```
from google.colab import drive
drive.mount('/content/drive')
```

```
Mounted at /content/drive
```

```
from google.colab import files
files.upload()
```

```
Choose Files kaggle.json
• kaggle.json(application/json) - 67 bytes, last modified: 11/13/2023 - 100% done
Saving kaggle.json to kaggle.json
{'kaggle.json':
b'{"username":"adityaadaki","key":"cb98516ac51f67d4df2bd5bcc7dc8d06"}'}
```

```
!rm -r ~/.kaggle
!mkdir ~/.kaggle
!mv ./kaggle.json ~/.kaggle/
!chmod 600 ~/.kaggle/kaggle.json
```

```
rm: cannot remove '/root/.kaggle': No such file or directory
```

```
! kaggle datasets list
```

```
ref                                                             title                                             size  lastUpdated
--------------------------------------------------------------  ------------------------------------------------  -----  --------------
maso0dahmed/netflix-movies-and-shows                            Netflix Movies and Shows                         172KB  2023-11-19 18:
carlmcbrideellis/llm-7-prompt-training-dataset                  LLM: 7 prompt training dataset                    41MB  2023-11-15 07:
thedrcat/daigt-proper-train-dataset                             DAIGT Proper Train Dataset                       119MB  2023-11-05 14:
thedrcat/daigt-v2-train-dataset                                 DAIGT V2 Train Dataset                            29MB  2023-11-16 01:
joebeachcapital/30000-spotify-songs                             30000 Spotify Songs                                3MB  2023-11-01 06:
iamsouravbanerjee/customer-shopping-trends-dataset              Customer Shopping Trends Dataset                 146KB  2023-10-05 06:
nelgiriyewithana/world-educational-data                         World Educational Data                             9KB  2023-11-04 06:
prasad22/healthcare-dataset                                     🩺Healthcare Dataset 💉                            483KB  2023-10-31
ddosad/auto-sales-data                                          Automobile Sales data                             79KB  2023-11-18 12:
dillonmyrick/high-school-student-performance-and-demographics   High School Student Performance & Demographics    24KB  2023-11-10 01:
jacksondivakarr/online-shopping-dataset                         🛒 Online Shopping Dataset 📊📉📈                    5MB  2023-11-
willianoliveiragibin/animal-condition                           Animal Condition                                  12KB  2023-11-14 20:
ethankeyes/nba-all-star-players-and-stats-1980-2022             NBA All Star Players and Stats 1980-2022          46KB  2023-11-16 21:
everydaycodings/job-opportunity-dataset                         Job Opportunities Dataset                         95KB  2023-11-20 08:
anshtanwar/top-200-trending-books-with-reviews                  Top 100 Bestselling Book Reviews on Amazon        422KB  2023-11-09 06:
joebeachcapital/coronavirus-covid-19-cases-daily-updates        Coronavirus (COVID-19) Cases (Daily Updates)      14MB  2023-11-23 23:
mauryansshivam/list-of-internet-products-of-top-tech-companies  List of Internet Products of Top Tech Companies    9KB  2023-11-15 19:
vikramrn/icc-mens-odi-world-cup-wc-2023                         ICC mens cricket odi world cup wc 2023 - batting  16KB  2023-11-20 12:
samybaladram/databank-world-development-indicators              🌎 Global Socio-Economic & Demographic Insights    2MB  2023-11-06 05
shudhanshusingh/real-estate-properties-dataset                  Real Estate Properties Dataset                   882KB  2023-11-18 20:
```

```
# wheat = olyadgetch/wheat-leaf-dataset 2gb
#Maize = smaranjitghose/corn-or-maize-leaf-disease-dataset 169mb
#rice2 = maimunulkjisan/rice-leaf-dataset-from-mendeley-data 205mb
#sugarcane = prabhakaransoundar/sugarcane-disease-dataset 2gb
#cotton = seroshkarim/cotton-leaf-disease-dataset 190mb
dataset_name = 'maimunulkjisan/rice-leaf-dataset-from-mendeley-data'
zip_name = dataset_name.split('/')[-1]

!kaggle datasets download -d {dataset_name}

