



STATUS DOCUMENT 1

“TeaBot” – Tea plantation preservation using an intelligent robot.



STUDENT NAME: PREMATHILAKE H.T.M.

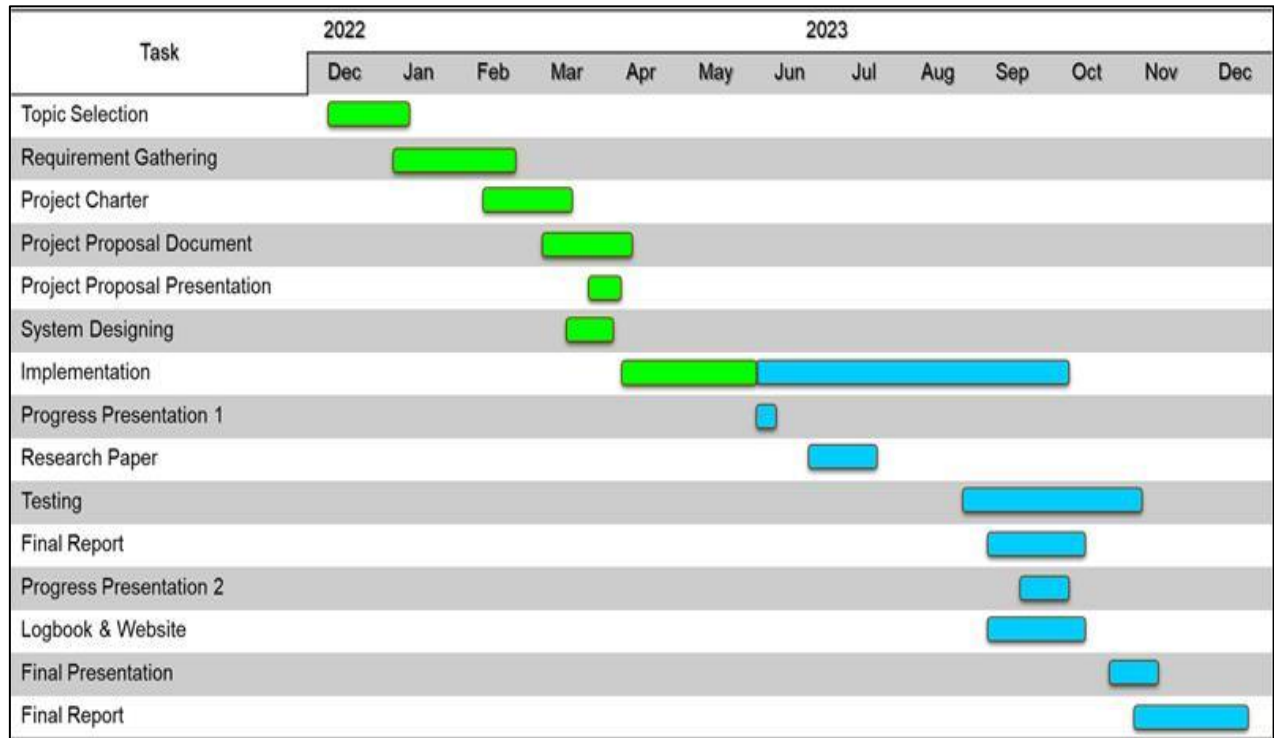
STUDENT NUMBER: IT20265410

GROUP ID: 2023-044

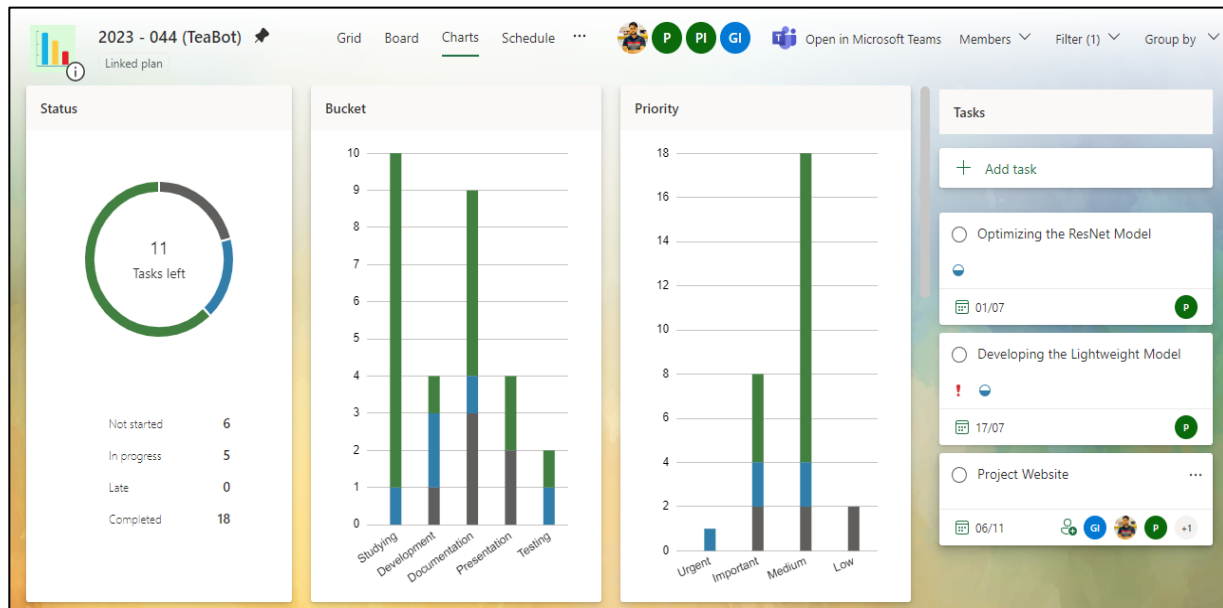
TABLE OF CONTENTS

- 1 GANNT CHART2
- 2 PROJECT VIEWS MS PLANNER.....3
- 3 WORK BREAK DOWN STRUCTURE MS PLANNER4
- 4 EMAILS, MEETINGS WITH SUPERVISOR, CO-SUPERVISOR.....5
- 5 MS TEAMS AND CALLS11
- 6 DEVELOPED PROTOTYPE14

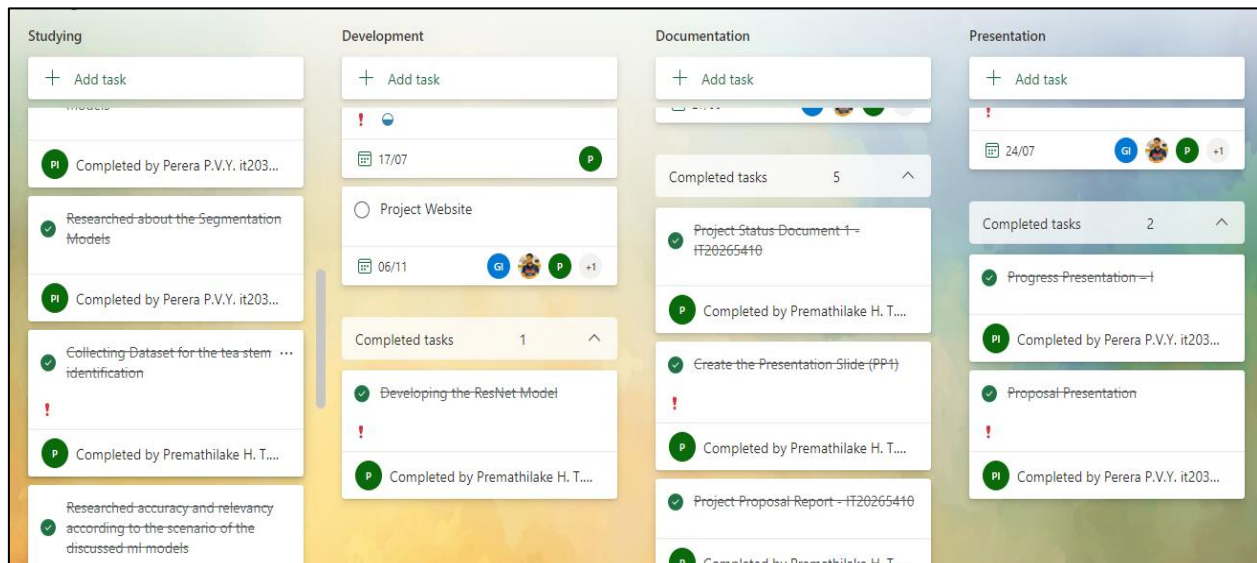
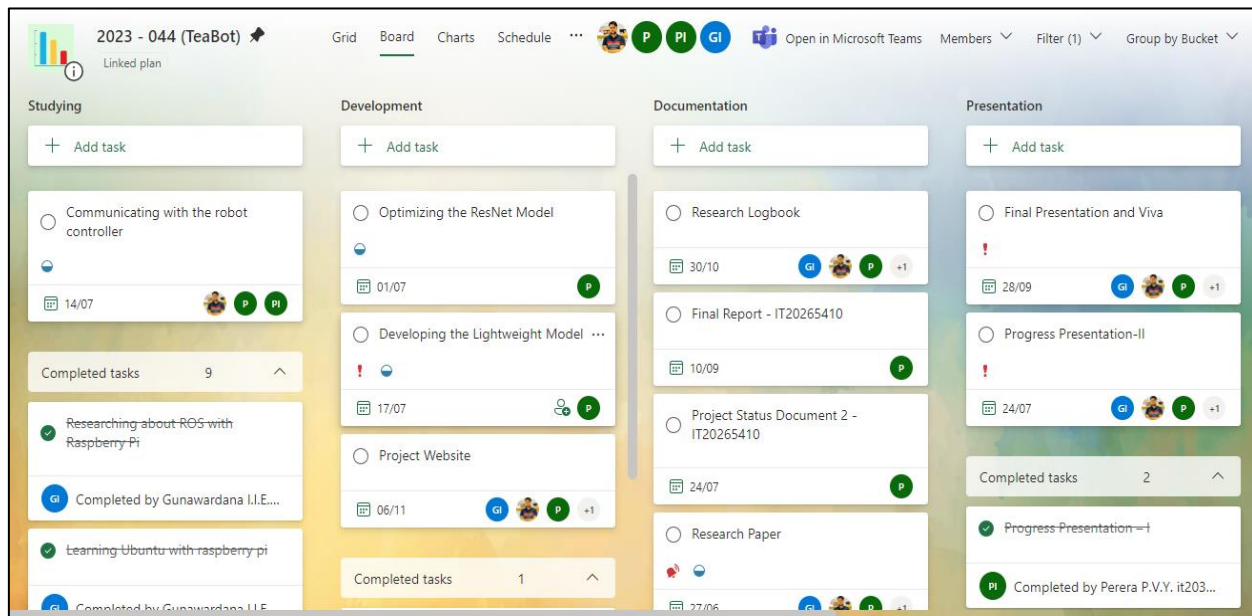
1 GANTT CHART



