

Final Project Submission

Please fill out:

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X-ray Image Predictions: Pneumonia or Normal



Summary

A local hospital wants to explore their image recognition options for pneumonia cases. They want eventually replace a few doctors due to staffing issues. They want to test it out for a trial version. Worldwide Pneumonia is a deadly and expensive condition, especially for children and the elderly. Using Convolutional Neural Networks, X-Ray images of Normal and Pneumonia patients, data scientists will attempt to build models that detect pneumonia with the goal of minimizing False Negatives (predicting no pneumonia, while there is). Because of the severity this is a main focus.

The dataset is from Chest X-Ray of "Normal" and "Pneumonia" images from [Kaggle](#) with a total of 5856 .jpeg files.

Based on the business goal and data, the main metrics will be Recall, F1-Score, and Loss, Accuracy will be secondary.

There is a data imbalance between categories and splits. After the images are loaded, the Train and Validation images are combined and then split 80/20 for each respective category (Normal, Pneumonia). This does not solve the data and split imbalance but improves the offset to support more accurate modeling evaluation metrics.

Modeling was done over 10 iterations (including a Transfer Model) with Hyperparameter tweaks: (Batch Size, Epochs, Dropout, Activation, Class Weight). The best models had no False Negatives or False Positives with scores of 1. The chosen model had the smallest loss.

Hospital Recommendations:

- Usage: The model is best as a learning tool and not an official diagnosis.
- Strategy: Use the model as an initial reviewer of the images.
- Staffing: The model is best used with a doctor, not standalone.

Technical Recommendations:

- Scope, review and process images more beforehand
- Visualize the activation functions to see better what areas the model layers are diagnosing
- Iterate model improvement with augmented data
- Visually inspect the images that were FN and FP.

Import Libraries

In [375...]

```
import os
import glob

#from google.colab import drive #Google Collab

import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
import pickle

import tensorflow

from tensorflow import keras
from tensorflow.keras.metrics import Accuracy, Precision, Recall
from tensorflow.keras.preprocessing.image import ImageDataGenerator, array_to_i
from tensorflow.keras import models, layers, optimizers, activations
from tensorflow.keras.layers import Conv2D, MaxPooling2D, Flatten, Dense, Dropout
from tensorflow.keras.utils import plot_model

from sklearn.model_selection import train_test_split

from sklearn.model_selection import GridSearchCV
from tensorflow.keras.wrappers.scikit_learn import KerasClassifier
from keras.optimizers import Adam

from tensorflow.keras.callbacks import ModelCheckpoint, EarlyStopping
from tensorflow.keras.applications import VGG19 #Pretrained Transfer Modeling
from sklearn.utils.class_weight import compute_class_weight

from keras.preprocessing import image
from PIL import Image

from sklearn.metrics import make_scorer
from sklearn.metrics import precision_score, f1_score, recall_score, accuracy_soc
from sklearn.metrics import precision_recall_curve, PrecisionRecallDisplay, ave
from sklearn.metrics import confusion_matrix as cm
from sklearn.metrics import classification_report, ConfusionMatrixDisplay
from sklearn.utils.class_weight import compute_class_weight
```

```
#Used to move files
import shutil

#Ignore warnings
import warnings
warnings.filterwarnings('ignore')
tf.__version__

# Stop Tensorflow errors from showing especially
import logging
tf.get_logger().setLevel(logging.ERROR)

# Showing the areas of the image boundaries
import lime
from lime import lime_base
from lime import lime_image
from skimage.segmentation import mark_boundaries
```

In []: #Getting start time
original_start = datetime.datetime.now()

The following modeling effort was developed on a Apple M2 Max 64GB computer.
There may be tasks that may longer execute on other hardware

Data Understanding

The dataset is from Chest X-Ray of "Normal" and "Pneumonia" images from [Kaggle](#) with a total of 5856 .jpeg files. This data set is already broken up into three folders (train, validation and test) and a folder for each category ("NORMAL" or "PNEUMONIA").

Original Dataset Splits

- Train [1341 NORMAL, 3875 PNEUMONIA]
- Validation [8 NORMAL, 8 PNEUMONIA]
- Test [234 NORMAL, 390 PNEUMONIA]

There is a data imbalance between categories and splits. After the images are loaded, the Train and Validation images are combined and then split 80/20 for each respective category (Normal, Pneumonia). This does not solve the data and split imbalance but improves the offset to support more accurate modeling evaluation metrics.

The original dataset is already split by the time this notebook is turned it. The following code will still work with the original dataset and previously shifted images

Loading Images

Images are loaded from the current directory joined with the location of the dataset. The python "glob" module [Glob, Tara Boyle, 2021](#) is used to retrieve files recursively. Without knowing all the file names "*" asterisks are used in place to get all fo the files.

```
In [377]: #Get Current directory
cur_dir = os.getcwd()
cur_dir
```

```
Out[377]: '/Users/deztanyjackson/Documents/0_Flatiron/Phase_4/Project_4/Image_Classification_P4'
```

Understanding the total images split among the respective directories

```
In [399]: #Retrieving dataset in the respective folders
train_data = glob.glob(os.path.join(cur_dir, 'data/chest_xray/train/**/*.*.jpeg'))
val_data = glob.glob(os.path.join(cur_dir, 'data/chest_xray/val/**/*.*.jpeg'))
test_data = glob.glob(os.path.join(cur_dir, 'data/chest_xray/test/**/*.*.jpeg'))

#Printing total number of images in different directories
print(f"Training Set has: {len(train_data)} images")
print(f"Validation Set has: {len(val_data)} images")
print(f"Testing Set has: {len(test_data)} images")
```

```
Training Set has: 2679 images
Validation Set has: 907 images
Testing Set has: 624 images
```

Understanding the total categories (Normal and Pneumonia) split among the respective directories

Initial Data Balancing

The data splitting and moving will not solve the data imbalance for training, but supports better modeling metric evaluations.

- Orinally started with 16 Validation Images
- Moving validation images to train set.
- Perform Random Train/Valid split 80/20 on Normal and Pneumonia images
- Move 20% of each back to validation folder

Retrieves Normal and Pneumonia specific images for each dataset

```
In [376]: #Pulling in Normal and Pneumonia specific data

#Training Data
t_norm = glob.glob(os.path.join(cur_dir, 'data/chest_xray/train/NORMAL/*.*.jpeg'))
t_pneu = glob.glob(os.path.join(cur_dir, 'data/chest_xray/train/PNEUMONIA/*.*.jpeg'))
#Validation Data
v_pneu = glob.glob(os.path.join(cur_dir, 'data/chest_xray/val/PNEUMONIA/*.*.jpeg'))
v_norm = glob.glob(os.path.join(cur_dir, 'data/chest_xray/val/NORMAL/*.*.jpeg'))
#Test Data
```

```
test_norm = glob.glob(os.path.join(cur_dir, 'data/chest_xray/test/NORMAL/*.jpeg')
test_pneu = glob.glob(os.path.join(cur_dir, 'data/chest_xray/test/PNEUMONIA/*.jp
```

Moving and Splitting Files (If Necessary)

Moving the validation data to the respective Normal and Pneumonia Training folders if the amount of files in the folders are less than 20 (This number is arbitrary)... If so, there will be a 80/20 split of the data and then the 20% of files are moved back to the respective Validation folder. The original dataset had 8 images per folder. The goal is to only move files if there is an huge value offset. If not, then the files don't need to move.

```
In [ ]: if len(v_pneu) < 20 | len(v_norm) < 20: # Only perform action if validation fo
    #Moving Validation to Test
    cat = [v_norm,v_pneu]
    for c in cat:
        if c == v_norm:
            images = [f for f in v_norm if '.jpeg' in f.lower()]
            for img in images:
                new_path = os.path.join(cur_dir,"data/chest_xray/train/NORMAL/")
                shutil.move(img,new_path)
        elif c == v_pneu:
            images = [f for f in v_pneu if '.jpeg' in f.lower()]
            for img in images:
                new_path = os.path.join(cur_dir,"data/chest_xray/train/PNEUMONIA")
                shutil.move(img,new_path)
        else:
            pass

    #Splitting the data 80/20 for the Normal and Pnuemonia categories.
    #Moving the 20% split to the respective Validation directories.
train_cat = [t_norm,t_pneu]
for cat in train_cat:
    train,val = train_test_split(cat, train_size=.8, random_state=42)
    if cat == t_norm:
        for img in val:
            new_path = os.path.join(cur_dir,"data/chest_xray/val/NORMAL/")
            shutil.move(img,new_path)
    elif cat == t_pneu:
        for img in val:
            new_path = os.path.join(cur_dir,"data/chest_xray/val/PNEUMONIA")
            shutil.move(img,new_path)
    else:
        pass
else: #If validation folders doesnt have less than 20 images then don't do anything
    pass
```

```
In [6]: #Printing Dataset values
```

```
#Totals for Training, Validation and Testing
print(f"Training Set has: {len(train_data)} images")
print(f"Validation Set has: {len(val_data)} images")
print(f"Testing Set has: {len(test_data)} images")
print("\n")
#Training Data
print(f"Training Pneumonia Amount: {len(t_pneu)} images")
```

```

print(f"Training Normal Amount: {len(t_norm)} images")
print(f"Training Normal to Pneumonia Ratio: {round(len(t_norm)/len(t_pneu),2)}")
print("\n")
#Validation Data
print(f"Validation Pneumonia Amount: {len(v_pneu)} images")
print(f"Validation Normal Amount: {len(v_norm)} images")
print(f"Validation Normal to Pneumonia Ratio: {round(len(v_norm)/len(v_pneu),2)}")

```

Training Set has: 4325 images
 Validation Set has: 907 images
 Testing Set has: 624 images

Training Pneumonia Amount: 3210 images
 Training Normal Amount: 1115 images
 Training Normal to Pneumonia Ratio: 0.35

Validation Pneumonia Amount: 673 images
 Validation Normal Amount: 234 images
 Validation Normal to Pneumonia Ratio: 0.35

There is still imbalance but better offset.

Normal and Pneumonia Images

Displaying 10 of the first images in the Normal and Pneumonia Training folders.
`".imread()"` method reads images from file into an array. All the images will be displayed a grid to show size and in the color gray.

NORMAL IMAGES

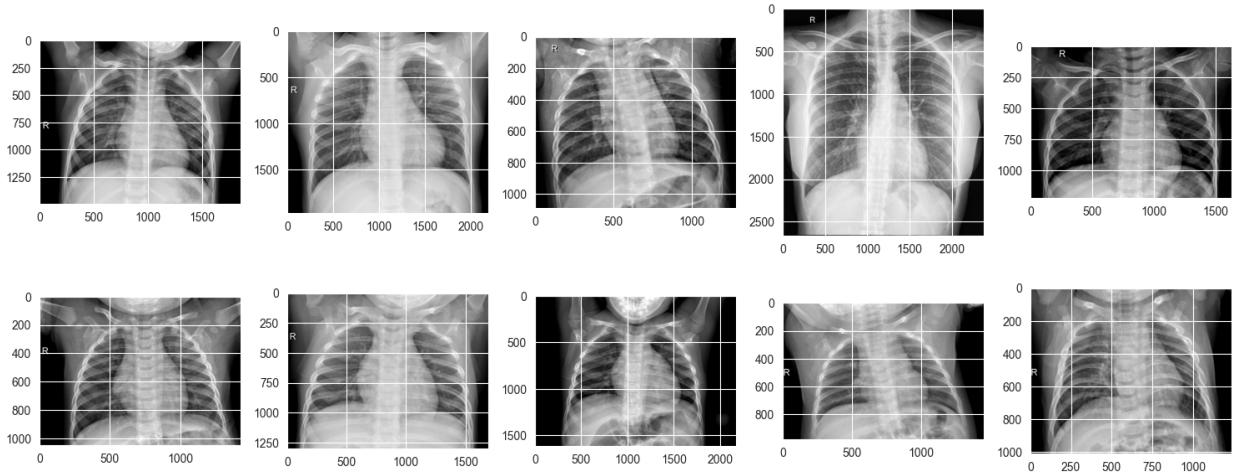
In [393...]

```

#Plotting 10 images from the train folder
plt.figure(figsize = (15,15))
print ("Sample of Normal Pictures")
for i in range(10):
    plt.subplot(5,5,i+1)
    #Reads images from file into an array
    img = plt.imread(t_norm[i])
    plt.imshow(img, cmap = "gray")
    plt.tight_layout()
plt.savefig('images/Img_Norm.png')

```

Sample of Normal Pictures

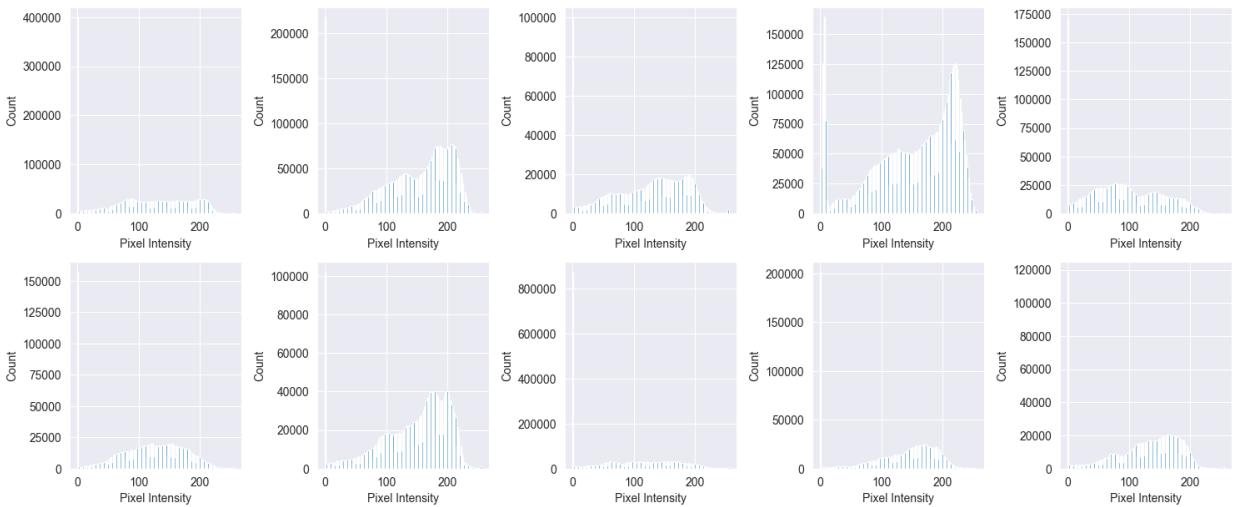


NORMAL PIXEL INTENSITY

Displaying pixel intensity associated with the plotted images

```
In [392...]: #Plotting 10 image pixels from the train folder
plt.figure(figsize = (15,15),facecolor="White")
print ("Associated Normal Pixel Intensities")
for i in range(10):
    plt.subplot(5,5,i+1)
    img = plt.imread(t_norm[i])
    plt.hist(img.ravel(), bins=150)
    plt.tight_layout()
    plt.ylabel("Count")
    plt.xlabel("Pixel Intensity")
plt.savefig('images/Hist_Norm.png')
#plt.axis('off')
```

Associated Normal Pixel Intensities



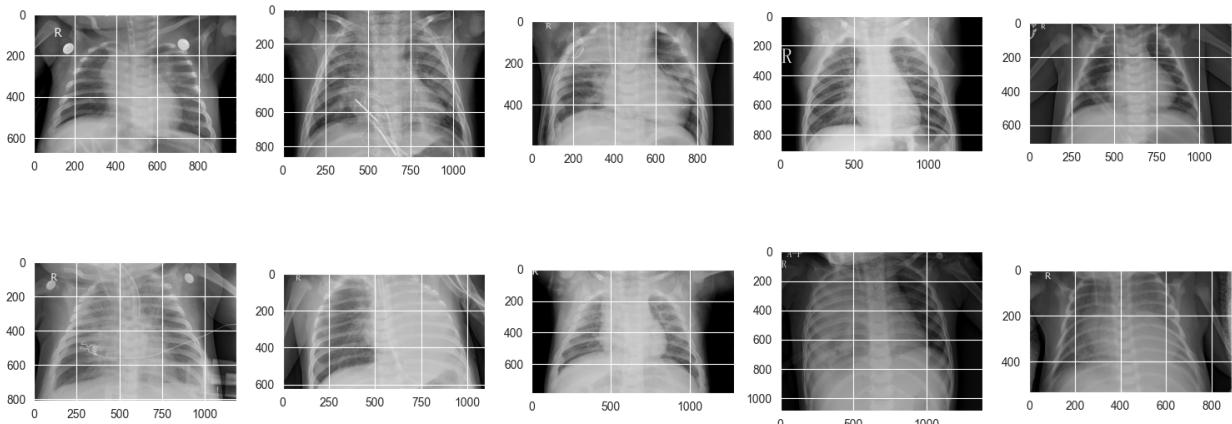
PNEUMONIA IMAGES

```
In [391...]: plt.figure(figsize = (15,15))
print ("Sample of Random Pneumonia Pictures")
for i in range(10):
```

```

plt.subplot(5,5,i+1)
img = plt.imread(t_pneu[i])
plt.imshow(img, cmap = "gray")
plt.tight_layout()
plt.savefig('images/Img_Pneu.png')
# plt.axis('off')

```

Sample of Random Pneumonia Pictures

Visually, both the Normal and Pneumonia pictures vary in size. Pneumonia pictures have a cloudier visual look.

PNEUMONIA PIXEL IMAGES

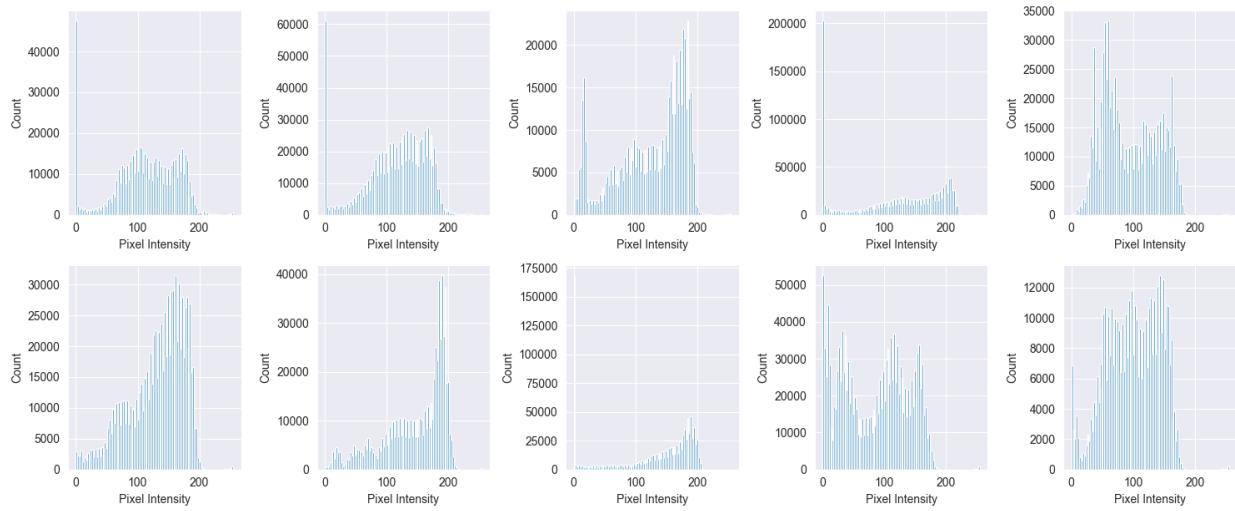
Displaying pixel intensity associated with the plotted images.

```

In [390...]: plt.figure(figsize = (15,15), facecolor="White")
print ("Associated Pneumonia Pixel Intensities")
for i in range(10):
    plt.subplot(5,5,i+1)
    img = plt.imread(t_pneu[i])
    plt.hist(img.ravel(), bins=100)
    plt.tight_layout()
    plt.ylabel("Count")
    plt.xlabel("Pixel Intensity")
plt.savefig('images/Hist_Pneu.png')
# plt.axis('off')

```

Associated Pneumonia Pixel Intensities



It appears the pixel intensity is more with Pneumonia.

Preprocessing Images

Rescaling the image Rescaling

For the initial dataset, the only preprocessing will be rescaling, creating target size and scoping the batch size. Further data augmentation will be done during the modeling.

Image Generator

Generating batches of tensor image data with real-time data augmentation.

```
In [13]: #ImageDataGenerator without pre data augmentation
train_datagen = ImageDataGenerator(rescale=1./255)
val_datagen = ImageDataGenerator(rescale=1./255)
test_datagen = ImageDataGenerator(rescale=1./255)
```

Creating directories for augmentation. The subdirectories will be understood by the operation.

```
In [14]: #Create Current Directories
train_directory= 'data/chest_xray/train'
validation_directory= 'data/chest_xray/val'
test_directory = 'data/chest_xray/test'
```

With the tensor image data and directory we will generate batches of augmented data.

Describe:

- Target Size - Dimensions the images will be resized to
- Batch Size - Size of batches of data
- Classes - Class names

- Class Mode - "Binary" 1D Binary labels
- Shuffle - Sorts data in a random matter, Default is True.
- Seed - Random seed for shuffling

```
In [15]: #Using a generator for the images to work with.
train_gen = train_datagen.flow_from_directory(train_directory,
                                              target_size = (224, 224),
                                              batch_size=64,
                                              classes = ["NORMAL", "PNEUMONIA"],
                                              class_mode = 'binary',
                                              seed = 42)

val_gen = val_datagen.flow_from_directory(validation_directory,
                                             target_size = (224, 224),
                                             batch_size = 32,
                                             classes = ["NORMAL", "PNEUMONIA"],
                                             class_mode = 'binary',
                                             seed = 42)

#Testing data will be used on Final Model only
test_gen = test_datagen.flow_from_directory(test_directory,
                                              target_size = (224, 224),
                                              batch_size = 624,
                                              classes = ["NORMAL", "PNEUMONIA"],
                                              class_mode = 'binary',
                                              seed = 42,
                                              shuffle= False)
```

Found 4325 images belonging to 2 classes.
 Found 907 images belonging to 2 classes.
 Found 624 images belonging to 2 classes.

```
In [16]: #Checking the class label and index match
print(train_gen.class_indices)
print(val_gen.class_indices)

{'NORMAL': 0, 'PNEUMONIA': 1}
{'NORMAL': 0, 'PNEUMONIA': 1}
```

Iterating through the generated images. X and y are the images and labels respectively. It is a sample equal to the batch size above.

```
In [233...]: X_train, y_train = next(train_gen)
X_val, y_val = next(val_gen)
X_test, y_test = next(test_gen)

print("X_train:", len(X_train), "y_train:", len(y_train))
print("X_val:", len(X_val), "y_val:", len(y_val))
print("X_test:", len(X_test), "y_test:", len(y_test))

X_train: 64 y_train: 64
X_val: 32 y_val: 32
X_test: 624 y_test: 624
```

Modeling

Custom Functions for Model Evaluation

Visualization Metrics,A.Jang 2023

```
In [305]: #Create a new directory for saved files
directory = "saved_files"
save_path = os.path.join(cur_dir,directory)
try:
    os.mkdir(save_path)
except OSError as error:
    print(error)

[Errno 17] File exists: '/Users/deztanyjackson/Documents/0_Flatiron/Phase_4/Project_4/Image_Classification_P4/saved_files'
```

```
In [19]: #Using Pickle in a function to save files
def save_file(name,file):
    """ Saving file to a specific directory using pickle"""
    saved_name = os.path.join(save_path,name)
    with open(saved_name, 'wb') as f:
        pickle.dump(file, f)
```

```
In [20]: #loading Pickle Files
def load_file(name):
    """ Loading file from a specific directory using pickle"""
    saved_name = os.path.join(save_path,name)
    with open(saved_name, 'rb') as f:
        file = pickle.load(f)
    return file
```

```
In [21]: #Printing metric subplots of training and validation per epoch
def eval_metrics(history):
    """ Plots Train and Validation metrics["acc","loss","recall","precision"]
    from a model's evaluation results."""

    fig, ax = plt.subplots(1,4, figsize = (25,5))
    fig.suptitle('Model Metrics Results')

    metrics = ["loss","recall","acc","precision"]

    for i, metric in enumerate(metrics):

        ax[i].plot(history.history[metric])
        ax[i].plot(history.history["val_" + metric])
        ax[i].set_title('Model {}'.format(metric))
        ax[i].set_ylabel(metric)
        ax[i].set_xlabel("Epochs")
        ax[i].legend(['train', 'val'])
```

Predictor Algorithm with Shuffle,by Jakob, 2021

```
In [22]: def predict_results(model,generator):
    """Generates prediction results and true labels from a specific model and s
    This formula works well for shuffled generated data."""

    # Create lists for storing the predictions and labels
    predictions = []
```

```

labels = []

# Get the total number of labels in generator
# (i.e. the length of the dataset where the generator generates batches from)
n = len(generator.labels)

# Loop over the generator
for data, label in generator:
    # Make predictions on data using the model. Store the results.
    predictions.extend(model.predict(data).flatten())

    # Store corresponding labels
    labels.extend(label)

    # We have to break out from the generator when we've processed
    # the entire once (otherwise we would end up with duplicates).
    if (len(label) < generator.batch_size) and (len(predictions) == n):
        break

return labels, predictions #y_true, y_hat_train/y_pred

```

In [23]:

```

def conf_matrix(y_true,y_pred, norm_bool):
    """Prints confusion matrix for the Normal and Pneumonia true and predicted
    y_pred = np.round(y_pred,0) #Rounding to the nearest 0 or 1, assumes threshold
    cmatrix= cm(y_true, y_pred, normalize=norm_bool)# Allows normalized matrix
    matrix_disp= ConfusionMatrixDisplay(cmatrix, display_labels= ["NORMAL", "PNEUMONIA"])
    matrix_disp.plot()

    plt.xlabel('Predictions')
    plt.ylabel('Actual')
    plt.title('Model Confusion Matrix')
    plt.show()

```

In [197...]

```

def eval_report(y_true, y_pred, gen, history):
    """ Displaying the classification report and loss from the model results"""
    y_pred = np.round(y_pred,0) # Rounding to the nearest 0 or 1
    #Display Precision, Recall, F1 and Accuracy
    print(classification_report(y_true, y_pred, digits = 3))
    print('\n')

    #Display Model Metrics
    loss, _, _, _ = history.model.evaluate(gen)

    print(f'Loss: {np.round(loss,4)}')

```

In [35]:

```

# set up the class weights using y_train
def calc_weight(labels):
    """ Setting the weights and pairing it with the classes for the class weight
    Labels can also be thought of as y_train"""
    classes = [0,1]
    weights = compute_class_weight(class_weight='balanced', classes=classes, y=labels)
    class_weights = dict(zip(classes, weights))
    return class_weights

```

The following is the outline of each model iteration:

- Sequence
- Compile
- Summary
- Fit
- Predict
- Conf_matrix
- Eval report
- Model Evaluation

Each iteration will have slight changes for improvement. They will be described more at the General descriptions of specific iterations.

The main metrics focused on are:

- Recall, F1 Score, Loss (Primary)
- and Accuracy (Secondary)

Because the goal is to minimized False Negatives of Pneumonia (predicting no Pneumonia, while there is). The True Positives will be looked at secondary.

There are a total of 10* model iterations with a Final Model. The model iterations are trained on the training data and tested on validation data. Both the training and validation data metrics will be displayed.

The Final Model will be chosen based on the main metrics. This final model will be used with the test data.

Main Hyperparameters & Parameters

[NN Hyperparameters, Rukshan P, 2022](#)

- Model
 - layers:
 - Conv2D:
 - MaxPooling2D:
 - Dense output:
 - filters:
 - activation:
 - Relu
 - Sigmoid:
 - dropout: Regularization technique that supports overfitting. Smaller network allows parameters to update more.
- Model Compile
 - loss:
 - binary_crossentropy
 - optimizer:

- adam
- learning rate:
- Fit
 - batchsize:
 - epochs:
 - early stopping: After convergence, stopping the training process after the validation and training error diverge
 - class weights:

Baseline Modeling (1)

Description of the main model hyperparameters and data parameters:

- Model
 - layers: 3 Conv2D each w/ MaxPooling2D, 2 Dense output layers
 - filters: 32,64,96 for Conv2D, 64,1 Dense layer
 - activation: Relu for all except Sigmoid for output layer
- Model Compile
 - loss: binary_crossentropy
 - optimizer:adam
 - learning rate: .001 (Default)
 - metrics: Accuracy,Recall,Precision
- Fit
 - data: train_gen, val_gen
 - train batchsize: 64
 - epochs: 10
- Additional Comments
 - Conv2D model is best for images
 - MaxPooling 2D is a downsampling strategy CNNs

```
In [25]: # Baseline Model Stack
baseline = models.Sequential([
    Conv2D(filters=32, kernel_size=(3, 3), activation='relu',
           padding = 'same', input_shape=(224,224,3)),
    MaxPooling2D(pool_size=(2, 2), strides=2),

    Conv2D(filters=64, kernel_size=(3, 3), activation='relu',
           padding = 'same'),
    MaxPooling2D(pool_size=(2, 2), strides=2),

    Conv2D(filters=96, kernel_size=(3, 3), activation='relu',
           padding = 'same'),
    MaxPooling2D(pool_size=(2, 2), strides=2),
    Flatten(),
    Dense(units=64, activation='relu'),
    Dense(units=1, activation='sigmoid'),
])
```

```
#Compile Model
baseline.compile(loss='binary_crossentropy',
                  optimizer='adam',
                  metrics=[ "acc", "Recall", "Precision"])
```

Metal device set to: Apple M2 Max

```
2023-03-28 22:08:54.318853: I tensorflow/core/common_runtime/pluggable_device/
pluggable_device_factory.cc:305] Could not identify NUMA node of platform GPU
ID 0, defaulting to 0. Your kernel may not have been built with NUMA support.
2023-03-28 22:08:54.319104: I tensorflow/core/common_runtime/pluggable_device/
pluggable_device_factory.cc:271] Created TensorFlow device (/job:localhost/rep
lica:0/task:0/device:GPU:0 with 0 MB memory) -> physical PluggableDevice (devi
ce: 0, name: METAL, pci bus id: <undefined>)
```

The model summary provides a description of the sequential Layers, Output Shapes and Learning Parameters.

In [45]: `#Display model summary ()
baseline.summary()`

Model: "sequential"

Layer (type)	Output Shape	Param #
<hr/>		
conv2d (Conv2D)	(None, 224, 224, 32)	896
max_pooling2d (MaxPooling2D)	(None, 112, 112, 32)	0
conv2d_1 (Conv2D)	(None, 112, 112, 64)	18496
max_pooling2d_1 (MaxPooling 2D)	(None, 56, 56, 64)	0
conv2d_2 (Conv2D)	(None, 56, 56, 96)	55392
max_pooling2d_2 (MaxPooling 2D)	(None, 28, 28, 96)	0
flatten (Flatten)	(None, 75264)	0
dense (Dense)	(None, 64)	4816960
dense_1 (Dense)	(None, 1)	65
<hr/>		
Total params: 4,891,809		
Trainable params: 4,891,809		
Non-trainable params: 0		

Returning a model object that contains model evaluation metrics, and hyperparameter attributes

In [26]: `#Fiting the data
history = baseline.fit(train_gen,
 epochs=10,
 verbose = 2,
 validation_data=val_gen)`

Epoch 1/10

```
2023-03-28 22:09:14.361758: W tensorflow/core/platform/profile_utils/cpu_util
s.cc:128] Failed to get CPU frequency: 0 Hz
2023-03-28 22:09:14.673991: I tensorflow/core/grappler/optimizers/custom_graph
_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
2023-03-28 22:09:37.361368: I tensorflow/core/grappler/optimizers/custom_graph
_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
68/68 - 29s - loss: 0.3879 - acc: 0.8509 - recall: 0.9115 - precision: 0.8902
- val_loss: 0.1003 - val_acc: 0.9669 - val_recall: 0.9866 - val_precision: 0.9
693 - 29s/epoch - 421ms/step
```

Epoch 2/10

```
68/68 - 27s - loss: 0.1125 - acc: 0.9575 - recall: 0.9713 - precision: 0.9713
- val_loss: 0.0975 - val_acc: 0.9570 - val_recall: 0.9510 - val_precision: 0.9
907 - 27s/epoch - 404ms/step
```

Epoch 3/10

```
68/68 - 25s - loss: 0.1107 - acc: 0.9595 - recall: 0.9695 - precision: 0.9759
- val_loss: 0.0879 - val_acc: 0.9724 - val_recall: 0.9881 - val_precision: 0.9
751 - 25s/epoch - 366ms/step
```

Epoch 4/10

```
68/68 - 25s - loss: 0.0653 - acc: 0.9776 - recall: 0.9819 - precision: 0.9878
- val_loss: 0.0569 - val_acc: 0.9824 - val_recall: 0.9896 - val_precision: 0.9
867 - 25s/epoch - 370ms/step
```

Epoch 5/10

```
68/68 - 25s - loss: 0.0456 - acc: 0.9838 - recall: 0.9879 - precision: 0.9903
- val_loss: 0.0618 - val_acc: 0.9802 - val_recall: 0.9822 - val_precision: 0.9
910 - 25s/epoch - 365ms/step
```

Epoch 6/10

```
68/68 - 25s - loss: 0.0406 - acc: 0.9836 - recall: 0.9872 - precision: 0.9906
- val_loss: 0.0576 - val_acc: 0.9835 - val_recall: 0.9911 - val_precision: 0.9
867 - 25s/epoch - 366ms/step
```

Epoch 7/10

```
68/68 - 25s - loss: 0.0301 - acc: 0.9891 - recall: 0.9919 - precision: 0.9934
- val_loss: 0.0578 - val_acc: 0.9802 - val_recall: 0.9911 - val_precision: 0.9
823 - 25s/epoch - 369ms/step
```

Epoch 8/10

```
68/68 - 25s - loss: 0.0277 - acc: 0.9894 - recall: 0.9919 - precision: 0.9938
- val_loss: 0.0641 - val_acc: 0.9791 - val_recall: 0.9881 - val_precision: 0.9
837 - 25s/epoch - 366ms/step
```

Epoch 9/10

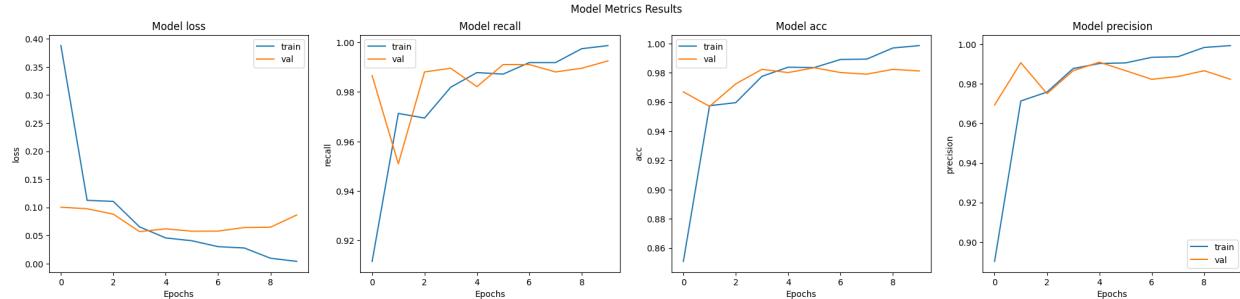
```
68/68 - 25s - loss: 0.0095 - acc: 0.9970 - recall: 0.9975 - precision: 0.9984
- val_loss: 0.0647 - val_acc: 0.9824 - val_recall: 0.9896 - val_precision: 0.9
867 - 25s/epoch - 370ms/step
```

Epoch 10/10

```
68/68 - 25s - loss: 0.0039 - acc: 0.9986 - recall: 0.9988 - precision: 0.9994
- val_loss: 0.0865 - val_acc: 0.9813 - val_recall: 0.9926 - val_precision: 0.9
824 - 25s/epoch - 370ms/step
```

Baseline Metrics

```
In [28]: #Plotting chosen Train and Validation Metrics
eval_metrics(history)
```



In [191]:

```
#Returns Train and Validation labels and predictions
train_labels, train_predictions = predict_results(baseline,train_gen)
val_labels, val_predictions = predict_results(baseline,val_gen)
```

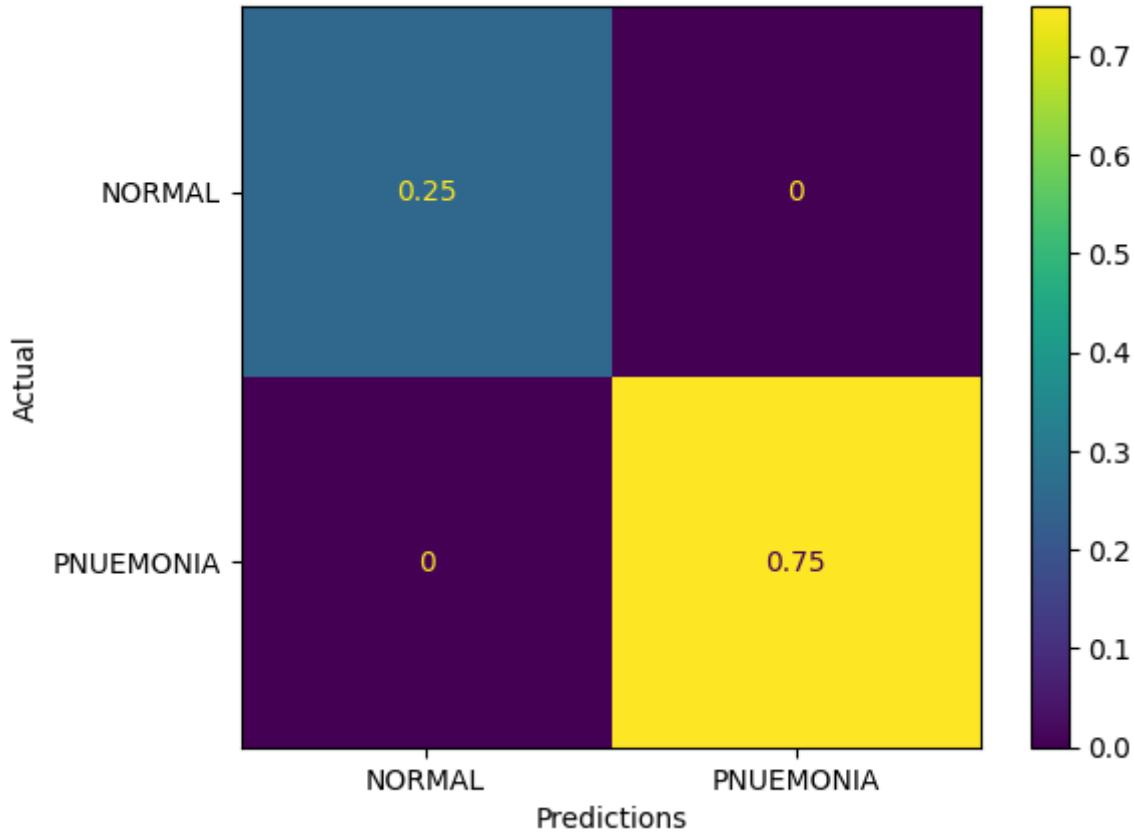
```
2/2 [=====] - 1s 675ms/step
1/1 [=====] - 0s 15ms/step
```

In [30]:

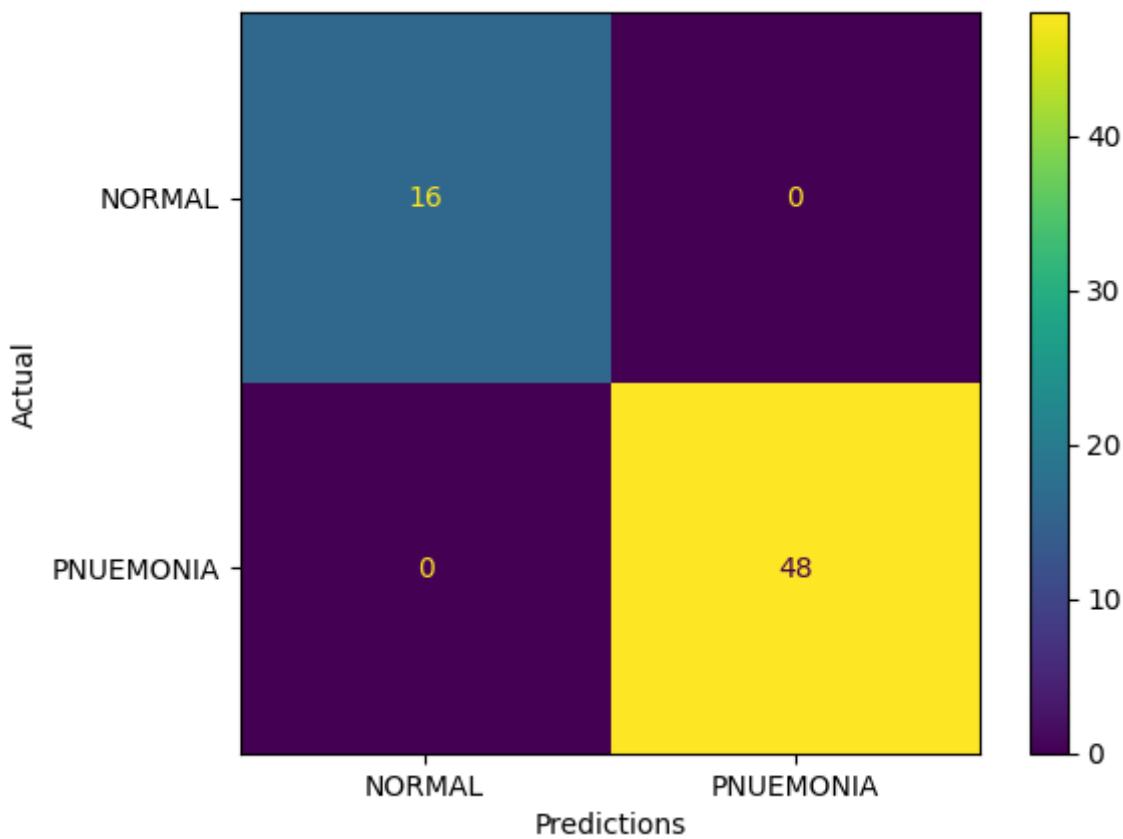
```
#Printing regular and normalized Confusion Matrices
print("Training Confusion Matrices:\n")
conf_matrix(train_labels,train_predictions, "all")
conf_matrix(train_labels,train_predictions, None)
print("Validation Confusion Matrices:\n")
conf_matrix(val_labels, val_predictions, "all")
conf_matrix(val_labels, val_predictions, None)
```

Training Confusion Matrices:

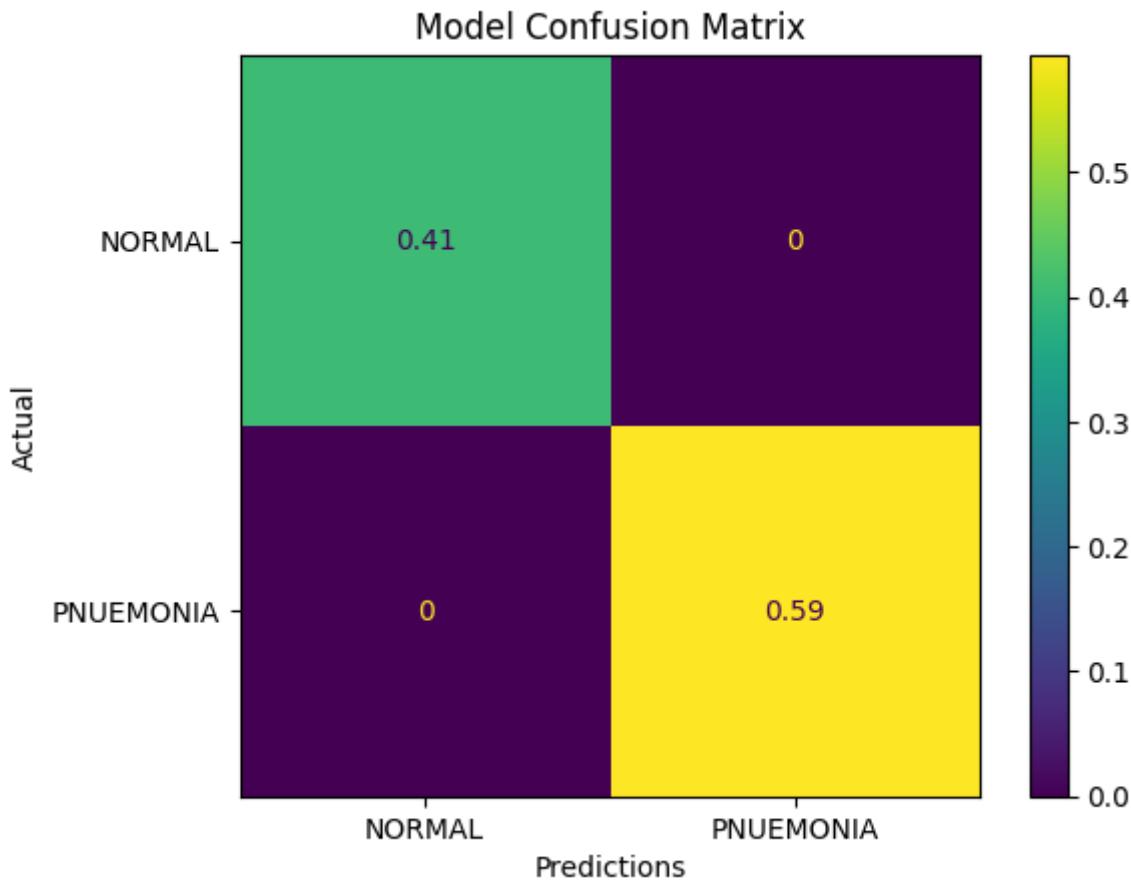
Model Confusion Matrix

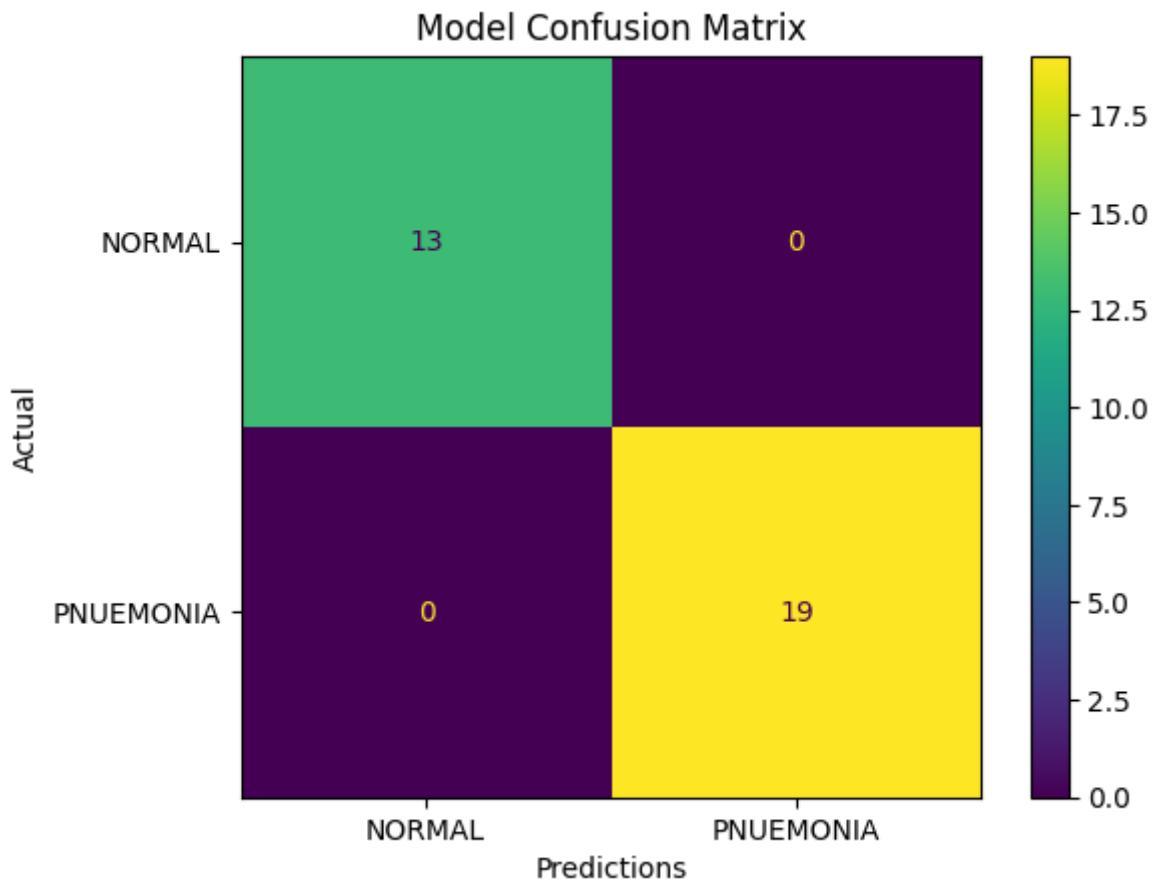


Model Confusion Matrix



Validation Confusion Matrices:





In [198]:

```
#Training Classification Report
print("Training Classificaiton Report:\n")
eval_report(train_labels,train_predictions,train_gen,history)
```

Training Classificaiton Report:

	precision	recall	f1-score	support
0.0	1.000	1.000	1.000	17
1.0	1.000	1.000	1.000	47
accuracy			1.000	64
macro avg	1.000	1.000	1.000	64
weighted avg	1.000	1.000	1.000	64

```
68/68 [=====] - 21s 311ms/step - loss: 0.0021 - acc: 0.9995 - recall: 1.0000 - precision: 0.9994
Loss: 0.0021
```

In [32]:

```
#Validation Classification Report
print("Validation Classificaiton Report:\n")
eval_report(val_labels,val_predictions,val_gen,history)
```

Validation Classification Report:

	precision	recall	f1-score	support
0.0	1.00	1.00	1.00	13
1.0	1.00	1.00	1.00	19
accuracy			1.00	32
macro avg	1.00	1.00	1.00	32
weighted avg	1.00	1.00	1.00	32

```
29/29 [=====] - 4s 149ms/step - loss: 0.0865 - acc: 0.9813 - recall: 0.9926 - precision: 0.9824
Loss: 0.0865
```

Baseline (1) Model Evaluation

- **Model Plots:** The baseline model is actually really good. There is slight variation and divergence but that may be due to the limited epochs.
 - **Confusion Matrix:** With the current batch size and imbalanced data, the model predicted everything as true, even on the training set. This led to no False Negatives, but many False Positives. This is with the validation model having 40% Normal images.
 - **Report:** The loss in the validation model is only slightly worse than the training model.
 - **The model is solid.** ThereTo help with the lingering data balance, we will work to improve that.
-

Baseline Model (2) with Class Weights

Change Description:

- Adding class weights to see if it helps with class imbalance.

Description of the model hyperparameters and data parameters:

- **Model**
 - layers: 3 Conv2D each w/ MaxPooling2D, 2 Dense output layers
 - filters: 32,64,96 for Conv2D, 64,1 Dense layer
 - activation: Relu for all except Sigmoid for output layer
- **Model Compile**
 - loss: binary_crossentropy
 - optimizer: adam
 - learning rate: .001 (Default)

- metrics: Accuracy, Recall, Precision
- Fit
 - data: train_gen, val_gen
 - train batchsize: 64
 - epochs: 10
 - Added class weights: {0: 1.6, 1: 0.7272727272727273}
- Additional Comments
 - Conv2D model is best for images
 - MaxPooling 2D is a downsampling strategy CNNs

```
In [33]: # Baseline Model Stack
baseline2 = models.Sequential([
    Conv2D(filters=32, kernel_size=(3, 3), activation='relu',
           padding = 'same', input_shape=(224,224,3)),
    MaxPooling2D(pool_size=(2, 2), strides=2),

    Conv2D(filters=64, kernel_size=(3, 3), activation='relu',
           padding = 'same'),
    MaxPooling2D(pool_size=(2, 2), strides=2),

    Conv2D(filters=96, kernel_size=(3, 3), activation='relu',
           padding = 'same'),
    MaxPooling2D(pool_size=(2, 2), strides=2),
    Flatten(),
    Dense(units=64, activation='relu'),
    Dense(units=1, activation='sigmoid'),
])

#Compile Model
baseline2.compile(loss='binary_crossentropy',
                  optimizer='adam',
                  metrics=['acc', "Recall", "Precision"])
```

Calculating class weights help to balance the dataset by weighting respectively.

```
In [36]: #Calculating class weights for imbalance
class_weights = calc_weight(y_train)
class_weights
```

```
Out[36]: {0: 1.6, 1: 0.7272727272727273}
```

```
In [37]: #Fitting the data on the baseline model with class weight
history2 = baseline2.fit(train_gen,
                         epochs=10,
                         verbose = 2,
                         class_weight=class_weights,
                         validation_data=val_gen)
```

Epoch 1/10

```
2023-03-28 22:18:01.775455: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
2023-03-28 22:18:23.311449: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
```

```
68/68 - 26s - loss: 0.3605 - acc: 0.8476 - recall: 0.8530 - precision: 0.9361  
- val_loss: 0.1322 - val_acc: 0.9526 - val_recall: 0.9495 - val_precision: 0.9  
861 - 26s/epoch - 386ms/step  
Epoch 2/10  
68/68 - 25s - loss: 0.1163 - acc: 0.9545 - recall: 0.9558 - precision: 0.9824  
- val_loss: 0.1033 - val_acc: 0.9559 - val_recall: 0.9450 - val_precision: 0.9  
953 - 25s/epoch - 369ms/step  
Epoch 3/10  
68/68 - 26s - loss: 0.0876 - acc: 0.9690 - recall: 0.9701 - precision: 0.9879  
- val_loss: 0.0550 - val_acc: 0.9779 - val_recall: 0.9881 - val_precision: 0.9  
823 - 26s/epoch - 386ms/step  
Epoch 4/10  
68/68 - 26s - loss: 0.0585 - acc: 0.9778 - recall: 0.9773 - precision: 0.9927  
- val_loss: 0.0607 - val_acc: 0.9757 - val_recall: 0.9777 - val_precision: 0.9  
895 - 26s/epoch - 380ms/step  
Epoch 5/10  
68/68 - 25s - loss: 0.0516 - acc: 0.9815 - recall: 0.9794 - precision: 0.9956  
- val_loss: 0.0787 - val_acc: 0.9735 - val_recall: 0.9688 - val_precision: 0.9  
954 - 25s/epoch - 371ms/step  
Epoch 6/10  
68/68 - 26s - loss: 0.0373 - acc: 0.9861 - recall: 0.9863 - precision: 0.9950  
- val_loss: 0.0690 - val_acc: 0.9802 - val_recall: 0.9896 - val_precision: 0.9  
838 - 26s/epoch - 385ms/step  
Epoch 7/10  
68/68 - 25s - loss: 0.0259 - acc: 0.9882 - recall: 0.9869 - precision: 0.9972  
- val_loss: 0.0626 - val_acc: 0.9824 - val_recall: 0.9911 - val_precision: 0.9  
852 - 25s/epoch - 373ms/step  
Epoch 8/10  
68/68 - 25s - loss: 0.0172 - acc: 0.9935 - recall: 0.9931 - precision: 0.9981  
- val_loss: 0.0885 - val_acc: 0.9746 - val_recall: 0.9822 - val_precision: 0.9  
836 - 25s/epoch - 370ms/step  
Epoch 9/10  
68/68 - 26s - loss: 0.0240 - acc: 0.9905 - recall: 0.9897 - precision: 0.9975  
- val_loss: 0.0676 - val_acc: 0.9779 - val_recall: 0.9851 - val_precision: 0.9  
851 - 26s/epoch - 379ms/step  
Epoch 10/10  
68/68 - 26s - loss: 0.0165 - acc: 0.9942 - recall: 0.9938 - precision: 0.9984  
- val_loss: 0.0717 - val_acc: 0.9813 - val_recall: 0.9911 - val_precision: 0.9  
838 - 26s/epoch - 376ms/step
```

In [38]: `#Baseline2 Summary
baseline2.summary()`

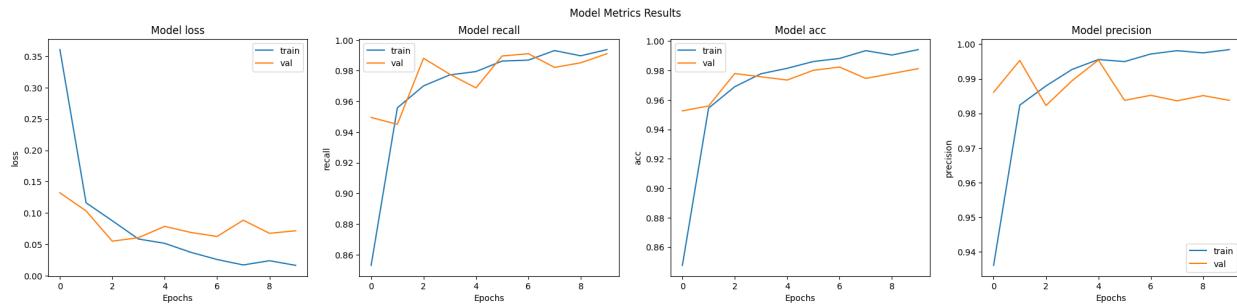
Model: "sequential_1"

Layer (type)	Output Shape	Param #
conv2d_3 (Conv2D)	(None, 224, 224, 32)	896
max_pooling2d_3 (MaxPooling 2D)	(None, 112, 112, 32)	0
conv2d_4 (Conv2D)	(None, 112, 112, 64)	18496
max_pooling2d_4 (MaxPooling 2D)	(None, 56, 56, 64)	0
conv2d_5 (Conv2D)	(None, 56, 56, 96)	55392
max_pooling2d_5 (MaxPooling 2D)	(None, 28, 28, 96)	0
flatten_1 (Flatten)	(None, 75264)	0
dense_2 (Dense)	(None, 64)	4816960
dense_3 (Dense)	(None, 1)	65

Total params: 4,891,809
Trainable params: 4,891,809
Non-trainable params: 0

```
In [39]: print("Baseline Evaluation Metrics w/ Class Weights :\n")
eval_metrics(history2)
```

Baseline Evaluation Metrics w/ Class Weights :



```
In [41]: #Returns Train and Validation labels and predictions
train_labels, train_predictions = predict_results(baseline2,train_gen)
val_labels, val_predictions = predict_results(baseline2,val_gen)
```

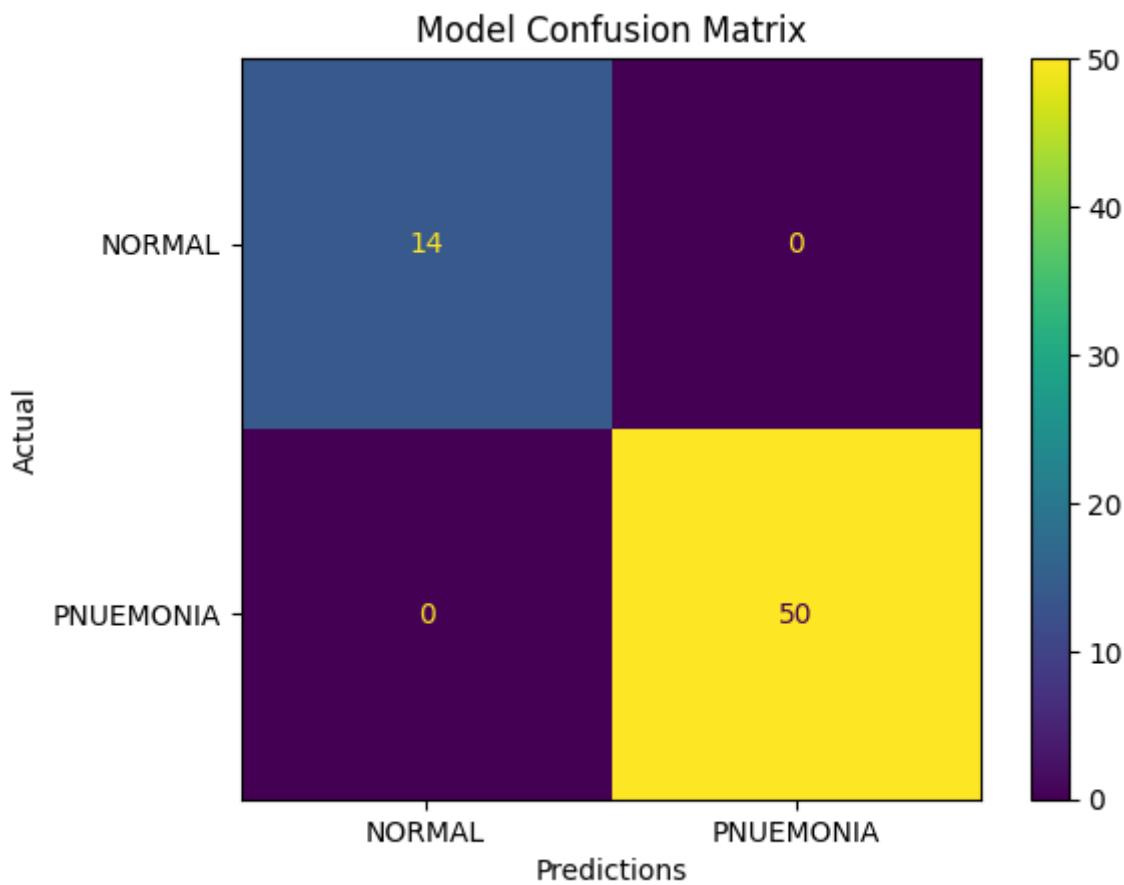
2/2 [=====] - 0s 102ms/step

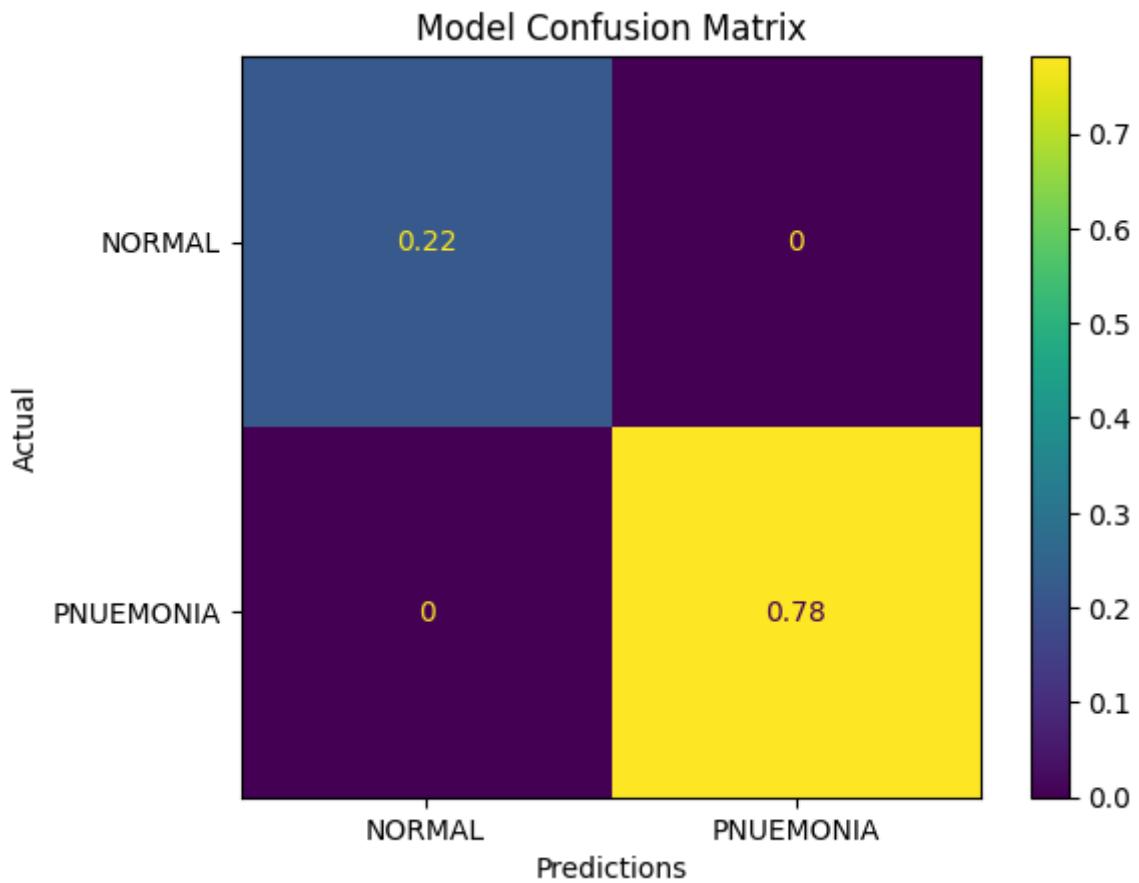
2023-03-28 22:24:48.666988: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
1/1 [=====] - 0s 18ms/step

```
In [42]: #Printing regular and normalized Confusion Matrices
print("Training Confusion Matrices:\n")
conf_matrix(train_labels,train_predictions, None)
conf_matrix(train_labels,train_predictions, "all")
print("Validation Confusion Matrices:\n")
```

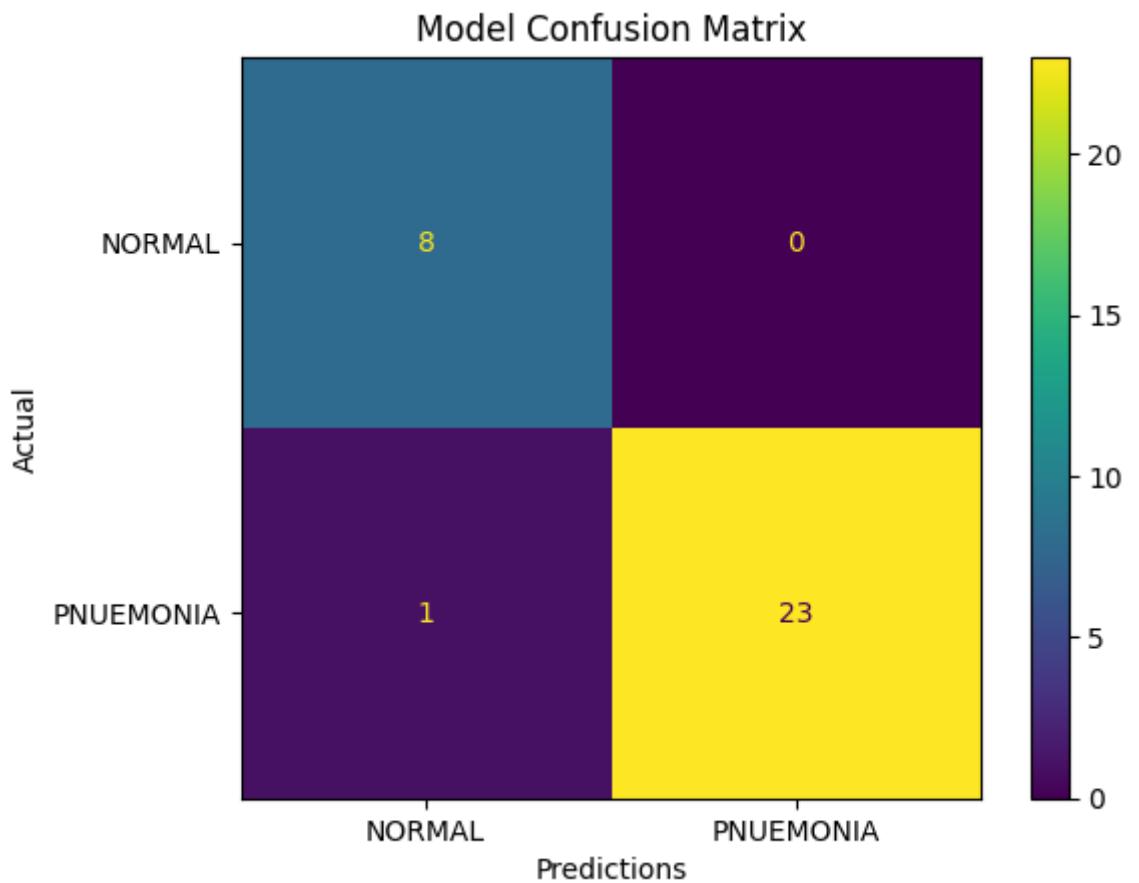
```
conf_matrix(val_labels, val_predictions, None)
conf_matrix(val_labels, val_predictions, "all")
```

Training Confusion Matrices:

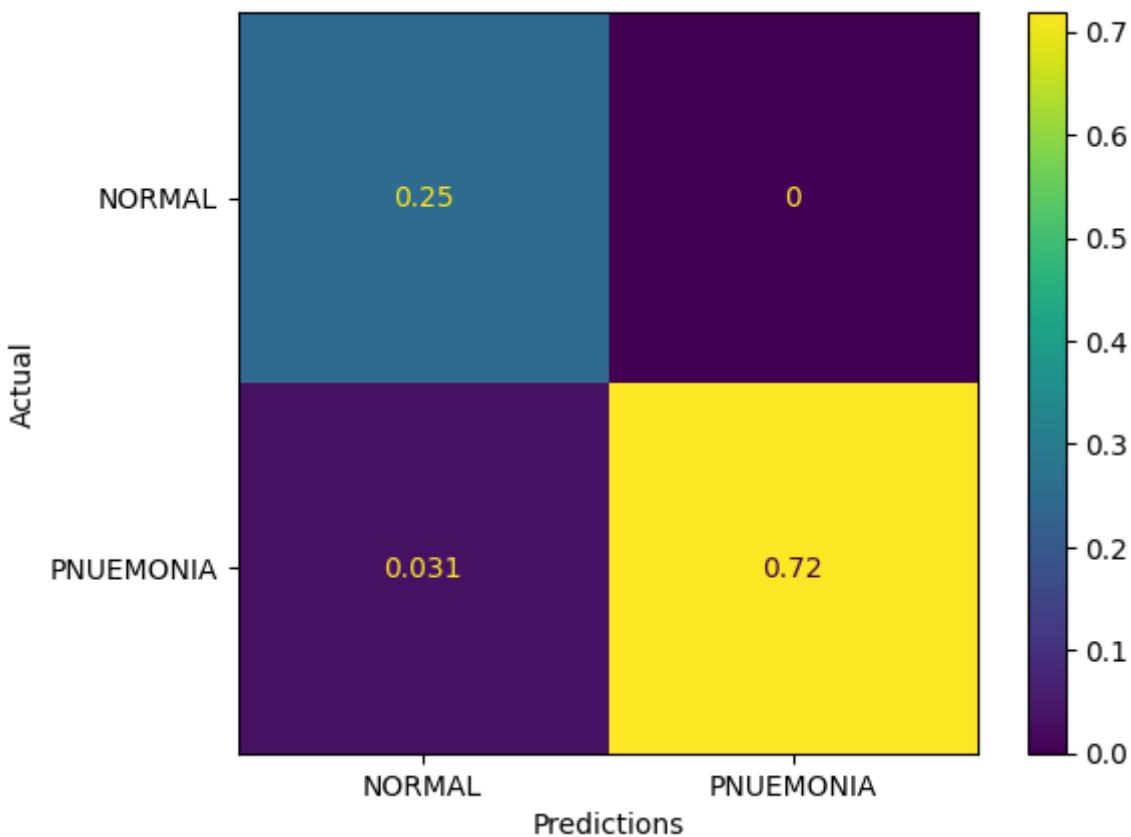




Validation Confusion Matrices:



Model Confusion Matrix



```
In [43]: #Training Classification Report
print("Training Classificaiton Report:\n")
eval_report(train_labels,train_predictions,train_gen,history2)
```

Training Classificaiton Report:

	precision	recall	f1-score	support
0.0	1.00	1.00	1.00	14
1.0	1.00	1.00	1.00	50
accuracy			1.00	64
macro avg	1.00	1.00	1.00	64
weighted avg	1.00	1.00	1.00	64

```
68/68 [=====] - 21s 303ms/step - loss: 0.0042 - acc: 0.9995 - recall: 0.9994 - precision: 1.0000
Loss: 0.0042
```

```
In [44]: #Training Classification Report
print("Validation Classificaiton Report:\n")
eval_report(val_labels,val_predictions,val_gen,history2)
```

Validation Classification Report:

	precision	recall	f1-score	support
0.0	0.89	1.00	0.94	8
1.0	1.00	0.96	0.98	24
accuracy			0.97	32
macro avg	0.94	0.98	0.96	32
weighted avg	0.97	0.97	0.97	32

```
29/29 [=====] - 4s 149ms/step - loss: 0.0717 - acc: 0.9813 - recall: 0.9911 - precision: 0.9838
Loss: 0.0717
```

Baseline (2) Model Evaluation

- **Model Plots:** Slight improvement with the class weight. The recall and accuracy do not diverge as much.
 - **Confusion Matrix:** There is one FN with the validation set and no False Positives. The validation set had 25% Normal images this time.
 - **Report:** The loss in the validation set decreased from the previous model, but slightly higher than the current training set
 - This model wasn't bad either. The loss decreased but the amount of FN increased.. The validation and training set are getting comparable results. The next models will add and tweak some hyperparameters to see if we can improve.
-

Model Iteration 3

Change Description:

- Increase Epochs, Adding EarlyStop and Dropout between Dense layers

Description of the model hyperparameters and data parameters:

- **Model**
 - layers: 3 Conv2D each w/ MaxPooling2D, 2 Dense output layers
 - filters: 32,64,96 for Conv2D, 64,1 Dense layer
 - activation: Relu for all except Sigmoid for output layer
 - dropout: .3
- **Model Compile**
 - loss: binary_crossentropy
 - optimizer:adam
 - learning rate: .001 (Default)

- metrics: Accuracy, Recall, Precision
- Fit
 - data: train_gen, val_gen
 - train batchsize: 64
 - epochs: 30
 - early stopping : True
 - class weights: {0: 1.6, 1: 0.7272727272727273}
- Additional Comments
 - Conv2D model is best for images
 - MaxPooling 2D is a downsampling strategy CNNs

```
In [52]: #Model 3 Sequential Layers
model_3= models.Sequential([
    Conv2D(filters=32, kernel_size=(3, 3), activation='relu',
           padding = 'same', input_shape=(224,224,3)),
    MaxPooling2D(pool_size=(2, 2), strides=2),

    Conv2D(filters=64, kernel_size=(3, 3), activation='relu',
           padding = 'same'),
    MaxPooling2D(pool_size=(2, 2), strides=2),

    Conv2D(filters=96, kernel_size=(3, 3), activation='relu',
           padding = 'same'),
    MaxPooling2D(pool_size=(2, 2), strides=2),
    Flatten(),
    Dense(units=64, activation='relu'),
    Dropout(0.3),
    Dense(units=1, activation='sigmoid'),
])
#Compile model
model_3.compile(loss='binary_crossentropy',
                 optimizer='adam',
                 metrics=["acc", "Recall", "Precision"])
)
```

Early stopping allows the execution of the model fitting to stop when the model has stopped improving.

```
In [50]: #Adding early stopping
es = EarlyStopping(monitor='val_loss', mode='min', verbose=1, patience=2)
```

```
In [53]: history3 = model_3.fit(train_gen,
                           epochs=30,
                           verbose = 2,
                           class_weight=class_weights,
                           validation_data=val_gen,
                           callbacks = es)
```

Epoch 1/30

```
2023-03-28 22:54:01.175345: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
2023-03-28 22:54:22.717240: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
```

```
68/68 - 27s - loss: 0.3631 - acc: 0.8400 - recall: 0.8470 - precision: 0.9312
- val_loss: 0.1341 - val_acc: 0.9515 - val_recall: 0.9941 - val_precision: 0.9
436 - 27s/epoch - 391ms/step
Epoch 2/30
68/68 - 26s - loss: 0.1335 - acc: 0.9531 - recall: 0.9558 - precision: 0.9805
- val_loss: 0.0760 - val_acc: 0.9746 - val_recall: 0.9792 - val_precision: 0.9
865 - 26s/epoch - 386ms/step
Epoch 3/30
68/68 - 26s - loss: 0.0917 - acc: 0.9660 - recall: 0.9651 - precision: 0.9888
- val_loss: 0.0737 - val_acc: 0.9735 - val_recall: 0.9733 - val_precision: 0.9
909 - 26s/epoch - 378ms/step
Epoch 4/30
68/68 - 26s - loss: 0.0827 - acc: 0.9683 - recall: 0.9688 - precision: 0.9882
- val_loss: 0.0676 - val_acc: 0.9779 - val_recall: 0.9881 - val_precision: 0.9
823 - 26s/epoch - 381ms/step
Epoch 5/30
68/68 - 26s - loss: 0.0680 - acc: 0.9750 - recall: 0.9741 - precision: 0.9921
- val_loss: 0.0579 - val_acc: 0.9791 - val_recall: 0.9866 - val_precision: 0.9
852 - 26s/epoch - 381ms/step
Epoch 6/30
68/68 - 26s - loss: 0.0556 - acc: 0.9797 - recall: 0.9791 - precision: 0.9934
- val_loss: 0.0634 - val_acc: 0.9813 - val_recall: 0.9807 - val_precision: 0.9
940 - 26s/epoch - 381ms/step
Epoch 7/30
68/68 - 26s - loss: 0.0457 - acc: 0.9813 - recall: 0.9813 - precision: 0.9934
- val_loss: 0.0626 - val_acc: 0.9802 - val_recall: 0.9866 - val_precision: 0.9
866 - 26s/epoch - 382ms/step
Epoch 7: early stopping
```

In [54]: `model_3.summary()`

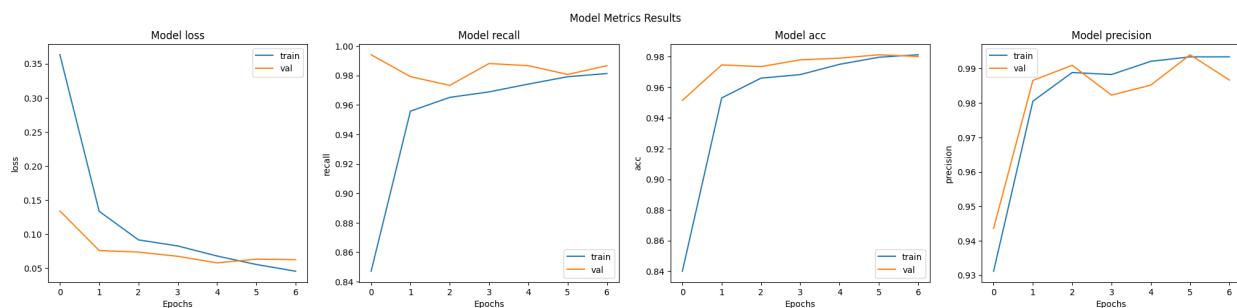
Model: "sequential_2"

Layer (type)	Output Shape	Param #
conv2d_6 (Conv2D)	(None, 224, 224, 32)	896
max_pooling2d_6 (MaxPooling 2D)	(None, 112, 112, 32)	0
conv2d_7 (Conv2D)	(None, 112, 112, 64)	18496
max_pooling2d_7 (MaxPooling 2D)	(None, 56, 56, 64)	0
conv2d_8 (Conv2D)	(None, 56, 56, 96)	55392
max_pooling2d_8 (MaxPooling 2D)	(None, 28, 28, 96)	0
flatten_2 (Flatten)	(None, 75264)	0
dense_4 (Dense)	(None, 64)	4816960
dropout (Dropout)	(None, 64)	0
dense_5 (Dense)	(None, 1)	65

Total params: 4,891,809
 Trainable params: 4,891,809
 Non-trainable params: 0

```
In [55]: print("Model 3: Dropout, EarlyStopping and 30 Epochs :\n")
eval_metrics(history3)
```

Model 3: Dropout, EarlyStopping and 30 Epochs :



```
In [56]: train_labels, train_predictions = predict_results(model_3,train_gen)
val_labels, val_predictions = predict_results(model_3,val_gen)
```

2/2 [=====] - 0s 88ms/step

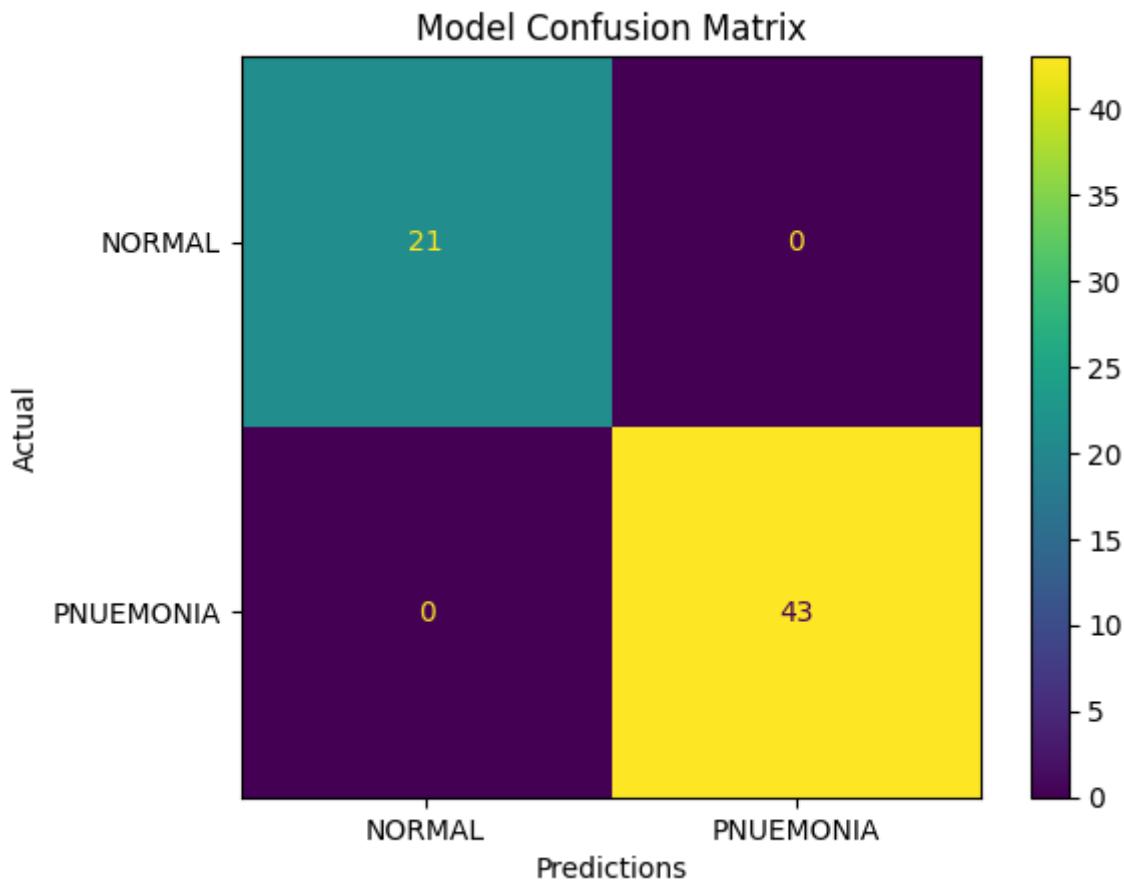
2023-03-28 23:08:19.071574: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.

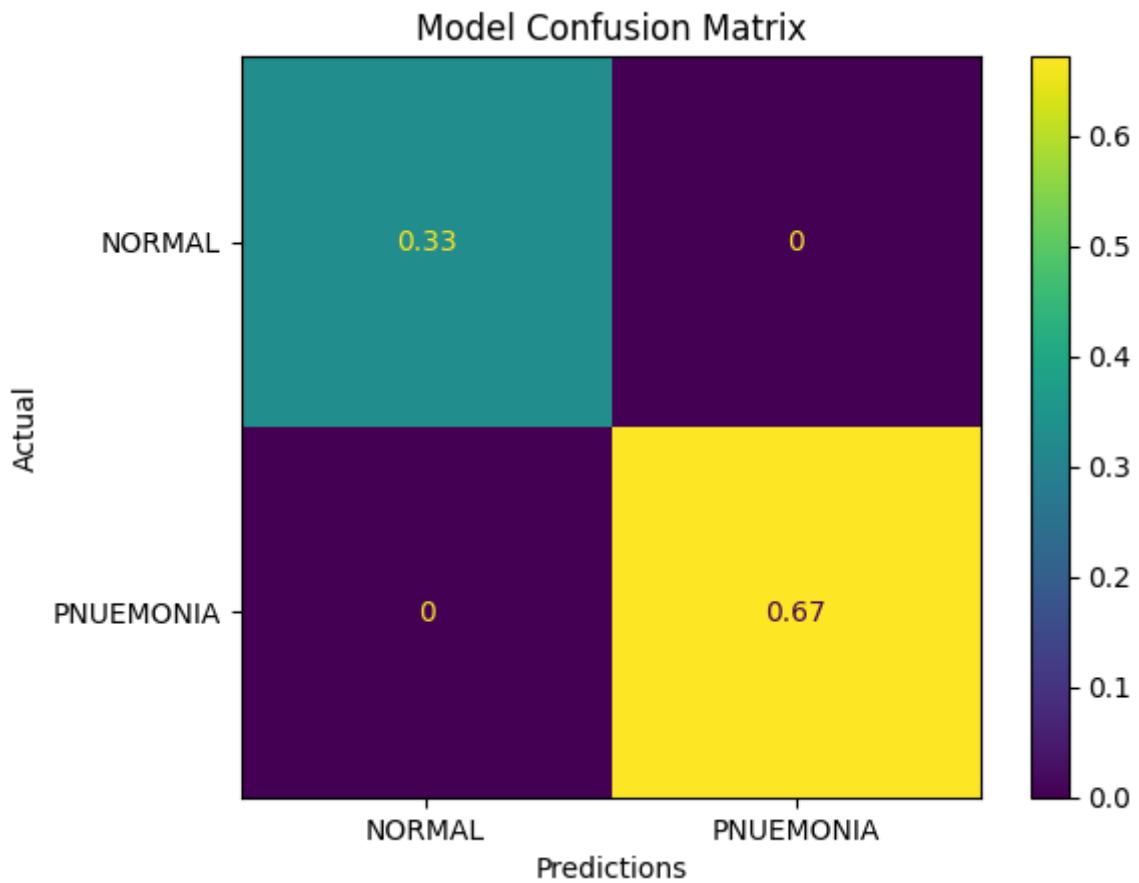
1/1 [=====] - 0s 15ms/step

```
In [57]: #Printing regular and normalized Confusion Matrices
print("Training Confusion Matrices:\n")
conf_matrix(train_labels,train_predictions, None)
conf_matrix(train_labels,train_predictions, "all")
```

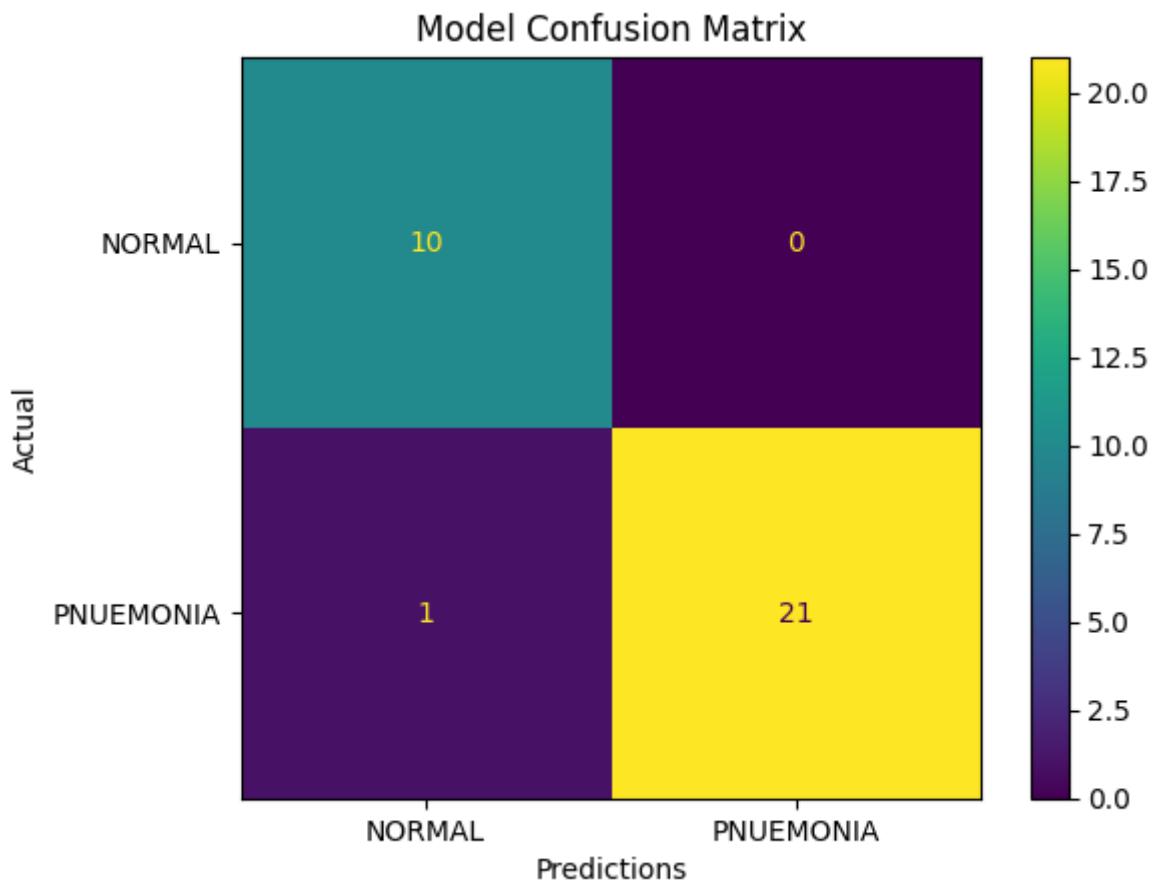
```
print("Validation Confusion Matrices:\n")
conf_matrix(val_labels, val_predictions, None)
conf_matrix(val_labels, val_predictions, "all")
```

Training Confusion Matrices:

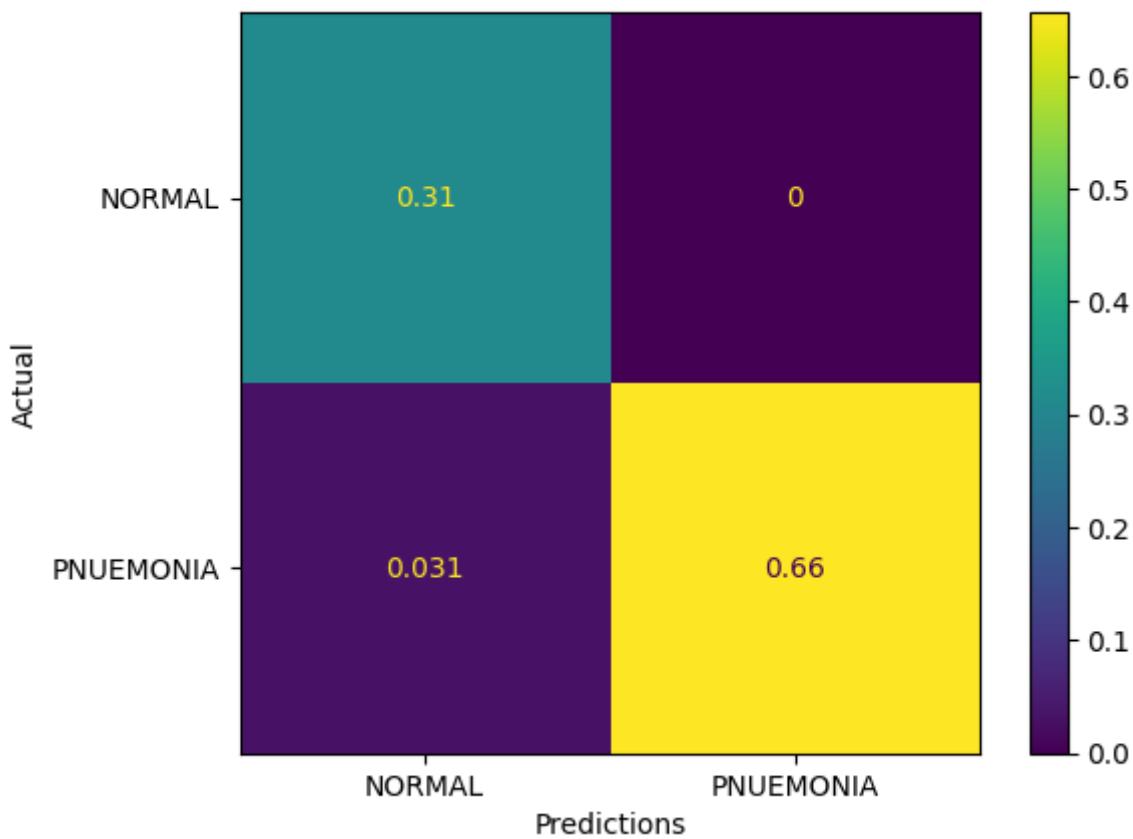




Validation Confusion Matrices:



Model Confusion Matrix



```
In [58]: #Training Classification Report
print("Training Classificaiton Report:\n")
eval_report(train_labels,train_predictions,train_gen,history3)
```

Training Classificaiton Report:

	precision	recall	f1-score	support
0.0	1.00	1.00	1.00	21
1.0	1.00	1.00	1.00	43
accuracy			1.00	64
macro avg	1.00	1.00	1.00	64
weighted avg	1.00	1.00	1.00	64

```
68/68 [=====] - 21s 304ms/step - loss: 0.0302 - acc: 0.9894 - recall: 0.9866 - precision: 0.9991
Loss: 0.0302
```

```
In [59]: #Training Classification Report
print("Validation Classificaiton Report:\n")
eval_report(val_labels,val_predictions,val_gen,history3)
```

Validation Classification Report:

	precision	recall	f1-score	support
0.0	0.91	1.00	0.95	10
1.0	1.00	0.95	0.98	22
accuracy			0.97	32
macro avg	0.95	0.98	0.96	32
weighted avg	0.97	0.97	0.97	32

```
29/29 [=====] - 4s 149ms/step - loss: 0.0626 - acc: 0.9802 - recall: 0.9866 - precision: 0.9866
Loss: 0.0626
```

Model 3 Evaluation

- **Model Plots:** The validation data seems to be fitting well.
 - **Confusion Matrix:** There is one FN.
 - **Report:** The validation loss is slightly more than the training model. The amount of Normal Validation images decreased to about 30%. This could have lead to slightly lower scores.
 - It isn't clear what to improve, optimizing this model with gridsearch will be the next step.
-

Model Iterations 4-7

These models will use Keras wrappers and GridSearchCV to optimize various hyperparameters in the models. The best parameters will be applied along to the model.

