methodology

Classifier

MobileNet v2 model

- As a base model for transfer learning stored on TensorFlow Hub.
- Basic information:
 - Input shape: 224x224x3 (224x224 pixels, 3 channels each, RGB format),
 - Epoch: 10

DATASET	
Training	80 %
Validation	20 %



05

Result and Analysis

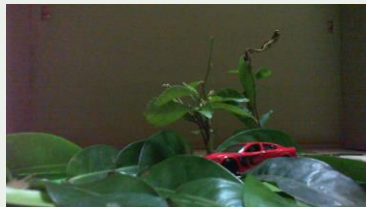
Forest Security System (FORCE)

Raw Image

CAR

TRUCK

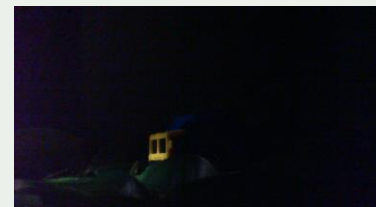
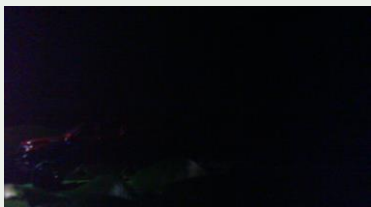
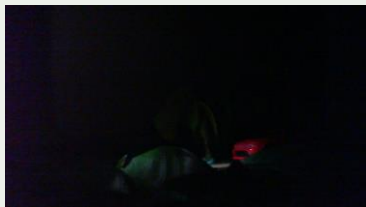
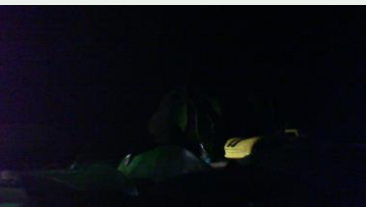
MORNING
0700



EVENING
1600



NIGHT
2300



Result: Pre-Processing



Original Image



Region of Interest ROI



Background Removal

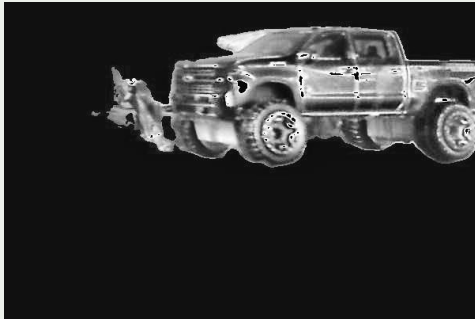


Image Enhancement

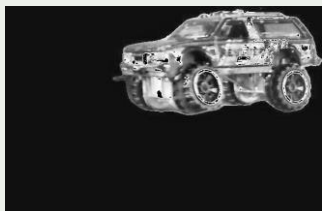
Feature: Time

CAR

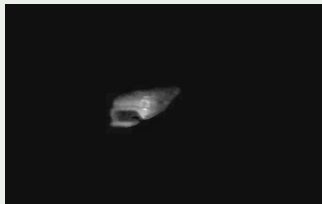
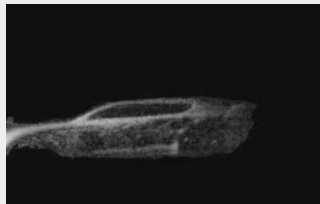
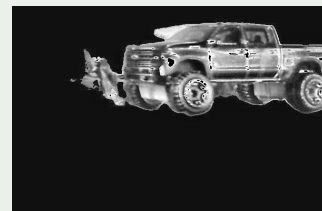
TRUCK