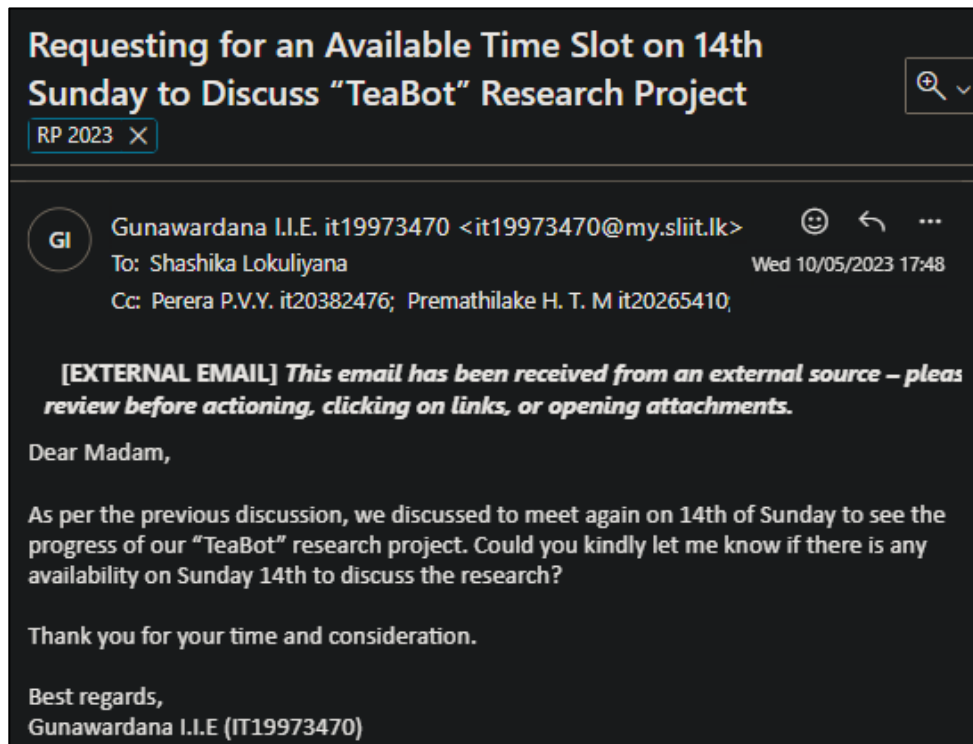
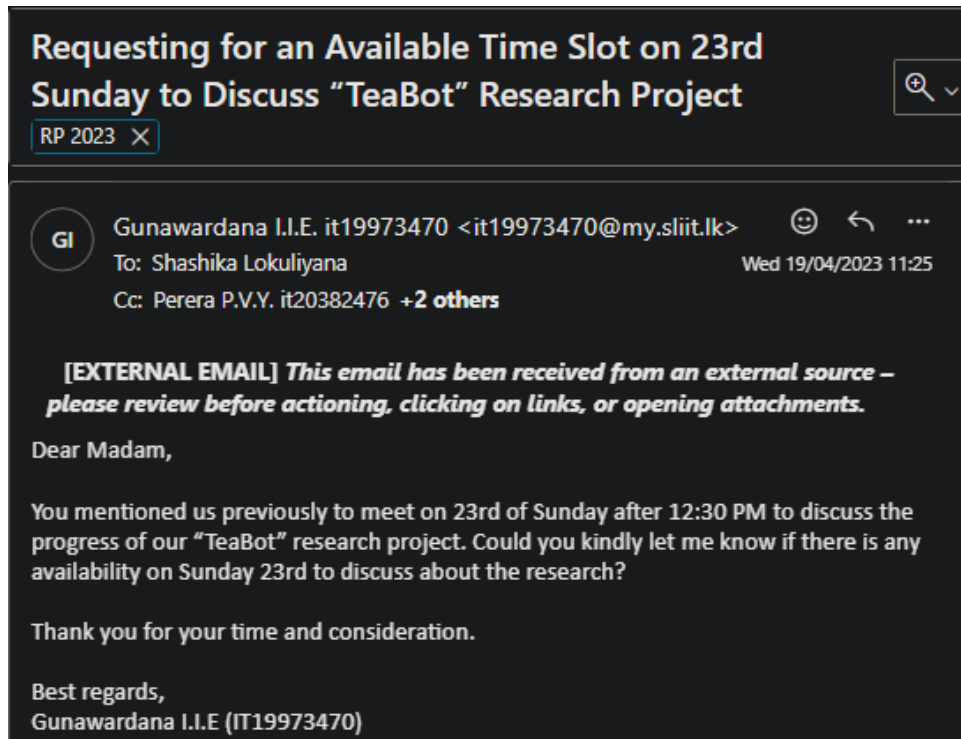
2 PROJECT VIEWS MS PLANNER