Model 4

Using gridsearch and keras wrappers to do some hyperparameter optimization

- **batch_size = [32,64,96,128]**
- **epochs = [30,45,60,90]**

Description of the model hyperparameters and data parameters:

- **Model**
 - **layers: 3 Conv2D each w/ MaxPooling2D, 2 Dense output layers**

- filters: 32,64,96 for Conv2D, 64,1 Dense layer
- activation: Relu for all except Sigmoid for output layer
- dropout: .3
- Model Compile
 - loss: binary_crossentropy
 - optimizer:adam
 - learning rate: .001 (Default)
 - metrics: Accuracy,Recall,Precision
- Fit
 - data: train_gen, val_gen
 - train batchsize: 128
 - epochs: 90
 - early stopping : True
 - class weights: {0: 1.6, 1: 0.7272727272727273}
- Additional Comments
 - Conv2D model is best for images
 - MaxPooling 2D is a downsampling strategy CNNs

In [60]: # Creating a function to supply to the Keras wrapper
def buildModel():

```
model = models.Sequential([
    Conv2D(filters=32, kernel_size=(3, 3), activation='relu',
           padding = 'same', input_shape=(224,224,3)),
    MaxPooling2D(pool_size=(2, 2), strides=2),

    Conv2D(filters=64, kernel_size=(3, 3), activation='relu',
           padding = 'same'),
    MaxPooling2D(pool_size=(2, 2), strides=2),

    Conv2D(filters=96, kernel_size=(3, 3), activation='relu',
           padding = 'same'),
    MaxPooling2D(pool_size=(2, 2), strides=2),

    Flatten(),
    Dense(units=64, activation='relu'),
    Dropout(0.3),
    Dense(units=1, activation='sigmoid'),])

model.compile(loss='binary_crossentropy',
               optimizer="adam",
               metrics=["acc", "Recall", "Precision"])
)
return model
```

Choosing hyperparameters range to optimize. Being mindful of hardware and software resources.

In [61]: #Choosing Paramers for Optimization
batch_size = [32,64,96,128]

```
epochs = [30, 45, 60, 90]
parameters = dict(batch_size=batch_size, epochs=epochs )
```

In [62]:

```
#Early Stopping
es = EarlyStopping(monitor='val_loss', mode='min', verbose=1, patience=2)
```

[GridSearchCV with CNN, Aaryn Dhore, 2020](#)

[GridSearch for Deep Learning, J. Brownlee, 2022](#)

KerasClassifier creates a classifier from the Model Sequence build model to use as an estimator. The created parameters will be used as the parameters in the Gridsearch to help optimize.

In [63]:

```
#Creating a wrapped classifier
classifier = KerasClassifier(build_fn=buildModel, class_weight = class_weights)

#Gridsearch Creating
grid_search = GridSearchCV(estimator = classifier,
                           param_grid = parameters,
                           refit = "Acc",
                           scoring = "accuracy",
                           cv = 3,return_train_score=True)

#Fitting Gridsearch
gs = grid_search.fit(X_train, y_train, verbose = 0)
```

```
2023-03-28 23:22:21.117278: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
1/1 [=====] - 0s 67ms/step
2/2 [=====] - 0s 49ms/step

2023-03-28 23:22:24.185717: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
2023-03-28 23:22:24.695543: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
1/1 [=====] - 0s 71ms/step
2/2 [=====] - 0s 48ms/step

2023-03-28 23:22:27.604357: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
2023-03-28 23:22:28.144039: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
1/1 [=====] - 0s 84ms/step
2/2 [=====] - ETA: 0s

2023-03-28 23:22:31.080631: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
2/2 [=====] - 0s 51ms/step

2023-03-28 23:22:31.638642: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
1/1 [=====] - 0s 72ms/step
2/2 [=====] - 0s 51ms/step

2023-03-28 23:22:35.912222: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
2023-03-28 23:22:36.742283: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
1/1 [=====] - 0s 64ms/step
2/2 [=====] - 0s 47ms/step
```

```
2023-03-28 23:22:41.030011: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
2023-03-28 23:22:41.553746: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
1/1 [=====] - Os 90ms/step
1/2 [=====>.....] - ETA: 0s

2023-03-28 23:22:46.042499: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
2/2 [=====] - Os 63ms/step

2023-03-28 23:22:46.624696: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
1/1 [=====] - Os 66ms/step
2/2 [=====] - Os 73ms/step

2023-03-28 23:22:51.938175: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
2023-03-28 23:22:52.470417: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
1/1 [=====] - Os 92ms/step
1/2 [=====>.....] - ETA: 0s

2023-03-28 23:22:58.026284: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
2/2 [=====] - Os 63ms/step

2023-03-28 23:22:58.886253: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
1/1 [=====] - Os 86ms/step

2023-03-28 23:23:04.533056: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
2/2 [=====] - Os 155ms/step

2023-03-28 23:23:05.305902: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
1/1 [=====] - Os 101ms/step
1/2 [=====>.....] - ETA: 0s

2023-03-28 23:23:13.092489: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
2/2 [=====] - Os 64ms/step

2023-03-28 23:23:13.690703: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
1/1 [=====] - Os 85ms/step
1/2 [=====>.....] - ETA: 0s

2023-03-28 23:23:21.945496: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
2/2 [=====] - Os 65ms/step

2023-03-28 23:23:22.545679: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
1/1 [=====] - Os 79ms/step
1/2 [=====>.....] - ETA: 0s

2023-03-28 23:23:30.740171: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
2/2 [=====] - Os 61ms/step

2023-03-28 23:23:31.589272: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
1/1 [=====] - Os 79ms/step
1/2 [=====>.....] - ETA: 0s

2023-03-28 23:23:34.314163: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
```

```
2/2 [=====] - 0s 60ms/step
2023-03-28 23:23:34.848362: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
1/1 [=====] - 0s 87ms/step
1/2 [=====>.....] - ETA: 0s

2023-03-28 23:23:37.788012: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
2/2 [=====] - 0s 63ms/step
2023-03-28 23:23:38.347591: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
1/1 [=====] - 0s 81ms/step
1/2 [=====>.....] - ETA: 0s

2023-03-28 23:23:40.962197: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
2/2 [=====] - 0s 63ms/step
2023-03-28 23:23:41.511744: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
1/1 [=====] - 0s 83ms/step
1/2 [=====>.....] - ETA: 0s

2023-03-28 23:23:45.002121: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
2/2 [=====] - 0s 70ms/step
2023-03-28 23:23:46.020205: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
1/1 [=====] - 0s 81ms/step
1/2 [=====>.....] - ETA: 0s

2023-03-28 23:23:49.622820: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
2/2 [=====] - 0s 61ms/step
2023-03-28 23:23:50.170343: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
1/1 [=====] - 0s 81ms/step
1/2 [=====>.....] - ETA: 0s

2023-03-28 23:23:53.854522: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
2/2 [=====] - 0s 63ms/step
2023-03-28 23:23:54.391458: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
1/1 [=====] - 0s 83ms/step
1/2 [=====>.....] - ETA: 0s

2023-03-28 23:23:58.989653: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
2/2 [=====] - 0s 64ms/step
2023-03-28 23:23:59.547357: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
1/1 [=====] - 0s 82ms/step
1/2 [=====>.....] - ETA: 0s

2023-03-28 23:24:04.095490: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
2/2 [=====] - 0s 62ms/step
2023-03-28 23:24:04.911569: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
1/1 [=====] - 0s 82ms/step
1/2 [=====>.....] - ETA: 0s
```

```
2023-03-28 23:24:09.668506: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.  
2/2 [=====] - 0s 62ms/step  
2023-03-28 23:24:10.215144: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.  
1/1 [=====] - 0s 83ms/step  
2023-03-28 23:24:16.460103: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.  
2/2 [=====] - 0s 153ms/step  
2023-03-28 23:24:17.204814: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.  
1/1 [=====] - 0s 76ms/step  
1/2 [=====>.....] - ETA: 0s  
2023-03-28 23:24:23.687980: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.  
2/2 [=====] - 0s 58ms/step  
2023-03-28 23:24:24.241472: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.  
1/1 [=====] - 0s 82ms/step  
1/2 [=====>.....] - ETA: 0s  
2023-03-28 23:24:30.869916: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.  
2/2 [=====] - 0s 56ms/step  
2023-03-28 23:24:31.677031: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.  
1/1 [=====] - 0s 86ms/step  
1/2 [=====>.....] - ETA: 0s  
2023-03-28 23:24:34.269920: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.  
2/2 [=====] - 0s 63ms/step  
2023-03-28 23:24:34.832803: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.  
1/1 [=====] - 0s 85ms/step  
1/2 [=====>.....] - ETA: 0s  
2023-03-28 23:24:37.700338: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.  
2/2 [=====] - 0s 65ms/step  
2023-03-28 23:24:38.278840: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.  
1/1 [=====] - 0s 84ms/step  
1/2 [=====>.....] - ETA: 0s  
2023-03-28 23:24:40.962771: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.  
2/2 [=====] - 0s 64ms/step  
2023-03-28 23:24:41.519359: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.  
1/1 [=====] - 0s 76ms/step  
1/2 [=====>.....] - ETA: 0s  
2023-03-28 23:24:45.041049: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.  
2/2 [=====] - 0s 73ms/step  
2023-03-28 23:24:45.586645: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.  
1/1 [=====] - 0s 83ms/step  
1/2 [=====>.....] - ETA: 0s
```

```
2023-03-28 23:24:49.667007: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.  
2/2 [=====] - 0s 62ms/step  
2023-03-28 23:24:50.215965: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.  
1/1 [=====] - 0s 83ms/step  
1/2 [=====>.....] - ETA: 0s  
2023-03-28 23:24:53.885787: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.  
2/2 [=====] - 0s 63ms/step  
2023-03-28 23:24:54.434894: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.  
1/1 [=====] - 0s 83ms/step  
1/2 [=====>.....] - ETA: 0s  
2023-03-28 23:24:59.174695: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.  
2/2 [=====] - 0s 59ms/step  
2023-03-28 23:24:59.722496: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.  
1/1 [=====] - 0s 75ms/step  
1/2 [=====>.....] - ETA: 0s  
2023-03-28 23:25:04.379341: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.  
2/2 [=====] - 0s 70ms/step  
2023-03-28 23:25:05.196127: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.  
1/1 [=====] - 0s 87ms/step  
1/2 [=====>.....] - ETA: 0s  
2023-03-28 23:25:10.043550: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.  
2/2 [=====] - 0s 65ms/step  
2023-03-28 23:25:10.610517: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.  
1/1 [=====] - 0s 79ms/step  
1/2 [=====>.....] - ETA: 0s  
2023-03-28 23:25:16.918543: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.  
2/2 [=====] - 0s 63ms/step  
2023-03-28 23:25:17.479704: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.  
1/1 [=====] - 0s 86ms/step  
1/2 [=====>.....] - ETA: 0s  
2023-03-28 23:25:24.189697: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.  
2/2 [=====] - 0s 61ms/step  
2023-03-28 23:25:24.757414: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.  
1/1 [=====] - 0s 76ms/step  
1/2 [=====>.....] - ETA: 0s  
2023-03-28 23:25:31.522734: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.  
2/2 [=====] - 0s 67ms/step  
2023-03-28 23:25:32.351215: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
```

```
1/1 [=====] - 0s 82ms/step
1/2 [=====>.....] - ETA: 0s
2023-03-28 23:25:34.987198: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
2/2 [=====] - 0s 62ms/step
2023-03-28 23:25:35.558233: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
1/1 [=====] - 0s 108ms/step
1/2 [=====>.....] - ETA: 0s
2023-03-28 23:25:38.371663: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
2/2 [=====] - 0s 63ms/step
2023-03-28 23:25:38.977231: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
1/1 [=====] - 0s 84ms/step
1/2 [=====>.....] - ETA: 0s
2023-03-28 23:25:41.933027: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
2/2 [=====] - 0s 61ms/step
2023-03-28 23:25:42.492972: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
1/1 [=====] - 0s 82ms/step
1/2 [=====>.....] - ETA: 0s
2023-03-28 23:25:46.070402: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
2/2 [=====] - 0s 66ms/step
2023-03-28 23:25:46.910873: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
1/1 [=====] - 0s 77ms/step
2/2 [=====] - 0s 59ms/step
2023-03-28 23:25:50.912782: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
2023-03-28 23:25:51.457267: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
1/1 [=====] - 0s 107ms/step
1/2 [=====>.....] - ETA: 0s
2023-03-28 23:25:55.110858: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
2/2 [=====] - 0s 81ms/step
2023-03-28 23:25:55.730376: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
1/1 [=====] - 0s 78ms/step
1/2 [=====>.....] - ETA: 0s
2023-03-28 23:26:00.433479: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
2/2 [=====] - 0s 61ms/step
2023-03-28 23:26:01.003175: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
1/1 [=====] - 0s 82ms/step
1/2 [=====>.....] - ETA: 0s
2023-03-28 23:26:05.777999: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
2/2 [=====] - 0s 66ms/step
2023-03-28 23:26:06.605928: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
```

```

1/1 [=====] - 0s 82ms/step
1/2 [=====>.....] - ETA: 0s
2023-03-28 23:26:11.530167: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
2/2 [=====] - 0s 63ms/step
2023-03-28 23:26:12.091947: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
1/1 [=====] - 0s 78ms/step
1/2 [=====>.....] - ETA: 0s
2023-03-28 23:26:18.457790: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
2/2 [=====] - 0s 59ms/step
2023-03-28 23:26:19.014041: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
1/1 [=====] - 0s 108ms/step
1/2 [=====>.....] - ETA: 0s
2023-03-28 23:26:25.760612: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
2/2 [=====] - 0s 82ms/step
2023-03-28 23:26:26.382581: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
1/1 [=====] - 0s 78ms/step
1/2 [=====>.....] - ETA: 0s
2023-03-28 23:26:33.139313: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
2/2 [=====] - 0s 99ms/step
2023-03-28 23:26:33.984687: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.

```

In [64]:

```
#Printing best score and parameters
print("Best: %f using %s" % (gs.best_score_, gs.best_params_))

Best: 0.749639 using {'batch_size': 128, 'epochs': 90}
```

Plotting Model 4 with best parameters

In [65]:

```
# Model 4
model_4= models.Sequential([
    Conv2D(filters=32, kernel_size=(3, 3), activation='relu',
           padding = 'same', input_shape=(224,224,3)),
    MaxPooling2D(pool_size=(2, 2), strides=2),

    Conv2D(filters=64, kernel_size=(3, 3), activation='relu',
           padding = 'same'),
    MaxPooling2D(pool_size=(2, 2), strides=2),

    Conv2D(filters=96, kernel_size=(3, 3), activation='relu',
           padding = 'same'),
    MaxPooling2D(pool_size=(2, 2), strides=2),

    Flatten(),
    Dense(units=64, activation='relu'),
    Dropout(0.3),
    Dense(units=1, activation='sigmoid'),
])

model_4.compile(loss='binary_crossentropy',
```

```
        optimizer='adam',
        metrics=[ "acc", "Recall", "Precision"]
    )
```

In [66]: #Fitting model with best parameters

```
history4 = model_4.fit(train_gen,batch_size= 128,
                       epochs=90,
                       verbose = 2,
                       class_weight=class_weights,
                       validation_data=val_gen,
                       callbacks = es) #stopping early because of time resources
```

Epoch 1/90

```
2023-03-28 23:32:11.773492: I tensorflow/core/grappler/optimizers/custom_graph
_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
2023-03-28 23:32:34.023271: I tensorflow/core/grappler/optimizers/custom_graph
_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
68/68 - 28s - loss: 0.3303 - acc: 0.8569 - recall: 0.8632 - precision: 0.9390
- val_loss: 0.1171 - val_acc: 0.9504 - val_recall: 0.9406 - val_precision: 0.9
922 - 28s/epoch - 405ms/step
```

Epoch 2/90

```
68/68 - 27s - loss: 0.1366 - acc: 0.9505 - recall: 0.9530 - precision: 0.9798
- val_loss: 0.0861 - val_acc: 0.9702 - val_recall: 0.9673 - val_precision: 0.9
924 - 27s/epoch - 391ms/step
```

Epoch 3/90

```
68/68 - 27s - loss: 0.0977 - acc: 0.9639 - recall: 0.9639 - precision: 0.9872
- val_loss: 0.0695 - val_acc: 0.9713 - val_recall: 0.9733 - val_precision: 0.9
879 - 27s/epoch - 393ms/step
```

Epoch 4/90

```
68/68 - 27s - loss: 0.0719 - acc: 0.9716 - recall: 0.9707 - precision: 0.9908
- val_loss: 0.0603 - val_acc: 0.9757 - val_recall: 0.9896 - val_precision: 0.9
780 - 27s/epoch - 403ms/step
```

Epoch 5/90

```
68/68 - 27s - loss: 0.0606 - acc: 0.9785 - recall: 0.9782 - precision: 0.9927
- val_loss: 0.0807 - val_acc: 0.9757 - val_recall: 0.9733 - val_precision: 0.9
939 - 27s/epoch - 399ms/step
```

Epoch 6/90

```
68/68 - 26s - loss: 0.0545 - acc: 0.9780 - recall: 0.9779 - precision: 0.9924
- val_loss: 0.0580 - val_acc: 0.9791 - val_recall: 0.9777 - val_precision: 0.9
940 - 26s/epoch - 380ms/step
```

Epoch 7/90

```
68/68 - 27s - loss: 0.0393 - acc: 0.9843 - recall: 0.9835 - precision: 0.9953
- val_loss: 0.0560 - val_acc: 0.9791 - val_recall: 0.9911 - val_precision: 0.9
809 - 27s/epoch - 394ms/step
```

Epoch 8/90

```
68/68 - 27s - loss: 0.0245 - acc: 0.9908 - recall: 0.9897 - precision: 0.9978
- val_loss: 0.0633 - val_acc: 0.9802 - val_recall: 0.9896 - val_precision: 0.9
838 - 27s/epoch - 392ms/step
```

Epoch 9/90

```
68/68 - 26s - loss: 0.0223 - acc: 0.9910 - recall: 0.9903 - precision: 0.9975
- val_loss: 0.0597 - val_acc: 0.9813 - val_recall: 0.9896 - val_precision: 0.9
852 - 26s/epoch - 383ms/step
```

Epoch 9: early stopping

In [67]: #Model Summary

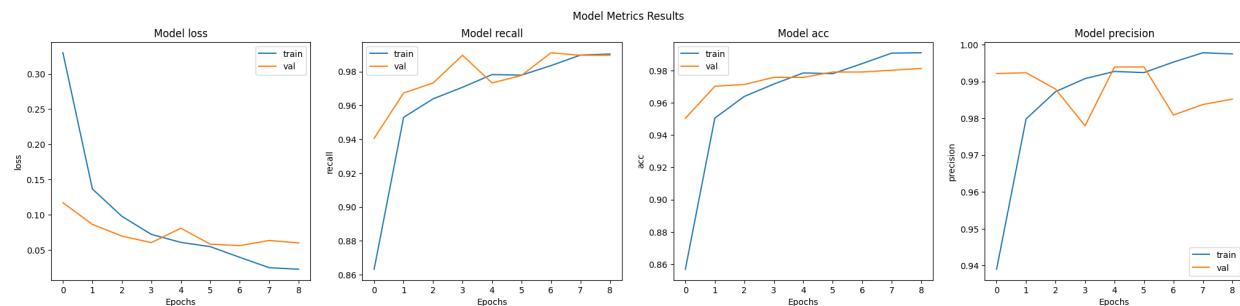
```
model_4.summary()
```

Model: "sequential_52"

Layer (type)	Output Shape	Param #
conv2d_156 (Conv2D)	(None, 224, 224, 32)	896
max_pooling2d_156 (MaxPooling2D)	(None, 112, 112, 32)	0
conv2d_157 (Conv2D)	(None, 112, 112, 64)	18496
max_pooling2d_157 (MaxPooling2D)	(None, 56, 56, 64)	0
conv2d_158 (Conv2D)	(None, 56, 56, 96)	55392
max_pooling2d_158 (MaxPooling2D)	(None, 28, 28, 96)	0
flatten_52 (Flatten)	(None, 75264)	0
dense_104 (Dense)	(None, 64)	4816960
dropout_50 (Dropout)	(None, 64)	0
dense_105 (Dense)	(None, 1)	65
<hr/>		
Total params:	4,891,809	
Trainable params:	4,891,809	
Non-trainable params:	0	

```
In [68]: print("Baseline Evaluation Metrics Best Metrics : \n")
eval_metrics(history4)
```

Baseline Evaluation Metrics Best Metrics :



```
In [69]: train_labels, train_predictions = predict_results(model_4,train_gen)
val_labels, val_predictions = predict_results(model_4,val_gen)
```

2/2 [=====] - 0s 95ms/step

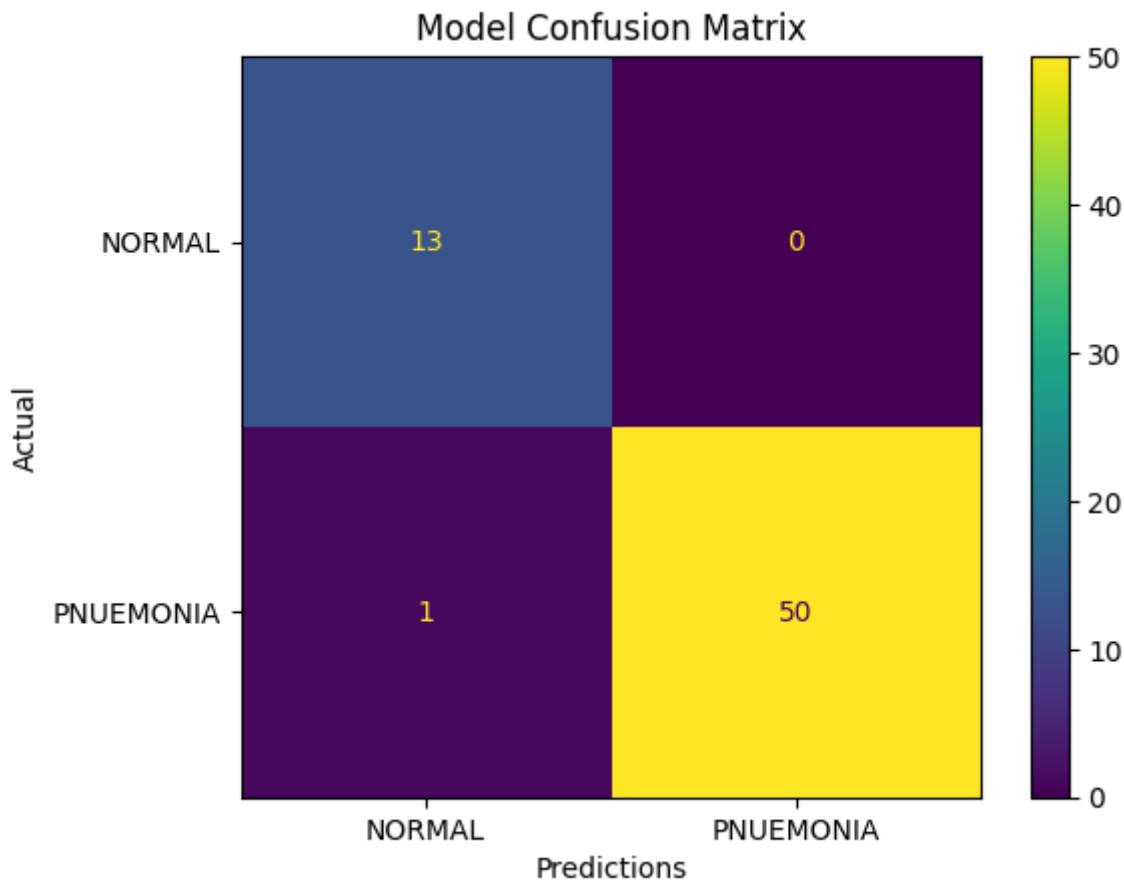
2023-03-28 23:42:16.343760: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.

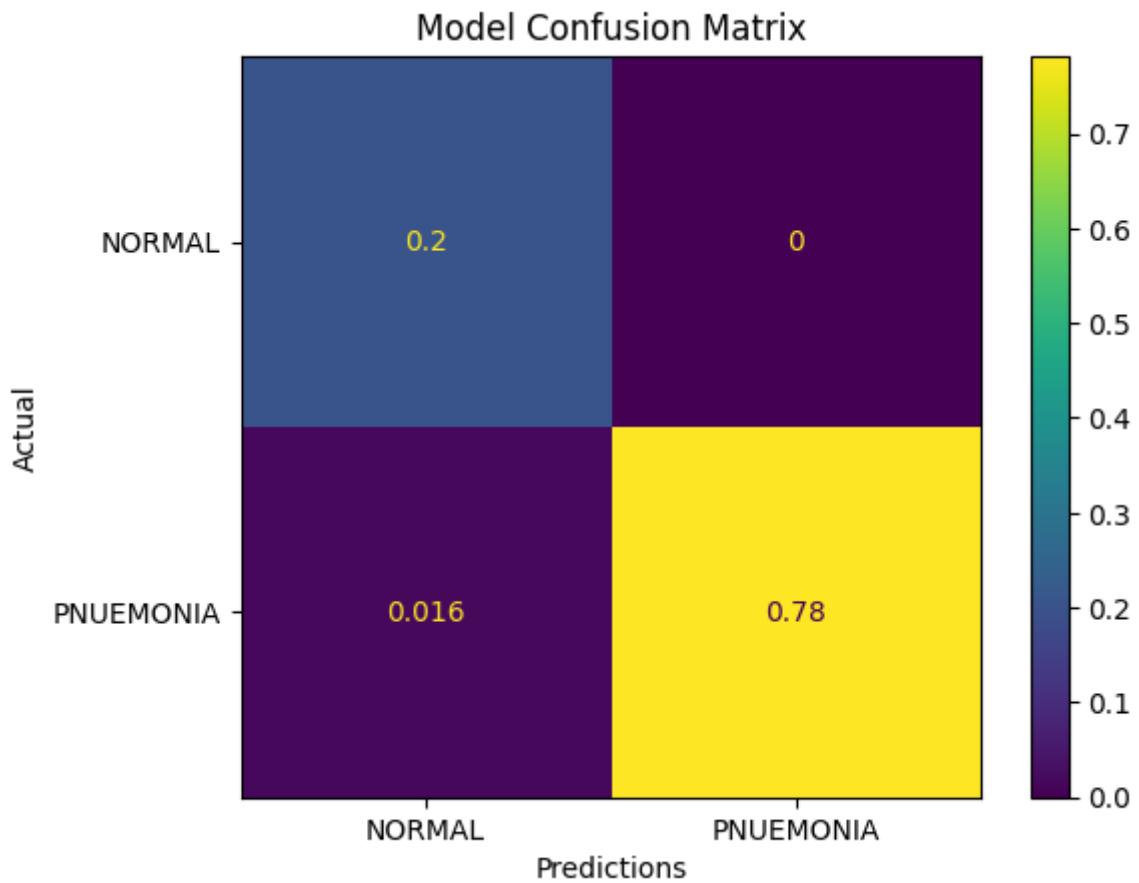
1/1 [=====] - 0s 12ms/step

```
In [70]: #Printing regular and normalized Confusion Matrices
print("Training Confusion Matrices:\n")
conf_matrix(train_labels,train_predictions, None)
conf_matrix(train_labels,train_predictions, "all")
```

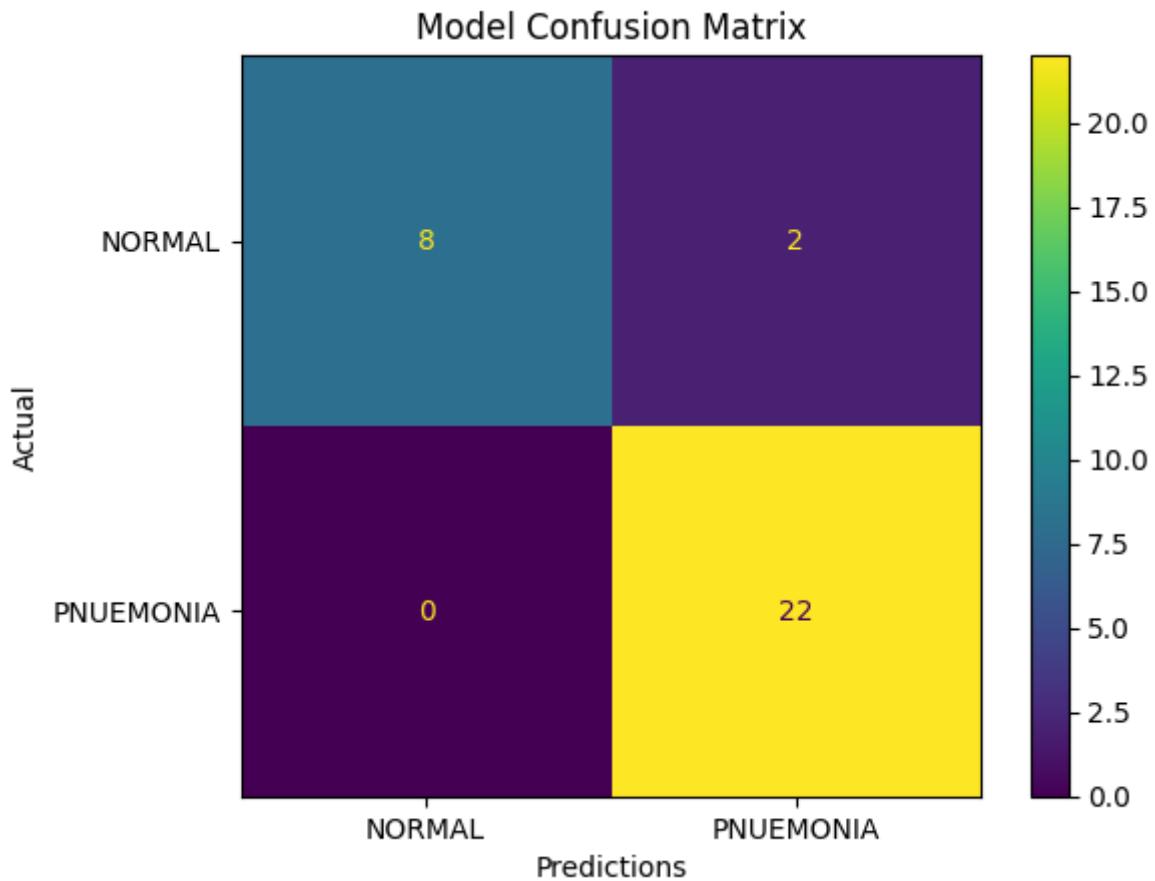
```
print("Validation Confusion Matrices:\n")
conf_matrix(val_labels, val_predictions, None)
conf_matrix(val_labels, val_predictions, "all")
```

Training Confusion Matrices:

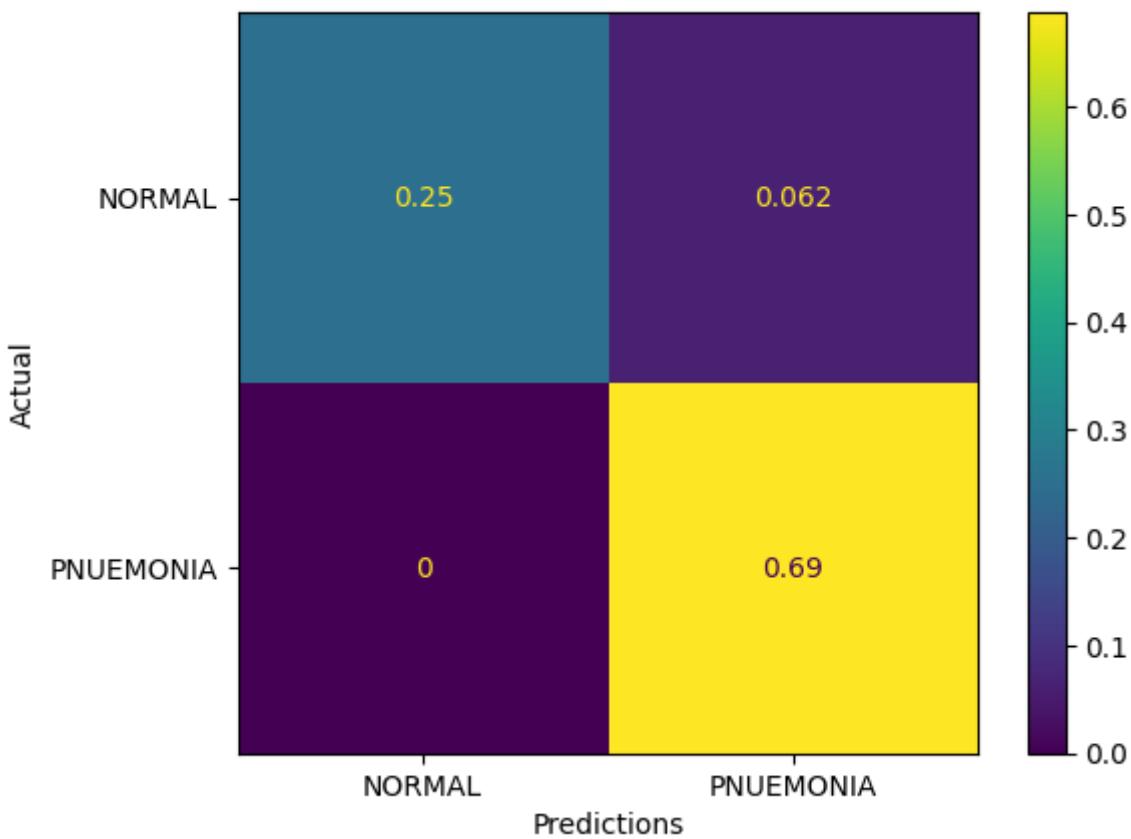




Validation Confusion Matrices:



Model Confusion Matrix



```
In [71]: #Training Classification Report
print("Training Classificaiton Report:\n")
eval_report(train_labels,train_predictions,train_gen,history4)
```

Training Classificaiton Report:

	precision	recall	f1-score	support
0.0	0.93	1.00	0.96	13
1.0	1.00	0.98	0.99	51
accuracy			0.98	64
macro avg	0.96	0.99	0.98	64
weighted avg	0.99	0.98	0.98	64

```
68/68 [=====] - 21s 302ms/step - loss: 0.0131 - acc: 0.9977 - recall: 0.9975 - precision: 0.9994
Loss: 0.0131
```

```
In [72]: #Training Classification Report
print("Validation Classificaiton Report:\n")
eval_report(val_labels,val_predictions,val_gen,history4)
```

Validation Classification Report:

	precision	recall	f1-score	support
0.0	1.00	0.80	0.89	10
1.0	0.92	1.00	0.96	22
accuracy			0.94	32
macro avg	0.96	0.90	0.92	32
weighted avg	0.94	0.94	0.94	32

```
29/29 [=====] - 5s 159ms/step - loss: 0.0597 - acc: 0.9813 - recall: 0.9896 - precision: 0.9852
Loss: 0.0597
```

Model 4 Evaluation

- **Model Plots:** The validation metrics are slightly worse than the training metrics, but not far off.
 - **Confusion Matrix:** The validation model had no FN, but 2 FP.
 - **Report:** The Validation Normal Recall scores are the lowest yet.
 - Overall the Recall and Loss are still acceptable
-

Model 5

Using gridsearch and keras wrappers to do some hyperparameter optimization

- epochs = [45,65,90]
- optimizer = ['adam', "SGD"]
- dropout_rate = [.3,.5]
- Will add Conv2D and a Dense layer for more complexity.

Description of the model hyperparameters and data parameters:

- **Model***
 - **layers: 4 Conv2D each w/ MaxPooling2D, 3 Dense output layers
 - filters: 32,64,96,128 for Conv2D, 128, 64,1 Dense layer
 - activation: Relu for all except Sigmoid for output layer
 - dropout: .5 between the dense output layers
- **Model Compile**
 - loss: binary_crossentropy
 - optimizer:adam
 - learning rate: .001 (Default)
 - metrics: Accuracy,Recall,Precision

- Fit
 - data: train_gen, val_gen
 - train batchsize: 128
 - epochs: 90
 - early stopping : True
 - class weights: {0: 1.6, 1: 0.7272727272727273}
- Additional Comments
 - Conv2D model is best for images
 - MaxPooling 2D is a downsampling strategy CNNs

```
In [74]: #Build model for classifier with parameters in signature
def buildModel(dropout_rate, optimizer = "adam"):

    model= models.Sequential([
        Conv2D(filters=32, kernel_size=(3, 3), activation='relu',
               padding = 'same', input_shape=(224,224,3)),
        MaxPooling2D(pool_size=(2, 2), strides=2),

        Conv2D(filters=64, kernel_size=(3, 3), activation='relu',
               padding = 'same'),
        MaxPooling2D(pool_size=(2, 2), strides=2),

        Conv2D(filters=96, kernel_size=(3, 3), activation='relu',
               padding = 'same'),
        MaxPooling2D(pool_size=(2, 2), strides=2),

        Conv2D(filters=128, kernel_size=(3, 3), activation='relu',
               padding = 'same'),
        MaxPooling2D(pool_size=(2, 2), strides=2),

        Flatten(),

        Dense(units=128, activation='relu'),
        Dropout(dropout_rate),
        Dense(units=64, activation='relu'),
        Dropout(dropout_rate),
        Dense(units=1, activation='sigmoid'),
    ])

    model.compile(loss='binary_crossentropy',
                  optimizer= optimizer,
                  metrics=[ "acc", "Recall", "Precision"]
                  )
    return model
```

```
In [78]: #Hyperparameters for GridsearchCV
epochs = [45,65,90]
optimizer = ['adam', "SGD"]
dropout_rate = [.3,.5]

#Creating a dictionary to use as parameters
parameters_2 = dict(optimizer=optimizer, dropout_rate=dropout_rate, epochs=epochs)
parameters_2
```

```
Out[78]: {'optimizer': ['adam', 'SGD'],
           'dropout_rate': [0.3, 0.5],
           'epochs': [45, 65, 90]}
```

```
In [79]: #Creating a wrapped classifier
classifier = KerasClassifier(build_fn=buildModel, batch_size = 128, class_weight=None)

#Gridsearch Creation
grid_search = GridSearchCV(estimator = classifier,
                           param_grid = parameters_2,
                           refit = "Acc",
                           scoring = "accuracy",
                           cv = 3, return_train_score=True)

#Gridsearch Fitting
gs_2 = grid_search.fit(X_train, y_train, verbose = 1)
```

Epoch 1/45

```
2023-03-29 00:05:24.915396: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
```

```
1/1 [=====] - 1s 1s/step - loss: 0.6529 - acc: 0.3333
- recall: 0.4062 - precision: 0.5909
Epoch 2/45
1/1 [=====] - 0s 160ms/step - loss: 0.6431 - acc: 0.7
143 - recall: 0.9375 - precision: 0.7500
Epoch 3/45
1/1 [=====] - 0s 113ms/step - loss: 0.6483 - acc: 0.7
381 - recall: 0.9688 - precision: 0.7561
Epoch 4/45
1/1 [=====] - 0s 148ms/step - loss: 0.6411 - acc: 0.7
619 - recall: 1.0000 - precision: 0.7619
Epoch 5/45
1/1 [=====] - 0s 109ms/step - loss: 0.6342 - acc: 0.7
619 - recall: 1.0000 - precision: 0.7619
Epoch 6/45
1/1 [=====] - 0s 149ms/step - loss: 0.6307 - acc: 0.7
619 - recall: 1.0000 - precision: 0.7619
Epoch 7/45
1/1 [=====] - 0s 52ms/step - loss: 0.6359 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 8/45
1/1 [=====] - 0s 115ms/step - loss: 0.6302 - acc: 0.7
619 - recall: 1.0000 - precision: 0.7619
Epoch 9/45
1/1 [=====] - 0s 99ms/step - loss: 0.6293 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 10/45
1/1 [=====] - 0s 171ms/step - loss: 0.6353 - acc: 0.7
619 - recall: 1.0000 - precision: 0.7619
Epoch 11/45
1/1 [=====] - 0s 142ms/step - loss: 0.6324 - acc: 0.7
619 - recall: 1.0000 - precision: 0.7619
Epoch 12/45
1/1 [=====] - 0s 47ms/step - loss: 0.6391 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 13/45
1/1 [=====] - 0s 48ms/step - loss: 0.6480 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 14/45
1/1 [=====] - 0s 94ms/step - loss: 0.6331 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 15/45
1/1 [=====] - 0s 63ms/step - loss: 0.6316 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 16/45
1/1 [=====] - 0s 105ms/step - loss: 0.6432 - acc: 0.7
619 - recall: 1.0000 - precision: 0.7619
Epoch 17/45
1/1 [=====] - 0s 332ms/step - loss: 0.6205 - acc: 0.7
619 - recall: 1.0000 - precision: 0.7619
Epoch 18/45
1/1 [=====] - 0s 92ms/step - loss: 0.6051 - acc: 0.73
81 - recall: 0.9688 - precision: 0.7561
Epoch 19/45
1/1 [=====] - 0s 102ms/step - loss: 0.6383 - acc: 0.7
381 - recall: 0.9688 - precision: 0.7561
Epoch 20/45
1/1 [=====] - 0s 50ms/step - loss: 0.6270 - acc: 0.73
81 - recall: 0.9688 - precision: 0.7561
Epoch 21/45
```

```
1/1 [=====] - 0s 61ms/step - loss: 0.6268 - acc: 0.73
81 - recall: 0.9688 - precision: 0.7561
Epoch 22/45
1/1 [=====] - 0s 49ms/step - loss: 0.6074 - acc: 0.78
57 - recall: 0.9688 - precision: 0.7949
Epoch 23/45
1/1 [=====] - 0s 99ms/step - loss: 0.5862 - acc: 0.76
19 - recall: 0.9375 - precision: 0.7895
Epoch 24/45
1/1 [=====] - 0s 102ms/step - loss: 0.6076 - acc: 0.7
619 - recall: 0.9375 - precision: 0.7895
Epoch 25/45
1/1 [=====] - 0s 48ms/step - loss: 0.5577 - acc: 0.76
19 - recall: 0.9062 - precision: 0.8056
Epoch 26/45
1/1 [=====] - 0s 50ms/step - loss: 0.6048 - acc: 0.78
57 - recall: 0.9062 - precision: 0.8286
Epoch 27/45
1/1 [=====] - 0s 49ms/step - loss: 0.6139 - acc: 0.71
43 - recall: 0.8750 - precision: 0.7778
Epoch 28/45
1/1 [=====] - 0s 49ms/step - loss: 0.5084 - acc: 0.71
43 - recall: 0.7812 - precision: 0.8333
Epoch 29/45
1/1 [=====] - 0s 49ms/step - loss: 0.4754 - acc: 0.78
57 - recall: 0.8125 - precision: 0.8966
Epoch 30/45
1/1 [=====] - 0s 48ms/step - loss: 0.4169 - acc: 0.83
33 - recall: 0.8750 - precision: 0.9032
Epoch 31/45
1/1 [=====] - 0s 50ms/step - loss: 0.4189 - acc: 0.73
81 - recall: 0.7188 - precision: 0.9200
Epoch 32/45
1/1 [=====] - 0s 47ms/step - loss: 0.4623 - acc: 0.76
19 - recall: 0.7188 - precision: 0.9583
Epoch 33/45
1/1 [=====] - 0s 48ms/step - loss: 0.4380 - acc: 0.80
95 - recall: 0.8125 - precision: 0.9286
Epoch 34/45
1/1 [=====] - 0s 47ms/step - loss: 0.4020 - acc: 0.85
71 - recall: 0.9062 - precision: 0.9062
Epoch 35/45
1/1 [=====] - 0s 47ms/step - loss: 0.4289 - acc: 0.80
95 - recall: 0.8750 - precision: 0.8750
Epoch 36/45
1/1 [=====] - 0s 47ms/step - loss: 0.3627 - acc: 0.85
71 - recall: 0.8125 - precision: 1.0000
Epoch 37/45
1/1 [=====] - 0s 49ms/step - loss: 0.3906 - acc: 0.71
43 - recall: 0.7188 - precision: 0.8846
Epoch 38/45
1/1 [=====] - 0s 61ms/step - loss: 0.3105 - acc: 0.80
95 - recall: 0.7500 - precision: 1.0000
Epoch 39/45
1/1 [=====] - 0s 47ms/step - loss: 0.3383 - acc: 0.76
19 - recall: 0.7500 - precision: 0.9231
Epoch 40/45
1/1 [=====] - 0s 83ms/step - loss: 0.3356 - acc: 0.76
19 - recall: 0.7500 - precision: 0.9231
Epoch 41/45
```

```
1/1 [=====] - 0s 48ms/step - loss: 0.3210 - acc: 0.83
33 - recall: 0.8125 - precision: 0.9630
Epoch 42/45
1/1 [=====] - 0s 47ms/step - loss: 0.2741 - acc: 0.85
71 - recall: 0.8438 - precision: 0.9643
Epoch 43/45
1/1 [=====] - 0s 47ms/step - loss: 0.3428 - acc: 0.83
33 - recall: 0.8125 - precision: 0.9630
Epoch 44/45
1/1 [=====] - 0s 48ms/step - loss: 0.2309 - acc: 0.90
48 - recall: 0.9062 - precision: 0.9667
Epoch 45/45
1/1 [=====] - 0s 47ms/step - loss: 0.2990 - acc: 0.85
71 - recall: 0.8750 - precision: 0.9333
1/1 [=====] - 0s 201ms/step
2023-03-29 00:05:29.536473: I tensorflow/core/grappler/optimizers/custom_graph
_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
2/2 [=====] - 0s 107ms/step
Epoch 1/45
2023-03-29 00:05:30.382326: I tensorflow/core/grappler/optimizers/custom_graph
_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
```

```
1/1 [=====] - 2s 2s/step - loss: 0.6988 - acc: 0.5581
- recall: 0.5517 - precision: 0.7273
Epoch 2/45
1/1 [=====] - 0s 184ms/step - loss: 0.6955 - acc: 0.4884
- recall: 0.4828 - precision: 0.6667
Epoch 3/45
1/1 [=====] - 0s 116ms/step - loss: 0.6932 - acc: 0.4651
- recall: 0.3103 - precision: 0.7500
Epoch 4/45
1/1 [=====] - 0s 155ms/step - loss: 0.7073 - acc: 0.4186
- recall: 0.2759 - precision: 0.6667
Epoch 5/45
1/1 [=====] - 0s 156ms/step - loss: 0.7156 - acc: 0.4651
- recall: 0.3103 - precision: 0.7500
Epoch 6/45
1/1 [=====] - 0s 99ms/step - loss: 0.6851 - acc: 0.5116
- recall: 0.4483 - precision: 0.7222
Epoch 7/45
1/1 [=====] - 0s 67ms/step - loss: 0.7120 - acc: 0.5116
- recall: 0.4828 - precision: 0.7000
Epoch 8/45
1/1 [=====] - 0s 147ms/step - loss: 0.7290 - acc: 0.4186
- recall: 0.4138 - precision: 0.6000
Epoch 9/45
1/1 [=====] - 0s 167ms/step - loss: 0.7010 - acc: 0.4884
- recall: 0.4138 - precision: 0.7059
Epoch 10/45
1/1 [=====] - 0s 95ms/step - loss: 0.6965 - acc: 0.4419
- recall: 0.2414 - precision: 0.7778
Epoch 11/45
1/1 [=====] - 0s 120ms/step - loss: 0.6885 - acc: 0.4419
- recall: 0.2069 - precision: 0.8571
Epoch 12/45
1/1 [=====] - 0s 56ms/step - loss: 0.6835 - acc: 0.4651
- recall: 0.2069 - precision: 1.0000
Epoch 13/45
1/1 [=====] - 0s 89ms/step - loss: 0.7019 - acc: 0.3488
- recall: 0.1379 - precision: 0.5714
Epoch 14/45
1/1 [=====] - 0s 64ms/step - loss: 0.6661 - acc: 0.4186
- recall: 0.2069 - precision: 0.7500
Epoch 15/45
1/1 [=====] - 0s 111ms/step - loss: 0.7103 - acc: 0.3256
- recall: 0.1724 - precision: 0.5000
Epoch 16/45
1/1 [=====] - 0s 147ms/step - loss: 0.6414 - acc: 0.5581
- recall: 0.4138 - precision: 0.8571
Epoch 17/45
1/1 [=====] - 0s 65ms/step - loss: 0.6535 - acc: 0.5814
- recall: 0.4483 - precision: 0.8667
Epoch 18/45
1/1 [=====] - 0s 103ms/step - loss: 0.6870 - acc: 0.5581
- recall: 0.4828 - precision: 0.7778
Epoch 19/45
1/1 [=====] - 0s 90ms/step - loss: 0.5779 - acc: 0.7442
- recall: 0.6897 - precision: 0.9091
Epoch 20/45
1/1 [=====] - 0s 50ms/step - loss: 0.5916 - acc: 0.7209
- recall: 0.7241 - precision: 0.8400
Epoch 21/45
```

```
1/1 [=====] - 0s 91ms/step - loss: 0.5960 - acc: 0.65
12 - recall: 0.6552 - precision: 0.7917
Epoch 22/45
1/1 [=====] - 0s 50ms/step - loss: 0.5972 - acc: 0.72
09 - recall: 0.7586 - precision: 0.8148
Epoch 23/45
1/1 [=====] - 0s 55ms/step - loss: 0.4442 - acc: 0.76
74 - recall: 0.7586 - precision: 0.8800
Epoch 24/45
1/1 [=====] - 0s 48ms/step - loss: 0.5198 - acc: 0.79
07 - recall: 0.7931 - precision: 0.8846
Epoch 25/45
1/1 [=====] - 0s 48ms/step - loss: 0.5216 - acc: 0.72
09 - recall: 0.7241 - precision: 0.8400
Epoch 26/45
1/1 [=====] - 0s 51ms/step - loss: 0.4160 - acc: 0.81
40 - recall: 0.8276 - precision: 0.8889
Epoch 27/45
1/1 [=====] - 0s 49ms/step - loss: 0.3560 - acc: 0.86
05 - recall: 0.8621 - precision: 0.9259
Epoch 28/45
1/1 [=====] - 0s 48ms/step - loss: 0.3789 - acc: 0.81
40 - recall: 0.8276 - precision: 0.8889
Epoch 29/45
1/1 [=====] - 0s 49ms/step - loss: 0.3808 - acc: 0.83
72 - recall: 0.7586 - precision: 1.0000
Epoch 30/45
1/1 [=====] - 0s 48ms/step - loss: 0.3326 - acc: 0.90
70 - recall: 0.9310 - precision: 0.9310
Epoch 31/45
1/1 [=====] - 0s 63ms/step - loss: 0.3228 - acc: 0.90
70 - recall: 0.9655 - precision: 0.9032
Epoch 32/45
1/1 [=====] - 0s 50ms/step - loss: 0.1935 - acc: 0.93
02 - recall: 0.8966 - precision: 1.0000
Epoch 33/45
1/1 [=====] - 0s 164ms/step - loss: 0.2405 - acc: 0.9
535 - recall: 0.9310 - precision: 1.0000
Epoch 34/45
1/1 [=====] - 0s 50ms/step - loss: 0.2166 - acc: 0.88
37 - recall: 0.8276 - precision: 1.0000
Epoch 35/45
1/1 [=====] - 0s 47ms/step - loss: 0.1407 - acc: 0.93
02 - recall: 0.8966 - precision: 1.0000
Epoch 36/45
1/1 [=====] - 0s 100ms/step - loss: 0.1466 - acc: 0.9
767 - recall: 0.9655 - precision: 1.0000
Epoch 37/45
1/1 [=====] - 0s 49ms/step - loss: 0.1025 - acc: 0.95
35 - recall: 0.9655 - precision: 0.9655
Epoch 38/45
1/1 [=====] - 0s 47ms/step - loss: 0.1579 - acc: 0.93
02 - recall: 0.8966 - precision: 1.0000
Epoch 39/45
1/1 [=====] - 0s 48ms/step - loss: 0.1495 - acc: 0.88
37 - recall: 0.9310 - precision: 0.9000
Epoch 40/45
1/1 [=====] - 0s 48ms/step - loss: 0.0628 - acc: 0.95
35 - recall: 0.9310 - precision: 1.0000
Epoch 41/45
```

```
1/1 [=====] - 0s 49ms/step - loss: 0.0551 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 42/45
1/1 [=====] - 0s 48ms/step - loss: 0.1044 - acc: 0.95
35 - recall: 0.9310 - precision: 1.0000
Epoch 43/45
1/1 [=====] - 0s 48ms/step - loss: 0.0642 - acc: 0.97
67 - recall: 0.9655 - precision: 1.0000
Epoch 44/45
1/1 [=====] - 0s 49ms/step - loss: 0.0442 - acc: 0.97
67 - recall: 0.9655 - precision: 1.0000
Epoch 45/45
1/1 [=====] - 0s 112ms/step - loss: 0.0676 - acc: 0.9
535 - recall: 0.9655 - precision: 0.9655
1/1 [=====] - 0s 207ms/step
2023-03-29 00:05:35.928095: I tensorflow/core/grappler/optimizers/custom_graph
_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
2/2 [=====] - 0s 128ms/step
Epoch 1/45
2023-03-29 00:05:36.820043: I tensorflow/core/grappler/optimizers/custom_graph
_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
```

```
1/1 [=====] - 1s 1s/step - loss: 0.7281 - acc: 0.4186
- recall: 0.2963 - precision: 0.5714
Epoch 2/45
1/1 [=====] - 0s 365ms/step - loss: 0.7278 - acc: 0.4
419 - recall: 0.2222 - precision: 0.6667
Epoch 3/45
1/1 [=====] - 0s 178ms/step - loss: 0.7169 - acc: 0.4
651 - recall: 0.1481 - precision: 1.0000
Epoch 4/45
1/1 [=====] - 0s 181ms/step - loss: 0.7301 - acc: 0.3
721 - recall: 0.0370 - precision: 0.5000
Epoch 5/45
1/1 [=====] - 0s 108ms/step - loss: 0.7068 - acc: 0.4
651 - recall: 0.2222 - precision: 0.7500
Epoch 6/45
1/1 [=====] - 0s 95ms/step - loss: 0.7529 - acc: 0.34
88 - recall: 0.1852 - precision: 0.4545
Epoch 7/45
1/1 [=====] - 0s 103ms/step - loss: 0.7225 - acc: 0.4
186 - recall: 0.1852 - precision: 0.6250
Epoch 8/45
1/1 [=====] - 0s 123ms/step - loss: 0.7304 - acc: 0.3
721 - recall: 0.0741 - precision: 0.5000
Epoch 9/45
1/1 [=====] - 0s 113ms/step - loss: 0.7157 - acc: 0.3
721 - recall: 0.0370 - precision: 0.5000
Epoch 10/45
1/1 [=====] - 0s 151ms/step - loss: 0.7211 - acc: 0.3
721 - recall: 0.0370 - precision: 0.5000
Epoch 11/45
1/1 [=====] - 0s 50ms/step - loss: 0.7040 - acc: 0.37
21 - recall: 0.0370 - precision: 0.5000
Epoch 12/45
1/1 [=====] - 0s 66ms/step - loss: 0.6925 - acc: 0.34
88 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 13/45
1/1 [=====] - 0s 113ms/step - loss: 0.6755 - acc: 0.3
953 - recall: 0.0370 - precision: 1.0000
Epoch 14/45
1/1 [=====] - 0s 94ms/step - loss: 0.6637 - acc: 0.34
88 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 15/45
1/1 [=====] - 0s 104ms/step - loss: 0.6568 - acc: 0.3
721 - recall: 0.0370 - precision: 0.5000
Epoch 16/45
1/1 [=====] - 0s 48ms/step - loss: 0.6183 - acc: 0.48
84 - recall: 0.2593 - precision: 0.7778
Epoch 17/45
1/1 [=====] - 0s 107ms/step - loss: 0.6469 - acc: 0.5
116 - recall: 0.3333 - precision: 0.7500
Epoch 18/45
1/1 [=====] - 0s 97ms/step - loss: 0.5642 - acc: 0.65
12 - recall: 0.5185 - precision: 0.8750
Epoch 19/45
1/1 [=====] - 0s 51ms/step - loss: 0.5258 - acc: 0.69
77 - recall: 0.5926 - precision: 0.8889
Epoch 20/45
1/1 [=====] - 0s 117ms/step - loss: 0.5593 - acc: 0.7
674 - recall: 0.7037 - precision: 0.9048
Epoch 21/45
```

```
1/1 [=====] - 0s 63ms/step - loss: 0.4689 - acc: 0.79
07 - recall: 0.7407 - precision: 0.9091
Epoch 22/45
1/1 [=====] - 0s 48ms/step - loss: 0.5225 - acc: 0.79
07 - recall: 0.7778 - precision: 0.8750
Epoch 23/45
1/1 [=====] - 0s 48ms/step - loss: 0.4594 - acc: 0.79
07 - recall: 0.7407 - precision: 0.9091
Epoch 24/45
1/1 [=====] - 0s 49ms/step - loss: 0.4113 - acc: 0.90
70 - recall: 0.9259 - precision: 0.9259
Epoch 25/45
1/1 [=====] - 0s 48ms/step - loss: 0.3417 - acc: 0.88
37 - recall: 0.8519 - precision: 0.9583
Epoch 26/45
1/1 [=====] - 0s 47ms/step - loss: 0.3326 - acc: 0.86
05 - recall: 0.8148 - precision: 0.9565
Epoch 27/45
1/1 [=====] - 0s 49ms/step - loss: 0.2490 - acc: 0.88
37 - recall: 0.8519 - precision: 0.9583
Epoch 28/45
1/1 [=====] - 0s 48ms/step - loss: 0.2613 - acc: 0.88
37 - recall: 0.8889 - precision: 0.9231
Epoch 29/45
1/1 [=====] - 0s 51ms/step - loss: 0.2177 - acc: 0.95
35 - recall: 0.9630 - precision: 0.9630
Epoch 30/45
1/1 [=====] - 0s 100ms/step - loss: 0.1790 - acc: 0.8
837 - recall: 0.8519 - precision: 0.9583
Epoch 31/45
1/1 [=====] - 0s 49ms/step - loss: 0.1728 - acc: 0.90
70 - recall: 0.9259 - precision: 0.9259
Epoch 32/45
1/1 [=====] - 0s 48ms/step - loss: 0.0756 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 33/45
1/1 [=====] - 0s 48ms/step - loss: 0.1127 - acc: 0.95
35 - recall: 0.9259 - precision: 1.0000
Epoch 34/45
1/1 [=====] - 0s 49ms/step - loss: 0.1322 - acc: 0.97
67 - recall: 1.0000 - precision: 0.9643
Epoch 35/45
1/1 [=====] - 0s 96ms/step - loss: 0.0757 - acc: 0.97
67 - recall: 0.9630 - precision: 1.0000
Epoch 36/45
1/1 [=====] - 0s 48ms/step - loss: 0.1504 - acc: 0.95
35 - recall: 0.9259 - precision: 1.0000
Epoch 37/45
1/1 [=====] - 0s 50ms/step - loss: 0.1281 - acc: 0.95
35 - recall: 0.9259 - precision: 1.0000
Epoch 38/45
1/1 [=====] - 0s 48ms/step - loss: 0.1124 - acc: 0.95
35 - recall: 1.0000 - precision: 0.9310
Epoch 39/45
1/1 [=====] - 0s 49ms/step - loss: 0.0511 - acc: 0.97
67 - recall: 0.9630 - precision: 1.0000
Epoch 40/45
1/1 [=====] - 0s 48ms/step - loss: 0.0623 - acc: 0.97
67 - recall: 0.9630 - precision: 1.0000
Epoch 41/45
```

```
1/1 [=====] - 0s 48ms/step - loss: 0.0310 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 42/45
1/1 [=====] - 0s 49ms/step - loss: 0.0261 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 43/45
1/1 [=====] - 0s 52ms/step - loss: 0.0216 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 44/45
1/1 [=====] - 0s 53ms/step - loss: 0.0379 - acc: 0.97
67 - recall: 1.0000 - precision: 0.9643
Epoch 45/45
1/1 [=====] - 0s 48ms/step - loss: 0.0060 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
1/1 [=====] - 0s 206ms/step
2023-03-29 00:05:41.555828: I tensorflow/core/grappler/optimizers/custom_graph
_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
2/2 [=====] - 0s 113ms/step
Epoch 1/45
2023-03-29 00:05:42.393191: I tensorflow/core/grappler/optimizers/custom_graph
_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
```

```
1/1 [=====] - 1s 1s/step - loss: 0.6498 - acc: 0.4524
- recall: 0.5000 - precision: 0.6957
Epoch 2/45
1/1 [=====] - 0s 158ms/step - loss: 0.6465 - acc: 0.6429
- recall: 0.7188 - precision: 0.7931
Epoch 3/45
1/1 [=====] - 0s 153ms/step - loss: 0.6454 - acc: 0.7143
- recall: 0.7812 - precision: 0.8333
Epoch 4/45
1/1 [=====] - 0s 93ms/step - loss: 0.6461 - acc: 0.6429
- recall: 0.8125 - precision: 0.7429
Epoch 5/45
1/1 [=====] - 0s 106ms/step - loss: 0.6475 - acc: 0.7143
- recall: 0.8438 - precision: 0.7941
Epoch 6/45
1/1 [=====] - 0s 172ms/step - loss: 0.6453 - acc: 0.7619
- recall: 0.9688 - precision: 0.7750
Epoch 7/45
1/1 [=====] - 0s 93ms/step - loss: 0.6448 - acc: 0.7381
- recall: 0.9375 - precision: 0.7692
Epoch 8/45
1/1 [=====] - 0s 104ms/step - loss: 0.6468 - acc: 0.7381
- recall: 0.9688 - precision: 0.7561
Epoch 9/45
1/1 [=====] - 0s 48ms/step - loss: 0.6438 - acc: 0.7381
- recall: 0.9688 - precision: 0.7561
Epoch 10/45
1/1 [=====] - 0s 150ms/step - loss: 0.6405 - acc: 0.7381
- recall: 0.9688 - precision: 0.7561
Epoch 11/45
1/1 [=====] - 0s 186ms/step - loss: 0.6462 - acc: 0.7619
- recall: 1.0000 - precision: 0.7619
Epoch 12/45
1/1 [=====] - 0s 136ms/step - loss: 0.6402 - acc: 0.7381
- recall: 0.9688 - precision: 0.7561
Epoch 13/45
1/1 [=====] - 0s 112ms/step - loss: 0.6453 - acc: 0.7619
- recall: 1.0000 - precision: 0.7619
Epoch 14/45
1/1 [=====] - 0s 96ms/step - loss: 0.6447 - acc: 0.7619
- recall: 1.0000 - precision: 0.7619
Epoch 15/45
1/1 [=====] - 0s 48ms/step - loss: 0.6406 - acc: 0.7619
- recall: 1.0000 - precision: 0.7619
Epoch 16/45
1/1 [=====] - 0s 98ms/step - loss: 0.6422 - acc: 0.7619
- recall: 1.0000 - precision: 0.7619
Epoch 17/45
1/1 [=====] - 0s 59ms/step - loss: 0.6414 - acc: 0.7619
- recall: 1.0000 - precision: 0.7619
Epoch 18/45
1/1 [=====] - 0s 60ms/step - loss: 0.6412 - acc: 0.7619
- recall: 1.0000 - precision: 0.7619
Epoch 19/45
1/1 [=====] - 0s 136ms/step - loss: 0.6412 - acc: 0.7619
- recall: 1.0000 - precision: 0.7619
Epoch 20/45
1/1 [=====] - 0s 46ms/step - loss: 0.6397 - acc: 0.7619
- recall: 1.0000 - precision: 0.7619
Epoch 21/45
```

```
1/1 [=====] - 0s 46ms/step - loss: 0.6397 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 22/45
1/1 [=====] - 0s 48ms/step - loss: 0.6419 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 23/45
1/1 [=====] - 0s 47ms/step - loss: 0.6449 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 24/45
1/1 [=====] - 0s 47ms/step - loss: 0.6355 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 25/45
1/1 [=====] - 0s 46ms/step - loss: 0.6416 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 26/45
1/1 [=====] - 0s 47ms/step - loss: 0.6417 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 27/45
1/1 [=====] - 0s 96ms/step - loss: 0.6395 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 28/45
1/1 [=====] - 0s 47ms/step - loss: 0.6433 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 29/45
1/1 [=====] - 0s 46ms/step - loss: 0.6320 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 30/45
1/1 [=====] - 0s 90ms/step - loss: 0.6352 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 31/45
1/1 [=====] - 0s 46ms/step - loss: 0.6425 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 32/45
1/1 [=====] - 0s 46ms/step - loss: 0.6315 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 33/45
1/1 [=====] - 0s 46ms/step - loss: 0.6401 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 34/45
1/1 [=====] - 0s 46ms/step - loss: 0.6344 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 35/45
1/1 [=====] - 0s 46ms/step - loss: 0.6333 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 36/45
1/1 [=====] - 0s 46ms/step - loss: 0.6331 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 37/45
1/1 [=====] - 0s 48ms/step - loss: 0.6340 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 38/45
1/1 [=====] - 0s 45ms/step - loss: 0.6395 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 39/45
1/1 [=====] - 0s 47ms/step - loss: 0.6342 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 40/45
1/1 [=====] - 0s 69ms/step - loss: 0.6339 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 41/45
```

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1/1 [=====] - 0s 47ms/step - loss: 0.6368 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 42/45
1/1 [=====] - 0s 45ms/step - loss: 0.6380 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 43/45
1/1 [=====] - 0s 45ms/step - loss: 0.6349 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 44/45
1/1 [=====] - 0s 46ms/step - loss: 0.6356 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 45/45
1/1 [=====] - 0s 45ms/step - loss: 0.6342 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
1/1 [=====] - 0s 213ms/step
2023-03-29 00:05:46.955852: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
2/2 [=====] - 0s 118ms/step
Epoch 1/45
2023-03-29 00:05:48.370013: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
```

```
1/1 [=====] - 2s 2s/step - loss: 0.7050 - acc: 0.3953
- recall: 0.4828 - precision: 0.5600
Epoch 2/45
1/1 [=====] - 0s 105ms/step - loss: 0.7020 - acc: 0.5
349 - recall: 0.5172 - precision: 0.7143
Epoch 3/45
1/1 [=====] - 0s 165ms/step - loss: 0.7008 - acc: 0.4
884 - recall: 0.4828 - precision: 0.6667
Epoch 4/45
1/1 [=====] - 0s 115ms/step - loss: 0.6998 - acc: 0.4
651 - recall: 0.4828 - precision: 0.6364
Epoch 5/45
1/1 [=====] - 0s 115ms/step - loss: 0.7015 - acc: 0.4
186 - recall: 0.3793 - precision: 0.6111
Epoch 6/45
1/1 [=====] - 0s 226ms/step - loss: 0.6999 - acc: 0.5
349 - recall: 0.4828 - precision: 0.7368
Epoch 7/45
1/1 [=====] - 0s 110ms/step - loss: 0.6984 - acc: 0.5
116 - recall: 0.4483 - precision: 0.7222
Epoch 8/45
1/1 [=====] - 0s 89ms/step - loss: 0.7007 - acc: 0.37
21 - recall: 0.3103 - precision: 0.5625
Epoch 9/45
1/1 [=====] - 0s 164ms/step - loss: 0.6997 - acc: 0.5
349 - recall: 0.4828 - precision: 0.7368
Epoch 10/45
1/1 [=====] - 0s 114ms/step - loss: 0.6998 - acc: 0.4
651 - recall: 0.4138 - precision: 0.6667
Epoch 11/45
1/1 [=====] - 0s 47ms/step - loss: 0.7005 - acc: 0.53
49 - recall: 0.4828 - precision: 0.7368
Epoch 12/45
1/1 [=====] - 0s 48ms/step - loss: 0.6992 - acc: 0.51
16 - recall: 0.4483 - precision: 0.7222
Epoch 13/45
1/1 [=====] - 0s 113ms/step - loss: 0.7030 - acc: 0.4
651 - recall: 0.4138 - precision: 0.6667
Epoch 14/45
1/1 [=====] - 0s 97ms/step - loss: 0.7006 - acc: 0.46
51 - recall: 0.4138 - precision: 0.6667
Epoch 15/45
1/1 [=====] - 0s 48ms/step - loss: 0.7003 - acc: 0.44
19 - recall: 0.3793 - precision: 0.6471
Epoch 16/45
1/1 [=====] - 0s 63ms/step - loss: 0.6980 - acc: 0.58
14 - recall: 0.5172 - precision: 0.7895
Epoch 17/45
1/1 [=====] - 0s 102ms/step - loss: 0.7016 - acc: 0.3
953 - recall: 0.3103 - precision: 0.6000
Epoch 18/45
1/1 [=====] - 0s 49ms/step - loss: 0.6987 - acc: 0.48
84 - recall: 0.3448 - precision: 0.7692
Epoch 19/45
1/1 [=====] - 0s 51ms/step - loss: 0.7000 - acc: 0.48
84 - recall: 0.3793 - precision: 0.7333
Epoch 20/45
1/1 [=====] - 0s 48ms/step - loss: 0.6998 - acc: 0.48
84 - recall: 0.3793 - precision: 0.7333
Epoch 21/45
```

```
1/1 [=====] - 0s 92ms/step - loss: 0.6970 - acc: 0.48  
84 - recall: 0.3793 - precision: 0.7333  
Epoch 22/45  
1/1 [=====] - 0s 47ms/step - loss: 0.7006 - acc: 0.44  
19 - recall: 0.3103 - precision: 0.6923  
Epoch 23/45  
1/1 [=====] - 0s 111ms/step - loss: 0.7016 - acc: 0.4  
651 - recall: 0.3448 - precision: 0.7143  
Epoch 24/45  
1/1 [=====] - 0s 85ms/step - loss: 0.6979 - acc: 0.48  
84 - recall: 0.4138 - precision: 0.7059  
Epoch 25/45  
1/1 [=====] - 0s 96ms/step - loss: 0.6999 - acc: 0.51  
16 - recall: 0.3793 - precision: 0.7857  
Epoch 26/45  
1/1 [=====] - 0s 46ms/step - loss: 0.6980 - acc: 0.53  
49 - recall: 0.4138 - precision: 0.8000  
Epoch 27/45  
1/1 [=====] - 0s 93ms/step - loss: 0.6975 - acc: 0.53  
49 - recall: 0.3793 - precision: 0.8462  
Epoch 28/45  
1/1 [=====] - 0s 47ms/step - loss: 0.6982 - acc: 0.48  
84 - recall: 0.3103 - precision: 0.8182  
Epoch 29/45  
1/1 [=====] - 0s 49ms/step - loss: 0.7026 - acc: 0.32  
56 - recall: 0.2069 - precision: 0.5000  
Epoch 30/45  
1/1 [=====] - 0s 46ms/step - loss: 0.6987 - acc: 0.41  
86 - recall: 0.3103 - precision: 0.6429  
Epoch 31/45  
1/1 [=====] - 0s 46ms/step - loss: 0.6976 - acc: 0.51  
16 - recall: 0.3448 - precision: 0.8333  
Epoch 32/45  
1/1 [=====] - 0s 47ms/step - loss: 0.6986 - acc: 0.51  
16 - recall: 0.3448 - precision: 0.8333  
Epoch 33/45  
1/1 [=====] - 0s 47ms/step - loss: 0.7001 - acc: 0.39  
53 - recall: 0.2759 - precision: 0.6154  
Epoch 34/45  
1/1 [=====] - 0s 48ms/step - loss: 0.6995 - acc: 0.46  
51 - recall: 0.3103 - precision: 0.7500  
Epoch 35/45  
1/1 [=====] - 0s 46ms/step - loss: 0.6991 - acc: 0.46  
51 - recall: 0.3103 - precision: 0.7500  
Epoch 36/45  
1/1 [=====] - 0s 49ms/step - loss: 0.6990 - acc: 0.44  
19 - recall: 0.2759 - precision: 0.7273  
Epoch 37/45  
1/1 [=====] - 0s 62ms/step - loss: 0.6987 - acc: 0.46  
51 - recall: 0.3448 - precision: 0.7143  
Epoch 38/45  
1/1 [=====] - 0s 47ms/step - loss: 0.7002 - acc: 0.44  
19 - recall: 0.3103 - precision: 0.6923  
Epoch 39/45  
1/1 [=====] - 0s 48ms/step - loss: 0.7005 - acc: 0.44  
19 - recall: 0.2759 - precision: 0.7273  
Epoch 40/45  
1/1 [=====] - 0s 47ms/step - loss: 0.6989 - acc: 0.46  
51 - recall: 0.2759 - precision: 0.8000  
Epoch 41/45
```

```
1/1 [=====] - 0s 48ms/step - loss: 0.6986 - acc: 0.44
19 - recall: 0.2414 - precision: 0.7778
Epoch 42/45
1/1 [=====] - 0s 47ms/step - loss: 0.6993 - acc: 0.44
19 - recall: 0.2759 - precision: 0.7273
Epoch 43/45
1/1 [=====] - 0s 47ms/step - loss: 0.6943 - acc: 0.51
16 - recall: 0.2759 - precision: 1.0000
Epoch 44/45
1/1 [=====] - 0s 47ms/step - loss: 0.6989 - acc: 0.41
86 - recall: 0.2069 - precision: 0.7500
Epoch 45/45
1/1 [=====] - 0s 47ms/step - loss: 0.6968 - acc: 0.44
19 - recall: 0.2414 - precision: 0.7778
1/1 [=====] - 0s 200ms/step
2023-03-29 00:05:52.902748: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
2/2 [=====] - 0s 214ms/step
Epoch 1/45
2023-03-29 00:05:53.817937: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
```

```
1/1 [=====] - 1s 1s/step - loss: 0.7273 - acc: 0.5581
- recall: 0.5926 - precision: 0.6667
Epoch 2/45
1/1 [=====] - 0s 163ms/step - loss: 0.7336 - acc: 0.3
023 - recall: 0.3333 - precision: 0.4286
Epoch 3/45
1/1 [=====] - 0s 106ms/step - loss: 0.7294 - acc: 0.3
953 - recall: 0.3333 - precision: 0.5294
Epoch 4/45
1/1 [=====] - 0s 155ms/step - loss: 0.7268 - acc: 0.5
116 - recall: 0.4074 - precision: 0.6875
Epoch 5/45
1/1 [=====] - 0s 66ms/step - loss: 0.7297 - acc: 0.4
61 - recall: 0.3333 - precision: 0.6429
Epoch 6/45
1/1 [=====] - 0s 99ms/step - loss: 0.7270 - acc: 0.3
53 - recall: 0.1852 - precision: 0.5556
Epoch 7/45
1/1 [=====] - 0s 116ms/step - loss: 0.7262 - acc: 0.4
419 - recall: 0.1852 - precision: 0.7143
Epoch 8/45
1/1 [=====] - 0s 97ms/step - loss: 0.7253 - acc: 0.4
84 - recall: 0.2222 - precision: 0.8571
Epoch 9/45
1/1 [=====] - 0s 167ms/step - loss: 0.7294 - acc: 0.3
488 - recall: 0.1111 - precision: 0.4286
Epoch 10/45
1/1 [=====] - 0s 181ms/step - loss: 0.7237 - acc: 0.4
186 - recall: 0.1481 - precision: 0.6667
Epoch 11/45
1/1 [=====] - 0s 66ms/step - loss: 0.7292 - acc: 0.4
1 - recall: 0.1111 - precision: 0.7500
Epoch 12/45
1/1 [=====] - 0s 122ms/step - loss: 0.7234 - acc: 0.4
419 - recall: 0.1111 - precision: 1.0000
Epoch 13/45
1/1 [=====] - 0s 90ms/step - loss: 0.7281 - acc: 0.3
0 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 14/45
1/1 [=====] - 0s 48ms/step - loss: 0.7269 - acc: 0.3
9 - recall: 0.0741 - precision: 0.6667
Epoch 15/45
1/1 [=====] - 0s 51ms/step - loss: 0.7255 - acc: 0.4
19 - recall: 0.1111 - precision: 1.0000
Epoch 16/45
1/1 [=====] - 0s 97ms/step - loss: 0.7254 - acc: 0.3
53 - recall: 0.0741 - precision: 0.6667
Epoch 17/45
1/1 [=====] - 0s 49ms/step - loss: 0.7237 - acc: 0.4
19 - recall: 0.1111 - precision: 1.0000
Epoch 18/45
1/1 [=====] - 0s 64ms/step - loss: 0.7264 - acc: 0.3
488 - recall: 0.0370 - precision: 0.3333
Epoch 19/45
1/1 [=====] - 0s 61ms/step - loss: 0.7242 - acc: 0.3
56 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 20/45
1/1 [=====] - 0s 48ms/step - loss: 0.7244 - acc: 0.4
44 - recall: 0.1111 - precision: 1.0000
Epoch 21/45
```

```
1/1 [=====] - 0s 89ms/step - loss: 0.7273 - acc: 0.37
21 - recall: 0.0370 - precision: 0.5000
Epoch 22/45
1/1 [=====] - 0s 49ms/step - loss: 0.7262 - acc: 0.37
21 - recall: 0.0370 - precision: 0.5000
Epoch 23/45
1/1 [=====] - 0s 96ms/step - loss: 0.7225 - acc: 0.39
53 - recall: 0.0370 - precision: 1.0000
Epoch 24/45
1/1 [=====] - 0s 48ms/step - loss: 0.7271 - acc: 0.37
21 - recall: 0.0370 - precision: 0.5000
Epoch 25/45
1/1 [=====] - 0s 47ms/step - loss: 0.7250 - acc: 0.34
88 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 26/45
1/1 [=====] - 0s 137ms/step - loss: 0.7275 - acc: 0.3
488 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 27/45
1/1 [=====] - 0s 47ms/step - loss: 0.7275 - acc: 0.34
88 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 28/45
1/1 [=====] - 0s 46ms/step - loss: 0.7230 - acc: 0.34
88 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 29/45
1/1 [=====] - 0s 46ms/step - loss: 0.7265 - acc: 0.34
88 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 30/45
1/1 [=====] - 0s 46ms/step - loss: 0.7230 - acc: 0.39
53 - recall: 0.0370 - precision: 1.0000
Epoch 31/45
1/1 [=====] - 0s 47ms/step - loss: 0.7221 - acc: 0.39
53 - recall: 0.0370 - precision: 1.0000
Epoch 32/45
1/1 [=====] - 0s 104ms/step - loss: 0.7259 - acc: 0.3
488 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 33/45
1/1 [=====] - 0s 49ms/step - loss: 0.7214 - acc: 0.39
53 - recall: 0.0370 - precision: 1.0000
Epoch 34/45
1/1 [=====] - 0s 47ms/step - loss: 0.7211 - acc: 0.37
21 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 35/45
1/1 [=====] - 0s 47ms/step - loss: 0.7225 - acc: 0.39
53 - recall: 0.0370 - precision: 1.0000
Epoch 36/45
1/1 [=====] - 0s 47ms/step - loss: 0.7256 - acc: 0.34
88 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 37/45
1/1 [=====] - 0s 127ms/step - loss: 0.7216 - acc: 0.3
953 - recall: 0.0370 - precision: 1.0000
Epoch 38/45
1/1 [=====] - 0s 49ms/step - loss: 0.7201 - acc: 0.39
53 - recall: 0.0370 - precision: 1.0000
Epoch 39/45
1/1 [=====] - 0s 47ms/step - loss: 0.7242 - acc: 0.34
88 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 40/45
1/1 [=====] - 0s 48ms/step - loss: 0.7218 - acc: 0.39
53 - recall: 0.0370 - precision: 1.0000
Epoch 41/45
```

```
1/1 [=====] - 0s 47ms/step - loss: 0.7196 - acc: 0.39
53 - recall: 0.0370 - precision: 1.0000
Epoch 42/45
1/1 [=====] - 0s 46ms/step - loss: 0.7176 - acc: 0.37
21 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 43/45
1/1 [=====] - 0s 47ms/step - loss: 0.7229 - acc: 0.34
88 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 44/45
1/1 [=====] - 0s 53ms/step - loss: 0.7213 - acc: 0.39
53 - recall: 0.0370 - precision: 1.0000
Epoch 45/45
1/1 [=====] - 0s 62ms/step - loss: 0.7202 - acc: 0.39
53 - recall: 0.0370 - precision: 1.0000
1/1 [=====] - 0s 207ms/step
2023-03-29 00:05:58.209153: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
2/2 [=====] - 0s 112ms/step
Epoch 1/65
2023-03-29 00:05:59.280906: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
```

```
1/1 [=====] - 1s 1s/step - loss: 0.6487 - acc: 0.5476
- recall: 0.5625 - precision: 0.7826
Epoch 2/65
1/1 [=====] - 0s 209ms/step - loss: 0.6365 - acc: 0.7
857 - recall: 1.0000 - precision: 0.7805
Epoch 3/65
1/1 [=====] - 0s 165ms/step - loss: 0.6143 - acc: 0.7
619 - recall: 1.0000 - precision: 0.7619
Epoch 4/65
1/1 [=====] - 0s 94ms/step - loss: 0.6822 - acc: 0.7
19 - recall: 1.0000 - precision: 0.7619
Epoch 5/65
1/1 [=====] - 0s 118ms/step - loss: 0.6561 - acc: 0.7
143 - recall: 0.9375 - precision: 0.7500
Epoch 6/65
1/1 [=====] - 0s 194ms/step - loss: 0.6387 - acc: 0.7
381 - recall: 0.9375 - precision: 0.7692
Epoch 7/65
1/1 [=====] - 0s 189ms/step - loss: 0.6432 - acc: 0.6
905 - recall: 0.8750 - precision: 0.7568
Epoch 8/65
1/1 [=====] - 0s 63ms/step - loss: 0.6400 - acc: 0.6
67 - recall: 0.8438 - precision: 0.7500
Epoch 9/65
1/1 [=====] - 0s 166ms/step - loss: 0.6416 - acc: 0.6
905 - recall: 0.9062 - precision: 0.7436
Epoch 10/65
1/1 [=====] - 0s 96ms/step - loss: 0.6404 - acc: 0.71
43 - recall: 0.9375 - precision: 0.7500
Epoch 11/65
1/1 [=====] - 0s 64ms/step - loss: 0.6365 - acc: 0.73
81 - recall: 0.9688 - precision: 0.7561
Epoch 12/65
1/1 [=====] - 0s 92ms/step - loss: 0.6176 - acc: 0.78
57 - recall: 1.0000 - precision: 0.7805
Epoch 13/65
1/1 [=====] - 0s 97ms/step - loss: 0.6435 - acc: 0.73
81 - recall: 0.9688 - precision: 0.7561
Epoch 14/65
1/1 [=====] - 0s 131ms/step - loss: 0.6007 - acc: 0.7
857 - recall: 1.0000 - precision: 0.7805
Epoch 15/65
1/1 [=====] - 0s 64ms/step - loss: 0.6001 - acc: 0.73
81 - recall: 0.9375 - precision: 0.7692
Epoch 16/65
1/1 [=====] - 0s 63ms/step - loss: 0.6438 - acc: 0.76
19 - recall: 0.8750 - precision: 0.8235
Epoch 17/65
1/1 [=====] - 0s 62ms/step - loss: 0.5600 - acc: 0.78
57 - recall: 0.8125 - precision: 0.8966
Epoch 18/65
1/1 [=====] - 0s 48ms/step - loss: 0.5967 - acc: 0.54
76 - recall: 0.5938 - precision: 0.7600
Epoch 19/65
1/1 [=====] - 0s 100ms/step - loss: 0.5292 - acc: 0.8
095 - recall: 0.8438 - precision: 0.9000
Epoch 20/65
1/1 [=====] - 0s 95ms/step - loss: 0.4887 - acc: 0.73
81 - recall: 0.8125 - precision: 0.8387
Epoch 21/65
```

```
1/1 [=====] - 0s 52ms/step - loss: 0.5601 - acc: 0.71
43 - recall: 0.8125 - precision: 0.8125
Epoch 22/65
1/1 [=====] - 0s 46ms/step - loss: 0.5476 - acc: 0.78
57 - recall: 0.8438 - precision: 0.8710
Epoch 23/65
1/1 [=====] - 0s 51ms/step - loss: 0.4084 - acc: 0.73
81 - recall: 0.7188 - precision: 0.9200
Epoch 24/65
1/1 [=====] - 0s 49ms/step - loss: 0.5034 - acc: 0.73
81 - recall: 0.7812 - precision: 0.8621
Epoch 25/65
1/1 [=====] - 0s 46ms/step - loss: 0.4263 - acc: 0.73
81 - recall: 0.7188 - precision: 0.9200
Epoch 26/65
1/1 [=====] - 0s 50ms/step - loss: 0.4318 - acc: 0.83
33 - recall: 0.8438 - precision: 0.9310
Epoch 27/65
1/1 [=====] - 0s 49ms/step - loss: 0.4750 - acc: 0.71
43 - recall: 0.7188 - precision: 0.8846
Epoch 28/65
1/1 [=====] - 0s 97ms/step - loss: 0.4043 - acc: 0.83
33 - recall: 0.8125 - precision: 0.9630
Epoch 29/65
1/1 [=====] - 0s 129ms/step - loss: 0.4403 - acc: 0.7
857 - recall: 0.7812 - precision: 0.9259
Epoch 30/65
1/1 [=====] - 0s 48ms/step - loss: 0.3569 - acc: 0.76
19 - recall: 0.7500 - precision: 0.9231
Epoch 31/65
1/1 [=====] - 0s 46ms/step - loss: 0.3812 - acc: 0.83
33 - recall: 0.8438 - precision: 0.9310
Epoch 32/65
1/1 [=====] - 0s 62ms/step - loss: 0.3293 - acc: 0.78
57 - recall: 0.7500 - precision: 0.9600
Epoch 33/65
1/1 [=====] - 0s 48ms/step - loss: 0.2943 - acc: 0.88
10 - recall: 0.8438 - precision: 1.0000
Epoch 34/65
1/1 [=====] - 0s 46ms/step - loss: 0.3241 - acc: 0.88
10 - recall: 0.8750 - precision: 0.9655
Epoch 35/65
1/1 [=====] - 0s 46ms/step - loss: 0.3217 - acc: 0.80
95 - recall: 0.8750 - precision: 0.8750
Epoch 36/65
1/1 [=====] - 0s 95ms/step - loss: 0.2513 - acc: 0.92
86 - recall: 0.9062 - precision: 1.0000
Epoch 37/65
1/1 [=====] - 0s 47ms/step - loss: 0.2306 - acc: 0.90
48 - recall: 0.9062 - precision: 0.9667
Epoch 38/65
1/1 [=====] - 0s 48ms/step - loss: 0.2833 - acc: 0.88
10 - recall: 0.8438 - precision: 1.0000
Epoch 39/65
1/1 [=====] - 0s 47ms/step - loss: 0.2823 - acc: 0.85
71 - recall: 0.8125 - precision: 1.0000
Epoch 40/65
1/1 [=====] - 0s 47ms/step - loss: 0.3467 - acc: 0.85
71 - recall: 0.8750 - precision: 0.9333
Epoch 41/65
```