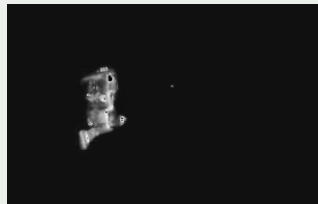
MORNING



EVENING



NIGHT



Feature: Position of Vehicle

CAR

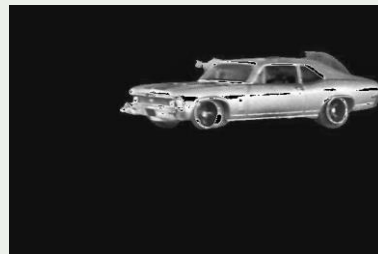
D



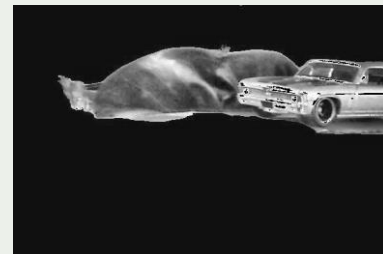
C



B



A



TRUCK

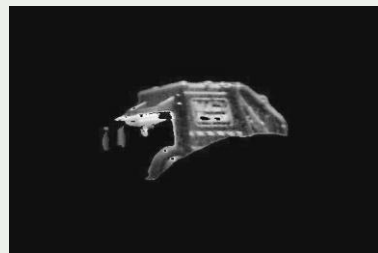
D



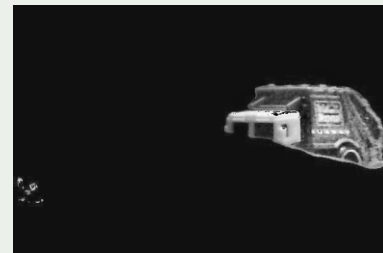
C



B



A



TensorFlow Classification

Pre-Processed Image vs Raw Image

Accuracy	Detection Accuracy
	Training
Pre-Processing	0.7600
Raw Image	0.5652

Model predictions (green: correct, red: incorrect)



Pre-processed dataset

Model predictions (green: correct, red: incorrect)



Original dataset

TensorFlow Classification

Time of Image taken

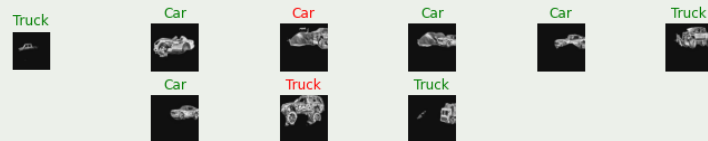
Accuracy	Detection Accuracy
	Training
Morning	0.8750
Evening	0.7500
Night	0.7500

Model predictions (green: correct, red: incorrect)



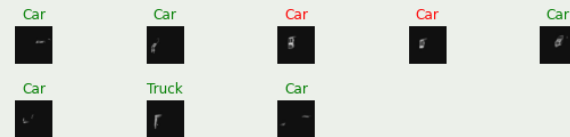
Morning

Model predictions (green: correct, red: incorrect)



Evening

Model predictions (green: correct, red: incorrect)

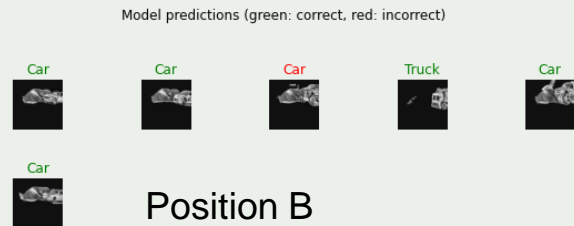
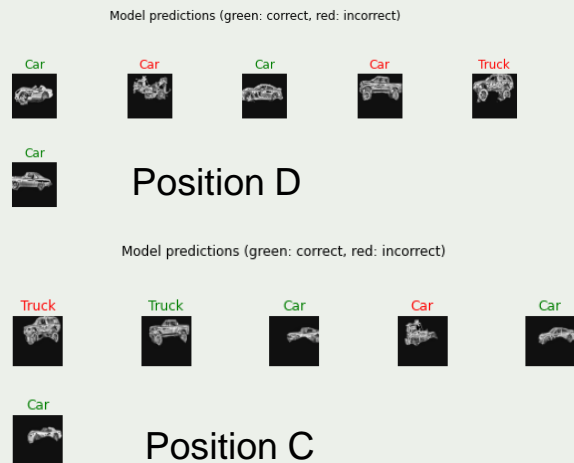
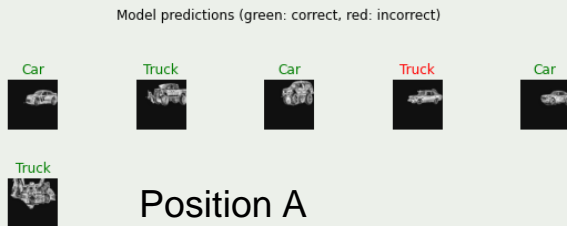


Night

TensorFlow Classification

Position of vehicle

Accuracy	Detection Accuracy
	Training
Position A	0.8333
Position B	0.8333
Position C	0.8333
Position D	0.6667





06

Impact to Society

Forest Security System (FORCE)

Impact to Society



01

It is possible to maintain the forest resources



02

Cultivate an awareness of the danger that intruders pose



03

The release of carbon dioxide can be reduce

Conclusion

Forest protection could be enhanced preventing exploitation of forest resources if image processing techniques are applied in the forest security system.

The system can be improved by using a camera that has night vision.





Thanks!

Do you have any questions?
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