```

```
Downloading rice-leaf-dataset-from-mendeley-data.zip to /content
 99% 193M/196M [00:02<00:00, 92.3MB/s]
100% 196M/196M [00:02<00:00, 89.5MB/s]
```

```
!unzip -q ./rice-leaf-dataset-from-mendeley-data.zip -d /content/drive/MyDrive/GROUP-4/EDI/Dataset
```

```
import numpy as np
import time

import PIL.Image as Image
import matplotlib.pylab as plt

import tensorflow as tf
import tensorflow_hub as hub

import os
import shutil
from sklearn.model_selection import train_test_split
from tqdm import tqdm

import matplotlib.pyplot as plt

from sklearn.metrics import confusion_matrix
import seaborn as sns

```

```
# directory_to_delete = "/content/drive/MyDrive/GROUP-4/EDI/split_dataset/rice_leaf/val"

#  # Use shutil.rmtree() to delete the directory and its contents
# shutil.rmtree(directory_to_delete)

# print(f"Directory '{directory_to_delete}' has been deleted.")

```

```
Directory '/content/drive/MyDrive/GROUP-4/EDI/split_dataset/rice_leaf/val' has been deleted.
```

```
# Define the source dataset directory
source_dataset_directory = "/content/drive/MyDrive/GROUP-4/EDI/Dataset/Rice Leaf Disease Images"

# Define the output directory where the split dataset will be saved
output_directory = "/content/drive/MyDrive/GROUP-4/EDI/split_dataset/rice_leaf"

# Get the list of all classes (subdirectories) in the source directory
classes = [d for d in os.listdir(source_dataset_directory) if os.path.isdir(os.path.join(source_dataset_directory, d)) and d not in ['tr

# Create the output directory if it doesn't exist
os.makedirs(output_directory, exist_ok=True)

# Iterate over each class
for class_name in classes:
    # Define the path to the class directory in the source dataset
    class_source_directory = os.path.join(source_dataset_directory, class_name)

    # Get the list of all files (images) in the class directory
    all_files = [f for f in os.listdir(class_source_directory) if os.path.isfile(os.path.join(class_source_directory, f))]

    # Check if the dataset for the current class is not empty
    if not all_files:
        print(f"Warning: The dataset for class {class_name} is empty.")
    else:
        # Split the dataset for the current class into train and validation sets
        train_files, val_files = train_test_split(all_files, test_size=0.3, random_state=42)

        # Function to copy files from source to destination
        def copy_files(file_list, src_dir, dest_dir):
            for file in tqdm(file_list, desc=f"Copying files for class {class_name}"):
                src_path = os.path.join(src_dir, file)
                dest_path = os.path.join(dest_dir, file)
                shutil.copy(src_path, dest_path)

        # Copy train files to the train folder
        train_directory = os.path.join(output_directory, 'train', class_name)
        os.makedirs(train_directory, exist_ok=True)
        copy_files(train_files, class_source_directory, train_directory)

        # Copy validation files to the val folder
        val_directory = os.path.join(output_directory, 'val', class_name)
        os.makedirs(val_directory, exist_ok=True)
        copy_files(val_files, class_source_directory, val_directory)