```
1/1 [=====] - 0s 46ms/step - loss: 0.3462 - acc: 0.85
71 - recall: 0.8750 - precision: 0.9333
Epoch 42/65
1/1 [=====] - 0s 47ms/step - loss: 0.2811 - acc: 0.85
71 - recall: 0.8125 - precision: 1.0000
Epoch 43/65
1/1 [=====] - 0s 46ms/step - loss: 0.1923 - acc: 0.90
48 - recall: 0.8750 - precision: 1.0000
Epoch 44/65
1/1 [=====] - 0s 48ms/step - loss: 0.2100 - acc: 0.88
10 - recall: 0.8438 - precision: 1.0000
Epoch 45/65
1/1 [=====] - 0s 47ms/step - loss: 0.1736 - acc: 0.95
24 - recall: 0.9375 - precision: 1.0000
Epoch 46/65
1/1 [=====] - 0s 46ms/step - loss: 0.1896 - acc: 0.90
48 - recall: 0.8750 - precision: 1.0000
Epoch 47/65
1/1 [=====] - 0s 47ms/step - loss: 0.1703 - acc: 0.95
24 - recall: 0.9375 - precision: 1.0000
Epoch 48/65
1/1 [=====] - 0s 47ms/step - loss: 0.1320 - acc: 0.95
24 - recall: 0.9375 - precision: 1.0000
Epoch 49/65
1/1 [=====] - 0s 48ms/step - loss: 0.1294 - acc: 0.97
62 - recall: 0.9688 - precision: 1.0000
Epoch 50/65
1/1 [=====] - 0s 47ms/step - loss: 0.1019 - acc: 0.97
62 - recall: 0.9688 - precision: 1.0000
Epoch 51/65
1/1 [=====] - 0s 46ms/step - loss: 0.0967 - acc: 0.97
62 - recall: 0.9688 - precision: 1.0000
Epoch 52/65
1/1 [=====] - 0s 59ms/step - loss: 0.0777 - acc: 0.95
24 - recall: 0.9688 - precision: 0.9688
Epoch 53/65
1/1 [=====] - 0s 47ms/step - loss: 0.1093 - acc: 0.97
62 - recall: 1.0000 - precision: 0.9697
Epoch 54/65
1/1 [=====] - 0s 46ms/step - loss: 0.0410 - acc: 0.97
62 - recall: 0.9688 - precision: 1.0000
Epoch 55/65
1/1 [=====] - 0s 47ms/step - loss: 0.1501 - acc: 0.92
86 - recall: 0.9062 - precision: 1.0000
Epoch 56/65
1/1 [=====] - 0s 47ms/step - loss: 0.0350 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 57/65
1/1 [=====] - 0s 46ms/step - loss: 0.0654 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 58/65
1/1 [=====] - 0s 46ms/step - loss: 0.0418 - acc: 0.97
62 - recall: 0.9688 - precision: 1.0000
Epoch 59/65
1/1 [=====] - 0s 47ms/step - loss: 0.0444 - acc: 0.97
62 - recall: 0.9688 - precision: 1.0000
Epoch 60/65
1/1 [=====] - 0s 46ms/step - loss: 0.0590 - acc: 0.95
24 - recall: 0.9375 - precision: 1.0000
Epoch 61/65
```

```
1/1 [=====] - 0s 46ms/step - loss: 0.0401 - acc: 0.97
62 - recall: 0.9688 - precision: 1.0000
Epoch 62/65
1/1 [=====] - 0s 46ms/step - loss: 0.1570 - acc: 0.95
24 - recall: 1.0000 - precision: 0.9412
Epoch 63/65
1/1 [=====] - 0s 46ms/step - loss: 0.0699 - acc: 0.97
62 - recall: 0.9688 - precision: 1.0000
Epoch 64/65
1/1 [=====] - 0s 47ms/step - loss: 0.0529 - acc: 0.97
62 - recall: 0.9688 - precision: 1.0000
Epoch 65/65
1/1 [=====] - 0s 46ms/step - loss: 0.0941 - acc: 0.97
62 - recall: 0.9688 - precision: 1.0000
2023-03-29 00:06:04.826968: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
1/1 [=====] - 0s 286ms/step
2/2 [=====] - 0s 173ms/step
Epoch 1/65
2023-03-29 00:06:05.879657: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
```

```
1/1 [=====] - 1s 1s/step - loss: 0.7005 - acc: 0.5581
- recall: 0.5862 - precision: 0.7083
Epoch 2/65
1/1 [=====] - 0s 366ms/step - loss: 0.6987 - acc: 0.6
512 - recall: 0.7931 - precision: 0.7188
Epoch 3/65
1/1 [=====] - 0s 199ms/step - loss: 0.6961 - acc: 0.6
047 - recall: 0.6552 - precision: 0.7308
Epoch 4/65
1/1 [=====] - 0s 150ms/step - loss: 0.7004 - acc: 0.4
419 - recall: 0.2759 - precision: 0.7273
Epoch 5/65
1/1 [=====] - 0s 191ms/step - loss: 0.7203 - acc: 0.4
651 - recall: 0.3448 - precision: 0.7143
Epoch 6/65
1/1 [=====] - 0s 53ms/step - loss: 0.6598 - acc: 0.58
14 - recall: 0.4138 - precision: 0.9231
Epoch 7/65
1/1 [=====] - 0s 109ms/step - loss: 0.7031 - acc: 0.4
651 - recall: 0.3793 - precision: 0.6875
Epoch 8/65
1/1 [=====] - 0s 65ms/step - loss: 0.6950 - acc: 0.51
16 - recall: 0.4138 - precision: 0.7500
Epoch 9/65
1/1 [=====] - 0s 67ms/step - loss: 0.7165 - acc: 0.39
53 - recall: 0.3793 - precision: 0.5789
Epoch 10/65
1/1 [=====] - 0s 63ms/step - loss: 0.7090 - acc: 0.48
84 - recall: 0.3793 - precision: 0.7333
Epoch 11/65
1/1 [=====] - 0s 106ms/step - loss: 0.7098 - acc: 0.4
186 - recall: 0.2759 - precision: 0.6667
Epoch 12/65
1/1 [=====] - 0s 104ms/step - loss: 0.6757 - acc: 0.5
349 - recall: 0.3793 - precision: 0.8462
Epoch 13/65
1/1 [=====] - 0s 100ms/step - loss: 0.7075 - acc: 0.3
256 - recall: 0.2069 - precision: 0.5000
Epoch 14/65
1/1 [=====] - 0s 68ms/step - loss: 0.6871 - acc: 0.48
84 - recall: 0.3103 - precision: 0.8182
Epoch 15/65
1/1 [=====] - 0s 175ms/step - loss: 0.6869 - acc: 0.4
651 - recall: 0.2414 - precision: 0.8750
Epoch 16/65
1/1 [=====] - 0s 49ms/step - loss: 0.6875 - acc: 0.37
21 - recall: 0.1724 - precision: 0.6250
Epoch 17/65
1/1 [=====] - 0s 204ms/step - loss: 0.6756 - acc: 0.5
116 - recall: 0.2759 - precision: 1.0000
Epoch 18/65
1/1 [=====] - 0s 51ms/step - loss: 0.6725 - acc: 0.48
84 - recall: 0.2414 - precision: 1.0000
Epoch 19/65
1/1 [=====] - 0s 151ms/step - loss: 0.6404 - acc: 0.4
419 - recall: 0.2414 - precision: 0.7778
Epoch 20/65
1/1 [=====] - 0s 65ms/step - loss: 0.7207 - acc: 0.39
53 - recall: 0.2069 - precision: 0.6667
Epoch 21/65
```

```
1/1 [=====] - 0s 49ms/step - loss: 0.7059 - acc: 0.39
53 - recall: 0.3103 - precision: 0.6000
Epoch 22/65
1/1 [=====] - 0s 132ms/step - loss: 0.6514 - acc: 0.6
977 - recall: 0.6552 - precision: 0.8636
Epoch 23/65
1/1 [=====] - 0s 140ms/step - loss: 0.6272 - acc: 0.7
209 - recall: 0.7931 - precision: 0.7931
Epoch 24/65
1/1 [=====] - 0s 49ms/step - loss: 0.6436 - acc: 0.72
09 - recall: 0.7241 - precision: 0.8400
Epoch 25/65
1/1 [=====] - 0s 51ms/step - loss: 0.6228 - acc: 0.67
44 - recall: 0.6552 - precision: 0.8261
Epoch 26/65
1/1 [=====] - 0s 51ms/step - loss: 0.5535 - acc: 0.72
09 - recall: 0.6897 - precision: 0.8696
Epoch 27/65
1/1 [=====] - 0s 59ms/step - loss: 0.5213 - acc: 0.76
74 - recall: 0.7241 - precision: 0.9130
Epoch 28/65
1/1 [=====] - 0s 53ms/step - loss: 0.4930 - acc: 0.72
09 - recall: 0.6552 - precision: 0.9048
Epoch 29/65
1/1 [=====] - 0s 51ms/step - loss: 0.4843 - acc: 0.74
42 - recall: 0.7241 - precision: 0.8750
Epoch 30/65
1/1 [=====] - 0s 49ms/step - loss: 0.5388 - acc: 0.83
72 - recall: 0.8966 - precision: 0.8667
Epoch 31/65
1/1 [=====] - 0s 49ms/step - loss: 0.4102 - acc: 0.81
40 - recall: 0.8621 - precision: 0.8621
Epoch 32/65
1/1 [=====] - 0s 50ms/step - loss: 0.3787 - acc: 0.83
72 - recall: 0.8621 - precision: 0.8929
Epoch 33/65
1/1 [=====] - 0s 86ms/step - loss: 0.3696 - acc: 0.90
70 - recall: 0.8966 - precision: 0.9630
Epoch 34/65
1/1 [=====] - 0s 99ms/step - loss: 0.3890 - acc: 0.81
40 - recall: 0.7241 - precision: 1.0000
Epoch 35/65
1/1 [=====] - 0s 48ms/step - loss: 0.3396 - acc: 0.79
07 - recall: 0.7931 - precision: 0.8846
Epoch 36/65
1/1 [=====] - 0s 48ms/step - loss: 0.2819 - acc: 0.88
37 - recall: 0.8966 - precision: 0.9286
Epoch 37/65
1/1 [=====] - 0s 55ms/step - loss: 0.2656 - acc: 0.88
37 - recall: 0.8621 - precision: 0.9615
Epoch 38/65
1/1 [=====] - 0s 50ms/step - loss: 0.1668 - acc: 0.90
70 - recall: 0.8621 - precision: 1.0000
Epoch 39/65
1/1 [=====] - 0s 49ms/step - loss: 0.1661 - acc: 0.93
02 - recall: 0.8966 - precision: 1.0000
Epoch 40/65
1/1 [=====] - 0s 50ms/step - loss: 0.2007 - acc: 0.88
37 - recall: 0.8966 - precision: 0.9286
Epoch 41/65
```

```
1/1 [=====] - 0s 48ms/step - loss: 0.1782 - acc: 0.90
70 - recall: 0.8621 - precision: 1.0000
Epoch 42/65
1/1 [=====] - 0s 49ms/step - loss: 0.2419 - acc: 0.93
02 - recall: 1.0000 - precision: 0.9062
Epoch 43/65
1/1 [=====] - 0s 48ms/step - loss: 0.1426 - acc: 0.95
35 - recall: 0.9655 - precision: 0.9655
Epoch 44/65
1/1 [=====] - 0s 47ms/step - loss: 0.0925 - acc: 0.95
35 - recall: 0.9310 - precision: 1.0000
Epoch 45/65
1/1 [=====] - 0s 47ms/step - loss: 0.1252 - acc: 0.95
35 - recall: 0.9310 - precision: 1.0000
Epoch 46/65
1/1 [=====] - 0s 48ms/step - loss: 0.0897 - acc: 0.97
67 - recall: 0.9655 - precision: 1.0000
Epoch 47/65
1/1 [=====] - 0s 47ms/step - loss: 0.0959 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 48/65
1/1 [=====] - 0s 47ms/step - loss: 0.0643 - acc: 0.97
67 - recall: 0.9655 - precision: 1.0000
Epoch 49/65
1/1 [=====] - 0s 49ms/step - loss: 0.0571 - acc: 0.97
67 - recall: 0.9655 - precision: 1.0000
Epoch 50/65
1/1 [=====] - 0s 49ms/step - loss: 0.1084 - acc: 0.95
35 - recall: 0.9310 - precision: 1.0000
Epoch 51/65
1/1 [=====] - 0s 49ms/step - loss: 0.0716 - acc: 0.97
67 - recall: 0.9655 - precision: 1.0000
Epoch 52/65
1/1 [=====] - 0s 49ms/step - loss: 0.0766 - acc: 0.97
67 - recall: 1.0000 - precision: 0.9667
Epoch 53/65
1/1 [=====] - 0s 47ms/step - loss: 0.0146 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 54/65
1/1 [=====] - 0s 48ms/step - loss: 0.0173 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 55/65
1/1 [=====] - 0s 48ms/step - loss: 0.0248 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 56/65
1/1 [=====] - 0s 47ms/step - loss: 0.0031 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 57/65
1/1 [=====] - 0s 47ms/step - loss: 0.0402 - acc: 0.97
67 - recall: 1.0000 - precision: 0.9667
Epoch 58/65
1/1 [=====] - 0s 48ms/step - loss: 0.0402 - acc: 0.97
67 - recall: 0.9655 - precision: 1.0000
Epoch 59/65
1/1 [=====] - 0s 47ms/step - loss: 0.0040 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 60/65
1/1 [=====] - 0s 47ms/step - loss: 0.0088 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 61/65
```

```
1/1 [=====] - 0s 48ms/step - loss: 0.0039 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 62/65
1/1 [=====] - 0s 47ms/step - loss: 0.0108 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 63/65
1/1 [=====] - 0s 47ms/step - loss: 0.0043 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 64/65
1/1 [=====] - 0s 47ms/step - loss: 0.0020 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 65/65
1/1 [=====] - 0s 49ms/step - loss: 0.0044 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
1/1 [=====] - 0s 197ms/step
2023-03-29 00:06:11.994096: I tensorflow/core/grappler/optimizers/custom_graph
_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
2/2 [=====] - 0s 114ms/step
Epoch 1/65
2023-03-29 00:06:13.232051: I tensorflow/core/grappler/optimizers/custom_graph
_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
```

```
1/1 [=====] - 2s 2s/step - loss: 0.7311 - acc: 0.4419
- recall: 0.5185 - precision: 0.5600
Epoch 2/65
1/1 [=====] - 0s 173ms/step - loss: 0.7215 - acc: 0.3
953 - recall: 0.1481 - precision: 0.5714
Epoch 3/65
1/1 [=====] - 0s 170ms/step - loss: 0.7074 - acc: 0.3
488 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 4/65
1/1 [=====] - 0s 160ms/step - loss: 0.7312 - acc: 0.3
953 - recall: 0.0370 - precision: 1.0000
Epoch 5/65
1/1 [=====] - 0s 109ms/step - loss: 0.7084 - acc: 0.3
953 - recall: 0.0741 - precision: 0.6667
Epoch 6/65
1/1 [=====] - 0s 70ms/step - loss: 0.7049 - acc: 0.53
49 - recall: 0.2963 - precision: 0.8889
Epoch 7/65
1/1 [=====] - 0s 61ms/step - loss: 0.6955 - acc: 0.44
19 - recall: 0.2593 - precision: 0.6364
Epoch 8/65
1/1 [=====] - 0s 202ms/step - loss: 0.7823 - acc: 0.3
023 - recall: 0.1481 - precision: 0.3636
Epoch 9/65
1/1 [=====] - 0s 162ms/step - loss: 0.6794 - acc: 0.5
116 - recall: 0.2593 - precision: 0.8750
Epoch 10/65
1/1 [=====] - 0s 112ms/step - loss: 0.7104 - acc: 0.3
256 - recall: 0.0741 - precision: 0.3333
Epoch 11/65
1/1 [=====] - 0s 97ms/step - loss: 0.7399 - acc: 0.32
56 - recall: 0.0741 - precision: 0.3333
Epoch 12/65
1/1 [=====] - 0s 98ms/step - loss: 0.6892 - acc: 0.41
86 - recall: 0.0741 - precision: 1.0000
Epoch 13/65
1/1 [=====] - 0s 49ms/step - loss: 0.6678 - acc: 0.39
53 - recall: 0.0741 - precision: 0.6667
Epoch 14/65
1/1 [=====] - 0s 52ms/step - loss: 0.6543 - acc: 0.37
21 - recall: 0.0741 - precision: 0.5000
Epoch 15/65
1/1 [=====] - 0s 126ms/step - loss: 0.6755 - acc: 0.5
581 - recall: 0.3333 - precision: 0.9000
Epoch 16/65
1/1 [=====] - 0s 50ms/step - loss: 0.5874 - acc: 0.69
77 - recall: 0.5556 - precision: 0.9375
Epoch 17/65
1/1 [=====] - 0s 98ms/step - loss: 0.5528 - acc: 0.72
09 - recall: 0.6296 - precision: 0.8947
Epoch 18/65
1/1 [=====] - 0s 48ms/step - loss: 0.4702 - acc: 0.72
09 - recall: 0.6296 - precision: 0.8947
Epoch 19/65
1/1 [=====] - 0s 63ms/step - loss: 0.5286 - acc: 0.72
09 - recall: 0.6667 - precision: 0.8571
Epoch 20/65
1/1 [=====] - 0s 54ms/step - loss: 0.4745 - acc: 0.74
42 - recall: 0.7037 - precision: 0.8636
Epoch 21/65
```

```
1/1 [=====] - 0s 51ms/step - loss: 0.4010 - acc: 0.83
72 - recall: 0.7778 - precision: 0.9545
Epoch 22/65
1/1 [=====] - 0s 52ms/step - loss: 0.3872 - acc: 0.86
05 - recall: 0.8519 - precision: 0.9200
Epoch 23/65
1/1 [=====] - 0s 137ms/step - loss: 0.3556 - acc: 0.8
605 - recall: 0.8519 - precision: 0.9200
Epoch 24/65
1/1 [=====] - 0s 51ms/step - loss: 0.3591 - acc: 0.83
72 - recall: 0.8519 - precision: 0.8846
Epoch 25/65
1/1 [=====] - 0s 93ms/step - loss: 0.2369 - acc: 0.93
02 - recall: 0.9259 - precision: 0.9615
Epoch 26/65
1/1 [=====] - 0s 73ms/step - loss: 0.1900 - acc: 0.95
35 - recall: 0.9630 - precision: 0.9630
Epoch 27/65
1/1 [=====] - 0s 49ms/step - loss: 0.2888 - acc: 0.83
72 - recall: 0.8148 - precision: 0.9167
Epoch 28/65
1/1 [=====] - 0s 90ms/step - loss: 0.1597 - acc: 0.97
67 - recall: 1.0000 - precision: 0.9643
Epoch 29/65
1/1 [=====] - 0s 49ms/step - loss: 0.2640 - acc: 0.88
37 - recall: 0.8889 - precision: 0.9231
Epoch 30/65
1/1 [=====] - 0s 53ms/step - loss: 0.1239 - acc: 0.95
35 - recall: 0.9630 - precision: 0.9630
Epoch 31/65
1/1 [=====] - 0s 49ms/step - loss: 0.1882 - acc: 0.93
02 - recall: 0.9259 - precision: 0.9615
Epoch 32/65
1/1 [=====] - 0s 50ms/step - loss: 0.0942 - acc: 0.97
67 - recall: 0.9630 - precision: 1.0000
Epoch 33/65
1/1 [=====] - 0s 49ms/step - loss: 0.0915 - acc: 0.93
02 - recall: 0.8889 - precision: 1.0000
Epoch 34/65
1/1 [=====] - 0s 47ms/step - loss: 0.1784 - acc: 0.90
70 - recall: 0.9630 - precision: 0.8966
Epoch 35/65
1/1 [=====] - 0s 48ms/step - loss: 0.1210 - acc: 0.93
02 - recall: 0.9259 - precision: 0.9615
Epoch 36/65
1/1 [=====] - 0s 49ms/step - loss: 0.2260 - acc: 0.86
05 - recall: 0.7778 - precision: 1.0000
Epoch 37/65
1/1 [=====] - 0s 49ms/step - loss: 0.0978 - acc: 0.95
35 - recall: 0.9259 - precision: 1.0000
Epoch 38/65
1/1 [=====] - 0s 54ms/step - loss: 0.1474 - acc: 0.97
67 - recall: 1.0000 - precision: 0.9643
Epoch 39/65
1/1 [=====] - 0s 142ms/step - loss: 0.0899 - acc: 0.9
767 - recall: 1.0000 - precision: 0.9643
Epoch 40/65
1/1 [=====] - 0s 49ms/step - loss: 0.0562 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 41/65
```

```
1/1 [=====] - 0s 48ms/step - loss: 0.0972 - acc: 0.93
02 - recall: 0.8889 - precision: 1.0000
Epoch 42/65
1/1 [=====] - 0s 48ms/step - loss: 0.0699 - acc: 0.95
35 - recall: 0.9259 - precision: 1.0000
Epoch 43/65
1/1 [=====] - 0s 108ms/step - loss: 0.0524 - acc: 0.9
767 - recall: 0.9630 - precision: 1.0000
Epoch 44/65
1/1 [=====] - 0s 55ms/step - loss: 0.0294 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 45/65
1/1 [=====] - 0s 53ms/step - loss: 0.0627 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 46/65
1/1 [=====] - 0s 65ms/step - loss: 0.2252 - acc: 0.95
35 - recall: 1.0000 - precision: 0.9310
Epoch 47/65
1/1 [=====] - 0s 48ms/step - loss: 0.0137 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 48/65
1/1 [=====] - 0s 99ms/step - loss: 0.0339 - acc: 0.97
67 - recall: 0.9630 - precision: 1.0000
Epoch 49/65
1/1 [=====] - 0s 50ms/step - loss: 0.0728 - acc: 0.95
35 - recall: 0.9259 - precision: 1.0000
Epoch 50/65
1/1 [=====] - 0s 49ms/step - loss: 0.1071 - acc: 0.95
35 - recall: 0.9259 - precision: 1.0000
Epoch 51/65
1/1 [=====] - 0s 48ms/step - loss: 0.0356 - acc: 0.95
35 - recall: 0.9259 - precision: 1.0000
Epoch 52/65
1/1 [=====] - 0s 48ms/step - loss: 0.0104 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 53/65
1/1 [=====] - 0s 49ms/step - loss: 0.0035 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 54/65
1/1 [=====] - 0s 48ms/step - loss: 0.1241 - acc: 0.97
67 - recall: 1.0000 - precision: 0.9643
Epoch 55/65
1/1 [=====] - 0s 47ms/step - loss: 0.0357 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 56/65
1/1 [=====] - 0s 48ms/step - loss: 0.0054 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 57/65
1/1 [=====] - 0s 50ms/step - loss: 0.0044 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 58/65
1/1 [=====] - 0s 49ms/step - loss: 0.0062 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 59/65
1/1 [=====] - 0s 48ms/step - loss: 0.0066 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 60/65
1/1 [=====] - 0s 51ms/step - loss: 0.0075 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 61/65
```

```
1/1 [=====] - 0s 49ms/step - loss: 0.0149 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 62/65
1/1 [=====] - 0s 48ms/step - loss: 0.0046 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 63/65
1/1 [=====] - 0s 49ms/step - loss: 0.0043 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 64/65
1/1 [=====] - 0s 49ms/step - loss: 0.0039 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 65/65
1/1 [=====] - 0s 148ms/step - loss: 0.0044 - acc: 1.0000
00 - recall: 1.0000 - precision: 1.0000
1/1 [=====] - 0s 209ms/step
2023-03-29 00:06:19.275825: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
2/2 [=====] - 0s 122ms/step
Epoch 1/65
2023-03-29 00:06:20.097352: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
```

```
1/1 [=====] - 1s 1s/step - loss: 0.6459 - acc: 0.6190
- recall: 0.7188 - precision: 0.7667
Epoch 2/65
1/1 [=====] - 0s 172ms/step - loss: 0.6461 - acc: 0.6
429 - recall: 0.7188 - precision: 0.7931
Epoch 3/65
1/1 [=====] - 0s 124ms/step - loss: 0.6476 - acc: 0.6
190 - recall: 0.7812 - precision: 0.7353
Epoch 4/65
1/1 [=====] - 0s 160ms/step - loss: 0.6464 - acc: 0.6
905 - recall: 0.8438 - precision: 0.7714
Epoch 5/65
1/1 [=====] - 0s 98ms/step - loss: 0.6474 - acc: 0.7
143 - recall: 0.8750 - precision: 0.7778
Epoch 6/65
1/1 [=====] - 0s 97ms/step - loss: 0.6451 - acc: 0.6
29 - recall: 0.8438 - precision: 0.7297
Epoch 7/65
1/1 [=====] - 0s 152ms/step - loss: 0.6482 - acc: 0.7
619 - recall: 0.9688 - precision: 0.7750
Epoch 8/65
1/1 [=====] - 0s 115ms/step - loss: 0.6446 - acc: 0.7
619 - recall: 0.9688 - precision: 0.7750
Epoch 9/65
1/1 [=====] - 0s 63ms/step - loss: 0.6446 - acc: 0.7
381 - recall: 0.9688 - precision: 0.7561
Epoch 10/65
1/1 [=====] - 0s 107ms/step - loss: 0.6466 - acc: 0.7
381 - recall: 0.9688 - precision: 0.7561
Epoch 11/65
1/1 [=====] - 0s 228ms/step - loss: 0.6417 - acc: 0.7
381 - recall: 0.9688 - precision: 0.7561
Epoch 12/65
1/1 [=====] - 0s 179ms/step - loss: 0.6442 - acc: 0.7
619 - recall: 1.0000 - precision: 0.7619
Epoch 13/65
1/1 [=====] - 0s 47ms/step - loss: 0.6436 - acc: 0.7
619 - recall: 1.0000 - precision: 0.7619
Epoch 14/65
1/1 [=====] - 0s 52ms/step - loss: 0.6413 - acc: 0.7
619 - recall: 1.0000 - precision: 0.7619
Epoch 15/65
1/1 [=====] - 0s 90ms/step - loss: 0.6446 - acc: 0.7
619 - recall: 1.0000 - precision: 0.7619
Epoch 16/65
1/1 [=====] - 0s 50ms/step - loss: 0.6440 - acc: 0.7
619 - recall: 1.0000 - precision: 0.7619
Epoch 17/65
1/1 [=====] - 0s 106ms/step - loss: 0.6429 - acc: 0.7
619 - recall: 1.0000 - precision: 0.7619
Epoch 18/65
1/1 [=====] - 0s 143ms/step - loss: 0.6412 - acc: 0.7
619 - recall: 1.0000 - precision: 0.7619
Epoch 19/65
1/1 [=====] - 0s 105ms/step - loss: 0.6405 - acc: 0.7
619 - recall: 1.0000 - precision: 0.7619
Epoch 20/65
1/1 [=====] - 0s 47ms/step - loss: 0.6372 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 21/65
```

```
1/1 [=====] - 0s 91ms/step - loss: 0.6395 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 22/65
1/1 [=====] - 0s 62ms/step - loss: 0.6450 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 23/65
1/1 [=====] - 0s 46ms/step - loss: 0.6372 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 24/65
1/1 [=====] - 0s 48ms/step - loss: 0.6379 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 25/65
1/1 [=====] - 0s 51ms/step - loss: 0.6373 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 26/65
1/1 [=====] - 0s 47ms/step - loss: 0.6372 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 27/65
1/1 [=====] - 0s 46ms/step - loss: 0.6366 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 28/65
1/1 [=====] - 0s 47ms/step - loss: 0.6371 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 29/65
1/1 [=====] - 0s 48ms/step - loss: 0.6413 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 30/65
1/1 [=====] - 0s 46ms/step - loss: 0.6397 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 31/65
1/1 [=====] - 0s 88ms/step - loss: 0.6390 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 32/65
1/1 [=====] - 0s 47ms/step - loss: 0.6376 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 33/65
1/1 [=====] - 0s 47ms/step - loss: 0.6388 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 34/65
1/1 [=====] - 0s 49ms/step - loss: 0.6357 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 35/65
1/1 [=====] - 0s 46ms/step - loss: 0.6328 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 36/65
1/1 [=====] - 0s 47ms/step - loss: 0.6304 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 37/65
1/1 [=====] - 0s 46ms/step - loss: 0.6396 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 38/65
1/1 [=====] - 0s 46ms/step - loss: 0.6307 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 39/65
1/1 [=====] - 0s 46ms/step - loss: 0.6403 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 40/65
1/1 [=====] - 0s 47ms/step - loss: 0.6397 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 41/65
```

```
1/1 [=====] - 0s 47ms/step - loss: 0.6304 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 42/65
1/1 [=====] - 0s 47ms/step - loss: 0.6299 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 43/65
1/1 [=====] - 0s 47ms/step - loss: 0.6354 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 44/65
1/1 [=====] - 0s 47ms/step - loss: 0.6345 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 45/65
1/1 [=====] - 0s 49ms/step - loss: 0.6357 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 46/65
1/1 [=====] - 0s 46ms/step - loss: 0.6354 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 47/65
1/1 [=====] - 0s 47ms/step - loss: 0.6352 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 48/65
1/1 [=====] - 0s 46ms/step - loss: 0.6392 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 49/65
1/1 [=====] - 0s 47ms/step - loss: 0.6404 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 50/65
1/1 [=====] - 0s 48ms/step - loss: 0.6319 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 51/65
1/1 [=====] - 0s 47ms/step - loss: 0.6316 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 52/65
1/1 [=====] - 0s 46ms/step - loss: 0.6340 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 53/65
1/1 [=====] - 0s 48ms/step - loss: 0.6363 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 54/65
1/1 [=====] - 0s 47ms/step - loss: 0.6402 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 55/65
1/1 [=====] - 0s 46ms/step - loss: 0.6322 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 56/65
1/1 [=====] - 0s 47ms/step - loss: 0.6416 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 57/65
1/1 [=====] - 0s 46ms/step - loss: 0.6370 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 58/65
1/1 [=====] - 0s 48ms/step - loss: 0.6322 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 59/65
1/1 [=====] - 0s 46ms/step - loss: 0.6286 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 60/65
1/1 [=====] - 0s 46ms/step - loss: 0.6370 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 61/65
```

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1/1 [=====] - 0s 46ms/step - loss: 0.6329 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 62/65
1/1 [=====] - 0s 46ms/step - loss: 0.6367 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 63/65
1/1 [=====] - 0s 48ms/step - loss: 0.6331 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 64/65
1/1 [=====] - 0s 47ms/step - loss: 0.6230 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 65/65
1/1 [=====] - 0s 46ms/step - loss: 0.6253 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
1/1 [=====] - 0s 195ms/step
2023-03-29 00:06:25.497997: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
2/2 [=====] - 0s 113ms/step
Epoch 1/65
2023-03-29 00:06:26.321029: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
```

```
1/1 [=====] - 2s 2s/step - loss: 0.7039 - acc: 0.4186
- recall: 0.4138 - precision: 0.6000
Epoch 2/65
1/1 [=====] - 0s 115ms/step - loss: 0.7031 - acc: 0.3
721 - recall: 0.3793 - precision: 0.5500
Epoch 3/65
1/1 [=====] - 0s 165ms/step - loss: 0.7018 - acc: 0.4
419 - recall: 0.4138 - precision: 0.6316
Epoch 4/65
1/1 [=====] - 0s 157ms/step - loss: 0.7006 - acc: 0.5
116 - recall: 0.4138 - precision: 0.7500
Epoch 5/65
1/1 [=====] - 0s 116ms/step - loss: 0.6994 - acc: 0.5
814 - recall: 0.4828 - precision: 0.8235
Epoch 6/65
1/1 [=====] - 0s 180ms/step - loss: 0.6977 - acc: 0.5
581 - recall: 0.5172 - precision: 0.7500
Epoch 7/65
1/1 [=====] - 0s 48ms/step - loss: 0.6997 - acc: 0.46
51 - recall: 0.3793 - precision: 0.6875
Epoch 8/65
1/1 [=====] - 0s 189ms/step - loss: 0.6998 - acc: 0.5
116 - recall: 0.4138 - precision: 0.7500
Epoch 9/65
1/1 [=====] - 0s 136ms/step - loss: 0.7029 - acc: 0.3
488 - recall: 0.2759 - precision: 0.5333
Epoch 10/65
1/1 [=====] - 0s 119ms/step - loss: 0.7005 - acc: 0.5
116 - recall: 0.4138 - precision: 0.7500
Epoch 11/65
1/1 [=====] - 0s 153ms/step - loss: 0.6989 - acc: 0.5
349 - recall: 0.4483 - precision: 0.7647
Epoch 12/65
1/1 [=====] - 0s 65ms/step - loss: 0.7015 - acc: 0.51
16 - recall: 0.4138 - precision: 0.7500
Epoch 13/65
1/1 [=====] - 0s 132ms/step - loss: 0.7006 - acc: 0.4
651 - recall: 0.3793 - precision: 0.6875
Epoch 14/65
1/1 [=====] - 0s 304ms/step - loss: 0.6985 - acc: 0.5
116 - recall: 0.4138 - precision: 0.7500
Epoch 15/65
1/1 [=====] - 0s 100ms/step - loss: 0.7020 - acc: 0.3
488 - recall: 0.2759 - precision: 0.5333
Epoch 16/65
1/1 [=====] - 0s 47ms/step - loss: 0.6985 - acc: 0.46
51 - recall: 0.3448 - precision: 0.7143
Epoch 17/65
1/1 [=====] - 0s 61ms/step - loss: 0.7003 - acc: 0.37
21 - recall: 0.2759 - precision: 0.5714
Epoch 18/65
1/1 [=====] - 0s 49ms/step - loss: 0.7000 - acc: 0.48
84 - recall: 0.3103 - precision: 0.8182
Epoch 19/65
1/1 [=====] - 0s 90ms/step - loss: 0.7009 - acc: 0.41
86 - recall: 0.2759 - precision: 0.6667
Epoch 20/65
1/1 [=====] - 0s 47ms/step - loss: 0.6989 - acc: 0.51
16 - recall: 0.3793 - precision: 0.7857
Epoch 21/65
```

```
1/1 [=====] - 0s 47ms/step - loss: 0.6993 - acc: 0.48
84 - recall: 0.3448 - precision: 0.7692
Epoch 22/65
1/1 [=====] - 0s 67ms/step - loss: 0.6982 - acc: 0.46
51 - recall: 0.3448 - precision: 0.7143
Epoch 23/65
1/1 [=====] - 0s 46ms/step - loss: 0.6974 - acc: 0.48
84 - recall: 0.3448 - precision: 0.7692
Epoch 24/65
1/1 [=====] - 0s 47ms/step - loss: 0.6981 - acc: 0.46
51 - recall: 0.3103 - precision: 0.7500
Epoch 25/65
1/1 [=====] - 0s 51ms/step - loss: 0.6997 - acc: 0.46
51 - recall: 0.3103 - precision: 0.7500
Epoch 26/65
1/1 [=====] - 0s 47ms/step - loss: 0.6977 - acc: 0.60
47 - recall: 0.4138 - precision: 1.0000
Epoch 27/65
1/1 [=====] - 0s 49ms/step - loss: 0.6980 - acc: 0.48
84 - recall: 0.3103 - precision: 0.8182
Epoch 28/65
1/1 [=====] - 0s 48ms/step - loss: 0.7003 - acc: 0.51
16 - recall: 0.3448 - precision: 0.8333
Epoch 29/65
1/1 [=====] - 0s 75ms/step - loss: 0.6984 - acc: 0.44
19 - recall: 0.2414 - precision: 0.7778
Epoch 30/65
1/1 [=====] - 0s 47ms/step - loss: 0.7005 - acc: 0.44
19 - recall: 0.2069 - precision: 0.8571
Epoch 31/65
1/1 [=====] - 0s 50ms/step - loss: 0.6981 - acc: 0.41
86 - recall: 0.2069 - precision: 0.7500
Epoch 32/65
1/1 [=====] - 0s 47ms/step - loss: 0.7005 - acc: 0.41
86 - recall: 0.2414 - precision: 0.7000
Epoch 33/65
1/1 [=====] - 0s 93ms/step - loss: 0.6988 - acc: 0.41
86 - recall: 0.2759 - precision: 0.6667
Epoch 34/65
1/1 [=====] - 0s 48ms/step - loss: 0.6964 - acc: 0.44
19 - recall: 0.2069 - precision: 0.8571
Epoch 35/65
1/1 [=====] - 0s 48ms/step - loss: 0.6993 - acc: 0.39
53 - recall: 0.2069 - precision: 0.6667
Epoch 36/65
1/1 [=====] - 0s 48ms/step - loss: 0.6981 - acc: 0.41
86 - recall: 0.2069 - precision: 0.7500
Epoch 37/65
1/1 [=====] - 0s 85ms/step - loss: 0.6999 - acc: 0.34
88 - recall: 0.1034 - precision: 0.6000
Epoch 38/65
1/1 [=====] - 0s 46ms/step - loss: 0.6993 - acc: 0.39
53 - recall: 0.1724 - precision: 0.7143
Epoch 39/65
1/1 [=====] - 0s 47ms/step - loss: 0.6950 - acc: 0.48
84 - recall: 0.2759 - precision: 0.8889
Epoch 40/65
1/1 [=====] - 0s 47ms/step - loss: 0.6969 - acc: 0.46
51 - recall: 0.2069 - precision: 1.0000
Epoch 41/65
```

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1/1 [=====] - 0s 48ms/step - loss: 0.6964 - acc: 0.46
51 - recall: 0.2414 - precision: 0.8750
Epoch 42/65
1/1 [=====] - 0s 48ms/step - loss: 0.6969 - acc: 0.46
51 - recall: 0.2759 - precision: 0.8000
Epoch 43/65
1/1 [=====] - 0s 48ms/step - loss: 0.6971 - acc: 0.51
16 - recall: 0.3103 - precision: 0.9000
Epoch 44/65
1/1 [=====] - 0s 47ms/step - loss: 0.6979 - acc: 0.46
51 - recall: 0.3793 - precision: 0.6875
Epoch 45/65
1/1 [=====] - 0s 48ms/step - loss: 0.7019 - acc: 0.41
86 - recall: 0.2759 - precision: 0.6667
Epoch 46/65
1/1 [=====] - 0s 47ms/step - loss: 0.6958 - acc: 0.51
16 - recall: 0.2759 - precision: 1.0000
Epoch 47/65
1/1 [=====] - 0s 51ms/step - loss: 0.6991 - acc: 0.44
19 - recall: 0.2069 - precision: 0.8571
Epoch 48/65
1/1 [=====] - 0s 48ms/step - loss: 0.7017 - acc: 0.37
21 - recall: 0.1724 - precision: 0.6250
Epoch 49/65
1/1 [=====] - 0s 48ms/step - loss: 0.6957 - acc: 0.53
49 - recall: 0.3448 - precision: 0.9091
Epoch 50/65
1/1 [=====] - 0s 48ms/step - loss: 0.6969 - acc: 0.48
84 - recall: 0.2759 - precision: 0.8889
Epoch 51/65
1/1 [=====] - 0s 47ms/step - loss: 0.6975 - acc: 0.44
19 - recall: 0.2069 - precision: 0.8571
Epoch 52/65
1/1 [=====] - 0s 47ms/step - loss: 0.6995 - acc: 0.37
21 - recall: 0.1034 - precision: 0.7500
Epoch 53/65
1/1 [=====] - 0s 47ms/step - loss: 0.6963 - acc: 0.48
84 - recall: 0.2759 - precision: 0.8889
Epoch 54/65
1/1 [=====] - 0s 48ms/step - loss: 0.6991 - acc: 0.41
86 - recall: 0.1724 - precision: 0.8333
Epoch 55/65
1/1 [=====] - 0s 47ms/step - loss: 0.6960 - acc: 0.51
16 - recall: 0.2759 - precision: 1.0000
Epoch 56/65
1/1 [=====] - 0s 48ms/step - loss: 0.7013 - acc: 0.39
53 - recall: 0.2069 - precision: 0.6667
Epoch 57/65
1/1 [=====] - 0s 48ms/step - loss: 0.6969 - acc: 0.51
16 - recall: 0.2759 - precision: 1.0000
Epoch 58/65
1/1 [=====] - 0s 46ms/step - loss: 0.6968 - acc: 0.44
19 - recall: 0.2414 - precision: 0.7778
Epoch 59/65
1/1 [=====] - 0s 47ms/step - loss: 0.6957 - acc: 0.44
19 - recall: 0.2414 - precision: 0.7778
Epoch 60/65
1/1 [=====] - 0s 47ms/step - loss: 0.6983 - acc: 0.41
86 - recall: 0.2069 - precision: 0.7500
Epoch 61/65
```

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1/1 [=====] - 0s 48ms/step - loss: 0.6939 - acc: 0.46
51 - recall: 0.2414 - precision: 0.8750
Epoch 62/65
1/1 [=====] - 0s 47ms/step - loss: 0.6961 - acc: 0.46
51 - recall: 0.2414 - precision: 0.8750
Epoch 63/65
1/1 [=====] - 0s 48ms/step - loss: 0.6976 - acc: 0.37
21 - recall: 0.1724 - precision: 0.6250
Epoch 64/65
1/1 [=====] - 0s 51ms/step - loss: 0.6960 - acc: 0.51
16 - recall: 0.2759 - precision: 1.0000
Epoch 65/65
1/1 [=====] - 0s 48ms/step - loss: 0.6986 - acc: 0.41
86 - recall: 0.1724 - precision: 0.8333
1/1 [=====] - 0s 202ms/step
2023-03-29 00:06:32.378890: I tensorflow/core/grappler/optimizers/custom_graph
_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
2/2 [=====] - 0s 141ms/step
Epoch 1/65
2023-03-29 00:06:33.211192: I tensorflow/core/grappler/optimizers/custom_graph
_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
```

```
1/1 [=====] - 1s 1s/step - loss: 0.7301 - acc: 0.5116
- recall: 0.5926 - precision: 0.6154
Epoch 2/65
1/1 [=====] - 0s 203ms/step - loss: 0.7295 - acc: 0.4
186 - recall: 0.3704 - precision: 0.5556
Epoch 3/65
1/1 [=====] - 0s 137ms/step - loss: 0.7284 - acc: 0.3
721 - recall: 0.2593 - precision: 0.5000
Epoch 4/65
1/1 [=====] - 0s 149ms/step - loss: 0.7260 - acc: 0.5
349 - recall: 0.3704 - precision: 0.7692
Epoch 5/65
1/1 [=====] - 0s 124ms/step - loss: 0.7287 - acc: 0.4
186 - recall: 0.2222 - precision: 0.6000
Epoch 6/65
1/1 [=====] - 0s 103ms/step - loss: 0.7281 - acc: 0.3
721 - recall: 0.1852 - precision: 0.5000
Epoch 7/65
1/1 [=====] - 0s 96ms/step - loss: 0.7269 - acc: 0.41
86 - recall: 0.1481 - precision: 0.6667
Epoch 8/65
1/1 [=====] - 0s 107ms/step - loss: 0.7276 - acc: 0.3
721 - recall: 0.1111 - precision: 0.5000
Epoch 9/65
1/1 [=====] - 0s 214ms/step - loss: 0.7226 - acc: 0.4
651 - recall: 0.1481 - precision: 1.0000
Epoch 10/65
1/1 [=====] - 0s 108ms/step - loss: 0.7251 - acc: 0.3
953 - recall: 0.0741 - precision: 0.6667
Epoch 11/65
1/1 [=====] - 0s 55ms/step - loss: 0.7242 - acc: 0.37
21 - recall: 0.0741 - precision: 0.5000
Epoch 12/65
1/1 [=====] - 0s 62ms/step - loss: 0.7248 - acc: 0.39
53 - recall: 0.0741 - precision: 0.6667
Epoch 13/65
1/1 [=====] - 0s 103ms/step - loss: 0.7253 - acc: 0.4
419 - recall: 0.1111 - precision: 1.0000
Epoch 14/65
1/1 [=====] - 0s 128ms/step - loss: 0.7254 - acc: 0.4
419 - recall: 0.1111 - precision: 1.0000
Epoch 15/65
1/1 [=====] - 0s 50ms/step - loss: 0.7268 - acc: 0.34
88 - recall: 0.0370 - precision: 0.3333
Epoch 16/65
1/1 [=====] - 0s 46ms/step - loss: 0.7237 - acc: 0.41
86 - recall: 0.0741 - precision: 1.0000
Epoch 17/65
1/1 [=====] - 0s 97ms/step - loss: 0.7298 - acc: 0.34
88 - recall: 0.0370 - precision: 0.3333
Epoch 18/65
1/1 [=====] - 0s 70ms/step - loss: 0.7238 - acc: 0.39
53 - recall: 0.0741 - precision: 0.6667
Epoch 19/65
1/1 [=====] - 0s 84ms/step - loss: 0.7277 - acc: 0.32
56 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 20/65
1/1 [=====] - 0s 135ms/step - loss: 0.7222 - acc: 0.3
953 - recall: 0.0370 - precision: 1.0000
Epoch 21/65
```

```
1/1 [=====] - 0s 47ms/step - loss: 0.7212 - acc: 0.41
86 - recall: 0.0741 - precision: 1.0000
Epoch 22/65
1/1 [=====] - 0s 48ms/step - loss: 0.7283 - acc: 0.37
21 - recall: 0.0370 - precision: 0.5000
Epoch 23/65
1/1 [=====] - 0s 50ms/step - loss: 0.7186 - acc: 0.41
86 - recall: 0.0741 - precision: 1.0000
Epoch 24/65
1/1 [=====] - 0s 47ms/step - loss: 0.7205 - acc: 0.39
53 - recall: 0.0370 - precision: 1.0000
Epoch 25/65
1/1 [=====] - 0s 85ms/step - loss: 0.7258 - acc: 0.34
88 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 26/65
1/1 [=====] - 0s 47ms/step - loss: 0.7217 - acc: 0.39
53 - recall: 0.0370 - precision: 1.0000
Epoch 27/65
1/1 [=====] - 0s 130ms/step - loss: 0.7229 - acc: 0.3
488 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 28/65
1/1 [=====] - 0s 48ms/step - loss: 0.7208 - acc: 0.39
53 - recall: 0.0370 - precision: 1.0000
Epoch 29/65
1/1 [=====] - 0s 47ms/step - loss: 0.7223 - acc: 0.39
53 - recall: 0.0370 - precision: 1.0000
Epoch 30/65
1/1 [=====] - 0s 47ms/step - loss: 0.7245 - acc: 0.34
88 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 31/65
1/1 [=====] - 0s 47ms/step - loss: 0.7238 - acc: 0.39
53 - recall: 0.0370 - precision: 1.0000
Epoch 32/65
1/1 [=====] - 0s 86ms/step - loss: 0.7246 - acc: 0.34
88 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 33/65
1/1 [=====] - 0s 90ms/step - loss: 0.7206 - acc: 0.39
53 - recall: 0.0370 - precision: 1.0000
Epoch 34/65
1/1 [=====] - 0s 47ms/step - loss: 0.7260 - acc: 0.34
88 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 35/65
1/1 [=====] - 0s 47ms/step - loss: 0.7190 - acc: 0.39
53 - recall: 0.0370 - precision: 1.0000
Epoch 36/65
1/1 [=====] - 0s 48ms/step - loss: 0.7194 - acc: 0.39
53 - recall: 0.0370 - precision: 1.0000
Epoch 37/65
1/1 [=====] - 0s 52ms/step - loss: 0.7245 - acc: 0.34
88 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 38/65
1/1 [=====] - 0s 47ms/step - loss: 0.7199 - acc: 0.39
53 - recall: 0.0370 - precision: 1.0000
Epoch 39/65
1/1 [=====] - 0s 48ms/step - loss: 0.7216 - acc: 0.34
88 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 40/65
1/1 [=====] - 0s 95ms/step - loss: 0.7218 - acc: 0.34
88 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 41/65
```

```
1/1 [=====] - 0s 47ms/step - loss: 0.7186 - acc: 0.39
53 - recall: 0.0370 - precision: 1.0000
Epoch 42/65
1/1 [=====] - 0s 48ms/step - loss: 0.7228 - acc: 0.39
53 - recall: 0.0370 - precision: 1.0000
Epoch 43/65
1/1 [=====] - 0s 48ms/step - loss: 0.7206 - acc: 0.34
88 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 44/65
1/1 [=====] - 0s 47ms/step - loss: 0.7202 - acc: 0.39
53 - recall: 0.0370 - precision: 1.0000
Epoch 45/65
1/1 [=====] - 0s 47ms/step - loss: 0.7187 - acc: 0.39
53 - recall: 0.0370 - precision: 1.0000
Epoch 46/65
1/1 [=====] - 0s 47ms/step - loss: 0.7203 - acc: 0.39
53 - recall: 0.0370 - precision: 1.0000
Epoch 47/65
1/1 [=====] - 0s 48ms/step - loss: 0.7180 - acc: 0.37
21 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 48/65
1/1 [=====] - 0s 47ms/step - loss: 0.7200 - acc: 0.39
53 - recall: 0.0370 - precision: 1.0000
Epoch 49/65
1/1 [=====] - 0s 48ms/step - loss: 0.7155 - acc: 0.39
53 - recall: 0.0370 - precision: 1.0000
Epoch 50/65
1/1 [=====] - 0s 48ms/step - loss: 0.7194 - acc: 0.34
88 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 51/65
1/1 [=====] - 0s 48ms/step - loss: 0.7168 - acc: 0.39
53 - recall: 0.0370 - precision: 1.0000
Epoch 52/65
1/1 [=====] - 0s 47ms/step - loss: 0.7157 - acc: 0.39
53 - recall: 0.0370 - precision: 1.0000
Epoch 53/65
1/1 [=====] - 0s 48ms/step - loss: 0.7153 - acc: 0.39
53 - recall: 0.0370 - precision: 1.0000
Epoch 54/65
1/1 [=====] - 0s 47ms/step - loss: 0.7224 - acc: 0.34
88 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 55/65
1/1 [=====] - 0s 47ms/step - loss: 0.7199 - acc: 0.39
53 - recall: 0.0370 - precision: 1.0000
Epoch 56/65
1/1 [=====] - 0s 47ms/step - loss: 0.7213 - acc: 0.39
53 - recall: 0.0370 - precision: 1.0000
Epoch 57/65
1/1 [=====] - 0s 47ms/step - loss: 0.7192 - acc: 0.39
53 - recall: 0.0370 - precision: 1.0000
Epoch 58/65
1/1 [=====] - 0s 46ms/step - loss: 0.7190 - acc: 0.39
53 - recall: 0.0370 - precision: 1.0000
Epoch 59/65
1/1 [=====] - 0s 49ms/step - loss: 0.7194 - acc: 0.39
53 - recall: 0.0370 - precision: 1.0000
Epoch 60/65
1/1 [=====] - 0s 47ms/step - loss: 0.7194 - acc: 0.34
88 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 61/65
```

```
1/1 [=====] - 0s 47ms/step - loss: 0.7213 - acc: 0.39
53 - recall: 0.0370 - precision: 1.0000
Epoch 62/65
1/1 [=====] - 0s 49ms/step - loss: 0.7173 - acc: 0.39
53 - recall: 0.0370 - precision: 1.0000
Epoch 63/65
1/1 [=====] - 0s 47ms/step - loss: 0.7198 - acc: 0.34
88 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 64/65
1/1 [=====] - 0s 47ms/step - loss: 0.7176 - acc: 0.39
53 - recall: 0.0370 - precision: 1.0000
Epoch 65/65
1/1 [=====] - 0s 49ms/step - loss: 0.7236 - acc: 0.34
88 - recall: 0.0000e+00 - precision: 0.0000e+00
2023-03-29 00:06:38.816104: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
1/1 [=====] - 0s 294ms/step
2/2 [=====] - 0s 178ms/step
Epoch 1/90
2023-03-29 00:06:40.454880: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
```

```
1/1 [=====] - 2s 2s/step - loss: 0.6445 - acc: 0.5714
- recall: 0.6250 - precision: 0.7692
Epoch 2/90
1/1 [=====] - 0s 198ms/step - loss: 0.6453 - acc: 0.7
143 - recall: 0.9375 - precision: 0.7500
Epoch 3/90
1/1 [=====] - 0s 198ms/step - loss: 0.6149 - acc: 0.7
381 - recall: 0.9688 - precision: 0.7561
Epoch 4/90
1/1 [=====] - 0s 124ms/step - loss: 0.6123 - acc: 0.7
619 - recall: 0.9375 - precision: 0.7895
Epoch 5/90
1/1 [=====] - 0s 116ms/step - loss: 0.6376 - acc: 0.6
905 - recall: 0.8750 - precision: 0.7568
Epoch 6/90
1/1 [=====] - 0s 247ms/step - loss: 0.6622 - acc: 0.6
667 - recall: 0.8438 - precision: 0.7500
Epoch 7/90
1/1 [=====] - 0s 119ms/step - loss: 0.6381 - acc: 0.6
905 - recall: 0.8438 - precision: 0.7714
Epoch 8/90
1/1 [=====] - 0s 70ms/step - loss: 0.6485 - acc: 0.64
29 - recall: 0.8438 - precision: 0.7297
Epoch 9/90
1/1 [=====] - 0s 151ms/step - loss: 0.6422 - acc: 0.6
905 - recall: 0.9062 - precision: 0.7436
Epoch 10/90
1/1 [=====] - 0s 63ms/step - loss: 0.6384 - acc: 0.76
19 - recall: 0.9688 - precision: 0.7750
Epoch 11/90
1/1 [=====] - 0s 56ms/step - loss: 0.6434 - acc: 0.71
43 - recall: 0.9375 - precision: 0.7500
Epoch 12/90
1/1 [=====] - 0s 192ms/step - loss: 0.6231 - acc: 0.7
381 - recall: 0.9688 - precision: 0.7561
Epoch 13/90
1/1 [=====] - 0s 105ms/step - loss: 0.6297 - acc: 0.7
143 - recall: 0.9375 - precision: 0.7500
Epoch 14/90
1/1 [=====] - 0s 49ms/step - loss: 0.6454 - acc: 0.73
81 - recall: 0.9688 - precision: 0.7561
Epoch 15/90
1/1 [=====] - 0s 51ms/step - loss: 0.6211 - acc: 0.73
81 - recall: 0.9688 - precision: 0.7561
Epoch 16/90
1/1 [=====] - 0s 50ms/step - loss: 0.6163 - acc: 0.71
43 - recall: 0.9375 - precision: 0.7500
Epoch 17/90
1/1 [=====] - 0s 108ms/step - loss: 0.6033 - acc: 0.7
619 - recall: 0.9375 - precision: 0.7895
Epoch 18/90
1/1 [=====] - 0s 117ms/step - loss: 0.5842 - acc: 0.7
857 - recall: 0.8750 - precision: 0.8485
Epoch 19/90
1/1 [=====] - 0s 53ms/step - loss: 0.5381 - acc: 0.80
95 - recall: 0.9062 - precision: 0.8529
Epoch 20/90
1/1 [=====] - 0s 65ms/step - loss: 0.4966 - acc: 0.83
33 - recall: 0.9062 - precision: 0.8788
Epoch 21/90
```

```
1/1 [=====] - 0s 47ms/step - loss: 0.5143 - acc: 0.78
57 - recall: 0.8125 - precision: 0.8966
Epoch 22/90
1/1 [=====] - 0s 141ms/step - loss: 0.4754 - acc: 0.8
333 - recall: 0.8438 - precision: 0.9310
Epoch 23/90
1/1 [=====] - 0s 49ms/step - loss: 0.4500 - acc: 0.78
57 - recall: 0.7812 - precision: 0.9259
Epoch 24/90
1/1 [=====] - 0s 140ms/step - loss: 0.4689 - acc: 0.7
619 - recall: 0.7188 - precision: 0.9583
Epoch 25/90
1/1 [=====] - 0s 96ms/step - loss: 0.3648 - acc: 0.83
33 - recall: 0.8438 - precision: 0.9310
Epoch 26/90
1/1 [=====] - 0s 49ms/step - loss: 0.5167 - acc: 0.80
95 - recall: 0.8750 - precision: 0.8750
Epoch 27/90
1/1 [=====] - 0s 47ms/step - loss: 0.4105 - acc: 0.80
95 - recall: 0.8438 - precision: 0.9000
Epoch 28/90
1/1 [=====] - 0s 49ms/step - loss: 0.3717 - acc: 0.83
33 - recall: 0.8438 - precision: 0.9310
Epoch 29/90
1/1 [=====] - 0s 135ms/step - loss: 0.3496 - acc: 0.8
810 - recall: 0.8438 - precision: 1.0000
Epoch 30/90
1/1 [=====] - 0s 48ms/step - loss: 0.3251 - acc: 0.88
10 - recall: 0.8438 - precision: 1.0000
Epoch 31/90
1/1 [=====] - 0s 46ms/step - loss: 0.2898 - acc: 0.88
10 - recall: 0.8750 - precision: 0.9655
Epoch 32/90
1/1 [=====] - 0s 49ms/step - loss: 0.3161 - acc: 0.85
71 - recall: 0.8750 - precision: 0.9333
Epoch 33/90
1/1 [=====] - 0s 54ms/step - loss: 0.2969 - acc: 0.90
48 - recall: 0.9062 - precision: 0.9667
Epoch 34/90
1/1 [=====] - 0s 48ms/step - loss: 0.3894 - acc: 0.85
71 - recall: 0.8438 - precision: 0.9643
Epoch 35/90
1/1 [=====] - 0s 48ms/step - loss: 0.2785 - acc: 0.88
10 - recall: 0.8438 - precision: 1.0000
Epoch 36/90
1/1 [=====] - 0s 47ms/step - loss: 0.2922 - acc: 0.88
10 - recall: 0.8750 - precision: 0.9655
Epoch 37/90
1/1 [=====] - 0s 47ms/step - loss: 0.2516 - acc: 0.90
48 - recall: 0.8750 - precision: 1.0000
Epoch 38/90
1/1 [=====] - 0s 50ms/step - loss: 0.1960 - acc: 0.90
48 - recall: 0.8750 - precision: 1.0000
Epoch 39/90
1/1 [=====] - 0s 48ms/step - loss: 0.1915 - acc: 0.90
48 - recall: 0.9062 - precision: 0.9667
Epoch 40/90
1/1 [=====] - 0s 47ms/step - loss: 0.1537 - acc: 0.92
86 - recall: 0.9062 - precision: 1.0000
Epoch 41/90
```

```
1/1 [=====] - 0s 48ms/step - loss: 0.1797 - acc: 0.92
86 - recall: 0.9062 - precision: 1.0000
Epoch 42/90
1/1 [=====] - 0s 48ms/step - loss: 0.1743 - acc: 0.92
86 - recall: 0.9062 - precision: 1.0000
Epoch 43/90
1/1 [=====] - 0s 46ms/step - loss: 0.1158 - acc: 0.95
24 - recall: 0.9375 - precision: 1.0000
Epoch 44/90
1/1 [=====] - 0s 47ms/step - loss: 0.1219 - acc: 0.95
24 - recall: 0.9375 - precision: 1.0000
Epoch 45/90
1/1 [=====] - 0s 47ms/step - loss: 0.2123 - acc: 0.90
48 - recall: 0.9062 - precision: 0.9667
Epoch 46/90
1/1 [=====] - 0s 48ms/step - loss: 0.1422 - acc: 0.95
24 - recall: 0.9688 - precision: 0.9688
Epoch 47/90
1/1 [=====] - 0s 51ms/step - loss: 0.0948 - acc: 0.95
24 - recall: 0.9375 - precision: 1.0000
Epoch 48/90
1/1 [=====] - 0s 47ms/step - loss: 0.0461 - acc: 0.97
62 - recall: 0.9688 - precision: 1.0000
Epoch 49/90
1/1 [=====] - 0s 48ms/step - loss: 0.1219 - acc: 0.95
24 - recall: 0.9688 - precision: 0.9688
Epoch 50/90
1/1 [=====] - 0s 47ms/step - loss: 0.0384 - acc: 0.97
62 - recall: 0.9688 - precision: 1.0000
Epoch 51/90
1/1 [=====] - 0s 47ms/step - loss: 0.0450 - acc: 0.95
24 - recall: 0.9375 - precision: 1.0000
Epoch 52/90
1/1 [=====] - 0s 48ms/step - loss: 0.1543 - acc: 0.92
86 - recall: 0.9375 - precision: 0.9677
Epoch 53/90
1/1 [=====] - 0s 48ms/step - loss: 0.0936 - acc: 0.95
24 - recall: 0.9375 - precision: 1.0000
Epoch 54/90
1/1 [=====] - 0s 47ms/step - loss: 0.1439 - acc: 0.95
24 - recall: 0.9688 - precision: 0.9688
Epoch 55/90
1/1 [=====] - 0s 46ms/step - loss: 0.1042 - acc: 0.95
24 - recall: 0.9375 - precision: 1.0000
Epoch 56/90
1/1 [=====] - 0s 46ms/step - loss: 0.1424 - acc: 0.92
86 - recall: 0.9062 - precision: 1.0000
Epoch 57/90
1/1 [=====] - 0s 46ms/step - loss: 0.1262 - acc: 0.90
48 - recall: 0.8750 - precision: 1.0000
Epoch 58/90
1/1 [=====] - 0s 47ms/step - loss: 0.0477 - acc: 0.97
62 - recall: 0.9688 - precision: 1.0000
Epoch 59/90
1/1 [=====] - 0s 47ms/step - loss: 0.1114 - acc: 0.92
86 - recall: 0.9375 - precision: 0.9677
Epoch 60/90
1/1 [=====] - 0s 47ms/step - loss: 0.0833 - acc: 0.97
62 - recall: 1.0000 - precision: 0.9697
Epoch 61/90
```

```
1/1 [=====] - 0s 47ms/step - loss: 0.0349 - acc: 1.00  
00 - recall: 1.0000 - precision: 1.0000  
Epoch 62/90  
1/1 [=====] - 0s 46ms/step - loss: 0.0300 - acc: 1.00  
00 - recall: 1.0000 - precision: 1.0000  
Epoch 63/90  
1/1 [=====] - 0s 47ms/step - loss: 0.0370 - acc: 0.97  
62 - recall: 0.9688 - precision: 1.0000  
Epoch 64/90  
1/1 [=====] - 0s 47ms/step - loss: 0.0357 - acc: 0.97  
62 - recall: 0.9688 - precision: 1.0000  
Epoch 65/90  
1/1 [=====] - 0s 48ms/step - loss: 0.0232 - acc: 0.97  
62 - recall: 0.9688 - precision: 1.0000  
Epoch 66/90  
1/1 [=====] - 0s 47ms/step - loss: 0.1036 - acc: 0.97  
62 - recall: 1.0000 - precision: 0.9697  
Epoch 67/90  
1/1 [=====] - 0s 47ms/step - loss: 0.0038 - acc: 1.00  
00 - recall: 1.0000 - precision: 1.0000  
Epoch 68/90  
1/1 [=====] - 0s 47ms/step - loss: 0.0278 - acc: 0.97  
62 - recall: 0.9688 - precision: 1.0000  
Epoch 69/90  
1/1 [=====] - 0s 47ms/step - loss: 0.0213 - acc: 1.00  
00 - recall: 1.0000 - precision: 1.0000  
Epoch 70/90  
1/1 [=====] - 0s 47ms/step - loss: 0.0333 - acc: 0.97  
62 - recall: 0.9688 - precision: 1.0000  
Epoch 71/90  
1/1 [=====] - 0s 48ms/step - loss: 0.0093 - acc: 1.00  
00 - recall: 1.0000 - precision: 1.0000  
Epoch 72/90  
1/1 [=====] - 0s 47ms/step - loss: 0.0055 - acc: 1.00  
00 - recall: 1.0000 - precision: 1.0000  
Epoch 73/90  
1/1 [=====] - 0s 46ms/step - loss: 0.0097 - acc: 1.00  
00 - recall: 1.0000 - precision: 1.0000  
Epoch 74/90  
1/1 [=====] - 0s 47ms/step - loss: 0.0195 - acc: 1.00  
00 - recall: 1.0000 - precision: 1.0000  
Epoch 75/90  
1/1 [=====] - 0s 48ms/step - loss: 0.0039 - acc: 1.00  
00 - recall: 1.0000 - precision: 1.0000  
Epoch 76/90  
1/1 [=====] - 0s 47ms/step - loss: 0.0014 - acc: 1.00  
00 - recall: 1.0000 - precision: 1.0000  
Epoch 77/90  
1/1 [=====] - 0s 156ms/step - loss: 0.0022 - acc: 1.00  
000 - recall: 1.0000 - precision: 1.0000  
Epoch 78/90  
1/1 [=====] - 0s 47ms/step - loss: 0.0044 - acc: 1.00  
00 - recall: 1.0000 - precision: 1.0000  
Epoch 79/90  
1/1 [=====] - 0s 47ms/step - loss: 0.0032 - acc: 1.00  
00 - recall: 1.0000 - precision: 1.0000  
Epoch 80/90  
1/1 [=====] - 0s 46ms/step - loss: 0.0029 - acc: 1.00  
00 - recall: 1.0000 - precision: 1.0000  
Epoch 81/90
```

```
1/1 [=====] - 0s 47ms/step - loss: 0.0045 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 82/90
1/1 [=====] - 0s 47ms/step - loss: 0.0039 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 83/90
1/1 [=====] - 0s 47ms/step - loss: 6.6283e-04 - acc:
1.0000 - recall: 1.0000 - precision: 1.0000
Epoch 84/90
1/1 [=====] - 0s 48ms/step - loss: 5.0111e-04 - acc:
1.0000 - recall: 1.0000 - precision: 1.0000
Epoch 85/90
1/1 [=====] - 0s 49ms/step - loss: 1.5600e-04 - acc:
1.0000 - recall: 1.0000 - precision: 1.0000
Epoch 86/90
1/1 [=====] - 0s 48ms/step - loss: 3.2815e-04 - acc:
1.0000 - recall: 1.0000 - precision: 1.0000
Epoch 87/90
1/1 [=====] - 0s 47ms/step - loss: 0.0027 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 88/90
1/1 [=====] - 0s 47ms/step - loss: 9.3708e-05 - acc:
1.0000 - recall: 1.0000 - precision: 1.0000
Epoch 89/90
1/1 [=====] - 0s 47ms/step - loss: 0.0014 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 90/90
1/1 [=====] - 0s 47ms/step - loss: 9.0167e-05 - acc:
1.0000 - recall: 1.0000 - precision: 1.0000
2023-03-29 00:06:47.597964: I tensorflow/core/grappler/optimizers/custom_graph_
_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
1/1 [=====] - 0s 267ms/step
2/2 [=====] - 0s 130ms/step
Epoch 1/90
2023-03-29 00:06:48.566605: I tensorflow/core/grappler/optimizers/custom_graph_
_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
```

```
1/1 [=====] - 1s 1s/step - loss: 0.6995 - acc: 0.6279
- recall: 0.6897 - precision: 0.7407
Epoch 2/90
1/1 [=====] - 0s 201ms/step - loss: 0.7068 - acc: 0.3
721 - recall: 0.2414 - precision: 0.5833
Epoch 3/90
1/1 [=====] - 0s 112ms/step - loss: 0.7043 - acc: 0.2
791 - recall: 0.0345 - precision: 0.2500
Epoch 4/90
1/1 [=====] - 0s 337ms/step - loss: 0.6984 - acc: 0.3
488 - recall: 0.0690 - precision: 0.6667
Epoch 5/90
1/1 [=====] - 0s 210ms/step - loss: 0.6933 - acc: 0.3
721 - recall: 0.0690 - precision: 1.0000
Epoch 6/90
1/1 [=====] - 0s 122ms/step - loss: 0.6937 - acc: 0.4
419 - recall: 0.1724 - precision: 1.0000
Epoch 7/90
1/1 [=====] - 0s 201ms/step - loss: 0.6873 - acc: 0.3
953 - recall: 0.1379 - precision: 0.8000
Epoch 8/90
1/1 [=====] - 0s 165ms/step - loss: 0.7153 - acc: 0.4
884 - recall: 0.4483 - precision: 0.6842
Epoch 9/90
1/1 [=====] - 0s 55ms/step - loss: 0.6991 - acc: 0.58
14 - recall: 0.5862 - precision: 0.7391
Epoch 10/90
1/1 [=====] - 0s 130ms/step - loss: 0.6967 - acc: 0.4
884 - recall: 0.4138 - precision: 0.7059
Epoch 11/90
1/1 [=====] - 0s 55ms/step - loss: 0.6792 - acc: 0.53
49 - recall: 0.3793 - precision: 0.8462
Epoch 12/90
1/1 [=====] - 0s 67ms/step - loss: 0.6757 - acc: 0.48
84 - recall: 0.2759 - precision: 0.8889
Epoch 13/90
1/1 [=====] - 0s 55ms/step - loss: 0.6696 - acc: 0.44
19 - recall: 0.2069 - precision: 0.8571
Epoch 14/90
1/1 [=====] - 0s 140ms/step - loss: 0.6753 - acc: 0.5
349 - recall: 0.3448 - precision: 0.9091
Epoch 15/90
1/1 [=====] - 0s 52ms/step - loss: 0.6766 - acc: 0.46
51 - recall: 0.3103 - precision: 0.7500
Epoch 16/90
1/1 [=====] - 0s 66ms/step - loss: 0.6283 - acc: 0.67
44 - recall: 0.5862 - precision: 0.8947
Epoch 17/90
1/1 [=====] - 0s 98ms/step - loss: 0.5990 - acc: 0.79
07 - recall: 0.7586 - precision: 0.9167
Epoch 18/90
1/1 [=====] - 0s 51ms/step - loss: 0.5604 - acc: 0.79
07 - recall: 0.7241 - precision: 0.9545
Epoch 19/90
1/1 [=====] - 0s 51ms/step - loss: 0.5775 - acc: 0.74
42 - recall: 0.7241 - precision: 0.8750
Epoch 20/90
1/1 [=====] - 0s 78ms/step - loss: 0.5880 - acc: 0.67
44 - recall: 0.6897 - precision: 0.8000
Epoch 21/90
```

```
1/1 [=====] - 0s 98ms/step - loss: 0.4404 - acc: 0.79
07 - recall: 0.7241 - precision: 0.9545
Epoch 22/90
1/1 [=====] - 0s 48ms/step - loss: 0.4698 - acc: 0.72
09 - recall: 0.6897 - precision: 0.8696
Epoch 23/90
1/1 [=====] - 0s 49ms/step - loss: 0.4836 - acc: 0.81
40 - recall: 0.7586 - precision: 0.9565
Epoch 24/90
1/1 [=====] - 0s 50ms/step - loss: 0.4522 - acc: 0.83
72 - recall: 0.8276 - precision: 0.9231
Epoch 25/90
1/1 [=====] - 0s 54ms/step - loss: 0.3890 - acc: 0.88
37 - recall: 0.8966 - precision: 0.9286
Epoch 26/90
1/1 [=====] - 0s 72ms/step - loss: 0.2823 - acc: 0.93
02 - recall: 0.9310 - precision: 0.9643
Epoch 27/90
1/1 [=====] - 0s 48ms/step - loss: 0.3110 - acc: 0.86
05 - recall: 0.7931 - precision: 1.0000
Epoch 28/90
1/1 [=====] - 0s 87ms/step - loss: 0.3122 - acc: 0.83
72 - recall: 0.8966 - precision: 0.8667
Epoch 29/90
1/1 [=====] - 0s 51ms/step - loss: 0.2320 - acc: 0.88
37 - recall: 0.8966 - precision: 0.9286
Epoch 30/90
1/1 [=====] - 0s 49ms/step - loss: 0.2808 - acc: 0.88
37 - recall: 0.8966 - precision: 0.9286
Epoch 31/90
1/1 [=====] - 0s 62ms/step - loss: 0.2375 - acc: 0.88
37 - recall: 0.8276 - precision: 1.0000
Epoch 32/90
1/1 [=====] - 0s 48ms/step - loss: 0.1884 - acc: 0.90
70 - recall: 0.8621 - precision: 1.0000
Epoch 33/90
1/1 [=====] - 0s 48ms/step - loss: 0.1812 - acc: 0.93
02 - recall: 0.9655 - precision: 0.9333
Epoch 34/90
1/1 [=====] - 0s 50ms/step - loss: 0.1307 - acc: 0.95
35 - recall: 0.9310 - precision: 1.0000
Epoch 35/90
1/1 [=====] - 0s 49ms/step - loss: 0.1096 - acc: 0.95
35 - recall: 0.9655 - precision: 0.9655
Epoch 36/90
1/1 [=====] - 0s 50ms/step - loss: 0.0883 - acc: 0.93
02 - recall: 0.8966 - precision: 1.0000
Epoch 37/90
1/1 [=====] - 0s 48ms/step - loss: 0.0781 - acc: 0.95
35 - recall: 0.9310 - precision: 1.0000
Epoch 38/90
1/1 [=====] - 0s 48ms/step - loss: 0.1090 - acc: 0.95
35 - recall: 1.0000 - precision: 0.9355
Epoch 39/90
1/1 [=====] - 0s 64ms/step - loss: 0.0636 - acc: 0.95
35 - recall: 0.9310 - precision: 1.0000
Epoch 40/90
1/1 [=====] - 0s 49ms/step - loss: 0.0652 - acc: 0.97
67 - recall: 0.9655 - precision: 1.0000
Epoch 41/90
```

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1/1 [=====] - 0s 88ms/step - loss: 0.1130 - acc: 0.95
35 - recall: 1.0000 - precision: 0.9355
Epoch 42/90
1/1 [=====] - 0s 94ms/step - loss: 0.1356 - acc: 0.95
35 - recall: 0.9310 - precision: 1.0000
Epoch 43/90
1/1 [=====] - 0s 146ms/step - loss: 0.2451 - acc: 0.9
302 - recall: 0.8966 - precision: 1.0000
Epoch 44/90
1/1 [=====] - 0s 55ms/step - loss: 0.1171 - acc: 0.90
70 - recall: 0.8966 - precision: 0.9630
Epoch 45/90
1/1 [=====] - 0s 49ms/step - loss: 0.0800 - acc: 0.95
35 - recall: 0.9655 - precision: 0.9655
Epoch 46/90
1/1 [=====] - 0s 50ms/step - loss: 0.1250 - acc: 0.97
67 - recall: 1.0000 - precision: 0.9667
Epoch 47/90
1/1 [=====] - 0s 49ms/step - loss: 0.1972 - acc: 0.97
67 - recall: 1.0000 - precision: 0.9667
Epoch 48/90
1/1 [=====] - 0s 49ms/step - loss: 0.1287 - acc: 0.95
35 - recall: 0.9310 - precision: 1.0000
Epoch 49/90
1/1 [=====] - 0s 51ms/step - loss: 0.1484 - acc: 0.93
02 - recall: 0.8966 - precision: 1.0000
Epoch 50/90
1/1 [=====] - 0s 48ms/step - loss: 0.1190 - acc: 0.93
02 - recall: 0.8966 - precision: 1.0000
Epoch 51/90
1/1 [=====] - 0s 146ms/step - loss: 0.0772 - acc: 0.9
535 - recall: 0.9310 - precision: 1.0000
Epoch 52/90
1/1 [=====] - 0s 49ms/step - loss: 0.1384 - acc: 0.93
02 - recall: 0.8966 - precision: 1.0000
Epoch 53/90
1/1 [=====] - 0s 48ms/step - loss: 0.0931 - acc: 0.97
67 - recall: 0.9655 - precision: 1.0000
Epoch 54/90
1/1 [=====] - 0s 48ms/step - loss: 0.0653 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 55/90
1/1 [=====] - 0s 48ms/step - loss: 0.0571 - acc: 0.97
67 - recall: 0.9655 - precision: 1.0000
Epoch 56/90
1/1 [=====] - 0s 49ms/step - loss: 0.0752 - acc: 0.95
35 - recall: 0.9310 - precision: 1.0000
Epoch 57/90
1/1 [=====] - 0s 48ms/step - loss: 0.0392 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 58/90
1/1 [=====] - 0s 49ms/step - loss: 0.0439 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 59/90
1/1 [=====] - 0s 49ms/step - loss: 0.0276 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 60/90
1/1 [=====] - 0s 50ms/step - loss: 0.0933 - acc: 0.97
67 - recall: 1.0000 - precision: 0.9667
Epoch 61/90
```

```
1/1 [=====] - 0s 49ms/step - loss: 0.0487 - acc: 0.95
35 - recall: 0.9310 - precision: 1.0000
Epoch 62/90
1/1 [=====] - 0s 49ms/step - loss: 0.0305 - acc: 0.97
67 - recall: 0.9655 - precision: 1.0000
Epoch 63/90
1/1 [=====] - 0s 49ms/step - loss: 0.0335 - acc: 0.95
35 - recall: 0.9310 - precision: 1.0000
Epoch 64/90
1/1 [=====] - 0s 49ms/step - loss: 0.0042 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 65/90
1/1 [=====] - 0s 49ms/step - loss: 0.0350 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 66/90
1/1 [=====] - 0s 48ms/step - loss: 0.0044 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 67/90
1/1 [=====] - 0s 49ms/step - loss: 0.0328 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 68/90
1/1 [=====] - 0s 48ms/step - loss: 8.2155e-04 - acc:
1.0000 - recall: 1.0000 - precision: 1.0000
Epoch 69/90
1/1 [=====] - 0s 48ms/step - loss: 0.0036 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 70/90
1/1 [=====] - 0s 48ms/step - loss: 0.0012 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 71/90
1/1 [=====] - 0s 49ms/step - loss: 0.0113 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 72/90
1/1 [=====] - 0s 50ms/step - loss: 0.0151 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 73/90
1/1 [=====] - 0s 50ms/step - loss: 0.0232 - acc: 0.97
67 - recall: 0.9655 - precision: 1.0000
Epoch 74/90
1/1 [=====] - 0s 49ms/step - loss: 5.6728e-05 - acc:
1.0000 - recall: 1.0000 - precision: 1.0000
Epoch 75/90
1/1 [=====] - 0s 48ms/step - loss: 0.0093 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 76/90
1/1 [=====] - 0s 50ms/step - loss: 0.0367 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 77/90
1/1 [=====] - 0s 49ms/step - loss: 2.9424e-04 - acc:
1.0000 - recall: 1.0000 - precision: 1.0000
Epoch 78/90
1/1 [=====] - 0s 53ms/step - loss: 2.4593e-04 - acc:
1.0000 - recall: 1.0000 - precision: 1.0000
Epoch 79/90
1/1 [=====] - 0s 51ms/step - loss: 0.0021 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 80/90
1/1 [=====] - 0s 51ms/step - loss: 3.8781e-04 - acc:
1.0000 - recall: 1.0000 - precision: 1.0000
Epoch 81/90
```

```
1/1 [=====] - 0s 52ms/step - loss: 0.0407 - acc: 0.97
67 - recall: 0.9655 - precision: 1.0000
Epoch 82/90
1/1 [=====] - 0s 54ms/step - loss: 0.0025 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 83/90
1/1 [=====] - 0s 56ms/step - loss: 0.0073 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 84/90
1/1 [=====] - 0s 56ms/step - loss: 6.0708e-04 - acc:
1.0000 - recall: 1.0000 - precision: 1.0000
Epoch 85/90
1/1 [=====] - 0s 59ms/step - loss: 9.9551e-05 - acc:
1.0000 - recall: 1.0000 - precision: 1.0000
Epoch 86/90
1/1 [=====] - 0s 56ms/step - loss: 2.3119e-04 - acc:
1.0000 - recall: 1.0000 - precision: 1.0000
Epoch 87/90
1/1 [=====] - 0s 59ms/step - loss: 0.0014 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 88/90
1/1 [=====] - 0s 59ms/step - loss: 0.0149 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 89/90
1/1 [=====] - 0s 61ms/step - loss: 7.4923e-05 - acc:
1.0000 - recall: 1.0000 - precision: 1.0000
Epoch 90/90
1/1 [=====] - 0s 58ms/step - loss: 1.9711e-04 - acc:
1.0000 - recall: 1.0000 - precision: 1.0000
2023-03-29 00:06:56.016017: I tensorflow/core/grappler/optimizers/custom_graph_
_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
1/1 [=====] - 0s 281ms/step
2/2 [=====] - 0s 180ms/step
Epoch 1/90
2023-03-29 00:06:57.029471: I tensorflow/core/grappler/optimizers/custom_graph_
_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
```

```
1/1 [=====] - 2s 2s/step - loss: 0.7304 - acc: 0.3953
- recall: 0.4444 - precision: 0.5217
Epoch 2/90
1/1 [=====] - 0s 184ms/step - loss: 0.7197 - acc: 0.4
186 - recall: 0.0741 - precision: 1.0000
Epoch 3/90
1/1 [=====] - 0s 111ms/step - loss: 0.7311 - acc: 0.3
488 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 4/90
1/1 [=====] - 0s 234ms/step - loss: 0.7228 - acc: 0.3
953 - recall: 0.0741 - precision: 0.6667
Epoch 5/90
1/1 [=====] - 0s 130ms/step - loss: 0.7286 - acc: 0.3
953 - recall: 0.0370 - precision: 1.0000
Epoch 6/90
1/1 [=====] - 0s 137ms/step - loss: 0.7442 - acc: 0.3
953 - recall: 0.0370 - precision: 1.0000
Epoch 7/90
1/1 [=====] - 0s 133ms/step - loss: 0.7145 - acc: 0.3
488 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 8/90
1/1 [=====] - 0s 192ms/step - loss: 0.7125 - acc: 0.3
488 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 9/90
1/1 [=====] - 0s 56ms/step - loss: 0.7098 - acc: 0.39
53 - recall: 0.0370 - precision: 1.0000
Epoch 10/90
1/1 [=====] - 0s 118ms/step - loss: 0.7025 - acc: 0.3
953 - recall: 0.0370 - precision: 1.0000
Epoch 11/90
1/1 [=====] - 0s 91ms/step - loss: 0.6996 - acc: 0.34
88 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 12/90
1/1 [=====] - 0s 179ms/step - loss: 0.6771 - acc: 0.3
721 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 13/90
1/1 [=====] - 0s 51ms/step - loss: 0.6639 - acc: 0.37
21 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 14/90
1/1 [=====] - 0s 97ms/step - loss: 0.6513 - acc: 0.37
21 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 15/90
1/1 [=====] - 0s 199ms/step - loss: 0.6362 - acc: 0.3
953 - recall: 0.0370 - precision: 1.0000
Epoch 16/90
1/1 [=====] - 0s 215ms/step - loss: 0.6099 - acc: 0.5
349 - recall: 0.2963 - precision: 0.8889
Epoch 17/90
1/1 [=====] - 0s 92ms/step - loss: 0.5634 - acc: 0.74
42 - recall: 0.6296 - precision: 0.9444
Epoch 18/90
1/1 [=====] - 0s 62ms/step - loss: 0.5777 - acc: 0.74
42 - recall: 0.6667 - precision: 0.9000
Epoch 19/90
1/1 [=====] - 0s 50ms/step - loss: 0.5331 - acc: 0.76
74 - recall: 0.7037 - precision: 0.9048
Epoch 20/90
1/1 [=====] - 0s 48ms/step - loss: 0.5108 - acc: 0.79
07 - recall: 0.7037 - precision: 0.9500
Epoch 21/90
```

```
1/1 [=====] - 0s 49ms/step - loss: 0.4518 - acc: 0.76  
74 - recall: 0.7037 - precision: 0.9048  
Epoch 22/90  
1/1 [=====] - 0s 50ms/step - loss: 0.4127 - acc: 0.79  
07 - recall: 0.7037 - precision: 0.9500  
Epoch 23/90  
1/1 [=====] - 0s 89ms/step - loss: 0.4252 - acc: 0.81  
40 - recall: 0.8148 - precision: 0.8800  
Epoch 24/90  
1/1 [=====] - 0s 50ms/step - loss: 0.3363 - acc: 0.81  
40 - recall: 0.7407 - precision: 0.9524  
Epoch 25/90  
1/1 [=====] - 0s 93ms/step - loss: 0.3611 - acc: 0.81  
40 - recall: 0.7778 - precision: 0.9130  
Epoch 26/90  
1/1 [=====] - 0s 176ms/step - loss: 0.3472 - acc: 0.8  
605 - recall: 0.9259 - precision: 0.8621  
Epoch 27/90  
1/1 [=====] - 0s 47ms/step - loss: 0.2649 - acc: 0.93  
02 - recall: 0.9630 - precision: 0.9286  
Epoch 28/90  
1/1 [=====] - 0s 62ms/step - loss: 0.3324 - acc: 0.83  
72 - recall: 0.7778 - precision: 0.9545  
Epoch 29/90  
1/1 [=====] - 0s 47ms/step - loss: 0.3435 - acc: 0.81  
40 - recall: 0.7407 - precision: 0.9524  
Epoch 30/90  
1/1 [=====] - 0s 48ms/step - loss: 0.1751 - acc: 0.90  
70 - recall: 0.8519 - precision: 1.0000  
Epoch 31/90  
1/1 [=====] - 0s 51ms/step - loss: 0.2591 - acc: 0.90  
70 - recall: 0.9630 - precision: 0.8966  
Epoch 32/90  
1/1 [=====] - 0s 47ms/step - loss: 0.2369 - acc: 0.93  
02 - recall: 0.9630 - precision: 0.9286  
Epoch 33/90  
1/1 [=====] - 0s 47ms/step - loss: 0.1568 - acc: 0.97  
67 - recall: 0.9630 - precision: 1.0000  
Epoch 34/90  
1/1 [=====] - 0s 47ms/step - loss: 0.1367 - acc: 0.93  
02 - recall: 0.8889 - precision: 1.0000  
Epoch 35/90  
1/1 [=====] - 0s 48ms/step - loss: 0.1014 - acc: 0.95  
35 - recall: 0.9630 - precision: 0.9630  
Epoch 36/90  
1/1 [=====] - 0s 47ms/step - loss: 0.0809 - acc: 0.97  
67 - recall: 0.9630 - precision: 1.0000  
Epoch 37/90  
1/1 [=====] - 0s 47ms/step - loss: 0.0879 - acc: 0.97  
67 - recall: 1.0000 - precision: 0.9643  
Epoch 38/90  
1/1 [=====] - 0s 47ms/step - loss: 0.0576 - acc: 1.00  
00 - recall: 1.0000 - precision: 1.0000  
Epoch 39/90  
1/1 [=====] - 0s 47ms/step - loss: 0.0541 - acc: 0.97  
67 - recall: 0.9630 - precision: 1.0000  
Epoch 40/90  
1/1 [=====] - 0s 47ms/step - loss: 0.0294 - acc: 0.97  
67 - recall: 0.9630 - precision: 1.0000  
Epoch 41/90
```

```
1/1 [=====] - 0s 80ms/step - loss: 0.0059 - acc: 1.00  
00 - recall: 1.0000 - precision: 1.0000  
Epoch 42/90  
1/1 [=====] - 0s 49ms/step - loss: 0.0453 - acc: 0.97  
67 - recall: 1.0000 - precision: 0.9643  
Epoch 43/90  
1/1 [=====] - 0s 47ms/step - loss: 0.0639 - acc: 0.95  
35 - recall: 0.9630 - precision: 0.9630  
Epoch 44/90  
1/1 [=====] - 0s 52ms/step - loss: 0.0213 - acc: 1.00  
00 - recall: 1.0000 - precision: 1.0000  
Epoch 45/90  
1/1 [=====] - 0s 47ms/step - loss: 0.0050 - acc: 1.00  
00 - recall: 1.0000 - precision: 1.0000  
Epoch 46/90  
1/1 [=====] - 0s 46ms/step - loss: 0.0099 - acc: 1.00  
00 - recall: 1.0000 - precision: 1.0000  
Epoch 47/90  
1/1 [=====] - 0s 263ms/step - loss: 0.0288 - acc: 1.00  
00 - recall: 1.0000 - precision: 1.0000  
Epoch 48/90  
1/1 [=====] - 0s 47ms/step - loss: 0.0137 - acc: 1.00  
00 - recall: 1.0000 - precision: 1.0000  
Epoch 49/90  
1/1 [=====] - 0s 48ms/step - loss: 0.0072 - acc: 1.00  
00 - recall: 1.0000 - precision: 1.0000  
Epoch 50/90  
1/1 [=====] - 0s 49ms/step - loss: 9.6972e-04 - acc:  
1.0000 - recall: 1.0000 - precision: 1.0000  
Epoch 51/90  
1/1 [=====] - 0s 48ms/step - loss: 2.4139e-04 - acc:  
1.0000 - recall: 1.0000 - precision: 1.0000  
Epoch 52/90  
1/1 [=====] - 0s 48ms/step - loss: 9.0878e-04 - acc:  
1.0000 - recall: 1.0000 - precision: 1.0000  
Epoch 53/90  
1/1 [=====] - 0s 49ms/step - loss: 4.3027e-04 - acc:  
1.0000 - recall: 1.0000 - precision: 1.0000  
Epoch 54/90  
1/1 [=====] - 0s 48ms/step - loss: 9.3806e-04 - acc:  
1.0000 - recall: 1.0000 - precision: 1.0000  
Epoch 55/90  
1/1 [=====] - 0s 48ms/step - loss: 0.0117 - acc: 1.00  
00 - recall: 1.0000 - precision: 1.0000  
Epoch 56/90  
1/1 [=====] - 0s 48ms/step - loss: 4.0543e-05 - acc:  
1.0000 - recall: 1.0000 - precision: 1.0000  
Epoch 57/90  
1/1 [=====] - 0s 49ms/step - loss: 1.6447e-04 - acc:  
1.0000 - recall: 1.0000 - precision: 1.0000  
Epoch 58/90  
1/1 [=====] - 0s 47ms/step - loss: 1.6374e-04 - acc:  
1.0000 - recall: 1.0000 - precision: 1.0000  
Epoch 59/90  
1/1 [=====] - 0s 47ms/step - loss: 5.1720e-04 - acc:  
1.0000 - recall: 1.0000 - precision: 1.0000  
Epoch 60/90  
1/1 [=====] - 0s 48ms/step - loss: 0.0121 - acc: 1.00  
00 - recall: 1.0000 - precision: 1.0000  
Epoch 61/90
```