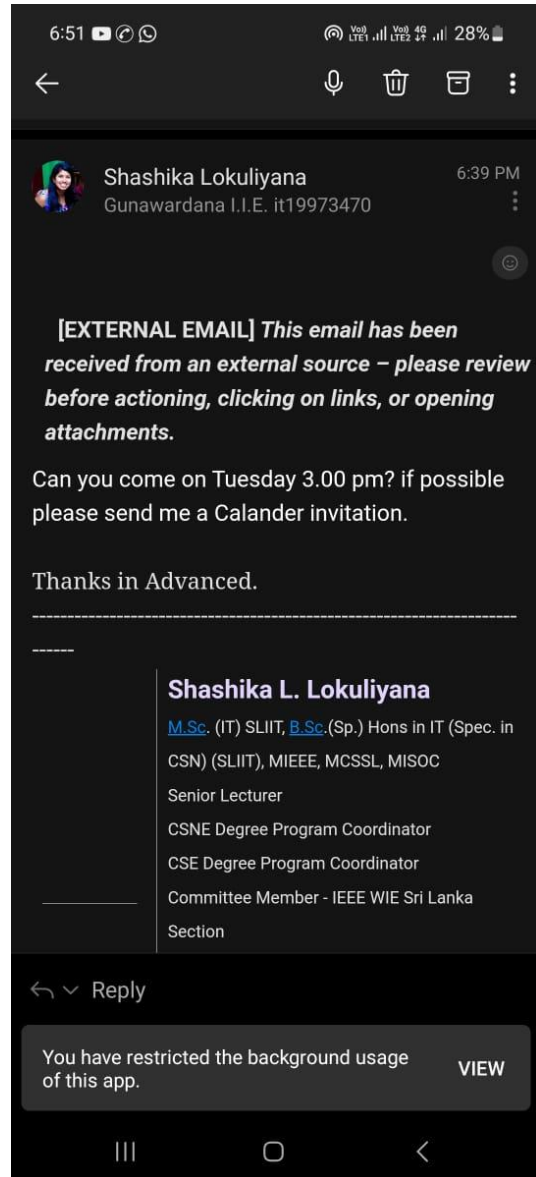
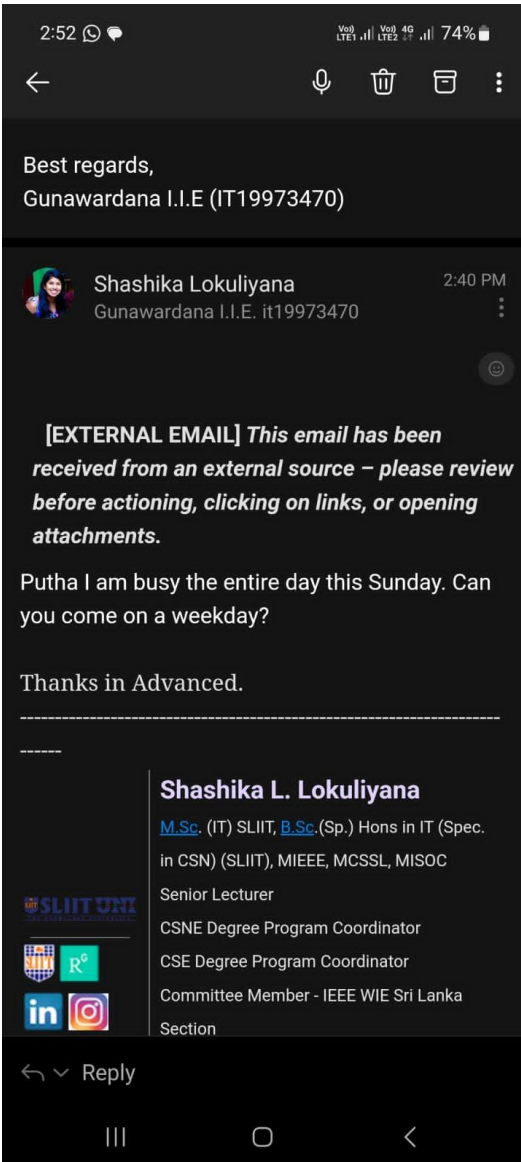


3 WORK BREAK DOWN STRUCTURE MS PLANNER

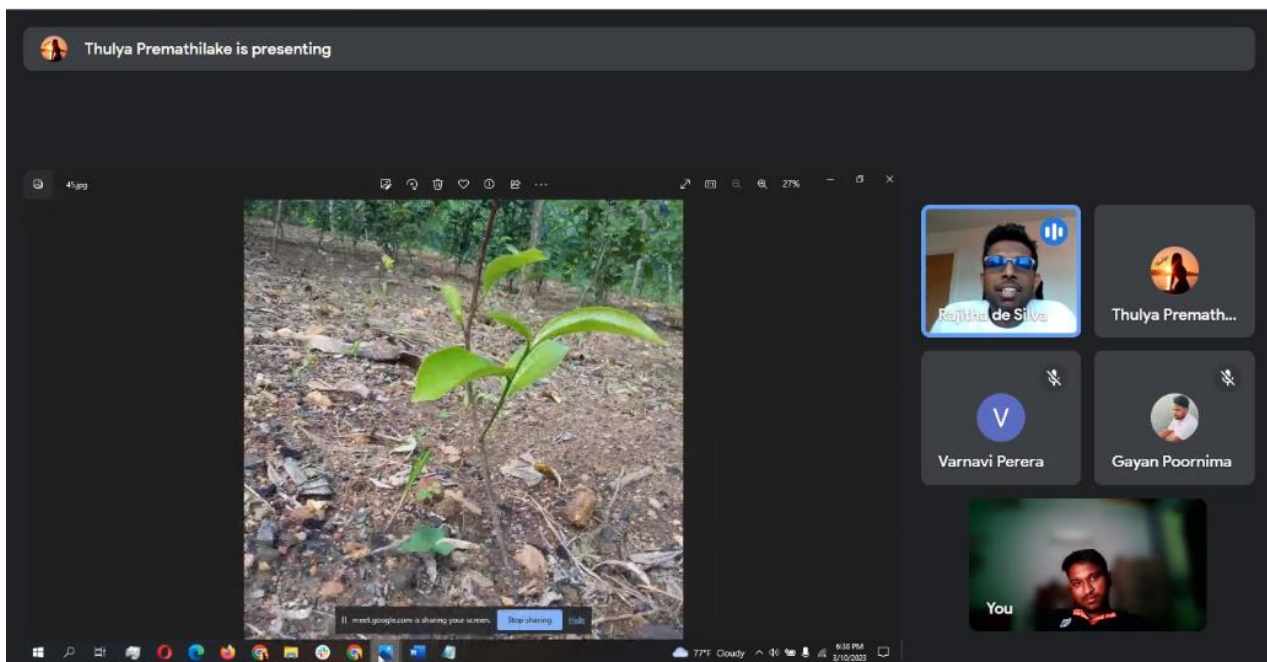
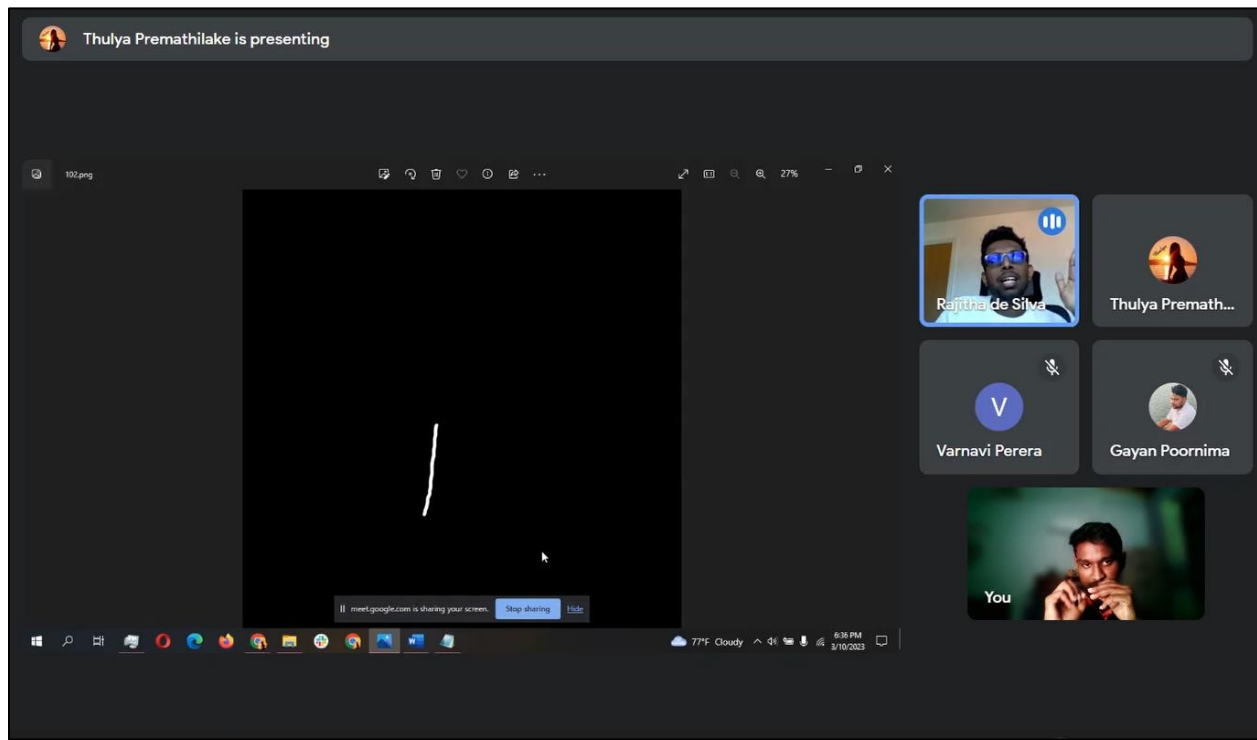