```

```
Copying files for class Bacterialblight: 100%|████████| 1108/1108 [00:10<00:00, 108.42it/s]
Copying files for class Bacterialblight: 100%|████████| 476/476 [00:03<00:00, 120.61it/s]
Copying files for class Blast: 100%|████████| 1008/1008 [00:09<00:00, 107.26it/s]
Copying files for class Blast: 100%|████████| 432/432 [00:03<00:00, 124.39it/s]
Copying files for class Brownspot: 100%|████████| 1120/1120 [00:10<00:00, 109.76it/s]
Copying files for class Brownspot: 100%|████████| 480/480 [00:03<00:00, 121.97it/s]
Copying files for class Tungro: 100%|████████| 915/915 [00:08<00:00, 112.06it/s]
Copying files for class Tungro: 100%|████████| 393/393 [00:03<00:00, 124.62it/s]
```

```
batch_size = 32
img_height = 224
img_width = 224
data_root = '/content/drive/MyDrive/GROUP-4/EDI/split_dataset/rice_leaf/train'

train_ds = tf.keras.preprocessing.image_dataset_from_directory(
  str(data_root),
  validation_split=0.2,
  subset="training",
  seed=123,
  image_size=(img_height, img_width),
  batch_size=batch_size)
```

```
Found 4151 files belonging to 4 classes.
Using 3321 files for training.
```

```
class_names = np.array(train_ds.class_names)
print('class names for predictions :',class_names)
```

```
class names for predictions : ['Bacterialblight' 'Blast' 'Brownspot' 'Tungro']
```

```
normalization_layer = tf.keras.layers.experimental.preprocessing.Rescaling(1./255)
train_ds = train_ds.map(lambda x, y: (normalization_layer(x), y))
```

```
AUTOTUNE = tf.data.AUTOTUNE
train_ds = train_ds.cache().prefetch(buffer_size=AUTOTUNE)
```

```
for image_batch, labels_batch in train_ds:
  print(image_batch.shape)
  print(labels_batch.shape)
  break
```

```
(32, 224, 224, 3)
(32,)
```

```
feature_extractor_model = "https://tfhub.dev/google/tf2-preview/mobilenet_v2/feature_vector/4"
feature_extractor_layer = hub.KerasLayer(
    feature_extractor_model, input_shape=(224, 224, 3), trainable=False)
```

```
num_classes = len(class_names)

model = tf.keras.Sequential([
  feature_extractor_layer,
  tf.keras.layers.Dense(num_classes)
])

model.summary()
```

```
Model: "sequential_3"
_________________________________________________________________
 Layer (type)                Output Shape              Param #
=================================================================
 keras_layer_3 (KerasLayer)  (None, 1280)              2257984

 dense_3 (Dense)             (None, 4)                 5124

=================================================================
Total params: 2263108 (8.63 MB)
Trainable params: 5124 (20.02 KB)
Non-trainable params: 2257984 (8.61 MB)
_________________________________________________________________
```

```
image_batch.shape
```

```
TensorShape([32, 224, 224, 3])
```

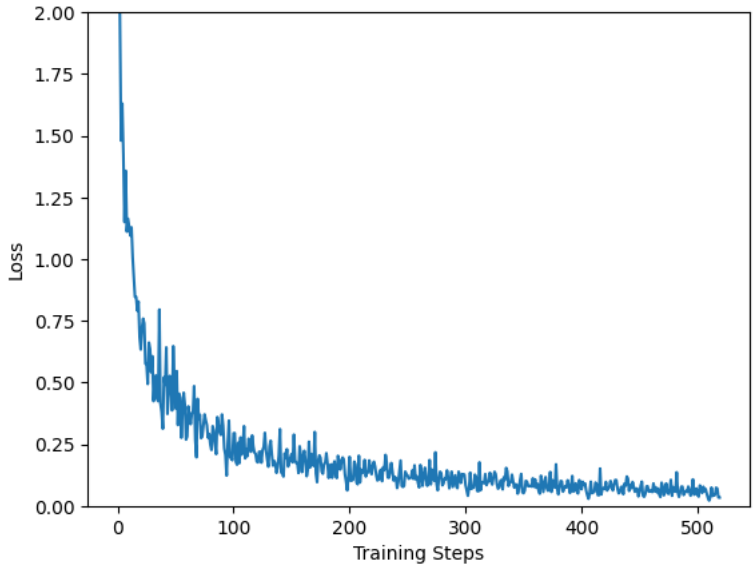
```
model.compile(
  optimizer=tf.keras.optimizers.Adam(),
  loss=tf.keras.losses.SparseCategoricalCrossentropy(from_logits=True),
  metrics=['acc'])
```

```
class CollectBatchStats(tf.keras.callbacks.Callback):
  def __init__(self):
    self.batch_losses = []
    self.batch_acc = []

  def on_train_batch_end(self, batch, logs=None):
    self.batch_losses.append(logs['loss'])
    self.batch_acc.append(logs['acc'])
    self.model.reset_metrics()

batch_stats_callback = CollectBatchStats()

history = model.fit(train_ds, epochs=5,
                    callbacks=[batch_stats_callback])
```

```
Epoch 1/5
104/104 [==============================] - 16s 114ms/step - loss: 0.0000e+00 - acc: 0.0000e+00
Epoch 2/5
104/104 [==============================] - 5s 46ms/step - loss: 0.0000e+00 - acc: 0.0000e+00
Epoch 3/5
104/104 [==============================] - 4s 41ms/step - loss: 0.0000e+00 - acc: 0.0000e+00
Epoch 4/5
104/104 [==============================] - 4s 41ms/step - loss: 0.0000e+00 - acc: 0.0000e+00
Epoch 5/5
104/104 [==============================] - 5s 44ms/step - loss: 0.0000e+00 - acc: 0.0000e+00
```