```
1/1 [=====] - 0s 48ms/step - loss: 2.0954e-05 - acc: 1.0000 - recall: 1.0000 - precision: 1.0000
Epoch 62/90
1/1 [=====] - 0s 48ms/step - loss: 3.9239e-05 - acc: 1.0000 - recall: 1.0000 - precision: 1.0000
Epoch 63/90
1/1 [=====] - 0s 48ms/step - loss: 0.0030 - acc: 1.0000 - recall: 1.0000 - precision: 1.0000
Epoch 64/90
1/1 [=====] - 0s 48ms/step - loss: 0.0042 - acc: 1.0000 - recall: 1.0000 - precision: 1.0000
Epoch 65/90
1/1 [=====] - 0s 48ms/step - loss: 0.2280 - acc: 0.9535 - recall: 1.0000 - precision: 0.9310
Epoch 66/90
1/1 [=====] - 0s 49ms/step - loss: 0.0012 - acc: 1.0000 - recall: 1.0000 - precision: 1.0000
Epoch 67/90
1/1 [=====] - 0s 49ms/step - loss: 0.4725 - acc: 0.8605 - recall: 0.7778 - precision: 1.0000
Epoch 68/90
1/1 [=====] - 0s 48ms/step - loss: 0.0847 - acc: 0.9767 - recall: 0.9630 - precision: 1.0000
Epoch 69/90
1/1 [=====] - 0s 49ms/step - loss: 0.0583 - acc: 0.9767 - recall: 0.9630 - precision: 1.0000
Epoch 70/90
1/1 [=====] - 0s 49ms/step - loss: 0.0014 - acc: 1.0000 - recall: 1.0000 - precision: 1.0000
Epoch 71/90
1/1 [=====] - 0s 49ms/step - loss: 0.1885 - acc: 0.9767 - recall: 1.0000 - precision: 0.9643
Epoch 72/90
1/1 [=====] - 0s 49ms/step - loss: 0.0551 - acc: 0.9767 - recall: 1.0000 - precision: 0.9643
Epoch 73/90
1/1 [=====] - 0s 50ms/step - loss: 0.0199 - acc: 1.0000 - recall: 1.0000 - precision: 1.0000
Epoch 74/90
1/1 [=====] - 0s 48ms/step - loss: 0.0593 - acc: 0.9767 - recall: 1.0000 - precision: 0.9643
Epoch 75/90
1/1 [=====] - 0s 48ms/step - loss: 0.0042 - acc: 1.0000 - recall: 1.0000 - precision: 1.0000
Epoch 76/90
1/1 [=====] - 0s 48ms/step - loss: 0.0227 - acc: 0.9767 - recall: 0.9630 - precision: 1.0000
Epoch 77/90
1/1 [=====] - 0s 52ms/step - loss: 0.0492 - acc: 0.9767 - recall: 0.9630 - precision: 1.0000
Epoch 78/90
1/1 [=====] - 0s 49ms/step - loss: 0.0388 - acc: 0.9767 - recall: 0.9630 - precision: 1.0000
Epoch 79/90
1/1 [=====] - 0s 49ms/step - loss: 0.0101 - acc: 1.0000 - recall: 1.0000 - precision: 1.0000
Epoch 80/90
1/1 [=====] - 0s 48ms/step - loss: 0.0093 - acc: 1.0000 - recall: 1.0000 - precision: 1.0000
Epoch 81/90
```

```
1/1 [=====] - 0s 48ms/step - loss: 0.0058 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 82/90
1/1 [=====] - 0s 48ms/step - loss: 0.0040 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 83/90
1/1 [=====] - 0s 48ms/step - loss: 0.0019 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 84/90
1/1 [=====] - 0s 48ms/step - loss: 0.0022 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 85/90
1/1 [=====] - 0s 47ms/step - loss: 8.5985e-04 - acc:
1.0000 - recall: 1.0000 - precision: 1.0000
Epoch 86/90
1/1 [=====] - 0s 48ms/step - loss: 9.2403e-04 - acc:
1.0000 - recall: 1.0000 - precision: 1.0000
Epoch 87/90
1/1 [=====] - 0s 48ms/step - loss: 0.0017 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 88/90
1/1 [=====] - 0s 48ms/step - loss: 0.0050 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 89/90
1/1 [=====] - 0s 49ms/step - loss: 9.4576e-04 - acc:
1.0000 - recall: 1.0000 - precision: 1.0000
Epoch 90/90
1/1 [=====] - 0s 48ms/step - loss: 2.7563e-04 - acc:
1.0000 - recall: 1.0000 - precision: 1.0000
1/1 [=====] - 0s 183ms/step

2023-03-29 00:07:04.881674: I tensorflow/core/grappler/optimizers/custom_graph_
_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
2/2 [=====] - 0s 153ms/step
Epoch 1/90

2023-03-29 00:07:05.811636: I tensorflow/core/grappler/optimizers/custom_graph_
_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
```

```
1/1 [=====] - 1s 1s/step - loss: 0.6441 - acc: 0.6429  
- recall: 0.6875 - precision: 0.8148  
Epoch 2/90  
1/1 [=====] - 0s 232ms/step - loss: 0.6469 - acc: 0.5  
476 - recall: 0.6250 - precision: 0.7407  
Epoch 3/90  
1/1 [=====] - 0s 117ms/step - loss: 0.6476 - acc: 0.6  
905 - recall: 0.8438 - precision: 0.7714  
Epoch 4/90  
1/1 [=====] - 0s 123ms/step - loss: 0.6436 - acc: 0.7  
381 - recall: 0.8438 - precision: 0.8182  
Epoch 5/90  
1/1 [=====] - 0s 190ms/step - loss: 0.6460 - acc: 0.7  
619 - recall: 0.9688 - precision: 0.7750  
Epoch 6/90  
1/1 [=====] - 0s 207ms/step - loss: 0.6457 - acc: 0.7  
619 - recall: 0.9688 - precision: 0.7750  
Epoch 7/90  
1/1 [=====] - 0s 136ms/step - loss: 0.6421 - acc: 0.7  
619 - recall: 0.9688 - precision: 0.7750  
Epoch 8/90  
1/1 [=====] - 0s 213ms/step - loss: 0.6433 - acc: 0.7  
619 - recall: 1.0000 - precision: 0.7619  
Epoch 9/90  
1/1 [=====] - 0s 95ms/step - loss: 0.6446 - acc: 0.76  
19 - recall: 1.0000 - precision: 0.7619  
Epoch 10/90  
1/1 [=====] - 0s 129ms/step - loss: 0.6495 - acc: 0.7  
619 - recall: 1.0000 - precision: 0.7619  
Epoch 11/90  
1/1 [=====] - 0s 96ms/step - loss: 0.6414 - acc: 0.76  
19 - recall: 1.0000 - precision: 0.7619  
Epoch 12/90  
1/1 [=====] - 0s 146ms/step - loss: 0.6453 - acc: 0.7  
619 - recall: 1.0000 - precision: 0.7619  
Epoch 13/90  
1/1 [=====] - 0s 47ms/step - loss: 0.6481 - acc: 0.76  
19 - recall: 1.0000 - precision: 0.7619  
Epoch 14/90  
1/1 [=====] - 0s 48ms/step - loss: 0.6421 - acc: 0.76  
19 - recall: 1.0000 - precision: 0.7619  
Epoch 15/90  
1/1 [=====] - 0s 49ms/step - loss: 0.6418 - acc: 0.76  
19 - recall: 1.0000 - precision: 0.7619  
Epoch 16/90  
1/1 [=====] - 0s 242ms/step - loss: 0.6427 - acc: 0.7  
619 - recall: 1.0000 - precision: 0.7619  
Epoch 17/90  
1/1 [=====] - 0s 86ms/step - loss: 0.6384 - acc: 0.76  
19 - recall: 1.0000 - precision: 0.7619  
Epoch 18/90  
1/1 [=====] - 0s 60ms/step - loss: 0.6422 - acc: 0.76  
19 - recall: 1.0000 - precision: 0.7619  
Epoch 19/90  
1/1 [=====] - 0s 58ms/step - loss: 0.6409 - acc: 0.76  
19 - recall: 1.0000 - precision: 0.7619  
Epoch 20/90  
1/1 [=====] - 0s 46ms/step - loss: 0.6417 - acc: 0.76  
19 - recall: 1.0000 - precision: 0.7619  
Epoch 21/90
```

```
1/1 [=====] - 0s 90ms/step - loss: 0.6390 - acc: 0.76  
19 - recall: 1.0000 - precision: 0.7619  
Epoch 22/90  
1/1 [=====] - 0s 46ms/step - loss: 0.6430 - acc: 0.76  
19 - recall: 1.0000 - precision: 0.7619  
Epoch 23/90  
1/1 [=====] - 0s 45ms/step - loss: 0.6391 - acc: 0.76  
19 - recall: 1.0000 - precision: 0.7619  
Epoch 24/90  
1/1 [=====] - 0s 49ms/step - loss: 0.6363 - acc: 0.76  
19 - recall: 1.0000 - precision: 0.7619  
Epoch 25/90  
1/1 [=====] - 0s 46ms/step - loss: 0.6405 - acc: 0.76  
19 - recall: 1.0000 - precision: 0.7619  
Epoch 26/90  
1/1 [=====] - 0s 122ms/step - loss: 0.6373 - acc: 0.7  
619 - recall: 1.0000 - precision: 0.7619  
Epoch 27/90  
1/1 [=====] - 0s 111ms/step - loss: 0.6366 - acc: 0.7  
619 - recall: 1.0000 - precision: 0.7619  
Epoch 28/90  
1/1 [=====] - 0s 47ms/step - loss: 0.6383 - acc: 0.76  
19 - recall: 1.0000 - precision: 0.7619  
Epoch 29/90  
1/1 [=====] - 0s 46ms/step - loss: 0.6392 - acc: 0.76  
19 - recall: 1.0000 - precision: 0.7619  
Epoch 30/90  
1/1 [=====] - 0s 49ms/step - loss: 0.6364 - acc: 0.76  
19 - recall: 1.0000 - precision: 0.7619  
Epoch 31/90  
1/1 [=====] - 0s 47ms/step - loss: 0.6356 - acc: 0.76  
19 - recall: 1.0000 - precision: 0.7619  
Epoch 32/90  
1/1 [=====] - 0s 47ms/step - loss: 0.6382 - acc: 0.76  
19 - recall: 1.0000 - precision: 0.7619  
Epoch 33/90  
1/1 [=====] - 0s 47ms/step - loss: 0.6384 - acc: 0.76  
19 - recall: 1.0000 - precision: 0.7619  
Epoch 34/90  
1/1 [=====] - 0s 46ms/step - loss: 0.6415 - acc: 0.76  
19 - recall: 1.0000 - precision: 0.7619  
Epoch 35/90  
1/1 [=====] - 0s 50ms/step - loss: 0.6355 - acc: 0.76  
19 - recall: 1.0000 - precision: 0.7619  
Epoch 36/90  
1/1 [=====] - 0s 46ms/step - loss: 0.6396 - acc: 0.76  
19 - recall: 1.0000 - precision: 0.7619  
Epoch 37/90  
1/1 [=====] - 0s 46ms/step - loss: 0.6348 - acc: 0.76  
19 - recall: 1.0000 - precision: 0.7619  
Epoch 38/90  
1/1 [=====] - 0s 46ms/step - loss: 0.6279 - acc: 0.76  
19 - recall: 1.0000 - precision: 0.7619  
Epoch 39/90  
1/1 [=====] - 0s 47ms/step - loss: 0.6391 - acc: 0.76  
19 - recall: 1.0000 - precision: 0.7619  
Epoch 40/90  
1/1 [=====] - 0s 147ms/step - loss: 0.6369 - acc: 0.7  
619 - recall: 1.0000 - precision: 0.7619  
Epoch 41/90
```

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1/1 [=====] - 0s 52ms/step - loss: 0.6340 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 42/90
1/1 [=====] - 0s 46ms/step - loss: 0.6390 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 43/90
1/1 [=====] - 0s 46ms/step - loss: 0.6361 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 44/90
1/1 [=====] - 0s 47ms/step - loss: 0.6259 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 45/90
1/1 [=====] - 0s 46ms/step - loss: 0.6296 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 46/90
1/1 [=====] - 0s 48ms/step - loss: 0.6314 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 47/90
1/1 [=====] - 0s 46ms/step - loss: 0.6368 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 48/90
1/1 [=====] - 0s 49ms/step - loss: 0.6358 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 49/90
1/1 [=====] - 0s 47ms/step - loss: 0.6324 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 50/90
1/1 [=====] - 0s 45ms/step - loss: 0.6379 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 51/90
1/1 [=====] - 0s 46ms/step - loss: 0.6338 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 52/90
1/1 [=====] - 0s 45ms/step - loss: 0.6339 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 53/90
1/1 [=====] - 0s 46ms/step - loss: 0.6356 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 54/90
1/1 [=====] - 0s 47ms/step - loss: 0.6355 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 55/90
1/1 [=====] - 0s 46ms/step - loss: 0.6311 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 56/90
1/1 [=====] - 0s 47ms/step - loss: 0.6295 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 57/90
1/1 [=====] - 0s 46ms/step - loss: 0.6293 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 58/90
1/1 [=====] - 0s 46ms/step - loss: 0.6285 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 59/90
1/1 [=====] - 0s 45ms/step - loss: 0.6297 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 60/90
1/1 [=====] - 0s 48ms/step - loss: 0.6308 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 61/90
```

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1/1 [=====] - 0s 48ms/step - loss: 0.6374 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 62/90
1/1 [=====] - 0s 47ms/step - loss: 0.6369 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 63/90
1/1 [=====] - 0s 59ms/step - loss: 0.6272 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 64/90
1/1 [=====] - 0s 47ms/step - loss: 0.6347 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 65/90
1/1 [=====] - 0s 47ms/step - loss: 0.6259 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 66/90
1/1 [=====] - 0s 46ms/step - loss: 0.6269 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 67/90
1/1 [=====] - 0s 46ms/step - loss: 0.6275 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 68/90
1/1 [=====] - 0s 47ms/step - loss: 0.6259 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 69/90
1/1 [=====] - 0s 46ms/step - loss: 0.6249 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 70/90
1/1 [=====] - 0s 47ms/step - loss: 0.6357 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 71/90
1/1 [=====] - 0s 46ms/step - loss: 0.6342 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 72/90
1/1 [=====] - 0s 47ms/step - loss: 0.6240 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 73/90
1/1 [=====] - 0s 47ms/step - loss: 0.6217 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 74/90
1/1 [=====] - 0s 47ms/step - loss: 0.6241 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 75/90
1/1 [=====] - 0s 46ms/step - loss: 0.6272 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 76/90
1/1 [=====] - 0s 46ms/step - loss: 0.6252 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 77/90
1/1 [=====] - 0s 46ms/step - loss: 0.6277 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 78/90
1/1 [=====] - 0s 46ms/step - loss: 0.6357 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 79/90
1/1 [=====] - 0s 47ms/step - loss: 0.6265 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 80/90
1/1 [=====] - 0s 47ms/step - loss: 0.6300 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 81/90
```

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1/1 [=====] - 0s 46ms/step - loss: 0.6375 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 82/90
1/1 [=====] - 0s 47ms/step - loss: 0.6341 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 83/90
1/1 [=====] - 0s 46ms/step - loss: 0.6282 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 84/90
1/1 [=====] - 0s 46ms/step - loss: 0.6311 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 85/90
1/1 [=====] - 0s 46ms/step - loss: 0.6252 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 86/90
1/1 [=====] - 0s 47ms/step - loss: 0.6350 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 87/90
1/1 [=====] - 0s 46ms/step - loss: 0.6303 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 88/90
1/1 [=====] - 0s 47ms/step - loss: 0.6334 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 89/90
1/1 [=====] - 0s 46ms/step - loss: 0.6266 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
1/1 [=====] - 0s 186ms/step
2023-03-29 00:07:13.323461: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
2/2 [=====] - 0s 109ms/step
Epoch 1/90
2023-03-29 00:07:14.491861: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
```

```
1/1 [=====] - 2s 2s/step - loss: 0.6991 - acc: 0.5814
- recall: 0.5862 - precision: 0.7391
Epoch 2/90
1/1 [=====] - 0s 197ms/step - loss: 0.7013 - acc: 0.4
651 - recall: 0.4138 - precision: 0.6667
Epoch 3/90
1/1 [=====] - 0s 103ms/step - loss: 0.6967 - acc: 0.6
279 - recall: 0.5517 - precision: 0.8421
Epoch 4/90
1/1 [=====] - 0s 138ms/step - loss: 0.6991 - acc: 0.5
116 - recall: 0.4483 - precision: 0.7222
Epoch 5/90
1/1 [=====] - 0s 52ms/step - loss: 0.7001 - acc: 0.48
84 - recall: 0.4483 - precision: 0.6842
Epoch 6/90
1/1 [=====] - 0s 119ms/step - loss: 0.6982 - acc: 0.5
349 - recall: 0.4828 - precision: 0.7368
Epoch 7/90
1/1 [=====] - 0s 129ms/step - loss: 0.6973 - acc: 0.6
279 - recall: 0.5517 - precision: 0.8421
Epoch 8/90
1/1 [=====] - 0s 196ms/step - loss: 0.7011 - acc: 0.4
651 - recall: 0.3793 - precision: 0.6875
Epoch 9/90
1/1 [=====] - 0s 74ms/step - loss: 0.6997 - acc: 0.46
51 - recall: 0.3793 - precision: 0.6875
Epoch 10/90
1/1 [=====] - 0s 124ms/step - loss: 0.6983 - acc: 0.5
581 - recall: 0.4828 - precision: 0.7778
Epoch 11/90
1/1 [=====] - 0s 130ms/step - loss: 0.6989 - acc: 0.5
581 - recall: 0.4828 - precision: 0.7778
Epoch 12/90
1/1 [=====] - 0s 54ms/step - loss: 0.6981 - acc: 0.48
84 - recall: 0.4138 - precision: 0.7059
Epoch 13/90
1/1 [=====] - 0s 65ms/step - loss: 0.6969 - acc: 0.55
81 - recall: 0.4828 - precision: 0.7778
Epoch 14/90
1/1 [=====] - 0s 152ms/step - loss: 0.7010 - acc: 0.4
884 - recall: 0.3793 - precision: 0.7333
Epoch 15/90
1/1 [=====] - 0s 177ms/step - loss: 0.6980 - acc: 0.4
884 - recall: 0.3793 - precision: 0.7333
Epoch 16/90
1/1 [=====] - 0s 52ms/step - loss: 0.7019 - acc: 0.39
53 - recall: 0.3103 - precision: 0.6000
Epoch 17/90
1/1 [=====] - 0s 49ms/step - loss: 0.6994 - acc: 0.46
51 - recall: 0.3793 - precision: 0.6875
Epoch 18/90
1/1 [=====] - 0s 133ms/step - loss: 0.7008 - acc: 0.3
721 - recall: 0.2759 - precision: 0.5714
Epoch 19/90
1/1 [=====] - 0s 167ms/step - loss: 0.6966 - acc: 0.5
349 - recall: 0.4138 - precision: 0.8000
Epoch 20/90
1/1 [=====] - 0s 131ms/step - loss: 0.6953 - acc: 0.5
814 - recall: 0.4828 - precision: 0.8235
Epoch 21/90
```

```
1/1 [=====] - 0s 142ms/step - loss: 0.6986 - acc: 0.5  
116 - recall: 0.4483 - precision: 0.7222  
Epoch 22/90  
1/1 [=====] - 0s 50ms/step - loss: 0.7018 - acc: 0.37  
21 - recall: 0.2414 - precision: 0.5833  
Epoch 23/90  
1/1 [=====] - 0s 46ms/step - loss: 0.6983 - acc: 0.55  
81 - recall: 0.4483 - precision: 0.8125  
Epoch 24/90  
1/1 [=====] - 0s 47ms/step - loss: 0.6987 - acc: 0.44  
19 - recall: 0.3103 - precision: 0.6923  
Epoch 25/90  
1/1 [=====] - 0s 48ms/step - loss: 0.6973 - acc: 0.51  
16 - recall: 0.3793 - precision: 0.7857  
Epoch 26/90  
1/1 [=====] - 0s 63ms/step - loss: 0.6964 - acc: 0.48  
84 - recall: 0.3448 - precision: 0.7692  
Epoch 27/90  
1/1 [=====] - 0s 47ms/step - loss: 0.6979 - acc: 0.48  
84 - recall: 0.3448 - precision: 0.7692  
Epoch 28/90  
1/1 [=====] - 0s 47ms/step - loss: 0.7021 - acc: 0.44  
19 - recall: 0.3103 - precision: 0.6923  
Epoch 29/90  
1/1 [=====] - 0s 47ms/step - loss: 0.6983 - acc: 0.48  
84 - recall: 0.3448 - precision: 0.7692  
Epoch 30/90  
1/1 [=====] - 0s 47ms/step - loss: 0.6997 - acc: 0.46  
51 - recall: 0.3103 - precision: 0.7500  
Epoch 31/90  
1/1 [=====] - 0s 117ms/step - loss: 0.7018 - acc: 0.3  
953 - recall: 0.2759 - precision: 0.6154  
Epoch 32/90  
1/1 [=====] - 0s 71ms/step - loss: 0.7008 - acc: 0.44  
19 - recall: 0.3103 - precision: 0.6923  
Epoch 33/90  
1/1 [=====] - 0s 72ms/step - loss: 0.6973 - acc: 0.48  
84 - recall: 0.3103 - precision: 0.8182  
Epoch 34/90  
1/1 [=====] - 0s 49ms/step - loss: 0.6944 - acc: 0.60  
47 - recall: 0.4138 - precision: 1.0000  
Epoch 35/90  
1/1 [=====] - 0s 48ms/step - loss: 0.7000 - acc: 0.44  
19 - recall: 0.3103 - precision: 0.6923  
Epoch 36/90  
1/1 [=====] - 0s 47ms/step - loss: 0.6969 - acc: 0.48  
84 - recall: 0.3103 - precision: 0.8182  
Epoch 37/90  
1/1 [=====] - 0s 48ms/step - loss: 0.6964 - acc: 0.55  
81 - recall: 0.3793 - precision: 0.9167  
Epoch 38/90  
1/1 [=====] - 0s 47ms/step - loss: 0.6965 - acc: 0.44  
19 - recall: 0.2759 - precision: 0.7273  
Epoch 39/90  
1/1 [=====] - 0s 46ms/step - loss: 0.6980 - acc: 0.58  
14 - recall: 0.4138 - precision: 0.9231  
Epoch 40/90  
1/1 [=====] - 0s 47ms/step - loss: 0.6997 - acc: 0.41  
86 - recall: 0.2414 - precision: 0.7000  
Epoch 41/90
```

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1/1 [=====] - 0s 47ms/step - loss: 0.6972 - acc: 0.51
16 - recall: 0.3793 - precision: 0.7857
Epoch 42/90
1/1 [=====] - 0s 47ms/step - loss: 0.6965 - acc: 0.48
84 - recall: 0.3103 - precision: 0.8182
Epoch 43/90
1/1 [=====] - 0s 83ms/step - loss: 0.6966 - acc: 0.51
16 - recall: 0.3448 - precision: 0.8333
Epoch 44/90
1/1 [=====] - 0s 47ms/step - loss: 0.6963 - acc: 0.53
49 - recall: 0.3448 - precision: 0.9091
Epoch 45/90
1/1 [=====] - 0s 91ms/step - loss: 0.6977 - acc: 0.53
49 - recall: 0.3448 - precision: 0.9091
Epoch 46/90
1/1 [=====] - 0s 48ms/step - loss: 0.6989 - acc: 0.51
16 - recall: 0.3448 - precision: 0.8333
Epoch 47/90
1/1 [=====] - 0s 47ms/step - loss: 0.7008 - acc: 0.46
51 - recall: 0.2759 - precision: 0.8000
Epoch 48/90
1/1 [=====] - 0s 49ms/step - loss: 0.6951 - acc: 0.58
14 - recall: 0.3793 - precision: 1.0000
Epoch 49/90
1/1 [=====] - 0s 47ms/step - loss: 0.6960 - acc: 0.58
14 - recall: 0.4483 - precision: 0.8667
Epoch 50/90
1/1 [=====] - 0s 48ms/step - loss: 0.6987 - acc: 0.44
19 - recall: 0.3103 - precision: 0.6923
Epoch 51/90
1/1 [=====] - 0s 46ms/step - loss: 0.6989 - acc: 0.44
19 - recall: 0.2759 - precision: 0.7273
Epoch 52/90
1/1 [=====] - 0s 47ms/step - loss: 0.6967 - acc: 0.53
49 - recall: 0.3448 - precision: 0.9091
Epoch 53/90
1/1 [=====] - 0s 47ms/step - loss: 0.6930 - acc: 0.55
81 - recall: 0.3793 - precision: 0.9167
Epoch 54/90
1/1 [=====] - 0s 46ms/step - loss: 0.6960 - acc: 0.46
51 - recall: 0.2759 - precision: 0.8000
Epoch 55/90
1/1 [=====] - 0s 50ms/step - loss: 0.6953 - acc: 0.41
86 - recall: 0.2759 - precision: 0.6667
Epoch 56/90
1/1 [=====] - 0s 47ms/step - loss: 0.6997 - acc: 0.41
86 - recall: 0.3103 - precision: 0.6429
Epoch 57/90
1/1 [=====] - 0s 47ms/step - loss: 0.7012 - acc: 0.30
23 - recall: 0.1724 - precision: 0.4545
Epoch 58/90
1/1 [=====] - 0s 47ms/step - loss: 0.6973 - acc: 0.48
84 - recall: 0.3103 - precision: 0.8182
Epoch 59/90
1/1 [=====] - 0s 47ms/step - loss: 0.6949 - acc: 0.55
81 - recall: 0.3793 - precision: 0.9167
Epoch 60/90
1/1 [=====] - 0s 47ms/step - loss: 0.6998 - acc: 0.37
21 - recall: 0.2069 - precision: 0.6000
Epoch 61/90
```

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1/1 [=====] - 0s 46ms/step - loss: 0.6969 - acc: 0.48
84 - recall: 0.3103 - precision: 0.8182
Epoch 62/90
1/1 [=====] - 0s 48ms/step - loss: 0.6982 - acc: 0.48
84 - recall: 0.3103 - precision: 0.8182
Epoch 63/90
1/1 [=====] - 0s 46ms/step - loss: 0.6939 - acc: 0.53
49 - recall: 0.3793 - precision: 0.8462
Epoch 64/90
1/1 [=====] - 0s 47ms/step - loss: 0.6960 - acc: 0.51
16 - recall: 0.3448 - precision: 0.8333
Epoch 65/90
1/1 [=====] - 0s 47ms/step - loss: 0.6951 - acc: 0.53
49 - recall: 0.3793 - precision: 0.8462
Epoch 66/90
1/1 [=====] - 0s 48ms/step - loss: 0.6996 - acc: 0.44
19 - recall: 0.2759 - precision: 0.7273
Epoch 67/90
1/1 [=====] - 0s 48ms/step - loss: 0.6950 - acc: 0.48
84 - recall: 0.3103 - precision: 0.8182
Epoch 68/90
1/1 [=====] - 0s 47ms/step - loss: 0.6954 - acc: 0.51
16 - recall: 0.3448 - precision: 0.8333
Epoch 69/90
1/1 [=====] - 0s 47ms/step - loss: 0.6957 - acc: 0.44
19 - recall: 0.2759 - precision: 0.7273
Epoch 70/90
1/1 [=====] - 0s 47ms/step - loss: 0.6916 - acc: 0.60
47 - recall: 0.4483 - precision: 0.9286
Epoch 71/90
1/1 [=====] - 0s 47ms/step - loss: 0.6947 - acc: 0.58
14 - recall: 0.4138 - precision: 0.9231
Epoch 72/90
1/1 [=====] - 0s 48ms/step - loss: 0.6989 - acc: 0.41
86 - recall: 0.3103 - precision: 0.6429
Epoch 73/90
1/1 [=====] - 0s 47ms/step - loss: 0.6966 - acc: 0.41
86 - recall: 0.3103 - precision: 0.6429
Epoch 74/90
1/1 [=====] - 0s 145ms/step - loss: 0.6933 - acc: 0.5
581 - recall: 0.4138 - precision: 0.8571
Epoch 75/90
1/1 [=====] - 0s 145ms/step - loss: 0.7006 - acc: 0.3
953 - recall: 0.2414 - precision: 0.6364
Epoch 76/90
1/1 [=====] - 0s 49ms/step - loss: 0.6957 - acc: 0.46
51 - recall: 0.2414 - precision: 0.8750
Epoch 77/90
1/1 [=====] - 0s 47ms/step - loss: 0.6982 - acc: 0.41
86 - recall: 0.2414 - precision: 0.7000
Epoch 78/90
1/1 [=====] - 0s 47ms/step - loss: 0.6965 - acc: 0.53
49 - recall: 0.3448 - precision: 0.9091
Epoch 79/90
1/1 [=====] - 0s 46ms/step - loss: 0.6930 - acc: 0.55
81 - recall: 0.3793 - precision: 0.9167
Epoch 80/90
1/1 [=====] - 0s 47ms/step - loss: 0.6938 - acc: 0.53
49 - recall: 0.3793 - precision: 0.8462
Epoch 81/90
```

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1/1 [=====] - 0s 48ms/step - loss: 0.6937 - acc: 0.46
51 - recall: 0.3103 - precision: 0.7500
Epoch 82/90
1/1 [=====] - 0s 47ms/step - loss: 0.6926 - acc: 0.60
47 - recall: 0.4138 - precision: 1.0000
Epoch 83/90
1/1 [=====] - 0s 47ms/step - loss: 0.6987 - acc: 0.44
19 - recall: 0.3103 - precision: 0.6923
Epoch 84/90
1/1 [=====] - 0s 47ms/step - loss: 0.6965 - acc: 0.48
84 - recall: 0.3103 - precision: 0.8182
Epoch 85/90
1/1 [=====] - 0s 47ms/step - loss: 0.6980 - acc: 0.44
19 - recall: 0.3448 - precision: 0.6667
Epoch 86/90
1/1 [=====] - 0s 48ms/step - loss: 0.6962 - acc: 0.46
51 - recall: 0.3103 - precision: 0.7500
Epoch 87/90
1/1 [=====] - 0s 46ms/step - loss: 0.6970 - acc: 0.41
86 - recall: 0.2759 - precision: 0.6667
Epoch 88/90
1/1 [=====] - 0s 46ms/step - loss: 0.6989 - acc: 0.39
53 - recall: 0.2414 - precision: 0.6364
Epoch 89/90
1/1 [=====] - 0s 47ms/step - loss: 0.6994 - acc: 0.37
21 - recall: 0.1724 - precision: 0.6250
Epoch 90/90
1/1 [=====] - 0s 47ms/step - loss: 0.6918 - acc: 0.58
14 - recall: 0.3793 - precision: 1.0000
1/1 [=====] - 0s 191ms/step

2023-03-29 00:07:21.920846: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
2/2 [=====] - 0s 218ms/step
Epoch 1/90

2023-03-29 00:07:22.821063: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
```

```
1/1 [=====] - 1s 1s/step - loss: 0.7288 - acc: 0.5581
- recall: 0.7407 - precision: 0.6250
Epoch 2/90
1/1 [=====] - 0s 196ms/step - loss: 0.7245 - acc: 0.5
581 - recall: 0.4444 - precision: 0.7500
Epoch 3/90
1/1 [=====] - 0s 207ms/step - loss: 0.7271 - acc: 0.4
419 - recall: 0.3704 - precision: 0.5882
Epoch 4/90
1/1 [=====] - 0s 110ms/step - loss: 0.7279 - acc: 0.5
581 - recall: 0.4074 - precision: 0.7857
Epoch 5/90
1/1 [=====] - 0s 141ms/step - loss: 0.7265 - acc: 0.5
349 - recall: 0.3333 - precision: 0.8182
Epoch 6/90
1/1 [=====] - 0s 178ms/step - loss: 0.7271 - acc: 0.4
651 - recall: 0.2222 - precision: 0.7500
Epoch 7/90
1/1 [=====] - 0s 153ms/step - loss: 0.7278 - acc: 0.4
419 - recall: 0.2222 - precision: 0.6667
Epoch 8/90
1/1 [=====] - 0s 110ms/step - loss: 0.7271 - acc: 0.3
953 - recall: 0.1481 - precision: 0.5714
Epoch 9/90
1/1 [=====] - 0s 111ms/step - loss: 0.7297 - acc: 0.4
651 - recall: 0.1481 - precision: 1.0000
Epoch 10/90
1/1 [=====] - 0s 75ms/step - loss: 0.7252 - acc: 0.34
88 - recall: 0.0370 - precision: 0.3333
Epoch 11/90
1/1 [=====] - 0s 48ms/step - loss: 0.7262 - acc: 0.41
86 - recall: 0.1111 - precision: 0.7500
Epoch 12/90
1/1 [=====] - 0s 132ms/step - loss: 0.7264 - acc: 0.3
953 - recall: 0.1111 - precision: 0.6000
Epoch 13/90
1/1 [=====] - 0s 91ms/step - loss: 0.7216 - acc: 0.44
19 - recall: 0.1111 - precision: 1.0000
Epoch 14/90
1/1 [=====] - 0s 75ms/step - loss: 0.7306 - acc: 0.30
23 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 15/90
1/1 [=====] - 0s 125ms/step - loss: 0.7264 - acc: 0.3
953 - recall: 0.0741 - precision: 0.6667
Epoch 16/90
1/1 [=====] - 0s 91ms/step - loss: 0.7228 - acc: 0.44
19 - recall: 0.1111 - precision: 1.0000
Epoch 17/90
1/1 [=====] - 0s 152ms/step - loss: 0.7265 - acc: 0.4
419 - recall: 0.1111 - precision: 1.0000
Epoch 18/90
1/1 [=====] - 0s 89ms/step - loss: 0.7205 - acc: 0.41
86 - recall: 0.0741 - precision: 1.0000
Epoch 19/90
1/1 [=====] - 0s 49ms/step - loss: 0.7296 - acc: 0.34
88 - recall: 0.0370 - precision: 0.3333
Epoch 20/90
1/1 [=====] - 0s 46ms/step - loss: 0.7219 - acc: 0.41
86 - recall: 0.0741 - precision: 1.0000
Epoch 21/90
```

```
1/1 [=====] - 0s 48ms/step - loss: 0.7243 - acc: 0.44
19 - recall: 0.1111 - precision: 1.0000
Epoch 22/90
1/1 [=====] - 0s 151ms/step - loss: 0.7226 - acc: 0.4
186 - recall: 0.0741 - precision: 1.0000
Epoch 23/90
1/1 [=====] - 0s 142ms/step - loss: 0.7223 - acc: 0.4
419 - recall: 0.1111 - precision: 1.0000
Epoch 24/90
1/1 [=====] - 0s 47ms/step - loss: 0.7196 - acc: 0.41
86 - recall: 0.0741 - precision: 1.0000
Epoch 25/90
1/1 [=====] - 0s 46ms/step - loss: 0.7235 - acc: 0.37
21 - recall: 0.0370 - precision: 0.5000
Epoch 26/90
1/1 [=====] - 0s 46ms/step - loss: 0.7287 - acc: 0.34
88 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 27/90
1/1 [=====] - 0s 91ms/step - loss: 0.7256 - acc: 0.37
21 - recall: 0.0370 - precision: 0.5000
Epoch 28/90
1/1 [=====] - 0s 47ms/step - loss: 0.7223 - acc: 0.34
88 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 29/90
1/1 [=====] - 0s 51ms/step - loss: 0.7257 - acc: 0.39
53 - recall: 0.0370 - precision: 1.0000
Epoch 30/90
1/1 [=====] - 0s 50ms/step - loss: 0.7279 - acc: 0.34
88 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 31/90
1/1 [=====] - 0s 47ms/step - loss: 0.7230 - acc: 0.39
53 - recall: 0.0370 - precision: 1.0000
Epoch 32/90
1/1 [=====] - 0s 48ms/step - loss: 0.7223 - acc: 0.39
53 - recall: 0.0370 - precision: 1.0000
Epoch 33/90
1/1 [=====] - 0s 84ms/step - loss: 0.7219 - acc: 0.39
53 - recall: 0.0370 - precision: 1.0000
Epoch 34/90
1/1 [=====] - 0s 46ms/step - loss: 0.7235 - acc: 0.34
88 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 35/90
1/1 [=====] - 0s 47ms/step - loss: 0.7208 - acc: 0.39
53 - recall: 0.0370 - precision: 1.0000
Epoch 36/90
1/1 [=====] - 0s 47ms/step - loss: 0.7208 - acc: 0.39
53 - recall: 0.0370 - precision: 1.0000
Epoch 37/90
1/1 [=====] - 0s 47ms/step - loss: 0.7239 - acc: 0.34
88 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 38/90
1/1 [=====] - 0s 47ms/step - loss: 0.7220 - acc: 0.39
53 - recall: 0.0370 - precision: 1.0000
Epoch 39/90
1/1 [=====] - 0s 48ms/step - loss: 0.7184 - acc: 0.39
53 - recall: 0.0370 - precision: 1.0000
Epoch 40/90
1/1 [=====] - 0s 47ms/step - loss: 0.7215 - acc: 0.34
88 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 41/90
```

```
1/1 [=====] - 0s 47ms/step - loss: 0.7215 - acc: 0.39
53 - recall: 0.0370 - precision: 1.0000
Epoch 42/90
1/1 [=====] - 0s 92ms/step - loss: 0.7204 - acc: 0.39
53 - recall: 0.0370 - precision: 1.0000
Epoch 43/90
1/1 [=====] - 0s 46ms/step - loss: 0.7230 - acc: 0.39
53 - recall: 0.0370 - precision: 1.0000
Epoch 44/90
1/1 [=====] - 0s 47ms/step - loss: 0.7198 - acc: 0.39
53 - recall: 0.0370 - precision: 1.0000
Epoch 45/90
1/1 [=====] - 0s 48ms/step - loss: 0.7214 - acc: 0.39
53 - recall: 0.0370 - precision: 1.0000
Epoch 46/90
1/1 [=====] - 0s 54ms/step - loss: 0.7215 - acc: 0.34
88 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 47/90
1/1 [=====] - 0s 47ms/step - loss: 0.7283 - acc: 0.34
88 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 48/90
1/1 [=====] - 0s 47ms/step - loss: 0.7209 - acc: 0.34
88 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 49/90
1/1 [=====] - 0s 47ms/step - loss: 0.7159 - acc: 0.39
53 - recall: 0.0370 - precision: 1.0000
Epoch 50/90
1/1 [=====] - 0s 49ms/step - loss: 0.7198 - acc: 0.39
53 - recall: 0.0370 - precision: 1.0000
Epoch 51/90
1/1 [=====] - 0s 48ms/step - loss: 0.7172 - acc: 0.39
53 - recall: 0.0370 - precision: 1.0000
Epoch 52/90
1/1 [=====] - 0s 47ms/step - loss: 0.7279 - acc: 0.34
88 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 53/90
1/1 [=====] - 0s 48ms/step - loss: 0.7223 - acc: 0.34
88 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 54/90
1/1 [=====] - 0s 46ms/step - loss: 0.7204 - acc: 0.34
88 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 55/90
1/1 [=====] - 0s 49ms/step - loss: 0.7206 - acc: 0.34
88 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 56/90
1/1 [=====] - 0s 47ms/step - loss: 0.7210 - acc: 0.37
21 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 57/90
1/1 [=====] - 0s 47ms/step - loss: 0.7223 - acc: 0.34
88 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 58/90
1/1 [=====] - 0s 47ms/step - loss: 0.7232 - acc: 0.34
88 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 59/90
1/1 [=====] - 0s 47ms/step - loss: 0.7223 - acc: 0.34
88 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 60/90
1/1 [=====] - 0s 47ms/step - loss: 0.7167 - acc: 0.39
53 - recall: 0.0370 - precision: 1.0000
Epoch 61/90
```

```
1/1 [=====] - 0s 46ms/step - loss: 0.7204 - acc: 0.37
21 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 62/90
1/1 [=====] - 0s 46ms/step - loss: 0.7194 - acc: 0.39
53 - recall: 0.0370 - precision: 1.0000
Epoch 63/90
1/1 [=====] - 0s 47ms/step - loss: 0.7165 - acc: 0.39
53 - recall: 0.0370 - precision: 1.0000
Epoch 64/90
1/1 [=====] - 0s 46ms/step - loss: 0.7181 - acc: 0.37
21 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 65/90
1/1 [=====] - 0s 46ms/step - loss: 0.7216 - acc: 0.34
88 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 66/90
1/1 [=====] - 0s 47ms/step - loss: 0.7157 - acc: 0.39
53 - recall: 0.0370 - precision: 1.0000
Epoch 67/90
1/1 [=====] - 0s 47ms/step - loss: 0.7191 - acc: 0.39
53 - recall: 0.0370 - precision: 1.0000
Epoch 68/90
1/1 [=====] - 0s 46ms/step - loss: 0.7212 - acc: 0.37
21 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 69/90
1/1 [=====] - 0s 46ms/step - loss: 0.7145 - acc: 0.39
53 - recall: 0.0370 - precision: 1.0000
Epoch 70/90
1/1 [=====] - 0s 47ms/step - loss: 0.7224 - acc: 0.34
88 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 71/90
1/1 [=====] - 0s 46ms/step - loss: 0.7220 - acc: 0.37
21 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 72/90
1/1 [=====] - 0s 47ms/step - loss: 0.7167 - acc: 0.39
53 - recall: 0.0370 - precision: 1.0000
Epoch 73/90
1/1 [=====] - 0s 46ms/step - loss: 0.7230 - acc: 0.34
88 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 74/90
1/1 [=====] - 0s 47ms/step - loss: 0.7149 - acc: 0.37
21 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 75/90
1/1 [=====] - 0s 47ms/step - loss: 0.7185 - acc: 0.39
53 - recall: 0.0370 - precision: 1.0000
Epoch 76/90
1/1 [=====] - 0s 47ms/step - loss: 0.7220 - acc: 0.34
88 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 77/90
1/1 [=====] - 0s 46ms/step - loss: 0.7245 - acc: 0.37
21 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 78/90
1/1 [=====] - 0s 48ms/step - loss: 0.7174 - acc: 0.37
21 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 79/90
1/1 [=====] - 0s 47ms/step - loss: 0.7264 - acc: 0.34
88 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 80/90
1/1 [=====] - 0s 48ms/step - loss: 0.7154 - acc: 0.39
53 - recall: 0.0370 - precision: 1.0000
Epoch 81/90
```

```
1/1 [=====] - 0s 47ms/step - loss: 0.7170 - acc: 0.37
21 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 82/90
1/1 [=====] - 0s 47ms/step - loss: 0.7208 - acc: 0.37
21 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 83/90
1/1 [=====] - 0s 48ms/step - loss: 0.7241 - acc: 0.37
21 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 84/90
1/1 [=====] - 0s 47ms/step - loss: 0.7158 - acc: 0.39
53 - recall: 0.0370 - precision: 1.0000
Epoch 85/90
1/1 [=====] - 0s 47ms/step - loss: 0.7156 - acc: 0.37
21 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 86/90
1/1 [=====] - 0s 47ms/step - loss: 0.7166 - acc: 0.37
21 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 87/90
1/1 [=====] - 0s 47ms/step - loss: 0.7132 - acc: 0.39
53 - recall: 0.0370 - precision: 1.0000
Epoch 88/90
1/1 [=====] - 0s 47ms/step - loss: 0.7124 - acc: 0.39
53 - recall: 0.0370 - precision: 1.0000
Epoch 89/90
1/1 [=====] - 0s 47ms/step - loss: 0.7166 - acc: 0.37
21 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 90/90
1/1 [=====] - 0s 47ms/step - loss: 0.7167 - acc: 0.39
53 - recall: 0.0370 - precision: 1.0000
1/1 [=====] - 0s 181ms/step

2023-03-29 00:07:30.113033: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
2/2 [=====] - 0s 113ms/step
Epoch 1/45

2023-03-29 00:07:30.947688: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
```

```
1/1 [=====] - 2s 2s/step - loss: 0.6487 - acc: 0.5714
- recall: 0.6250 - precision: 0.7692
Epoch 2/45
1/1 [=====] - 0s 175ms/step - loss: 0.6337 - acc: 0.6
667 - recall: 0.8438 - precision: 0.7500
Epoch 3/45
1/1 [=====] - 0s 153ms/step - loss: 0.6684 - acc: 0.7
143 - recall: 0.9062 - precision: 0.7632
Epoch 4/45
1/1 [=====] - 0s 96ms/step - loss: 0.6020 - acc: 0.80
95 - recall: 0.9375 - precision: 0.8333
Epoch 5/45
1/1 [=====] - 0s 167ms/step - loss: 0.6495 - acc: 0.6
905 - recall: 0.8438 - precision: 0.7714
Epoch 6/45
1/1 [=====] - 0s 140ms/step - loss: 0.6655 - acc: 0.6
905 - recall: 0.8438 - precision: 0.7714
Epoch 7/45
1/1 [=====] - 0s 52ms/step - loss: 0.6813 - acc: 0.59
52 - recall: 0.7500 - precision: 0.7273
Epoch 8/45
1/1 [=====] - 0s 140ms/step - loss: 0.6484 - acc: 0.5
476 - recall: 0.6875 - precision: 0.7097
Epoch 9/45
1/1 [=====] - 0s 168ms/step - loss: 0.6422 - acc: 0.7
143 - recall: 0.8438 - precision: 0.7941
Epoch 10/45
1/1 [=====] - 0s 122ms/step - loss: 0.6452 - acc: 0.6
667 - recall: 0.8125 - precision: 0.7647
Epoch 11/45
1/1 [=====] - 0s 135ms/step - loss: 0.6368 - acc: 0.7
619 - recall: 0.8750 - precision: 0.8235
Epoch 12/45
1/1 [=====] - 0s 87ms/step - loss: 0.6515 - acc: 0.61
90 - recall: 0.8125 - precision: 0.7222
Epoch 13/45
1/1 [=====] - 0s 120ms/step - loss: 0.6446 - acc: 0.6
905 - recall: 0.8750 - precision: 0.7568
Epoch 14/45
1/1 [=====] - 0s 189ms/step - loss: 0.6352 - acc: 0.6
905 - recall: 0.8750 - precision: 0.7568
Epoch 15/45
1/1 [=====] - 0s 129ms/step - loss: 0.6203 - acc: 0.7
619 - recall: 0.9375 - precision: 0.7895
Epoch 16/45
1/1 [=====] - 0s 157ms/step - loss: 0.6153 - acc: 0.7
619 - recall: 0.9375 - precision: 0.7895
Epoch 17/45
1/1 [=====] - 0s 189ms/step - loss: 0.6358 - acc: 0.7
143 - recall: 0.9062 - precision: 0.7632
Epoch 18/45
1/1 [=====] - 0s 51ms/step - loss: 0.6573 - acc: 0.71
43 - recall: 0.9062 - precision: 0.7632
Epoch 19/45
1/1 [=====] - 0s 105ms/step - loss: 0.6485 - acc: 0.7
143 - recall: 0.9062 - precision: 0.7632
Epoch 20/45
1/1 [=====] - 0s 49ms/step - loss: 0.6622 - acc: 0.71
43 - recall: 0.9062 - precision: 0.7632
Epoch 21/45
```

```
1/1 [=====] - 0s 48ms/step - loss: 0.6447 - acc: 0.71
43 - recall: 0.9062 - precision: 0.7632
Epoch 22/45
1/1 [=====] - 0s 96ms/step - loss: 0.6197 - acc: 0.76
19 - recall: 0.9375 - precision: 0.7895
Epoch 23/45
1/1 [=====] - 0s 47ms/step - loss: 0.6298 - acc: 0.73
81 - recall: 0.9688 - precision: 0.7561
Epoch 24/45
1/1 [=====] - 0s 49ms/step - loss: 0.6330 - acc: 0.76
19 - recall: 0.9375 - precision: 0.7895
Epoch 25/45
1/1 [=====] - 0s 145ms/step - loss: 0.6257 - acc: 0.7
381 - recall: 0.9375 - precision: 0.7692
Epoch 26/45
1/1 [=====] - 0s 46ms/step - loss: 0.6346 - acc: 0.69
05 - recall: 0.8750 - precision: 0.7568
Epoch 27/45
1/1 [=====] - 0s 48ms/step - loss: 0.6167 - acc: 0.73
81 - recall: 0.8750 - precision: 0.8000
Epoch 28/45
1/1 [=====] - 0s 47ms/step - loss: 0.5945 - acc: 0.76
19 - recall: 0.9375 - precision: 0.7895
Epoch 29/45
1/1 [=====] - 0s 54ms/step - loss: 0.5895 - acc: 0.76
19 - recall: 0.9062 - precision: 0.8056
Epoch 30/45
1/1 [=====] - 0s 49ms/step - loss: 0.6355 - acc: 0.78
57 - recall: 0.9062 - precision: 0.8286
Epoch 31/45
1/1 [=====] - 0s 47ms/step - loss: 0.5205 - acc: 0.80
95 - recall: 0.9062 - precision: 0.8529
Epoch 32/45
1/1 [=====] - 0s 128ms/step - loss: 0.6405 - acc: 0.6
667 - recall: 0.8125 - precision: 0.7647
Epoch 33/45
1/1 [=====] - 0s 47ms/step - loss: 0.5277 - acc: 0.76
19 - recall: 0.9062 - precision: 0.8056
Epoch 34/45
1/1 [=====] - 0s 47ms/step - loss: 0.5719 - acc: 0.76
19 - recall: 0.8750 - precision: 0.8235
Epoch 35/45
1/1 [=====] - 0s 46ms/step - loss: 0.5078 - acc: 0.76
19 - recall: 0.8438 - precision: 0.8438
Epoch 36/45
1/1 [=====] - 0s 46ms/step - loss: 0.5088 - acc: 0.80
95 - recall: 0.8750 - precision: 0.8750
Epoch 37/45
1/1 [=====] - 0s 46ms/step - loss: 0.5041 - acc: 0.73
81 - recall: 0.8438 - precision: 0.8182
Epoch 38/45
1/1 [=====] - 0s 46ms/step - loss: 0.4811 - acc: 0.83
33 - recall: 0.8750 - precision: 0.9032
Epoch 39/45
1/1 [=====] - 0s 48ms/step - loss: 0.4390 - acc: 0.83
33 - recall: 0.8438 - precision: 0.9310
Epoch 40/45
1/1 [=====] - 0s 46ms/step - loss: 0.4668 - acc: 0.80
95 - recall: 0.8438 - precision: 0.9000
Epoch 41/45
```

```
1/1 [=====] - 0s 46ms/step - loss: 0.4204 - acc: 0.76
19 - recall: 0.7500 - precision: 0.9231
Epoch 42/45
1/1 [=====] - 0s 50ms/step - loss: 0.2954 - acc: 0.90
48 - recall: 0.9062 - precision: 0.9667
Epoch 43/45
1/1 [=====] - 0s 48ms/step - loss: 0.4284 - acc: 0.85
71 - recall: 0.8750 - precision: 0.9333
Epoch 44/45
1/1 [=====] - 0s 46ms/step - loss: 0.4922 - acc: 0.69
05 - recall: 0.7188 - precision: 0.8519
Epoch 45/45
1/1 [=====] - 0s 46ms/step - loss: 0.4429 - acc: 0.73
81 - recall: 0.7188 - precision: 0.9200
2023-03-29 00:07:36.248115: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
1/1 [=====] - 0s 279ms/step
2/2 [=====] - 0s 172ms/step
Epoch 1/45
2023-03-29 00:07:37.268805: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
```

```
1/1 [=====] - 2s 2s/step - loss: 0.6982 - acc: 0.5581
- recall: 0.5862 - precision: 0.7083
Epoch 2/45
1/1 [=====] - 0s 201ms/step - loss: 0.6581 - acc: 0.6
977 - recall: 0.7241 - precision: 0.8077
Epoch 3/45
1/1 [=====] - 0s 166ms/step - loss: 0.7587 - acc: 0.5
814 - recall: 0.6207 - precision: 0.7200
Epoch 4/45
1/1 [=====] - 0s 195ms/step - loss: 0.7674 - acc: 0.4
884 - recall: 0.4828 - precision: 0.6667
Epoch 5/45
1/1 [=====] - 0s 207ms/step - loss: 0.6921 - acc: 0.5
581 - recall: 0.5172 - precision: 0.7500
Epoch 6/45
1/1 [=====] - 0s 54ms/step - loss: 0.7077 - acc: 0.53
49 - recall: 0.4828 - precision: 0.7368
Epoch 7/45
1/1 [=====] - 0s 89ms/step - loss: 0.6909 - acc: 0.53
49 - recall: 0.4828 - precision: 0.7368
Epoch 8/45
1/1 [=====] - 0s 50ms/step - loss: 0.6878 - acc: 0.62
79 - recall: 0.5862 - precision: 0.8095
Epoch 9/45
1/1 [=====] - 0s 217ms/step - loss: 0.6903 - acc: 0.5
581 - recall: 0.5172 - precision: 0.7500
Epoch 10/45
1/1 [=====] - 0s 245ms/step - loss: 0.6918 - acc: 0.4
884 - recall: 0.4483 - precision: 0.6842
Epoch 11/45
1/1 [=====] - 0s 221ms/step - loss: 0.6838 - acc: 0.6
512 - recall: 0.5862 - precision: 0.8500
Epoch 12/45
1/1 [=====] - 0s 85ms/step - loss: 0.7036 - acc: 0.46
51 - recall: 0.4138 - precision: 0.6667
Epoch 13/45
1/1 [=====] - 0s 49ms/step - loss: 0.6680 - acc: 0.53
49 - recall: 0.4483 - precision: 0.7647
Epoch 14/45
1/1 [=====] - 0s 74ms/step - loss: 0.7865 - acc: 0.39
53 - recall: 0.3448 - precision: 0.5882
Epoch 15/45
1/1 [=====] - 0s 53ms/step - loss: 0.6889 - acc: 0.48
84 - recall: 0.4138 - precision: 0.7059
Epoch 16/45
1/1 [=====] - 0s 169ms/step - loss: 0.6803 - acc: 0.5
814 - recall: 0.4828 - precision: 0.8235
Epoch 17/45
1/1 [=====] - 0s 154ms/step - loss: 0.7055 - acc: 0.3
953 - recall: 0.3448 - precision: 0.5882
Epoch 18/45
1/1 [=====] - 0s 75ms/step - loss: 0.7088 - acc: 0.34
88 - recall: 0.2759 - precision: 0.5333
Epoch 19/45
1/1 [=====] - 0s 50ms/step - loss: 0.7140 - acc: 0.37
21 - recall: 0.2759 - precision: 0.5714
Epoch 20/45
1/1 [=====] - 0s 135ms/step - loss: 0.6938 - acc: 0.4
884 - recall: 0.3103 - precision: 0.8182
Epoch 21/45
```

```
1/1 [=====] - 0s 55ms/step - loss: 0.7125 - acc: 0.37
21 - recall: 0.2069 - precision: 0.6000
Epoch 22/45
1/1 [=====] - 0s 46ms/step - loss: 0.6954 - acc: 0.44
19 - recall: 0.2414 - precision: 0.7778
Epoch 23/45
1/1 [=====] - 0s 70ms/step - loss: 0.6963 - acc: 0.44
19 - recall: 0.2069 - precision: 0.8571
Epoch 24/45
1/1 [=====] - 0s 47ms/step - loss: 0.7011 - acc: 0.37
21 - recall: 0.1379 - precision: 0.6667
Epoch 25/45
1/1 [=====] - 0s 53ms/step - loss: 0.6999 - acc: 0.32
56 - recall: 0.0690 - precision: 0.5000
Epoch 26/45
1/1 [=====] - 0s 163ms/step - loss: 0.6988 - acc: 0.3
721 - recall: 0.1034 - precision: 0.7500
Epoch 27/45
1/1 [=====] - 0s 156ms/step - loss: 0.6982 - acc: 0.3
256 - recall: 0.0690 - precision: 0.5000
Epoch 28/45
1/1 [=====] - 0s 141ms/step - loss: 0.7042 - acc: 0.3
023 - recall: 0.0690 - precision: 0.4000
Epoch 29/45
1/1 [=====] - 0s 129ms/step - loss: 0.6953 - acc: 0.3
721 - recall: 0.1034 - precision: 0.7500
Epoch 30/45
1/1 [=====] - 0s 47ms/step - loss: 0.6902 - acc: 0.44
19 - recall: 0.1724 - precision: 1.0000
Epoch 31/45
1/1 [=====] - 0s 47ms/step - loss: 0.6875 - acc: 0.39
53 - recall: 0.1724 - precision: 0.7143
Epoch 32/45
1/1 [=====] - 0s 47ms/step - loss: 0.6798 - acc: 0.48
84 - recall: 0.2414 - precision: 1.0000
Epoch 33/45
1/1 [=====] - 0s 47ms/step - loss: 0.6766 - acc: 0.34
88 - recall: 0.1034 - precision: 0.6000
Epoch 34/45
1/1 [=====] - 0s 50ms/step - loss: 0.6762 - acc: 0.39
53 - recall: 0.2069 - precision: 0.6667
Epoch 35/45
1/1 [=====] - 0s 47ms/step - loss: 0.6677 - acc: 0.48
84 - recall: 0.3103 - precision: 0.8182
Epoch 36/45
1/1 [=====] - 0s 90ms/step - loss: 0.6124 - acc: 0.69
77 - recall: 0.6207 - precision: 0.9000
Epoch 37/45
1/1 [=====] - 0s 49ms/step - loss: 0.6006 - acc: 0.69
77 - recall: 0.6897 - precision: 0.8333
Epoch 38/45
1/1 [=====] - 0s 47ms/step - loss: 0.5526 - acc: 0.74
42 - recall: 0.6897 - precision: 0.9091
Epoch 39/45
1/1 [=====] - 0s 47ms/step - loss: 0.6337 - acc: 0.62
79 - recall: 0.6207 - precision: 0.7826
Epoch 40/45
1/1 [=====] - 0s 51ms/step - loss: 0.5904 - acc: 0.72
09 - recall: 0.7241 - precision: 0.8400
Epoch 41/45
```

```
1/1 [=====] - 0s 120ms/step - loss: 0.5515 - acc: 0.7  
674 - recall: 0.8276 - precision: 0.8276  
Epoch 42/45  
1/1 [=====] - 0s 48ms/step - loss: 0.5246 - acc: 0.81  
40 - recall: 0.8621 - precision: 0.8621  
Epoch 43/45  
1/1 [=====] - 0s 47ms/step - loss: 0.5484 - acc: 0.83  
72 - recall: 0.8621 - precision: 0.8929  
Epoch 44/45  
1/1 [=====] - 0s 47ms/step - loss: 0.5097 - acc: 0.81  
40 - recall: 0.8276 - precision: 0.8889  
Epoch 45/45  
1/1 [=====] - 0s 47ms/step - loss: 0.4802 - acc: 0.74  
42 - recall: 0.7586 - precision: 0.8462  
1/1 [=====] - 0s 196ms/step  
2023-03-29 00:07:42.901220: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.  
2/2 [=====] - 0s 176ms/step  
Epoch 1/45  
2023-03-29 00:07:44.282357: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
```

```
1/1 [=====] - 2s 2s/step - loss: 0.7290 - acc: 0.4884
- recall: 0.5556 - precision: 0.6000
Epoch 2/45
1/1 [=====] - 0s 255ms/step - loss: 0.7234 - acc: 0.4
651 - recall: 0.3704 - precision: 0.6250
Epoch 3/45
1/1 [=====] - 0s 253ms/step - loss: 0.7295 - acc: 0.3
953 - recall: 0.2593 - precision: 0.5385
Epoch 4/45
1/1 [=====] - 0s 209ms/step - loss: 0.7460 - acc: 0.3
488 - recall: 0.1852 - precision: 0.4545
Epoch 5/45
1/1 [=====] - 0s 154ms/step - loss: 0.7005 - acc: 0.4
651 - recall: 0.2593 - precision: 0.7000
Epoch 6/45
1/1 [=====] - 0s 73ms/step - loss: 0.7314 - acc: 0.37
21 - recall: 0.0741 - precision: 0.5000
Epoch 7/45
1/1 [=====] - 0s 52ms/step - loss: 0.7160 - acc: 0.41
86 - recall: 0.0741 - precision: 1.0000
Epoch 8/45
1/1 [=====] - 0s 156ms/step - loss: 0.6902 - acc: 0.4
186 - recall: 0.0741 - precision: 1.0000
Epoch 9/45
1/1 [=====] - 0s 209ms/step - loss: 0.7224 - acc: 0.3
953 - recall: 0.0741 - precision: 0.6667
Epoch 10/45
1/1 [=====] - 0s 142ms/step - loss: 0.7306 - acc: 0.4
186 - recall: 0.0741 - precision: 1.0000
Epoch 11/45
1/1 [=====] - 0s 249ms/step - loss: 0.7076 - acc: 0.4
186 - recall: 0.0741 - precision: 1.0000
Epoch 12/45
1/1 [=====] - 0s 47ms/step - loss: 0.7056 - acc: 0.41
86 - recall: 0.0741 - precision: 1.0000
Epoch 13/45
1/1 [=====] - 0s 121ms/step - loss: 0.7104 - acc: 0.3
721 - recall: 0.0370 - precision: 0.5000
Epoch 14/45
1/1 [=====] - 0s 171ms/step - loss: 0.6863 - acc: 0.4
419 - recall: 0.1111 - precision: 1.0000
Epoch 15/45
1/1 [=====] - 0s 53ms/step - loss: 0.7047 - acc: 0.37
21 - recall: 0.0370 - precision: 0.5000
Epoch 16/45
1/1 [=====] - 0s 133ms/step - loss: 0.7028 - acc: 0.3
953 - recall: 0.0741 - precision: 0.6667
Epoch 17/45
1/1 [=====] - 0s 47ms/step - loss: 0.6798 - acc: 0.41
86 - recall: 0.1111 - precision: 0.7500
Epoch 18/45
1/1 [=====] - 0s 74ms/step - loss: 0.6797 - acc: 0.41
86 - recall: 0.1481 - precision: 0.6667
Epoch 19/45
1/1 [=====] - 0s 52ms/step - loss: 0.6614 - acc: 0.60
47 - recall: 0.3704 - precision: 1.0000
Epoch 20/45
1/1 [=====] - 0s 49ms/step - loss: 0.6542 - acc: 0.60
47 - recall: 0.4815 - precision: 0.8125
Epoch 21/45
```

```
1/1 [=====] - 0s 142ms/step - loss: 0.5926 - acc: 0.6  
512 - recall: 0.5185 - precision: 0.8750  
Epoch 22/45  
1/1 [=====] - 0s 132ms/step - loss: 0.6380 - acc: 0.5  
581 - recall: 0.3704 - precision: 0.8333  
Epoch 23/45  
1/1 [=====] - 0s 139ms/step - loss: 0.5963 - acc: 0.6  
047 - recall: 0.4444 - precision: 0.8571  
Epoch 24/45  
1/1 [=====] - 0s 47ms/step - loss: 0.5233 - acc: 0.76  
74 - recall: 0.6667 - precision: 0.9474  
Epoch 25/45  
1/1 [=====] - 0s 47ms/step - loss: 0.5626 - acc: 0.76  
74 - recall: 0.7037 - precision: 0.9048  
Epoch 26/45  
1/1 [=====] - 0s 48ms/step - loss: 0.4405 - acc: 0.83  
72 - recall: 0.7778 - precision: 0.9545  
Epoch 27/45  
1/1 [=====] - 0s 129ms/step - loss: 0.4812 - acc: 0.7  
674 - recall: 0.7037 - precision: 0.9048  
Epoch 28/45  
1/1 [=====] - 0s 47ms/step - loss: 0.4964 - acc: 0.79  
07 - recall: 0.7037 - precision: 0.9500  
Epoch 29/45  
1/1 [=====] - 0s 129ms/step - loss: 0.4352 - acc: 0.7  
907 - recall: 0.7037 - precision: 0.9500  
Epoch 30/45  
1/1 [=====] - 0s 74ms/step - loss: 0.3427 - acc: 0.83  
72 - recall: 0.7778 - precision: 0.9545  
Epoch 31/45  
1/1 [=====] - 0s 47ms/step - loss: 0.4338 - acc: 0.76  
74 - recall: 0.7407 - precision: 0.8696  
Epoch 32/45  
1/1 [=====] - 0s 50ms/step - loss: 0.4397 - acc: 0.86  
05 - recall: 0.8519 - precision: 0.9200  
Epoch 33/45  
1/1 [=====] - 0s 47ms/step - loss: 0.2990 - acc: 0.88  
37 - recall: 0.8519 - precision: 0.9583  
Epoch 34/45  
1/1 [=====] - 0s 73ms/step - loss: 0.3487 - acc: 0.88  
37 - recall: 0.8519 - precision: 0.9583  
Epoch 35/45  
1/1 [=====] - 0s 49ms/step - loss: 0.3821 - acc: 0.83  
72 - recall: 0.8148 - precision: 0.9167  
Epoch 36/45  
1/1 [=====] - 0s 46ms/step - loss: 0.2875 - acc: 0.88  
37 - recall: 0.8889 - precision: 0.9231  
Epoch 37/45  
1/1 [=====] - 0s 48ms/step - loss: 0.3077 - acc: 0.90  
70 - recall: 0.9259 - precision: 0.9259  
Epoch 38/45  
1/1 [=====] - 0s 51ms/step - loss: 0.1998 - acc: 0.93  
02 - recall: 0.8889 - precision: 1.0000  
Epoch 39/45  
1/1 [=====] - 0s 48ms/step - loss: 0.2767 - acc: 0.90  
70 - recall: 0.8889 - precision: 0.9600  
Epoch 40/45  
1/1 [=====] - 0s 47ms/step - loss: 0.2217 - acc: 0.90  
70 - recall: 0.9259 - precision: 0.9259  
Epoch 41/45
```

```
1/1 [=====] - 0s 48ms/step - loss: 0.1026 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 42/45
1/1 [=====] - 0s 52ms/step - loss: 0.1426 - acc: 0.97
67 - recall: 1.0000 - precision: 0.9643
Epoch 43/45
1/1 [=====] - 0s 47ms/step - loss: 0.0704 - acc: 0.97
67 - recall: 0.9630 - precision: 1.0000
Epoch 44/45
1/1 [=====] - 0s 47ms/step - loss: 0.0764 - acc: 0.93
02 - recall: 0.8889 - precision: 1.0000
Epoch 45/45
1/1 [=====] - 0s 47ms/step - loss: 0.0768 - acc: 0.97
67 - recall: 1.0000 - precision: 0.9643
1/1 [=====] - 0s 179ms/step
2023-03-29 00:07:49.717907: I tensorflow/core/grappler/optimizers/custom_graph
_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
2/2 [=====] - 0s 217ms/step
Epoch 1/45
2023-03-29 00:07:50.585277: I tensorflow/core/grappler/optimizers/custom_graph
_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
```

```
1/1 [=====] - 1s 1s/step - loss: 0.6517 - acc: 0.5000
- recall: 0.5625 - precision: 0.7200
Epoch 2/45
1/1 [=====] - 0s 447ms/step - loss: 0.6492 - acc: 0.5000
- recall: 0.5312 - precision: 0.7391
Epoch 3/45
1/1 [=====] - 0s 245ms/step - loss: 0.6465 - acc: 0.5714
- recall: 0.6250 - precision: 0.7692
Epoch 4/45
1/1 [=====] - 0s 253ms/step - loss: 0.6479 - acc: 0.5952
- recall: 0.6562 - precision: 0.7778
Epoch 5/45
1/1 [=====] - 0s 196ms/step - loss: 0.6533 - acc: 0.5714
- recall: 0.6562 - precision: 0.7500
Epoch 6/45
1/1 [=====] - 0s 160ms/step - loss: 0.6432 - acc: 0.6190
- recall: 0.7188 - precision: 0.7667
Epoch 7/45
1/1 [=====] - 0s 88ms/step - loss: 0.6474 - acc: 0.6429
- recall: 0.7812 - precision: 0.7576
Epoch 8/45
1/1 [=====] - 0s 52ms/step - loss: 0.6430 - acc: 0.6429
- recall: 0.7500 - precision: 0.7742
Epoch 9/45
1/1 [=====] - 0s 130ms/step - loss: 0.6447 - acc: 0.6905
- recall: 0.8125 - precision: 0.7879
Epoch 10/45
1/1 [=====] - 0s 48ms/step - loss: 0.6480 - acc: 0.6190
- recall: 0.7812 - precision: 0.7353
Epoch 11/45
1/1 [=====] - 0s 143ms/step - loss: 0.6471 - acc: 0.6667
- recall: 0.8438 - precision: 0.7500
Epoch 12/45
1/1 [=====] - 0s 218ms/step - loss: 0.6477 - acc: 0.7143
- recall: 0.9062 - precision: 0.7632
Epoch 13/45
1/1 [=====] - 0s 160ms/step - loss: 0.6435 - acc: 0.7143
- recall: 0.9062 - precision: 0.7632
Epoch 14/45
1/1 [=====] - 0s 51ms/step - loss: 0.6412 - acc: 0.7143
- recall: 0.9375 - precision: 0.7500
Epoch 15/45
1/1 [=====] - 0s 229ms/step - loss: 0.6413 - acc: 0.7143
- recall: 0.9375 - precision: 0.7500
Epoch 16/45
1/1 [=====] - 0s 48ms/step - loss: 0.6380 - acc: 0.7143
- recall: 0.9375 - precision: 0.7500
Epoch 17/45
1/1 [=====] - 0s 74ms/step - loss: 0.6410 - acc: 0.7381
- recall: 0.9375 - precision: 0.7692
Epoch 18/45
1/1 [=====] - 0s 49ms/step - loss: 0.6498 - acc: 0.7143
- recall: 0.9375 - precision: 0.7500
Epoch 19/45
1/1 [=====] - 0s 123ms/step - loss: 0.6403 - acc: 0.7619
- recall: 0.9688 - precision: 0.7750
Epoch 20/45
1/1 [=====] - 0s 47ms/step - loss: 0.6456 - acc: 0.7143
- recall: 0.9375 - precision: 0.7500
Epoch 21/45
```

```
1/1 [=====] - 0s 46ms/step - loss: 0.6415 - acc: 0.71  
43 - recall: 0.9375 - precision: 0.7500  
Epoch 22/45  
1/1 [=====] - 0s 137ms/step - loss: 0.6384 - acc: 0.8  
095 - recall: 1.0000 - precision: 0.8000  
Epoch 23/45  
1/1 [=====] - 0s 47ms/step - loss: 0.6363 - acc: 0.78  
57 - recall: 1.0000 - precision: 0.7805  
Epoch 24/45  
1/1 [=====] - 0s 49ms/step - loss: 0.6414 - acc: 0.73  
81 - recall: 0.9688 - precision: 0.7561  
Epoch 25/45  
1/1 [=====] - 0s 126ms/step - loss: 0.6381 - acc: 0.7  
857 - recall: 1.0000 - precision: 0.7805  
Epoch 26/45  
1/1 [=====] - 0s 139ms/step - loss: 0.6367 - acc: 0.7  
857 - recall: 1.0000 - precision: 0.7805  
Epoch 27/45  
1/1 [=====] - 0s 46ms/step - loss: 0.6383 - acc: 0.78  
57 - recall: 1.0000 - precision: 0.7805  
Epoch 28/45  
1/1 [=====] - 0s 71ms/step - loss: 0.6484 - acc: 0.73  
81 - recall: 0.9688 - precision: 0.7561  
Epoch 29/45  
1/1 [=====] - 0s 46ms/step - loss: 0.6402 - acc: 0.73  
81 - recall: 0.9688 - precision: 0.7561  
Epoch 30/45  
1/1 [=====] - 0s 47ms/step - loss: 0.6384 - acc: 0.78  
57 - recall: 1.0000 - precision: 0.7805  
Epoch 31/45  
1/1 [=====] - 0s 46ms/step - loss: 0.6417 - acc: 0.73  
81 - recall: 0.9688 - precision: 0.7561  
Epoch 32/45  
1/1 [=====] - 0s 46ms/step - loss: 0.6375 - acc: 0.78  
57 - recall: 1.0000 - precision: 0.7805  
Epoch 33/45  
1/1 [=====] - 0s 46ms/step - loss: 0.6443 - acc: 0.73  
81 - recall: 0.9688 - precision: 0.7561  
Epoch 34/45  
1/1 [=====] - 0s 45ms/step - loss: 0.6287 - acc: 0.78  
57 - recall: 1.0000 - precision: 0.7805  
Epoch 35/45  
1/1 [=====] - 0s 120ms/step - loss: 0.6266 - acc: 0.7  
857 - recall: 1.0000 - precision: 0.7805  
Epoch 36/45  
1/1 [=====] - 0s 46ms/step - loss: 0.6393 - acc: 0.73  
81 - recall: 0.9688 - precision: 0.7561  
Epoch 37/45  
1/1 [=====] - 0s 45ms/step - loss: 0.6420 - acc: 0.73  
81 - recall: 0.9688 - precision: 0.7561  
Epoch 38/45  
1/1 [=====] - 0s 45ms/step - loss: 0.6355 - acc: 0.73  
81 - recall: 0.9688 - precision: 0.7561  
Epoch 39/45  
1/1 [=====] - 0s 46ms/step - loss: 0.6440 - acc: 0.73  
81 - recall: 0.9688 - precision: 0.7561  
Epoch 40/45  
1/1 [=====] - 0s 47ms/step - loss: 0.6452 - acc: 0.73  
81 - recall: 0.9688 - precision: 0.7561  
Epoch 41/45
```

```
1/1 [=====] - 0s 49ms/step - loss: 0.6369 - acc: 0.73
81 - recall: 0.9688 - precision: 0.7561
Epoch 42/45
1/1 [=====] - 0s 46ms/step - loss: 0.6415 - acc: 0.73
81 - recall: 0.9688 - precision: 0.7561
Epoch 43/45
1/1 [=====] - 0s 47ms/step - loss: 0.6383 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 44/45
1/1 [=====] - 0s 47ms/step - loss: 0.6395 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 45/45
1/1 [=====] - 0s 45ms/step - loss: 0.6282 - acc: 0.78
57 - recall: 1.0000 - precision: 0.7805
2023-03-29 00:07:56.253341: I tensorflow/core/grappler/optimizers/custom_graph_
_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
1/1 [=====] - 0s 275ms/step
2/2 [=====] - 0s 169ms/step
Epoch 1/45
2023-03-29 00:07:57.242562: I tensorflow/core/grappler/optimizers/custom_graph_
_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
```

```
1/1 [=====] - 2s 2s/step - loss: 0.6993 - acc: 0.4884
- recall: 0.5517 - precision: 0.6400
Epoch 2/45
1/1 [=====] - 0s 248ms/step - loss: 0.6971 - acc: 0.5
814 - recall: 0.5517 - precision: 0.7619
Epoch 3/45
1/1 [=====] - 0s 223ms/step - loss: 0.6950 - acc: 0.5
814 - recall: 0.5172 - precision: 0.7895
Epoch 4/45
1/1 [=====] - 0s 171ms/step - loss: 0.7014 - acc: 0.5
116 - recall: 0.5172 - precision: 0.6818
Epoch 5/45
1/1 [=====] - 0s 168ms/step - loss: 0.7023 - acc: 0.5
581 - recall: 0.5517 - precision: 0.7273
Epoch 6/45
1/1 [=====] - 0s 244ms/step - loss: 0.6962 - acc: 0.5
814 - recall: 0.5862 - precision: 0.7391
Epoch 7/45
1/1 [=====] - 0s 158ms/step - loss: 0.7014 - acc: 0.5
116 - recall: 0.5172 - precision: 0.6818
Epoch 8/45
1/1 [=====] - 0s 172ms/step - loss: 0.7099 - acc: 0.4
186 - recall: 0.4828 - precision: 0.5833
Epoch 9/45
1/1 [=====] - 0s 73ms/step - loss: 0.6997 - acc: 0.51
16 - recall: 0.5517 - precision: 0.6667
Epoch 10/45
1/1 [=====] - 0s 164ms/step - loss: 0.6977 - acc: 0.5
581 - recall: 0.5862 - precision: 0.7083
Epoch 11/45
1/1 [=====] - 0s 213ms/step - loss: 0.7005 - acc: 0.5
116 - recall: 0.4828 - precision: 0.7000
Epoch 12/45
1/1 [=====] - 0s 140ms/step - loss: 0.7090 - acc: 0.3
953 - recall: 0.4138 - precision: 0.5714
Epoch 13/45
1/1 [=====] - 0s 167ms/step - loss: 0.7049 - acc: 0.3
953 - recall: 0.4138 - precision: 0.5714
Epoch 14/45
1/1 [=====] - 0s 74ms/step - loss: 0.6992 - acc: 0.48
84 - recall: 0.4828 - precision: 0.6667
Epoch 15/45
1/1 [=====] - 0s 49ms/step - loss: 0.7009 - acc: 0.44
19 - recall: 0.4483 - precision: 0.6190
Epoch 16/45
1/1 [=====] - 0s 50ms/step - loss: 0.7000 - acc: 0.53
49 - recall: 0.4828 - precision: 0.7368
Epoch 17/45
1/1 [=====] - 0s 50ms/step - loss: 0.7040 - acc: 0.44
19 - recall: 0.4483 - precision: 0.6190
Epoch 18/45
1/1 [=====] - 0s 126ms/step - loss: 0.7004 - acc: 0.4
884 - recall: 0.4483 - precision: 0.6842
Epoch 19/45
1/1 [=====] - 0s 127ms/step - loss: 0.7055 - acc: 0.3
953 - recall: 0.4138 - precision: 0.5714
Epoch 20/45
1/1 [=====] - 0s 78ms/step - loss: 0.7023 - acc: 0.55
81 - recall: 0.4828 - precision: 0.7778
Epoch 21/45
```

```
1/1 [=====] - 0s 47ms/step - loss: 0.7048 - acc: 0.44  
19 - recall: 0.4138 - precision: 0.6316  
Epoch 22/45  
1/1 [=====] - 0s 134ms/step - loss: 0.6989 - acc: 0.5  
349 - recall: 0.4483 - precision: 0.7647  
Epoch 23/45  
1/1 [=====] - 0s 128ms/step - loss: 0.7017 - acc: 0.5  
349 - recall: 0.4483 - precision: 0.7647  
Epoch 24/45  
1/1 [=====] - 0s 50ms/step - loss: 0.6981 - acc: 0.55  
81 - recall: 0.4828 - precision: 0.7778  
Epoch 25/45  
1/1 [=====] - 0s 47ms/step - loss: 0.6955 - acc: 0.58  
14 - recall: 0.5172 - precision: 0.7895  
Epoch 26/45  
1/1 [=====] - 0s 46ms/step - loss: 0.6942 - acc: 0.55  
81 - recall: 0.4828 - precision: 0.7778  
Epoch 27/45  
1/1 [=====] - 0s 125ms/step - loss: 0.6954 - acc: 0.5  
116 - recall: 0.4828 - precision: 0.7000  
Epoch 28/45  
1/1 [=====] - 0s 155ms/step - loss: 0.7013 - acc: 0.5  
116 - recall: 0.4483 - precision: 0.7222  
Epoch 29/45  
1/1 [=====] - 0s 47ms/step - loss: 0.6994 - acc: 0.51  
16 - recall: 0.4483 - precision: 0.7222  
Epoch 30/45  
1/1 [=====] - 0s 143ms/step - loss: 0.6952 - acc: 0.5  
581 - recall: 0.4828 - precision: 0.7778  
Epoch 31/45  
1/1 [=====] - 0s 143ms/step - loss: 0.7053 - acc: 0.4  
651 - recall: 0.4138 - precision: 0.6667  
Epoch 32/45  
1/1 [=====] - 0s 48ms/step - loss: 0.6936 - acc: 0.58  
14 - recall: 0.5172 - precision: 0.7895  
Epoch 33/45  
1/1 [=====] - 0s 46ms/step - loss: 0.7077 - acc: 0.41  
86 - recall: 0.4138 - precision: 0.6000  
Epoch 34/45  
1/1 [=====] - 0s 47ms/step - loss: 0.6991 - acc: 0.48  
84 - recall: 0.4138 - precision: 0.7059  
Epoch 35/45  
1/1 [=====] - 0s 46ms/step - loss: 0.7021 - acc: 0.51  
16 - recall: 0.4483 - precision: 0.7222  
Epoch 36/45  
1/1 [=====] - 0s 47ms/step - loss: 0.6995 - acc: 0.53  
49 - recall: 0.4828 - precision: 0.7368  
Epoch 37/45  
1/1 [=====] - 0s 48ms/step - loss: 0.7101 - acc: 0.27  
91 - recall: 0.2759 - precision: 0.4444  
Epoch 38/45  
1/1 [=====] - 0s 120ms/step - loss: 0.7010 - acc: 0.4  
651 - recall: 0.4138 - precision: 0.6667  
Epoch 39/45  
1/1 [=====] - 0s 49ms/step - loss: 0.7013 - acc: 0.44  
19 - recall: 0.3793 - precision: 0.6471  
Epoch 40/45  
1/1 [=====] - 0s 49ms/step - loss: 0.6959 - acc: 0.51  
16 - recall: 0.4483 - precision: 0.7222  
Epoch 41/45
```

```
1/1 [=====] - 0s 48ms/step - loss: 0.6956 - acc: 0.62
79 - recall: 0.5517 - precision: 0.8421
Epoch 42/45
1/1 [=====] - 0s 48ms/step - loss: 0.7020 - acc: 0.46
51 - recall: 0.4483 - precision: 0.6500
Epoch 43/45
1/1 [=====] - 0s 48ms/step - loss: 0.7015 - acc: 0.51
16 - recall: 0.4483 - precision: 0.7222
Epoch 44/45
1/1 [=====] - 0s 47ms/step - loss: 0.7025 - acc: 0.41
86 - recall: 0.3793 - precision: 0.6111
Epoch 45/45
1/1 [=====] - 0s 46ms/step - loss: 0.6963 - acc: 0.48
84 - recall: 0.4138 - precision: 0.7059
2023-03-29 00:08:03.214158: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
1/1 [=====] - 0s 268ms/step
2/2 [=====] - 0s 167ms/step
Epoch 1/45
2023-03-29 00:08:04.185410: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
```

```
1/1 [=====] - 2s 2s/step - loss: 0.7341 - acc: 0.3953
- recall: 0.4444 - precision: 0.5217
Epoch 2/45
1/1 [=====] - 0s 238ms/step - loss: 0.7306 - acc: 0.5
116 - recall: 0.5185 - precision: 0.6364
Epoch 3/45
1/1 [=====] - 0s 245ms/step - loss: 0.7225 - acc: 0.6
047 - recall: 0.5926 - precision: 0.7273
Epoch 4/45
1/1 [=====] - 0s 237ms/step - loss: 0.7290 - acc: 0.4
419 - recall: 0.4444 - precision: 0.5714
Epoch 5/45
1/1 [=====] - 0s 157ms/step - loss: 0.7308 - acc: 0.4
186 - recall: 0.4074 - precision: 0.5500
Epoch 6/45
1/1 [=====] - 0s 237ms/step - loss: 0.7265 - acc: 0.4
884 - recall: 0.4444 - precision: 0.6316
Epoch 7/45
1/1 [=====] - 0s 163ms/step - loss: 0.7292 - acc: 0.4
884 - recall: 0.4074 - precision: 0.6471
Epoch 8/45
1/1 [=====] - 0s 50ms/step - loss: 0.7259 - acc: 0.48
84 - recall: 0.4074 - precision: 0.6471
Epoch 9/45
1/1 [=====] - 0s 238ms/step - loss: 0.7266 - acc: 0.4
419 - recall: 0.3704 - precision: 0.5882
Epoch 10/45
1/1 [=====] - 0s 50ms/step - loss: 0.7265 - acc: 0.51
16 - recall: 0.3704 - precision: 0.7143
Epoch 11/45
1/1 [=====] - 0s 52ms/step - loss: 0.7274 - acc: 0.46
51 - recall: 0.3704 - precision: 0.6250
Epoch 12/45
1/1 [=====] - 0s 71ms/step - loss: 0.7311 - acc: 0.46
51 - recall: 0.3333 - precision: 0.6429
Epoch 13/45
1/1 [=====] - 0s 50ms/step - loss: 0.7262 - acc: 0.55
81 - recall: 0.4074 - precision: 0.7857
Epoch 14/45
1/1 [=====] - 0s 52ms/step - loss: 0.7219 - acc: 0.46
51 - recall: 0.3333 - precision: 0.6429
Epoch 15/45
1/1 [=====] - 0s 135ms/step - loss: 0.7221 - acc: 0.5
581 - recall: 0.3704 - precision: 0.8333
Epoch 16/45
1/1 [=====] - 0s 47ms/step - loss: 0.7272 - acc: 0.39
53 - recall: 0.2222 - precision: 0.5455
Epoch 17/45
1/1 [=====] - 0s 161ms/step - loss: 0.7264 - acc: 0.4
884 - recall: 0.3333 - precision: 0.6923
Epoch 18/45
1/1 [=====] - 0s 48ms/step - loss: 0.7306 - acc: 0.44
19 - recall: 0.2593 - precision: 0.6364
Epoch 19/45
1/1 [=====] - 0s 150ms/step - loss: 0.7255 - acc: 0.3
953 - recall: 0.1852 - precision: 0.5556
Epoch 20/45
1/1 [=====] - 0s 48ms/step - loss: 0.7283 - acc: 0.41
86 - recall: 0.1852 - precision: 0.6250
Epoch 21/45
```

```
1/1 [=====] - 0s 48ms/step - loss: 0.7217 - acc: 0.44
19 - recall: 0.1852 - precision: 0.7143
Epoch 22/45
1/1 [=====] - 0s 123ms/step - loss: 0.7225 - acc: 0.3
721 - recall: 0.1111 - precision: 0.5000
Epoch 23/45
1/1 [=====] - 0s 135ms/step - loss: 0.7303 - acc: 0.3
953 - recall: 0.1481 - precision: 0.5714
Epoch 24/45
1/1 [=====] - 0s 51ms/step - loss: 0.7268 - acc: 0.37
21 - recall: 0.0741 - precision: 0.5000
Epoch 25/45
1/1 [=====] - 0s 49ms/step - loss: 0.7293 - acc: 0.41
86 - recall: 0.1111 - precision: 0.7500
Epoch 26/45
1/1 [=====] - 0s 46ms/step - loss: 0.7273 - acc: 0.39
53 - recall: 0.1111 - precision: 0.6000
Epoch 27/45
1/1 [=====] - 0s 52ms/step - loss: 0.7337 - acc: 0.34
88 - recall: 0.0741 - precision: 0.4000
Epoch 28/45
1/1 [=====] - 0s 122ms/step - loss: 0.7296 - acc: 0.3
953 - recall: 0.0741 - precision: 0.6667
Epoch 29/45
1/1 [=====] - 0s 139ms/step - loss: 0.7268 - acc: 0.3
488 - recall: 0.0370 - precision: 0.3333
Epoch 30/45
1/1 [=====] - 0s 48ms/step - loss: 0.7288 - acc: 0.39
53 - recall: 0.0741 - precision: 0.6667
Epoch 31/45
1/1 [=====] - 0s 133ms/step - loss: 0.7263 - acc: 0.3
953 - recall: 0.0741 - precision: 0.6667
Epoch 32/45
1/1 [=====] - 0s 46ms/step - loss: 0.7232 - acc: 0.34
88 - recall: 0.0370 - precision: 0.3333
Epoch 33/45
1/1 [=====] - 0s 47ms/step - loss: 0.7210 - acc: 0.41
86 - recall: 0.0741 - precision: 1.0000
Epoch 34/45
1/1 [=====] - 0s 47ms/step - loss: 0.7293 - acc: 0.34
88 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 35/45
1/1 [=====] - 0s 46ms/step - loss: 0.7250 - acc: 0.37
21 - recall: 0.0370 - precision: 0.5000
Epoch 36/45
1/1 [=====] - 0s 48ms/step - loss: 0.7265 - acc: 0.37
21 - recall: 0.0370 - precision: 0.5000
Epoch 37/45
1/1 [=====] - 0s 49ms/step - loss: 0.7231 - acc: 0.41
86 - recall: 0.0741 - precision: 1.0000
Epoch 38/45
1/1 [=====] - 0s 47ms/step - loss: 0.7236 - acc: 0.32
56 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 39/45
1/1 [=====] - 0s 47ms/step - loss: 0.7239 - acc: 0.39
53 - recall: 0.0370 - precision: 1.0000
Epoch 40/45
1/1 [=====] - 0s 46ms/step - loss: 0.7270 - acc: 0.34
88 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 41/45
```

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1/1 [=====] - 0s 47ms/step - loss: 0.7208 - acc: 0.39
53 - recall: 0.0370 - precision: 1.0000
Epoch 42/45
1/1 [=====] - 0s 47ms/step - loss: 0.7186 - acc: 0.39
53 - recall: 0.0370 - precision: 1.0000
Epoch 43/45
1/1 [=====] - 0s 47ms/step - loss: 0.7240 - acc: 0.39
53 - recall: 0.0370 - precision: 1.0000
Epoch 44/45
1/1 [=====] - 0s 47ms/step - loss: 0.7177 - acc: 0.41
86 - recall: 0.0741 - precision: 1.0000
Epoch 45/45
1/1 [=====] - 0s 46ms/step - loss: 0.7258 - acc: 0.41
86 - recall: 0.0741 - precision: 1.0000
2023-03-29 00:08:09.631446: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
1/1 [=====] - 0s 287ms/step
2/2 [=====] - 0s 228ms/step
Epoch 1/65
2023-03-29 00:08:11.103944: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
```

```
1/1 [=====] - 2s 2s/step - loss: 0.6472 - acc: 0.4762
- recall: 0.5000 - precision: 0.7273
Epoch 2/65
1/1 [=====] - 0s 461ms/step - loss: 0.6249 - acc: 0.7
619 - recall: 0.9062 - precision: 0.8056
Epoch 3/65
1/1 [=====] - 0s 252ms/step - loss: 0.6696 - acc: 0.6
667 - recall: 0.8438 - precision: 0.7500
Epoch 4/65
1/1 [=====] - 0s 260ms/step - loss: 0.6755 - acc: 0.6
667 - recall: 0.8750 - precision: 0.7368
Epoch 5/65
1/1 [=====] - 0s 84ms/step - loss: 0.6538 - acc: 0.66
67 - recall: 0.8438 - precision: 0.7500
Epoch 6/65
1/1 [=====] - 0s 245ms/step - loss: 0.6456 - acc: 0.6
905 - recall: 0.7812 - precision: 0.8065
Epoch 7/65
1/1 [=====] - 0s 53ms/step - loss: 0.6431 - acc: 0.54
76 - recall: 0.6875 - precision: 0.7097
Epoch 8/65
1/1 [=====] - 0s 221ms/step - loss: 0.6480 - acc: 0.6
429 - recall: 0.7812 - precision: 0.7576
Epoch 9/65
1/1 [=====] - 0s 77ms/step - loss: 0.6243 - acc: 0.88
10 - recall: 0.9688 - precision: 0.8857
Epoch 10/65
1/1 [=====] - 0s 75ms/step - loss: 0.6475 - acc: 0.71
43 - recall: 0.9062 - precision: 0.7632
Epoch 11/65
1/1 [=====] - 0s 50ms/step - loss: 0.6450 - acc: 0.73
81 - recall: 0.9688 - precision: 0.7561
Epoch 12/65
1/1 [=====] - 0s 76ms/step - loss: 0.6264 - acc: 0.76
19 - recall: 0.9688 - precision: 0.7750
Epoch 13/65
1/1 [=====] - 0s 145ms/step - loss: 0.6160 - acc: 0.7
381 - recall: 0.9688 - precision: 0.7561
Epoch 14/65
1/1 [=====] - 0s 77ms/step - loss: 0.6266 - acc: 0.73
81 - recall: 0.9688 - precision: 0.7561
Epoch 15/65
1/1 [=====] - 0s 131ms/step - loss: 0.6351 - acc: 0.7
381 - recall: 0.9688 - precision: 0.7561
Epoch 16/65
1/1 [=====] - 0s 50ms/step - loss: 0.6879 - acc: 0.78
57 - recall: 1.0000 - precision: 0.7805
Epoch 17/65
1/1 [=====] - 0s 153ms/step - loss: 0.6315 - acc: 0.7
619 - recall: 0.9688 - precision: 0.7750
Epoch 18/65
1/1 [=====] - 0s 144ms/step - loss: 0.6278 - acc: 0.7
619 - recall: 0.9688 - precision: 0.7750
Epoch 19/65
1/1 [=====] - 0s 52ms/step - loss: 0.6161 - acc: 0.73
81 - recall: 0.9375 - precision: 0.7692
Epoch 20/65
1/1 [=====] - 0s 207ms/step - loss: 0.6316 - acc: 0.7
381 - recall: 0.9375 - precision: 0.7692
Epoch 21/65
```