4 EMAILS, MEETINGS WITH SUPERVISOR, CO-SUPERVISOR

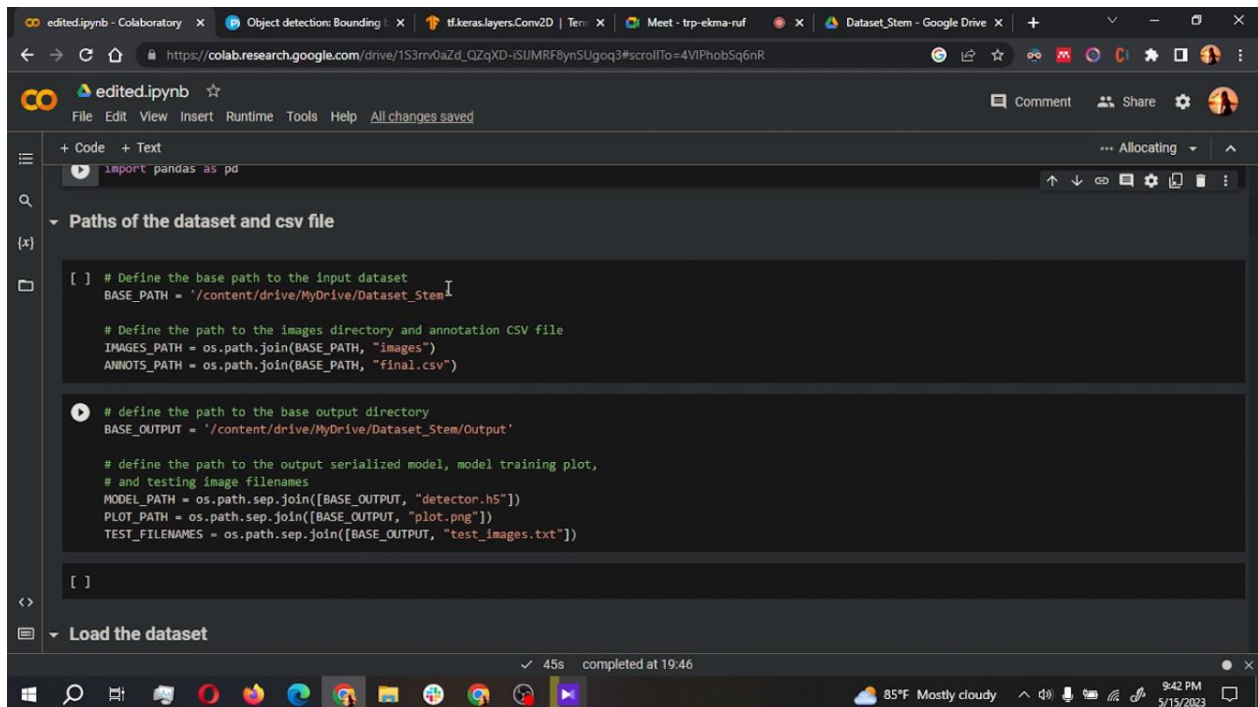




Screenshots of meetings about dataset collection, and data labeling methods for stem identification with external supervisor Dr Rajitha De Silva.



Discussions regarding model development.



The screenshot shows a Google Colab notebook interface. The top bar includes tabs for 'edited.ipynb - Colaboratory', 'Object detection: Bounding', 'tf.keras.layers.Conv2D | Ten...', 'Meet - trp-ekma-ruf', and 'Dataset_Stem - Google Drive'. The address bar shows the URL: https://colab.research.google.com/drive/1S3rmv0aZd_QZqXD-ISUMRF8ynSUgoq3#scrollTo=4VlPhobSq6nR. The notebook has a menu bar with 'File', 'Edit', 'View', 'Insert', 'Runtime', 'Tools', and 'Help'. Below the menu, there are tabs for '+ Code' and '+ Text'. The code is organized into sections: 'Paths of the dataset and csv file' and 'Load the dataset'. The code defines paths for the input dataset, images directory, annotation CSV file, base output directory, and output files. It also defines the path to the output serialized model, model training plot, and testing image filenames. The code is as follows:

```
[ ] # Define the base path to the input dataset
BASE_PATH = '/content/drive/MyDrive/Dataset_Stem'

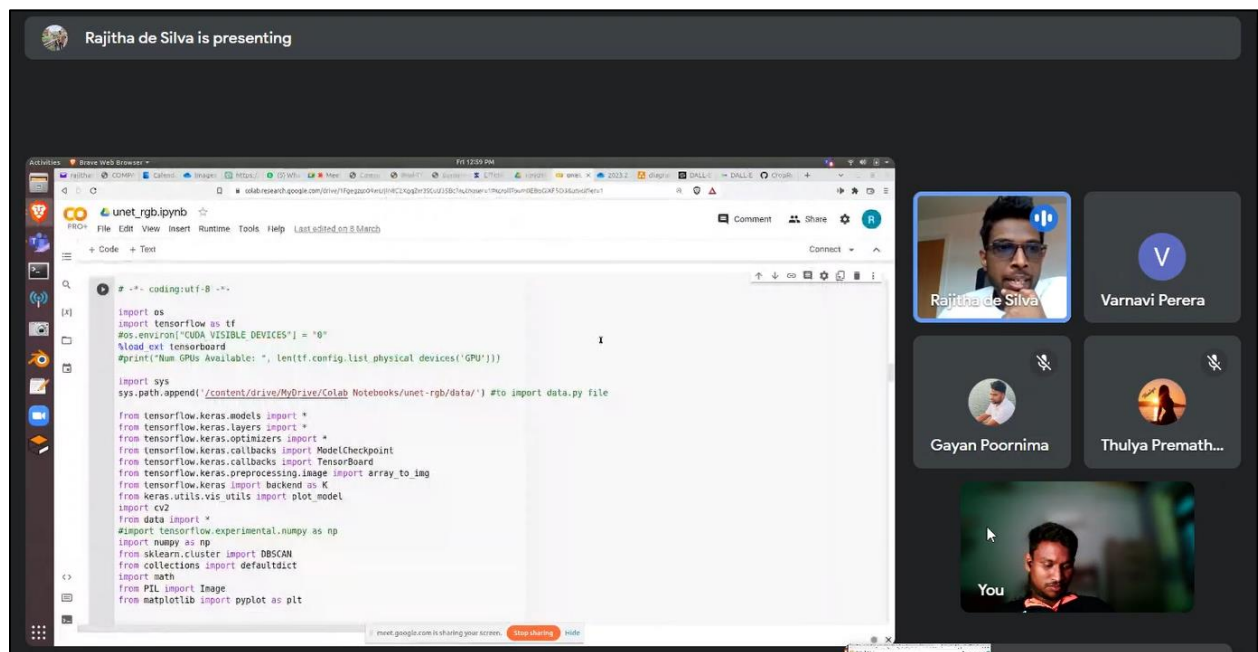
# Define the path to the images directory and annotation CSV file
IMAGES_PATH = os.path.join(BASE_PATH, "images")
ANNOTATIONS_PATH = os.path.join(BASE_PATH, "final.csv")

# define the path to the base output directory
BASE_OUTPUT = '/content/drive/MyDrive/Dataset_Stem/Output'

# define the path to the output serialized model, model training plot,
# and testing image filenames
MODEL_PATH = os.path.sep.join([BASE_OUTPUT, "detector.h5"])
PLOT_PATH = os.path.sep.join([BASE_OUTPUT, "plot.png"])
TEST_FILENAMES = os.path.sep.join([BASE_OUTPUT, "test_images.txt"])

[ ]
```

The bottom status bar shows '45s completed at 19:46' and a system tray with weather information (85°F Mostly cloudy) and the date (5/15/2023).