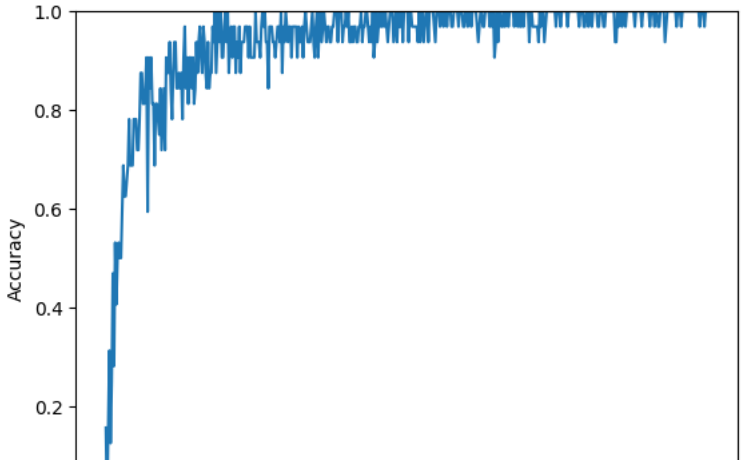
```
plt.figure()
plt.ylabel("Loss")
plt.xlabel("Training Steps")
plt.ylim([0,2])
plt.plot(batch_stats_callback.batch_losses)
```

```
[<matplotlib.lines.Line2D at 0x7c4b1c9427d0>]
```

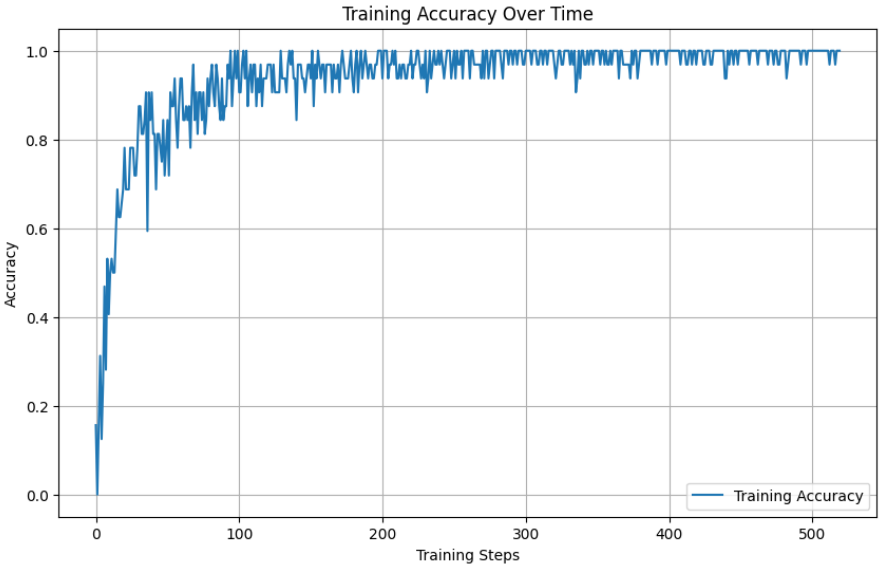



```
plt.figure()
plt.ylabel("Accuracy")
plt.xlabel("Training Steps")
plt.ylim([0,1])
plt.plot(batch_stats_callback.batch_acc)
```

```
[<matplotlib.lines.Line2D at 0x7c4b1c995de0>]
```




```
import matplotlib.pyplot as plt

# Access accuracy values collected during training
batch_acc = batch_stats_callback.batch_acc

# Plot the accuracy matrix
plt.figure(figsize=(10, 6))
plt.plot(batch_acc, label='Training Accuracy')
plt.xlabel('Training Steps')
plt.ylabel('Accuracy')
plt.title('Training Accuracy Over Time')
plt.legend()
plt.grid(True)
plt.show()