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1/1 [=====] - 0s 219ms/step - loss: 0.6132 - acc: 0.7  
857 - recall: 1.0000 - precision: 0.7805  
Epoch 22/65  
1/1 [=====] - 0s 51ms/step - loss: 0.6161 - acc: 0.78  
57 - recall: 0.9688 - precision: 0.7949  
Epoch 23/65  
1/1 [=====] - 0s 47ms/step - loss: 0.6030 - acc: 0.73  
81 - recall: 0.9375 - precision: 0.7692  
Epoch 24/65  
1/1 [=====] - 0s 125ms/step - loss: 0.5759 - acc: 0.7  
619 - recall: 0.8750 - precision: 0.8235  
Epoch 25/65  
1/1 [=====] - 0s 52ms/step - loss: 0.5777 - acc: 0.80  
95 - recall: 0.8750 - precision: 0.8750  
Epoch 26/65  
1/1 [=====] - 0s 130ms/step - loss: 0.5415 - acc: 0.7  
619 - recall: 0.8438 - precision: 0.8438  
Epoch 27/65  
1/1 [=====] - 0s 47ms/step - loss: 0.5430 - acc: 0.76  
19 - recall: 0.7812 - precision: 0.8929  
Epoch 28/65  
1/1 [=====] - 0s 142ms/step - loss: 0.4672 - acc: 0.8  
095 - recall: 0.8125 - precision: 0.9286  
Epoch 29/65  
1/1 [=====] - 0s 47ms/step - loss: 0.4901 - acc: 0.76  
19 - recall: 0.8125 - precision: 0.8667  
Epoch 30/65  
1/1 [=====] - 0s 48ms/step - loss: 0.4301 - acc: 0.78  
57 - recall: 0.8125 - precision: 0.8966  
Epoch 31/65  
1/1 [=====] - 0s 75ms/step - loss: 0.3442 - acc: 0.85  
71 - recall: 0.8750 - precision: 0.9333  
Epoch 32/65  
1/1 [=====] - 0s 47ms/step - loss: 0.4297 - acc: 0.76  
19 - recall: 0.7500 - precision: 0.9231  
Epoch 33/65  
1/1 [=====] - 0s 49ms/step - loss: 0.3860 - acc: 0.78  
57 - recall: 0.7812 - precision: 0.9259  
Epoch 34/65  
1/1 [=====] - 0s 47ms/step - loss: 0.3383 - acc: 0.83  
33 - recall: 0.8438 - precision: 0.9310  
Epoch 35/65  
1/1 [=====] - 0s 47ms/step - loss: 0.3719 - acc: 0.80  
95 - recall: 0.8125 - precision: 0.9286  
Epoch 36/65  
1/1 [=====] - 0s 47ms/step - loss: 0.3639 - acc: 0.83  
33 - recall: 0.8438 - precision: 0.9310  
Epoch 37/65  
1/1 [=====] - 0s 47ms/step - loss: 0.2931 - acc: 0.88  
10 - recall: 0.8438 - precision: 1.0000  
Epoch 38/65  
1/1 [=====] - 0s 47ms/step - loss: 0.3398 - acc: 0.88  
10 - recall: 0.8750 - precision: 0.9655  
Epoch 39/65  
1/1 [=====] - 0s 47ms/step - loss: 0.3135 - acc: 0.90  
48 - recall: 0.9062 - precision: 0.9667  
Epoch 40/65  
1/1 [=====] - 0s 47ms/step - loss: 0.3523 - acc: 0.78  
57 - recall: 0.7500 - precision: 0.9600  
Epoch 41/65
```

```
1/1 [=====] - 0s 198ms/step - loss: 0.2927 - acc: 0.8  
571 - recall: 0.8750 - precision: 0.9333  
Epoch 42/65  
1/1 [=====] - 0s 49ms/step - loss: 0.2637 - acc: 0.88  
10 - recall: 0.9062 - precision: 0.9355  
Epoch 43/65  
1/1 [=====] - 0s 47ms/step - loss: 0.2351 - acc: 0.85  
71 - recall: 0.8125 - precision: 1.0000  
Epoch 44/65  
1/1 [=====] - 0s 46ms/step - loss: 0.2133 - acc: 0.85  
71 - recall: 0.8125 - precision: 1.0000  
Epoch 45/65  
1/1 [=====] - 0s 47ms/step - loss: 0.2768 - acc: 0.92  
86 - recall: 0.9062 - precision: 1.0000  
Epoch 46/65  
1/1 [=====] - 0s 47ms/step - loss: 0.1679 - acc: 0.97  
62 - recall: 0.9688 - precision: 1.0000  
Epoch 47/65  
1/1 [=====] - 0s 48ms/step - loss: 0.2653 - acc: 0.90  
48 - recall: 0.9062 - precision: 0.9667  
Epoch 48/65  
1/1 [=====] - 0s 46ms/step - loss: 0.3164 - acc: 0.83  
33 - recall: 0.8750 - precision: 0.9032  
Epoch 49/65  
1/1 [=====] - 0s 47ms/step - loss: 0.1491 - acc: 0.90  
48 - recall: 0.8750 - precision: 1.0000  
Epoch 50/65  
1/1 [=====] - 0s 135ms/step - loss: 0.2150 - acc: 0.8  
810 - recall: 0.8750 - precision: 0.9655  
Epoch 51/65  
1/1 [=====] - 0s 47ms/step - loss: 0.1826 - acc: 0.90  
48 - recall: 0.8750 - precision: 1.0000  
Epoch 52/65  
1/1 [=====] - 0s 47ms/step - loss: 0.2077 - acc: 0.85  
71 - recall: 0.8750 - precision: 0.9333  
Epoch 53/65  
1/1 [=====] - 0s 47ms/step - loss: 0.2314 - acc: 0.85  
71 - recall: 0.9062 - precision: 0.9062  
Epoch 54/65  
1/1 [=====] - 0s 46ms/step - loss: 0.1613 - acc: 0.92  
86 - recall: 0.9375 - precision: 0.9677  
Epoch 55/65  
1/1 [=====] - 0s 49ms/step - loss: 0.1612 - acc: 0.90  
48 - recall: 0.9062 - precision: 0.9667  
Epoch 56/65  
1/1 [=====] - 0s 46ms/step - loss: 0.2264 - acc: 0.90  
48 - recall: 0.9062 - precision: 0.9667  
Epoch 57/65  
1/1 [=====] - 0s 47ms/step - loss: 0.1506 - acc: 0.95  
24 - recall: 0.9375 - precision: 1.0000  
Epoch 58/65  
1/1 [=====] - 0s 48ms/step - loss: 0.1195 - acc: 0.97  
62 - recall: 0.9688 - precision: 1.0000  
Epoch 59/65  
1/1 [=====] - 0s 48ms/step - loss: 0.1115 - acc: 0.97  
62 - recall: 0.9688 - precision: 1.0000  
Epoch 60/65  
1/1 [=====] - 0s 47ms/step - loss: 0.0748 - acc: 0.95  
24 - recall: 0.9375 - precision: 1.0000  
Epoch 61/65
```

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1/1 [=====] - 0s 47ms/step - loss: 0.0758 - acc: 0.97
62 - recall: 0.9688 - precision: 1.0000
Epoch 62/65
1/1 [=====] - 0s 46ms/step - loss: 0.1346 - acc: 0.95
24 - recall: 0.9688 - precision: 0.9688
Epoch 63/65
1/1 [=====] - 0s 46ms/step - loss: 0.0895 - acc: 0.97
62 - recall: 0.9688 - precision: 1.0000
Epoch 64/65
1/1 [=====] - 0s 47ms/step - loss: 0.0377 - acc: 0.97
62 - recall: 0.9688 - precision: 1.0000
Epoch 65/65
1/1 [=====] - 0s 48ms/step - loss: 0.0275 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
2023-03-29 00:08:18.268549: I tensorflow/core/grappler/optimizers/custom_graph_
_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
1/1 [=====] - 0s 279ms/step
2/2 [=====] - 0s 168ms/step
Epoch 1/65
2023-03-29 00:08:19.299564: I tensorflow/core/grappler/optimizers/custom_graph_
_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
```

```
1/1 [=====] - 2s 2s/step - loss: 0.7036 - acc: 0.4419
- recall: 0.4828 - precision: 0.6087
Epoch 2/65
1/1 [=====] - 0s 259ms/step - loss: 0.6856 - acc: 0.6
047 - recall: 0.6207 - precision: 0.7500
Epoch 3/65
1/1 [=====] - 0s 253ms/step - loss: 0.7649 - acc: 0.3
721 - recall: 0.4828 - precision: 0.5385
Epoch 4/65
1/1 [=====] - 0s 252ms/step - loss: 0.6969 - acc: 0.5
116 - recall: 0.4483 - precision: 0.7222
Epoch 5/65
1/1 [=====] - 0s 246ms/step - loss: 0.7155 - acc: 0.3
953 - recall: 0.3103 - precision: 0.6000
Epoch 6/65
1/1 [=====] - 0s 66ms/step - loss: 0.7015 - acc: 0.51
16 - recall: 0.4138 - precision: 0.7500
Epoch 7/65
1/1 [=====] - 0s 247ms/step - loss: 0.6901 - acc: 0.6
047 - recall: 0.4483 - precision: 0.9286
Epoch 8/65
1/1 [=====] - 0s 227ms/step - loss: 0.7024 - acc: 0.4
651 - recall: 0.3448 - precision: 0.7143
Epoch 9/65
1/1 [=====] - 0s 169ms/step - loss: 0.6877 - acc: 0.5
116 - recall: 0.3448 - precision: 0.8333
Epoch 10/65
1/1 [=====] - 0s 166ms/step - loss: 0.6824 - acc: 0.4
884 - recall: 0.3103 - precision: 0.8182
Epoch 11/65
1/1 [=====] - 0s 77ms/step - loss: 0.7093 - acc: 0.44
19 - recall: 0.3103 - precision: 0.6923
Epoch 12/65
1/1 [=====] - 0s 52ms/step - loss: 0.6771 - acc: 0.46
51 - recall: 0.3448 - precision: 0.7143
Epoch 13/65
1/1 [=====] - 0s 71ms/step - loss: 0.6602 - acc: 0.46
51 - recall: 0.3448 - precision: 0.7143
Epoch 14/65
1/1 [=====] - 0s 255ms/step - loss: 0.7191 - acc: 0.4
884 - recall: 0.3448 - precision: 0.7692
Epoch 15/65
1/1 [=====] - 0s 185ms/step - loss: 0.7097 - acc: 0.4
186 - recall: 0.3448 - precision: 0.6250
Epoch 16/65
1/1 [=====] - 0s 48ms/step - loss: 0.7199 - acc: 0.41
86 - recall: 0.3448 - precision: 0.6250
Epoch 17/65
1/1 [=====] - 0s 76ms/step - loss: 0.6776 - acc: 0.55
81 - recall: 0.4828 - precision: 0.7778
Epoch 18/65
1/1 [=====] - 0s 128ms/step - loss: 0.6914 - acc: 0.5
581 - recall: 0.4138 - precision: 0.8571
Epoch 19/65
1/1 [=====] - 0s 206ms/step - loss: 0.6357 - acc: 0.6
744 - recall: 0.6552 - precision: 0.8261
Epoch 20/65
1/1 [=====] - 0s 55ms/step - loss: 0.6478 - acc: 0.60
47 - recall: 0.5517 - precision: 0.8000
Epoch 21/65
```

```
1/1 [=====] - 0s 56ms/step - loss: 0.6528 - acc: 0.67  
44 - recall: 0.6207 - precision: 0.8571  
Epoch 22/65  
1/1 [=====] - 0s 47ms/step - loss: 0.6251 - acc: 0.65  
12 - recall: 0.6207 - precision: 0.8182  
Epoch 23/65  
1/1 [=====] - 0s 72ms/step - loss: 0.5271 - acc: 0.79  
07 - recall: 0.7586 - precision: 0.9167  
Epoch 24/65  
1/1 [=====] - 0s 125ms/step - loss: 0.6486 - acc: 0.6  
279 - recall: 0.6552 - precision: 0.7600  
Epoch 25/65  
1/1 [=====] - 0s 144ms/step - loss: 0.5567 - acc: 0.7  
674 - recall: 0.7586 - precision: 0.8800  
Epoch 26/65  
1/1 [=====] - 0s 61ms/step - loss: 0.5126 - acc: 0.76  
74 - recall: 0.7586 - precision: 0.8800  
Epoch 27/65  
1/1 [=====] - 0s 52ms/step - loss: 0.4932 - acc: 0.79  
07 - recall: 0.8276 - precision: 0.8571  
Epoch 28/65  
1/1 [=====] - 0s 49ms/step - loss: 0.5337 - acc: 0.74  
42 - recall: 0.7931 - precision: 0.8214  
Epoch 29/65  
1/1 [=====] - 0s 51ms/step - loss: 0.3439 - acc: 0.81  
40 - recall: 0.7931 - precision: 0.9200  
Epoch 30/65  
1/1 [=====] - 0s 48ms/step - loss: 0.5953 - acc: 0.72  
09 - recall: 0.7586 - precision: 0.8148  
Epoch 31/65  
1/1 [=====] - 0s 47ms/step - loss: 0.4172 - acc: 0.88  
37 - recall: 0.8966 - precision: 0.9286  
Epoch 32/65  
1/1 [=====] - 0s 47ms/step - loss: 0.3354 - acc: 0.90  
70 - recall: 0.8966 - precision: 0.9630  
Epoch 33/65  
1/1 [=====] - 0s 47ms/step - loss: 0.3353 - acc: 0.90  
70 - recall: 0.9310 - precision: 0.9310  
Epoch 34/65  
1/1 [=====] - 0s 47ms/step - loss: 0.2650 - acc: 0.88  
37 - recall: 0.8621 - precision: 0.9615  
Epoch 35/65  
1/1 [=====] - 0s 47ms/step - loss: 0.2374 - acc: 0.90  
70 - recall: 0.8966 - precision: 0.9630  
Epoch 36/65  
1/1 [=====] - 0s 47ms/step - loss: 0.2513 - acc: 0.90  
70 - recall: 0.8966 - precision: 0.9630  
Epoch 37/65  
1/1 [=====] - 0s 144ms/step - loss: 0.2460 - acc: 0.8  
837 - recall: 0.8276 - precision: 1.0000  
Epoch 38/65  
1/1 [=====] - 0s 52ms/step - loss: 0.1942 - acc: 0.93  
02 - recall: 0.8966 - precision: 1.0000  
Epoch 39/65  
1/1 [=====] - 0s 51ms/step - loss: 0.2370 - acc: 0.88  
37 - recall: 0.8966 - precision: 0.9286  
Epoch 40/65  
1/1 [=====] - 0s 47ms/step - loss: 0.1999 - acc: 0.95  
35 - recall: 0.9655 - precision: 0.9655  
Epoch 41/65
```

```
1/1 [=====] - 0s 49ms/step - loss: 0.1781 - acc: 0.93
02 - recall: 0.9655 - precision: 0.9333
Epoch 42/65
1/1 [=====] - 0s 48ms/step - loss: 0.1213 - acc: 0.90
70 - recall: 0.8966 - precision: 0.9630
Epoch 43/65
1/1 [=====] - 0s 50ms/step - loss: 0.1615 - acc: 0.90
70 - recall: 0.8966 - precision: 0.9630
Epoch 44/65
1/1 [=====] - 0s 48ms/step - loss: 0.0786 - acc: 0.97
67 - recall: 0.9655 - precision: 1.0000
Epoch 45/65
1/1 [=====] - 0s 47ms/step - loss: 0.0791 - acc: 0.97
67 - recall: 0.9655 - precision: 1.0000
Epoch 46/65
1/1 [=====] - 0s 47ms/step - loss: 0.1129 - acc: 0.95
35 - recall: 1.0000 - precision: 0.9355
Epoch 47/65
1/1 [=====] - 0s 47ms/step - loss: 0.1129 - acc: 0.95
35 - recall: 0.9310 - precision: 1.0000
Epoch 48/65
1/1 [=====] - 0s 48ms/step - loss: 0.1919 - acc: 0.95
35 - recall: 0.9655 - precision: 0.9655
Epoch 49/65
1/1 [=====] - 0s 48ms/step - loss: 0.0648 - acc: 0.97
67 - recall: 1.0000 - precision: 0.9667
Epoch 50/65
1/1 [=====] - 0s 48ms/step - loss: 0.0178 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 51/65
1/1 [=====] - 0s 47ms/step - loss: 0.0722 - acc: 0.97
67 - recall: 1.0000 - precision: 0.9667
Epoch 52/65
1/1 [=====] - 0s 48ms/step - loss: 0.0233 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 53/65
1/1 [=====] - 0s 47ms/step - loss: 0.0199 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 54/65
1/1 [=====] - 0s 48ms/step - loss: 0.0126 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 55/65
1/1 [=====] - 0s 46ms/step - loss: 0.2077 - acc: 0.95
35 - recall: 1.0000 - precision: 0.9355
Epoch 56/65
1/1 [=====] - 0s 48ms/step - loss: 0.0101 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 57/65
1/1 [=====] - 0s 47ms/step - loss: 0.1751 - acc: 0.90
70 - recall: 0.8621 - precision: 1.0000
Epoch 58/65
1/1 [=====] - 0s 48ms/step - loss: 0.0747 - acc: 0.93
02 - recall: 0.9310 - precision: 0.9643
Epoch 59/65
1/1 [=====] - 0s 48ms/step - loss: 0.0769 - acc: 0.95
35 - recall: 0.9310 - precision: 1.0000
Epoch 60/65
1/1 [=====] - 0s 47ms/step - loss: 0.0560 - acc: 0.97
67 - recall: 0.9655 - precision: 1.0000
Epoch 61/65
```

```
1/1 [=====] - 0s 47ms/step - loss: 0.0420 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 62/65
1/1 [=====] - 0s 48ms/step - loss: 0.0564 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 63/65
1/1 [=====] - 0s 48ms/step - loss: 0.0421 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 64/65
1/1 [=====] - 0s 48ms/step - loss: 0.0219 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 65/65
1/1 [=====] - 0s 47ms/step - loss: 0.0315 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
2023-03-29 00:08:26.366402: I tensorflow/core/grappler/optimizers/custom_graph_
_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
1/1 [=====] - 0s 273ms/step
2/2 [=====] - 0s 166ms/step
Epoch 1/65
2023-03-29 00:08:27.436815: I tensorflow/core/grappler/optimizers/custom_graph_
_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
```

```
1/1 [=====] - 2s 2s/step - loss: 0.7283 - acc: 0.5116
- recall: 0.4074 - precision: 0.6875
Epoch 2/65
1/1 [=====] - 0s 263ms/step - loss: 0.7336 - acc: 0.4
186 - recall: 0.2963 - precision: 0.5714
Epoch 3/65
1/1 [=====] - 0s 172ms/step - loss: 0.7122 - acc: 0.4
419 - recall: 0.2593 - precision: 0.6364
Epoch 4/65
1/1 [=====] - 0s 256ms/step - loss: 0.7246 - acc: 0.4
651 - recall: 0.2222 - precision: 0.7500
Epoch 5/65
1/1 [=====] - 0s 156ms/step - loss: 0.8043 - acc: 0.2
326 - recall: 0.0741 - precision: 0.2000
Epoch 6/65
1/1 [=====] - 0s 174ms/step - loss: 0.7094 - acc: 0.5
349 - recall: 0.2963 - precision: 0.8889
Epoch 7/65
1/1 [=====] - 0s 139ms/step - loss: 0.7129 - acc: 0.4
651 - recall: 0.2222 - precision: 0.7500
Epoch 8/65
1/1 [=====] - 0s 146ms/step - loss: 0.7273 - acc: 0.4
186 - recall: 0.1852 - precision: 0.6250
Epoch 9/65
1/1 [=====] - 0s 156ms/step - loss: 0.7266 - acc: 0.3
953 - recall: 0.1481 - precision: 0.5714
Epoch 10/65
1/1 [=====] - 0s 142ms/step - loss: 0.7143 - acc: 0.4
884 - recall: 0.1852 - precision: 1.0000
Epoch 11/65
1/1 [=====] - 0s 217ms/step - loss: 0.7187 - acc: 0.3
721 - recall: 0.0741 - precision: 0.5000
Epoch 12/65
1/1 [=====] - 0s 73ms/step - loss: 0.7272 - acc: 0.37
21 - recall: 0.0741 - precision: 0.5000
Epoch 13/65
1/1 [=====] - 0s 57ms/step - loss: 0.7471 - acc: 0.37
21 - recall: 0.0741 - precision: 0.5000
Epoch 14/65
1/1 [=====] - 0s 52ms/step - loss: 0.7251 - acc: 0.41
86 - recall: 0.0741 - precision: 1.0000
Epoch 15/65
1/1 [=====] - 0s 221ms/step - loss: 0.7150 - acc: 0.3
953 - recall: 0.0741 - precision: 0.6667
Epoch 16/65
1/1 [=====] - 0s 222ms/step - loss: 0.7205 - acc: 0.3
721 - recall: 0.0370 - precision: 0.5000
Epoch 17/65
1/1 [=====] - 0s 76ms/step - loss: 0.7199 - acc: 0.39
53 - recall: 0.0741 - precision: 0.6667
Epoch 18/65
1/1 [=====] - 0s 52ms/step - loss: 0.7146 - acc: 0.37
21 - recall: 0.0370 - precision: 0.5000
Epoch 19/65
1/1 [=====] - 0s 48ms/step - loss: 0.7097 - acc: 0.41
86 - recall: 0.0741 - precision: 1.0000
Epoch 20/65
1/1 [=====] - 0s 131ms/step - loss: 0.7083 - acc: 0.3
953 - recall: 0.0370 - precision: 1.0000
Epoch 21/65
```

```
1/1 [=====] - 0s 49ms/step - loss: 0.6907 - acc: 0.39
53 - recall: 0.0370 - precision: 1.0000
Epoch 22/65
1/1 [=====] - 0s 50ms/step - loss: 0.6596 - acc: 0.39
53 - recall: 0.0370 - precision: 1.0000
Epoch 23/65
1/1 [=====] - 0s 147ms/step - loss: 0.6664 - acc: 0.3
721 - recall: 0.0370 - precision: 0.5000
Epoch 24/65
1/1 [=====] - 0s 53ms/step - loss: 0.6551 - acc: 0.39
53 - recall: 0.0741 - precision: 0.6667
Epoch 25/65
1/1 [=====] - 0s 49ms/step - loss: 0.6268 - acc: 0.41
86 - recall: 0.0741 - precision: 1.0000
Epoch 26/65
1/1 [=====] - 0s 77ms/step - loss: 0.6441 - acc: 0.44
19 - recall: 0.1481 - precision: 0.8000
Epoch 27/65
1/1 [=====] - 0s 48ms/step - loss: 0.6330 - acc: 0.41
86 - recall: 0.0741 - precision: 1.0000
Epoch 28/65
1/1 [=====] - 0s 47ms/step - loss: 0.6063 - acc: 0.51
16 - recall: 0.2593 - precision: 0.8750
Epoch 29/65
1/1 [=====] - 0s 48ms/step - loss: 0.5594 - acc: 0.60
47 - recall: 0.4074 - precision: 0.9167
Epoch 30/65
1/1 [=====] - 0s 47ms/step - loss: 0.5387 - acc: 0.65
12 - recall: 0.4444 - precision: 1.0000
Epoch 31/65
1/1 [=====] - 0s 128ms/step - loss: 0.4817 - acc: 0.7
907 - recall: 0.6667 - precision: 1.0000
Epoch 32/65
1/1 [=====] - 0s 47ms/step - loss: 0.4422 - acc: 0.81
40 - recall: 0.7407 - precision: 0.9524
Epoch 33/65
1/1 [=====] - 0s 210ms/step - loss: 0.6017 - acc: 0.7
907 - recall: 0.7407 - precision: 0.9091
Epoch 34/65
1/1 [=====] - 0s 50ms/step - loss: 0.4486 - acc: 0.79
07 - recall: 0.7037 - precision: 0.9500
Epoch 35/65
1/1 [=====] - 0s 49ms/step - loss: 0.4602 - acc: 0.86
05 - recall: 0.8519 - precision: 0.9200
Epoch 36/65
1/1 [=====] - 0s 49ms/step - loss: 0.3772 - acc: 0.86
05 - recall: 0.8148 - precision: 0.9565
Epoch 37/65
1/1 [=====] - 0s 48ms/step - loss: 0.3880 - acc: 0.83
72 - recall: 0.8148 - precision: 0.9167
Epoch 38/65
1/1 [=====] - 0s 52ms/step - loss: 0.2926 - acc: 0.90
70 - recall: 0.8889 - precision: 0.9600
Epoch 39/65
1/1 [=====] - 0s 52ms/step - loss: 0.4050 - acc: 0.83
72 - recall: 0.8148 - precision: 0.9167
Epoch 40/65
1/1 [=====] - 0s 48ms/step - loss: 0.3469 - acc: 0.88
37 - recall: 0.8889 - precision: 0.9231
Epoch 41/65
```

```
1/1 [=====] - 0s 48ms/step - loss: 0.2667 - acc: 0.90
70 - recall: 0.8889 - precision: 0.9600
Epoch 42/65
1/1 [=====] - 0s 48ms/step - loss: 0.2918 - acc: 0.93
02 - recall: 1.0000 - precision: 0.9000
Epoch 43/65
1/1 [=====] - 0s 248ms/step - loss: 0.2645 - acc: 0.9
302 - recall: 0.9630 - precision: 0.9286
Epoch 44/65
1/1 [=====] - 0s 47ms/step - loss: 0.2507 - acc: 0.88
37 - recall: 0.8889 - precision: 0.9231
Epoch 45/65
1/1 [=====] - 0s 139ms/step - loss: 0.1611 - acc: 0.9
767 - recall: 1.0000 - precision: 0.9643
Epoch 46/65
1/1 [=====] - 0s 48ms/step - loss: 0.1189 - acc: 0.93
02 - recall: 0.9630 - precision: 0.9286
Epoch 47/65
1/1 [=====] - 0s 72ms/step - loss: 0.0963 - acc: 0.97
67 - recall: 1.0000 - precision: 0.9643
Epoch 48/65
1/1 [=====] - 0s 48ms/step - loss: 0.0991 - acc: 0.97
67 - recall: 1.0000 - precision: 0.9643
Epoch 49/65
1/1 [=====] - 0s 49ms/step - loss: 0.0715 - acc: 0.97
67 - recall: 0.9630 - precision: 1.0000
Epoch 50/65
1/1 [=====] - 0s 49ms/step - loss: 0.0522 - acc: 0.97
67 - recall: 0.9630 - precision: 1.0000
Epoch 51/65
1/1 [=====] - 0s 49ms/step - loss: 0.0310 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 52/65
1/1 [=====] - 0s 52ms/step - loss: 0.0802 - acc: 0.97
67 - recall: 1.0000 - precision: 0.9643
Epoch 53/65
1/1 [=====] - 0s 49ms/step - loss: 0.0776 - acc: 0.95
35 - recall: 0.9630 - precision: 0.9630
Epoch 54/65
1/1 [=====] - 0s 49ms/step - loss: 0.0737 - acc: 0.95
35 - recall: 0.9630 - precision: 0.9630
Epoch 55/65
1/1 [=====] - 0s 47ms/step - loss: 0.1350 - acc: 0.90
70 - recall: 0.8519 - precision: 1.0000
Epoch 56/65
1/1 [=====] - 0s 47ms/step - loss: 0.0336 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 57/65
1/1 [=====] - 0s 47ms/step - loss: 0.0354 - acc: 0.97
67 - recall: 1.0000 - precision: 0.9643
Epoch 58/65
1/1 [=====] - 0s 47ms/step - loss: 0.0681 - acc: 0.97
67 - recall: 1.0000 - precision: 0.9643
Epoch 59/65
1/1 [=====] - 0s 47ms/step - loss: 0.0095 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 60/65
1/1 [=====] - 0s 47ms/step - loss: 0.0139 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 61/65
```

```
1/1 [=====] - 0s 48ms/step - loss: 0.0553 - acc: 0.95
35 - recall: 0.9630 - precision: 0.9630
Epoch 62/65
1/1 [=====] - 0s 48ms/step - loss: 0.0782 - acc: 0.93
02 - recall: 0.9259 - precision: 0.9615
Epoch 63/65
1/1 [=====] - 0s 49ms/step - loss: 0.0347 - acc: 0.97
67 - recall: 0.9630 - precision: 1.0000
Epoch 64/65
1/1 [=====] - 0s 48ms/step - loss: 0.0169 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 65/65
1/1 [=====] - 0s 64ms/step - loss: 0.0293 - acc: 0.97
67 - recall: 1.0000 - precision: 0.9643
2023-03-29 00:08:34.699449: I tensorflow/core/grappler/optimizers/custom_graph_
_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
1/1 [=====] - 0s 281ms/step
2/2 [=====] - 0s 169ms/step
Epoch 1/65
2023-03-29 00:08:36.060219: I tensorflow/core/grappler/optimizers/custom_graph_
_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
```

```
1/1 [=====] - 2s 2s/step - loss: 0.6503 - acc: 0.4524
- recall: 0.4375 - precision: 0.7368
Epoch 2/65
1/1 [=====] - 0s 251ms/step - loss: 0.6557 - acc: 0.4524
- recall: 0.5312 - precision: 0.6800
Epoch 3/65
1/1 [=====] - 0s 248ms/step - loss: 0.6478 - acc: 0.5238
- recall: 0.5625 - precision: 0.7500
Epoch 4/65
1/1 [=====] - 0s 141ms/step - loss: 0.6493 - acc: 0.5714
- recall: 0.6250 - precision: 0.7692
Epoch 5/65
1/1 [=====] - 0s 75ms/step - loss: 0.6425 - acc: 0.7381
- recall: 0.7812 - precision: 0.8621
Epoch 6/65
1/1 [=====] - 0s 161ms/step - loss: 0.6416 - acc: 0.6429
- recall: 0.6875 - precision: 0.8148
Epoch 7/65
1/1 [=====] - 0s 220ms/step - loss: 0.6414 - acc: 0.7143
- recall: 0.8125 - precision: 0.8125
Epoch 8/65
1/1 [=====] - 0s 208ms/step - loss: 0.6440 - acc: 0.6429
- recall: 0.7500 - precision: 0.7742
Epoch 9/65
1/1 [=====] - 0s 51ms/step - loss: 0.6468 - acc: 0.7143
- recall: 0.8750 - precision: 0.7778
Epoch 10/65
1/1 [=====] - 0s 157ms/step - loss: 0.6414 - acc: 0.7619
- recall: 0.9062 - precision: 0.8056
Epoch 11/65
1/1 [=====] - 0s 52ms/step - loss: 0.6452 - acc: 0.7143
- recall: 0.8750 - precision: 0.7778
Epoch 12/65
1/1 [=====] - 0s 127ms/step - loss: 0.6426 - acc: 0.7619
- recall: 0.9375 - precision: 0.7895
Epoch 13/65
1/1 [=====] - 0s 245ms/step - loss: 0.6417 - acc: 0.8095
- recall: 0.9688 - precision: 0.8158
Epoch 14/65
1/1 [=====] - 0s 138ms/step - loss: 0.6400 - acc: 0.7619
- recall: 0.9375 - precision: 0.7895
Epoch 15/65
1/1 [=====] - 0s 131ms/step - loss: 0.6447 - acc: 0.7857
- recall: 0.9688 - precision: 0.7949
Epoch 16/65
1/1 [=====] - 0s 52ms/step - loss: 0.6402 - acc: 0.7857
- recall: 0.9688 - precision: 0.7949
Epoch 17/65
1/1 [=====] - 0s 74ms/step - loss: 0.6398 - acc: 0.7857
- recall: 1.0000 - precision: 0.7805
Epoch 18/65
1/1 [=====] - 0s 123ms/step - loss: 0.6362 - acc: 0.7381
- recall: 0.9375 - precision: 0.7692
Epoch 19/65
1/1 [=====] - 0s 138ms/step - loss: 0.6369 - acc: 0.7143
- recall: 0.9375 - precision: 0.7500
Epoch 20/65
1/1 [=====] - 0s 50ms/step - loss: 0.6381 - acc: 0.7381
- recall: 0.9688 - precision: 0.7561
Epoch 21/65
```

```
1/1 [=====] - 0s 46ms/step - loss: 0.6464 - acc: 0.73
81 - recall: 0.9688 - precision: 0.7561
Epoch 22/65
1/1 [=====] - 0s 217ms/step - loss: 0.6441 - acc: 0.7
381 - recall: 0.9688 - precision: 0.7561
Epoch 23/65
1/1 [=====] - 0s 46ms/step - loss: 0.6453 - acc: 0.80
95 - recall: 1.0000 - precision: 0.8000
Epoch 24/65
1/1 [=====] - 0s 46ms/step - loss: 0.6410 - acc: 0.73
81 - recall: 0.9688 - precision: 0.7561
Epoch 25/65
1/1 [=====] - 0s 48ms/step - loss: 0.6477 - acc: 0.73
81 - recall: 0.9688 - precision: 0.7561
Epoch 26/65
1/1 [=====] - 0s 62ms/step - loss: 0.6441 - acc: 0.73
81 - recall: 0.9688 - precision: 0.7561
Epoch 27/65
1/1 [=====] - 0s 217ms/step - loss: 0.6388 - acc: 0.7
857 - recall: 1.0000 - precision: 0.7805
Epoch 28/65
1/1 [=====] - 0s 49ms/step - loss: 0.6440 - acc: 0.73
81 - recall: 0.9688 - precision: 0.7561
Epoch 29/65
1/1 [=====] - 0s 47ms/step - loss: 0.6420 - acc: 0.73
81 - recall: 0.9688 - precision: 0.7561
Epoch 30/65
1/1 [=====] - 0s 72ms/step - loss: 0.6416 - acc: 0.73
81 - recall: 0.9688 - precision: 0.7561
Epoch 31/65
1/1 [=====] - 0s 46ms/step - loss: 0.6389 - acc: 0.73
81 - recall: 0.9688 - precision: 0.7561
Epoch 32/65
1/1 [=====] - 0s 47ms/step - loss: 0.6520 - acc: 0.73
81 - recall: 0.9688 - precision: 0.7561
Epoch 33/65
1/1 [=====] - 0s 51ms/step - loss: 0.6433 - acc: 0.73
81 - recall: 0.9688 - precision: 0.7561
Epoch 34/65
1/1 [=====] - 0s 71ms/step - loss: 0.6434 - acc: 0.73
81 - recall: 0.9688 - precision: 0.7561
Epoch 35/65
1/1 [=====] - 0s 46ms/step - loss: 0.6437 - acc: 0.73
81 - recall: 0.9688 - precision: 0.7561
Epoch 36/65
1/1 [=====] - 0s 47ms/step - loss: 0.6385 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 37/65
1/1 [=====] - 0s 46ms/step - loss: 0.6297 - acc: 0.73
81 - recall: 0.9688 - precision: 0.7561
Epoch 38/65
1/1 [=====] - 0s 46ms/step - loss: 0.6460 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 39/65
1/1 [=====] - 0s 46ms/step - loss: 0.6406 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 40/65
1/1 [=====] - 0s 47ms/step - loss: 0.6356 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 41/65
```

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1/1 [=====] - 0s 72ms/step - loss: 0.6436 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 42/65
1/1 [=====] - 0s 46ms/step - loss: 0.6383 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 43/65
1/1 [=====] - 0s 49ms/step - loss: 0.6399 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 44/65
1/1 [=====] - 0s 47ms/step - loss: 0.6428 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 45/65
1/1 [=====] - 0s 47ms/step - loss: 0.6426 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 46/65
1/1 [=====] - 0s 48ms/step - loss: 0.6343 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 47/65
1/1 [=====] - 0s 47ms/step - loss: 0.6427 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 48/65
1/1 [=====] - 0s 47ms/step - loss: 0.6384 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 49/65
1/1 [=====] - 0s 48ms/step - loss: 0.6363 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 50/65
1/1 [=====] - 0s 47ms/step - loss: 0.6347 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 51/65
1/1 [=====] - 0s 48ms/step - loss: 0.6285 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 52/65
1/1 [=====] - 0s 47ms/step - loss: 0.6412 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 53/65
1/1 [=====] - 0s 46ms/step - loss: 0.6354 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 54/65
1/1 [=====] - 0s 46ms/step - loss: 0.6353 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 55/65
1/1 [=====] - 0s 46ms/step - loss: 0.6405 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 56/65
1/1 [=====] - 0s 47ms/step - loss: 0.6438 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 57/65
1/1 [=====] - 0s 46ms/step - loss: 0.6436 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 58/65
1/1 [=====] - 0s 48ms/step - loss: 0.6385 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 59/65
1/1 [=====] - 0s 46ms/step - loss: 0.6300 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 60/65
1/1 [=====] - 0s 46ms/step - loss: 0.6323 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 61/65
```

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1/1 [=====] - 0s 46ms/step - loss: 0.6416 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 62/65
1/1 [=====] - 0s 46ms/step - loss: 0.6310 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 63/65
1/1 [=====] - 0s 47ms/step - loss: 0.6371 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 64/65
1/1 [=====] - 0s 46ms/step - loss: 0.6268 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 65/65
1/1 [=====] - 0s 46ms/step - loss: 0.6449 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
2023-03-29 00:08:42.717339: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
1/1 [=====] - 0s 272ms/step
2/2 [=====] - 1s 398ms/step
Epoch 1/65
2023-03-29 00:08:43.975798: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
```

```
1/1 [=====] - 2s 2s/step - loss: 0.7009 - acc: 0.5581
- recall: 0.5862 - precision: 0.7083
Epoch 2/65
1/1 [=====] - 0s 249ms/step - loss: 0.7015 - acc: 0.5
814 - recall: 0.5862 - precision: 0.7391
Epoch 3/65
1/1 [=====] - 0s 239ms/step - loss: 0.7007 - acc: 0.4
884 - recall: 0.5172 - precision: 0.6522
Epoch 4/65
1/1 [=====] - 0s 247ms/step - loss: 0.7019 - acc: 0.4
651 - recall: 0.4828 - precision: 0.6364
Epoch 5/65
1/1 [=====] - 0s 157ms/step - loss: 0.7064 - acc: 0.4
419 - recall: 0.4828 - precision: 0.6087
Epoch 6/65
1/1 [=====] - 0s 238ms/step - loss: 0.6903 - acc: 0.6
977 - recall: 0.6897 - precision: 0.8333
Epoch 7/65
1/1 [=====] - 0s 92ms/step - loss: 0.6964 - acc: 0.58
14 - recall: 0.5862 - precision: 0.7391
Epoch 8/65
1/1 [=====] - 0s 75ms/step - loss: 0.7010 - acc: 0.55
81 - recall: 0.5862 - precision: 0.7083
Epoch 9/65
1/1 [=====] - 0s 73ms/step - loss: 0.7031 - acc: 0.46
51 - recall: 0.5172 - precision: 0.6250
Epoch 10/65
1/1 [=====] - 0s 143ms/step - loss: 0.7001 - acc: 0.4
884 - recall: 0.5172 - precision: 0.6522
Epoch 11/65
1/1 [=====] - 0s 152ms/step - loss: 0.7011 - acc: 0.5
349 - recall: 0.5517 - precision: 0.6957
Epoch 12/65
1/1 [=====] - 0s 130ms/step - loss: 0.7039 - acc: 0.4
419 - recall: 0.5172 - precision: 0.6000
Epoch 13/65
1/1 [=====] - 0s 51ms/step - loss: 0.7015 - acc: 0.55
81 - recall: 0.5517 - precision: 0.7273
Epoch 14/65
1/1 [=====] - 0s 215ms/step - loss: 0.7048 - acc: 0.4
419 - recall: 0.4483 - precision: 0.6190
Epoch 15/65
1/1 [=====] - 0s 135ms/step - loss: 0.6934 - acc: 0.6
279 - recall: 0.5862 - precision: 0.8095
Epoch 16/65
1/1 [=====] - 0s 134ms/step - loss: 0.7018 - acc: 0.5
349 - recall: 0.5172 - precision: 0.7143
Epoch 17/65
1/1 [=====] - 0s 50ms/step - loss: 0.7033 - acc: 0.39
53 - recall: 0.4138 - precision: 0.5714
Epoch 18/65
1/1 [=====] - 0s 46ms/step - loss: 0.6956 - acc: 0.58
14 - recall: 0.5517 - precision: 0.7619
Epoch 19/65
1/1 [=====] - 0s 144ms/step - loss: 0.6961 - acc: 0.5
581 - recall: 0.5517 - precision: 0.7273
Epoch 20/65
1/1 [=====] - 0s 78ms/step - loss: 0.7053 - acc: 0.41
86 - recall: 0.4483 - precision: 0.5909
Epoch 21/65
```

```
1/1 [=====] - 0s 147ms/step - loss: 0.6996 - acc: 0.5  
349 - recall: 0.5172 - precision: 0.7143  
Epoch 22/65  
1/1 [=====] - 0s 129ms/step - loss: 0.6957 - acc: 0.5  
814 - recall: 0.5172 - precision: 0.7895  
Epoch 23/65  
1/1 [=====] - 0s 50ms/step - loss: 0.6999 - acc: 0.44  
19 - recall: 0.3793 - precision: 0.6471  
Epoch 24/65  
1/1 [=====] - 0s 50ms/step - loss: 0.7014 - acc: 0.39  
53 - recall: 0.3448 - precision: 0.5882  
Epoch 25/65  
1/1 [=====] - 0s 47ms/step - loss: 0.6979 - acc: 0.55  
81 - recall: 0.5172 - precision: 0.7500  
Epoch 26/65  
1/1 [=====] - 0s 47ms/step - loss: 0.7048 - acc: 0.41  
86 - recall: 0.3793 - precision: 0.6111  
Epoch 27/65  
1/1 [=====] - 0s 127ms/step - loss: 0.7105 - acc: 0.3  
256 - recall: 0.3103 - precision: 0.5000  
Epoch 28/65  
1/1 [=====] - 0s 49ms/step - loss: 0.6989 - acc: 0.58  
14 - recall: 0.5172 - precision: 0.7895  
Epoch 29/65  
1/1 [=====] - 0s 47ms/step - loss: 0.7031 - acc: 0.48  
84 - recall: 0.4828 - precision: 0.6667  
Epoch 30/65  
1/1 [=====] - 0s 46ms/step - loss: 0.6959 - acc: 0.51  
16 - recall: 0.4483 - precision: 0.7222  
Epoch 31/65  
1/1 [=====] - 0s 165ms/step - loss: 0.7028 - acc: 0.4  
419 - recall: 0.4138 - precision: 0.6316  
Epoch 32/65  
1/1 [=====] - 0s 53ms/step - loss: 0.7013 - acc: 0.46  
51 - recall: 0.4138 - precision: 0.6667  
Epoch 33/65  
1/1 [=====] - 0s 47ms/step - loss: 0.6918 - acc: 0.69  
77 - recall: 0.6207 - precision: 0.9000  
Epoch 34/65  
1/1 [=====] - 0s 47ms/step - loss: 0.7017 - acc: 0.51  
16 - recall: 0.4828 - precision: 0.7000  
Epoch 35/65  
1/1 [=====] - 0s 47ms/step - loss: 0.6956 - acc: 0.53  
49 - recall: 0.4828 - precision: 0.7368  
Epoch 36/65  
1/1 [=====] - 0s 47ms/step - loss: 0.7019 - acc: 0.46  
51 - recall: 0.4138 - precision: 0.6667  
Epoch 37/65  
1/1 [=====] - 0s 53ms/step - loss: 0.6959 - acc: 0.51  
16 - recall: 0.4138 - precision: 0.7500  
Epoch 38/65  
1/1 [=====] - 0s 47ms/step - loss: 0.6990 - acc: 0.44  
19 - recall: 0.3793 - precision: 0.6471  
Epoch 39/65  
1/1 [=====] - 0s 49ms/step - loss: 0.6981 - acc: 0.51  
16 - recall: 0.4483 - precision: 0.7222  
Epoch 40/65  
1/1 [=====] - 0s 145ms/step - loss: 0.6999 - acc: 0.4  
651 - recall: 0.4138 - precision: 0.6667  
Epoch 41/65
```

```
1/1 [=====] - 0s 48ms/step - loss: 0.6954 - acc: 0.53
49 - recall: 0.4483 - precision: 0.7647
Epoch 42/65
1/1 [=====] - 0s 48ms/step - loss: 0.7033 - acc: 0.41
86 - recall: 0.3793 - precision: 0.6111
Epoch 43/65
1/1 [=====] - 0s 47ms/step - loss: 0.7004 - acc: 0.51
16 - recall: 0.4483 - precision: 0.7222
Epoch 44/65
1/1 [=====] - 0s 48ms/step - loss: 0.6946 - acc: 0.53
49 - recall: 0.4483 - precision: 0.7647
Epoch 45/65
1/1 [=====] - 0s 47ms/step - loss: 0.7029 - acc: 0.37
21 - recall: 0.3448 - precision: 0.5556
Epoch 46/65
1/1 [=====] - 0s 47ms/step - loss: 0.7019 - acc: 0.41
86 - recall: 0.3793 - precision: 0.6111
Epoch 47/65
1/1 [=====] - 0s 48ms/step - loss: 0.7034 - acc: 0.48
84 - recall: 0.4483 - precision: 0.6842
Epoch 48/65
1/1 [=====] - 0s 47ms/step - loss: 0.6980 - acc: 0.46
51 - recall: 0.4138 - precision: 0.6667
Epoch 49/65
1/1 [=====] - 0s 47ms/step - loss: 0.6994 - acc: 0.53
49 - recall: 0.4828 - precision: 0.7368
Epoch 50/65
1/1 [=====] - 0s 47ms/step - loss: 0.6959 - acc: 0.58
14 - recall: 0.5172 - precision: 0.7895
Epoch 51/65
1/1 [=====] - 0s 46ms/step - loss: 0.7036 - acc: 0.48
84 - recall: 0.4483 - precision: 0.6842
Epoch 52/65
1/1 [=====] - 0s 47ms/step - loss: 0.6933 - acc: 0.53
49 - recall: 0.4483 - precision: 0.7647
Epoch 53/65
1/1 [=====] - 0s 47ms/step - loss: 0.6998 - acc: 0.48
84 - recall: 0.4138 - precision: 0.7059
Epoch 54/65
1/1 [=====] - 0s 50ms/step - loss: 0.6953 - acc: 0.53
49 - recall: 0.4828 - precision: 0.7368
Epoch 55/65
1/1 [=====] - 0s 48ms/step - loss: 0.6963 - acc: 0.48
84 - recall: 0.4483 - precision: 0.6842
Epoch 56/65
1/1 [=====] - 0s 47ms/step - loss: 0.6897 - acc: 0.62
79 - recall: 0.5517 - precision: 0.8421
Epoch 57/65
1/1 [=====] - 0s 47ms/step - loss: 0.7010 - acc: 0.51
16 - recall: 0.4828 - precision: 0.7000
Epoch 58/65
1/1 [=====] - 0s 47ms/step - loss: 0.7041 - acc: 0.39
53 - recall: 0.3793 - precision: 0.5789
Epoch 59/65
1/1 [=====] - 0s 49ms/step - loss: 0.6995 - acc: 0.44
19 - recall: 0.3793 - precision: 0.6471
Epoch 60/65
1/1 [=====] - 0s 47ms/step - loss: 0.6951 - acc: 0.44
19 - recall: 0.3793 - precision: 0.6471
Epoch 61/65
```

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1/1 [=====] - 0s 47ms/step - loss: 0.6985 - acc: 0.46
51 - recall: 0.3793 - precision: 0.6875
Epoch 62/65
1/1 [=====] - 0s 46ms/step - loss: 0.6943 - acc: 0.53
49 - recall: 0.4483 - precision: 0.7647
Epoch 63/65
1/1 [=====] - 0s 46ms/step - loss: 0.6976 - acc: 0.55
81 - recall: 0.4828 - precision: 0.7778
Epoch 64/65
1/1 [=====] - 0s 46ms/step - loss: 0.6969 - acc: 0.41
86 - recall: 0.3448 - precision: 0.6250
Epoch 65/65
1/1 [=====] - 0s 46ms/step - loss: 0.7046 - acc: 0.44
19 - recall: 0.3793 - precision: 0.6471
2023-03-29 00:08:50.741542: I tensorflow/core/grappler/optimizers/custom_graph_
_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
1/1 [=====] - 0s 282ms/step
2/2 [=====] - 0s 174ms/step
Epoch 1/65
2023-03-29 00:08:51.806578: I tensorflow/core/grappler/optimizers/custom_graph_
_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
```

```
1/1 [=====] - 2s 2s/step - loss: 0.7288 - acc: 0.6279
- recall: 0.5926 - precision: 0.7619
Epoch 2/65
1/1 [=====] - 0s 172ms/step - loss: 0.7341 - acc: 0.3
721 - recall: 0.3704 - precision: 0.5000
Epoch 3/65
1/1 [=====] - 0s 166ms/step - loss: 0.7269 - acc: 0.5
116 - recall: 0.4444 - precision: 0.6667
Epoch 4/65
1/1 [=====] - 0s 446ms/step - loss: 0.7313 - acc: 0.5
581 - recall: 0.4815 - precision: 0.7222
Epoch 5/65
1/1 [=====] - 0s 251ms/step - loss: 0.7340 - acc: 0.4
651 - recall: 0.4074 - precision: 0.6111
Epoch 6/65
1/1 [=====] - 0s 137ms/step - loss: 0.7299 - acc: 0.4
419 - recall: 0.3704 - precision: 0.5882
Epoch 7/65
1/1 [=====] - 0s 222ms/step - loss: 0.7283 - acc: 0.4
419 - recall: 0.3704 - precision: 0.5882
Epoch 8/65
1/1 [=====] - 0s 134ms/step - loss: 0.7299 - acc: 0.4
419 - recall: 0.3704 - precision: 0.5882
Epoch 9/65
1/1 [=====] - 0s 81ms/step - loss: 0.7252 - acc: 0.53
49 - recall: 0.4444 - precision: 0.7059
Epoch 10/65
1/1 [=====] - 0s 74ms/step - loss: 0.7271 - acc: 0.44
19 - recall: 0.3704 - precision: 0.5882
Epoch 11/65
1/1 [=====] - 0s 229ms/step - loss: 0.7260 - acc: 0.4
651 - recall: 0.3704 - precision: 0.6250
Epoch 12/65
1/1 [=====] - 0s 127ms/step - loss: 0.7310 - acc: 0.3
953 - recall: 0.2593 - precision: 0.5385
Epoch 13/65
1/1 [=====] - 0s 165ms/step - loss: 0.7250 - acc: 0.4
186 - recall: 0.2593 - precision: 0.5833
Epoch 14/65
1/1 [=====] - 0s 47ms/step - loss: 0.7295 - acc: 0.39
53 - recall: 0.2593 - precision: 0.5385
Epoch 15/65
1/1 [=====] - 0s 49ms/step - loss: 0.7238 - acc: 0.51
16 - recall: 0.2593 - precision: 0.8750
Epoch 16/65
1/1 [=====] - 0s 47ms/step - loss: 0.7309 - acc: 0.32
56 - recall: 0.1481 - precision: 0.4000
Epoch 17/65
1/1 [=====] - 0s 136ms/step - loss: 0.7284 - acc: 0.3
721 - recall: 0.1481 - precision: 0.5000
Epoch 18/65
1/1 [=====] - 0s 157ms/step - loss: 0.7246 - acc: 0.4
651 - recall: 0.2222 - precision: 0.7500
Epoch 19/65
1/1 [=====] - 0s 143ms/step - loss: 0.7248 - acc: 0.4
186 - recall: 0.1481 - precision: 0.6667
Epoch 20/65
1/1 [=====] - 0s 51ms/step - loss: 0.7220 - acc: 0.48
84 - recall: 0.2222 - precision: 0.8571
Epoch 21/65
```

```
1/1 [=====] - 0s 156ms/step - loss: 0.7241 - acc: 0.4  
651 - recall: 0.2222 - precision: 0.7500  
Epoch 22/65  
1/1 [=====] - 0s 46ms/step - loss: 0.7263 - acc: 0.44  
19 - recall: 0.1852 - precision: 0.7143  
Epoch 23/65  
1/1 [=====] - 0s 123ms/step - loss: 0.7255 - acc: 0.3  
488 - recall: 0.1111 - precision: 0.4286  
Epoch 24/65  
1/1 [=====] - 0s 47ms/step - loss: 0.7263 - acc: 0.39  
53 - recall: 0.1481 - precision: 0.5714  
Epoch 25/65  
1/1 [=====] - 0s 74ms/step - loss: 0.7277 - acc: 0.32  
56 - recall: 0.0741 - precision: 0.3333  
Epoch 26/65  
1/1 [=====] - 0s 141ms/step - loss: 0.7232 - acc: 0.4  
651 - recall: 0.2222 - precision: 0.7500  
Epoch 27/65  
1/1 [=====] - 0s 47ms/step - loss: 0.7223 - acc: 0.44  
19 - recall: 0.1481 - precision: 0.8000  
Epoch 28/65  
1/1 [=====] - 0s 125ms/step - loss: 0.7277 - acc: 0.3  
256 - recall: 0.0741 - precision: 0.3333  
Epoch 29/65  
1/1 [=====] - 0s 47ms/step - loss: 0.7339 - acc: 0.32  
56 - recall: 0.0741 - precision: 0.3333  
Epoch 30/65  
1/1 [=====] - 0s 47ms/step - loss: 0.7208 - acc: 0.44  
19 - recall: 0.1111 - precision: 1.0000  
Epoch 31/65  
1/1 [=====] - 0s 47ms/step - loss: 0.7197 - acc: 0.48  
84 - recall: 0.1852 - precision: 1.0000  
Epoch 32/65  
1/1 [=====] - 0s 48ms/step - loss: 0.7309 - acc: 0.39  
53 - recall: 0.1111 - precision: 0.6000  
Epoch 33/65  
1/1 [=====] - 0s 49ms/step - loss: 0.7265 - acc: 0.39  
53 - recall: 0.0741 - precision: 0.6667  
Epoch 34/65  
1/1 [=====] - 0s 130ms/step - loss: 0.7247 - acc: 0.3  
953 - recall: 0.0741 - precision: 0.6667  
Epoch 35/65  
1/1 [=====] - 0s 46ms/step - loss: 0.7131 - acc: 0.44  
19 - recall: 0.1111 - precision: 1.0000  
Epoch 36/65  
1/1 [=====] - 0s 47ms/step - loss: 0.7258 - acc: 0.41  
86 - recall: 0.0741 - precision: 1.0000  
Epoch 37/65  
1/1 [=====] - 0s 46ms/step - loss: 0.7198 - acc: 0.41  
86 - recall: 0.0741 - precision: 1.0000  
Epoch 38/65  
1/1 [=====] - 0s 49ms/step - loss: 0.7223 - acc: 0.44  
19 - recall: 0.1111 - precision: 1.0000  
Epoch 39/65  
1/1 [=====] - 0s 47ms/step - loss: 0.7230 - acc: 0.44  
19 - recall: 0.1111 - precision: 1.0000  
Epoch 40/65  
1/1 [=====] - 0s 46ms/step - loss: 0.7284 - acc: 0.32  
56 - recall: 0.0000e+00 - precision: 0.0000e+00  
Epoch 41/65
```

```
1/1 [=====] - 0s 47ms/step - loss: 0.7246 - acc: 0.37
21 - recall: 0.0370 - precision: 0.5000
Epoch 42/65
1/1 [=====] - 0s 47ms/step - loss: 0.7223 - acc: 0.41
86 - recall: 0.0741 - precision: 1.0000
Epoch 43/65
1/1 [=====] - 0s 46ms/step - loss: 0.7194 - acc: 0.39
53 - recall: 0.0370 - precision: 1.0000
Epoch 44/65
1/1 [=====] - 0s 48ms/step - loss: 0.7323 - acc: 0.37
21 - recall: 0.0370 - precision: 0.5000
Epoch 45/65
1/1 [=====] - 0s 47ms/step - loss: 0.7249 - acc: 0.39
53 - recall: 0.0370 - precision: 1.0000
Epoch 46/65
1/1 [=====] - 0s 47ms/step - loss: 0.7210 - acc: 0.39
53 - recall: 0.0370 - precision: 1.0000
Epoch 47/65
1/1 [=====] - 0s 50ms/step - loss: 0.7256 - acc: 0.34
88 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 48/65
1/1 [=====] - 0s 47ms/step - loss: 0.7244 - acc: 0.39
53 - recall: 0.0370 - precision: 1.0000
Epoch 49/65
1/1 [=====] - 0s 46ms/step - loss: 0.7224 - acc: 0.39
53 - recall: 0.0370 - precision: 1.0000
Epoch 50/65
1/1 [=====] - 0s 47ms/step - loss: 0.7226 - acc: 0.39
53 - recall: 0.0370 - precision: 1.0000
Epoch 51/65
1/1 [=====] - 0s 48ms/step - loss: 0.7259 - acc: 0.34
88 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 52/65
1/1 [=====] - 0s 47ms/step - loss: 0.7129 - acc: 0.41
86 - recall: 0.0741 - precision: 1.0000
Epoch 53/65
1/1 [=====] - 0s 48ms/step - loss: 0.7202 - acc: 0.39
53 - recall: 0.0370 - precision: 1.0000
Epoch 54/65
1/1 [=====] - 0s 47ms/step - loss: 0.7243 - acc: 0.39
53 - recall: 0.0370 - precision: 1.0000
Epoch 55/65
1/1 [=====] - 0s 47ms/step - loss: 0.7189 - acc: 0.39
53 - recall: 0.0370 - precision: 1.0000
Epoch 56/65
1/1 [=====] - 0s 52ms/step - loss: 0.7284 - acc: 0.34
88 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 57/65
1/1 [=====] - 0s 48ms/step - loss: 0.7225 - acc: 0.34
88 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 58/65
1/1 [=====] - 0s 46ms/step - loss: 0.7124 - acc: 0.39
53 - recall: 0.0370 - precision: 1.0000
Epoch 59/65
1/1 [=====] - 0s 46ms/step - loss: 0.7340 - acc: 0.34
88 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 60/65
1/1 [=====] - 0s 46ms/step - loss: 0.7172 - acc: 0.39
53 - recall: 0.0370 - precision: 1.0000
Epoch 61/65
```

```
1/1 [=====] - 0s 46ms/step - loss: 0.7175 - acc: 0.39
53 - recall: 0.0370 - precision: 1.0000
Epoch 62/65
1/1 [=====] - 0s 46ms/step - loss: 0.7172 - acc: 0.39
53 - recall: 0.0370 - precision: 1.0000
Epoch 63/65
1/1 [=====] - 0s 48ms/step - loss: 0.7161 - acc: 0.39
53 - recall: 0.0370 - precision: 1.0000
Epoch 64/65
1/1 [=====] - 0s 47ms/step - loss: 0.7296 - acc: 0.34
88 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 65/65
1/1 [=====] - 0s 47ms/step - loss: 0.7230 - acc: 0.34
88 - recall: 0.0000e+00 - precision: 0.0000e+00
2023-03-29 00:08:58.769324: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
1/1 [=====] - 0s 287ms/step
2/2 [=====] - 0s 177ms/step
Epoch 1/90
2023-03-29 00:08:59.831177: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
```

```
1/1 [=====] - 2s 2s/step - loss: 0.6559 - acc: 0.4048
- recall: 0.4375 - precision: 0.6667
Epoch 2/90
1/1 [=====] - 0s 257ms/step - loss: 0.6553 - acc: 0.6
429 - recall: 0.8125 - precision: 0.7429
Epoch 3/90
1/1 [=====] - 0s 148ms/step - loss: 0.6358 - acc: 0.7
619 - recall: 0.9062 - precision: 0.8056
Epoch 4/90
1/1 [=====] - 0s 252ms/step - loss: 0.6521 - acc: 0.6
905 - recall: 0.9062 - precision: 0.7436
Epoch 5/90
1/1 [=====] - 0s 220ms/step - loss: 0.6321 - acc: 0.7
143 - recall: 0.9062 - precision: 0.7632
Epoch 6/90
1/1 [=====] - 0s 240ms/step - loss: 0.6724 - acc: 0.6
905 - recall: 0.9062 - precision: 0.7436
Epoch 7/90
1/1 [=====] - 0s 78ms/step - loss: 0.6332 - acc: 0.76
19 - recall: 0.9375 - precision: 0.7895
Epoch 8/90
1/1 [=====] - 0s 171ms/step - loss: 0.6435 - acc: 0.7
381 - recall: 0.9062 - precision: 0.7838
Epoch 9/90
1/1 [=====] - 0s 144ms/step - loss: 0.6519 - acc: 0.6
190 - recall: 0.8125 - precision: 0.7222
Epoch 10/90
1/1 [=====] - 0s 72ms/step - loss: 0.6412 - acc: 0.73
81 - recall: 0.9375 - precision: 0.7692
Epoch 11/90
1/1 [=====] - 0s 218ms/step - loss: 0.6454 - acc: 0.7
143 - recall: 0.9375 - precision: 0.7500
Epoch 12/90
1/1 [=====] - 0s 235ms/step - loss: 0.6413 - acc: 0.7
619 - recall: 0.9688 - precision: 0.7750
Epoch 13/90
1/1 [=====] - 0s 143ms/step - loss: 0.6532 - acc: 0.7
143 - recall: 0.9375 - precision: 0.7500
Epoch 14/90
1/1 [=====] - 0s 71ms/step - loss: 0.6395 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 15/90
1/1 [=====] - 0s 50ms/step - loss: 0.6283 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 16/90
1/1 [=====] - 0s 78ms/step - loss: 0.6396 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 17/90
1/1 [=====] - 0s 207ms/step - loss: 0.6370 - acc: 0.7
619 - recall: 1.0000 - precision: 0.7619
Epoch 18/90
1/1 [=====] - 0s 173ms/step - loss: 0.6226 - acc: 0.7
857 - recall: 1.0000 - precision: 0.7805
Epoch 19/90
1/1 [=====] - 0s 142ms/step - loss: 0.6495 - acc: 0.7
381 - recall: 0.9688 - precision: 0.7561
Epoch 20/90
1/1 [=====] - 0s 126ms/step - loss: 0.5998 - acc: 0.7
857 - recall: 1.0000 - precision: 0.7805
Epoch 21/90
```

```
1/1 [=====] - 0s 47ms/step - loss: 0.6249 - acc: 0.76  
19 - recall: 1.0000 - precision: 0.7619  
Epoch 22/90  
1/1 [=====] - 0s 121ms/step - loss: 0.6374 - acc: 0.7  
619 - recall: 1.0000 - precision: 0.7619  
Epoch 23/90  
1/1 [=====] - 0s 71ms/step - loss: 0.5776 - acc: 0.76  
19 - recall: 1.0000 - precision: 0.7619  
Epoch 24/90  
1/1 [=====] - 0s 54ms/step - loss: 0.6085 - acc: 0.76  
19 - recall: 1.0000 - precision: 0.7619  
Epoch 25/90  
1/1 [=====] - 0s 51ms/step - loss: 0.6011 - acc: 0.78  
57 - recall: 1.0000 - precision: 0.7805  
Epoch 26/90  
1/1 [=====] - 0s 48ms/step - loss: 0.5530 - acc: 0.78  
57 - recall: 0.9688 - precision: 0.7949  
Epoch 27/90  
1/1 [=====] - 0s 47ms/step - loss: 0.5742 - acc: 0.80  
95 - recall: 1.0000 - precision: 0.8000  
Epoch 28/90  
1/1 [=====] - 0s 53ms/step - loss: 0.4874 - acc: 0.83  
33 - recall: 0.9062 - precision: 0.8788  
Epoch 29/90  
1/1 [=====] - 0s 47ms/step - loss: 0.4783 - acc: 0.85  
71 - recall: 0.9375 - precision: 0.8824  
Epoch 30/90  
1/1 [=====] - 0s 216ms/step - loss: 0.4855 - acc: 0.8  
810 - recall: 0.9375 - precision: 0.9091  
Epoch 31/90  
1/1 [=====] - 0s 47ms/step - loss: 0.4948 - acc: 0.76  
19 - recall: 0.8438 - precision: 0.8438  
Epoch 32/90  
1/1 [=====] - 0s 47ms/step - loss: 0.4243 - acc: 0.78  
57 - recall: 0.8438 - precision: 0.8710  
Epoch 33/90  
1/1 [=====] - 0s 47ms/step - loss: 0.4296 - acc: 0.83  
33 - recall: 0.9062 - precision: 0.8788  
Epoch 34/90  
1/1 [=====] - 0s 50ms/step - loss: 0.4216 - acc: 0.76  
19 - recall: 0.8125 - precision: 0.8667  
Epoch 35/90  
1/1 [=====] - 0s 46ms/step - loss: 0.4353 - acc: 0.78  
57 - recall: 0.8438 - precision: 0.8710  
Epoch 36/90  
1/1 [=====] - 0s 46ms/step - loss: 0.3296 - acc: 0.85  
71 - recall: 0.9375 - precision: 0.8824  
Epoch 37/90  
1/1 [=====] - 0s 47ms/step - loss: 0.4181 - acc: 0.85  
71 - recall: 0.8438 - precision: 0.9643  
Epoch 38/90  
1/1 [=====] - 0s 47ms/step - loss: 0.4129 - acc: 0.73  
81 - recall: 0.7188 - precision: 0.9200  
Epoch 39/90  
1/1 [=====] - 0s 130ms/step - loss: 0.3768 - acc: 0.8  
333 - recall: 0.8750 - precision: 0.9032  
Epoch 40/90  
1/1 [=====] - 0s 47ms/step - loss: 0.3055 - acc: 0.88  
10 - recall: 0.9062 - precision: 0.9355  
Epoch 41/90
```

```
1/1 [=====] - 0s 46ms/step - loss: 0.3190 - acc: 0.80
95 - recall: 0.8438 - precision: 0.9000
Epoch 42/90
1/1 [=====] - 0s 47ms/step - loss: 0.3809 - acc: 0.80
95 - recall: 0.7500 - precision: 1.0000
Epoch 43/90
1/1 [=====] - 0s 51ms/step - loss: 0.3571 - acc: 0.73
81 - recall: 0.6562 - precision: 1.0000
Epoch 44/90
1/1 [=====] - 0s 47ms/step - loss: 0.3430 - acc: 0.80
95 - recall: 0.7500 - precision: 1.0000
Epoch 45/90
1/1 [=====] - 0s 50ms/step - loss: 0.3228 - acc: 0.85
71 - recall: 0.8750 - precision: 0.9333
Epoch 46/90
1/1 [=====] - 0s 47ms/step - loss: 0.3633 - acc: 0.83
33 - recall: 0.8438 - precision: 0.9310
Epoch 47/90
1/1 [=====] - 0s 47ms/step - loss: 0.3213 - acc: 0.85
71 - recall: 0.9062 - precision: 0.9062
Epoch 48/90
1/1 [=====] - 0s 47ms/step - loss: 0.2344 - acc: 0.88
10 - recall: 0.8750 - precision: 0.9655
Epoch 49/90
1/1 [=====] - 0s 50ms/step - loss: 0.2853 - acc: 0.85
71 - recall: 0.8438 - precision: 0.9643
Epoch 50/90
1/1 [=====] - 0s 48ms/step - loss: 0.2663 - acc: 0.88
10 - recall: 0.9062 - precision: 0.9355
Epoch 51/90
1/1 [=====] - 0s 47ms/step - loss: 0.2847 - acc: 0.85
71 - recall: 0.8438 - precision: 0.9643
Epoch 52/90
1/1 [=====] - 0s 47ms/step - loss: 0.2130 - acc: 0.85
71 - recall: 0.8125 - precision: 1.0000
Epoch 53/90
1/1 [=====] - 0s 53ms/step - loss: 0.2050 - acc: 0.90
48 - recall: 0.8750 - precision: 1.0000
Epoch 54/90
1/1 [=====] - 0s 47ms/step - loss: 0.2997 - acc: 0.85
71 - recall: 0.8438 - precision: 0.9643
Epoch 55/90
1/1 [=====] - 0s 47ms/step - loss: 0.2618 - acc: 0.90
48 - recall: 0.9062 - precision: 0.9667
Epoch 56/90
1/1 [=====] - 0s 47ms/step - loss: 0.2957 - acc: 0.85
71 - recall: 0.8438 - precision: 0.9643
Epoch 57/90
1/1 [=====] - 0s 47ms/step - loss: 0.2503 - acc: 0.88
10 - recall: 0.8438 - precision: 1.0000
Epoch 58/90
1/1 [=====] - 0s 47ms/step - loss: 0.2572 - acc: 0.92
86 - recall: 0.9062 - precision: 1.0000
Epoch 59/90
1/1 [=====] - 0s 47ms/step - loss: 0.1866 - acc: 0.95
24 - recall: 0.9375 - precision: 1.0000
Epoch 60/90
1/1 [=====] - 0s 47ms/step - loss: 0.2563 - acc: 0.83
33 - recall: 0.8750 - precision: 0.9032
Epoch 61/90
```

```
1/1 [=====] - 0s 46ms/step - loss: 0.1885 - acc: 0.90
48 - recall: 0.8750 - precision: 1.0000
Epoch 62/90
1/1 [=====] - 0s 47ms/step - loss: 0.2239 - acc: 0.90
48 - recall: 0.9062 - precision: 0.9667
Epoch 63/90
1/1 [=====] - 0s 47ms/step - loss: 0.1527 - acc: 0.92
86 - recall: 0.9062 - precision: 1.0000
Epoch 64/90
1/1 [=====] - 0s 49ms/step - loss: 0.1312 - acc: 0.90
48 - recall: 0.8750 - precision: 1.0000
Epoch 65/90
1/1 [=====] - 0s 47ms/step - loss: 0.1775 - acc: 0.90
48 - recall: 0.8750 - precision: 1.0000
Epoch 66/90
1/1 [=====] - 0s 47ms/step - loss: 0.1697 - acc: 0.90
48 - recall: 0.9062 - precision: 0.9667
Epoch 67/90
1/1 [=====] - 0s 47ms/step - loss: 0.0928 - acc: 0.97
62 - recall: 1.0000 - precision: 0.9697
Epoch 68/90
1/1 [=====] - 0s 47ms/step - loss: 0.1520 - acc: 0.95
24 - recall: 0.9375 - precision: 1.0000
Epoch 69/90
1/1 [=====] - 0s 46ms/step - loss: 0.1015 - acc: 0.95
24 - recall: 0.9688 - precision: 0.9688
Epoch 70/90
1/1 [=====] - 0s 48ms/step - loss: 0.0955 - acc: 0.95
24 - recall: 0.9375 - precision: 1.0000
Epoch 71/90
1/1 [=====] - 0s 47ms/step - loss: 0.2204 - acc: 0.90
48 - recall: 0.9375 - precision: 0.9375
Epoch 72/90
1/1 [=====] - 0s 47ms/step - loss: 0.1290 - acc: 0.92
86 - recall: 0.9375 - precision: 0.9677
Epoch 73/90
1/1 [=====] - 0s 46ms/step - loss: 0.1367 - acc: 0.95
24 - recall: 0.9688 - precision: 0.9688
Epoch 74/90
1/1 [=====] - 0s 46ms/step - loss: 0.0884 - acc: 0.97
62 - recall: 0.9688 - precision: 1.0000
Epoch 75/90
1/1 [=====] - 0s 46ms/step - loss: 0.0600 - acc: 0.97
62 - recall: 0.9688 - precision: 1.0000
Epoch 76/90
1/1 [=====] - 0s 47ms/step - loss: 0.1145 - acc: 0.92
86 - recall: 0.9375 - precision: 0.9677
Epoch 77/90
1/1 [=====] - 0s 46ms/step - loss: 0.0388 - acc: 0.97
62 - recall: 0.9688 - precision: 1.0000
Epoch 78/90
1/1 [=====] - 0s 47ms/step - loss: 0.0657 - acc: 0.97
62 - recall: 0.9688 - precision: 1.0000
Epoch 79/90
1/1 [=====] - 0s 48ms/step - loss: 0.0570 - acc: 0.97
62 - recall: 0.9688 - precision: 1.0000
Epoch 80/90
1/1 [=====] - 0s 47ms/step - loss: 0.0210 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 81/90
```

```
1/1 [=====] - 0s 46ms/step - loss: 0.0220 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 82/90
1/1 [=====] - 0s 47ms/step - loss: 0.0647 - acc: 0.95
24 - recall: 0.9375 - precision: 1.0000
Epoch 83/90
1/1 [=====] - 0s 46ms/step - loss: 0.0263 - acc: 0.97
62 - recall: 0.9688 - precision: 1.0000
Epoch 84/90
1/1 [=====] - 0s 48ms/step - loss: 0.0122 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 85/90
1/1 [=====] - 0s 46ms/step - loss: 0.0155 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 86/90
1/1 [=====] - 0s 46ms/step - loss: 0.0640 - acc: 0.95
24 - recall: 0.9688 - precision: 0.9688
Epoch 87/90
1/1 [=====] - 0s 47ms/step - loss: 0.0109 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 88/90
1/1 [=====] - 0s 47ms/step - loss: 0.0504 - acc: 0.97
62 - recall: 1.0000 - precision: 0.9697
Epoch 89/90
1/1 [=====] - 0s 47ms/step - loss: 0.0297 - acc: 0.97
62 - recall: 1.0000 - precision: 0.9697
Epoch 90/90
1/1 [=====] - 0s 48ms/step - loss: 0.0149 - acc: 0.97
62 - recall: 0.9688 - precision: 1.0000
2023-03-29 00:09:08.167655: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
1/1 [=====] - 0s 288ms/step
2/2 [=====] - 0s 163ms/step
Epoch 1/90
2023-03-29 00:09:09.596921: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
```

```
1/1 [=====] - 2s 2s/step - loss: 0.6975 - acc: 0.4651
- recall: 0.3448 - precision: 0.7143
Epoch 2/90
1/1 [=====] - 0s 254ms/step - loss: 0.7067 - acc: 0.4
884 - recall: 0.5172 - precision: 0.6522
Epoch 3/90
1/1 [=====] - 0s 176ms/step - loss: 0.6813 - acc: 0.5
116 - recall: 0.4828 - precision: 0.7000
Epoch 4/90
1/1 [=====] - 0s 258ms/step - loss: 0.6917 - acc: 0.5
349 - recall: 0.4483 - precision: 0.7647
Epoch 5/90
1/1 [=====] - 0s 255ms/step - loss: 0.8428 - acc: 0.2
791 - recall: 0.2069 - precision: 0.4286
Epoch 6/90
1/1 [=====] - 0s 175ms/step - loss: 0.6686 - acc: 0.6
047 - recall: 0.4828 - precision: 0.8750
Epoch 7/90
1/1 [=====] - 0s 136ms/step - loss: 0.6924 - acc: 0.5
116 - recall: 0.4138 - precision: 0.7500
Epoch 8/90
1/1 [=====] - 0s 62ms/step - loss: 0.7072 - acc: 0.46
51 - recall: 0.4138 - precision: 0.6667
Epoch 9/90
1/1 [=====] - 0s 221ms/step - loss: 0.7183 - acc: 0.2
558 - recall: 0.2414 - precision: 0.4118
Epoch 10/90
1/1 [=====] - 0s 247ms/step - loss: 0.6972 - acc: 0.5
349 - recall: 0.4483 - precision: 0.7647
Epoch 11/90
1/1 [=====] - 0s 77ms/step - loss: 0.7072 - acc: 0.41
86 - recall: 0.3448 - precision: 0.6250
Epoch 12/90
1/1 [=====] - 0s 147ms/step - loss: 0.6999 - acc: 0.4
651 - recall: 0.3793 - precision: 0.6875
Epoch 13/90
1/1 [=====] - 0s 257ms/step - loss: 0.6980 - acc: 0.3
953 - recall: 0.2759 - precision: 0.6154
Epoch 14/90
1/1 [=====] - 0s 128ms/step - loss: 0.6978 - acc: 0.4
186 - recall: 0.2414 - precision: 0.7000
Epoch 15/90
1/1 [=====] - 0s 63ms/step - loss: 0.7043 - acc: 0.27
91 - recall: 0.1379 - precision: 0.4000
Epoch 16/90
1/1 [=====] - 0s 133ms/step - loss: 0.7003 - acc: 0.3
953 - recall: 0.1724 - precision: 0.7143
Epoch 17/90
1/1 [=====] - 0s 52ms/step - loss: 0.6928 - acc: 0.41
86 - recall: 0.1724 - precision: 0.8333
Epoch 18/90
1/1 [=====] - 0s 73ms/step - loss: 0.6939 - acc: 0.39
53 - recall: 0.1379 - precision: 0.8000
Epoch 19/90
1/1 [=====] - 0s 52ms/step - loss: 0.6955 - acc: 0.37
21 - recall: 0.1034 - precision: 0.7500
Epoch 20/90
1/1 [=====] - 0s 134ms/step - loss: 0.6883 - acc: 0.4
419 - recall: 0.1724 - precision: 1.0000
Epoch 21/90
```

```
1/1 [=====] - 0s 49ms/step - loss: 0.6869 - acc: 0.41  
86 - recall: 0.1724 - precision: 0.8333  
Epoch 22/90  
1/1 [=====] - 0s 48ms/step - loss: 0.7014 - acc: 0.39  
53 - recall: 0.1379 - precision: 0.8000  
Epoch 23/90  
1/1 [=====] - 0s 333ms/step - loss: 0.7320 - acc: 0.3  
953 - recall: 0.1379 - precision: 0.8000  
Epoch 24/90  
1/1 [=====] - 0s 58ms/step - loss: 0.6839 - acc: 0.37  
21 - recall: 0.1379 - precision: 0.6667  
Epoch 25/90  
1/1 [=====] - 0s 50ms/step - loss: 0.6648 - acc: 0.44  
19 - recall: 0.2069 - precision: 0.8571  
Epoch 26/90  
1/1 [=====] - 0s 132ms/step - loss: 0.7158 - acc: 0.2  
558 - recall: 0.1034 - precision: 0.3333  
Epoch 27/90  
1/1 [=====] - 0s 52ms/step - loss: 0.6785 - acc: 0.44  
19 - recall: 0.2414 - precision: 0.7778  
Epoch 28/90  
1/1 [=====] - 0s 50ms/step - loss: 0.6820 - acc: 0.51  
16 - recall: 0.2759 - precision: 1.0000  
Epoch 29/90  
1/1 [=====] - 0s 48ms/step - loss: 0.6777 - acc: 0.48  
84 - recall: 0.2414 - precision: 1.0000  
Epoch 30/90  
1/1 [=====] - 0s 48ms/step - loss: 0.6561 - acc: 0.48  
84 - recall: 0.2759 - precision: 0.8889  
Epoch 31/90  
1/1 [=====] - 0s 47ms/step - loss: 0.6835 - acc: 0.37  
21 - recall: 0.1724 - precision: 0.6250  
Epoch 32/90  
1/1 [=====] - 0s 48ms/step - loss: 0.6299 - acc: 0.48  
84 - recall: 0.2414 - precision: 1.0000  
Epoch 33/90  
1/1 [=====] - 0s 47ms/step - loss: 0.6444 - acc: 0.46  
51 - recall: 0.2414 - precision: 0.8750  
Epoch 34/90  
1/1 [=====] - 0s 47ms/step - loss: 0.6107 - acc: 0.51  
16 - recall: 0.3448 - precision: 0.8333  
Epoch 35/90  
1/1 [=====] - 0s 48ms/step - loss: 0.6243 - acc: 0.53  
49 - recall: 0.3448 - precision: 0.9091  
Epoch 36/90  
1/1 [=====] - 0s 50ms/step - loss: 0.6508 - acc: 0.55  
81 - recall: 0.4138 - precision: 0.8571  
Epoch 37/90  
1/1 [=====] - 0s 48ms/step - loss: 0.6491 - acc: 0.60  
47 - recall: 0.4828 - precision: 0.8750  
Epoch 38/90  
1/1 [=====] - 0s 48ms/step - loss: 0.5627 - acc: 0.62  
79 - recall: 0.5862 - precision: 0.8095  
Epoch 39/90  
1/1 [=====] - 0s 73ms/step - loss: 0.5017 - acc: 0.81  
40 - recall: 0.7586 - precision: 0.9565  
Epoch 40/90  
1/1 [=====] - 0s 48ms/step - loss: 0.4877 - acc: 0.83  
72 - recall: 0.7931 - precision: 0.9583  
Epoch 41/90
```

```
1/1 [=====] - 0s 71ms/step - loss: 0.5208 - acc: 0.72
09 - recall: 0.7241 - precision: 0.8400
Epoch 42/90
1/1 [=====] - 0s 48ms/step - loss: 0.4937 - acc: 0.76
74 - recall: 0.7241 - precision: 0.9130
Epoch 43/90
1/1 [=====] - 0s 48ms/step - loss: 0.3790 - acc: 0.76
74 - recall: 0.7241 - precision: 0.9130
Epoch 44/90
1/1 [=====] - 0s 48ms/step - loss: 0.4979 - acc: 0.72
09 - recall: 0.7241 - precision: 0.8400
Epoch 45/90
1/1 [=====] - 0s 135ms/step - loss: 0.3135 - acc: 0.8
837 - recall: 0.8621 - precision: 0.9615
Epoch 46/90
1/1 [=====] - 0s 48ms/step - loss: 0.3757 - acc: 0.86
05 - recall: 0.8966 - precision: 0.8966
Epoch 47/90
1/1 [=====] - 0s 49ms/step - loss: 0.3483 - acc: 0.86
05 - recall: 0.8621 - precision: 0.9259
Epoch 48/90
1/1 [=====] - 0s 48ms/step - loss: 0.2569 - acc: 0.88
37 - recall: 0.8621 - precision: 0.9615
Epoch 49/90
1/1 [=====] - 0s 48ms/step - loss: 0.2220 - acc: 0.90
70 - recall: 0.8966 - precision: 0.9630
Epoch 50/90
1/1 [=====] - 0s 50ms/step - loss: 0.1563 - acc: 0.93
02 - recall: 0.8966 - precision: 1.0000
Epoch 51/90
1/1 [=====] - 0s 49ms/step - loss: 0.2218 - acc: 0.88
37 - recall: 0.8621 - precision: 0.9615
Epoch 52/90
1/1 [=====] - 0s 52ms/step - loss: 0.1287 - acc: 0.93
02 - recall: 0.8966 - precision: 1.0000
Epoch 53/90
1/1 [=====] - 0s 47ms/step - loss: 0.1204 - acc: 0.95
35 - recall: 0.9310 - precision: 1.0000
Epoch 54/90
1/1 [=====] - 0s 48ms/step - loss: 0.0661 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 55/90
1/1 [=====] - 0s 49ms/step - loss: 0.2894 - acc: 0.88
37 - recall: 0.9310 - precision: 0.9000
Epoch 56/90
1/1 [=====] - 0s 49ms/step - loss: 0.2339 - acc: 0.88
37 - recall: 0.8621 - precision: 0.9615
Epoch 57/90
1/1 [=====] - 0s 50ms/step - loss: 0.2292 - acc: 0.90
70 - recall: 0.9310 - precision: 0.9310
Epoch 58/90
1/1 [=====] - 0s 48ms/step - loss: 0.2071 - acc: 0.90
70 - recall: 0.9310 - precision: 0.9310
Epoch 59/90
1/1 [=====] - 0s 47ms/step - loss: 0.1242 - acc: 0.95
35 - recall: 0.9655 - precision: 0.9655
Epoch 60/90
1/1 [=====] - 0s 48ms/step - loss: 0.3288 - acc: 0.95
35 - recall: 1.0000 - precision: 0.9355
Epoch 61/90
```

```
1/1 [=====] - 0s 51ms/step - loss: 0.0776 - acc: 0.97
67 - recall: 1.0000 - precision: 0.9667
Epoch 62/90
1/1 [=====] - 0s 48ms/step - loss: 0.1063 - acc: 0.95
35 - recall: 0.9310 - precision: 1.0000
Epoch 63/90
1/1 [=====] - 0s 48ms/step - loss: 0.1034 - acc: 0.90
70 - recall: 0.8966 - precision: 0.9630
Epoch 64/90
1/1 [=====] - 0s 63ms/step - loss: 0.1265 - acc: 0.90
70 - recall: 0.8966 - precision: 0.9630
Epoch 65/90
1/1 [=====] - 0s 48ms/step - loss: 0.1251 - acc: 0.93
02 - recall: 0.9310 - precision: 0.9643
Epoch 66/90
1/1 [=====] - 0s 47ms/step - loss: 0.0658 - acc: 0.97
67 - recall: 0.9655 - precision: 1.0000
Epoch 67/90
1/1 [=====] - 0s 48ms/step - loss: 0.1063 - acc: 0.95
35 - recall: 0.9655 - precision: 0.9655
Epoch 68/90
1/1 [=====] - 0s 49ms/step - loss: 0.1204 - acc: 0.93
02 - recall: 0.8966 - precision: 1.0000
Epoch 69/90
1/1 [=====] - 0s 48ms/step - loss: 0.0558 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 70/90
1/1 [=====] - 0s 48ms/step - loss: 0.0765 - acc: 0.95
35 - recall: 0.9655 - precision: 0.9655
Epoch 71/90
1/1 [=====] - 0s 48ms/step - loss: 0.0552 - acc: 0.97
67 - recall: 1.0000 - precision: 0.9667
Epoch 72/90
1/1 [=====] - 0s 48ms/step - loss: 0.0324 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 73/90
1/1 [=====] - 0s 49ms/step - loss: 0.0212 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 74/90
1/1 [=====] - 0s 48ms/step - loss: 0.0438 - acc: 0.97
67 - recall: 0.9655 - precision: 1.0000
Epoch 75/90
1/1 [=====] - 0s 47ms/step - loss: 0.0109 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 76/90
1/1 [=====] - 0s 47ms/step - loss: 0.0597 - acc: 0.97
67 - recall: 1.0000 - precision: 0.9667
Epoch 77/90
1/1 [=====] - 0s 48ms/step - loss: 0.0056 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 78/90
1/1 [=====] - 0s 48ms/step - loss: 0.0080 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 79/90
1/1 [=====] - 0s 49ms/step - loss: 0.0051 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 80/90
1/1 [=====] - 0s 48ms/step - loss: 0.0032 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 81/90
```