The screenshot shows a Google Meet session. At the top, a banner indicates 'Rajitha de Silva is presenting'. The main window displays a Google Colab notebook titled 'unet_rgb.ipynb'. The code in the notebook is as follows:

```
# -*- coding: utf-8 -*-

import os
import tensorflow as tf
os.environ['CUDA_VISIBLE_DEVICES'] = '0'
%load_ext tensorboard
#print('Num GPUs Available: ', len(tf.config.list_physical_devices('GPU'))))

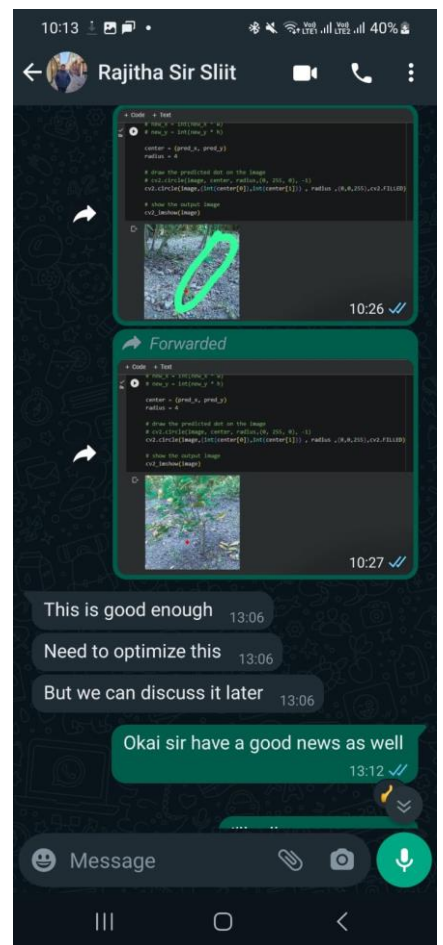
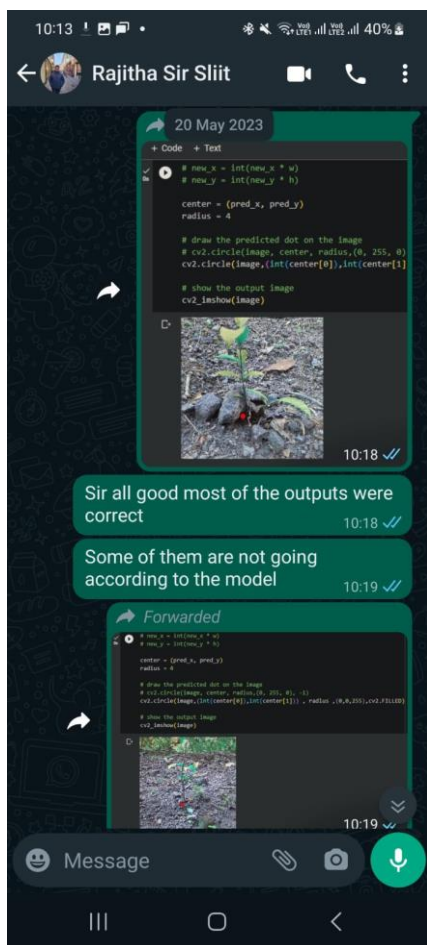
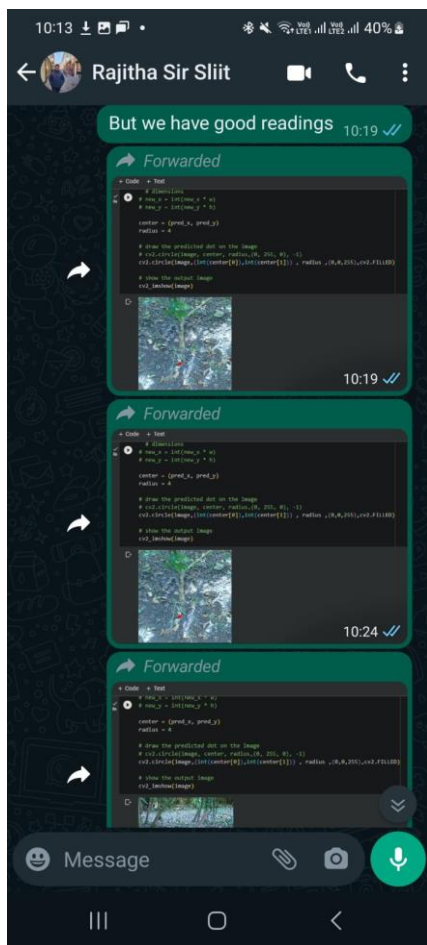
import sys
sys.path.append('/content/drive/MyDrive/Colab Notebooks/unet-rgb/data/') #to import data.py file

from tensorflow.keras.models import *
from tensorflow.keras.layers import *
from tensorflow.keras.optimizers import *
from tensorflow.keras.callbacks import ModelCheckpoint
from tensorflow.keras.callbacks import TensorBoard
from tensorflow.keras.preprocessing.image import array_to_img
from tensorflow.keras import backend as K
from keras.utils.vis_utils import plot_model
import cv2
from data import *
#import tensorflow.experimental.numpy as np
import numpy as np
from sklearn.cluster import DBSCAN
from collections import defaultdict
import math
from PIL import Image
from matplotlib import pyplot as plt
```

On the right side of the screen, there is a grid of participant video feeds. The participants are: Rajitha de Silva (presenting), Varnavi Perera, Gayan Poornima, Thulya Premath..., and You (the user). The bottom status bar shows 'meet.google.com is sharing your screen' and a 'Stop sharing' button.

WhatsApp conversations with the external supervisor.





5 MS TEAMS AND CALLS

The screenshot shows a Microsoft Teams chat window with the 'General' channel selected. At the top, there are tabs for 'General', 'Posts', 'Files', and 'Tasks'. A 'Meet' button is visible in the top right corner. A meeting announcement states: 'Meeting in "General" started'. Below this, there is a 'Collapse all' button and a row of reaction emojis. The chat history shows several messages:

- A message from Premathilake H. T. M. (it20265410) at 2/8 10:00 AM with the subject 'Raspberry Pi'.
- A message from Gunawardana I.I.E. (it19973470) at 2/8 10:03 AM with the subject 'BTS7960 43A Motor Driver'.
- A message from Premathilake H. T. M. (it20265410) at 2/8 10:26 AM with the subject 'proportional-integral-derivative'.
- A message from Hettiarachchi T. C. D. S. (it19206806) at 2/8 10:51 AM with the subject 'PhD Candidate at University of Lincoln'.
- A message from Bamunusinghe G.P. (it20011970) at 2/8 10:52 AM. The message content is: 'Water is sprayed to the tree root using a water spraying mechanism. Basically, physics governs everything. Using computer visualization, we must determine the location of the tree's root and its distance from the surface. After determining the speed of the moving object, the water must be accurately sprayed at the root by adjusting the angle of the water sprayer nozzle. There are numerous variables in this mathematical parabolic water spraying system. Vehicle speed, root distance, water pressure, nozzle water pressure, and nozzle angle all have an impact. Additionally, the...' followed by a 'See more' link and a URL: <https://onlinelibrary.wiley.com/doi/abs/10.1002/ps.2780330403>.

The screenshot shows a Microsoft Teams chat window with the 'General' channel selected. At the top, there are tabs for 'General', 'Posts', 'Files', and 'Tasks'. A 'Meet' button is visible in the top right corner. The chat history shows several posts:

- A post with a green header image and the text 'divided particulate matter used as ...' and 'www.sciencedirect.com'. Below it is a URL: <https://www.sciencedirect.com/science/article/pii/S0048969721061805>.
- A post with a header image showing 'Spray drift' and the title 'Are spray drift losses to agricultural roads more important for surface water contaminatio...'. The text below the title is: 'Spray drift is considered a major pesticide transport pathway to surface waters. Current research and legislation usually only considers direct spray ...'. Below it is a URL: <https://onlinelibrary.wiley.com/doi/full/10.1002/ps.1321>.
- A post with a header image showing 'Spray drift' and the title 'Are spray drift losses to agricultural roads more important for surface water contaminatio...'. The text below the title is: 'Spray drift is considered a major pesticide transport pathway to surface waters. Current research and legislation usually only considers direct spray ...'. Below it is a URL: <https://elibrary.asabe.org/abstract.asp?aid=2990>.
- A post with a header image showing 'Spray drift' and the title 'Are spray drift losses to agricultural roads more important for surface water contaminatio...'. The text below the title is: 'Spray drift is considered a major pesticide transport pathway to surface waters. Current research and legislation usually only considers direct spray ...'. Below it is a URL: <https://www.practicalmachinist.com/forum/threads/ot-physics-problem-regarding-water-spray-from-a-wheel.271709/>.
- A post with a header image showing 'OT Physics problem regarding water spray from a wheel' and the text: 'We are taught that in a closed system moving at a constant speed, the motion does not affect actions within the system. We do not feel any effect of the earth's velocity through space and occupant...'. Below it is a URL: www.practicalmachinist.com.
- A message from Perera P.V.V. (it20382476) at 2/8 11:25 AM. The message content is: 'IT4010-TAF (2).docx'.

General
Posts
Files
Tasks
+

Meet

...

PI

Perera P.V.V. it20382476 2/8 1:17 PM

TA (1).docx

...

agri robot.pdf

...