```



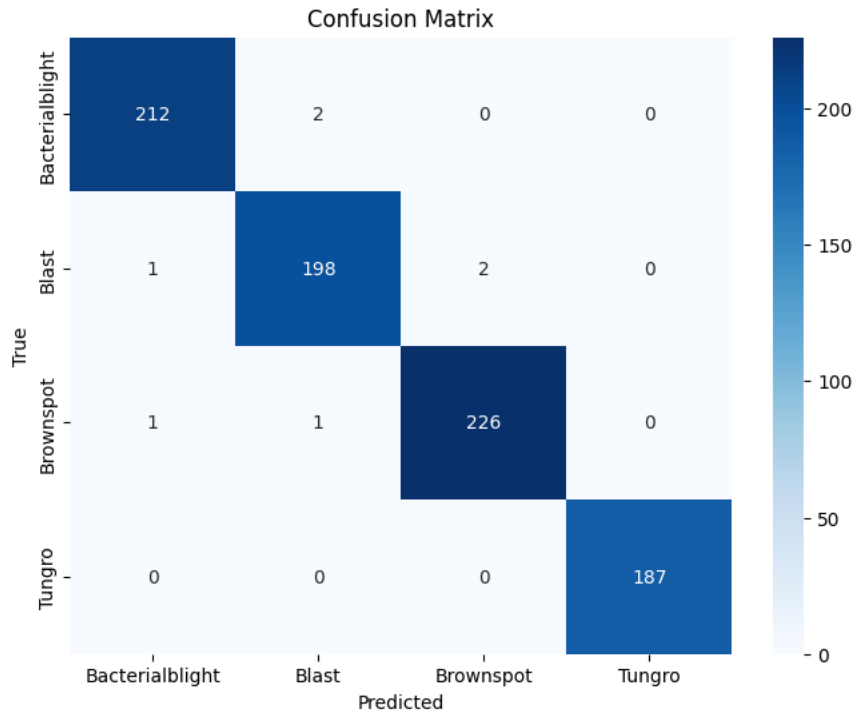
```
# Load and preprocess validation dataset
data_root_val = '/content/drive/MyDrive/GROUP-4/EDI/split_dataset/rice_leaf/val'

val_ds = tf.keras.preprocessing.image_dataset_from_directory(
  str(data_root),
  validation_split=0.2,
  subset="validation",  # Use validation subset
  seed=123,
  image_size=(img_height, img_width),
  batch_size=batch_size)

val_ds = val_ds.map(lambda x, y: (normalization_layer(x), y))
val_ds = val_ds.cache().prefetch(buffer_size=AUTOTUNE)

# Evaluate the model on the validation dataset
val_loss, val_accuracy = model.evaluate(val_ds)

print(f"Validation Loss: {val_loss * 100:.2f}%")
print(f"Validation Accuracy: {val_accuracy * 100:.2f}%")

```

```
Found 4151 files belonging to 4 classes.
Using 830 files for validation.
26/26 [==============================] - 4s 92ms/step - loss: 0.0629 - acc: 0.9916
Validation Loss: 6.29%
Validation Accuracy: 99.16%
```

```
true_labels = []
predicted_labels = []

for images, labels in val_ds:
    true_labels.extend(labels.numpy())  # Collect true labels
    predictions = model.predict(images)
    predicted_labels.extend(tf.argmax(predictions, axis=1).numpy())  # Collect predicted labels