```
1/1 [=====] - 0s 48ms/step - loss: 0.0525 - acc: 0.97
67 - recall: 1.0000 - precision: 0.9667
Epoch 82/90
1/1 [=====] - 0s 48ms/step - loss: 0.0023 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 83/90
1/1 [=====] - 0s 48ms/step - loss: 0.0469 - acc: 0.97
67 - recall: 1.0000 - precision: 0.9667
Epoch 84/90
1/1 [=====] - 0s 48ms/step - loss: 0.0281 - acc: 0.97
67 - recall: 1.0000 - precision: 0.9667
Epoch 85/90
1/1 [=====] - 0s 48ms/step - loss: 0.0026 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 86/90
1/1 [=====] - 0s 50ms/step - loss: 0.0019 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 87/90
1/1 [=====] - 0s 48ms/step - loss: 0.0013 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 88/90
1/1 [=====] - 0s 48ms/step - loss: 0.0019 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 89/90
1/1 [=====] - 0s 47ms/step - loss: 0.0289 - acc: 0.97
67 - recall: 1.0000 - precision: 0.9667
Epoch 90/90
1/1 [=====] - 0s 47ms/step - loss: 1.3562e-04 - acc:
1.0000 - recall: 1.0000 - precision: 1.0000
2023-03-29 00:09:18.059162: I tensorflow/core/grappler/optimizers/custom_graph_
_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
1/1 [=====] - 0s 295ms/step
2/2 [=====] - 0s 171ms/step
Epoch 1/90
2023-03-29 00:09:19.153028: I tensorflow/core/grappler/optimizers/custom_graph_
_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
```

```
1/1 [=====] - 2s 2s/step - loss: 0.7324 - acc: 0.4419
- recall: 0.5185 - precision: 0.5600
Epoch 2/90
1/1 [=====] - 0s 257ms/step - loss: 0.7295 - acc: 0.3953
- recall: 0.1852 - precision: 0.5556
Epoch 3/90
1/1 [=====] - 0s 261ms/step - loss: 0.7116 - acc: 0.4651
- recall: 0.2222 - precision: 0.7500
Epoch 4/90
1/1 [=====] - 0s 245ms/step - loss: 0.7048 - acc: 0.4651
- recall: 0.1852 - precision: 0.8333
Epoch 5/90
1/1 [=====] - 0s 260ms/step - loss: 0.7340 - acc: 0.4186
- recall: 0.1111 - precision: 0.7500
Epoch 6/90
1/1 [=====] - 0s 173ms/step - loss: 0.6934 - acc: 0.4419
- recall: 0.1481 - precision: 0.8000
Epoch 7/90
1/1 [=====] - 0s 166ms/step - loss: 0.7343 - acc: 0.3023
- recall: 0.0741 - precision: 0.2857
Epoch 8/90
1/1 [=====] - 0s 253ms/step - loss: 0.6808 - acc: 0.4651
- recall: 0.2593 - precision: 0.7000
Epoch 9/90
1/1 [=====] - 0s 220ms/step - loss: 0.7300 - acc: 0.4419
- recall: 0.2222 - precision: 0.6667
Epoch 10/90
1/1 [=====] - 0s 56ms/step - loss: 0.7088 - acc: 0.4651
- recall: 0.2222 - precision: 0.7500
Epoch 11/90
1/1 [=====] - 0s 56ms/step - loss: 0.7199 - acc: 0.4884
- recall: 0.2222 - precision: 0.8571
Epoch 12/90
1/1 [=====] - 0s 77ms/step - loss: 0.6656 - acc: 0.5349
- recall: 0.2593 - precision: 1.0000
Epoch 13/90
1/1 [=====] - 0s 212ms/step - loss: 0.6515 - acc: 0.4186
- recall: 0.1481 - precision: 0.6667
Epoch 14/90
1/1 [=====] - 0s 76ms/step - loss: 0.7475 - acc: 0.4186
- recall: 0.1852 - precision: 0.6250
Epoch 15/90
1/1 [=====] - 0s 81ms/step - loss: 0.6915 - acc: 0.3721
- recall: 0.1111 - precision: 0.5000
Epoch 16/90
1/1 [=====] - 0s 61ms/step - loss: 0.7072 - acc: 0.4651
- recall: 0.2593 - precision: 0.7000
Epoch 17/90
1/1 [=====] - 0s 73ms/step - loss: 0.6935 - acc: 0.5581
- recall: 0.3333 - precision: 0.9000
Epoch 18/90
1/1 [=====] - 0s 51ms/step - loss: 0.6882 - acc: 0.5814
- recall: 0.3704 - precision: 0.9091
Epoch 19/90
1/1 [=====] - 0s 48ms/step - loss: 0.6287 - acc: 0.5814
- recall: 0.4074 - precision: 0.8462
Epoch 20/90
1/1 [=====] - 0s 126ms/step - loss: 0.6679 - acc: 0.5349
- recall: 0.4074 - precision: 0.7333
Epoch 21/90
```

```
1/1 [=====] - 0s 128ms/step - loss: 0.5833 - acc: 0.6  
279 - recall: 0.4815 - precision: 0.8667  
Epoch 22/90  
1/1 [=====] - 0s 48ms/step - loss: 0.6556 - acc: 0.58  
14 - recall: 0.4444 - precision: 0.8000  
Epoch 23/90  
1/1 [=====] - 0s 53ms/step - loss: 0.6206 - acc: 0.67  
44 - recall: 0.5926 - precision: 0.8421  
Epoch 24/90  
1/1 [=====] - 0s 52ms/step - loss: 0.5632 - acc: 0.69  
77 - recall: 0.5926 - precision: 0.8889  
Epoch 25/90  
1/1 [=====] - 0s 49ms/step - loss: 0.5360 - acc: 0.72  
09 - recall: 0.6667 - precision: 0.8571  
Epoch 26/90  
1/1 [=====] - 0s 47ms/step - loss: 0.5740 - acc: 0.74  
42 - recall: 0.7037 - precision: 0.8636  
Epoch 27/90  
1/1 [=====] - 0s 49ms/step - loss: 0.5293 - acc: 0.79  
07 - recall: 0.7778 - precision: 0.8750  
Epoch 28/90  
1/1 [=====] - 0s 140ms/step - loss: 0.5139 - acc: 0.7  
442 - recall: 0.7037 - precision: 0.8636  
Epoch 29/90  
1/1 [=====] - 0s 51ms/step - loss: 0.4976 - acc: 0.81  
40 - recall: 0.7778 - precision: 0.9130  
Epoch 30/90  
1/1 [=====] - 0s 54ms/step - loss: 0.5066 - acc: 0.79  
07 - recall: 0.7407 - precision: 0.9091  
Epoch 31/90  
1/1 [=====] - 0s 47ms/step - loss: 0.4118 - acc: 0.76  
74 - recall: 0.7037 - precision: 0.9048  
Epoch 32/90  
1/1 [=====] - 0s 48ms/step - loss: 0.3480 - acc: 0.79  
07 - recall: 0.7037 - precision: 0.9500  
Epoch 33/90  
1/1 [=====] - 0s 47ms/step - loss: 0.3613 - acc: 0.83  
72 - recall: 0.7778 - precision: 0.9545  
Epoch 34/90  
1/1 [=====] - 0s 48ms/step - loss: 0.3057 - acc: 0.86  
05 - recall: 0.8148 - precision: 0.9565  
Epoch 35/90  
1/1 [=====] - 0s 131ms/step - loss: 0.4147 - acc: 0.8  
140 - recall: 0.8889 - precision: 0.8276  
Epoch 36/90  
1/1 [=====] - 0s 48ms/step - loss: 0.2649 - acc: 0.86  
05 - recall: 0.8148 - precision: 0.9565  
Epoch 37/90  
1/1 [=====] - 0s 333ms/step - loss: 0.3362 - acc: 0.8  
837 - recall: 0.8519 - precision: 0.9583  
Epoch 38/90  
1/1 [=====] - 0s 49ms/step - loss: 0.2768 - acc: 0.83  
72 - recall: 0.8148 - precision: 0.9167  
Epoch 39/90  
1/1 [=====] - 0s 127ms/step - loss: 0.2658 - acc: 0.9  
070 - recall: 0.8889 - precision: 0.9600  
Epoch 40/90  
1/1 [=====] - 0s 50ms/step - loss: 0.2717 - acc: 0.93  
02 - recall: 0.9630 - precision: 0.9286  
Epoch 41/90
```

```
1/1 [=====] - 0s 47ms/step - loss: 0.1949 - acc: 0.93
02 - recall: 0.9630 - precision: 0.9286
Epoch 42/90
1/1 [=====] - 0s 47ms/step - loss: 0.2011 - acc: 0.95
35 - recall: 0.9630 - precision: 0.9630
Epoch 43/90
1/1 [=====] - 0s 49ms/step - loss: 0.1044 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 44/90
1/1 [=====] - 0s 49ms/step - loss: 0.1281 - acc: 0.95
35 - recall: 0.9630 - precision: 0.9630
Epoch 45/90
1/1 [=====] - 0s 49ms/step - loss: 0.1333 - acc: 0.95
35 - recall: 0.9259 - precision: 1.0000
Epoch 46/90
1/1 [=====] - 0s 48ms/step - loss: 0.2031 - acc: 0.90
70 - recall: 0.9259 - precision: 0.9259
Epoch 47/90
1/1 [=====] - 0s 47ms/step - loss: 0.0583 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 48/90
1/1 [=====] - 0s 48ms/step - loss: 0.0757 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 49/90
1/1 [=====] - 0s 49ms/step - loss: 0.0706 - acc: 0.95
35 - recall: 0.9259 - precision: 1.0000
Epoch 50/90
1/1 [=====] - 0s 51ms/step - loss: 0.0908 - acc: 0.95
35 - recall: 0.9630 - precision: 0.9630
Epoch 51/90
1/1 [=====] - 0s 47ms/step - loss: 0.0280 - acc: 0.97
67 - recall: 0.9630 - precision: 1.0000
Epoch 52/90
1/1 [=====] - 0s 47ms/step - loss: 0.0251 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 53/90
1/1 [=====] - 0s 47ms/step - loss: 0.0177 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 54/90
1/1 [=====] - 0s 49ms/step - loss: 0.0120 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 55/90
1/1 [=====] - 0s 49ms/step - loss: 0.0372 - acc: 0.97
67 - recall: 1.0000 - precision: 0.9643
Epoch 56/90
1/1 [=====] - 0s 48ms/step - loss: 0.0360 - acc: 0.97
67 - recall: 0.9630 - precision: 1.0000
Epoch 57/90
1/1 [=====] - 0s 48ms/step - loss: 0.0023 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 58/90
1/1 [=====] - 0s 47ms/step - loss: 0.0083 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 59/90
1/1 [=====] - 0s 48ms/step - loss: 5.1562e-04 - acc:
1.0000 - recall: 1.0000 - precision: 1.0000
Epoch 60/90
1/1 [=====] - 0s 50ms/step - loss: 0.0521 - acc: 0.97
67 - recall: 1.0000 - precision: 0.9643
Epoch 61/90
```

```
1/1 [=====] - 0s 47ms/step - loss: 0.0018 - acc: 1.00  
00 - recall: 1.0000 - precision: 1.0000  
Epoch 62/90  
1/1 [=====] - 0s 47ms/step - loss: 0.0040 - acc: 1.00  
00 - recall: 1.0000 - precision: 1.0000  
Epoch 63/90  
1/1 [=====] - 0s 47ms/step - loss: 0.0227 - acc: 1.00  
00 - recall: 1.0000 - precision: 1.0000  
Epoch 64/90  
1/1 [=====] - 0s 55ms/step - loss: 0.0370 - acc: 0.97  
67 - recall: 1.0000 - precision: 0.9643  
Epoch 65/90  
1/1 [=====] - 0s 52ms/step - loss: 0.0104 - acc: 1.00  
00 - recall: 1.0000 - precision: 1.0000  
Epoch 66/90  
1/1 [=====] - 0s 48ms/step - loss: 0.0037 - acc: 1.00  
00 - recall: 1.0000 - precision: 1.0000  
Epoch 67/90  
1/1 [=====] - 0s 48ms/step - loss: 0.0038 - acc: 1.00  
00 - recall: 1.0000 - precision: 1.0000  
Epoch 68/90  
1/1 [=====] - 0s 47ms/step - loss: 0.0023 - acc: 1.00  
00 - recall: 1.0000 - precision: 1.0000  
Epoch 69/90  
1/1 [=====] - 0s 48ms/step - loss: 0.0017 - acc: 1.00  
00 - recall: 1.0000 - precision: 1.0000  
Epoch 70/90  
1/1 [=====] - 0s 48ms/step - loss: 0.0371 - acc: 0.97  
67 - recall: 1.0000 - precision: 0.9643  
Epoch 71/90  
1/1 [=====] - 0s 47ms/step - loss: 0.0281 - acc: 0.97  
67 - recall: 1.0000 - precision: 0.9643  
Epoch 72/90  
1/1 [=====] - 0s 49ms/step - loss: 0.0576 - acc: 0.97  
67 - recall: 1.0000 - precision: 0.9643  
Epoch 73/90  
1/1 [=====] - 0s 47ms/step - loss: 0.0408 - acc: 0.97  
67 - recall: 1.0000 - precision: 0.9643  
Epoch 74/90  
1/1 [=====] - 0s 48ms/step - loss: 0.0014 - acc: 1.00  
00 - recall: 1.0000 - precision: 1.0000  
Epoch 75/90  
1/1 [=====] - 0s 48ms/step - loss: 0.0015 - acc: 1.00  
00 - recall: 1.0000 - precision: 1.0000  
Epoch 76/90  
1/1 [=====] - 0s 47ms/step - loss: 0.0012 - acc: 1.00  
00 - recall: 1.0000 - precision: 1.0000  
Epoch 77/90  
1/1 [=====] - 0s 55ms/step - loss: 9.2806e-04 - acc:  
1.0000 - recall: 1.0000 - precision: 1.0000  
Epoch 78/90  
1/1 [=====] - 0s 48ms/step - loss: 0.0272 - acc: 0.97  
67 - recall: 1.0000 - precision: 0.9643  
Epoch 79/90  
1/1 [=====] - 0s 48ms/step - loss: 0.0019 - acc: 1.00  
00 - recall: 1.0000 - precision: 1.0000  
Epoch 80/90  
1/1 [=====] - 0s 47ms/step - loss: 0.0283 - acc: 0.97  
67 - recall: 1.0000 - precision: 0.9643  
Epoch 81/90
```

```
1/1 [=====] - 0s 48ms/step - loss: 5.4597e-04 - acc: 1.0000 - recall: 1.0000 - precision: 1.0000
Epoch 82/90
1/1 [=====] - 0s 48ms/step - loss: 0.0272 - acc: 0.9767 - recall: 1.0000 - precision: 0.9643
Epoch 83/90
1/1 [=====] - 0s 48ms/step - loss: 0.0261 - acc: 0.9767 - recall: 1.0000 - precision: 0.9643
Epoch 84/90
1/1 [=====] - 0s 48ms/step - loss: 4.6352e-04 - acc: 1.0000 - recall: 1.0000 - precision: 1.0000
Epoch 85/90
1/1 [=====] - 0s 48ms/step - loss: 0.0263 - acc: 0.9767 - recall: 1.0000 - precision: 0.9643
Epoch 86/90
1/1 [=====] - 0s 48ms/step - loss: 0.0271 - acc: 0.9767 - recall: 1.0000 - precision: 0.9643
Epoch 87/90
1/1 [=====] - 0s 47ms/step - loss: 4.6684e-05 - acc: 1.0000 - recall: 1.0000 - precision: 1.0000
Epoch 88/90
1/1 [=====] - 0s 48ms/step - loss: 0.0031 - acc: 1.0000 - recall: 1.0000 - precision: 1.0000
Epoch 89/90
1/1 [=====] - 0s 48ms/step - loss: 0.0262 - acc: 0.9767 - recall: 1.0000 - precision: 0.9643
Epoch 90/90
1/1 [=====] - 0s 49ms/step - loss: 7.2971e-04 - acc: 1.0000 - recall: 1.0000 - precision: 1.0000
2023-03-29 00:09:27.536902: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
1/1 [=====] - 0s 293ms/step
2/2 [=====] - 0s 196ms/step
Epoch 1/90
2023-03-29 00:09:28.629178: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
```

```
1/1 [=====] - 2s 2s/step - loss: 0.6479 - acc: 0.5476
- recall: 0.5938 - precision: 0.7600
Epoch 2/90
1/1 [=====] - 0s 246ms/step - loss: 0.6442 - acc: 0.6
190 - recall: 0.6562 - precision: 0.8077
Epoch 3/90
1/1 [=====] - 0s 249ms/step - loss: 0.6458 - acc: 0.6
667 - recall: 0.6875 - precision: 0.8462
Epoch 4/90
1/1 [=====] - 0s 164ms/step - loss: 0.6475 - acc: 0.5
238 - recall: 0.6250 - precision: 0.7143
Epoch 5/90
1/1 [=====] - 0s 239ms/step - loss: 0.6499 - acc: 0.6
667 - recall: 0.7500 - precision: 0.8000
Epoch 6/90
1/1 [=====] - 0s 78ms/step - loss: 0.6486 - acc: 0.61
90 - recall: 0.7500 - precision: 0.7500
Epoch 7/90
1/1 [=====] - 0s 153ms/step - loss: 0.6453 - acc: 0.5
714 - recall: 0.7188 - precision: 0.7188
Epoch 8/90
1/1 [=====] - 0s 136ms/step - loss: 0.6432 - acc: 0.6
905 - recall: 0.8438 - precision: 0.7714
Epoch 9/90
1/1 [=====] - 0s 137ms/step - loss: 0.6491 - acc: 0.6
190 - recall: 0.7812 - precision: 0.7353
Epoch 10/90
1/1 [=====] - 0s 213ms/step - loss: 0.6349 - acc: 0.7
857 - recall: 0.9062 - precision: 0.8286
Epoch 11/90
1/1 [=====] - 0s 141ms/step - loss: 0.6525 - acc: 0.7
381 - recall: 0.9062 - precision: 0.7838
Epoch 12/90
1/1 [=====] - 0s 231ms/step - loss: 0.6558 - acc: 0.6
905 - recall: 0.9062 - precision: 0.7436
Epoch 13/90
1/1 [=====] - 0s 70ms/step - loss: 0.6487 - acc: 0.76
19 - recall: 0.9375 - precision: 0.7895
Epoch 14/90
1/1 [=====] - 0s 49ms/step - loss: 0.6484 - acc: 0.64
29 - recall: 0.8438 - precision: 0.7297
Epoch 15/90
1/1 [=====] - 0s 51ms/step - loss: 0.6429 - acc: 0.71
43 - recall: 0.9375 - precision: 0.7500
Epoch 16/90
1/1 [=====] - 0s 130ms/step - loss: 0.6363 - acc: 0.7
857 - recall: 0.9688 - precision: 0.7949
Epoch 17/90
1/1 [=====] - 0s 71ms/step - loss: 0.6464 - acc: 0.69
05 - recall: 0.9062 - precision: 0.7436
Epoch 18/90
1/1 [=====] - 0s 46ms/step - loss: 0.6379 - acc: 0.76
19 - recall: 0.9688 - precision: 0.7750
Epoch 19/90
1/1 [=====] - 0s 76ms/step - loss: 0.6411 - acc: 0.80
95 - recall: 1.0000 - precision: 0.8000
Epoch 20/90
1/1 [=====] - 0s 53ms/step - loss: 0.6366 - acc: 0.73
81 - recall: 0.9375 - precision: 0.7692
Epoch 21/90
```

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1/1 [=====] - 0s 46ms/step - loss: 0.6431 - acc: 0.71  
43 - recall: 0.9375 - precision: 0.7500  
Epoch 22/90  
1/1 [=====] - 0s 48ms/step - loss: 0.6395 - acc: 0.73  
81 - recall: 0.9688 - precision: 0.7561  
Epoch 23/90  
1/1 [=====] - 0s 47ms/step - loss: 0.6390 - acc: 0.76  
19 - recall: 0.9688 - precision: 0.7750  
Epoch 24/90  
1/1 [=====] - 0s 47ms/step - loss: 0.6408 - acc: 0.76  
19 - recall: 1.0000 - precision: 0.7619  
Epoch 25/90  
1/1 [=====] - 0s 74ms/step - loss: 0.6401 - acc: 0.78  
57 - recall: 1.0000 - precision: 0.7805  
Epoch 26/90  
1/1 [=====] - 0s 45ms/step - loss: 0.6337 - acc: 0.76  
19 - recall: 1.0000 - precision: 0.7619  
Epoch 27/90  
1/1 [=====] - 0s 46ms/step - loss: 0.6455 - acc: 0.76  
19 - recall: 1.0000 - precision: 0.7619  
Epoch 28/90  
1/1 [=====] - 0s 46ms/step - loss: 0.6451 - acc: 0.76  
19 - recall: 1.0000 - precision: 0.7619  
Epoch 29/90  
1/1 [=====] - 0s 46ms/step - loss: 0.6430 - acc: 0.73  
81 - recall: 0.9688 - precision: 0.7561  
Epoch 30/90  
1/1 [=====] - 0s 162ms/step - loss: 0.6385 - acc: 0.7  
619 - recall: 1.0000 - precision: 0.7619  
Epoch 31/90  
1/1 [=====] - 0s 124ms/step - loss: 0.6414 - acc: 0.7  
619 - recall: 1.0000 - precision: 0.7619  
Epoch 32/90  
1/1 [=====] - 0s 131ms/step - loss: 0.6405 - acc: 0.7  
381 - recall: 0.9688 - precision: 0.7561  
Epoch 33/90  
1/1 [=====] - 0s 50ms/step - loss: 0.6380 - acc: 0.76  
19 - recall: 1.0000 - precision: 0.7619  
Epoch 34/90  
1/1 [=====] - 0s 46ms/step - loss: 0.6343 - acc: 0.76  
19 - recall: 1.0000 - precision: 0.7619  
Epoch 35/90  
1/1 [=====] - 0s 46ms/step - loss: 0.6421 - acc: 0.76  
19 - recall: 1.0000 - precision: 0.7619  
Epoch 36/90  
1/1 [=====] - 0s 46ms/step - loss: 0.6416 - acc: 0.76  
19 - recall: 1.0000 - precision: 0.7619  
Epoch 37/90  
1/1 [=====] - 0s 49ms/step - loss: 0.6275 - acc: 0.76  
19 - recall: 1.0000 - precision: 0.7619  
Epoch 38/90  
1/1 [=====] - 0s 133ms/step - loss: 0.6340 - acc: 0.7  
619 - recall: 1.0000 - precision: 0.7619  
Epoch 39/90  
1/1 [=====] - 0s 45ms/step - loss: 0.6372 - acc: 0.76  
19 - recall: 1.0000 - precision: 0.7619  
Epoch 40/90  
1/1 [=====] - 0s 46ms/step - loss: 0.6353 - acc: 0.76  
19 - recall: 1.0000 - precision: 0.7619  
Epoch 41/90
```

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1/1 [=====] - 0s 50ms/step - loss: 0.6279 - acc: 0.76  
19 - recall: 1.0000 - precision: 0.7619  
Epoch 42/90  
1/1 [=====] - 0s 136ms/step - loss: 0.6401 - acc: 0.7  
19 - recall: 1.0000 - precision: 0.7619  
Epoch 43/90  
1/1 [=====] - 0s 48ms/step - loss: 0.6473 - acc: 0.76  
19 - recall: 1.0000 - precision: 0.7619  
Epoch 44/90  
1/1 [=====] - 0s 46ms/step - loss: 0.6297 - acc: 0.76  
19 - recall: 1.0000 - precision: 0.7619  
Epoch 45/90  
1/1 [=====] - 0s 46ms/step - loss: 0.6322 - acc: 0.76  
19 - recall: 1.0000 - precision: 0.7619  
Epoch 46/90  
1/1 [=====] - 0s 49ms/step - loss: 0.6335 - acc: 0.76  
19 - recall: 1.0000 - precision: 0.7619  
Epoch 47/90  
1/1 [=====] - 0s 47ms/step - loss: 0.6312 - acc: 0.76  
19 - recall: 1.0000 - precision: 0.7619  
Epoch 48/90  
1/1 [=====] - 0s 46ms/step - loss: 0.6310 - acc: 0.76  
19 - recall: 1.0000 - precision: 0.7619  
Epoch 49/90  
1/1 [=====] - 0s 129ms/step - loss: 0.6366 - acc: 0.7  
619 - recall: 1.0000 - precision: 0.7619  
Epoch 50/90  
1/1 [=====] - 0s 46ms/step - loss: 0.6314 - acc: 0.76  
19 - recall: 1.0000 - precision: 0.7619  
Epoch 51/90  
1/1 [=====] - 0s 45ms/step - loss: 0.6319 - acc: 0.76  
19 - recall: 1.0000 - precision: 0.7619  
Epoch 52/90  
1/1 [=====] - 0s 46ms/step - loss: 0.6506 - acc: 0.76  
19 - recall: 1.0000 - precision: 0.7619  
Epoch 53/90  
1/1 [=====] - 0s 47ms/step - loss: 0.6305 - acc: 0.76  
19 - recall: 1.0000 - precision: 0.7619  
Epoch 54/90  
1/1 [=====] - 0s 150ms/step - loss: 0.6239 - acc: 0.7  
619 - recall: 1.0000 - precision: 0.7619  
Epoch 55/90  
1/1 [=====] - 0s 153ms/step - loss: 0.6292 - acc: 0.7  
619 - recall: 1.0000 - precision: 0.7619  
Epoch 56/90  
1/1 [=====] - 0s 49ms/step - loss: 0.6308 - acc: 0.76  
19 - recall: 1.0000 - precision: 0.7619  
Epoch 57/90  
1/1 [=====] - 0s 47ms/step - loss: 0.6292 - acc: 0.76  
19 - recall: 1.0000 - precision: 0.7619  
Epoch 58/90  
1/1 [=====] - 0s 47ms/step - loss: 0.6306 - acc: 0.76  
19 - recall: 1.0000 - precision: 0.7619  
Epoch 59/90  
1/1 [=====] - 0s 48ms/step - loss: 0.6394 - acc: 0.76  
19 - recall: 1.0000 - precision: 0.7619  
Epoch 60/90  
1/1 [=====] - 0s 47ms/step - loss: 0.6347 - acc: 0.76  
19 - recall: 1.0000 - precision: 0.7619  
Epoch 61/90
```

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1/1 [=====] - 0s 47ms/step - loss: 0.6243 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 62/90
1/1 [=====] - 0s 46ms/step - loss: 0.6387 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 63/90
1/1 [=====] - 0s 46ms/step - loss: 0.6329 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 64/90
1/1 [=====] - 0s 46ms/step - loss: 0.6458 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 65/90
1/1 [=====] - 0s 46ms/step - loss: 0.6495 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 66/90
1/1 [=====] - 0s 47ms/step - loss: 0.6378 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 67/90
1/1 [=====] - 0s 46ms/step - loss: 0.6311 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 68/90
1/1 [=====] - 0s 46ms/step - loss: 0.6320 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 69/90
1/1 [=====] - 0s 47ms/step - loss: 0.6272 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 70/90
1/1 [=====] - 0s 46ms/step - loss: 0.6228 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 71/90
1/1 [=====] - 0s 47ms/step - loss: 0.6250 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 72/90
1/1 [=====] - 0s 46ms/step - loss: 0.6394 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 73/90
1/1 [=====] - 0s 47ms/step - loss: 0.6360 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 74/90
1/1 [=====] - 0s 46ms/step - loss: 0.6370 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 75/90
1/1 [=====] - 0s 47ms/step - loss: 0.6314 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 76/90
1/1 [=====] - 0s 46ms/step - loss: 0.6272 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 77/90
1/1 [=====] - 0s 46ms/step - loss: 0.6359 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 78/90
1/1 [=====] - 0s 47ms/step - loss: 0.6418 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 79/90
1/1 [=====] - 0s 46ms/step - loss: 0.6241 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 80/90
1/1 [=====] - 0s 47ms/step - loss: 0.6346 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 81/90
```

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1/1 [=====] - 0s 47ms/step - loss: 0.6388 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 82/90
1/1 [=====] - 0s 46ms/step - loss: 0.6373 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 83/90
1/1 [=====] - 0s 46ms/step - loss: 0.6338 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 84/90
1/1 [=====] - 0s 46ms/step - loss: 0.6197 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 85/90
1/1 [=====] - 0s 46ms/step - loss: 0.6185 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 86/90
1/1 [=====] - 0s 46ms/step - loss: 0.6347 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 87/90
1/1 [=====] - 0s 46ms/step - loss: 0.6310 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 88/90
1/1 [=====] - 0s 48ms/step - loss: 0.6301 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 89/90
1/1 [=====] - 0s 45ms/step - loss: 0.6299 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 90/90
1/1 [=====] - 0s 46ms/step - loss: 0.6318 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
2023-03-29 00:09:36.786023: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
1/1 [=====] - 0s 275ms/step
2/2 [=====] - 0s 170ms/step
Epoch 1/90
2023-03-29 00:09:37.836490: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
```

```
1/1 [=====] - 2s 2s/step - loss: 0.7057 - acc: 0.4651
- recall: 0.5517 - precision: 0.6154
Epoch 2/90
1/1 [=====] - 0s 249ms/step - loss: 0.7004 - acc: 0.5
116 - recall: 0.4828 - precision: 0.7000
Epoch 3/90
1/1 [=====] - 0s 248ms/step - loss: 0.7021 - acc: 0.5
116 - recall: 0.4828 - precision: 0.7000
Epoch 4/90
1/1 [=====] - 0s 253ms/step - loss: 0.6950 - acc: 0.5
349 - recall: 0.5172 - precision: 0.7143
Epoch 5/90
1/1 [=====] - 0s 156ms/step - loss: 0.6967 - acc: 0.5
814 - recall: 0.5172 - precision: 0.7895
Epoch 6/90
1/1 [=====] - 0s 92ms/step - loss: 0.6974 - acc: 0.58
14 - recall: 0.5172 - precision: 0.7895
Epoch 7/90
1/1 [=====] - 0s 227ms/step - loss: 0.7005 - acc: 0.4
651 - recall: 0.4483 - precision: 0.6500
Epoch 8/90
1/1 [=====] - 0s 161ms/step - loss: 0.7037 - acc: 0.5
116 - recall: 0.4828 - precision: 0.7000
Epoch 9/90
1/1 [=====] - 0s 165ms/step - loss: 0.7043 - acc: 0.4
186 - recall: 0.4138 - precision: 0.6000
Epoch 10/90
1/1 [=====] - 0s 75ms/step - loss: 0.6989 - acc: 0.51
16 - recall: 0.4828 - precision: 0.7000
Epoch 11/90
1/1 [=====] - 0s 74ms/step - loss: 0.6932 - acc: 0.58
14 - recall: 0.5172 - precision: 0.7895
Epoch 12/90
1/1 [=====] - 0s 229ms/step - loss: 0.7003 - acc: 0.5
349 - recall: 0.4828 - precision: 0.7368
Epoch 13/90
1/1 [=====] - 0s 49ms/step - loss: 0.7006 - acc: 0.48
84 - recall: 0.4483 - precision: 0.6842
Epoch 14/90
1/1 [=====] - 0s 121ms/step - loss: 0.7033 - acc: 0.4
419 - recall: 0.4138 - precision: 0.6316
Epoch 15/90
1/1 [=====] - 0s 129ms/step - loss: 0.6994 - acc: 0.5
349 - recall: 0.4828 - precision: 0.7368
Epoch 16/90
1/1 [=====] - 0s 121ms/step - loss: 0.7042 - acc: 0.3
953 - recall: 0.3793 - precision: 0.5789
Epoch 17/90
1/1 [=====] - 0s 135ms/step - loss: 0.6943 - acc: 0.5
814 - recall: 0.5172 - precision: 0.7895
Epoch 18/90
1/1 [=====] - 0s 132ms/step - loss: 0.6968 - acc: 0.5
814 - recall: 0.5172 - precision: 0.7895
Epoch 19/90
1/1 [=====] - 0s 46ms/step - loss: 0.6983 - acc: 0.58
14 - recall: 0.5517 - precision: 0.7619
Epoch 20/90
1/1 [=====] - 0s 145ms/step - loss: 0.7021 - acc: 0.4
419 - recall: 0.4138 - precision: 0.6316
Epoch 21/90
```

```
1/1 [=====] - 0s 48ms/step - loss: 0.7001 - acc: 0.48  
84 - recall: 0.4138 - precision: 0.7059  
Epoch 22/90  
1/1 [=====] - 0s 134ms/step - loss: 0.6968 - acc: 0.5  
349 - recall: 0.4828 - precision: 0.7368  
Epoch 23/90  
1/1 [=====] - 0s 159ms/step - loss: 0.7027 - acc: 0.4  
419 - recall: 0.4138 - precision: 0.6316  
Epoch 24/90  
1/1 [=====] - 0s 130ms/step - loss: 0.7016 - acc: 0.4  
651 - recall: 0.4138 - precision: 0.6667  
Epoch 25/90  
1/1 [=====] - 0s 50ms/step - loss: 0.7044 - acc: 0.41  
86 - recall: 0.3793 - precision: 0.6111  
Epoch 26/90  
1/1 [=====] - 0s 115ms/step - loss: 0.6955 - acc: 0.5  
581 - recall: 0.4828 - precision: 0.7778  
Epoch 27/90  
1/1 [=====] - 0s 49ms/step - loss: 0.7075 - acc: 0.41  
86 - recall: 0.4138 - precision: 0.6000  
Epoch 28/90  
1/1 [=====] - 0s 51ms/step - loss: 0.7064 - acc: 0.41  
86 - recall: 0.3793 - precision: 0.6111  
Epoch 29/90  
1/1 [=====] - 0s 47ms/step - loss: 0.7018 - acc: 0.41  
86 - recall: 0.3793 - precision: 0.6111  
Epoch 30/90  
1/1 [=====] - 0s 47ms/step - loss: 0.7023 - acc: 0.37  
21 - recall: 0.3103 - precision: 0.5625  
Epoch 31/90  
1/1 [=====] - 0s 47ms/step - loss: 0.7032 - acc: 0.41  
86 - recall: 0.3793 - precision: 0.6111  
Epoch 32/90  
1/1 [=====] - 0s 47ms/step - loss: 0.7033 - acc: 0.37  
21 - recall: 0.3448 - precision: 0.5556  
Epoch 33/90  
1/1 [=====] - 0s 50ms/step - loss: 0.7039 - acc: 0.34  
88 - recall: 0.3103 - precision: 0.5294  
Epoch 34/90  
1/1 [=====] - 0s 47ms/step - loss: 0.6995 - acc: 0.37  
21 - recall: 0.3103 - precision: 0.5625  
Epoch 35/90  
1/1 [=====] - 0s 48ms/step - loss: 0.6971 - acc: 0.53  
49 - recall: 0.4828 - precision: 0.7368  
Epoch 36/90  
1/1 [=====] - 0s 48ms/step - loss: 0.6982 - acc: 0.48  
84 - recall: 0.4138 - precision: 0.7059  
Epoch 37/90  
1/1 [=====] - 0s 46ms/step - loss: 0.7048 - acc: 0.27  
91 - recall: 0.2414 - precision: 0.4375  
Epoch 38/90  
1/1 [=====] - 0s 47ms/step - loss: 0.7013 - acc: 0.48  
84 - recall: 0.4138 - precision: 0.7059  
Epoch 39/90  
1/1 [=====] - 0s 48ms/step - loss: 0.7062 - acc: 0.39  
53 - recall: 0.3448 - precision: 0.5882  
Epoch 40/90  
1/1 [=====] - 0s 46ms/step - loss: 0.7019 - acc: 0.41  
86 - recall: 0.3793 - precision: 0.6111  
Epoch 41/90
```

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1/1 [=====] - 0s 49ms/step - loss: 0.7032 - acc: 0.37
21 - recall: 0.3103 - precision: 0.5625
Epoch 42/90
1/1 [=====] - 0s 48ms/step - loss: 0.6967 - acc: 0.48
84 - recall: 0.4138 - precision: 0.7059
Epoch 43/90
1/1 [=====] - 0s 47ms/step - loss: 0.7006 - acc: 0.44
19 - recall: 0.3448 - precision: 0.6667
Epoch 44/90
1/1 [=====] - 0s 47ms/step - loss: 0.6987 - acc: 0.55
81 - recall: 0.4138 - precision: 0.8571
Epoch 45/90
1/1 [=====] - 0s 48ms/step - loss: 0.6960 - acc: 0.51
16 - recall: 0.4138 - precision: 0.7500
Epoch 46/90
1/1 [=====] - 0s 53ms/step - loss: 0.7020 - acc: 0.39
53 - recall: 0.2759 - precision: 0.6154
Epoch 47/90
1/1 [=====] - 0s 73ms/step - loss: 0.6960 - acc: 0.51
16 - recall: 0.4138 - precision: 0.7500
Epoch 48/90
1/1 [=====] - 0s 48ms/step - loss: 0.6990 - acc: 0.44
19 - recall: 0.3448 - precision: 0.6667
Epoch 49/90
1/1 [=====] - 0s 49ms/step - loss: 0.6912 - acc: 0.60
47 - recall: 0.4483 - precision: 0.9286
Epoch 50/90
1/1 [=====] - 0s 47ms/step - loss: 0.6989 - acc: 0.41
86 - recall: 0.3103 - precision: 0.6429
Epoch 51/90
1/1 [=====] - 0s 48ms/step - loss: 0.7054 - acc: 0.37
21 - recall: 0.3103 - precision: 0.5625
Epoch 52/90
1/1 [=====] - 0s 48ms/step - loss: 0.6949 - acc: 0.60
47 - recall: 0.5172 - precision: 0.8333
Epoch 53/90
1/1 [=====] - 0s 47ms/step - loss: 0.6944 - acc: 0.60
47 - recall: 0.5172 - precision: 0.8333
Epoch 54/90
1/1 [=====] - 0s 49ms/step - loss: 0.6953 - acc: 0.58
14 - recall: 0.5172 - precision: 0.7895
Epoch 55/90
1/1 [=====] - 0s 47ms/step - loss: 0.6952 - acc: 0.48
84 - recall: 0.4138 - precision: 0.7059
Epoch 56/90
1/1 [=====] - 0s 48ms/step - loss: 0.6963 - acc: 0.46
51 - recall: 0.4138 - precision: 0.6667
Epoch 57/90
1/1 [=====] - 0s 49ms/step - loss: 0.6897 - acc: 0.53
49 - recall: 0.4483 - precision: 0.7647
Epoch 58/90
1/1 [=====] - 0s 52ms/step - loss: 0.7031 - acc: 0.37
21 - recall: 0.3448 - precision: 0.5556
Epoch 59/90
1/1 [=====] - 0s 48ms/step - loss: 0.7051 - acc: 0.37
21 - recall: 0.2759 - precision: 0.5714
Epoch 60/90
1/1 [=====] - 0s 48ms/step - loss: 0.6970 - acc: 0.48
84 - recall: 0.4138 - precision: 0.7059
Epoch 61/90
```

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1/1 [=====] - 0s 48ms/step - loss: 0.7003 - acc: 0.51
16 - recall: 0.4828 - precision: 0.7000
Epoch 62/90
1/1 [=====] - 0s 46ms/step - loss: 0.6973 - acc: 0.53
49 - recall: 0.4828 - precision: 0.7368
Epoch 63/90
1/1 [=====] - 0s 47ms/step - loss: 0.6958 - acc: 0.48
84 - recall: 0.4483 - precision: 0.6842
Epoch 64/90
1/1 [=====] - 0s 48ms/step - loss: 0.6993 - acc: 0.48
84 - recall: 0.4483 - precision: 0.6842
Epoch 65/90
1/1 [=====] - 0s 47ms/step - loss: 0.7004 - acc: 0.41
86 - recall: 0.3793 - precision: 0.6111
Epoch 66/90
1/1 [=====] - 0s 47ms/step - loss: 0.7053 - acc: 0.41
86 - recall: 0.3793 - precision: 0.6111
Epoch 67/90
1/1 [=====] - 0s 47ms/step - loss: 0.7032 - acc: 0.46
51 - recall: 0.3448 - precision: 0.7143
Epoch 68/90
1/1 [=====] - 0s 46ms/step - loss: 0.6982 - acc: 0.53
49 - recall: 0.3793 - precision: 0.8462
Epoch 69/90
1/1 [=====] - 0s 46ms/step - loss: 0.7008 - acc: 0.51
16 - recall: 0.3793 - precision: 0.7857
Epoch 70/90
1/1 [=====] - 0s 46ms/step - loss: 0.6972 - acc: 0.48
84 - recall: 0.4138 - precision: 0.7059
Epoch 71/90
1/1 [=====] - 0s 47ms/step - loss: 0.6946 - acc: 0.55
81 - recall: 0.4483 - precision: 0.8125
Epoch 72/90
1/1 [=====] - 0s 150ms/step - loss: 0.6962 - acc: 0.5
814 - recall: 0.4828 - precision: 0.8235
Epoch 73/90
1/1 [=====] - 0s 157ms/step - loss: 0.6998 - acc: 0.5
349 - recall: 0.4138 - precision: 0.8000
Epoch 74/90
1/1 [=====] - 0s 48ms/step - loss: 0.6959 - acc: 0.51
16 - recall: 0.4138 - precision: 0.7500
Epoch 75/90
1/1 [=====] - 0s 48ms/step - loss: 0.6982 - acc: 0.55
81 - recall: 0.4828 - precision: 0.7778
Epoch 76/90
1/1 [=====] - 0s 48ms/step - loss: 0.6917 - acc: 0.58
14 - recall: 0.4483 - precision: 0.8667
Epoch 77/90
1/1 [=====] - 0s 47ms/step - loss: 0.6930 - acc: 0.58
14 - recall: 0.4483 - precision: 0.8667
Epoch 78/90
1/1 [=====] - 0s 47ms/step - loss: 0.6980 - acc: 0.48
84 - recall: 0.3448 - precision: 0.7692
Epoch 79/90
1/1 [=====] - 0s 46ms/step - loss: 0.6909 - acc: 0.46
51 - recall: 0.3448 - precision: 0.7143
Epoch 80/90
1/1 [=====] - 0s 46ms/step - loss: 0.6976 - acc: 0.51
16 - recall: 0.3793 - precision: 0.7857
Epoch 81/90
```

```
1/1 [=====] - 0s 47ms/step - loss: 0.7002 - acc: 0.41
86 - recall: 0.2759 - precision: 0.6667
Epoch 82/90
1/1 [=====] - 0s 47ms/step - loss: 0.6893 - acc: 0.55
81 - recall: 0.3793 - precision: 0.9167
Epoch 83/90
1/1 [=====] - 0s 47ms/step - loss: 0.6914 - acc: 0.53
49 - recall: 0.3793 - precision: 0.8462
Epoch 84/90
1/1 [=====] - 0s 47ms/step - loss: 0.7026 - acc: 0.46
51 - recall: 0.3448 - precision: 0.7143
Epoch 85/90
1/1 [=====] - 0s 47ms/step - loss: 0.6956 - acc: 0.44
19 - recall: 0.2759 - precision: 0.7273
Epoch 86/90
1/1 [=====] - 0s 48ms/step - loss: 0.6975 - acc: 0.46
51 - recall: 0.3103 - precision: 0.7500
Epoch 87/90
1/1 [=====] - 0s 47ms/step - loss: 0.6944 - acc: 0.48
84 - recall: 0.3793 - precision: 0.7333
Epoch 88/90
1/1 [=====] - 0s 49ms/step - loss: 0.6989 - acc: 0.44
19 - recall: 0.3103 - precision: 0.6923
Epoch 89/90
1/1 [=====] - 0s 47ms/step - loss: 0.6904 - acc: 0.60
47 - recall: 0.4483 - precision: 0.9286
Epoch 90/90
1/1 [=====] - 0s 48ms/step - loss: 0.6951 - acc: 0.44
19 - recall: 0.3103 - precision: 0.6923
2023-03-29 00:09:46.209488: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
1/1 [=====] - 0s 283ms/step
2/2 [=====] - 0s 167ms/step
Epoch 1/90
2023-03-29 00:09:47.607275: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
```

```
1/1 [=====] - 2s 2s/step - loss: 0.7283 - acc: 0.5116
- recall: 0.4815 - precision: 0.6500
Epoch 2/90
1/1 [=====] - 0s 255ms/step - loss: 0.7279 - acc: 0.5
814 - recall: 0.5185 - precision: 0.7368
Epoch 3/90
1/1 [=====] - 0s 245ms/step - loss: 0.7235 - acc: 0.5
814 - recall: 0.5185 - precision: 0.7368
Epoch 4/90
1/1 [=====] - 0s 249ms/step - loss: 0.7294 - acc: 0.4
419 - recall: 0.4074 - precision: 0.5789
Epoch 5/90
1/1 [=====] - 0s 212ms/step - loss: 0.7274 - acc: 0.5
349 - recall: 0.4815 - precision: 0.6842
Epoch 6/90
1/1 [=====] - 0s 72ms/step - loss: 0.7240 - acc: 0.58
14 - recall: 0.5185 - precision: 0.7368
Epoch 7/90
1/1 [=====] - 0s 133ms/step - loss: 0.7253 - acc: 0.4
884 - recall: 0.4074 - precision: 0.6471
Epoch 8/90
1/1 [=====] - 0s 164ms/step - loss: 0.7313 - acc: 0.4
419 - recall: 0.3704 - precision: 0.5882
Epoch 9/90
1/1 [=====] - 0s 161ms/step - loss: 0.7319 - acc: 0.5
116 - recall: 0.4444 - precision: 0.6667
Epoch 10/90
1/1 [=====] - 0s 142ms/step - loss: 0.7321 - acc: 0.3
488 - recall: 0.2963 - precision: 0.4706
Epoch 11/90
1/1 [=====] - 0s 216ms/step - loss: 0.7329 - acc: 0.4
186 - recall: 0.3333 - precision: 0.5625
Epoch 12/90
1/1 [=====] - 0s 55ms/step - loss: 0.7272 - acc: 0.48
84 - recall: 0.3333 - precision: 0.6923
Epoch 13/90
1/1 [=====] - 0s 137ms/step - loss: 0.7237 - acc: 0.4
651 - recall: 0.2963 - precision: 0.6667
Epoch 14/90
1/1 [=====] - 0s 49ms/step - loss: 0.7201 - acc: 0.44
19 - recall: 0.2593 - precision: 0.6364
Epoch 15/90
1/1 [=====] - 0s 122ms/step - loss: 0.7219 - acc: 0.5
116 - recall: 0.2963 - precision: 0.8000
Epoch 16/90
1/1 [=====] - 0s 142ms/step - loss: 0.7268 - acc: 0.4
419 - recall: 0.2593 - precision: 0.6364
Epoch 17/90
1/1 [=====] - 0s 79ms/step - loss: 0.7294 - acc: 0.37
21 - recall: 0.1852 - precision: 0.5000
Epoch 18/90
1/1 [=====] - 0s 159ms/step - loss: 0.7193 - acc: 0.4
186 - recall: 0.1852 - precision: 0.6250
Epoch 19/90
1/1 [=====] - 0s 123ms/step - loss: 0.7337 - acc: 0.3
023 - recall: 0.1111 - precision: 0.3333
Epoch 20/90
1/1 [=====] - 0s 72ms/step - loss: 0.7265 - acc: 0.37
21 - recall: 0.1481 - precision: 0.5000
Epoch 21/90
```

```
1/1 [=====] - 0s 71ms/step - loss: 0.7306 - acc: 0.41
86 - recall: 0.1481 - precision: 0.6667
Epoch 22/90
1/1 [=====] - 0s 47ms/step - loss: 0.7219 - acc: 0.39
53 - recall: 0.1111 - precision: 0.6000
Epoch 23/90
1/1 [=====] - 0s 165ms/step - loss: 0.7256 - acc: 0.4
651 - recall: 0.1852 - precision: 0.8333
Epoch 24/90
1/1 [=====] - 0s 47ms/step - loss: 0.7230 - acc: 0.41
86 - recall: 0.1111 - precision: 0.7500
Epoch 25/90
1/1 [=====] - 0s 47ms/step - loss: 0.7230 - acc: 0.46
51 - recall: 0.1852 - precision: 0.8333
Epoch 26/90
1/1 [=====] - 0s 47ms/step - loss: 0.7240 - acc: 0.37
21 - recall: 0.0741 - precision: 0.5000
Epoch 27/90
1/1 [=====] - 0s 50ms/step - loss: 0.7243 - acc: 0.37
21 - recall: 0.0741 - precision: 0.5000
Epoch 28/90
1/1 [=====] - 0s 48ms/step - loss: 0.7305 - acc: 0.39
53 - recall: 0.1111 - precision: 0.6000
Epoch 29/90
1/1 [=====] - 0s 47ms/step - loss: 0.7259 - acc: 0.37
21 - recall: 0.0741 - precision: 0.5000
Epoch 30/90
1/1 [=====] - 0s 132ms/step - loss: 0.7244 - acc: 0.3
721 - recall: 0.0741 - precision: 0.5000
Epoch 31/90
1/1 [=====] - 0s 144ms/step - loss: 0.7197 - acc: 0.4
884 - recall: 0.1852 - precision: 1.0000
Epoch 32/90
1/1 [=====] - 0s 48ms/step - loss: 0.7303 - acc: 0.37
21 - recall: 0.0741 - precision: 0.5000
Epoch 33/90
1/1 [=====] - 0s 47ms/step - loss: 0.7300 - acc: 0.37
21 - recall: 0.0741 - precision: 0.5000
Epoch 34/90
1/1 [=====] - 0s 47ms/step - loss: 0.7302 - acc: 0.27
91 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 35/90
1/1 [=====] - 0s 48ms/step - loss: 0.7169 - acc: 0.41
86 - recall: 0.1111 - precision: 0.7500
Epoch 36/90
1/1 [=====] - 0s 47ms/step - loss: 0.7215 - acc: 0.39
53 - recall: 0.0741 - precision: 0.6667
Epoch 37/90
1/1 [=====] - 0s 47ms/step - loss: 0.7264 - acc: 0.41
86 - recall: 0.1111 - precision: 0.7500
Epoch 38/90
1/1 [=====] - 0s 48ms/step - loss: 0.7175 - acc: 0.39
53 - recall: 0.0741 - precision: 0.6667
Epoch 39/90
1/1 [=====] - 0s 50ms/step - loss: 0.7227 - acc: 0.34
88 - recall: 0.0370 - precision: 0.3333
Epoch 40/90
1/1 [=====] - 0s 47ms/step - loss: 0.7181 - acc: 0.41
86 - recall: 0.1111 - precision: 0.7500
Epoch 41/90
```

```
1/1 [=====] - 0s 47ms/step - loss: 0.7265 - acc: 0.32
56 - recall: 0.0370 - precision: 0.2500
Epoch 42/90
1/1 [=====] - 0s 47ms/step - loss: 0.7106 - acc: 0.46
51 - recall: 0.1481 - precision: 1.0000
Epoch 43/90
1/1 [=====] - 0s 48ms/step - loss: 0.7245 - acc: 0.32
56 - recall: 0.0370 - precision: 0.2500
Epoch 44/90
1/1 [=====] - 0s 48ms/step - loss: 0.7174 - acc: 0.44
19 - recall: 0.1111 - precision: 1.0000
Epoch 45/90
1/1 [=====] - 0s 48ms/step - loss: 0.7286 - acc: 0.32
56 - recall: 0.0370 - precision: 0.2500
Epoch 46/90
1/1 [=====] - 0s 48ms/step - loss: 0.7213 - acc: 0.41
86 - recall: 0.1111 - precision: 0.7500
Epoch 47/90
1/1 [=====] - 0s 48ms/step - loss: 0.7099 - acc: 0.44
19 - recall: 0.1111 - precision: 1.0000
Epoch 48/90
1/1 [=====] - 0s 49ms/step - loss: 0.7230 - acc: 0.39
53 - recall: 0.0741 - precision: 0.6667
Epoch 49/90
1/1 [=====] - 0s 48ms/step - loss: 0.7203 - acc: 0.44
19 - recall: 0.1111 - precision: 1.0000
Epoch 50/90
1/1 [=====] - 0s 48ms/step - loss: 0.7158 - acc: 0.39
53 - recall: 0.0741 - precision: 0.6667
Epoch 51/90
1/1 [=====] - 0s 48ms/step - loss: 0.7189 - acc: 0.41
86 - recall: 0.0741 - precision: 1.0000
Epoch 52/90
1/1 [=====] - 0s 47ms/step - loss: 0.7235 - acc: 0.39
53 - recall: 0.0741 - precision: 0.6667
Epoch 53/90
1/1 [=====] - 0s 47ms/step - loss: 0.7188 - acc: 0.41
86 - recall: 0.0741 - precision: 1.0000
Epoch 54/90
1/1 [=====] - 0s 48ms/step - loss: 0.7110 - acc: 0.37
21 - recall: 0.0370 - precision: 0.5000
Epoch 55/90
1/1 [=====] - 0s 47ms/step - loss: 0.7258 - acc: 0.32
56 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 56/90
1/1 [=====] - 0s 48ms/step - loss: 0.7282 - acc: 0.37
21 - recall: 0.0370 - precision: 0.5000
Epoch 57/90
1/1 [=====] - 0s 47ms/step - loss: 0.7203 - acc: 0.34
88 - recall: 0.0370 - precision: 0.3333
Epoch 58/90
1/1 [=====] - 0s 47ms/step - loss: 0.7209 - acc: 0.34
88 - recall: 0.0370 - precision: 0.3333
Epoch 59/90
1/1 [=====] - 0s 47ms/step - loss: 0.7115 - acc: 0.44
19 - recall: 0.1111 - precision: 1.0000
Epoch 60/90
1/1 [=====] - 0s 49ms/step - loss: 0.7151 - acc: 0.44
19 - recall: 0.1111 - precision: 1.0000
Epoch 61/90
```

```
1/1 [=====] - 0s 48ms/step - loss: 0.7201 - acc: 0.39
53 - recall: 0.0741 - precision: 0.6667
Epoch 62/90
1/1 [=====] - 0s 48ms/step - loss: 0.7210 - acc: 0.34
88 - recall: 0.0370 - precision: 0.3333
Epoch 63/90
1/1 [=====] - 0s 48ms/step - loss: 0.7195 - acc: 0.39
53 - recall: 0.0741 - precision: 0.6667
Epoch 64/90
1/1 [=====] - 0s 49ms/step - loss: 0.7143 - acc: 0.44
19 - recall: 0.1111 - precision: 1.0000
Epoch 65/90
1/1 [=====] - 0s 48ms/step - loss: 0.7217 - acc: 0.39
53 - recall: 0.0741 - precision: 0.6667
Epoch 66/90
1/1 [=====] - 0s 47ms/step - loss: 0.7310 - acc: 0.37
21 - recall: 0.0741 - precision: 0.5000
Epoch 67/90
1/1 [=====] - 0s 48ms/step - loss: 0.7239 - acc: 0.41
86 - recall: 0.1111 - precision: 0.7500
Epoch 68/90
1/1 [=====] - 0s 47ms/step - loss: 0.7366 - acc: 0.30
23 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 69/90
1/1 [=====] - 0s 48ms/step - loss: 0.7188 - acc: 0.39
53 - recall: 0.0741 - precision: 0.6667
Epoch 70/90
1/1 [=====] - 0s 48ms/step - loss: 0.7133 - acc: 0.39
53 - recall: 0.0741 - precision: 0.6667
Epoch 71/90
1/1 [=====] - 0s 49ms/step - loss: 0.7138 - acc: 0.44
19 - recall: 0.1111 - precision: 1.0000
Epoch 72/90
1/1 [=====] - 0s 47ms/step - loss: 0.7227 - acc: 0.41
86 - recall: 0.1111 - precision: 0.7500
Epoch 73/90
1/1 [=====] - 0s 47ms/step - loss: 0.7125 - acc: 0.46
51 - recall: 0.1481 - precision: 1.0000
Epoch 74/90
1/1 [=====] - 0s 47ms/step - loss: 0.7171 - acc: 0.41
86 - recall: 0.1111 - precision: 0.7500
Epoch 75/90
1/1 [=====] - 0s 48ms/step - loss: 0.7264 - acc: 0.34
88 - recall: 0.0370 - precision: 0.3333
Epoch 76/90
1/1 [=====] - 0s 48ms/step - loss: 0.7218 - acc: 0.44
19 - recall: 0.1111 - precision: 1.0000
Epoch 77/90
1/1 [=====] - 0s 47ms/step - loss: 0.7316 - acc: 0.34
88 - recall: 0.0370 - precision: 0.3333
Epoch 78/90
1/1 [=====] - 0s 47ms/step - loss: 0.7101 - acc: 0.39
53 - recall: 0.0741 - precision: 0.6667
Epoch 79/90
1/1 [=====] - 0s 47ms/step - loss: 0.7239 - acc: 0.39
53 - recall: 0.0741 - precision: 0.6667
Epoch 80/90
1/1 [=====] - 0s 48ms/step - loss: 0.7094 - acc: 0.41
86 - recall: 0.0741 - precision: 1.0000
Epoch 81/90
```

```
1/1 [=====] - 0s 47ms/step - loss: 0.7205 - acc: 0.39
53 - recall: 0.0370 - precision: 1.0000
Epoch 82/90
1/1 [=====] - 0s 47ms/step - loss: 0.7080 - acc: 0.39
53 - recall: 0.0370 - precision: 1.0000
Epoch 83/90
1/1 [=====] - 0s 48ms/step - loss: 0.7263 - acc: 0.34
88 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 84/90
1/1 [=====] - 0s 146ms/step - loss: 0.7217 - acc: 0.3
488 - recall: 0.0370 - precision: 0.3333
Epoch 85/90
1/1 [=====] - 0s 52ms/step - loss: 0.7181 - acc: 0.41
86 - recall: 0.0741 - precision: 1.0000
Epoch 86/90
1/1 [=====] - 0s 48ms/step - loss: 0.7089 - acc: 0.39
53 - recall: 0.0370 - precision: 1.0000
Epoch 87/90
1/1 [=====] - 0s 47ms/step - loss: 0.7119 - acc: 0.41
86 - recall: 0.0741 - precision: 1.0000
Epoch 88/90
1/1 [=====] - 0s 47ms/step - loss: 0.7149 - acc: 0.37
21 - recall: 0.0370 - precision: 0.5000
Epoch 89/90
1/1 [=====] - 0s 48ms/step - loss: 0.7118 - acc: 0.41
86 - recall: 0.0741 - precision: 1.0000
Epoch 90/90
1/1 [=====] - 0s 47ms/step - loss: 0.7194 - acc: 0.41
86 - recall: 0.0741 - precision: 1.0000
2023-03-29 00:09:55.867940: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
1/1 [=====] - 0s 284ms/step
2/2 [=====] - 0s 171ms/step
Epoch 1/90
2023-03-29 00:09:56.950693: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
```

```
1/1 [=====] - 2s 2s/step - loss: 0.6977 - acc: 0.4219
- recall: 0.5000 - precision: 0.5946
Epoch 2/90
1/1 [=====] - 0s 210ms/step - loss: 0.6948 - acc: 0.5
312 - recall: 0.5000 - precision: 0.7333
Epoch 3/90
1/1 [=====] - 0s 269ms/step - loss: 0.7097 - acc: 0.4
531 - recall: 0.4545 - precision: 0.6452
Epoch 4/90
1/1 [=====] - 0s 249ms/step - loss: 0.7001 - acc: 0.4
219 - recall: 0.4545 - precision: 0.6061
Epoch 5/90
1/1 [=====] - 0s 258ms/step - loss: 0.6794 - acc: 0.5
625 - recall: 0.5000 - precision: 0.7857
Epoch 6/90
1/1 [=====] - 0s 148ms/step - loss: 0.6711 - acc: 0.6
250 - recall: 0.5682 - precision: 0.8333
Epoch 7/90
1/1 [=====] - 0s 224ms/step - loss: 0.7090 - acc: 0.4
375 - recall: 0.4318 - precision: 0.6333
Epoch 8/90
1/1 [=====] - 0s 182ms/step - loss: 0.7057 - acc: 0.5
000 - recall: 0.4545 - precision: 0.7143
Epoch 9/90
1/1 [=====] - 0s 231ms/step - loss: 0.7115 - acc: 0.4
688 - recall: 0.4545 - precision: 0.6667
Epoch 10/90
1/1 [=====] - 0s 69ms/step - loss: 0.7028 - acc: 0.51
56 - recall: 0.5000 - precision: 0.7097
Epoch 11/90
1/1 [=====] - 0s 178ms/step - loss: 0.6848 - acc: 0.5
625 - recall: 0.5455 - precision: 0.7500
Epoch 12/90
1/1 [=====] - 0s 257ms/step - loss: 0.6960 - acc: 0.4
688 - recall: 0.5000 - precision: 0.6471
Epoch 13/90
1/1 [=====] - 0s 177ms/step - loss: 0.6913 - acc: 0.5
781 - recall: 0.5909 - precision: 0.7429
Epoch 14/90
1/1 [=====] - 0s 163ms/step - loss: 0.6847 - acc: 0.6
875 - recall: 0.6818 - precision: 0.8333
Epoch 15/90
1/1 [=====] - 0s 153ms/step - loss: 0.6912 - acc: 0.5
156 - recall: 0.5455 - precision: 0.6857
Epoch 16/90
1/1 [=====] - 0s 97ms/step - loss: 0.6865 - acc: 0.60
94 - recall: 0.6136 - precision: 0.7714
Epoch 17/90
1/1 [=====] - 0s 88ms/step - loss: 0.6971 - acc: 0.50
00 - recall: 0.5455 - precision: 0.6667
Epoch 18/90
1/1 [=====] - 0s 70ms/step - loss: 0.6909 - acc: 0.59
38 - recall: 0.6364 - precision: 0.7368
Epoch 19/90
1/1 [=====] - 0s 69ms/step - loss: 0.6857 - acc: 0.54
69 - recall: 0.5682 - precision: 0.7143
Epoch 20/90
1/1 [=====] - 0s 66ms/step - loss: 0.6868 - acc: 0.65
62 - recall: 0.6364 - precision: 0.8235
Epoch 21/90
```

```
1/1 [=====] - 0s 138ms/step - loss: 0.7049 - acc: 0.4  
375 - recall: 0.4091 - precision: 0.6429  
Epoch 22/90  
1/1 [=====] - 0s 135ms/step - loss: 0.6757 - acc: 0.5  
781 - recall: 0.5455 - precision: 0.7742  
Epoch 23/90  
1/1 [=====] - 0s 65ms/step - loss: 0.6855 - acc: 0.57  
81 - recall: 0.5455 - precision: 0.7742  
Epoch 24/90  
1/1 [=====] - 0s 65ms/step - loss: 0.6749 - acc: 0.57  
81 - recall: 0.5227 - precision: 0.7931  
Epoch 25/90  
1/1 [=====] - 0s 153ms/step - loss: 0.6560 - acc: 0.5  
938 - recall: 0.5227 - precision: 0.8214  
Epoch 26/90  
1/1 [=====] - 0s 142ms/step - loss: 0.6699 - acc: 0.5  
781 - recall: 0.4545 - precision: 0.8696  
Epoch 27/90  
1/1 [=====] - 0s 68ms/step - loss: 0.6157 - acc: 0.65  
62 - recall: 0.5227 - precision: 0.9583  
Epoch 28/90  
1/1 [=====] - 0s 65ms/step - loss: 0.6084 - acc: 0.62  
50 - recall: 0.4773 - precision: 0.9545  
Epoch 29/90  
1/1 [=====] - 0s 68ms/step - loss: 0.5745 - acc: 0.65  
62 - recall: 0.5455 - precision: 0.9231  
Epoch 30/90  
1/1 [=====] - 0s 73ms/step - loss: 0.5811 - acc: 0.73  
44 - recall: 0.7045 - precision: 0.8857  
Epoch 31/90  
1/1 [=====] - 0s 70ms/step - loss: 0.6064 - acc: 0.78  
12 - recall: 0.7727 - precision: 0.8947  
Epoch 32/90  
1/1 [=====] - 0s 67ms/step - loss: 0.5498 - acc: 0.76  
56 - recall: 0.7727 - precision: 0.8718  
Epoch 33/90  
1/1 [=====] - 0s 69ms/step - loss: 0.5718 - acc: 0.79  
69 - recall: 0.7955 - precision: 0.8974  
Epoch 34/90  
1/1 [=====] - 0s 68ms/step - loss: 0.4943 - acc: 0.81  
25 - recall: 0.8182 - precision: 0.9000  
Epoch 35/90  
1/1 [=====] - 0s 90ms/step - loss: 0.5123 - acc: 0.79  
69 - recall: 0.7955 - precision: 0.8974  
Epoch 36/90  
1/1 [=====] - 0s 65ms/step - loss: 0.5016 - acc: 0.79  
69 - recall: 0.7727 - precision: 0.9189  
Epoch 37/90  
1/1 [=====] - 0s 66ms/step - loss: 0.5179 - acc: 0.81  
25 - recall: 0.7727 - precision: 0.9444  
Epoch 38/90  
1/1 [=====] - 0s 66ms/step - loss: 0.5010 - acc: 0.81  
25 - recall: 0.7955 - precision: 0.9211  
Epoch 39/90  
1/1 [=====] - 0s 66ms/step - loss: 0.4790 - acc: 0.82  
81 - recall: 0.8409 - precision: 0.9024  
Epoch 40/90  
1/1 [=====] - 0s 70ms/step - loss: 0.4242 - acc: 0.85  
94 - recall: 0.8409 - precision: 0.9487  
Epoch 41/90
```

```
1/1 [=====] - 0s 66ms/step - loss: 0.4180 - acc: 0.82
81 - recall: 0.8182 - precision: 0.9231
Epoch 42/90
1/1 [=====] - 0s 65ms/step - loss: 0.3997 - acc: 0.81
25 - recall: 0.8182 - precision: 0.9000
Epoch 43/90
1/1 [=====] - 0s 65ms/step - loss: 0.3856 - acc: 0.82
81 - recall: 0.7955 - precision: 0.9459
Epoch 44/90
1/1 [=====] - 0s 78ms/step - loss: 0.2373 - acc: 0.89
06 - recall: 0.8636 - precision: 0.9744
Epoch 45/90
1/1 [=====] - 0s 65ms/step - loss: 0.2704 - acc: 0.84
38 - recall: 0.8182 - precision: 0.9474
Epoch 46/90
1/1 [=====] - 0s 90ms/step - loss: 0.1655 - acc: 0.92
19 - recall: 0.8864 - precision: 1.0000
Epoch 47/90
1/1 [=====] - 0s 65ms/step - loss: 0.2538 - acc: 0.90
62 - recall: 0.9091 - precision: 0.9524
Epoch 48/90
1/1 [=====] - 0s 65ms/step - loss: 0.3222 - acc: 0.85
94 - recall: 0.8182 - precision: 0.9730
Epoch 49/90
1/1 [=====] - 0s 65ms/step - loss: 0.1447 - acc: 0.90
62 - recall: 0.8864 - precision: 0.9750
Epoch 50/90
1/1 [=====] - 0s 71ms/step - loss: 0.2243 - acc: 0.89
06 - recall: 0.9091 - precision: 0.9302
Epoch 51/90
1/1 [=====] - 0s 65ms/step - loss: 0.2000 - acc: 0.89
06 - recall: 0.8864 - precision: 0.9512
Epoch 52/90
1/1 [=====] - 0s 66ms/step - loss: 0.1834 - acc: 0.92
19 - recall: 0.9091 - precision: 0.9756
Epoch 53/90
1/1 [=====] - 0s 65ms/step - loss: 0.1814 - acc: 0.93
75 - recall: 0.9091 - precision: 1.0000
Epoch 54/90
1/1 [=====] - 0s 66ms/step - loss: 0.1207 - acc: 0.92
19 - recall: 0.9091 - precision: 0.9756
Epoch 55/90
1/1 [=====] - 0s 66ms/step - loss: 0.1651 - acc: 0.90
62 - recall: 0.9091 - precision: 0.9524
Epoch 56/90
1/1 [=====] - 0s 66ms/step - loss: 0.0959 - acc: 0.95
31 - recall: 0.9545 - precision: 0.9767
Epoch 57/90
1/1 [=====] - 0s 67ms/step - loss: 0.0851 - acc: 0.96
88 - recall: 0.9545 - precision: 1.0000
Epoch 58/90
1/1 [=====] - 0s 66ms/step - loss: 0.0695 - acc: 0.96
88 - recall: 0.9545 - precision: 1.0000
Epoch 59/90
1/1 [=====] - 0s 66ms/step - loss: 0.0992 - acc: 0.96
88 - recall: 1.0000 - precision: 0.9565
Epoch 60/90
1/1 [=====] - 0s 67ms/step - loss: 0.0402 - acc: 0.98
44 - recall: 0.9773 - precision: 1.0000
Epoch 61/90
```

```
1/1 [=====] - 0s 67ms/step - loss: 0.1553 - acc: 0.93
75 - recall: 0.9318 - precision: 0.9762
Epoch 62/90
1/1 [=====] - 0s 66ms/step - loss: 0.0145 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 63/90
1/1 [=====] - 0s 66ms/step - loss: 0.1931 - acc: 0.93
75 - recall: 1.0000 - precision: 0.9167
Epoch 64/90
1/1 [=====] - 0s 66ms/step - loss: 0.0482 - acc: 0.98
44 - recall: 0.9773 - precision: 1.0000
Epoch 65/90
1/1 [=====] - 0s 66ms/step - loss: 0.1388 - acc: 0.93
75 - recall: 0.9091 - precision: 1.0000
Epoch 66/90
1/1 [=====] - 0s 66ms/step - loss: 0.0636 - acc: 0.98
44 - recall: 0.9773 - precision: 1.0000
Epoch 67/90
1/1 [=====] - 0s 70ms/step - loss: 0.0229 - acc: 0.98
44 - recall: 0.9773 - precision: 1.0000
Epoch 68/90
1/1 [=====] - 0s 69ms/step - loss: 0.0358 - acc: 0.98
44 - recall: 0.9773 - precision: 1.0000
Epoch 69/90
1/1 [=====] - 0s 80ms/step - loss: 0.0450 - acc: 0.98
44 - recall: 1.0000 - precision: 0.9778
Epoch 70/90
1/1 [=====] - 0s 69ms/step - loss: 0.0494 - acc: 0.98
44 - recall: 1.0000 - precision: 0.9778
Epoch 71/90
1/1 [=====] - 0s 75ms/step - loss: 0.0151 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 72/90
1/1 [=====] - 0s 172ms/step - loss: 0.0233 - acc: 1.00
000 - recall: 1.0000 - precision: 1.0000
Epoch 73/90
1/1 [=====] - 0s 231ms/step - loss: 0.0581 - acc: 0.9688
688 - recall: 0.9773 - precision: 0.9773
Epoch 74/90
1/1 [=====] - 0s 83ms/step - loss: 0.0343 - acc: 0.9688
recall: 0.9545 - precision: 1.0000
Epoch 75/90
1/1 [=====] - 0s 82ms/step - loss: 0.0070 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 76/90
1/1 [=====] - 0s 79ms/step - loss: 0.0035 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 77/90
1/1 [=====] - 0s 78ms/step - loss: 0.0098 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 78/90
1/1 [=====] - 0s 80ms/step - loss: 0.0149 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 79/90
1/1 [=====] - 0s 80ms/step - loss: 0.0103 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 80/90
1/1 [=====] - 0s 88ms/step - loss: 0.0074 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 81/90
```

```

1/1 [=====] - 0s 85ms/step - loss: 0.0234 - acc: 0.98
44 - recall: 1.0000 - precision: 0.9778
Epoch 82/90
1/1 [=====] - 0s 82ms/step - loss: 0.0273 - acc: 0.98
44 - recall: 1.0000 - precision: 0.9778
Epoch 83/90
1/1 [=====] - 0s 83ms/step - loss: 0.0052 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 84/90
1/1 [=====] - 0s 82ms/step - loss: 0.0052 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 85/90
1/1 [=====] - 0s 81ms/step - loss: 0.0239 - acc: 0.98
44 - recall: 1.0000 - precision: 0.9778
Epoch 86/90
1/1 [=====] - 0s 140ms/step - loss: 3.6089e-04 - acc:
1.0000 - recall: 1.0000 - precision: 1.0000
Epoch 87/90
1/1 [=====] - 0s 74ms/step - loss: 0.0226 - acc: 0.98
44 - recall: 1.0000 - precision: 0.9778
Epoch 88/90
1/1 [=====] - 0s 77ms/step - loss: 0.0195 - acc: 0.98
44 - recall: 1.0000 - precision: 0.9778
Epoch 89/90
1/1 [=====] - 0s 77ms/step - loss: 0.0029 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 90/90
1/1 [=====] - 0s 78ms/step - loss: 6.4183e-04 - acc:
1.0000 - recall: 1.0000 - precision: 1.0000

```

In [80]: `print("Best: %f using %s" % (gs_2.best_score_, gs_2.best_params_))`

```
Best: 0.781385 using {'dropout_rate': 0.5, 'epochs': 90, 'optimizer': 'adam'}
```

Model 5 with Best Parameters

In [83]:

```

model_5= models.Sequential([
    Conv2D(filters=32, kernel_size=(3, 3), activation='relu',
           padding = 'same', input_shape=(224,224,3)),
    MaxPooling2D(pool_size=(2, 2), strides=2),

    Conv2D(filters=64, kernel_size=(3, 3), activation='relu',
           padding = 'same'),
    MaxPooling2D(pool_size=(2, 2), strides=2),

    Conv2D(filters=96, kernel_size=(3, 3), activation='relu',
           padding = 'same'),
    MaxPooling2D(pool_size=(2, 2), strides=2),

    Conv2D(filters=128, kernel_size=(3, 3), activation='relu',
           padding = 'same'),
    MaxPooling2D(pool_size=(2, 2), strides=2),

    Flatten(),

    Dense(units=128, activation='relu'),
    Dropout(.5),
    Dense(units=64, activation='relu'),
])

```

```

        Dropout(.5),
        Dense(units=1, activation='sigmoid'),
    ])

model_5.compile(loss='binary_crossentropy',
                 optimizer= "adam",
                 metrics=[ "acc", "Recall", "Precision"]
)

```

In [84]: #Model 5 Summary
model_5.summary()

Model: "sequential_128"

Layer (type)	Output Shape	Param #
<hr/>		
conv2d_607 (Conv2D)	(None, 224, 224, 32)	896
max_pooling2d_607 (MaxPooling2D)	(None, 112, 112, 32)	0
conv2d_608 (Conv2D)	(None, 112, 112, 64)	18496
max_pooling2d_608 (MaxPooling2D)	(None, 56, 56, 64)	0
conv2d_609 (Conv2D)	(None, 56, 56, 96)	55392
max_pooling2d_609 (MaxPooling2D)	(None, 28, 28, 96)	0
conv2d_610 (Conv2D)	(None, 28, 28, 128)	110720
max_pooling2d_610 (MaxPooling2D)	(None, 14, 14, 128)	0
flatten_128 (Flatten)	(None, 25088)	0
dense_331 (Dense)	(None, 128)	3211392
dropout_201 (Dropout)	(None, 128)	0
dense_332 (Dense)	(None, 64)	8256
dropout_202 (Dropout)	(None, 64)	0
dense_333 (Dense)	(None, 1)	65
<hr/>		
Total params: 3,405,217		
Trainable params: 3,405,217		
Non-trainable params: 0		

In [85]: #Modeling with best parameters
history5 = model_5.fit(train_gen,
 epochs=90,
 verbose = 2,
 class_weight=class_weights,

```
validation_data=val_gen,
callbacks = es) #stopping early because of time resources
```

Epoch 1/90

2023-03-29 00:12:14.167993: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.

2023-03-29 00:12:36.454603: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.

68/68 - 28s - loss: 0.3709 - acc: 0.8301 - recall: 0.8477 - precision: 0.9171
- val_loss: 0.2002 - val_acc: 0.9107 - val_recall: 0.8841 - val_precision: 0.9

950 - 28s/epoch - 412ms/step

Epoch 2/90

68/68 - 27s - loss: 0.1666 - acc: 0.9378 - recall: 0.9414 - precision: 0.9739
- val_loss: 0.1095 - val_acc: 0.9526 - val_recall: 0.9450 - val_precision: 0.9

907 - 27s/epoch - 396ms/step

Epoch 3/90

68/68 - 27s - loss: 0.1326 - acc: 0.9531 - recall: 0.9548 - precision: 0.9814
- val_loss: 0.0794 - val_acc: 0.9757 - val_recall: 0.9777 - val_precision: 0.9

895 - 27s/epoch - 397ms/step

Epoch 4/90

68/68 - 27s - loss: 0.0934 - acc: 0.9646 - recall: 0.9685 - precision: 0.9835
- val_loss: 0.0834 - val_acc: 0.9669 - val_recall: 0.9629 - val_precision: 0.9

923 - 27s/epoch - 396ms/step

Epoch 5/90

68/68 - 26s - loss: 0.0748 - acc: 0.9709 - recall: 0.9723 - precision: 0.9883
- val_loss: 0.0584 - val_acc: 0.9813 - val_recall: 0.9881 - val_precision: 0.9

866 - 26s/epoch - 389ms/step

Epoch 6/90

68/68 - 26s - loss: 0.0647 - acc: 0.9757 - recall: 0.9751 - precision: 0.9921
- val_loss: 0.0586 - val_acc: 0.9802 - val_recall: 0.9851 - val_precision: 0.9

881 - 26s/epoch - 388ms/step

Epoch 7/90

68/68 - 26s - loss: 0.0529 - acc: 0.9806 - recall: 0.9801 - precision: 0.9937
- val_loss: 0.0556 - val_acc: 0.9824 - val_recall: 0.9851 - val_precision: 0.9

910 - 26s/epoch - 383ms/step

Epoch 8/90

68/68 - 26s - loss: 0.0457 - acc: 0.9847 - recall: 0.9850 - precision: 0.9943
- val_loss: 0.0590 - val_acc: 0.9824 - val_recall: 0.9866 - val_precision: 0.9

896 - 26s/epoch - 377ms/step

Epoch 9/90

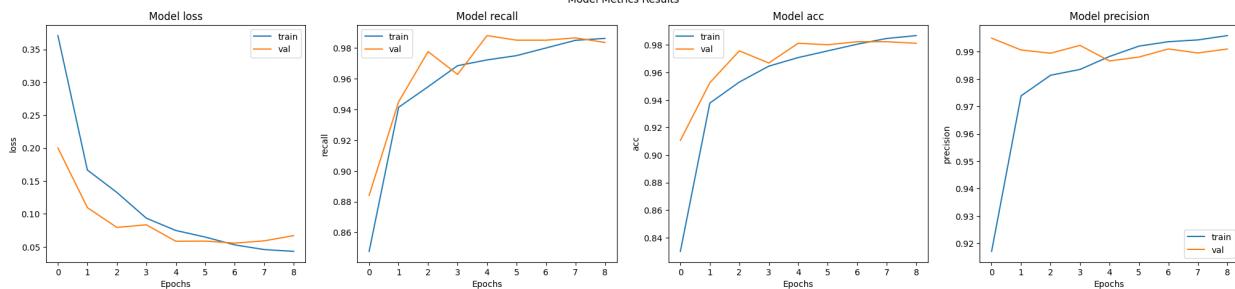
68/68 - 29s - loss: 0.0430 - acc: 0.9868 - recall: 0.9863 - precision: 0.9959
- val_loss: 0.0670 - val_acc: 0.9813 - val_recall: 0.9837 - val_precision: 0.9

910 - 29s/epoch - 427ms/step

Epoch 9: early stopping

In [86]: `print("Model 5 with updated hyperparamters :\\n")
eval_metrics(history5)`

Model 5 with updated hyperparamters :

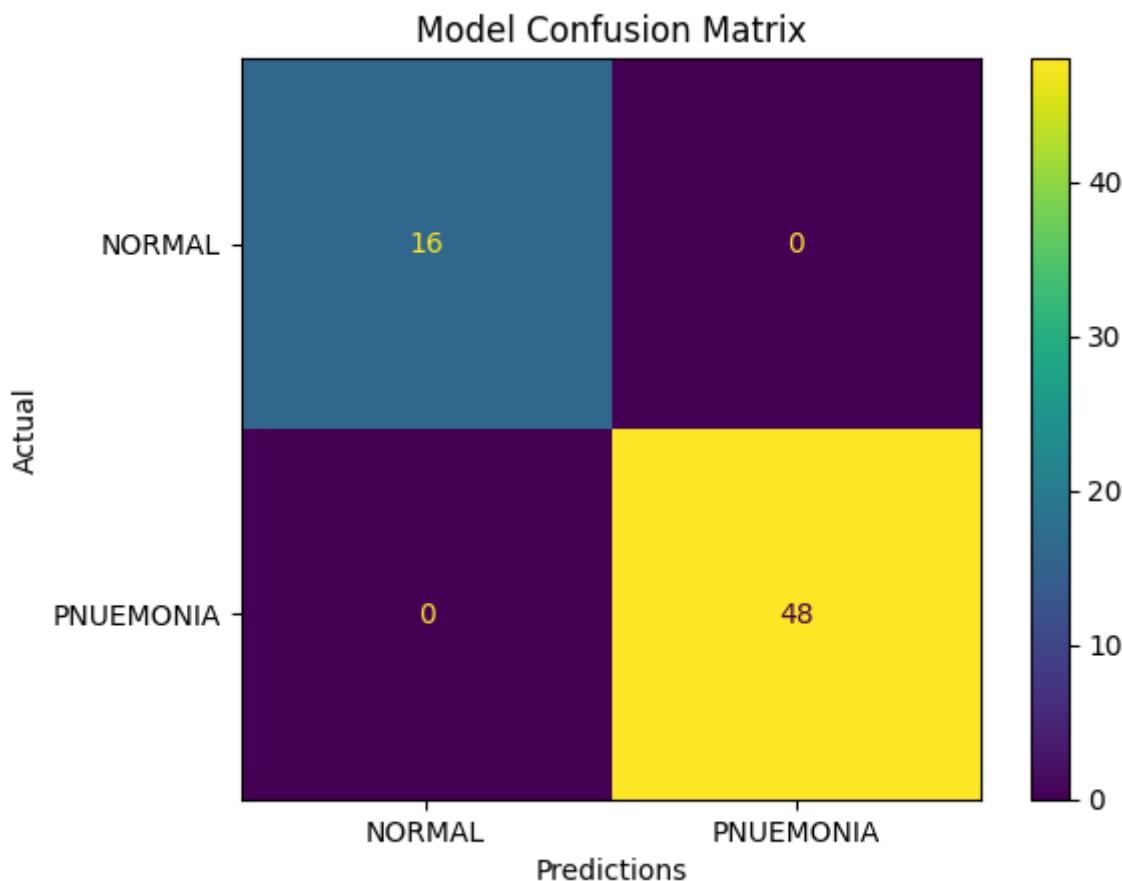


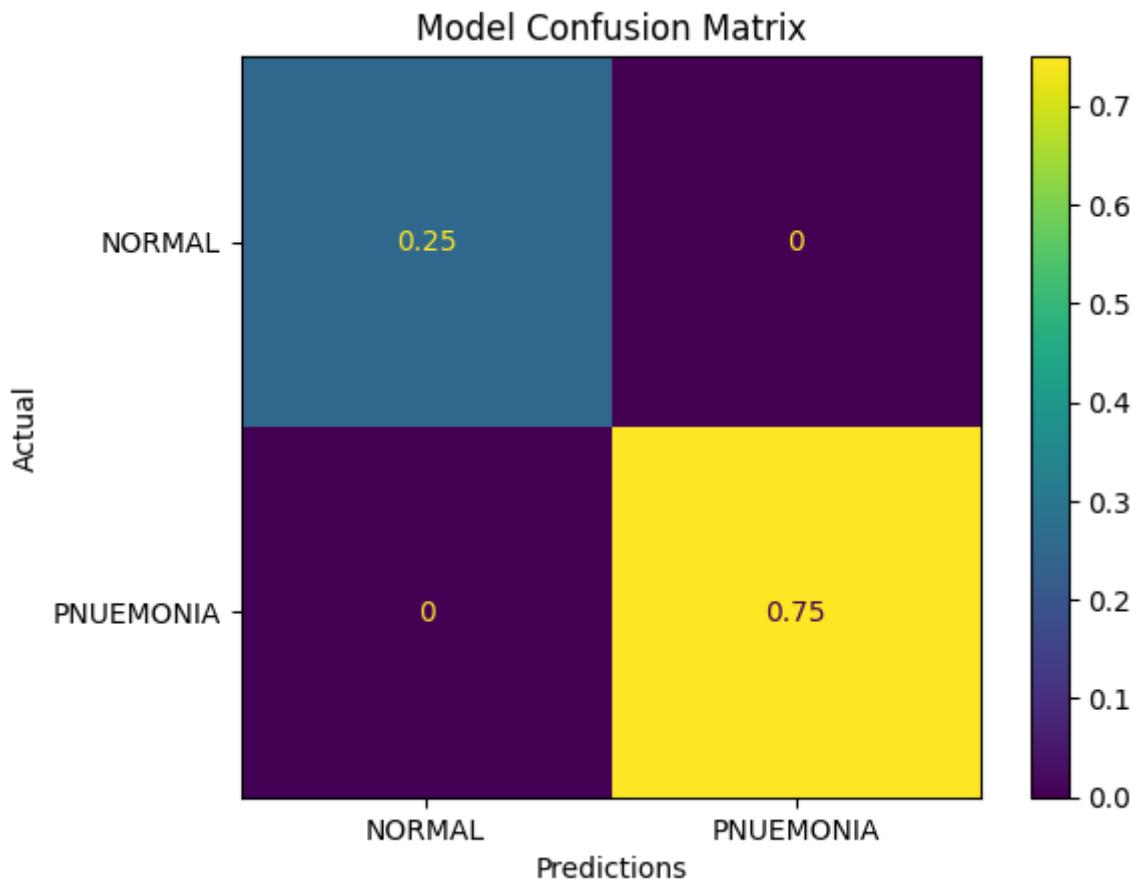
```
In [87]: train_labels, train_predictions = predict_results(model_5,train_gen)
val_labels, val_predictions = predict_results(model_5,val_gen)

1/2 [=====>.....] - ETA: 0s
2023-03-29 00:18:13.028210: I tensorflow/core/grappler/optimizers/custom_graph_
_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
2/2 [=====] - 0s 5ms/step
1/1 [=====] - 0s 14ms/step
```

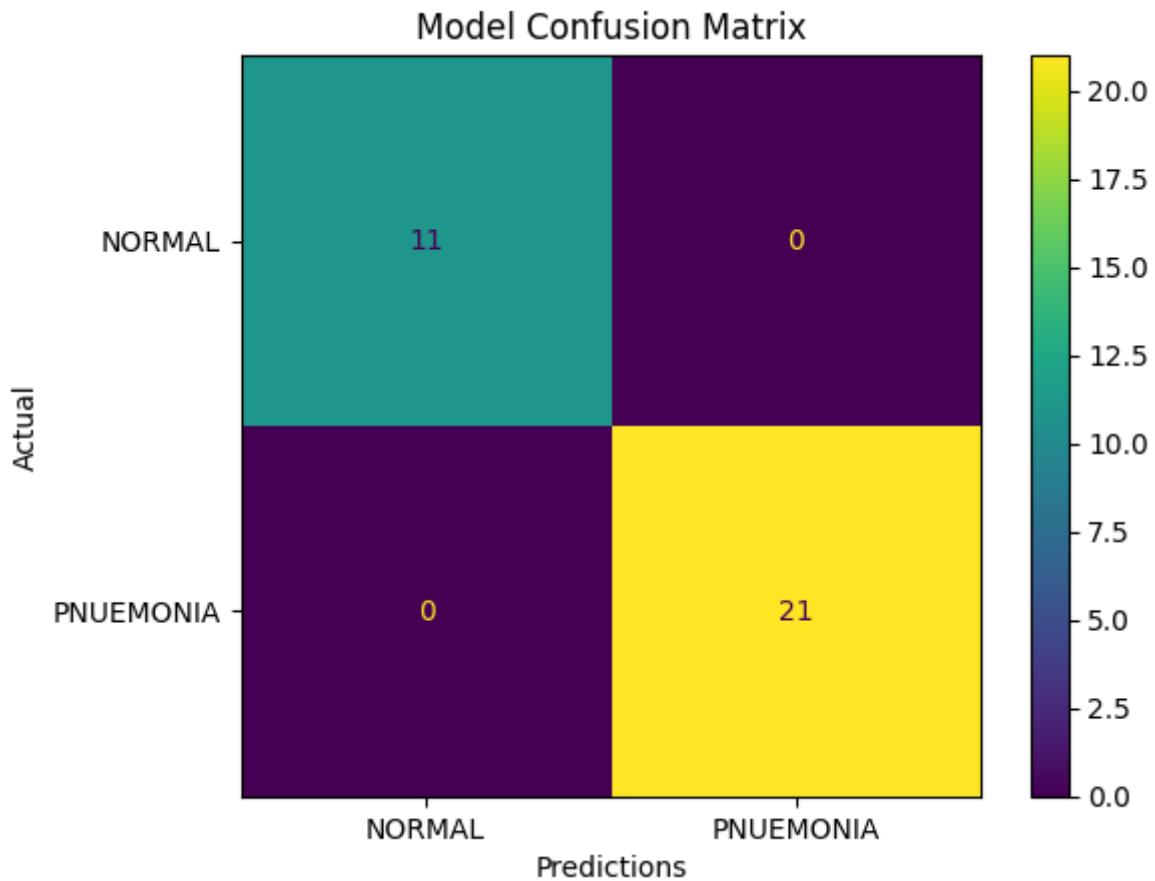
```
In [88]: #Printing regular and normalized Confusion Matrices
print("Training Confusion Matrices:\n")
conf_matrix(train_labels,train_predictions, None)
conf_matrix(train_labels,train_predictions, "all")
print("Validation Confusion Matrices:\n")
conf_matrix(val_labels, val_predictions, None)
conf_matrix(val_labels, val_predictions, "all")
```

Training Confusion Matrices:

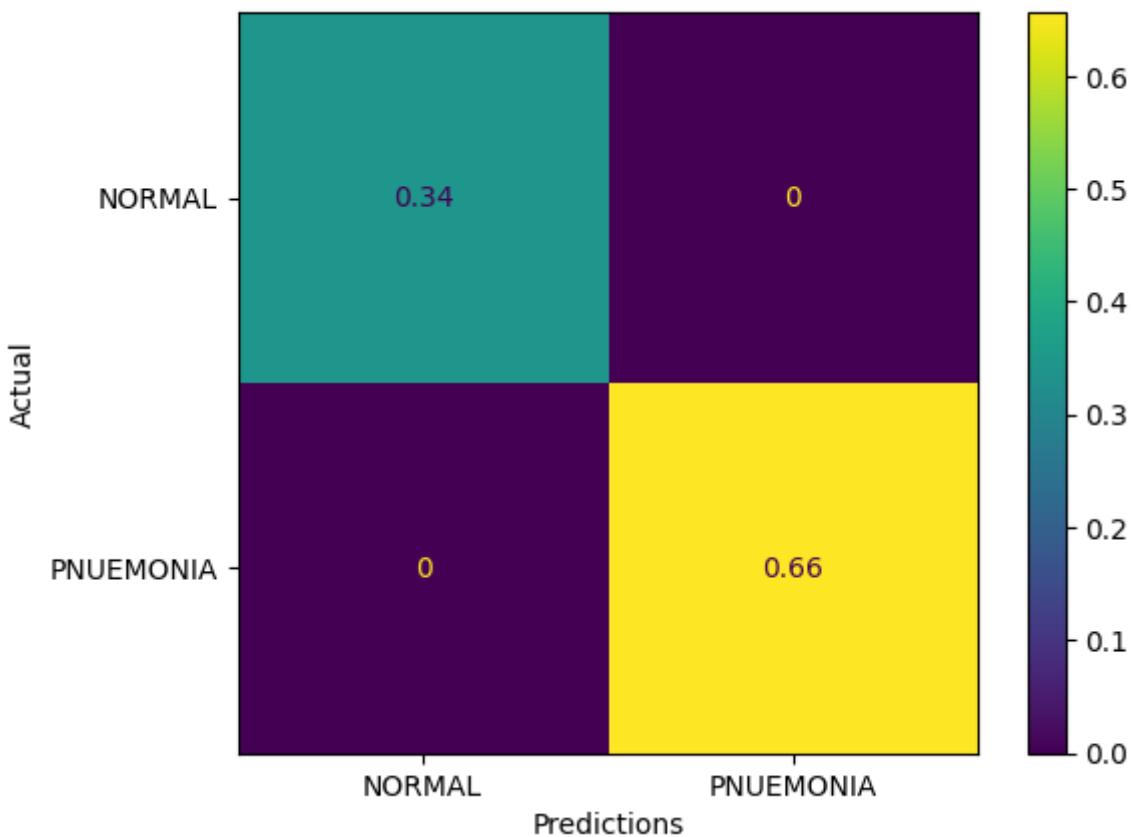




Validation Confusion Matrices:



Model Confusion Matrix