Meeting ended: 3h 54m

PI

PI

GI

PI

Reply

General
Posts
Files
Tasks
+

Meet

...

task of accurately and punctually watering and fertilizing crops with manual labor is not feasible, and, in some situations, it has decreased productivity. Large-scale organizations require many human resources to maintain crops. Moreover, in some regions, due to socialization, only a few people are engaged as laborers. So, it has been critical for large-scale organizations to carry on their day-to-day activities. Due to the economic crisis in Sri Lanka, these owners have to spend a lot of financial resources on maintenance. Hence, gaining a considerable amount of profit is more challenging. Further, to overcome these disadvantages, automatic watering systems have been implemented, such as Center Pivot Irrigation, Drip Irrigation. In the Center Pivot Irrigation system, the required services and maintenance must be supplied at the correct time, or the system will break down. Frequent replacement of sprinkler nozzles is needed, which involves a high initial cost. Additionally, for some soil conditions like clayey soil, there is a chance that the wheel gets stuck. [1] When it comes to the Drip Irrigation system, implementing the system requires a high initial cost. Also, the short lifespan of pipes in this system needs frequent maintenance [2]. In the matter of fertilizing systems also have negative impacts on large-scale agri-fields. Considering all the facts, of systems mentioned above also do not fulfill the requirements, so a novel system should be suggested to increase productivity up to the expected level.

[See less](#)

Reply

Meeting in "General" ended: 5m 45s

PI

Reply

Friday, March 3, 2023

General
Posts
Files
Tasks
+

Meet
i
...

General started

2 replies from IT20382476 and IT19206806

Reply

Monday, March 27, 2023

Meeting in "Presentation" ended: 1m 14s

Reply

New channel meeting ended: 2m 2s

Attendance report
Click here to download attendance report

Reply

Practice Presentation ended: 50m 43s

Reply

Sunday, May 14, 2023

New conversation

General
Posts
Files
Tasks
+

Meet
i
...

+ New
Upload
Share
Copy link
Sync
Download
...
All Documents*
Filter
Info

... > General > Bamunusinghe G.P it20011970, Perera P.V.Y. it20382476, Premathilake H. T. M it20265410

Name
Modified
Modifie...
Sort
Add column

Modified By : Premathilake H. T. M it20265410 (1)

Recordings
March 3
Premathilake H. T. ...

Modified By : Perera P.V.Y. it20382476 (4)

agri robot.pdf
February 8
Perera P.V.Y. it2038...

IT4010-TAF (2).docx
February 8
Perera P.V.Y. it2038...

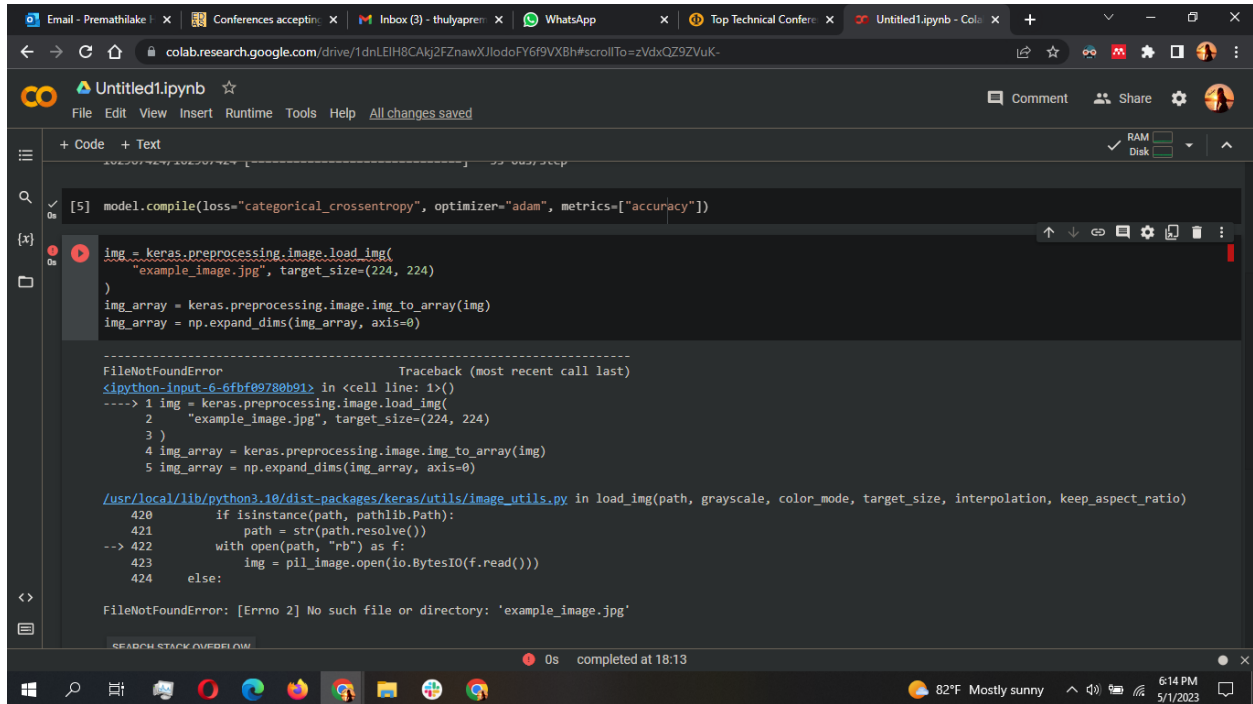
TA (1).docx
February 8
Perera P.V.Y. it2038...

TA.docx
February 8
Perera P.V.Y. it2038...

Modified By : Bamunusinghe G.P it20011970 (1)

Submitted Docs
March 13
Bamunusinghe G.P...

6 DEVELOPED PROTOTYPE



The screenshot shows a Google Colab notebook interface. The top bar includes tabs for 'Email - Premathilake', 'Conferences acceptin...', 'Inbox (3) - thulyapre...', 'WhatsApp', 'Top Technical Confere...', and 'Untitled1.ipynb - Colab'. The address bar shows the URL 'colab.research.google.com/drive/1dnLEIH8CAKj2FZnawXJlodoFY6f9VXBh#scrollTo=zVdxQZ9ZVuK-'. The notebook title is 'Untitled1.ipynb'. The menu bar includes 'File', 'Edit', 'View', 'Insert', 'Runtime', 'Tools', 'Help', and 'All changes saved'. The left sidebar shows a file explorer with a folder icon and a search icon. The main code area shows the following code:

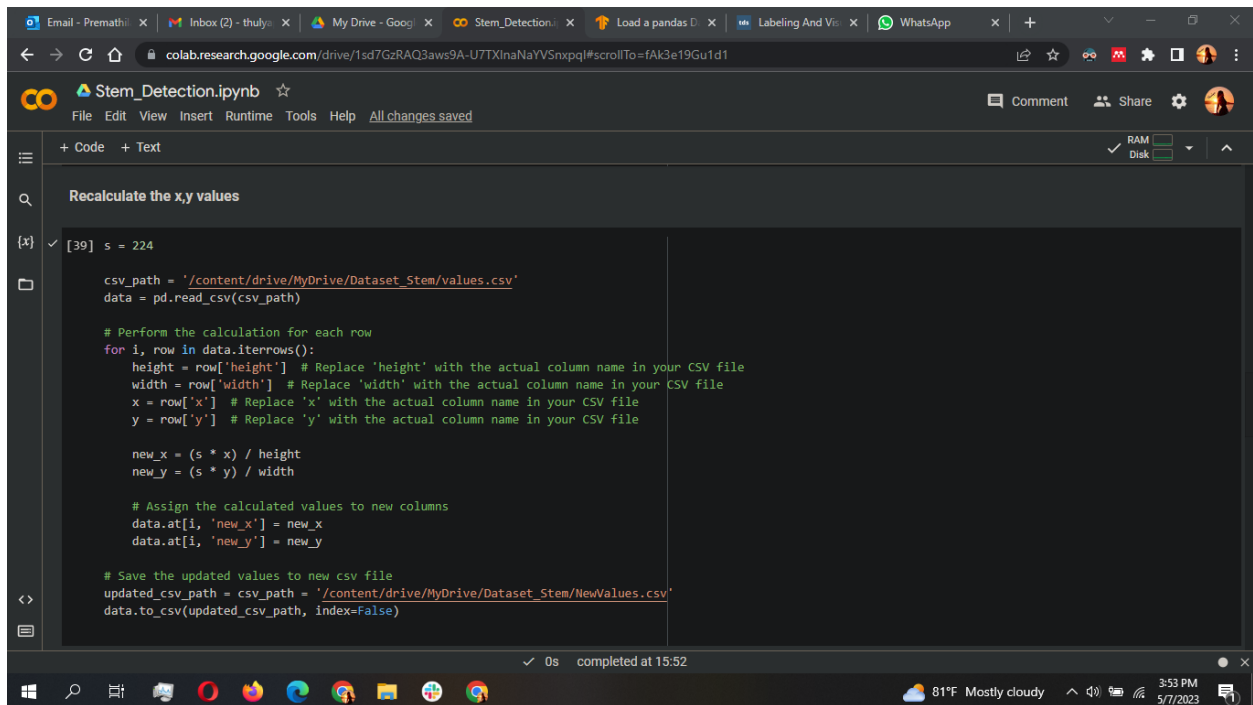
```
[5] model.compile(loss="categorical_crossentropy", optimizer="adam", metrics=["accuracy"])

img = keras.preprocessing.image.load_img(
    "example_image.jpg", target_size=(224, 224)
)
img_array = keras.preprocessing.image.img_to_array(img)
img_array = np.expand_dims(img_array, axis=0)
```