```

```
1/1 [==============================] - 1s 768ms/step
1/1 [==============================] - 0s 51ms/step
1/1 [==============================] - 0s 63ms/step
1/1 [==============================] - 0s 48ms/step
1/1 [==============================] - 0s 53ms/step
1/1 [==============================] - 0s 47ms/step
1/1 [==============================] - 0s 40ms/step
1/1 [==============================] - 0s 44ms/step
1/1 [==============================] - 0s 48ms/step
1/1 [==============================] - 0s 55ms/step
1/1 [==============================] - 0s 47ms/step
1/1 [==============================] - 0s 45ms/step
1/1 [==============================] - 0s 51ms/step
1/1 [==============================] - 0s 41ms/step
1/1 [==============================] - 0s 49ms/step
1/1 [==============================] - 0s 37ms/step
1/1 [==============================] - 0s 44ms/step
1/1 [==============================] - 0s 31ms/step
1/1 [==============================] - 0s 34ms/step
1/1 [==============================] - 0s 32ms/step
1/1 [==============================] - 0s 34ms/step
1/1 [==============================] - 0s 32ms/step
1/1 [==============================] - 0s 33ms/step
1/1 [==============================] - 0s 33ms/step
1/1 [==============================] - 0s 31ms/step
1/1 [==============================] - 0s 493ms/step
```

```
import numpy as np
import matplotlib.pyplot as plt
from sklearn.metrics import confusion_matrix
import seaborn as sns

# Calculate confusion matrix
cm = confusion_matrix(true_labels, predicted_labels)

# Plot confusion matrix as a heatmap
plt.figure(figsize=(8, 6))
sns.heatmap(cm, annot=True, fmt="d", cmap="Blues", xticklabels=class_names, yticklabels=class_names)
plt.xlabel('Predicted')
plt.ylabel('True')
plt.title('Confusion Matrix')
plt.show()

```




```
# Specify the path for saving the model in Google Drive
h5_export_path = "/content/drive/MyDrive/rice_model.h5"

# Save the model as an HDF5 file
model.save(h5_export_path)

print(f"Model saved as {h5_export_path}")

```

```
/usr/local/lib/python3.10/dist-packages/keras/src/engine/training.py:3079: UserWarning: You are saving your model as an HDF5 file via `
  saving_api.save_model(
Model saved as /content/drive/MyDrive/rice_model.h5
```

```
import numpy as np
import matplotlib.pyplot as plt
from sklearn.metrics import confusion_matrix, precision_score, recall_score, f1_score
import seaborn as sns
import pandas as pd  # Import pandas library

# Generate example data (replace this with your actual data)
np.random.seed(42)
true_labels = np.random.randint(0, 4, 100)
predicted_labels = np.random.randint(0, 4, 100)
class_names = ['Class 0', 'Class 1', 'Class 2','class 3']

# Calculate confusion matrix
cm = confusion_matrix(true_labels, predicted_labels)

# Calculate precision, recall, and f1 score for each class
```

```
precision = precision_score(true_labels, predicted_labels, average=None)
recall = recall_score(true_labels, predicted_labels, average=None)
f1 = f1_score(true_labels, predicted_labels, average=None)

# Plot precision, recall, and f1 score in a table
plt.figure(figsize=(12, 8))
table_data = {'Class Name': class_names, 'Precision': precision, 'Recall': recall, 'F1 Score': f1}
sns.heatmap(pd.DataFrame(table_data).set_index('Class Name'), annot=True, cmap="YlGnBu", fmt=".3f", cbar=False)
plt.xlabel('Metrics')
plt.title('Precision, Recall, and F1 Score for Each Class')
plt.show()

```

```
import numpy as np
import matplotlib.pyplot as plt
from sklearn.metrics import confusion_matrix, precision_score, recall_score
import pandas as pd

# Calculate confusion matrix
cm = confusion_matrix(true_labels, predicted_labels)

# Calculate precision and recall for each class as float values
precision = precision_score(true_labels, predicted_labels, average=None)
```