```
In [89]: #Training Classification Report
print("Training Classificaiton Report:\n")
eval_report(train_labels,train_predictions,train_gen,history5)
```

Training Classificaiton Report:

	precision	recall	f1-score	support
0.0	1.00	1.00	1.00	16
1.0	1.00	1.00	1.00	48
accuracy			1.00	64
macro avg	1.00	1.00	1.00	64
weighted avg	1.00	1.00	1.00	64

```
68/68 [=====] - 22s 320ms/step - loss: 0.0206 - acc: 0.9931 - recall: 0.9907 - precision: 1.0000
Loss: 0.0206
```

```
In [90]: #Training Classification Report
print("Validation Classificaiton Report:\n")
eval_report(val_labels,val_predictions,val_gen,history5)
```

Validation Classification Report:

	precision	recall	f1-score	support
0.0	1.00	1.00	1.00	11
1.0	1.00	1.00	1.00	21
accuracy			1.00	32
macro avg	1.00	1.00	1.00	32
weighted avg	1.00	1.00	1.00	32

```
29/29 [=====] - 5s 152ms/step - loss: 0.0670 - acc: 0.9813 - recall: 0.9837 - precision: 0.9910
Loss: 0.067
```

Model 5 Evaluation - Needs Update

- **Model Plots:** The metrics seem to be converging better.
 - **Confusion Matrix:** None of the models have FN or FP.
 - **Report:** The validation recall is about .98, less than other models but still solid.
 - This model wasn't bad. The validation's loss increased. The recall and f1score decreased from the previous model metrics.
-

Data Augmentation**Data Augmentation, YASSINE GHOUZAM, 2017**

After several iterations of hyperparameter changes, the data will be augmented to see if this helps the models.

- `rotation_range=10`, randomly rotate images in the range (degrees, 0 to 180)
- `zoom_range = [.1,.2]`, Randomly zoom image
- `width_shift_range=[.1,.2]`, randomly shift images horizontally (fraction of total width)
- `height_shift_range=[.1,.2]`, Shift height

```
In [91]: datagen = ImageDataGenerator(rescale=1/255,
                                    rotation_range=10, # randomly rotate images in the range (degrees, 0 to 180)
                                    zoom_range = [.1,.2], # Randomly zoom image
                                    width_shift_range=[.1,.2], # randomly shift images horizontally (fraction of total width)
                                    height_shift_range=[.1,.2], # randomly shift images vertically (fraction of total height)
                                    )
```

```
In [92]: train_gen_aug = datagen.flow_from_directory(train_directory,
                                                 target_size = (224, 224),
                                                 batch_size=128,
```

```
classes = ["NORMAL", "PNEUMONIA"]
class_mode = 'binary',
seed = 42)
```

```
Found 4325 images belonging to 2 classes.
```

Model 6 (Model 5 with different augmented training data)

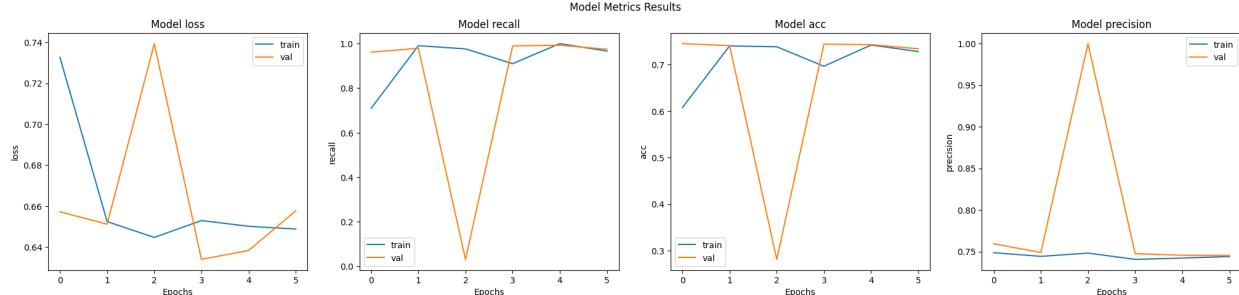
```
In [ ]: #Using the same model with augmented data
model_6 = model_5
```

```
In [93]: history6 = model_5.fit(train_gen_aug,batch_size=128,
                           epochs=90,
                           verbose = 2,
                           class_weight=class_weights,
                           validation_data=val_gen,
                           callbacks = es) #stopping early because of time resources
```

Epoch 1/90
 34/34 - 44s - loss: 0.7326 - acc: 0.6079 - recall: 0.7100 - precision: 0.7487
 - val_loss: 0.6572 - val_acc: 0.7453 - val_recall: 0.9614 - val_precision: 0.7594 - 44s/epoch - 1s/step
 Epoch 2/90
 34/34 - 44s - loss: 0.6524 - acc: 0.7403 - recall: 0.9907 - precision: 0.7442
 - val_loss: 0.6512 - val_acc: 0.7409 - val_recall: 0.9792 - val_precision: 0.7489 - 44s/epoch - 1s/step
 Epoch 3/90
 34/34 - 44s - loss: 0.6447 - acc: 0.7385 - recall: 0.9763 - precision: 0.7481
 - val_loss: 0.7393 - val_acc: 0.2811 - val_recall: 0.0312 - val_precision: 1.0000 - 44s/epoch - 1s/step
 Epoch 4/90
 34/34 - 44s - loss: 0.6529 - acc: 0.6966 - recall: 0.9100 - precision: 0.7406
 - val_loss: 0.6340 - val_acc: 0.7442 - val_recall: 0.9896 - val_precision: 0.7475 - 44s/epoch - 1s/step
 Epoch 5/90
 34/34 - 43s - loss: 0.6501 - acc: 0.7422 - recall: 1.0000 - precision: 0.7422
 - val_loss: 0.6383 - val_acc: 0.7431 - val_recall: 0.9926 - val_precision: 0.7455 - 43s/epoch - 1s/step
 Epoch 6/90
 34/34 - 44s - loss: 0.6488 - acc: 0.7283 - recall: 0.9664 - precision: 0.7441
 - val_loss: 0.6577 - val_acc: 0.7343 - val_recall: 0.9747 - val_precision: 0.7455 - 44s/epoch - 1s/step
 Epoch 6: early stopping

```
In [94]: print("Model 6 with augmented data :\n")
eval_metrics(history6)
```

```
Model 6 with augmented data :
```

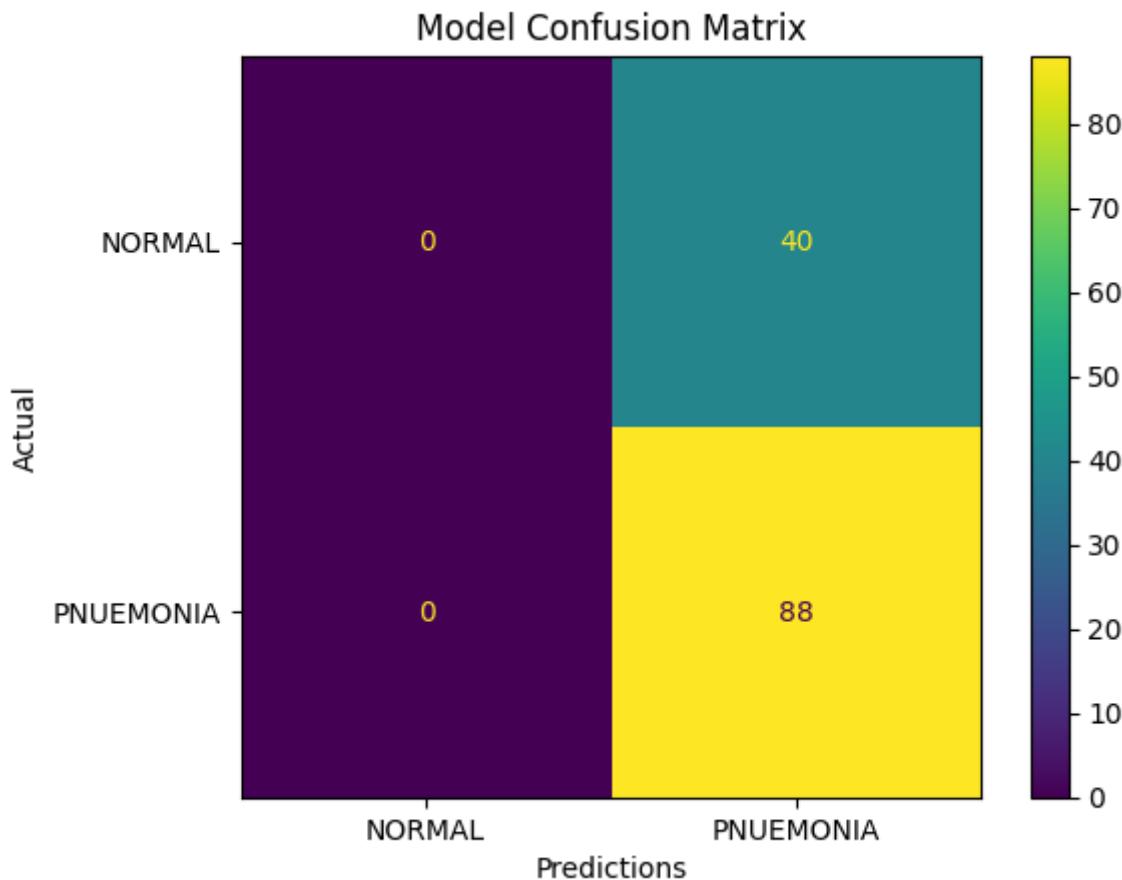


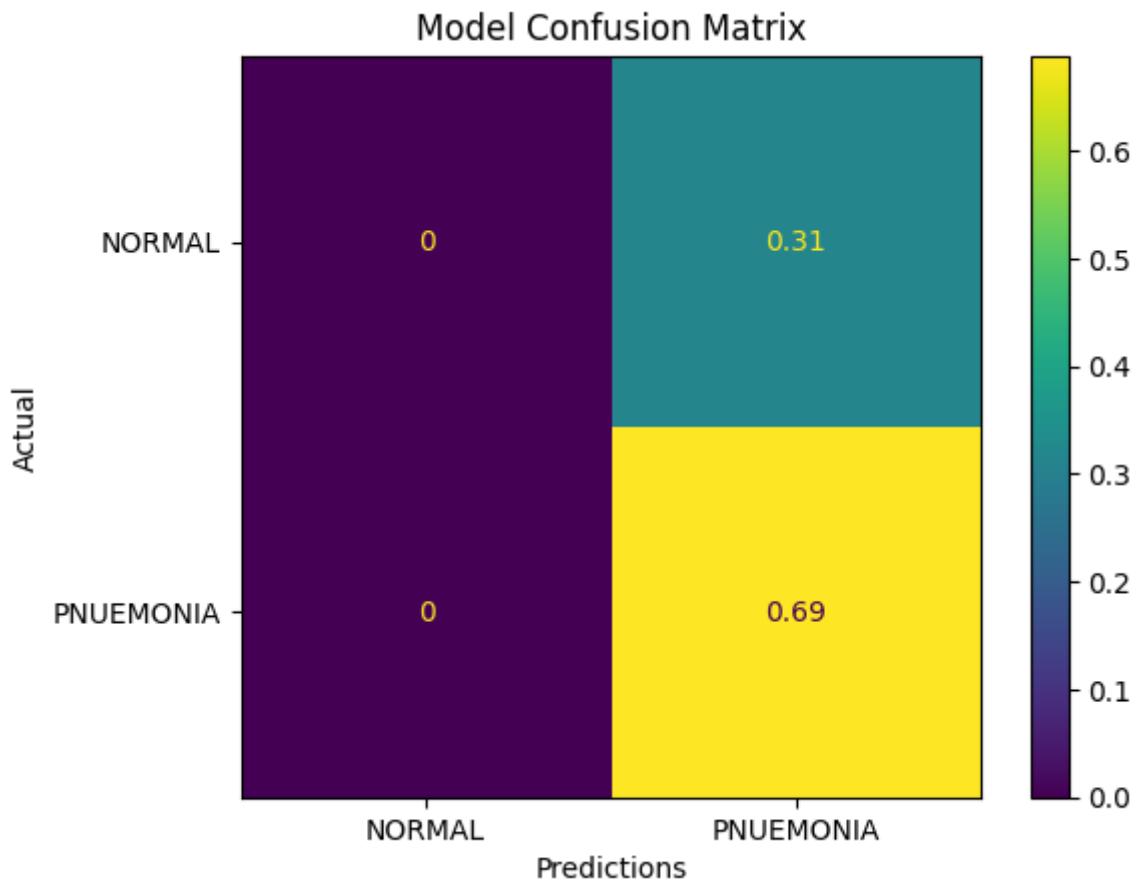
```
In [95]: train_labels, train_predictions = predict_results(model_5, train_gen_aug)
val_labels, val_predictions = predict_results(model_5, val_gen)
```

```
4/4 [=====] - 0s 40ms/step
1/1 [=====] - 0s 14ms/step
```

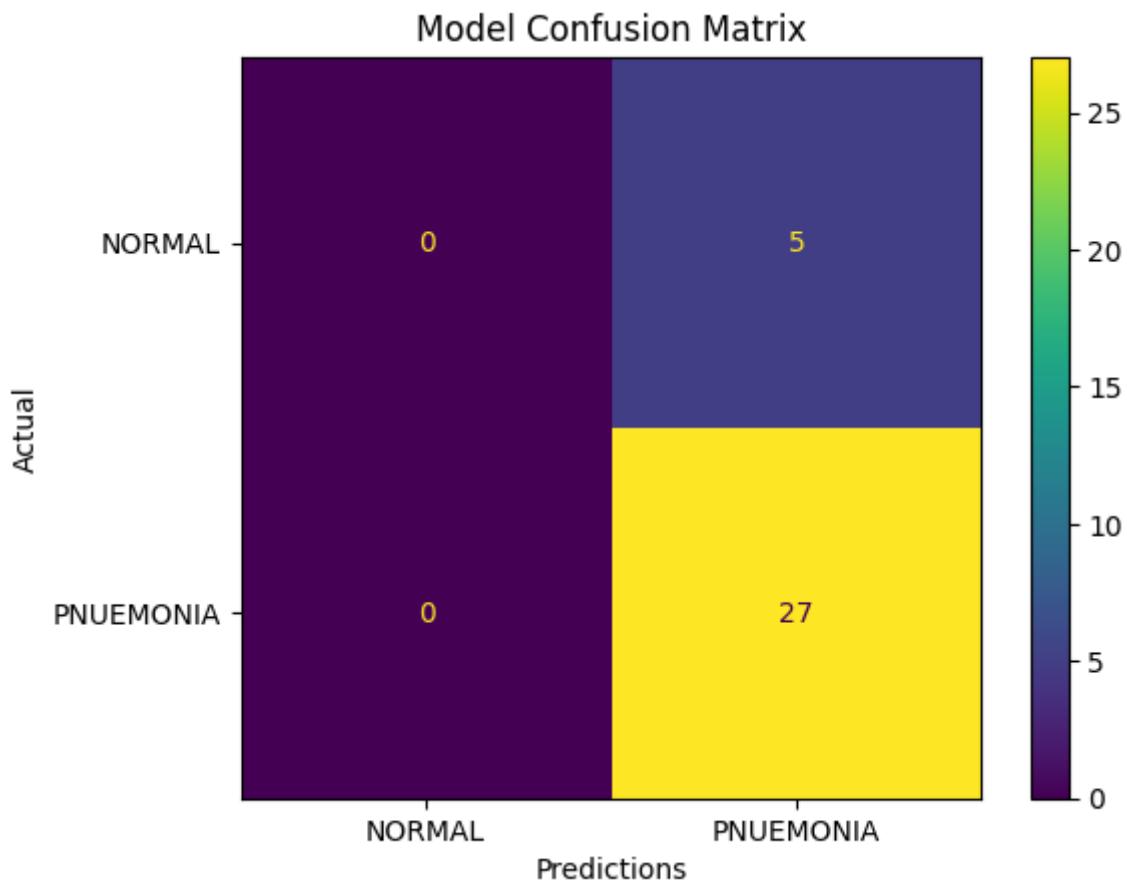
```
In [96]: #Printing regular and normalized Confusion Matrices
print("Training Confusion Matrices:\n")
conf_matrix(train_labels,train_predictions, None)
conf_matrix(train_labels,train_predictions, "all")
print("Validation Confusion Matrices:\n")
conf_matrix(val_labels, val_predictions, None)
conf_matrix(val_labels, val_predictions, "all")
```

Training Confusion Matrices:

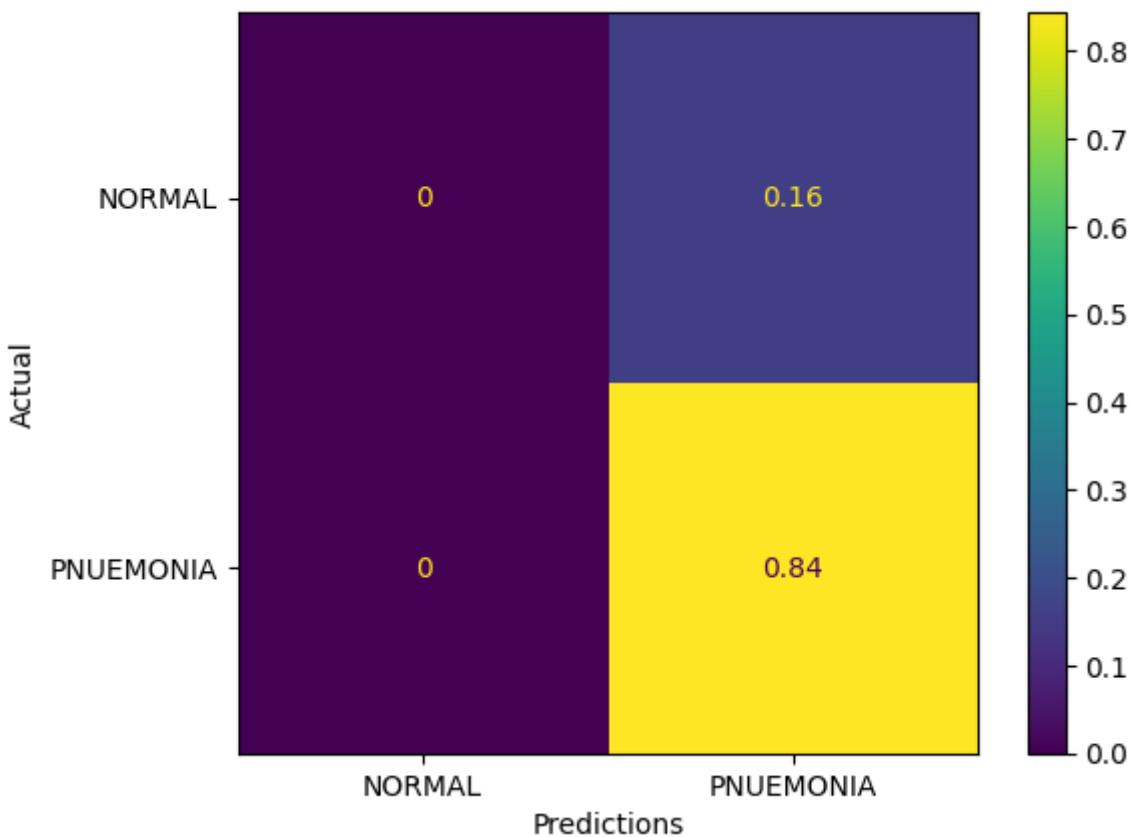




Validation Confusion Matrices:



Model Confusion Matrix



```
In [97]: #Training Classification Report
print("Training Classificaiton Report:\n")
eval_report(train_labels,train_predictions,train_gen,history6)
```

Training Classificaiton Report:

	precision	recall	f1-score	support
0.0	0.00	0.00	0.00	40
1.0	0.69	1.00	0.81	88
accuracy			0.69	128
macro avg	0.34	0.50	0.41	128
weighted avg	0.47	0.69	0.56	128

```
68/68 [=====] - 22s 316ms/step - loss: 0.6567 - acc: 0.7392 - recall: 0.9685 - precision: 0.7517
Loss: 0.6567
```

```
In [98]: #Training Classification Report
print("Validation Classificaiton Report:\n")
eval_report(val_labels,val_predictions,val_gen,history6)
```

Validation Classification Report:

	precision	recall	f1-score	support
0.0	0.00	0.00	0.00	5
1.0	0.84	1.00	0.92	27
accuracy			0.84	32
macro avg	0.42	0.50	0.46	32
weighted avg	0.71	0.84	0.77	32

```
29/29 [=====] - 5s 155ms/step - loss: 0.6577 - acc: 0.7343 - recall: 0.9747 - precision: 0.7455
Loss: 0.6577
```

Model 6 Evaluation - Needs Updating

Using augmented training data produced the worst results so far. Epoch 2 caused the most variation. The model had no False Negatives, but many False Positives. The training data trained on 30% of Normal values in a batch. The loss is the highest so far in all iterations. The augmented data will not be used in the next iteration.

Model 7 - Learning Rate Optimization

Using gridsearch and keras wrappers to do some hyperparameter optimization

- `learning_rate = [.001,.01,.1,.2]`

Description of the model hyperparameters and data parameters:

- Model*
 - layers: 3 Conv2D each w/ MaxPooling2D, 3 Dense output layers
 - filters: 32,64,96,128 for Conv2D, 64,1 Dense layer
 - activation: Relu for all except Sigmoid for output layer
 - dropout:** .5 between the dense output layers
- Model Compile
 - loss: `binary_crossentropy`
 - optimizer:`adam`
 - learning rate: `.001 (Default)`
 - metrics: Accuracy,Recall,Precision
- Fit
 - data: `train_gen, val_gen`
 - train batchsize: 128
 - epochs: 90
 - early stopping : True
 - class weights: {0: 1.6, 1: 0.7272727272727273}

- Additional Comments
 - Conv2D model is best for images
 - MaxPooling 2D is a downsampling strategy CNNs

In [101...]

```
def buildModel(learning_rate):

    model= models.Sequential([
        Conv2D(filters=32, kernel_size=(3, 3), activation='relu',
               padding = 'same', input_shape=(224,224,3)),
        MaxPooling2D(pool_size=(2, 2), strides=2),

        Conv2D(filters=64, kernel_size=(3, 3), activation='relu',
               padding = 'same'),
        MaxPooling2D(pool_size=(2, 2), strides=2),

        Conv2D(filters=96, kernel_size=(3, 3), activation='relu',
               padding = 'same'),
        MaxPooling2D(pool_size=(2, 2), strides=2),

        Conv2D(filters=96, kernel_size=(3, 3), activation='relu',
               padding = 'same'),
        MaxPooling2D(pool_size=(2, 2), strides=2),

        Conv2D(filters=128, kernel_size=(3, 3), activation='relu',
               padding = 'same'),
        MaxPooling2D(pool_size=(2, 2), strides=2),

        Conv2D(filters=128, kernel_size=(3, 3), activation='relu',
               padding = 'same'),
        MaxPooling2D(pool_size=(2, 2), strides=2),

        Flatten(),

        Dense(units=128, activation='relu'),
        Dropout(.3),
        Dense(units=64, activation='relu'),
        Dropout(.3),
        Dense(units=1, activation='sigmoid'),
    ])

    model.compile(loss='binary_crossentropy',
                  optimizer = Adam(learning_rate = learning_rate, ),
                  metrics=[ "acc", "Recall", "Precision"])

    return model
```

Learning rate determines the weights of our neural network with respect to the loss gradient.

In [102...]

```
learning_rate = [.001,.01,.1,.2]
parameters_3 = dict( learning_rate=learning_rate)
parameters_3
```

Out[102]:

```
{'learning_rate': [0.001, 0.01, 0.1, 0.2]}
```

```
In [103...]: classifier = KerasClassifier(build_fn=buildModel, batch_size = 128, epochs = 90
#What hyperparameter we want to play with

grid_search = GridSearchCV(estimator = classifier,
                           error_score="raise",
                           param_grid = parameters_3,
                           refit = "Acc",
                           scoring = "accuracy",
                           cv = 3,return_train_score=True)
gs_3 = grid_search.fit(X_train, y_train, verbose = 1)
```

Epoch 1/90

```
2023-03-29 01:09:25.357383: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
```

```
1/1 [=====] - 2s 2s/step - loss: 0.6461 - acc: 0.7143
- recall: 0.7812 - precision: 0.8333
Epoch 2/90
1/1 [=====] - 0s 268ms/step - loss: 0.6403 - acc: 0.7
619 - recall: 1.0000 - precision: 0.7619
Epoch 3/90
1/1 [=====] - 0s 245ms/step - loss: 0.6806 - acc: 0.7
619 - recall: 1.0000 - precision: 0.7619
Epoch 4/90
1/1 [=====] - 0s 227ms/step - loss: 0.6596 - acc: 0.7
143 - recall: 0.9375 - precision: 0.7500
Epoch 5/90
1/1 [=====] - 0s 256ms/step - loss: 0.6433 - acc: 0.6
905 - recall: 0.8438 - precision: 0.7714
Epoch 6/90
1/1 [=====] - 0s 94ms/step - loss: 0.6333 - acc: 0.78
57 - recall: 0.9688 - precision: 0.7949
Epoch 7/90
1/1 [=====] - 0s 62ms/step - loss: 0.6416 - acc: 0.73
81 - recall: 0.9688 - precision: 0.7561
Epoch 8/90
1/1 [=====] - 0s 254ms/step - loss: 0.6467 - acc: 0.7
381 - recall: 0.9688 - precision: 0.7561
Epoch 9/90
1/1 [=====] - 0s 162ms/step - loss: 0.6527 - acc: 0.7
381 - recall: 0.9688 - precision: 0.7561
Epoch 10/90
1/1 [=====] - 0s 153ms/step - loss: 0.6382 - acc: 0.7
381 - recall: 0.9688 - precision: 0.7561
Epoch 11/90
1/1 [=====] - 0s 247ms/step - loss: 0.6252 - acc: 0.7
381 - recall: 0.9688 - precision: 0.7561
Epoch 12/90
1/1 [=====] - 0s 139ms/step - loss: 0.6412 - acc: 0.7
619 - recall: 0.9688 - precision: 0.7750
Epoch 13/90
1/1 [=====] - 0s 138ms/step - loss: 0.6367 - acc: 0.7
381 - recall: 0.9688 - precision: 0.7561
Epoch 14/90
1/1 [=====] - 0s 137ms/step - loss: 0.6138 - acc: 0.7
619 - recall: 1.0000 - precision: 0.7619
Epoch 15/90
1/1 [=====] - 0s 79ms/step - loss: 0.6159 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 16/90
1/1 [=====] - 0s 47ms/step - loss: 0.6158 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 17/90
1/1 [=====] - 0s 74ms/step - loss: 0.5883 - acc: 0.78
57 - recall: 1.0000 - precision: 0.7805
Epoch 18/90
1/1 [=====] - 0s 134ms/step - loss: 0.6339 - acc: 0.7
381 - recall: 0.9688 - precision: 0.7561
Epoch 19/90
1/1 [=====] - 0s 125ms/step - loss: 0.6406 - acc: 0.7
381 - recall: 0.9688 - precision: 0.7561
Epoch 20/90
1/1 [=====] - 0s 130ms/step - loss: 0.5980 - acc: 0.7
381 - recall: 0.9688 - precision: 0.7561
Epoch 21/90
```

```
1/1 [=====] - 0s 48ms/step - loss: 0.6005 - acc: 0.76
19 - recall: 0.9375 - precision: 0.7895
Epoch 22/90
1/1 [=====] - 0s 46ms/step - loss: 0.5518 - acc: 0.78
57 - recall: 0.9062 - precision: 0.8286
Epoch 23/90
1/1 [=====] - 0s 47ms/step - loss: 0.5552 - acc: 0.80
95 - recall: 0.9062 - precision: 0.8529
Epoch 24/90
1/1 [=====] - 0s 51ms/step - loss: 0.5305 - acc: 0.78
57 - recall: 0.8750 - precision: 0.8485
Epoch 25/90
1/1 [=====] - 0s 47ms/step - loss: 0.4451 - acc: 0.80
95 - recall: 0.8438 - precision: 0.9000
Epoch 26/90
1/1 [=====] - 0s 136ms/step - loss: 0.3762 - acc: 0.8
571 - recall: 0.9062 - precision: 0.9062
Epoch 27/90
1/1 [=====] - 0s 47ms/step - loss: 0.5409 - acc: 0.73
81 - recall: 0.7500 - precision: 0.8889
Epoch 28/90
1/1 [=====] - 0s 52ms/step - loss: 0.5264 - acc: 0.80
95 - recall: 0.8125 - precision: 0.9286
Epoch 29/90
1/1 [=====] - 0s 144ms/step - loss: 0.4375 - acc: 0.8
095 - recall: 0.8438 - precision: 0.9000
Epoch 30/90
1/1 [=====] - 0s 52ms/step - loss: 0.4602 - acc: 0.83
33 - recall: 0.8750 - precision: 0.9032
Epoch 31/90
1/1 [=====] - 0s 47ms/step - loss: 0.4034 - acc: 0.80
95 - recall: 0.7812 - precision: 0.9615
Epoch 32/90
1/1 [=====] - 0s 72ms/step - loss: 0.4381 - acc: 0.69
05 - recall: 0.6562 - precision: 0.9130
Epoch 33/90
1/1 [=====] - 0s 50ms/step - loss: 0.4650 - acc: 0.71
43 - recall: 0.6875 - precision: 0.9167
Epoch 34/90
1/1 [=====] - 0s 47ms/step - loss: 0.4382 - acc: 0.71
43 - recall: 0.7188 - precision: 0.8846
Epoch 35/90
1/1 [=====] - 0s 136ms/step - loss: 0.4059 - acc: 0.7
619 - recall: 0.7500 - precision: 0.9231
Epoch 36/90
1/1 [=====] - 0s 51ms/step - loss: 0.4019 - acc: 0.78
57 - recall: 0.7500 - precision: 0.9600
Epoch 37/90
1/1 [=====] - 0s 49ms/step - loss: 0.3793 - acc: 0.80
95 - recall: 0.7812 - precision: 0.9615
Epoch 38/90
1/1 [=====] - 0s 50ms/step - loss: 0.3761 - acc: 0.78
57 - recall: 0.7500 - precision: 0.9600
Epoch 39/90
1/1 [=====] - 0s 47ms/step - loss: 0.3122 - acc: 0.85
71 - recall: 0.8125 - precision: 1.0000
Epoch 40/90
1/1 [=====] - 0s 255ms/step - loss: 0.2500 - acc: 0.9
048 - recall: 0.9062 - precision: 0.9667
Epoch 41/90
```

```
1/1 [=====] - 0s 50ms/step - loss: 0.2856 - acc: 0.88
10 - recall: 0.8750 - precision: 0.9655
Epoch 42/90
1/1 [=====] - 0s 49ms/step - loss: 0.2486 - acc: 0.90
48 - recall: 0.8750 - precision: 1.0000
Epoch 43/90
1/1 [=====] - 0s 48ms/step - loss: 0.2420 - acc: 0.85
71 - recall: 0.8125 - precision: 1.0000
Epoch 44/90
1/1 [=====] - 0s 47ms/step - loss: 0.2173 - acc: 0.85
71 - recall: 0.8438 - precision: 0.9643
Epoch 45/90
1/1 [=====] - 0s 47ms/step - loss: 0.2770 - acc: 0.88
10 - recall: 0.9375 - precision: 0.9091
Epoch 46/90
1/1 [=====] - 0s 46ms/step - loss: 0.2138 - acc: 0.92
86 - recall: 0.9375 - precision: 0.9677
Epoch 47/90
1/1 [=====] - 0s 48ms/step - loss: 0.3986 - acc: 0.78
57 - recall: 0.7188 - precision: 1.0000
Epoch 48/90
1/1 [=====] - 0s 48ms/step - loss: 0.1541 - acc: 0.95
24 - recall: 0.9375 - precision: 1.0000
Epoch 49/90
1/1 [=====] - 0s 47ms/step - loss: 0.2881 - acc: 0.90
48 - recall: 0.9375 - precision: 0.9375
Epoch 50/90
1/1 [=====] - 0s 49ms/step - loss: 0.3256 - acc: 0.85
71 - recall: 0.9375 - precision: 0.8824
Epoch 51/90
1/1 [=====] - 0s 46ms/step - loss: 0.1708 - acc: 0.95
24 - recall: 0.9375 - precision: 1.0000
Epoch 52/90
1/1 [=====] - 0s 47ms/step - loss: 0.2129 - acc: 0.90
48 - recall: 0.8750 - precision: 1.0000
Epoch 53/90
1/1 [=====] - 0s 47ms/step - loss: 0.2552 - acc: 0.90
48 - recall: 0.8750 - precision: 1.0000
Epoch 54/90
1/1 [=====] - 0s 48ms/step - loss: 0.1946 - acc: 0.92
86 - recall: 0.9062 - precision: 1.0000
Epoch 55/90
1/1 [=====] - 0s 48ms/step - loss: 0.2314 - acc: 0.90
48 - recall: 0.8750 - precision: 1.0000
Epoch 56/90
1/1 [=====] - 0s 47ms/step - loss: 0.1936 - acc: 0.92
86 - recall: 0.9062 - precision: 1.0000
Epoch 57/90
1/1 [=====] - 0s 48ms/step - loss: 0.1931 - acc: 0.95
24 - recall: 0.9375 - precision: 1.0000
Epoch 58/90
1/1 [=====] - 0s 47ms/step - loss: 0.1669 - acc: 0.92
86 - recall: 0.9062 - precision: 1.0000
Epoch 59/90
1/1 [=====] - 0s 47ms/step - loss: 0.1886 - acc: 0.92
86 - recall: 0.9375 - precision: 0.9677
Epoch 60/90
1/1 [=====] - 0s 46ms/step - loss: 0.1366 - acc: 0.95
24 - recall: 0.9375 - precision: 1.0000
Epoch 61/90
```

```
1/1 [=====] - 0s 47ms/step - loss: 0.1440 - acc: 0.92
86 - recall: 0.9062 - precision: 1.0000
Epoch 62/90
1/1 [=====] - 0s 46ms/step - loss: 0.1313 - acc: 0.95
24 - recall: 0.9375 - precision: 1.0000
Epoch 63/90
1/1 [=====] - 0s 46ms/step - loss: 0.1276 - acc: 0.95
24 - recall: 0.9375 - precision: 1.0000
Epoch 64/90
1/1 [=====] - 0s 46ms/step - loss: 0.0926 - acc: 0.92
86 - recall: 0.9062 - precision: 1.0000
Epoch 65/90
1/1 [=====] - 0s 47ms/step - loss: 0.1146 - acc: 0.92
86 - recall: 0.9375 - precision: 0.9677
Epoch 66/90
1/1 [=====] - 0s 47ms/step - loss: 0.1835 - acc: 0.90
48 - recall: 0.9375 - precision: 0.9375
Epoch 67/90
1/1 [=====] - 0s 47ms/step - loss: 0.1027 - acc: 0.95
24 - recall: 0.9375 - precision: 1.0000
Epoch 68/90
1/1 [=====] - 0s 47ms/step - loss: 0.0990 - acc: 0.95
24 - recall: 0.9375 - precision: 1.0000
Epoch 69/90
1/1 [=====] - 0s 48ms/step - loss: 0.0854 - acc: 0.95
24 - recall: 0.9375 - precision: 1.0000
Epoch 70/90
1/1 [=====] - 0s 47ms/step - loss: 0.0645 - acc: 0.97
62 - recall: 0.9688 - precision: 1.0000
Epoch 71/90
1/1 [=====] - 0s 46ms/step - loss: 0.0988 - acc: 0.95
24 - recall: 0.9688 - precision: 0.9688
Epoch 72/90
1/1 [=====] - 0s 48ms/step - loss: 0.0677 - acc: 0.97
62 - recall: 0.9688 - precision: 1.0000
Epoch 73/90
1/1 [=====] - 0s 47ms/step - loss: 0.0449 - acc: 0.97
62 - recall: 0.9688 - precision: 1.0000
Epoch 74/90
1/1 [=====] - 0s 48ms/step - loss: 0.0668 - acc: 0.97
62 - recall: 0.9688 - precision: 1.0000
Epoch 75/90
1/1 [=====] - 0s 47ms/step - loss: 0.0518 - acc: 0.97
62 - recall: 0.9688 - precision: 1.0000
Epoch 76/90
1/1 [=====] - 0s 47ms/step - loss: 0.0267 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 77/90
1/1 [=====] - 0s 48ms/step - loss: 0.0181 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 78/90
1/1 [=====] - 0s 46ms/step - loss: 0.0245 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 79/90
1/1 [=====] - 0s 47ms/step - loss: 0.0140 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 80/90
1/1 [=====] - 0s 49ms/step - loss: 0.0070 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 81/90
```

```
1/1 [=====] - 0s 47ms/step - loss: 0.0302 - acc: 0.97
62 - recall: 0.9688 - precision: 1.0000
Epoch 82/90
1/1 [=====] - 0s 48ms/step - loss: 0.0104 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 83/90
1/1 [=====] - 0s 46ms/step - loss: 0.0044 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 84/90
1/1 [=====] - 0s 47ms/step - loss: 0.0027 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 85/90
1/1 [=====] - 0s 49ms/step - loss: 0.0039 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 86/90
1/1 [=====] - 0s 47ms/step - loss: 0.0062 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 87/90
1/1 [=====] - 0s 47ms/step - loss: 0.0014 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 88/90
1/1 [=====] - 0s 48ms/step - loss: 0.0016 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 89/90
1/1 [=====] - 0s 47ms/step - loss: 2.3399e-04 - acc:
1.0000 - recall: 1.0000 - precision: 1.0000
Epoch 90/90
1/1 [=====] - 0s 47ms/step - loss: 0.0299 - acc: 0.97
62 - recall: 0.9688 - precision: 1.0000
2023-03-29 01:09:34.077544: I tensorflow/core/grappler/optimizers/custom_graph_
_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
1/1 [=====] - 0s 306ms/step
2/2 [=====] - 0s 246ms/step
Epoch 1/90
2023-03-29 01:09:35.239296: I tensorflow/core/grappler/optimizers/custom_graph_
_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
```

```
1/1 [=====] - 2s 2s/step - loss: 0.7013 - acc: 0.4884  
- recall: 0.4828 - precision: 0.6667  
Epoch 2/90  
1/1 [=====] - 0s 198ms/step - loss: 0.7059 - acc: 0.5  
349 - recall: 0.6552 - precision: 0.6552  
Epoch 3/90  
1/1 [=====] - 0s 298ms/step - loss: 0.6957 - acc: 0.6  
047 - recall: 0.5517 - precision: 0.8000  
Epoch 4/90  
1/1 [=====] - 0s 258ms/step - loss: 0.6905 - acc: 0.5  
581 - recall: 0.5862 - precision: 0.7083  
Epoch 5/90  
1/1 [=====] - 0s 248ms/step - loss: 0.7126 - acc: 0.5  
581 - recall: 0.6207 - precision: 0.6923  
Epoch 6/90  
1/1 [=====] - 0s 81ms/step - loss: 0.6942 - acc: 0.53  
49 - recall: 0.5172 - precision: 0.7143  
Epoch 7/90  
1/1 [=====] - 0s 159ms/step - loss: 0.6859 - acc: 0.4  
651 - recall: 0.2414 - precision: 0.8750  
Epoch 8/90  
1/1 [=====] - 0s 148ms/step - loss: 0.6847 - acc: 0.4  
419 - recall: 0.2069 - precision: 0.8571  
Epoch 9/90  
1/1 [=====] - 0s 163ms/step - loss: 0.6679 - acc: 0.4  
884 - recall: 0.2759 - precision: 0.8889  
Epoch 10/90  
1/1 [=====] - 0s 155ms/step - loss: 0.7010 - acc: 0.4  
419 - recall: 0.2414 - precision: 0.7778  
Epoch 11/90  
1/1 [=====] - 0s 79ms/step - loss: 0.7028 - acc: 0.34  
88 - recall: 0.2069 - precision: 0.5455  
Epoch 12/90  
1/1 [=====] - 0s 94ms/step - loss: 0.6868 - acc: 0.48  
84 - recall: 0.2414 - precision: 1.0000  
Epoch 13/90  
1/1 [=====] - 0s 54ms/step - loss: 0.6944 - acc: 0.46  
51 - recall: 0.2414 - precision: 0.8750  
Epoch 14/90  
1/1 [=====] - 0s 130ms/step - loss: 0.6696 - acc: 0.6  
047 - recall: 0.4138 - precision: 1.0000  
Epoch 15/90  
1/1 [=====] - 0s 75ms/step - loss: 0.6432 - acc: 0.62  
79 - recall: 0.4828 - precision: 0.9333  
Epoch 16/90  
1/1 [=====] - 0s 138ms/step - loss: 0.6690 - acc: 0.5  
116 - recall: 0.4138 - precision: 0.7500  
Epoch 17/90  
1/1 [=====] - 0s 142ms/step - loss: 0.5906 - acc: 0.6  
512 - recall: 0.5862 - precision: 0.8500  
Epoch 18/90  
1/1 [=====] - 0s 225ms/step - loss: 0.6188 - acc: 0.6  
279 - recall: 0.4828 - precision: 0.9333  
Epoch 19/90  
1/1 [=====] - 0s 79ms/step - loss: 0.5726 - acc: 0.69  
77 - recall: 0.6552 - precision: 0.8636  
Epoch 20/90  
1/1 [=====] - 0s 51ms/step - loss: 0.5285 - acc: 0.79  
07 - recall: 0.8276 - precision: 0.8571  
Epoch 21/90
```

```
1/1 [=====] - 0s 77ms/step - loss: 0.4702 - acc: 0.83
72 - recall: 0.7931 - precision: 0.9583
Epoch 22/90
1/1 [=====] - 0s 134ms/step - loss: 0.5610 - acc: 0.7
209 - recall: 0.5862 - precision: 1.0000
Epoch 23/90
1/1 [=====] - 0s 147ms/step - loss: 0.5030 - acc: 0.7
442 - recall: 0.7586 - precision: 0.8462
Epoch 24/90
1/1 [=====] - 0s 54ms/step - loss: 0.4687 - acc: 0.81
40 - recall: 0.8621 - precision: 0.8621
Epoch 25/90
1/1 [=====] - 0s 139ms/step - loss: 0.4551 - acc: 0.8
140 - recall: 0.9655 - precision: 0.8000
Epoch 26/90
1/1 [=====] - 0s 72ms/step - loss: 0.4520 - acc: 0.81
40 - recall: 0.9310 - precision: 0.8182
Epoch 27/90
1/1 [=====] - 0s 155ms/step - loss: 0.4051 - acc: 0.8
140 - recall: 0.8276 - precision: 0.8889
Epoch 28/90
1/1 [=====] - 0s 48ms/step - loss: 0.3902 - acc: 0.79
07 - recall: 0.8276 - precision: 0.8571
Epoch 29/90
1/1 [=====] - 0s 49ms/step - loss: 0.3227 - acc: 0.86
05 - recall: 0.7931 - precision: 1.0000
Epoch 30/90
1/1 [=====] - 0s 49ms/step - loss: 0.3793 - acc: 0.81
40 - recall: 0.7586 - precision: 0.9565
Epoch 31/90
1/1 [=====] - 0s 127ms/step - loss: 0.2820 - acc: 0.8
605 - recall: 0.7931 - precision: 1.0000
Epoch 32/90
1/1 [=====] - 0s 49ms/step - loss: 0.2239 - acc: 0.90
70 - recall: 0.9310 - precision: 0.9310
Epoch 33/90
1/1 [=====] - 0s 53ms/step - loss: 0.2450 - acc: 0.86
05 - recall: 0.8621 - precision: 0.9259
Epoch 34/90
1/1 [=====] - 0s 48ms/step - loss: 0.2213 - acc: 0.88
37 - recall: 0.8966 - precision: 0.9286
Epoch 35/90
1/1 [=====] - 0s 47ms/step - loss: 0.2255 - acc: 0.88
37 - recall: 0.8621 - precision: 0.9615
Epoch 36/90
1/1 [=====] - 0s 47ms/step - loss: 0.1858 - acc: 0.90
70 - recall: 0.9310 - precision: 0.9310
Epoch 37/90
1/1 [=====] - 0s 48ms/step - loss: 0.1000 - acc: 0.95
35 - recall: 0.9310 - precision: 1.0000
Epoch 38/90
1/1 [=====] - 0s 48ms/step - loss: 0.1807 - acc: 0.90
70 - recall: 0.9310 - precision: 0.9310
Epoch 39/90
1/1 [=====] - 0s 47ms/step - loss: 0.1457 - acc: 0.95
35 - recall: 0.9655 - precision: 0.9655
Epoch 40/90
1/1 [=====] - 0s 47ms/step - loss: 0.1230 - acc: 0.95
35 - recall: 0.9310 - precision: 1.0000
Epoch 41/90
```

```
1/1 [=====] - 0s 47ms/step - loss: 0.0780 - acc: 0.97  
67 - recall: 0.9655 - precision: 1.0000  
Epoch 42/90  
1/1 [=====] - 0s 48ms/step - loss: 0.1093 - acc: 0.95  
35 - recall: 0.9310 - precision: 1.0000  
Epoch 43/90  
1/1 [=====] - 0s 48ms/step - loss: 0.0855 - acc: 1.00  
00 - recall: 1.0000 - precision: 1.0000  
Epoch 44/90  
1/1 [=====] - 0s 52ms/step - loss: 0.1023 - acc: 0.95  
35 - recall: 0.9310 - precision: 1.0000  
Epoch 45/90  
1/1 [=====] - 0s 137ms/step - loss: 0.0210 - acc: 1.0000  
recall: 1.0000 - precision: 1.0000  
Epoch 46/90  
1/1 [=====] - 0s 51ms/step - loss: 0.0766 - acc: 0.95  
35 - recall: 0.9655 - precision: 0.9655  
Epoch 47/90  
1/1 [=====] - 0s 329ms/step - loss: 0.0888 - acc: 0.9302  
recall: 0.8966 - precision: 1.0000  
Epoch 48/90  
1/1 [=====] - 0s 61ms/step - loss: 0.0593 - acc: 0.95  
35 - recall: 0.9310 - precision: 1.0000  
Epoch 49/90  
1/1 [=====] - 0s 50ms/step - loss: 0.0443 - acc: 0.97  
67 - recall: 0.9655 - precision: 1.0000  
Epoch 50/90  
1/1 [=====] - 0s 47ms/step - loss: 0.0375 - acc: 1.0000  
recall: 1.0000 - precision: 1.0000  
Epoch 51/90  
1/1 [=====] - 0s 47ms/step - loss: 0.0990 - acc: 0.9302  
recall: 1.0000 - precision: 0.9062  
Epoch 52/90  
1/1 [=====] - 0s 47ms/step - loss: 0.0406 - acc: 1.0000  
recall: 1.0000 - precision: 1.0000  
Epoch 53/90  
1/1 [=====] - 0s 47ms/step - loss: 0.0616 - acc: 0.95  
35 - recall: 0.9310 - precision: 1.0000  
Epoch 54/90  
1/1 [=====] - 0s 48ms/step - loss: 0.1047 - acc: 0.95  
35 - recall: 0.9310 - precision: 1.0000  
Epoch 55/90  
1/1 [=====] - 0s 48ms/step - loss: 0.0266 - acc: 0.97  
67 - recall: 0.9655 - precision: 1.0000  
Epoch 56/90  
1/1 [=====] - 0s 48ms/step - loss: 0.0085 - acc: 1.0000  
recall: 1.0000 - precision: 1.0000  
Epoch 57/90  
1/1 [=====] - 0s 48ms/step - loss: 0.0692 - acc: 0.97  
67 - recall: 1.0000 - precision: 0.9667  
Epoch 58/90  
1/1 [=====] - 0s 48ms/step - loss: 0.0218 - acc: 1.0000  
recall: 1.0000 - precision: 1.0000  
Epoch 59/90  
1/1 [=====] - 0s 47ms/step - loss: 0.0182 - acc: 0.97  
67 - recall: 0.9655 - precision: 1.0000  
Epoch 60/90  
1/1 [=====] - 0s 47ms/step - loss: 0.1148 - acc: 0.95  
35 - recall: 0.9310 - precision: 1.0000  
Epoch 61/90
```

```
1/1 [=====] - 0s 47ms/step - loss: 0.0067 - acc: 1.00  
00 - recall: 1.0000 - precision: 1.0000  
Epoch 62/90  
1/1 [=====] - 0s 49ms/step - loss: 0.0580 - acc: 0.97  
67 - recall: 1.0000 - precision: 0.9667  
Epoch 63/90  
1/1 [=====] - 0s 48ms/step - loss: 0.0037 - acc: 1.00  
00 - recall: 1.0000 - precision: 1.0000  
Epoch 64/90  
1/1 [=====] - 0s 52ms/step - loss: 0.0224 - acc: 0.97  
67 - recall: 0.9655 - precision: 1.0000  
Epoch 65/90  
1/1 [=====] - 0s 47ms/step - loss: 0.0123 - acc: 1.00  
00 - recall: 1.0000 - precision: 1.0000  
Epoch 66/90  
1/1 [=====] - 0s 48ms/step - loss: 0.0243 - acc: 0.97  
67 - recall: 0.9655 - precision: 1.0000  
Epoch 67/90  
1/1 [=====] - 0s 47ms/step - loss: 0.0158 - acc: 1.00  
00 - recall: 1.0000 - precision: 1.0000  
Epoch 68/90  
1/1 [=====] - 0s 51ms/step - loss: 0.0053 - acc: 1.00  
00 - recall: 1.0000 - precision: 1.0000  
Epoch 69/90  
1/1 [=====] - 0s 47ms/step - loss: 0.0093 - acc: 1.00  
00 - recall: 1.0000 - precision: 1.0000  
Epoch 70/90  
1/1 [=====] - 0s 47ms/step - loss: 0.0199 - acc: 0.97  
67 - recall: 0.9655 - precision: 1.0000  
Epoch 71/90  
1/1 [=====] - 0s 48ms/step - loss: 0.0177 - acc: 1.00  
00 - recall: 1.0000 - precision: 1.0000  
Epoch 72/90  
1/1 [=====] - 0s 48ms/step - loss: 0.0079 - acc: 1.00  
00 - recall: 1.0000 - precision: 1.0000  
Epoch 73/90  
1/1 [=====] - 0s 48ms/step - loss: 0.0148 - acc: 1.00  
00 - recall: 1.0000 - precision: 1.0000  
Epoch 74/90  
1/1 [=====] - 0s 47ms/step - loss: 0.0027 - acc: 1.00  
00 - recall: 1.0000 - precision: 1.0000  
Epoch 75/90  
1/1 [=====] - 0s 47ms/step - loss: 0.0018 - acc: 1.00  
00 - recall: 1.0000 - precision: 1.0000  
Epoch 76/90  
1/1 [=====] - 0s 48ms/step - loss: 0.0036 - acc: 1.00  
00 - recall: 1.0000 - precision: 1.0000  
Epoch 77/90  
1/1 [=====] - 0s 47ms/step - loss: 0.0105 - acc: 1.00  
00 - recall: 1.0000 - precision: 1.0000  
Epoch 78/90  
1/1 [=====] - 0s 48ms/step - loss: 0.0018 - acc: 1.00  
00 - recall: 1.0000 - precision: 1.0000  
Epoch 79/90  
1/1 [=====] - 0s 49ms/step - loss: 4.8321e-04 - acc:  
1.0000 - recall: 1.0000 - precision: 1.0000  
Epoch 80/90  
1/1 [=====] - 0s 48ms/step - loss: 7.4248e-04 - acc:  
1.0000 - recall: 1.0000 - precision: 1.0000  
Epoch 81/90
```

```
1/1 [=====] - 0s 47ms/step - loss: 0.0041 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 82/90
1/1 [=====] - 0s 48ms/step - loss: 4.5173e-04 - acc:
1.0000 - recall: 1.0000 - precision: 1.0000
Epoch 83/90
1/1 [=====] - 0s 47ms/step - loss: 0.0010 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 84/90
1/1 [=====] - 0s 48ms/step - loss: 9.2541e-04 - acc:
1.0000 - recall: 1.0000 - precision: 1.0000
Epoch 85/90
1/1 [=====] - 0s 48ms/step - loss: 5.7493e-04 - acc:
1.0000 - recall: 1.0000 - precision: 1.0000
Epoch 86/90
1/1 [=====] - 0s 47ms/step - loss: 2.8841e-04 - acc:
1.0000 - recall: 1.0000 - precision: 1.0000
Epoch 87/90
1/1 [=====] - 0s 47ms/step - loss: 6.1409e-05 - acc:
1.0000 - recall: 1.0000 - precision: 1.0000
Epoch 88/90
1/1 [=====] - 0s 48ms/step - loss: 2.6421e-05 - acc:
1.0000 - recall: 1.0000 - precision: 1.0000
Epoch 89/90
1/1 [=====] - 0s 47ms/step - loss: 6.7967e-05 - acc:
1.0000 - recall: 1.0000 - precision: 1.0000
Epoch 90/90
1/1 [=====] - 0s 47ms/step - loss: 1.1837e-04 - acc:
1.0000 - recall: 1.0000 - precision: 1.0000
2023-03-29 01:09:44.103305: I tensorflow/core/grappler/optimizers/custom_graph_
_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
1/1 [=====] - 0s 294ms/step
2/2 [=====] - 0s 181ms/step
Epoch 1/90
2023-03-29 01:09:45.522696: I tensorflow/core/grappler/optimizers/custom_graph_
_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
```

```
1/1 [=====] - 2s 2s/step - loss: 0.7289 - acc: 0.6047
- recall: 0.7037 - precision: 0.6786
Epoch 2/90
1/1 [=====] - 0s 272ms/step - loss: 0.7105 - acc: 0.3
953 - recall: 0.0370 - precision: 1.0000
Epoch 3/90
1/1 [=====] - 0s 277ms/step - loss: 0.7724 - acc: 0.3
488 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 4/90
1/1 [=====] - 0s 165ms/step - loss: 0.7205 - acc: 0.3
256 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 5/90
1/1 [=====] - 0s 160ms/step - loss: 0.7200 - acc: 0.3
953 - recall: 0.1111 - precision: 0.6000
Epoch 6/90
1/1 [=====] - 0s 87ms/step - loss: 0.7280 - acc: 0.39
53 - recall: 0.1111 - precision: 0.6000
Epoch 7/90
1/1 [=====] - 0s 248ms/step - loss: 0.7151 - acc: 0.4
186 - recall: 0.1481 - precision: 0.6667
Epoch 8/90
1/1 [=====] - 0s 157ms/step - loss: 0.6983 - acc: 0.4
651 - recall: 0.1852 - precision: 0.8333
Epoch 9/90
1/1 [=====] - 0s 235ms/step - loss: 0.7134 - acc: 0.3
953 - recall: 0.0741 - precision: 0.6667
Epoch 10/90
1/1 [=====] - 0s 162ms/step - loss: 0.7083 - acc: 0.3
256 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 11/90
1/1 [=====] - 0s 81ms/step - loss: 0.6945 - acc: 0.41
86 - recall: 0.0741 - precision: 1.0000
Epoch 12/90
1/1 [=====] - 0s 145ms/step - loss: 0.7167 - acc: 0.3
488 - recall: 0.0370 - precision: 0.3333
Epoch 13/90
1/1 [=====] - 0s 56ms/step - loss: 0.6697 - acc: 0.46
51 - recall: 0.1481 - precision: 1.0000
Epoch 14/90
1/1 [=====] - 0s 225ms/step - loss: 0.6930 - acc: 0.4
884 - recall: 0.1852 - precision: 1.0000
Epoch 15/90
1/1 [=====] - 0s 144ms/step - loss: 0.6381 - acc: 0.5
116 - recall: 0.2222 - precision: 1.0000
Epoch 16/90
1/1 [=====] - 0s 49ms/step - loss: 0.6033 - acc: 0.60
47 - recall: 0.4074 - precision: 0.9167
Epoch 17/90
1/1 [=====] - 0s 158ms/step - loss: 0.5830 - acc: 0.6
279 - recall: 0.4444 - precision: 0.9231
Epoch 18/90
1/1 [=====] - 0s 51ms/step - loss: 0.5196 - acc: 0.69
77 - recall: 0.5926 - precision: 0.8889
Epoch 19/90
1/1 [=====] - 0s 149ms/step - loss: 0.5452 - acc: 0.6
744 - recall: 0.6296 - precision: 0.8095
Epoch 20/90
1/1 [=====] - 0s 51ms/step - loss: 0.5105 - acc: 0.74
42 - recall: 0.6667 - precision: 0.9000
Epoch 21/90
```

```
1/1 [=====] - 0s 54ms/step - loss: 0.5356 - acc: 0.81
40 - recall: 0.7778 - precision: 0.9130
Epoch 22/90
1/1 [=====] - 0s 50ms/step - loss: 0.4982 - acc: 0.86
05 - recall: 0.8148 - precision: 0.9565
Epoch 23/90
1/1 [=====] - 0s 151ms/step - loss: 0.4314 - acc: 0.8
837 - recall: 0.8519 - precision: 0.9583
Epoch 24/90
1/1 [=====] - 0s 142ms/step - loss: 0.3727 - acc: 0.8
372 - recall: 0.8148 - precision: 0.9167
Epoch 25/90
1/1 [=====] - 0s 47ms/step - loss: 0.3549 - acc: 0.88
37 - recall: 0.8519 - precision: 0.9583
Epoch 26/90
1/1 [=====] - 0s 50ms/step - loss: 0.3139 - acc: 0.93
02 - recall: 0.8889 - precision: 1.0000
Epoch 27/90
1/1 [=====] - 0s 50ms/step - loss: 0.3513 - acc: 0.86
05 - recall: 0.8889 - precision: 0.8889
Epoch 28/90
1/1 [=====] - 0s 134ms/step - loss: 0.2290 - acc: 0.9
070 - recall: 0.8889 - precision: 0.9600
Epoch 29/90
1/1 [=====] - 0s 47ms/step - loss: 0.2114 - acc: 0.90
70 - recall: 0.8889 - precision: 0.9600
Epoch 30/90
1/1 [=====] - 0s 47ms/step - loss: 0.2157 - acc: 0.88
37 - recall: 0.8519 - precision: 0.9583
Epoch 31/90
1/1 [=====] - 0s 48ms/step - loss: 0.1566 - acc: 0.93
02 - recall: 0.8889 - precision: 1.0000
Epoch 32/90
1/1 [=====] - 0s 47ms/step - loss: 0.1271 - acc: 0.93
02 - recall: 0.9259 - precision: 0.9615
Epoch 33/90
1/1 [=====] - 0s 47ms/step - loss: 0.0847 - acc: 0.93
02 - recall: 0.8889 - precision: 1.0000
Epoch 34/90
1/1 [=====] - 0s 47ms/step - loss: 0.1047 - acc: 0.97
67 - recall: 0.9630 - precision: 1.0000
Epoch 35/90
1/1 [=====] - 0s 46ms/step - loss: 0.0691 - acc: 0.97
67 - recall: 0.9630 - precision: 1.0000
Epoch 36/90
1/1 [=====] - 0s 47ms/step - loss: 0.0688 - acc: 0.95
35 - recall: 0.9630 - precision: 0.9630
Epoch 37/90
1/1 [=====] - 0s 47ms/step - loss: 0.0350 - acc: 0.97
67 - recall: 0.9630 - precision: 1.0000
Epoch 38/90
1/1 [=====] - 0s 126ms/step - loss: 0.0071 - acc: 1.0
000 - recall: 1.0000 - precision: 1.0000
Epoch 39/90
1/1 [=====] - 0s 52ms/step - loss: 0.0084 - acc: 1.0
000 - recall: 1.0000 - precision: 1.0000
Epoch 40/90
1/1 [=====] - 0s 62ms/step - loss: 0.0157 - acc: 1.0
000 - recall: 1.0000 - precision: 1.0000
Epoch 41/90
```

```
1/1 [=====] - 0s 46ms/step - loss: 0.0058 - acc: 1.00  
00 - recall: 1.0000 - precision: 1.0000  
Epoch 42/90  
1/1 [=====] - 0s 53ms/step - loss: 9.7765e-04 - acc:  
1.0000 - recall: 1.0000 - precision: 1.0000  
Epoch 43/90  
1/1 [=====] - 0s 49ms/step - loss: 0.0103 - acc: 1.00  
00 - recall: 1.0000 - precision: 1.0000  
Epoch 44/90  
1/1 [=====] - 0s 47ms/step - loss: 6.5710e-04 - acc:  
1.0000 - recall: 1.0000 - precision: 1.0000  
Epoch 45/90  
1/1 [=====] - 0s 48ms/step - loss: 0.0016 - acc: 1.00  
00 - recall: 1.0000 - precision: 1.0000  
Epoch 46/90  
1/1 [=====] - 0s 47ms/step - loss: 0.0183 - acc: 0.97  
67 - recall: 0.9630 - precision: 1.0000  
Epoch 47/90  
1/1 [=====] - 0s 47ms/step - loss: 1.2658e-04 - acc:  
1.0000 - recall: 1.0000 - precision: 1.0000  
Epoch 48/90  
1/1 [=====] - 0s 48ms/step - loss: 0.0153 - acc: 1.00  
00 - recall: 1.0000 - precision: 1.0000  
Epoch 49/90  
1/1 [=====] - 0s 51ms/step - loss: 7.2115e-04 - acc:  
1.0000 - recall: 1.0000 - precision: 1.0000  
Epoch 50/90  
1/1 [=====] - 0s 49ms/step - loss: 5.2029e-05 - acc:  
1.0000 - recall: 1.0000 - precision: 1.0000  
Epoch 51/90  
1/1 [=====] - 0s 48ms/step - loss: 0.0035 - acc: 1.00  
00 - recall: 1.0000 - precision: 1.0000  
Epoch 52/90  
1/1 [=====] - 0s 49ms/step - loss: 0.0078 - acc: 1.00  
00 - recall: 1.0000 - precision: 1.0000  
Epoch 53/90  
1/1 [=====] - 0s 47ms/step - loss: 2.2162e-05 - acc:  
1.0000 - recall: 1.0000 - precision: 1.0000  
Epoch 54/90  
1/1 [=====] - 0s 248ms/step - loss: 3.9378e-04 - acc:  
1.0000 - recall: 1.0000 - precision: 1.0000  
Epoch 55/90  
1/1 [=====] - 0s 54ms/step - loss: 5.1303e-04 - acc:  
1.0000 - recall: 1.0000 - precision: 1.0000  
Epoch 56/90  
1/1 [=====] - 0s 54ms/step - loss: 0.2935 - acc: 0.97  
67 - recall: 1.0000 - precision: 0.9643  
Epoch 57/90  
1/1 [=====] - 0s 47ms/step - loss: 8.6203e-04 - acc:  
1.0000 - recall: 1.0000 - precision: 1.0000  
Epoch 58/90  
1/1 [=====] - 0s 47ms/step - loss: 0.1095 - acc: 0.93  
02 - recall: 0.8889 - precision: 1.0000  
Epoch 59/90  
1/1 [=====] - 0s 48ms/step - loss: 8.7792e-04 - acc:  
1.0000 - recall: 1.0000 - precision: 1.0000  
Epoch 60/90  
1/1 [=====] - 0s 49ms/step - loss: 0.0044 - acc: 1.00  
00 - recall: 1.0000 - precision: 1.0000  
Epoch 61/90
```

```
1/1 [=====] - 0s 48ms/step - loss: 0.0321 - acc: 0.97  
67 - recall: 1.0000 - precision: 0.9643  
Epoch 62/90  
1/1 [=====] - 0s 48ms/step - loss: 0.0049 - acc: 1.00  
00 - recall: 1.0000 - precision: 1.0000  
Epoch 63/90  
1/1 [=====] - 0s 47ms/step - loss: 0.0011 - acc: 1.00  
00 - recall: 1.0000 - precision: 1.0000  
Epoch 64/90  
1/1 [=====] - 0s 48ms/step - loss: 4.3547e-04 - acc:  
1.0000 - recall: 1.0000 - precision: 1.0000  
Epoch 65/90  
1/1 [=====] - 0s 47ms/step - loss: 0.0090 - acc: 1.00  
00 - recall: 1.0000 - precision: 1.0000  
Epoch 66/90  
1/1 [=====] - 0s 47ms/step - loss: 0.0360 - acc: 0.97  
67 - recall: 0.9630 - precision: 1.0000  
Epoch 67/90  
1/1 [=====] - 0s 47ms/step - loss: 0.0037 - acc: 1.00  
00 - recall: 1.0000 - precision: 1.0000  
Epoch 68/90  
1/1 [=====] - 0s 47ms/step - loss: 0.0489 - acc: 1.00  
00 - recall: 1.0000 - precision: 1.0000  
Epoch 69/90  
1/1 [=====] - 0s 47ms/step - loss: 0.0365 - acc: 0.97  
67 - recall: 1.0000 - precision: 0.9643  
Epoch 70/90  
1/1 [=====] - 0s 49ms/step - loss: 3.5103e-04 - acc:  
1.0000 - recall: 1.0000 - precision: 1.0000  
Epoch 71/90  
1/1 [=====] - 0s 49ms/step - loss: 0.0140 - acc: 1.00  
00 - recall: 1.0000 - precision: 1.0000  
Epoch 72/90  
1/1 [=====] - 0s 49ms/step - loss: 0.1021 - acc: 0.95  
35 - recall: 0.9259 - precision: 1.0000  
Epoch 73/90  
1/1 [=====] - 0s 47ms/step - loss: 0.0308 - acc: 0.97  
67 - recall: 0.9630 - precision: 1.0000  
Epoch 74/90  
1/1 [=====] - 0s 51ms/step - loss: 0.0125 - acc: 1.00  
00 - recall: 1.0000 - precision: 1.0000  
Epoch 75/90  
1/1 [=====] - 0s 48ms/step - loss: 8.2762e-04 - acc:  
1.0000 - recall: 1.0000 - precision: 1.0000  
Epoch 76/90  
1/1 [=====] - 0s 47ms/step - loss: 0.0020 - acc: 1.00  
00 - recall: 1.0000 - precision: 1.0000  
Epoch 77/90  
1/1 [=====] - 0s 48ms/step - loss: 0.0104 - acc: 1.00  
00 - recall: 1.0000 - precision: 1.0000  
Epoch 78/90  
1/1 [=====] - 0s 47ms/step - loss: 0.0028 - acc: 1.00  
00 - recall: 1.0000 - precision: 1.0000  
Epoch 79/90  
1/1 [=====] - 0s 48ms/step - loss: 0.1301 - acc: 0.97  
67 - recall: 1.0000 - precision: 0.9643  
Epoch 80/90  
1/1 [=====] - 0s 47ms/step - loss: 0.0014 - acc: 1.00  
00 - recall: 1.0000 - precision: 1.0000  
Epoch 81/90
```

```
1/1 [=====] - 0s 47ms/step - loss: 0.0028 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 82/90
1/1 [=====] - 0s 48ms/step - loss: 5.4124e-04 - acc:
1.0000 - recall: 1.0000 - precision: 1.0000
Epoch 83/90
1/1 [=====] - 0s 47ms/step - loss: 0.0059 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 84/90
1/1 [=====] - 0s 48ms/step - loss: 0.0063 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 85/90
1/1 [=====] - 0s 47ms/step - loss: 0.0105 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 86/90
1/1 [=====] - 0s 47ms/step - loss: 0.0259 - acc: 0.97
67 - recall: 0.9630 - precision: 1.0000
Epoch 87/90
1/1 [=====] - 0s 48ms/step - loss: 0.0024 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 88/90
1/1 [=====] - 0s 47ms/step - loss: 0.0058 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 89/90
1/1 [=====] - 0s 47ms/step - loss: 0.0015 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 90/90
1/1 [=====] - 0s 47ms/step - loss: 0.0013 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
2023-03-29 01:09:54.048731: I tensorflow/core/grappler/optimizers/custom_graph_
_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
1/1 [=====] - 0s 276ms/step
2/2 [=====] - 0s 175ms/step
Epoch 1/90
2023-03-29 01:09:55.084304: I tensorflow/core/grappler/optimizers/custom_graph_
_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
```

```
1/1 [=====] - 2s 2s/step - loss: 0.6505 - acc: 0.3810
- recall: 0.4688 - precision: 0.6250
Epoch 2/90
1/1 [=====] - 0s 255ms/step - loss: 23.5721 - acc: 0.
7619 - recall: 1.0000 - precision: 0.7619
Epoch 3/90
1/1 [=====] - 0s 257ms/step - loss: 0.7884 - acc: 0.2
381 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 4/90
1/1 [=====] - 0s 252ms/step - loss: 0.6696 - acc: 0.2
619 - recall: 0.0312 - precision: 1.0000
Epoch 5/90
1/1 [=====] - 0s 169ms/step - loss: 0.6475 - acc: 0.4
762 - recall: 0.5312 - precision: 0.7083
Epoch 6/90
1/1 [=====] - 0s 148ms/step - loss: 0.6358 - acc: 0.7
381 - recall: 0.9375 - precision: 0.7692
Epoch 7/90
1/1 [=====] - 0s 141ms/step - loss: 0.6594 - acc: 0.7
381 - recall: 0.9062 - precision: 0.7838
Epoch 8/90
1/1 [=====] - 0s 154ms/step - loss: 0.7123 - acc: 0.3
095 - recall: 0.1250 - precision: 0.8000
Epoch 9/90
1/1 [=====] - 0s 131ms/step - loss: 0.6631 - acc: 0.3
571 - recall: 0.2500 - precision: 0.7273
Epoch 10/90
1/1 [=====] - 0s 77ms/step - loss: 0.6530 - acc: 0.57
14 - recall: 0.6875 - precision: 0.7333
Epoch 11/90
1/1 [=====] - 0s 234ms/step - loss: 0.6432 - acc: 0.7
143 - recall: 0.9375 - precision: 0.7500
Epoch 12/90
1/1 [=====] - 0s 219ms/step - loss: 0.6434 - acc: 0.7
619 - recall: 1.0000 - precision: 0.7619
Epoch 13/90
1/1 [=====] - 0s 156ms/step - loss: 0.6376 - acc: 0.7
619 - recall: 1.0000 - precision: 0.7619
Epoch 14/90
1/1 [=====] - 0s 134ms/step - loss: 0.6421 - acc: 0.7
619 - recall: 1.0000 - precision: 0.7619
Epoch 15/90
1/1 [=====] - 0s 54ms/step - loss: 0.6378 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 16/90
1/1 [=====] - 0s 53ms/step - loss: 0.6445 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 17/90
1/1 [=====] - 0s 150ms/step - loss: 0.6383 - acc: 0.7
619 - recall: 1.0000 - precision: 0.7619
Epoch 18/90
1/1 [=====] - 0s 52ms/step - loss: 0.6293 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 19/90
1/1 [=====] - 0s 57ms/step - loss: 0.6211 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 20/90
1/1 [=====] - 0s 52ms/step - loss: 0.6281 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 21/90
```

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1/1 [=====] - 0s 48ms/step - loss: 0.6206 - acc: 0.76  
19 - recall: 1.0000 - precision: 0.7619  
Epoch 22/90  
1/1 [=====] - 0s 75ms/step - loss: 0.6413 - acc: 0.76  
19 - recall: 1.0000 - precision: 0.7619  
Epoch 23/90  
1/1 [=====] - 0s 125ms/step - loss: 0.6554 - acc: 0.76  
19 - recall: 1.0000 - precision: 0.7619  
Epoch 24/90  
1/1 [=====] - 0s 52ms/step - loss: 0.6127 - acc: 0.76  
19 - recall: 1.0000 - precision: 0.7619  
Epoch 25/90  
1/1 [=====] - 0s 47ms/step - loss: 0.6325 - acc: 0.76  
19 - recall: 1.0000 - precision: 0.7619  
Epoch 26/90  
1/1 [=====] - 0s 53ms/step - loss: 0.6256 - acc: 0.76  
19 - recall: 1.0000 - precision: 0.7619  
Epoch 27/90  
1/1 [=====] - 0s 47ms/step - loss: 0.6423 - acc: 0.76  
19 - recall: 1.0000 - precision: 0.7619  
Epoch 28/90  
1/1 [=====] - 0s 53ms/step - loss: 0.6303 - acc: 0.76  
19 - recall: 1.0000 - precision: 0.7619  
Epoch 29/90  
1/1 [=====] - 0s 47ms/step - loss: 0.6275 - acc: 0.76  
19 - recall: 1.0000 - precision: 0.7619  
Epoch 30/90  
1/1 [=====] - 0s 50ms/step - loss: 0.6444 - acc: 0.76  
19 - recall: 1.0000 - precision: 0.7619  
Epoch 31/90  
1/1 [=====] - 0s 47ms/step - loss: 0.6443 - acc: 0.76  
19 - recall: 1.0000 - precision: 0.7619  
Epoch 32/90  
1/1 [=====] - 0s 50ms/step - loss: 0.6226 - acc: 0.76  
19 - recall: 1.0000 - precision: 0.7619  
Epoch 33/90  
1/1 [=====] - 0s 51ms/step - loss: 0.6351 - acc: 0.76  
19 - recall: 1.0000 - precision: 0.7619  
Epoch 34/90  
1/1 [=====] - 0s 47ms/step - loss: 0.6299 - acc: 0.76  
19 - recall: 1.0000 - precision: 0.7619  
Epoch 35/90  
1/1 [=====] - 0s 47ms/step - loss: 0.6488 - acc: 0.76  
19 - recall: 1.0000 - precision: 0.7619  
Epoch 36/90  
1/1 [=====] - 0s 50ms/step - loss: 0.6255 - acc: 0.76  
19 - recall: 1.0000 - precision: 0.7619  
Epoch 37/90  
1/1 [=====] - 0s 50ms/step - loss: 0.6403 - acc: 0.76  
19 - recall: 1.0000 - precision: 0.7619  
Epoch 38/90  
1/1 [=====] - 0s 48ms/step - loss: 0.6231 - acc: 0.76  
19 - recall: 1.0000 - precision: 0.7619  
Epoch 39/90  
1/1 [=====] - 0s 72ms/step - loss: 0.6234 - acc: 0.76  
19 - recall: 1.0000 - precision: 0.7619  
Epoch 40/90  
1/1 [=====] - 0s 124ms/step - loss: 0.6296 - acc: 0.76  
19 - recall: 1.0000 - precision: 0.7619  
Epoch 41/90
```

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1/1 [=====] - 0s 48ms/step - loss: 0.6296 - acc: 0.76  
19 - recall: 1.0000 - precision: 0.7619  
Epoch 42/90  
1/1 [=====] - 0s 46ms/step - loss: 0.6320 - acc: 0.76  
19 - recall: 1.0000 - precision: 0.7619  
Epoch 43/90  
1/1 [=====] - 0s 136ms/step - loss: 0.6269 - acc: 0.76  
19 - recall: 1.0000 - precision: 0.7619  
Epoch 44/90  
1/1 [=====] - 0s 46ms/step - loss: 0.6296 - acc: 0.76  
19 - recall: 1.0000 - precision: 0.7619  
Epoch 45/90  
1/1 [=====] - 0s 134ms/step - loss: 0.6209 - acc: 0.76  
19 - recall: 1.0000 - precision: 0.7619  
Epoch 46/90  
1/1 [=====] - 0s 45ms/step - loss: 0.6360 - acc: 0.76  
19 - recall: 1.0000 - precision: 0.7619  
Epoch 47/90  
1/1 [=====] - 0s 46ms/step - loss: 0.6236 - acc: 0.76  
19 - recall: 1.0000 - precision: 0.7619  
Epoch 48/90  
1/1 [=====] - 0s 46ms/step - loss: 0.6496 - acc: 0.76  
19 - recall: 1.0000 - precision: 0.7619  
Epoch 49/90  
1/1 [=====] - 0s 46ms/step - loss: 0.6281 - acc: 0.76  
19 - recall: 1.0000 - precision: 0.7619  
Epoch 50/90  
1/1 [=====] - 0s 47ms/step - loss: 0.6388 - acc: 0.76  
19 - recall: 1.0000 - precision: 0.7619  
Epoch 51/90  
1/1 [=====] - 0s 47ms/step - loss: 0.6273 - acc: 0.76  
19 - recall: 1.0000 - precision: 0.7619  
Epoch 52/90  
1/1 [=====] - 0s 46ms/step - loss: 0.6323 - acc: 0.76  
19 - recall: 1.0000 - precision: 0.7619  
Epoch 53/90  
1/1 [=====] - 0s 46ms/step - loss: 0.6370 - acc: 0.76  
19 - recall: 1.0000 - precision: 0.7619  
Epoch 54/90  
1/1 [=====] - 0s 47ms/step - loss: 0.6399 - acc: 0.76  
19 - recall: 1.0000 - precision: 0.7619  
Epoch 55/90  
1/1 [=====] - 0s 73ms/step - loss: 0.6297 - acc: 0.76  
19 - recall: 1.0000 - precision: 0.7619  
Epoch 56/90  
1/1 [=====] - 0s 47ms/step - loss: 0.6433 - acc: 0.76  
19 - recall: 1.0000 - precision: 0.7619  
Epoch 57/90  
1/1 [=====] - 0s 47ms/step - loss: 0.6329 - acc: 0.76  
19 - recall: 1.0000 - precision: 0.7619  
Epoch 58/90  
1/1 [=====] - 0s 48ms/step - loss: 0.6368 - acc: 0.76  
19 - recall: 1.0000 - precision: 0.7619  
Epoch 59/90  
1/1 [=====] - 0s 47ms/step - loss: 0.6408 - acc: 0.76  
19 - recall: 1.0000 - precision: 0.7619  
Epoch 60/90  
1/1 [=====] - 0s 46ms/step - loss: 0.6339 - acc: 0.76  
19 - recall: 1.0000 - precision: 0.7619  
Epoch 61/90
```

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1/1 [=====] - 0s 272ms/step - loss: 0.6251 - acc: 0.7  
619 - recall: 1.0000 - precision: 0.7619  
Epoch 62/90  
1/1 [=====] - 0s 48ms/step - loss: 0.6335 - acc: 0.76  
19 - recall: 1.0000 - precision: 0.7619  
Epoch 63/90  
1/1 [=====] - 0s 50ms/step - loss: 0.6271 - acc: 0.76  
19 - recall: 1.0000 - precision: 0.7619  
Epoch 64/90  
1/1 [=====] - 0s 47ms/step - loss: 0.6336 - acc: 0.76  
19 - recall: 1.0000 - precision: 0.7619  
Epoch 65/90  
1/1 [=====] - 0s 47ms/step - loss: 0.6268 - acc: 0.76  
19 - recall: 1.0000 - precision: 0.7619  
Epoch 66/90  
1/1 [=====] - 0s 46ms/step - loss: 0.6321 - acc: 0.76  
19 - recall: 1.0000 - precision: 0.7619  
Epoch 67/90  
1/1 [=====] - 0s 47ms/step - loss: 0.6332 - acc: 0.76  
19 - recall: 1.0000 - precision: 0.7619  
Epoch 68/90  
1/1 [=====] - 0s 141ms/step - loss: 0.6279 - acc: 0.7  
619 - recall: 1.0000 - precision: 0.7619  
Epoch 69/90  
1/1 [=====] - 0s 49ms/step - loss: 0.6362 - acc: 0.76  
19 - recall: 1.0000 - precision: 0.7619  
Epoch 70/90  
1/1 [=====] - 0s 47ms/step - loss: 0.6307 - acc: 0.76  
19 - recall: 1.0000 - precision: 0.7619  
Epoch 71/90  
1/1 [=====] - 0s 47ms/step - loss: 0.6197 - acc: 0.76  
19 - recall: 1.0000 - precision: 0.7619  
Epoch 72/90  
1/1 [=====] - 0s 46ms/step - loss: 0.6301 - acc: 0.76  
19 - recall: 1.0000 - precision: 0.7619  
Epoch 73/90  
1/1 [=====] - 0s 47ms/step - loss: 0.6451 - acc: 0.76  
19 - recall: 1.0000 - precision: 0.7619  
Epoch 74/90  
1/1 [=====] - 0s 46ms/step - loss: 0.6438 - acc: 0.76  
19 - recall: 1.0000 - precision: 0.7619  
Epoch 75/90  
1/1 [=====] - 0s 46ms/step - loss: 0.6434 - acc: 0.76  
19 - recall: 1.0000 - precision: 0.7619  
Epoch 76/90  
1/1 [=====] - 0s 45ms/step - loss: 0.6411 - acc: 0.76  
19 - recall: 1.0000 - precision: 0.7619  
Epoch 77/90  
1/1 [=====] - 0s 47ms/step - loss: 0.6250 - acc: 0.76  
19 - recall: 1.0000 - precision: 0.7619  
Epoch 78/90  
1/1 [=====] - 0s 47ms/step - loss: 0.6240 - acc: 0.76  
19 - recall: 1.0000 - precision: 0.7619  
Epoch 79/90  
1/1 [=====] - 0s 47ms/step - loss: 0.6298 - acc: 0.76  
19 - recall: 1.0000 - precision: 0.7619  
Epoch 80/90  
1/1 [=====] - 0s 46ms/step - loss: 0.6350 - acc: 0.76  
19 - recall: 1.0000 - precision: 0.7619  
Epoch 81/90
```

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1/1 [=====] - 0s 47ms/step - loss: 0.6357 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 82/90
1/1 [=====] - 0s 46ms/step - loss: 0.6169 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 83/90
1/1 [=====] - 0s 46ms/step - loss: 0.6335 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 84/90
1/1 [=====] - 0s 46ms/step - loss: 0.6373 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 85/90
1/1 [=====] - 0s 46ms/step - loss: 0.6409 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 86/90
1/1 [=====] - 0s 45ms/step - loss: 0.6349 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 87/90
1/1 [=====] - 0s 47ms/step - loss: 0.6400 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 88/90
1/1 [=====] - 0s 46ms/step - loss: 0.6306 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 89/90
1/1 [=====] - 0s 48ms/step - loss: 0.6299 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 90/90
1/1 [=====] - 0s 46ms/step - loss: 0.6308 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
2023-03-29 01:10:03.606718: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
1/1 [=====] - 0s 286ms/step
2/2 [=====] - 0s 179ms/step
Epoch 1/90
2023-03-29 01:10:04.688276: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
```

```
1/1 [=====] - 2s 2s/step - loss: 0.7028 - acc: 0.5349
- recall: 0.6207 - precision: 0.6667
Epoch 2/90
1/1 [=====] - 0s 266ms/step - loss: 17.4490 - acc: 0.
3256 - recall: 0.1379 - precision: 0.5000
Epoch 3/90
1/1 [=====] - 0s 216ms/step - loss: 0.8125 - acc: 0.6
744 - recall: 1.0000 - precision: 0.6744
Epoch 4/90
1/1 [=====] - 0s 239ms/step - loss: 0.7096 - acc: 0.6
744 - recall: 1.0000 - precision: 0.6744
Epoch 5/90
1/1 [=====] - 0s 155ms/step - loss: 0.7058 - acc: 0.6
744 - recall: 1.0000 - precision: 0.6744
Epoch 6/90
1/1 [=====] - 0s 270ms/step - loss: 0.7014 - acc: 0.5
349 - recall: 0.5172 - precision: 0.7143
Epoch 7/90
1/1 [=====] - 0s 162ms/step - loss: 0.7025 - acc: 0.4
186 - recall: 0.4828 - precision: 0.5833
Epoch 8/90
1/1 [=====] - 0s 85ms/step - loss: 0.7037 - acc: 0.53
49 - recall: 0.5862 - precision: 0.6800
Epoch 9/90
1/1 [=====] - 0s 168ms/step - loss: 0.6992 - acc: 0.4
419 - recall: 0.3793 - precision: 0.6471
Epoch 10/90
1/1 [=====] - 0s 77ms/step - loss: 0.6997 - acc: 0.34
88 - recall: 0.1379 - precision: 0.5714
Epoch 11/90
1/1 [=====] - 0s 155ms/step - loss: 0.7070 - acc: 0.3
256 - recall: 0.0690 - precision: 0.5000
Epoch 12/90
1/1 [=====] - 0s 165ms/step - loss: 0.7082 - acc: 0.3
488 - recall: 0.1034 - precision: 0.6000
Epoch 13/90
1/1 [=====] - 0s 131ms/step - loss: 0.7004 - acc: 0.3
953 - recall: 0.1034 - precision: 1.0000
Epoch 14/90
1/1 [=====] - 0s 75ms/step - loss: 0.7004 - acc: 0.32
56 - recall: 0.0345 - precision: 0.5000
Epoch 15/90
1/1 [=====] - 0s 101ms/step - loss: 0.7023 - acc: 0.3
256 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 16/90
1/1 [=====] - 0s 50ms/step - loss: 0.7010 - acc: 0.48
84 - recall: 0.5172 - precision: 0.6522
Epoch 17/90
1/1 [=====] - 0s 146ms/step - loss: 1.1065 - acc: 0.6
744 - recall: 1.0000 - precision: 0.6744
Epoch 18/90
1/1 [=====] - 0s 54ms/step - loss: 0.6928 - acc: 0.32
56 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 19/90
1/1 [=====] - 0s 162ms/step - loss: 0.7080 - acc: 0.3
256 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 20/90
1/1 [=====] - 0s 48ms/step - loss: 0.6977 - acc: 0.39
53 - recall: 0.1034 - precision: 1.0000
Epoch 21/90
```

```
1/1 [=====] - 0s 49ms/step - loss: 5.0945 - acc: 0.39
53 - recall: 0.1724 - precision: 0.7143
Epoch 22/90
1/1 [=====] - 0s 51ms/step - loss: 0.7053 - acc: 0.32
56 - recall: 0.1034 - precision: 0.5000
Epoch 23/90
1/1 [=====] - 0s 125ms/step - loss: 0.6947 - acc: 0.5
116 - recall: 0.3448 - precision: 0.8333
Epoch 24/90
1/1 [=====] - 0s 47ms/step - loss: 0.7031 - acc: 0.51
16 - recall: 0.5517 - precision: 0.6667
Epoch 25/90
1/1 [=====] - 0s 140ms/step - loss: 0.7032 - acc: 0.6
512 - recall: 0.8276 - precision: 0.7059
Epoch 26/90
1/1 [=====] - 0s 137ms/step - loss: 0.7147 - acc: 0.5
581 - recall: 0.8276 - precision: 0.6316
Epoch 27/90
1/1 [=====] - 0s 126ms/step - loss: 0.7049 - acc: 0.6
279 - recall: 0.8966 - precision: 0.6667
Epoch 28/90
1/1 [=====] - 0s 167ms/step - loss: 0.7103 - acc: 0.6
512 - recall: 0.9310 - precision: 0.6750
Epoch 29/90
1/1 [=====] - 0s 48ms/step - loss: 0.6992 - acc: 0.55
81 - recall: 0.7241 - precision: 0.6562
Epoch 30/90
1/1 [=====] - 0s 49ms/step - loss: 0.7025 - acc: 0.48
84 - recall: 0.5172 - precision: 0.6522
Epoch 31/90
1/1 [=====] - 0s 49ms/step - loss: 0.7010 - acc: 0.51
16 - recall: 0.6207 - precision: 0.6429
Epoch 32/90
1/1 [=====] - 0s 47ms/step - loss: 0.9450 - acc: 0.67
44 - recall: 1.0000 - precision: 0.6744
Epoch 33/90
1/1 [=====] - 0s 50ms/step - loss: 0.7026 - acc: 0.41
86 - recall: 0.3448 - precision: 0.6250
Epoch 34/90
1/1 [=====] - 0s 150ms/step - loss: 0.7045 - acc: 0.6
977 - recall: 1.0000 - precision: 0.6905
Epoch 35/90
1/1 [=====] - 0s 47ms/step - loss: 0.7064 - acc: 0.55
81 - recall: 0.7586 - precision: 0.6471
Epoch 36/90
1/1 [=====] - 0s 47ms/step - loss: 0.7019 - acc: 0.58
14 - recall: 0.6897 - precision: 0.6897
Epoch 37/90
1/1 [=====] - 0s 47ms/step - loss: 0.7037 - acc: 0.32
56 - recall: 0.2414 - precision: 0.5000
Epoch 38/90
1/1 [=====] - 0s 51ms/step - loss: 0.6974 - acc: 0.41
86 - recall: 0.1379 - precision: 1.0000
Epoch 39/90
1/1 [=====] - 0s 52ms/step - loss: 0.7002 - acc: 0.34
88 - recall: 0.0345 - precision: 1.0000
Epoch 40/90
1/1 [=====] - 0s 79ms/step - loss: 0.6998 - acc: 0.32
56 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 41/90
```