The code execution results show a `FileNotFoundError` with the message: `FileNotFoundError: [Errno 2] No such file or directory: 'example_image.jpg'`. The traceback shows the error occurred in `<ipython-input-6-6fbf09780b91> in <cell line: 1>():` at line 1, column 1. The stack trace includes the following frames:

- `1 img = keras.preprocessing.image.load_img(`
- `2 "example_image.jpg", target_size=(224, 224)`
- `3)`
- `4 img_array = keras.preprocessing.image.img_to_array(img)`
- `5 img_array = np.expand_dims(img_array, axis=0)`

The bottom status bar shows '0s completed at 18:13' and a system tray with '82°F Mostly sunny' and '6:14 PM 5/1/2023'.



The screenshot shows a Google Colab notebook interface. The top bar includes tabs for 'Email - Premathilake', 'Inbox (2) - thulya...', 'My Drive - Goog...', 'Stem_Detection...', 'Load a pandas D...', 'Labeling And Vi...', and 'WhatsApp'. The address bar shows the URL 'colab.research.google.com/drive/1sd7GzRAQ3aws9A-U7TXlnaNaVVSxnpql#scrollTo=fAK3e19GuId1'. The notebook title is 'Stem_Detection.ipynb'. The menu bar includes 'File', 'Edit', 'View', 'Insert', 'Runtime', 'Tools', 'Help', and 'All changes saved'. The left sidebar shows a file explorer with a folder icon and a search icon. The main code area shows the following code:

```
[39] s = 224

csv_path = '/content/drive/MyDrive/Dataset_Stem/values.csv'
data = pd.read_csv(csv_path)

# Perform the calculation for each row
for i, row in data.iterrows():
    height = row['height'] # Replace 'height' with the actual column name in your CSV file
    width = row['width'] # Replace 'width' with the actual column name in your CSV file
    x = row['x'] # Replace 'x' with the actual column name in your CSV file
    y = row['y'] # Replace 'y' with the actual column name in your CSV file

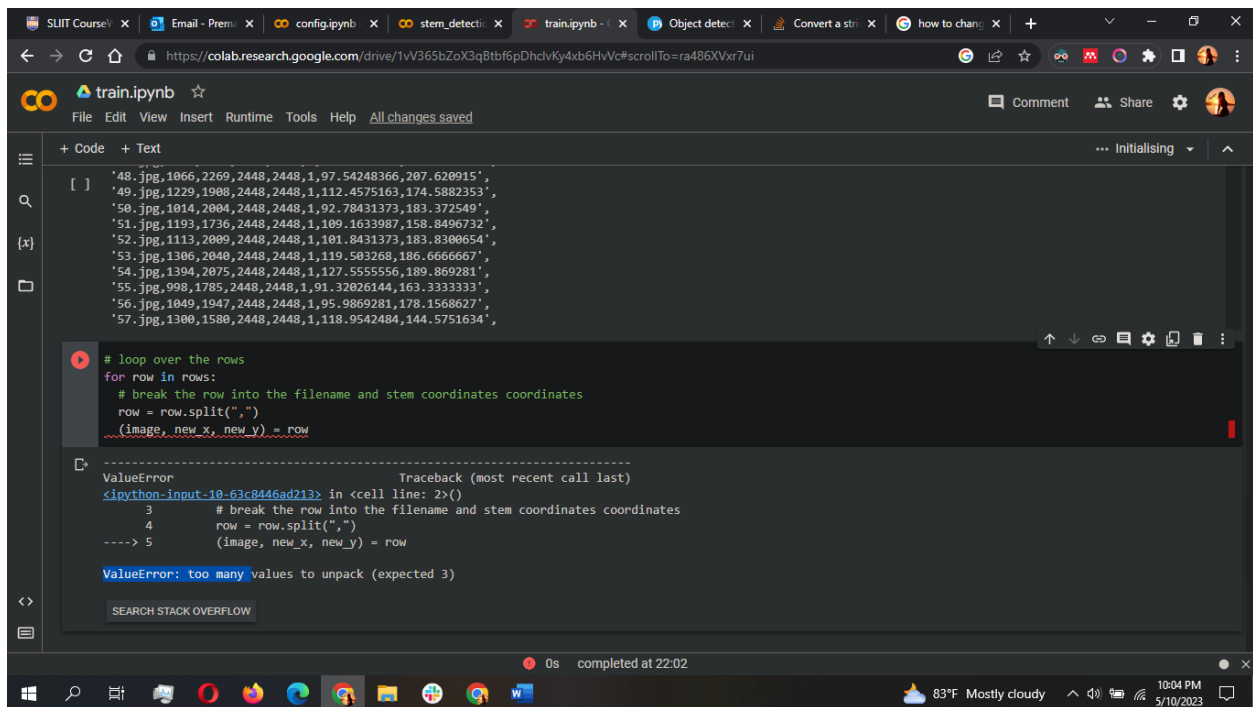
    new_x = (s * x) / height
    new_y = (s * y) / width

    # Assign the calculated values to new columns
    data.at[i, 'new_x'] = new_x
    data.at[i, 'new_y'] = new_y

# Save the updated values to new csv file
updated_csv_path = csv_path + '/content/drive/MyDrive/Dataset_Stem/NewValues.csv'
data.to_csv(updated_csv_path, index=False)
```

The bottom status bar shows '0s completed at 15:52' and a system tray with '81°F Mostly cloudy' and '3:53 PM 5/1/2023'.

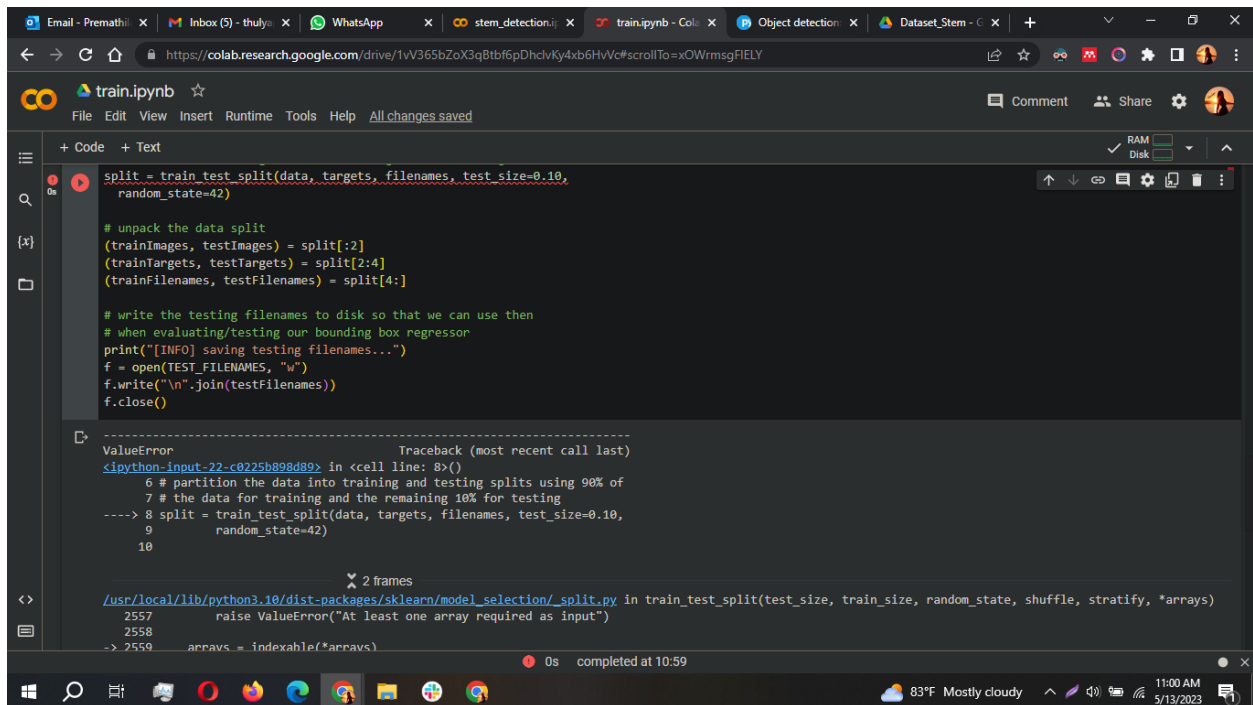
I encountered an error while looping through the data in the CSV file.



The screenshot shows a Google Colab notebook titled 'train.ipynb'. The code cell contains a list of image filenames and their bounding box coordinates, followed by a loop that attempts to unpack each row into three variables: 'image', 'new_x', and 'new_y'. The error message indicates that the row contains more than three values, which is why the unpacking fails.

```
[ ] '48.jpg,1066,2269,2448,2448,1,97.54248366,207.620915',  
    '49.jpg,1229,1908,2448,2448,1,112.4575163,174.5882353',  
    '50.jpg,1014,2004,2448,2448,1,92.78431373,183.372549',  
    '51.jpg,1193,1736,2448,2448,1,109.1633987,158.8496732',  
    '52.jpg,1113,2009,2448,2448,1,101.8431373,183.8300654',  
    '53.jpg,1306,2040,2448,2448,1,119.503268,186.6666667',  
    '54.jpg,1394,2075,2448,2448,1,127.5555556,189.869281',  
    '55.jpg,998,1785,2448,2448,1,91.32026144,163.3333333',  
    '56.jpg,1049,1947,2448,2448,1,95.9869281,178.1568627',  
    '57.jpg,1300,1580,2448,2448,1,118.9542484,144.5751634',  
  
# loop over the rows  
for row in rows:  
    # break the row into the filename and stem coordinates coordinates  
    row = row.split(",")  
    (image, new_x, new_y) = row  
  
ValueError                                Traceback (most recent call last)  
<ipython-input-10-63c84d6ad213> in <cell line: 2>()  
      3     # break the row into the filename and stem coordinates coordinates  
      4     row = row.split(",")  
----> 5     (image, new_x, new_y) = row  
  
ValueError: too many values to unpack (expected 3)
```

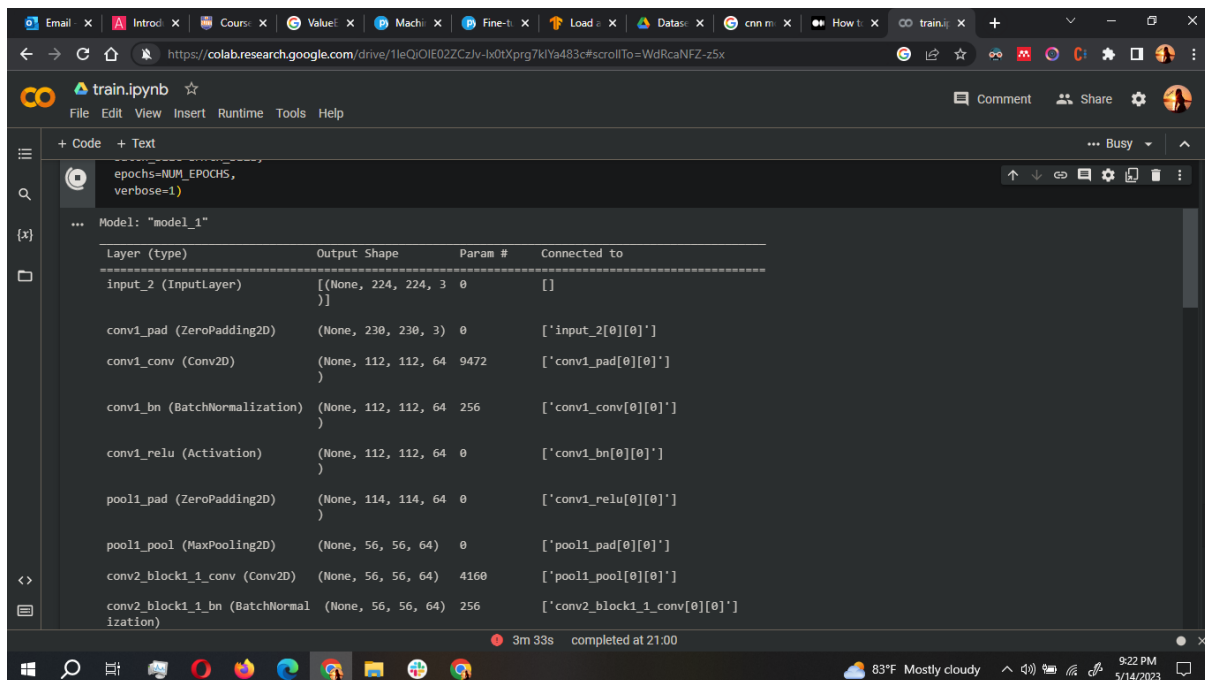
I encountered the following error due to the output location.



The screenshot shows a Google Colab notebook titled 'train.ipynb'. The code cell contains a function 'train_test_split' that is used to split the data into training and testing sets. The error message indicates that the function requires at least one array as input, which is not the case here.

```
split = train_test_split(data, targets, filenames, test_size=0.10,  
                        random_state=42)  
  
# unpack the data split  
(trainImages, testImages) = split[:2]  
(trainTargets, testTargets) = split[2:4]  
(trainFilenames, testFilenames) = split[4:]  
  
# write the testing filenames to disk so that we can use them  
# when evaluating/testing our bounding box regressor  
print("[INFO] saving testing filenames...")  
f = open(TEST_FILENAMES, "w")  
f.write("\n".join(testFilenames))  
f.close()  
  
ValueError                                Traceback (most recent call last)  
<ipython-input-22-c0225b898d89> in <cell line: 8>()  
      6 # partition the data into training and testing splits using 90% of  
      7 # the data for training and the remaining 10% for testing  
----> 8 split = train_test_split(data, targets, filenames, test_size=0.10,  
      9                        random_state=42)  
     10  
  
2 frames  
/usr/local/lib/python3.10/dist-packages/sklearn/model_selection/_split.py in train_test_split(test_size, train_size, random_state, shuffle, stratify, *arrays)  
    2557     raise ValueError("At least one array required as input")  
    2558  
-> 2559     arrays = indexable(*arrays)
```


Train the developed model.



The screenshot shows a Google Colab notebook interface. The top bar includes the 'train.ipynb' title and standard menu options (File, Edit, View, Insert, Runtime, Tools, Help). The left sidebar shows the file explorer and a search bar. The main area displays a code cell with the following content:

```
epochs=NUM_EPOCHS,
verbose=1)

... Model: "model_1"
```

Layer (type)	Output Shape	Param #	Connected to
input_2 (InputLayer)	[(None, 224, 224, 3)]	0	[]
conv1_pad (ZeroPadding2D)	(None, 230, 230, 3)	0	['input_2[0][0]']
conv1_conv (Conv2D)	(None, 112, 112, 64)	9472	['conv1_pad[0][0]']
conv1_bn (BatchNormalization)	(None, 112, 112, 64)	256	['conv1_conv[0][0]']
conv1_relu (Activation)	(None, 112, 112, 64)	0	['conv1_bn[0][0]']
pool1_pad (ZeroPadding2D)	(None, 114, 114, 64)	0	['conv1_relu[0][0]']
pool1_pool (MaxPooling2D)	(None, 56, 56, 64)	0	['pool1_pad[0][0]']
conv2_block1_1_conv (Conv2D)	(None, 56, 56, 64)	4160	['pool1_pool[0][0]']
conv2_block1_1_bn (BatchNormalization)	(None, 56, 56, 64)	256	['conv2_block1_1_conv[0][0]']

The bottom status bar indicates the notebook is 'Busy', took '3m 33s' to execute, and was 'completed at 21:00'. The system tray shows a temperature of 83°F, 'Mostly cloudy' weather, and the time '9:22 PM 5/14/2023'.

Get the output.



The screenshot shows a Jupyter notebook interface. The top bar includes a play button icon and a '0s' timer. The main area displays a code cell with the following content:

```
# new_x = int(new_x * w)
# new_y = int(new_y * h)

center = (pred_x, pred_y)
radius = 4

# draw the predicted dot on the image
# cv2.circle(image, center, radius,(0, 255, 0), -1)
cv2.circle(image,(int(center[0]),int(center[1])), radius ,(0,0,255),cv2.FILLED)

# show the output image
cv2_imshow(image)
```

Below the code cell, there is a thumbnail image of a small plant growing in a field of dark, rocky soil. A red dot is visible on the plant, indicating the predicted location.