```
1/1 [=====] - 0s 49ms/step - loss: 0.7003 - acc: 0.32
56 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 42/90
1/1 [=====] - 0s 46ms/step - loss: 0.7041 - acc: 0.32
56 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 43/90
1/1 [=====] - 0s 47ms/step - loss: 0.7000 - acc: 0.32
56 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 44/90
1/1 [=====] - 0s 48ms/step - loss: 0.7020 - acc: 0.32
56 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 45/90
1/1 [=====] - 0s 50ms/step - loss: 0.7000 - acc: 0.32
56 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 46/90
1/1 [=====] - 0s 46ms/step - loss: 0.7016 - acc: 0.32
56 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 47/90
1/1 [=====] - 0s 50ms/step - loss: 0.6983 - acc: 0.41
86 - recall: 0.1724 - precision: 0.8333
Epoch 48/90
1/1 [=====] - 0s 50ms/step - loss: 0.7347 - acc: 0.67
44 - recall: 1.0000 - precision: 0.6744
Epoch 49/90
1/1 [=====] - 0s 57ms/step - loss: 0.6957 - acc: 0.32
56 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 50/90
1/1 [=====] - 0s 67ms/step - loss: 0.7011 - acc: 0.32
56 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 51/90
1/1 [=====] - 0s 48ms/step - loss: 0.6988 - acc: 0.32
56 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 52/90
1/1 [=====] - 0s 48ms/step - loss: 0.7040 - acc: 0.32
56 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 53/90
1/1 [=====] - 0s 48ms/step - loss: 0.7016 - acc: 0.32
56 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 54/90
1/1 [=====] - 0s 48ms/step - loss: 0.7012 - acc: 0.32
56 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 55/90
1/1 [=====] - 0s 49ms/step - loss: 0.6977 - acc: 0.32
56 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 56/90
1/1 [=====] - 0s 48ms/step - loss: 0.7041 - acc: 0.32
56 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 57/90
1/1 [=====] - 0s 47ms/step - loss: 0.7057 - acc: 0.32
56 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 58/90
1/1 [=====] - 0s 48ms/step - loss: 0.6979 - acc: 0.32
56 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 59/90
1/1 [=====] - 0s 47ms/step - loss: 0.7011 - acc: 0.32
56 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 60/90
1/1 [=====] - 0s 48ms/step - loss: 0.6993 - acc: 0.32
56 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 61/90
```

```
1/1 [=====] - 0s 48ms/step - loss: 0.7023 - acc: 0.32
56 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 62/90
1/1 [=====] - 0s 48ms/step - loss: 0.7009 - acc: 0.32
56 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 63/90
1/1 [=====] - 0s 48ms/step - loss: 0.7068 - acc: 0.30
23 - recall: 0.2069 - precision: 0.4615
Epoch 64/90
1/1 [=====] - 0s 47ms/step - loss: 0.7082 - acc: 0.25
58 - recall: 0.1379 - precision: 0.3636
Epoch 65/90
1/1 [=====] - 0s 49ms/step - loss: 0.6975 - acc: 0.34
88 - recall: 0.0345 - precision: 1.0000
Epoch 66/90
1/1 [=====] - 0s 50ms/step - loss: 0.7029 - acc: 0.32
56 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 67/90
1/1 [=====] - 0s 48ms/step - loss: 0.7013 - acc: 0.32
56 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 68/90
1/1 [=====] - 0s 48ms/step - loss: 0.6984 - acc: 0.32
56 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 69/90
1/1 [=====] - 0s 48ms/step - loss: 0.7015 - acc: 0.32
56 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 70/90
1/1 [=====] - 0s 48ms/step - loss: 0.7012 - acc: 0.32
56 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 71/90
1/1 [=====] - 0s 50ms/step - loss: 0.6978 - acc: 0.32
56 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 72/90
1/1 [=====] - 0s 48ms/step - loss: 0.7057 - acc: 0.30
23 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 73/90
1/1 [=====] - 0s 47ms/step - loss: 0.7003 - acc: 0.32
56 - recall: 0.0345 - precision: 0.5000
Epoch 74/90
1/1 [=====] - 0s 47ms/step - loss: 0.6954 - acc: 0.37
21 - recall: 0.0690 - precision: 1.0000
Epoch 75/90
1/1 [=====] - 0s 52ms/step - loss: 0.6988 - acc: 0.37
21 - recall: 0.1034 - precision: 0.7500
Epoch 76/90
1/1 [=====] - 0s 48ms/step - loss: 0.7037 - acc: 0.41
86 - recall: 0.2069 - precision: 0.7500
Epoch 77/90
1/1 [=====] - 0s 48ms/step - loss: 0.7013 - acc: 0.41
86 - recall: 0.2414 - precision: 0.7000
Epoch 78/90
1/1 [=====] - 0s 48ms/step - loss: 0.7021 - acc: 0.37
21 - recall: 0.1724 - precision: 0.6250
Epoch 79/90
1/1 [=====] - 0s 47ms/step - loss: 0.7047 - acc: 0.41
86 - recall: 0.2414 - precision: 0.7000
Epoch 80/90
1/1 [=====] - 0s 48ms/step - loss: 0.7025 - acc: 0.32
56 - recall: 0.1379 - precision: 0.5000
Epoch 81/90
```

```
1/1 [=====] - 0s 152ms/step - loss: 0.6979 - acc: 0.4  
651 - recall: 0.2414 - precision: 0.8750  
Epoch 82/90  
1/1 [=====] - 0s 140ms/step - loss: 0.6969 - acc: 0.3  
953 - recall: 0.1379 - precision: 0.8000  
Epoch 83/90  
1/1 [=====] - 0s 50ms/step - loss: 0.6993 - acc: 0.41  
86 - recall: 0.1379 - precision: 1.0000  
Epoch 84/90  
1/1 [=====] - 0s 48ms/step - loss: 0.6991 - acc: 0.39  
53 - recall: 0.1379 - precision: 0.8000  
Epoch 85/90  
1/1 [=====] - 0s 48ms/step - loss: 0.7001 - acc: 0.41  
86 - recall: 0.3103 - precision: 0.6429  
Epoch 86/90  
1/1 [=====] - 0s 47ms/step - loss: 0.7095 - acc: 0.39  
53 - recall: 0.4483 - precision: 0.5652  
Epoch 87/90  
1/1 [=====] - 0s 48ms/step - loss: 0.6974 - acc: 0.60  
47 - recall: 0.6897 - precision: 0.7143  
Epoch 88/90  
1/1 [=====] - 0s 47ms/step - loss: 0.7004 - acc: 0.51  
16 - recall: 0.6207 - precision: 0.6429  
Epoch 89/90  
1/1 [=====] - 0s 47ms/step - loss: 0.6936 - acc: 0.55  
81 - recall: 0.5517 - precision: 0.7273  
Epoch 90/90  
1/1 [=====] - 0s 48ms/step - loss: 0.7039 - acc: 0.39  
53 - recall: 0.3448 - precision: 0.5882  
2023-03-29 01:10:13.275835: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.  
1/1 [=====] - 0s 293ms/step  
2/2 [=====] - 0s 170ms/step  
Epoch 1/90  
2023-03-29 01:10:14.364206: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
```

```
1/1 [=====] - 2s 2s/step - loss: 0.7281 - acc: 0.5581
- recall: 0.5185 - precision: 0.7000
Epoch 2/90
1/1 [=====] - 0s 271ms/step - loss: 54.4978 - acc: 0.
3953 - recall: 0.0370 - precision: 1.0000
Epoch 3/90
1/1 [=====] - 0s 252ms/step - loss: 0.8251 - acc: 0.6
279 - recall: 1.0000 - precision: 0.6279
Epoch 4/90
1/1 [=====] - 0s 81ms/step - loss: 0.9478 - acc: 0.60
47 - recall: 0.9630 - precision: 0.6190
Epoch 5/90
1/1 [=====] - 0s 245ms/step - loss: 0.7253 - acc: 0.5
814 - recall: 0.7037 - precision: 0.6552
Epoch 6/90
1/1 [=====] - 0s 168ms/step - loss: 0.7281 - acc: 0.3
953 - recall: 0.1111 - precision: 0.6000
Epoch 7/90
1/1 [=====] - 0s 216ms/step - loss: 0.7129 - acc: 0.3
721 - recall: 0.0370 - precision: 0.5000
Epoch 8/90
1/1 [=====] - 0s 74ms/step - loss: 0.7678 - acc: 0.44
19 - recall: 0.1111 - precision: 1.0000
Epoch 9/90
1/1 [=====] - 0s 55ms/step - loss: 0.6981 - acc: 0.60
47 - recall: 0.4815 - precision: 0.8125
Epoch 10/90
1/1 [=====] - 0s 50ms/step - loss: 0.7536 - acc: 0.53
49 - recall: 0.8148 - precision: 0.5946
Epoch 11/90
1/1 [=====] - 0s 142ms/step - loss: 0.7236 - acc: 0.5
814 - recall: 0.7407 - precision: 0.6452
Epoch 12/90
1/1 [=====] - 0s 144ms/step - loss: 0.7338 - acc: 0.4
419 - recall: 0.4074 - precision: 0.5789
Epoch 13/90
1/1 [=====] - 0s 54ms/step - loss: 0.7252 - acc: 0.34
88 - recall: 0.0370 - precision: 0.3333
Epoch 14/90
1/1 [=====] - 0s 56ms/step - loss: 0.7210 - acc: 0.37
21 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 15/90
1/1 [=====] - 0s 73ms/step - loss: 0.7241 - acc: 0.37
21 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 16/90
1/1 [=====] - 0s 128ms/step - loss: 0.7206 - acc: 0.3
721 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 17/90
1/1 [=====] - 0s 50ms/step - loss: 0.7386 - acc: 0.34
88 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 18/90
1/1 [=====] - 0s 129ms/step - loss: 0.7145 - acc: 0.3
721 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 19/90
1/1 [=====] - 0s 146ms/step - loss: 0.7160 - acc: 0.3
721 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 20/90
1/1 [=====] - 0s 52ms/step - loss: 0.7166 - acc: 0.37
21 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 21/90
```

```
1/1 [=====] - 0s 224ms/step - loss: 0.7163 - acc: 0.3  
721 - recall: 0.0000e+00 - precision: 0.0000e+00  
Epoch 22/90  
1/1 [=====] - 0s 54ms/step - loss: 0.7240 - acc: 0.37  
21 - recall: 0.0000e+00 - precision: 0.0000e+00  
Epoch 23/90  
1/1 [=====] - 0s 140ms/step - loss: 0.7286 - acc: 0.3  
721 - recall: 0.0000e+00 - precision: 0.0000e+00  
Epoch 24/90  
1/1 [=====] - 0s 144ms/step - loss: 0.7441 - acc: 0.3  
721 - recall: 0.0000e+00 - precision: 0.0000e+00  
Epoch 25/90  
1/1 [=====] - 0s 160ms/step - loss: 0.7235 - acc: 0.3  
721 - recall: 0.0000e+00 - precision: 0.0000e+00  
Epoch 26/90  
1/1 [=====] - 0s 72ms/step - loss: 0.7240 - acc: 0.37  
21 - recall: 0.0000e+00 - precision: 0.0000e+00  
Epoch 27/90  
1/1 [=====] - 0s 74ms/step - loss: 0.7221 - acc: 0.37  
21 - recall: 0.0000e+00 - precision: 0.0000e+00  
Epoch 28/90  
1/1 [=====] - 0s 49ms/step - loss: 0.7298 - acc: 0.37  
21 - recall: 0.0000e+00 - precision: 0.0000e+00  
Epoch 29/90  
1/1 [=====] - 0s 50ms/step - loss: 0.7186 - acc: 0.37  
21 - recall: 0.0000e+00 - precision: 0.0000e+00  
Epoch 30/90  
1/1 [=====] - 0s 122ms/step - loss: 0.7206 - acc: 0.3  
721 - recall: 0.0000e+00 - precision: 0.0000e+00  
Epoch 31/90  
1/1 [=====] - 0s 48ms/step - loss: 0.7263 - acc: 0.37  
21 - recall: 0.0000e+00 - precision: 0.0000e+00  
Epoch 32/90  
1/1 [=====] - 0s 48ms/step - loss: 0.7130 - acc: 0.37  
21 - recall: 0.0000e+00 - precision: 0.0000e+00  
Epoch 33/90  
1/1 [=====] - 0s 50ms/step - loss: 0.7160 - acc: 0.37  
21 - recall: 0.0000e+00 - precision: 0.0000e+00  
Epoch 34/90  
1/1 [=====] - 0s 48ms/step - loss: 0.7185 - acc: 0.37  
21 - recall: 0.0000e+00 - precision: 0.0000e+00  
Epoch 35/90  
1/1 [=====] - 0s 48ms/step - loss: 0.7227 - acc: 0.37  
21 - recall: 0.0000e+00 - precision: 0.0000e+00  
Epoch 36/90  
1/1 [=====] - 0s 51ms/step - loss: 0.7225 - acc: 0.37  
21 - recall: 0.0000e+00 - precision: 0.0000e+00  
Epoch 37/90  
1/1 [=====] - 0s 132ms/step - loss: 0.7278 - acc: 0.3  
721 - recall: 0.0000e+00 - precision: 0.0000e+00  
Epoch 38/90  
1/1 [=====] - 0s 49ms/step - loss: 0.7236 - acc: 0.37  
21 - recall: 0.0000e+00 - precision: 0.0000e+00  
Epoch 39/90  
1/1 [=====] - 0s 128ms/step - loss: 0.7228 - acc: 0.3  
721 - recall: 0.0000e+00 - precision: 0.0000e+00  
Epoch 40/90  
1/1 [=====] - 0s 48ms/step - loss: 0.7203 - acc: 0.37  
21 - recall: 0.0000e+00 - precision: 0.0000e+00  
Epoch 41/90
```

```
1/1 [=====] - 0s 50ms/step - loss: 0.7181 - acc: 0.37
21 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 42/90
1/1 [=====] - 0s 49ms/step - loss: 0.7217 - acc: 0.37
21 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 43/90
1/1 [=====] - 0s 48ms/step - loss: 0.7186 - acc: 0.37
21 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 44/90
1/1 [=====] - 0s 48ms/step - loss: 0.7245 - acc: 0.37
21 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 45/90
1/1 [=====] - 0s 48ms/step - loss: 0.7221 - acc: 0.37
21 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 46/90
1/1 [=====] - 0s 48ms/step - loss: 0.7159 - acc: 0.37
21 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 47/90
1/1 [=====] - 0s 48ms/step - loss: 0.7183 - acc: 0.37
21 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 48/90
1/1 [=====] - 0s 49ms/step - loss: 0.7202 - acc: 0.37
21 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 49/90
1/1 [=====] - 0s 47ms/step - loss: 0.7241 - acc: 0.37
21 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 50/90
1/1 [=====] - 0s 48ms/step - loss: 0.7159 - acc: 0.37
21 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 51/90
1/1 [=====] - 0s 48ms/step - loss: 0.7242 - acc: 0.37
21 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 52/90
1/1 [=====] - 0s 48ms/step - loss: 0.7206 - acc: 0.37
21 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 53/90
1/1 [=====] - 0s 47ms/step - loss: 0.7162 - acc: 0.37
21 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 54/90
1/1 [=====] - 0s 48ms/step - loss: 0.7170 - acc: 0.37
21 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 55/90
1/1 [=====] - 0s 47ms/step - loss: 0.7209 - acc: 0.37
21 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 56/90
1/1 [=====] - 0s 48ms/step - loss: 0.7174 - acc: 0.37
21 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 57/90
1/1 [=====] - 0s 47ms/step - loss: 0.7134 - acc: 0.37
21 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 58/90
1/1 [=====] - 0s 47ms/step - loss: 0.7174 - acc: 0.37
21 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 59/90
1/1 [=====] - 0s 49ms/step - loss: 0.7173 - acc: 0.37
21 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 60/90
1/1 [=====] - 0s 47ms/step - loss: 0.7209 - acc: 0.37
21 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 61/90
```

```
1/1 [=====] - 0s 48ms/step - loss: 0.7213 - acc: 0.37
21 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 62/90
1/1 [=====] - 0s 48ms/step - loss: 0.7194 - acc: 0.37
21 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 63/90
1/1 [=====] - 0s 47ms/step - loss: 0.7203 - acc: 0.37
21 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 64/90
1/1 [=====] - 0s 74ms/step - loss: 0.7261 - acc: 0.37
21 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 65/90
1/1 [=====] - 0s 47ms/step - loss: 0.7117 - acc: 0.37
21 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 66/90
1/1 [=====] - 0s 48ms/step - loss: 0.7240 - acc: 0.37
21 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 67/90
1/1 [=====] - 0s 48ms/step - loss: 0.7198 - acc: 0.37
21 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 68/90
1/1 [=====] - 0s 48ms/step - loss: 0.7208 - acc: 0.37
21 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 69/90
1/1 [=====] - 0s 47ms/step - loss: 0.7182 - acc: 0.37
21 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 70/90
1/1 [=====] - 0s 47ms/step - loss: 0.7158 - acc: 0.37
21 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 71/90
1/1 [=====] - 0s 47ms/step - loss: 0.7266 - acc: 0.37
21 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 72/90
1/1 [=====] - 0s 49ms/step - loss: 0.7170 - acc: 0.37
21 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 73/90
1/1 [=====] - 0s 47ms/step - loss: 0.7215 - acc: 0.37
21 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 74/90
1/1 [=====] - 0s 149ms/step - loss: 0.7142 - acc: 0.3
721 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 75/90
1/1 [=====] - 0s 49ms/step - loss: 0.7262 - acc: 0.37
21 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 76/90
1/1 [=====] - 0s 47ms/step - loss: 0.7218 - acc: 0.37
21 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 77/90
1/1 [=====] - 0s 48ms/step - loss: 0.7204 - acc: 0.37
21 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 78/90
1/1 [=====] - 0s 48ms/step - loss: 0.7215 - acc: 0.37
21 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 79/90
1/1 [=====] - 0s 48ms/step - loss: 0.7208 - acc: 0.37
21 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 80/90
1/1 [=====] - 0s 47ms/step - loss: 0.7228 - acc: 0.37
21 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 81/90
```

```
1/1 [=====] - 0s 48ms/step - loss: 0.7249 - acc: 0.37
21 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 82/90
1/1 [=====] - 0s 47ms/step - loss: 0.7135 - acc: 0.37
21 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 83/90
1/1 [=====] - 0s 48ms/step - loss: 0.7189 - acc: 0.37
21 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 84/90
1/1 [=====] - 0s 46ms/step - loss: 0.7252 - acc: 0.37
21 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 85/90
1/1 [=====] - 0s 47ms/step - loss: 0.7148 - acc: 0.37
21 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 86/90
1/1 [=====] - 0s 47ms/step - loss: 0.7191 - acc: 0.37
21 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 87/90
1/1 [=====] - 0s 47ms/step - loss: 0.7278 - acc: 0.37
21 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 88/90
1/1 [=====] - 0s 48ms/step - loss: 0.7275 - acc: 0.37
21 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 89/90
1/1 [=====] - 0s 48ms/step - loss: 0.7231 - acc: 0.37
21 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 90/90
1/1 [=====] - 0s 47ms/step - loss: 0.7234 - acc: 0.37
21 - recall: 0.0000e+00 - precision: 0.0000e+00
2023-03-29 01:10:22.605641: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
1/1 [=====] - 0s 374ms/step
2/2 [=====] - 0s 163ms/step
Epoch 1/90
2023-03-29 01:10:24.283495: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
```

```
1/1 [=====] - 2s 2s/step - loss: 0.6502 - acc: 0.4286
- recall: 0.5000 - precision: 0.6667
Epoch 2/90
1/1 [=====] - 0s 261ms/step - loss: 102357680.0000 -
acc: 0.7619 - recall: 1.0000 - precision: 0.7619
Epoch 3/90
1/1 [=====] - 0s 177ms/step - loss: 13674.0713 - acc:
0.2381 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 4/90
1/1 [=====] - 0s 259ms/step - loss: 525595.6250 - ac
c: 0.2143 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 5/90
1/1 [=====] - 0s 140ms/step - loss: 419296.6875 - ac
c: 0.7381 - recall: 0.9688 - precision: 0.7561
Epoch 6/90
1/1 [=====] - 0s 140ms/step - loss: 255544.4375 - ac
c: 0.5476 - recall: 0.6250 - precision: 0.7407
Epoch 7/90
1/1 [=====] - 0s 167ms/step - loss: 56981296.0000 - a
cc: 0.2381 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 8/90
1/1 [=====] - 0s 226ms/step - loss: 42228.4766 - acc:
0.3095 - recall: 0.1250 - precision: 0.8000
Epoch 9/90
1/1 [=====] - 0s 80ms/step - loss: 2299485.5000 - ac
c: 0.2381 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 10/90
1/1 [=====] - 0s 168ms/step - loss: 3503.8569 - acc:
0.3095 - recall: 0.1250 - precision: 0.8000
Epoch 11/90
1/1 [=====] - 0s 60ms/step - loss: 277.9178 - acc: 0.
5238 - recall: 0.5625 - precision: 0.7500
Epoch 12/90
1/1 [=====] - 0s 54ms/step - loss: 3580.2798 - acc:
0.4762 - recall: 0.3750 - precision: 0.8571
Epoch 13/90
1/1 [=====] - 0s 81ms/step - loss: 1274.5269 - acc:
0.6667 - recall: 0.8125 - precision: 0.7647
Epoch 14/90
1/1 [=====] - 0s 237ms/step - loss: 1503.0038 - acc:
0.7143 - recall: 0.9375 - precision: 0.7500
Epoch 15/90
1/1 [=====] - 0s 51ms/step - loss: 2126.0901 - acc:
0.7381 - recall: 0.9688 - precision: 0.7561
Epoch 16/90
1/1 [=====] - 0s 48ms/step - loss: 872.8498 - acc: 0.
7619 - recall: 1.0000 - precision: 0.7619
Epoch 17/90
1/1 [=====] - 0s 221ms/step - loss: 86.0257 - acc: 0.
7381 - recall: 0.9062 - precision: 0.7838
Epoch 18/90
1/1 [=====] - 0s 50ms/step - loss: 114.7668 - acc: 0.
3333 - recall: 0.2812 - precision: 0.6429
Epoch 19/90
1/1 [=====] - 0s 76ms/step - loss: 76.4247 - acc: 0.6
667 - recall: 0.8438 - precision: 0.7500
Epoch 20/90
1/1 [=====] - 0s 149ms/step - loss: 72.1102 - acc: 0.
6429 - recall: 0.8125 - precision: 0.7429
Epoch 21/90
```

```
1/1 [=====] - 0s 46ms/step - loss: 86.4686 - acc: 0.5  
476 - recall: 0.6875 - precision: 0.7097  
Epoch 22/90  
1/1 [=====] - 0s 59ms/step - loss: 49.9689 - acc: 0.3  
571 - recall: 0.2500 - precision: 0.7273  
Epoch 23/90  
1/1 [=====] - 0s 46ms/step - loss: 12.5521 - acc: 0.3  
571 - recall: 0.2500 - precision: 0.7273  
Epoch 24/90  
1/1 [=====] - 0s 130ms/step - loss: 1.3024 - acc: 0.4  
524 - recall: 0.3438 - precision: 0.8462  
Epoch 25/90  
1/1 [=====] - 0s 72ms/step - loss: 0.8779 - acc: 0.45  
24 - recall: 0.3750 - precision: 0.8000  
Epoch 26/90  
1/1 [=====] - 0s 149ms/step - loss: 0.6843 - acc: 0.5  
714 - recall: 0.5625 - precision: 0.8182  
Epoch 27/90  
1/1 [=====] - 0s 49ms/step - loss: 5.1457 - acc: 0.66  
67 - recall: 0.8750 - precision: 0.7368  
Epoch 28/90  
1/1 [=====] - 0s 48ms/step - loss: 4.8471 - acc: 0.71  
43 - recall: 0.9062 - precision: 0.7632  
Epoch 29/90  
1/1 [=====] - 0s 76ms/step - loss: 0.7647 - acc: 0.61  
90 - recall: 0.6562 - precision: 0.8077  
Epoch 30/90  
1/1 [=====] - 0s 48ms/step - loss: 0.7817 - acc: 0.71  
43 - recall: 0.8438 - precision: 0.7941  
Epoch 31/90  
1/1 [=====] - 0s 49ms/step - loss: 4.1144 - acc: 0.66  
67 - recall: 0.8750 - precision: 0.7368  
Epoch 32/90  
1/1 [=====] - 0s 46ms/step - loss: 0.8294 - acc: 0.42  
86 - recall: 0.4062 - precision: 0.7222  
Epoch 33/90  
1/1 [=====] - 0s 46ms/step - loss: 0.7297 - acc: 0.42  
86 - recall: 0.3125 - precision: 0.8333  
Epoch 34/90  
1/1 [=====] - 0s 47ms/step - loss: 0.7691 - acc: 0.38  
10 - recall: 0.3438 - precision: 0.6875  
Epoch 35/90  
1/1 [=====] - 0s 46ms/step - loss: 0.7138 - acc: 0.42  
86 - recall: 0.4375 - precision: 0.7000  
Epoch 36/90  
1/1 [=====] - 0s 128ms/step - loss: 0.6442 - acc: 0.5  
714 - recall: 0.5938 - precision: 0.7917  
Epoch 37/90  
1/1 [=====] - 0s 50ms/step - loss: 0.7396 - acc: 0.50  
00 - recall: 0.6562 - precision: 0.6774  
Epoch 38/90  
1/1 [=====] - 0s 130ms/step - loss: 0.7049 - acc: 0.6  
429 - recall: 0.7812 - precision: 0.7576  
Epoch 39/90  
1/1 [=====] - 0s 47ms/step - loss: 0.6970 - acc: 0.66  
67 - recall: 0.8125 - precision: 0.7647  
Epoch 40/90  
1/1 [=====] - 0s 47ms/step - loss: 0.6579 - acc: 0.64  
29 - recall: 0.8125 - precision: 0.7429  
Epoch 41/90
```

```
1/1 [=====] - 0s 47ms/step - loss: 0.6562 - acc: 0.64
29 - recall: 0.8125 - precision: 0.7429
Epoch 42/90
1/1 [=====] - 0s 49ms/step - loss: 0.6331 - acc: 0.71
43 - recall: 0.8750 - precision: 0.7778
Epoch 43/90
1/1 [=====] - 0s 136ms/step - loss: 0.7432 - acc: 0.6
190 - recall: 0.8125 - precision: 0.7222
Epoch 44/90
1/1 [=====] - 0s 47ms/step - loss: 0.5366 - acc: 0.80
95 - recall: 0.9375 - precision: 0.8333
Epoch 45/90
1/1 [=====] - 0s 49ms/step - loss: 0.6622 - acc: 0.69
05 - recall: 0.8438 - precision: 0.7714
Epoch 46/90
1/1 [=====] - 0s 47ms/step - loss: 0.5920 - acc: 0.71
43 - recall: 0.8438 - precision: 0.7941
Epoch 47/90
1/1 [=====] - 0s 47ms/step - loss: 0.6281 - acc: 0.64
29 - recall: 0.7812 - precision: 0.7576
Epoch 48/90
1/1 [=====] - 0s 47ms/step - loss: 0.6441 - acc: 0.61
90 - recall: 0.7500 - precision: 0.7500
Epoch 49/90
1/1 [=====] - 0s 49ms/step - loss: 0.6130 - acc: 0.71
43 - recall: 0.8125 - precision: 0.8125
Epoch 50/90
1/1 [=====] - 0s 50ms/step - loss: 0.6878 - acc: 0.50
00 - recall: 0.6562 - precision: 0.6774
Epoch 51/90
1/1 [=====] - 0s 48ms/step - loss: 0.6263 - acc: 0.71
43 - recall: 0.8125 - precision: 0.8125
Epoch 52/90
1/1 [=====] - 0s 125ms/step - loss: 0.6725 - acc: 0.5
714 - recall: 0.7188 - precision: 0.7188
Epoch 53/90
1/1 [=====] - 0s 48ms/step - loss: 0.6419 - acc: 0.69
05 - recall: 0.8125 - precision: 0.7879
Epoch 54/90
1/1 [=====] - 0s 48ms/step - loss: 0.6327 - acc: 0.64
29 - recall: 0.7812 - precision: 0.7576
Epoch 55/90
1/1 [=====] - 0s 49ms/step - loss: 0.6100 - acc: 0.73
81 - recall: 0.9062 - precision: 0.7838
Epoch 56/90
1/1 [=====] - 0s 48ms/step - loss: 0.6371 - acc: 0.80
95 - recall: 1.0000 - precision: 0.8000
Epoch 57/90
1/1 [=====] - 0s 49ms/step - loss: 0.6684 - acc: 0.73
81 - recall: 0.9688 - precision: 0.7561
Epoch 58/90
1/1 [=====] - 0s 48ms/step - loss: 0.6287 - acc: 0.73
81 - recall: 0.9688 - precision: 0.7561
Epoch 59/90
1/1 [=====] - 0s 46ms/step - loss: 0.6664 - acc: 0.73
81 - recall: 0.9688 - precision: 0.7561
Epoch 60/90
1/1 [=====] - 0s 51ms/step - loss: 0.6454 - acc: 0.78
57 - recall: 1.0000 - precision: 0.7805
Epoch 61/90
```

```
1/1 [=====] - 0s 47ms/step - loss: 0.6556 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 62/90
1/1 [=====] - 0s 48ms/step - loss: 0.6426 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 63/90
1/1 [=====] - 0s 48ms/step - loss: 0.6026 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 64/90
1/1 [=====] - 0s 47ms/step - loss: 0.6177 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 65/90
1/1 [=====] - 0s 47ms/step - loss: 0.6266 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 66/90
1/1 [=====] - 0s 47ms/step - loss: 0.6411 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 67/90
1/1 [=====] - 0s 48ms/step - loss: 0.6401 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 68/90
1/1 [=====] - 0s 48ms/step - loss: 0.6133 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 69/90
1/1 [=====] - 0s 48ms/step - loss: 0.6118 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 70/90
1/1 [=====] - 0s 48ms/step - loss: 0.6224 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 71/90
1/1 [=====] - 0s 52ms/step - loss: 0.6261 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 72/90
1/1 [=====] - 0s 47ms/step - loss: 0.6146 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 73/90
1/1 [=====] - 0s 48ms/step - loss: 0.6183 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 74/90
1/1 [=====] - 0s 47ms/step - loss: 0.6339 - acc: 0.73
81 - recall: 0.9375 - precision: 0.7692
Epoch 75/90
1/1 [=====] - 0s 48ms/step - loss: 0.6331 - acc: 0.73
81 - recall: 0.9062 - precision: 0.7838
Epoch 76/90
1/1 [=====] - 0s 48ms/step - loss: 0.6071 - acc: 0.69
85 - recall: 0.8438 - precision: 0.7714
Epoch 77/90
1/1 [=====] - 0s 48ms/step - loss: 0.6301 - acc: 0.69
85 - recall: 0.8438 - precision: 0.7714
Epoch 78/90
1/1 [=====] - 0s 48ms/step - loss: 0.6857 - acc: 0.54
76 - recall: 0.6875 - precision: 0.7097
Epoch 79/90
1/1 [=====] - 0s 47ms/step - loss: 0.6318 - acc: 0.59
52 - recall: 0.6875 - precision: 0.7586
Epoch 80/90
1/1 [=====] - 0s 48ms/step - loss: 0.6254 - acc: 0.64
29 - recall: 0.7188 - precision: 0.7931
Epoch 81/90
```

```
1/1 [=====] - 0s 48ms/step - loss: 0.6704 - acc: 0.50
00 - recall: 0.6250 - precision: 0.6897
Epoch 82/90
1/1 [=====] - 0s 47ms/step - loss: 0.6729 - acc: 0.61
90 - recall: 0.7812 - precision: 0.7353
Epoch 83/90
1/1 [=====] - 0s 47ms/step - loss: 0.6521 - acc: 0.76
19 - recall: 0.9688 - precision: 0.7750
Epoch 84/90
1/1 [=====] - 0s 46ms/step - loss: 0.6506 - acc: 0.73
81 - recall: 0.9688 - precision: 0.7561
Epoch 85/90
1/1 [=====] - 0s 47ms/step - loss: 0.6256 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 86/90
1/1 [=====] - 0s 48ms/step - loss: 0.6364 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 87/90
1/1 [=====] - 0s 47ms/step - loss: 0.6343 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 88/90
1/1 [=====] - 0s 46ms/step - loss: 0.6356 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 89/90
1/1 [=====] - 0s 47ms/step - loss: 0.6335 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 90/90
1/1 [=====] - 0s 48ms/step - loss: 0.6337 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
2023-03-29 01:10:32.490045: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
1/1 [=====] - 0s 305ms/step
2/2 [=====] - 1s 384ms/step
Epoch 1/90
2023-03-29 01:10:33.827700: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
```

```
1/1 [=====] - 2s 2s/step - loss: 0.6966 - acc: 0.6977
- recall: 0.7586 - precision: 0.7857
Epoch 2/90
1/1 [=====] - 0s 188ms/step - loss: 106103368.0000 -
acc: 0.6744 - recall: 0.6897 - precision: 0.8000
Epoch 3/90
1/1 [=====] - 0s 264ms/step - loss: 158.2381 - acc:
0.3256 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 4/90
1/1 [=====] - 0s 78ms/step - loss: 24.2246 - acc: 0.4
651 - recall: 0.6207 - precision: 0.6000
Epoch 5/90
1/1 [=====] - 0s 255ms/step - loss: 2465.8542 - acc:
0.3488 - recall: 0.1724 - precision: 0.5556
Epoch 6/90
1/1 [=====] - 0s 80ms/step - loss: 500.4754 - acc: 0.
6047 - recall: 0.7241 - precision: 0.7000
Epoch 7/90
1/1 [=====] - 0s 212ms/step - loss: 23.4519 - acc: 0.
6744 - recall: 0.9310 - precision: 0.6923
Epoch 8/90
1/1 [=====] - 0s 170ms/step - loss: 4.1689 - acc: 0.6
744 - recall: 1.0000 - precision: 0.6744
Epoch 9/90
1/1 [=====] - 0s 150ms/step - loss: 1.7581 - acc: 0.3
721 - recall: 0.0690 - precision: 1.0000
Epoch 10/90
1/1 [=====] - 0s 215ms/step - loss: 1.3094 - acc: 0.5
349 - recall: 0.5172 - precision: 0.7143
Epoch 11/90
1/1 [=====] - 0s 84ms/step - loss: 0.7423 - acc: 0.48
84 - recall: 0.3448 - precision: 0.7692
Epoch 12/90
1/1 [=====] - 0s 82ms/step - loss: 4.0869 - acc: 0.37
21 - recall: 0.2069 - precision: 0.6000
Epoch 13/90
1/1 [=====] - 0s 162ms/step - loss: 0.7082 - acc: 0.5
814 - recall: 0.5172 - precision: 0.7895
Epoch 14/90
1/1 [=====] - 0s 54ms/step - loss: 0.7300 - acc: 0.46
51 - recall: 0.3793 - precision: 0.6875
Epoch 15/90
1/1 [=====] - 0s 228ms/step - loss: 0.7280 - acc: 0.5
116 - recall: 0.4828 - precision: 0.7000
Epoch 16/90
1/1 [=====] - 0s 134ms/step - loss: 0.7669 - acc: 0.5
116 - recall: 0.5172 - precision: 0.6818
Epoch 17/90
1/1 [=====] - 0s 134ms/step - loss: 0.6864 - acc: 0.5
116 - recall: 0.4828 - precision: 0.7000
Epoch 18/90
1/1 [=====] - 0s 55ms/step - loss: 51.9356 - acc: 0.3
256 - recall: 0.1724 - precision: 0.5000
Epoch 19/90
1/1 [=====] - 0s 143ms/step - loss: 0.7067 - acc: 0.4
651 - recall: 0.2759 - precision: 0.8000
Epoch 20/90
1/1 [=====] - 0s 141ms/step - loss: 9.2379 - acc: 0.4
651 - recall: 0.4138 - precision: 0.6667
Epoch 21/90
```

```
1/1 [=====] - 0s 52ms/step - loss: 0.7162 - acc: 0.48  
84 - recall: 0.4828 - precision: 0.6667  
Epoch 22/90  
1/1 [=====] - 0s 51ms/step - loss: 0.7304 - acc: 0.44  
19 - recall: 0.3793 - precision: 0.6471  
Epoch 23/90  
1/1 [=====] - 0s 47ms/step - loss: 4.5256 - acc: 0.34  
88 - recall: 0.2414 - precision: 0.5385  
Epoch 24/90  
1/1 [=====] - 0s 143ms/step - loss: 0.7837 - acc: 0.5  
814 - recall: 0.7586 - precision: 0.6667  
Epoch 25/90  
1/1 [=====] - 0s 48ms/step - loss: 0.6897 - acc: 0.65  
12 - recall: 0.7586 - precision: 0.7333  
Epoch 26/90  
1/1 [=====] - 0s 50ms/step - loss: 0.7411 - acc: 0.58  
14 - recall: 0.6897 - precision: 0.6897  
Epoch 27/90  
1/1 [=====] - 0s 137ms/step - loss: 0.7151 - acc: 0.5  
581 - recall: 0.6552 - precision: 0.6786  
Epoch 28/90  
1/1 [=====] - 0s 50ms/step - loss: 0.6971 - acc: 0.55  
81 - recall: 0.5862 - precision: 0.7083  
Epoch 29/90  
1/1 [=====] - 0s 51ms/step - loss: 0.7522 - acc: 0.44  
19 - recall: 0.4483 - precision: 0.6190  
Epoch 30/90  
1/1 [=====] - 0s 48ms/step - loss: 0.7250 - acc: 0.48  
84 - recall: 0.4828 - precision: 0.6667  
Epoch 31/90  
1/1 [=====] - 0s 47ms/step - loss: 1.4823 - acc: 0.55  
81 - recall: 0.7586 - precision: 0.6471  
Epoch 32/90  
1/1 [=====] - 0s 47ms/step - loss: 0.7806 - acc: 0.34  
88 - recall: 0.0690 - precision: 0.6667  
Epoch 33/90  
1/1 [=====] - 0s 47ms/step - loss: 0.8489 - acc: 0.30  
23 - recall: 0.0345 - precision: 0.3333  
Epoch 34/90  
1/1 [=====] - 0s 77ms/step - loss: 0.7495 - acc: 0.34  
88 - recall: 0.1034 - precision: 0.6000  
Epoch 35/90  
1/1 [=====] - 0s 128ms/step - loss: 0.7607 - acc: 0.4  
186 - recall: 0.2414 - precision: 0.7000  
Epoch 36/90  
1/1 [=====] - 0s 48ms/step - loss: 0.7517 - acc: 0.41  
86 - recall: 0.4138 - precision: 0.6000  
Epoch 37/90  
1/1 [=====] - 0s 48ms/step - loss: 0.7547 - acc: 0.48  
84 - recall: 0.6207 - precision: 0.6207  
Epoch 38/90  
1/1 [=====] - 0s 50ms/step - loss: 0.7578 - acc: 0.62  
79 - recall: 0.8621 - precision: 0.6757  
Epoch 39/90  
1/1 [=====] - 0s 123ms/step - loss: 0.6949 - acc: 0.6  
977 - recall: 0.9310 - precision: 0.7105  
Epoch 40/90  
1/1 [=====] - 0s 48ms/step - loss: 0.7491 - acc: 0.60  
47 - recall: 0.7586 - precision: 0.6875  
Epoch 41/90
```

```
1/1 [=====] - 0s 48ms/step - loss: 0.7165 - acc: 0.53
49 - recall: 0.6552 - precision: 0.6552
Epoch 42/90
1/1 [=====] - 0s 48ms/step - loss: 0.7014 - acc: 0.58
14 - recall: 0.6207 - precision: 0.7200
Epoch 43/90
1/1 [=====] - 0s 51ms/step - loss: 0.7265 - acc: 0.51
16 - recall: 0.3793 - precision: 0.7857
Epoch 44/90
1/1 [=====] - 0s 48ms/step - loss: 0.7079 - acc: 0.34
88 - recall: 0.1034 - precision: 0.6000
Epoch 45/90
1/1 [=====] - 0s 47ms/step - loss: 0.6740 - acc: 0.34
88 - recall: 0.0690 - precision: 0.6667
Epoch 46/90
1/1 [=====] - 0s 48ms/step - loss: 0.7248 - acc: 0.32
56 - recall: 0.0345 - precision: 0.5000
Epoch 47/90
1/1 [=====] - 0s 47ms/step - loss: 0.6874 - acc: 0.37
21 - recall: 0.0690 - precision: 1.0000
Epoch 48/90
1/1 [=====] - 0s 48ms/step - loss: 0.7262 - acc: 0.30
23 - recall: 0.0345 - precision: 0.3333
Epoch 49/90
1/1 [=====] - 0s 48ms/step - loss: 0.7018 - acc: 0.39
53 - recall: 0.1379 - precision: 0.8000
Epoch 50/90
1/1 [=====] - 0s 49ms/step - loss: 0.7081 - acc: 0.39
53 - recall: 0.2414 - precision: 0.6364
Epoch 51/90
1/1 [=====] - 0s 48ms/step - loss: 0.7133 - acc: 0.46
51 - recall: 0.4828 - precision: 0.6364
Epoch 52/90
1/1 [=====] - 0s 48ms/step - loss: 0.7081 - acc: 0.48
84 - recall: 0.5862 - precision: 0.6296
Epoch 53/90
1/1 [=====] - 0s 53ms/step - loss: 0.7066 - acc: 0.53
49 - recall: 0.5517 - precision: 0.6957
Epoch 54/90
1/1 [=====] - 0s 48ms/step - loss: 0.7167 - acc: 0.48
84 - recall: 0.5172 - precision: 0.6522
Epoch 55/90
1/1 [=====] - 0s 48ms/step - loss: 0.7161 - acc: 0.39
53 - recall: 0.3448 - precision: 0.5882
Epoch 56/90
1/1 [=====] - 0s 48ms/step - loss: 0.6939 - acc: 0.53
49 - recall: 0.4138 - precision: 0.8000
Epoch 57/90
1/1 [=====] - 0s 48ms/step - loss: 0.6844 - acc: 0.58
14 - recall: 0.4483 - precision: 0.8667
Epoch 58/90
1/1 [=====] - 0s 48ms/step - loss: 0.7030 - acc: 0.44
19 - recall: 0.3448 - precision: 0.6667
Epoch 59/90
1/1 [=====] - 0s 48ms/step - loss: 0.6932 - acc: 0.53
49 - recall: 0.3793 - precision: 0.8462
Epoch 60/90
1/1 [=====] - 0s 47ms/step - loss: 0.7095 - acc: 0.39
53 - recall: 0.2759 - precision: 0.6154
Epoch 61/90
```

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1/1 [=====] - 0s 47ms/step - loss: 0.7067 - acc: 0.30
23 - recall: 0.1034 - precision: 0.4286
Epoch 62/90
1/1 [=====] - 0s 48ms/step - loss: 0.7080 - acc: 0.34
88 - recall: 0.1379 - precision: 0.5714
Epoch 63/90
1/1 [=====] - 0s 47ms/step - loss: 0.6943 - acc: 0.34
88 - recall: 0.0345 - precision: 1.0000
Epoch 64/90
1/1 [=====] - 0s 48ms/step - loss: 0.6917 - acc: 0.34
88 - recall: 0.0345 - precision: 1.0000
Epoch 65/90
1/1 [=====] - 0s 47ms/step - loss: 0.6985 - acc: 0.34
88 - recall: 0.0345 - precision: 1.0000
Epoch 66/90
1/1 [=====] - 0s 47ms/step - loss: 0.7061 - acc: 0.34
88 - recall: 0.0345 - precision: 1.0000
Epoch 67/90
1/1 [=====] - 0s 47ms/step - loss: 0.7031 - acc: 0.41
86 - recall: 0.1379 - precision: 1.0000
Epoch 68/90
1/1 [=====] - 0s 48ms/step - loss: 0.7001 - acc: 0.32
56 - recall: 0.0690 - precision: 0.5000
Epoch 69/90
1/1 [=====] - 0s 48ms/step - loss: 0.6873 - acc: 0.41
86 - recall: 0.1379 - precision: 1.0000
Epoch 70/90
1/1 [=====] - 0s 48ms/step - loss: 0.7180 - acc: 0.30
23 - recall: 0.0690 - precision: 0.4000
Epoch 71/90
1/1 [=====] - 0s 48ms/step - loss: 0.6965 - acc: 0.53
49 - recall: 0.3793 - precision: 0.8462
Epoch 72/90
1/1 [=====] - 0s 46ms/step - loss: 0.7094 - acc: 0.39
53 - recall: 0.3103 - precision: 0.6000
Epoch 73/90
1/1 [=====] - 0s 47ms/step - loss: 0.7358 - acc: 0.25
58 - recall: 0.2069 - precision: 0.4000
Epoch 74/90
1/1 [=====] - 0s 46ms/step - loss: 0.6885 - acc: 0.53
49 - recall: 0.4138 - precision: 0.8000
Epoch 75/90
1/1 [=====] - 0s 47ms/step - loss: 0.7105 - acc: 0.39
53 - recall: 0.3103 - precision: 0.6000
Epoch 76/90
1/1 [=====] - 0s 46ms/step - loss: 0.6942 - acc: 0.53
49 - recall: 0.4138 - precision: 0.8000
Epoch 77/90
1/1 [=====] - 0s 48ms/step - loss: 0.6914 - acc: 0.53
49 - recall: 0.4138 - precision: 0.8000
Epoch 78/90
1/1 [=====] - 0s 48ms/step - loss: 0.7017 - acc: 0.44
19 - recall: 0.3448 - precision: 0.6667
Epoch 79/90
1/1 [=====] - 0s 50ms/step - loss: 0.7055 - acc: 0.44
19 - recall: 0.3448 - precision: 0.6667
Epoch 80/90
1/1 [=====] - 0s 48ms/step - loss: 0.7060 - acc: 0.39
53 - recall: 0.3103 - precision: 0.6000
Epoch 81/90
```

```
1/1 [=====] - 0s 48ms/step - loss: 0.6970 - acc: 0.48
84 - recall: 0.3793 - precision: 0.7333
Epoch 82/90
1/1 [=====] - 0s 48ms/step - loss: 0.7017 - acc: 0.44
19 - recall: 0.3448 - precision: 0.6667
Epoch 83/90
1/1 [=====] - 0s 48ms/step - loss: 0.6952 - acc: 0.48
84 - recall: 0.3793 - precision: 0.7333
Epoch 84/90
1/1 [=====] - 0s 48ms/step - loss: 0.7004 - acc: 0.44
19 - recall: 0.3448 - precision: 0.6667
Epoch 85/90
1/1 [=====] - 0s 48ms/step - loss: 0.6943 - acc: 0.53
49 - recall: 0.4138 - precision: 0.8000
Epoch 86/90
1/1 [=====] - 0s 48ms/step - loss: 0.6959 - acc: 0.48
84 - recall: 0.3793 - precision: 0.7333
Epoch 87/90
1/1 [=====] - 0s 47ms/step - loss: 0.6895 - acc: 0.58
14 - recall: 0.4138 - precision: 0.9231
Epoch 88/90
1/1 [=====] - 0s 47ms/step - loss: 0.6937 - acc: 0.53
49 - recall: 0.4138 - precision: 0.8000
Epoch 89/90
1/1 [=====] - 0s 47ms/step - loss: 0.6950 - acc: 0.53
49 - recall: 0.4138 - precision: 0.8000
Epoch 90/90
1/1 [=====] - 0s 48ms/step - loss: 0.6890 - acc: 0.51
16 - recall: 0.4138 - precision: 0.7500
2023-03-29 01:10:42.025295: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
1/1 [=====] - 0s 277ms/step
2/2 [=====] - 0s 216ms/step
Epoch 1/90
2023-03-29 01:10:43.090431: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
```

```
1/1 [=====] - 2s 2s/step - loss: 0.7278 - acc: 0.6977
- recall: 0.8148 - precision: 0.7333
Epoch 2/90
1/1 [=====] - 0s 197ms/step - loss: 543252864.0000 -
acc: 0.3721 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 3/90
1/1 [=====] - 1s 505ms/step - loss: 7723.7158 - acc:
0.6279 - recall: 1.0000 - precision: 0.6279
Epoch 4/90
1/1 [=====] - 0s 274ms/step - loss: 265605.0938 - ac
c: 0.6279 - recall: 1.0000 - precision: 0.6279
Epoch 5/90
1/1 [=====] - 0s 257ms/step - loss: 1050842.5000 - ac
c: 0.6047 - recall: 0.9630 - precision: 0.6190
Epoch 6/90
1/1 [=====] - 0s 162ms/step - loss: 679000.3750 - ac
c: 0.3953 - recall: 0.3704 - precision: 0.5263
Epoch 7/90
1/1 [=====] - 0s 132ms/step - loss: 177630.2500 - ac
c: 0.3488 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 8/90
1/1 [=====] - 0s 154ms/step - loss: 223134.0000 - ac
c: 0.4884 - recall: 0.7037 - precision: 0.5758
Epoch 9/90
1/1 [=====] - 0s 135ms/step - loss: 201173.4844 - ac
c: 0.4651 - recall: 0.3333 - precision: 0.6429
Epoch 10/90
1/1 [=====] - 0s 55ms/step - loss: 82735.4375 - acc:
0.5814 - recall: 0.4444 - precision: 0.8000
Epoch 11/90
1/1 [=====] - 0s 179ms/step - loss: 29570.7969 - acc:
0.6512 - recall: 0.7037 - precision: 0.7308
Epoch 12/90
1/1 [=====] - 0s 55ms/step - loss: 107008.3359 - acc:
0.6279 - recall: 0.7407 - precision: 0.6897
Epoch 13/90
1/1 [=====] - 0s 47ms/step - loss: 24444.9570 - acc:
0.4884 - recall: 0.2593 - precision: 0.7778
Epoch 14/90
1/1 [=====] - 0s 140ms/step - loss: 76024.9609 - acc:
0.3953 - recall: 0.1481 - precision: 0.5714
Epoch 15/90
1/1 [=====] - 0s 154ms/step - loss: 334820.2188 - ac
c: 0.6279 - recall: 1.0000 - precision: 0.6279
Epoch 16/90
1/1 [=====] - 0s 57ms/step - loss: 45441.6641 - acc:
0.3953 - recall: 0.2593 - precision: 0.5385
Epoch 17/90
1/1 [=====] - 0s 76ms/step - loss: 64200.4609 - acc:
0.3721 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 18/90
1/1 [=====] - 0s 126ms/step - loss: 6752.1553 - acc:
0.4186 - recall: 0.1481 - precision: 0.6667
Epoch 19/90
1/1 [=====] - 0s 142ms/step - loss: 811.1055 - acc:
0.5814 - recall: 0.6667 - precision: 0.6667
Epoch 20/90
1/1 [=====] - 0s 136ms/step - loss: 2029.3361 - acc:
0.4419 - recall: 0.5185 - precision: 0.5600
Epoch 21/90
```

```
1/1 [=====] - 0s 222ms/step - loss: 1727.2764 - acc: 0.5349 - recall: 0.3333 - precision: 0.8182
Epoch 22/90
1/1 [=====] - 0s 48ms/step - loss: 1749.3059 - acc: 0.5116 - recall: 0.7037 - precision: 0.5938
Epoch 23/90
1/1 [=====] - 0s 139ms/step - loss: 1349.4584 - acc: 0.6279 - recall: 0.4074 - precision: 1.0000
Epoch 24/90
1/1 [=====] - 0s 51ms/step - loss: 9755.7139 - acc: 0.3488 - recall: 0.1481 - precision: 0.4444
Epoch 25/90
1/1 [=====] - 0s 54ms/step - loss: 1258.3262 - acc: 0.5116 - recall: 0.5926 - precision: 0.6154
Epoch 26/90
1/1 [=====] - 0s 48ms/step - loss: 419.5172 - acc: 0.5349 - recall: 0.7778 - precision: 0.6000
Epoch 27/90
1/1 [=====] - 0s 134ms/step - loss: 127.9083 - acc: 0.5116 - recall: 0.7778 - precision: 0.5833
Epoch 28/90
1/1 [=====] - 0s 48ms/step - loss: 45.6186 - acc: 0.5581 - recall: 0.8519 - precision: 0.6053
Epoch 29/90
1/1 [=====] - 0s 74ms/step - loss: 20.4308 - acc: 0.6047 - recall: 0.7407 - precision: 0.6667
Epoch 30/90
1/1 [=====] - 0s 72ms/step - loss: 24.4965 - acc: 0.4651 - recall: 0.4815 - precision: 0.5909
Epoch 31/90
1/1 [=====] - 0s 48ms/step - loss: 13.3560 - acc: 0.5814 - recall: 0.4444 - precision: 0.8000
Epoch 32/90
1/1 [=====] - 0s 72ms/step - loss: 22.4894 - acc: 0.3023 - recall: 0.1852 - precision: 0.3846
Epoch 33/90
1/1 [=====] - 0s 51ms/step - loss: 14.1546 - acc: 0.4884 - recall: 0.2963 - precision: 0.7273
Epoch 34/90
1/1 [=====] - 0s 51ms/step - loss: 16.2149 - acc: 0.4186 - recall: 0.3704 - precision: 0.5556
Epoch 35/90
1/1 [=====] - 0s 65ms/step - loss: 12.1490 - acc: 0.4651 - recall: 0.4074 - precision: 0.6111
Epoch 36/90
1/1 [=====] - 0s 52ms/step - loss: 6.4261 - acc: 0.549 - recall: 0.4074 - precision: 0.7333
Epoch 37/90
1/1 [=====] - 0s 48ms/step - loss: 6.9590 - acc: 0.3488 - recall: 0.3333 - precision: 0.4737
Epoch 38/90
1/1 [=====] - 0s 47ms/step - loss: 5.0486 - acc: 0.5116 - recall: 0.4815 - precision: 0.6500
Epoch 39/90
1/1 [=====] - 0s 47ms/step - loss: 5.3084 - acc: 0.4419 - recall: 0.3704 - precision: 0.5882
Epoch 40/90
1/1 [=====] - 0s 48ms/step - loss: 2.0068 - acc: 0.5581 - recall: 0.4444 - precision: 0.7500
Epoch 41/90
```

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1/1 [=====] - 0s 53ms/step - loss: 1.9629 - acc: 0.51
16 - recall: 0.2963 - precision: 0.8000
Epoch 42/90
1/1 [=====] - 0s 47ms/step - loss: 2.1896 - acc: 0.37
21 - recall: 0.1481 - precision: 0.5000
Epoch 43/90
1/1 [=====] - 0s 48ms/step - loss: 1.4563 - acc: 0.44
19 - recall: 0.2222 - precision: 0.6667
Epoch 44/90
1/1 [=====] - 0s 49ms/step - loss: 1.0595 - acc: 0.41
86 - recall: 0.1852 - precision: 0.6250
Epoch 45/90
1/1 [=====] - 0s 49ms/step - loss: 1.2852 - acc: 0.44
19 - recall: 0.1852 - precision: 0.7143
Epoch 46/90
1/1 [=====] - 0s 47ms/step - loss: 0.9031 - acc: 0.46
51 - recall: 0.1852 - precision: 0.8333
Epoch 47/90
1/1 [=====] - 0s 49ms/step - loss: 1.0521 - acc: 0.37
21 - recall: 0.1111 - precision: 0.5000
Epoch 48/90
1/1 [=====] - 0s 49ms/step - loss: 0.8131 - acc: 0.46
51 - recall: 0.1852 - precision: 0.8333
Epoch 49/90
1/1 [=====] - 0s 49ms/step - loss: 0.7519 - acc: 0.44
19 - recall: 0.1481 - precision: 0.8000
Epoch 50/90
1/1 [=====] - 0s 47ms/step - loss: 0.9432 - acc: 0.34
88 - recall: 0.0741 - precision: 0.4000
Epoch 51/90
1/1 [=====] - 0s 47ms/step - loss: 0.8538 - acc: 0.44
19 - recall: 0.1481 - precision: 0.8000
Epoch 52/90
1/1 [=====] - 0s 48ms/step - loss: 0.8486 - acc: 0.39
53 - recall: 0.1111 - precision: 0.6000
Epoch 53/90
1/1 [=====] - 0s 48ms/step - loss: 0.8231 - acc: 0.41
86 - recall: 0.1111 - precision: 0.7500
Epoch 54/90
1/1 [=====] - 0s 47ms/step - loss: 0.8598 - acc: 0.32
56 - recall: 0.0370 - precision: 0.2500
Epoch 55/90
1/1 [=====] - 0s 49ms/step - loss: 0.8343 - acc: 0.34
88 - recall: 0.0741 - precision: 0.4000
Epoch 56/90
1/1 [=====] - 0s 47ms/step - loss: 0.8048 - acc: 0.37
21 - recall: 0.0741 - precision: 0.5000
Epoch 57/90
1/1 [=====] - 0s 47ms/step - loss: 0.7186 - acc: 0.44
19 - recall: 0.1111 - precision: 1.0000
Epoch 58/90
1/1 [=====] - 0s 48ms/step - loss: 0.7543 - acc: 0.34
88 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 59/90
1/1 [=====] - 0s 47ms/step - loss: 0.7327 - acc: 0.39
53 - recall: 0.0370 - precision: 1.0000
Epoch 60/90
1/1 [=====] - 0s 47ms/step - loss: 0.7230 - acc: 0.39
53 - recall: 0.0370 - precision: 1.0000
Epoch 61/90
```

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1/1 [=====] - 0s 47ms/step - loss: 0.7503 - acc: 0.34
88 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 62/90
1/1 [=====] - 0s 48ms/step - loss: 0.7509 - acc: 0.34
88 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 63/90
1/1 [=====] - 0s 47ms/step - loss: 0.7531 - acc: 0.39
53 - recall: 0.0370 - precision: 1.0000
Epoch 64/90
1/1 [=====] - 0s 48ms/step - loss: 0.7127 - acc: 0.37
21 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 65/90
1/1 [=====] - 0s 47ms/step - loss: 0.7094 - acc: 0.37
21 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 66/90
1/1 [=====] - 0s 48ms/step - loss: 0.7554 - acc: 0.39
53 - recall: 0.0370 - precision: 1.0000
Epoch 67/90
1/1 [=====] - 0s 48ms/step - loss: 0.7855 - acc: 0.34
88 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 68/90
1/1 [=====] - 0s 48ms/step - loss: 0.6977 - acc: 0.39
53 - recall: 0.0370 - precision: 1.0000
Epoch 69/90
1/1 [=====] - 0s 49ms/step - loss: 0.7409 - acc: 0.39
53 - recall: 0.0370 - precision: 1.0000
Epoch 70/90
1/1 [=====] - 0s 48ms/step - loss: 0.7919 - acc: 0.34
88 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 71/90
1/1 [=====] - 0s 48ms/step - loss: 0.7814 - acc: 0.34
88 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 72/90
1/1 [=====] - 0s 47ms/step - loss: 0.7360 - acc: 0.39
53 - recall: 0.0370 - precision: 1.0000
Epoch 73/90
1/1 [=====] - 0s 48ms/step - loss: 0.7350 - acc: 0.39
53 - recall: 0.0370 - precision: 1.0000
Epoch 74/90
1/1 [=====] - 0s 47ms/step - loss: 0.7372 - acc: 0.34
88 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 75/90
1/1 [=====] - 0s 48ms/step - loss: 0.7119 - acc: 0.37
21 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 76/90
1/1 [=====] - 0s 47ms/step - loss: 0.7237 - acc: 0.37
21 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 77/90
1/1 [=====] - 0s 47ms/step - loss: 0.7192 - acc: 0.37
21 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 78/90
1/1 [=====] - 0s 49ms/step - loss: 0.7344 - acc: 0.32
56 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 79/90
1/1 [=====] - 0s 48ms/step - loss: 0.7214 - acc: 0.37
21 - recall: 0.0370 - precision: 0.5000
Epoch 80/90
1/1 [=====] - 0s 47ms/step - loss: 0.7171 - acc: 0.39
53 - recall: 0.0370 - precision: 1.0000
Epoch 81/90
```

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1/1 [=====] - 0s 141ms/step - loss: 0.7268 - acc: 0.3  
488 - recall: 0.0000e+00 - precision: 0.0000e+00  
Epoch 82/90  
1/1 [=====] - 0s 50ms/step - loss: 0.7183 - acc: 0.39  
53 - recall: 0.0370 - precision: 1.0000  
Epoch 83/90  
1/1 [=====] - 0s 48ms/step - loss: 0.7195 - acc: 0.37  
21 - recall: 0.0000e+00 - precision: 0.0000e+00  
Epoch 84/90  
1/1 [=====] - 0s 49ms/step - loss: 0.7232 - acc: 0.37  
21 - recall: 0.0000e+00 - precision: 0.0000e+00  
Epoch 85/90  
1/1 [=====] - 0s 50ms/step - loss: 0.7231 - acc: 0.37  
21 - recall: 0.0000e+00 - precision: 0.0000e+00  
Epoch 86/90  
1/1 [=====] - 0s 47ms/step - loss: 0.7169 - acc: 0.37  
21 - recall: 0.0000e+00 - precision: 0.0000e+00  
Epoch 87/90  
1/1 [=====] - 0s 47ms/step - loss: 0.7267 - acc: 0.37  
21 - recall: 0.0000e+00 - precision: 0.0000e+00  
Epoch 88/90  
1/1 [=====] - 0s 49ms/step - loss: 0.7276 - acc: 0.37  
21 - recall: 0.0000e+00 - precision: 0.0000e+00  
Epoch 89/90  
1/1 [=====] - 0s 49ms/step - loss: 0.7133 - acc: 0.37  
21 - recall: 0.0000e+00 - precision: 0.0000e+00  
Epoch 90/90  
1/1 [=====] - 0s 48ms/step - loss: 0.7276 - acc: 0.37  
21 - recall: 0.0000e+00 - precision: 0.0000e+00  
2023-03-29 01:10:51.881133: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.  
1/1 [=====] - 0s 281ms/step  
2/2 [=====] - 0s 226ms/step  
Epoch 1/90  
2023-03-29 01:10:52.956858: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
```

```
1/1 [=====] - 2s 2s/step - loss: 0.6491 - acc: 0.4286
- recall: 0.4375 - precision: 0.7000
Epoch 2/90
1/1 [=====] - 0s 268ms/step - loss: 63209684992.0000
- acc: 0.7619 - recall: 1.0000 - precision: 0.7619
Epoch 3/90
1/1 [=====] - 0s 261ms/step - loss: 5674255.0000 - ac
c: 0.2381 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 4/90
1/1 [=====] - 0s 253ms/step - loss: 1072300.3750 - ac
c: 0.5000 - recall: 0.5625 - precision: 0.7200
Epoch 5/90
1/1 [=====] - 0s 186ms/step - loss: 26558562.0000 - a
cc: 0.3571 - recall: 0.1562 - precision: 1.0000
Epoch 6/90
1/1 [=====] - 0s 172ms/step - loss: 2035727.2500 - ac
c: 0.7619 - recall: 1.0000 - precision: 0.7619
Epoch 7/90
1/1 [=====] - 0s 145ms/step - loss: 1640176.7500 - ac
c: 0.7619 - recall: 1.0000 - precision: 0.7619
Epoch 8/90
1/1 [=====] - 0s 59ms/step - loss: 836391.6250 - acc:
0.7619 - recall: 1.0000 - precision: 0.7619
Epoch 9/90
1/1 [=====] - 0s 163ms/step - loss: 1035345.8125 - ac
c: 0.7619 - recall: 1.0000 - precision: 0.7619
Epoch 10/90
1/1 [=====] - 0s 151ms/step - loss: 18450.7090 - acc:
0.2857 - recall: 0.1250 - precision: 0.6667
Epoch 11/90
1/1 [=====] - 0s 139ms/step - loss: 175901.0312 - ac
c: 0.7619 - recall: 1.0000 - precision: 0.7619
Epoch 12/90
1/1 [=====] - 0s 135ms/step - loss: 23116.3926 - acc:
0.5238 - recall: 0.4688 - precision: 0.8333
Epoch 13/90
1/1 [=====] - 0s 214ms/step - loss: 472562.1875 - ac
c: 0.7381 - recall: 0.9688 - precision: 0.7561
Epoch 14/90
1/1 [=====] - 0s 51ms/step - loss: 305827.8438 - acc:
0.5000 - recall: 0.4375 - precision: 0.8235
Epoch 15/90
1/1 [=====] - 0s 243ms/step - loss: 285927.4375 - ac
c: 0.2619 - recall: 0.0938 - precision: 0.6000
Epoch 16/90
1/1 [=====] - 0s 47ms/step - loss: 231287.6406 - acc:
0.2857 - recall: 0.0938 - precision: 0.7500
Epoch 17/90
1/1 [=====] - 0s 79ms/step - loss: 994565.8125 - acc:
0.4524 - recall: 0.3750 - precision: 0.8000
Epoch 18/90
1/1 [=====] - 0s 136ms/step - loss: 347589.6250 - ac
c: 0.4762 - recall: 0.5938 - precision: 0.6786
Epoch 19/90
1/1 [=====] - 0s 124ms/step - loss: 1911836.6250 - ac
c: 0.2381 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 20/90
1/1 [=====] - 0s 166ms/step - loss: 81318.2500 - acc:
0.5714 - recall: 0.6875 - precision: 0.7333
Epoch 21/90
```

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1/1 [=====] - 0s 50ms/step - loss: 79407.4922 - acc: 0.5238 - recall: 0.5938 - precision: 0.7308
Epoch 22/90
1/1 [=====] - 0s 52ms/step - loss: 40273.5078 - acc: 0.5000 - recall: 0.4688 - precision: 0.7895
Epoch 23/90
1/1 [=====] - 0s 74ms/step - loss: 108144.7422 - acc: 0.6667 - recall: 0.8438 - precision: 0.7500
Epoch 24/90
1/1 [=====] - 0s 49ms/step - loss: 129893.4531 - acc: 0.6429 - recall: 0.8125 - precision: 0.7429
Epoch 25/90
1/1 [=====] - 0s 50ms/step - loss: 54301.3633 - acc: 0.4286 - recall: 0.3750 - precision: 0.7500
Epoch 26/90
1/1 [=====] - 0s 51ms/step - loss: 27258.9863 - acc: 0.4048 - recall: 0.3125 - precision: 0.7692
Epoch 27/90
1/1 [=====] - 0s 47ms/step - loss: 6590.2358 - acc: 0.4286 - recall: 0.3125 - precision: 0.8333
Epoch 28/90
1/1 [=====] - 0s 50ms/step - loss: 30111.3926 - acc: 0.6190 - recall: 0.7500 - precision: 0.7500
Epoch 29/90
1/1 [=====] - 0s 152ms/step - loss: 4680.9512 - acc: 0.5714 - recall: 0.5312 - precision: 0.8500
Epoch 30/90
1/1 [=====] - 0s 48ms/step - loss: 9019.9385 - acc: 0.6190 - recall: 0.7500 - precision: 0.7500
Epoch 31/90
1/1 [=====] - 0s 48ms/step - loss: 9163.6133 - acc: 0.6905 - recall: 0.7812 - precision: 0.8065
Epoch 32/90
1/1 [=====] - 0s 71ms/step - loss: 16387.8965 - acc: 0.6905 - recall: 0.8125 - precision: 0.7879
Epoch 33/90
1/1 [=====] - 0s 47ms/step - loss: 19181.5840 - acc: 0.5952 - recall: 0.7500 - precision: 0.7273
Epoch 34/90
1/1 [=====] - 0s 47ms/step - loss: 9931.0283 - acc: 0.6429 - recall: 0.8125 - precision: 0.7429
Epoch 35/90
1/1 [=====] - 0s 47ms/step - loss: 6009.3794 - acc: 0.5952 - recall: 0.7812 - precision: 0.7143
Epoch 36/90
1/1 [=====] - 0s 48ms/step - loss: 1517.4720 - acc: 0.8095 - recall: 0.9688 - precision: 0.8158
Epoch 37/90
1/1 [=====] - 0s 47ms/step - loss: 3591.9006 - acc: 0.7381 - recall: 0.9375 - precision: 0.7692
Epoch 38/90
1/1 [=====] - 0s 48ms/step - loss: 10718.2910 - acc: 0.5476 - recall: 0.6875 - precision: 0.7097
Epoch 39/90
1/1 [=====] - 0s 47ms/step - loss: 1728.4318 - acc: 0.7143 - recall: 0.9375 - precision: 0.7500
Epoch 40/90
1/1 [=====] - 0s 46ms/step - loss: 119357.1250 - acc: 0.7619 - recall: 1.0000 - precision: 0.7619
Epoch 41/90
```

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1/1 [=====] - 0s 46ms/step - loss: 1584.3615 - acc: 0.5714 - recall: 0.7500 - precision: 0.7059
Epoch 42/90
1/1 [=====] - 0s 134ms/step - loss: 1517.8944 - acc: 0.7857 - recall: 0.9375 - precision: 0.8108
Epoch 43/90
1/1 [=====] - 0s 47ms/step - loss: 684.6006 - acc: 0.7143 - recall: 0.8750 - precision: 0.7778
Epoch 44/90
1/1 [=====] - 0s 49ms/step - loss: 867.0201 - acc: 0.7619 - recall: 0.9688 - precision: 0.7750
Epoch 45/90
1/1 [=====] - 0s 46ms/step - loss: 375.7514 - acc: 0.7619 - recall: 0.9688 - precision: 0.7750
Epoch 46/90
1/1 [=====] - 0s 47ms/step - loss: 6991.5806 - acc: 0.6429 - recall: 0.8125 - precision: 0.7429
Epoch 47/90
1/1 [=====] - 0s 51ms/step - loss: 6333.1885 - acc: 0.7619 - recall: 1.0000 - precision: 0.7619
Epoch 48/90
1/1 [=====] - 0s 47ms/step - loss: 0.6434 - acc: 0.7619 - recall: 1.0000 - precision: 0.7619
Epoch 49/90
1/1 [=====] - 0s 47ms/step - loss: 0.6448 - acc: 0.7619 - recall: 1.0000 - precision: 0.7619
Epoch 50/90
1/1 [=====] - 0s 48ms/step - loss: 427.5116 - acc: 0.7381 - recall: 0.9688 - precision: 0.7561
Epoch 51/90
1/1 [=====] - 0s 47ms/step - loss: 7876.1846 - acc: 0.7381 - recall: 0.9688 - precision: 0.7561
Epoch 52/90
1/1 [=====] - 0s 47ms/step - loss: 468.4199 - acc: 0.7619 - recall: 1.0000 - precision: 0.7619
Epoch 53/90
1/1 [=====] - 0s 47ms/step - loss: 0.6452 - acc: 0.7619 - recall: 1.0000 - precision: 0.7619
Epoch 54/90
1/1 [=====] - 0s 48ms/step - loss: 0.6442 - acc: 0.7619 - recall: 1.0000 - precision: 0.7619
Epoch 55/90
1/1 [=====] - 0s 47ms/step - loss: 0.6430 - acc: 0.7619 - recall: 1.0000 - precision: 0.7619
Epoch 56/90
1/1 [=====] - 0s 47ms/step - loss: 0.6415 - acc: 0.7619 - recall: 1.0000 - precision: 0.7619
Epoch 57/90
1/1 [=====] - 0s 47ms/step - loss: 76.6131 - acc: 0.7381 - recall: 0.9688 - precision: 0.7561
Epoch 58/90
1/1 [=====] - 0s 46ms/step - loss: 0.6383 - acc: 0.7619 - recall: 1.0000 - precision: 0.7619
Epoch 59/90
1/1 [=====] - 0s 47ms/step - loss: 20.8038 - acc: 0.7619 - recall: 1.0000 - precision: 0.7619
Epoch 60/90
1/1 [=====] - 0s 47ms/step - loss: 0.6355 - acc: 0.7619 - recall: 1.0000 - precision: 0.7619
Epoch 61/90
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1/1 [=====] - 0s 47ms/step - loss: 0.6344 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 62/90
1/1 [=====] - 0s 47ms/step - loss: 0.6335 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 63/90
1/1 [=====] - 0s 47ms/step - loss: 0.6328 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 64/90
1/1 [=====] - 0s 51ms/step - loss: 0.6229 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 65/90
1/1 [=====] - 0s 47ms/step - loss: 0.6228 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 66/90
1/1 [=====] - 0s 47ms/step - loss: 0.6229 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 67/90
1/1 [=====] - 0s 46ms/step - loss: 863.3932 - acc: 0.
7619 - recall: 1.0000 - precision: 0.7619
Epoch 68/90
1/1 [=====] - 0s 46ms/step - loss: 0.6321 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 69/90
1/1 [=====] - 0s 46ms/step - loss: 0.6323 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 70/90
1/1 [=====] - 0s 47ms/step - loss: 0.6324 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 71/90
1/1 [=====] - 0s 46ms/step - loss: 0.6326 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 72/90
1/1 [=====] - 0s 48ms/step - loss: 0.6327 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 73/90
1/1 [=====] - 0s 46ms/step - loss: 0.6328 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 74/90
1/1 [=====] - 0s 47ms/step - loss: 0.6329 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 75/90
1/1 [=====] - 0s 47ms/step - loss: 0.6329 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 76/90
1/1 [=====] - 0s 48ms/step - loss: 0.6329 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 77/90
1/1 [=====] - 0s 47ms/step - loss: 0.6328 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 78/90
1/1 [=====] - 0s 46ms/step - loss: 0.6328 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 79/90
1/1 [=====] - 0s 47ms/step - loss: 0.6327 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 80/90
1/1 [=====] - 0s 47ms/step - loss: 0.6326 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 81/90
```

```
1/1 [=====] - 0s 47ms/step - loss: 0.6324 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 82/90
1/1 [=====] - 0s 48ms/step - loss: 0.6323 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 83/90
1/1 [=====] - 0s 47ms/step - loss: 0.6235 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 84/90
1/1 [=====] - 0s 47ms/step - loss: 0.6233 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 85/90
1/1 [=====] - 0s 47ms/step - loss: 0.6232 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 86/90
1/1 [=====] - 0s 48ms/step - loss: 0.6231 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 87/90
1/1 [=====] - 0s 46ms/step - loss: 0.6230 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 88/90
1/1 [=====] - 0s 46ms/step - loss: 0.6229 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
Epoch 89/90
1/1 [=====] - 0s 46ms/step - loss: 273.0543 - acc: 0.
7619 - recall: 1.0000 - precision: 0.7619
Epoch 90/90
1/1 [=====] - 0s 46ms/step - loss: 0.6321 - acc: 0.76
19 - recall: 1.0000 - precision: 0.7619
2023-03-29 01:11:01.355120: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
1/1 [=====] - 0s 278ms/step
2/2 [=====] - 0s 173ms/step
Epoch 1/90
2023-03-29 01:11:02.774661: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
```

```
1/1 [=====] - 2s 2s/step - loss: 0.7005 - acc: 0.4884
- recall: 0.5862 - precision: 0.6296
Epoch 2/90
1/1 [=====] - 0s 177ms/step - loss: 51709915136.0000
- acc: 0.3488 - recall: 0.0345 - precision: 1.0000
Epoch 3/90
1/1 [=====] - 0s 260ms/step - loss: 31707424.0000 - a
cc: 0.6744 - recall: 1.0000 - precision: 0.6744
Epoch 4/90
1/1 [=====] - 0s 169ms/step - loss: 16377134.0000 - a
cc: 0.6744 - recall: 1.0000 - precision: 0.6744
Epoch 5/90
1/1 [=====] - 0s 185ms/step - loss: 556470.6250 - ac
c: 0.6744 - recall: 1.0000 - precision: 0.6744
Epoch 6/90
1/1 [=====] - 0s 168ms/step - loss: 1438093.0000 - ac
c: 0.6744 - recall: 1.0000 - precision: 0.6744
Epoch 7/90
1/1 [=====] - 0s 163ms/step - loss: 116715.1953 - ac
c: 0.3256 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 8/90
1/1 [=====] - 0s 154ms/step - loss: 446196.4062 - ac
c: 0.3256 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 9/90
1/1 [=====] - 0s 149ms/step - loss: 429400.0000 - ac
c: 0.4186 - recall: 0.1379 - precision: 1.0000
Epoch 10/90
1/1 [=====] - 0s 171ms/step - loss: 555846.0625 - ac
c: 0.6744 - recall: 0.8966 - precision: 0.7027
Epoch 11/90
1/1 [=====] - 0s 146ms/step - loss: 438238.4062 - ac
c: 0.5349 - recall: 0.7586 - precision: 0.6286
Epoch 12/90
1/1 [=====] - 0s 152ms/step - loss: 2247344.7500 - ac
c: 0.3488 - recall: 0.0345 - precision: 1.0000
Epoch 13/90
1/1 [=====] - 0s 169ms/step - loss: 400676.0938 - ac
c: 0.3953 - recall: 0.1034 - precision: 1.0000
Epoch 14/90
1/1 [=====] - 0s 128ms/step - loss: 957724.8125 - ac
c: 0.6047 - recall: 0.6552 - precision: 0.7308
Epoch 15/90
1/1 [=====] - 0s 55ms/step - loss: 28610.4648 - acc:
0.5814 - recall: 0.7586 - precision: 0.6667
Epoch 16/90
1/1 [=====] - 0s 125ms/step - loss: 30237.4883 - acc:
0.2791 - recall: 0.1724 - precision: 0.4167
Epoch 17/90
1/1 [=====] - 0s 146ms/step - loss: 38328.9805 - acc:
0.3721 - recall: 0.2069 - precision: 0.6000
Epoch 18/90
1/1 [=====] - 0s 74ms/step - loss: 86673.1016 - acc:
0.3023 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 19/90
1/1 [=====] - 0s 51ms/step - loss: 61822.1523 - acc:
0.4651 - recall: 0.4828 - precision: 0.6364
Epoch 20/90
1/1 [=====] - 0s 50ms/step - loss: 63263.7305 - acc:
0.6744 - recall: 0.8621 - precision: 0.7143
Epoch 21/90
```

```
1/1 [=====] - 0s 51ms/step - loss: 54809.8477 - acc: 0.5581 - recall: 0.6897 - precision: 0.6667
Epoch 22/90
1/1 [=====] - 0s 137ms/step - loss: 66195.7578 - acc: 0.3488 - recall: 0.0690 - precision: 0.6667
Epoch 23/90
1/1 [=====] - 0s 142ms/step - loss: 20005.5898 - acc: 0.5116 - recall: 0.4483 - precision: 0.7222
Epoch 24/90
1/1 [=====] - 0s 52ms/step - loss: 18758.1094 - acc: 0.5116 - recall: 0.6552 - precision: 0.6333
Epoch 25/90
1/1 [=====] - 0s 56ms/step - loss: 7404.1191 - acc: 0.6047 - recall: 0.7931 - precision: 0.6765
Epoch 26/90
1/1 [=====] - 0s 48ms/step - loss: 579.3589 - acc: 0.4884 - recall: 0.4483 - precision: 0.6842
Epoch 27/90
1/1 [=====] - 0s 52ms/step - loss: 0.7483 - acc: 0.5581 - recall: 0.6552 - precision: 0.6786
Epoch 28/90
1/1 [=====] - 0s 78ms/step - loss: 0.7112 - acc: 0.6047 - recall: 0.6897 - precision: 0.7143
Epoch 29/90
1/1 [=====] - 0s 51ms/step - loss: 0.7716 - acc: 0.4651 - recall: 0.5862 - precision: 0.6071
Epoch 30/90
1/1 [=====] - 0s 51ms/step - loss: 30.2763 - acc: 0.3953 - recall: 0.3103 - precision: 0.6000
Epoch 31/90
1/1 [=====] - 0s 222ms/step - loss: 7626.5107 - acc: 0.6512 - recall: 0.9310 - precision: 0.6750
Epoch 32/90
1/1 [=====] - 0s 123ms/step - loss: 0.7190 - acc: 0.5116 - recall: 0.6207 - precision: 0.6429
Epoch 33/90
1/1 [=====] - 0s 49ms/step - loss: 586637.6875 - acc: 0.6744 - recall: 1.0000 - precision: 0.6744
Epoch 34/90
1/1 [=====] - 0s 52ms/step - loss: 0.7229 - acc: 0.3256 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 35/90
1/1 [=====] - 0s 74ms/step - loss: 0.7281 - acc: 0.3256 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 36/90
1/1 [=====] - 0s 49ms/step - loss: 8430.8906 - acc: 0.6512 - recall: 0.7931 - precision: 0.7188
Epoch 37/90
1/1 [=====] - 0s 55ms/step - loss: 0.7404 - acc: 0.3256 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 38/90
1/1 [=====] - 0s 49ms/step - loss: 0.7457 - acc: 0.3256 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 39/90
1/1 [=====] - 0s 50ms/step - loss: 562428.4375 - acc: 0.6279 - recall: 0.9310 - precision: 0.6585
Epoch 40/90
1/1 [=====] - 0s 49ms/step - loss: 0.7576 - acc: 0.3256 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 41/90
```

```
1/1 [=====] - 0s 50ms/step - loss: 2097.7144 - acc: 0.5349 - recall: 0.6552 - precision: 0.6552
Epoch 42/90
1/1 [=====] - 0s 57ms/step - loss: 0.7731 - acc: 0.32
56 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 43/90
1/1 [=====] - 0s 141ms/step - loss: 0.7923 - acc: 0.3
256 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 44/90
1/1 [=====] - 0s 50ms/step - loss: 0.7955 - acc: 0.32
56 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 45/90
1/1 [=====] - 0s 51ms/step - loss: 0.8058 - acc: 0.32
56 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 46/90
1/1 [=====] - 0s 49ms/step - loss: 0.8107 - acc: 0.32
56 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 47/90
1/1 [=====] - 0s 49ms/step - loss: 0.7977 - acc: 0.32
56 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 48/90
1/1 [=====] - 0s 48ms/step - loss: 0.7817 - acc: 0.32
56 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 49/90
1/1 [=====] - 0s 48ms/step - loss: 0.7706 - acc: 0.32
56 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 50/90
1/1 [=====] - 0s 48ms/step - loss: 0.7609 - acc: 0.32
56 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 51/90
1/1 [=====] - 0s 47ms/step - loss: 0.7481 - acc: 0.32
56 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 52/90
1/1 [=====] - 0s 47ms/step - loss: 0.7397 - acc: 0.32
56 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 53/90
1/1 [=====] - 0s 46ms/step - loss: 0.7336 - acc: 0.32
56 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 54/90
1/1 [=====] - 0s 47ms/step - loss: 0.7233 - acc: 0.32
56 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 55/90
1/1 [=====] - 0s 49ms/step - loss: 0.7167 - acc: 0.32
56 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 56/90
1/1 [=====] - 0s 48ms/step - loss: 0.7113 - acc: 0.32
56 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 57/90
1/1 [=====] - 0s 47ms/step - loss: 0.7071 - acc: 0.32
56 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 58/90
1/1 [=====] - 0s 47ms/step - loss: 829.9582 - acc: 0.
4419 - recall: 0.6207 - precision: 0.5806
Epoch 59/90
1/1 [=====] - 0s 47ms/step - loss: 0.7028 - acc: 0.32
56 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 60/90
1/1 [=====] - 0s 47ms/step - loss: 0.7020 - acc: 0.32
56 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 61/90
```

```
1/1 [=====] - 0s 47ms/step - loss: 28396.4180 - acc: 0.4651 - recall: 0.3793 - precision: 0.6875
Epoch 62/90
1/1 [=====] - 0s 48ms/step - loss: 0.7009 - acc: 0.32
56 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 63/90
1/1 [=====] - 0s 47ms/step - loss: 0.7006 - acc: 0.32
56 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 64/90
1/1 [=====] - 0s 47ms/step - loss: 0.7006 - acc: 0.32
56 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 65/90
1/1 [=====] - 0s 47ms/step - loss: 0.7007 - acc: 0.32
56 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 66/90
1/1 [=====] - 0s 49ms/step - loss: 0.7009 - acc: 0.32
56 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 67/90
1/1 [=====] - 0s 49ms/step - loss: 0.7012 - acc: 0.67
44 - recall: 1.0000 - precision: 0.6744
Epoch 68/90
1/1 [=====] - 0s 48ms/step - loss: 0.7014 - acc: 0.67
44 - recall: 1.0000 - precision: 0.6744
Epoch 69/90
1/1 [=====] - 0s 48ms/step - loss: 0.7017 - acc: 0.67
44 - recall: 1.0000 - precision: 0.6744
Epoch 70/90
1/1 [=====] - 0s 47ms/step - loss: 0.7019 - acc: 0.67
44 - recall: 1.0000 - precision: 0.6744
Epoch 71/90
1/1 [=====] - 0s 46ms/step - loss: 0.7021 - acc: 0.67
44 - recall: 1.0000 - precision: 0.6744
Epoch 72/90
1/1 [=====] - 0s 51ms/step - loss: 0.7022 - acc: 0.67
44 - recall: 1.0000 - precision: 0.6744
Epoch 73/90
1/1 [=====] - 0s 46ms/step - loss: 0.7022 - acc: 0.67
44 - recall: 1.0000 - precision: 0.6744
Epoch 74/90
1/1 [=====] - 0s 53ms/step - loss: 0.7022 - acc: 0.67
44 - recall: 1.0000 - precision: 0.6744
Epoch 75/90
1/1 [=====] - 0s 47ms/step - loss: 0.7021 - acc: 0.67
44 - recall: 1.0000 - precision: 0.6744
Epoch 76/90
1/1 [=====] - 0s 48ms/step - loss: 0.7019 - acc: 0.67
44 - recall: 1.0000 - precision: 0.6744
Epoch 77/90
1/1 [=====] - 0s 48ms/step - loss: 0.7018 - acc: 0.67
44 - recall: 1.0000 - precision: 0.6744
Epoch 78/90
1/1 [=====] - 0s 48ms/step - loss: 0.7016 - acc: 0.67
44 - recall: 1.0000 - precision: 0.6744
Epoch 79/90
1/1 [=====] - 0s 48ms/step - loss: 0.7014 - acc: 0.67
44 - recall: 1.0000 - precision: 0.6744
Epoch 80/90
1/1 [=====] - 0s 47ms/step - loss: 0.7012 - acc: 0.67
44 - recall: 1.0000 - precision: 0.6744
Epoch 81/90
```

```
1/1 [=====] - 0s 47ms/step - loss: 0.7010 - acc: 0.32
56 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 82/90
1/1 [=====] - 0s 47ms/step - loss: 0.7009 - acc: 0.32
56 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 83/90
1/1 [=====] - 0s 47ms/step - loss: 0.7008 - acc: 0.32
56 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 84/90
1/1 [=====] - 0s 48ms/step - loss: 0.7007 - acc: 0.32
56 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 85/90
1/1 [=====] - 0s 47ms/step - loss: 0.7006 - acc: 0.32
56 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 86/90
1/1 [=====] - 0s 47ms/step - loss: 0.7006 - acc: 0.32
56 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 87/90
1/1 [=====] - 0s 51ms/step - loss: 0.7006 - acc: 0.32
56 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 88/90
1/1 [=====] - 0s 48ms/step - loss: 0.7006 - acc: 0.32
56 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 89/90
1/1 [=====] - 0s 47ms/step - loss: 0.7006 - acc: 0.32
56 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 90/90
1/1 [=====] - 0s 47ms/step - loss: 0.7007 - acc: 0.32
56 - recall: 0.0000e+00 - precision: 0.0000e+00
2023-03-29 01:11:11.346832: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
1/1 [=====] - 0s 266ms/step
2/2 [=====] - 0s 240ms/step
Epoch 1/90
2023-03-29 01:11:12.450834: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
```

```
1/1 [=====] - 2s 2s/step - loss: 0.7284 - acc: 0.6279  
- recall: 0.7037 - precision: 0.7037  
Epoch 2/90  
1/1 [=====] - 0s 261ms/step - loss: 142840823808.0000  
- acc: 0.3721 - recall: 0.0000e+00 - precision: 0.0000e+00  
Epoch 3/90  
1/1 [=====] - 0s 267ms/step - loss: 8738413.0000 - ac  
cc: 0.6279 - recall: 1.0000 - precision: 0.6279  
Epoch 4/90  
1/1 [=====] - 0s 363ms/step - loss: 152109648.0000 -  
acc: 0.6279 - recall: 1.0000 - precision: 0.6279  
Epoch 5/90  
1/1 [=====] - 0s 259ms/step - loss: 24155984.0000 - a  
cc: 0.3721 - recall: 0.0000e+00 - precision: 0.0000e+00  
Epoch 6/90  
1/1 [=====] - 0s 143ms/step - loss: 5359326.5000 - ac  
cc: 0.5349 - recall: 0.4074 - precision: 0.7333  
Epoch 7/90  
1/1 [=====] - 0s 272ms/step - loss: 62771068.0000 - a  
cc: 0.3721 - recall: 0.0000e+00 - precision: 0.0000e+00  
Epoch 8/90  
1/1 [=====] - 0s 245ms/step - loss: 2251302.2500 - ac  
cc: 0.5581 - recall: 0.7778 - precision: 0.6176  
Epoch 9/90  
1/1 [=====] - 0s 162ms/step - loss: 364761.2500 - ac  
cc: 0.3953 - recall: 0.0370 - precision: 1.0000  
Epoch 10/90  
1/1 [=====] - 0s 137ms/step - loss: 140774.7500 - ac  
cc: 0.4651 - recall: 0.4815 - precision: 0.5909  
Epoch 11/90  
1/1 [=====] - 0s 167ms/step - loss: 188381.1406 - ac  
cc: 0.4186 - recall: 0.1481 - precision: 0.6667  
Epoch 12/90  
1/1 [=====] - 0s 56ms/step - loss: 133853.8906 - acc:  
0.6279 - recall: 1.0000 - precision: 0.6279  
Epoch 13/90  
1/1 [=====] - 0s 53ms/step - loss: 121446.8359 - acc:  
0.6512 - recall: 0.9259 - precision: 0.6579  
Epoch 14/90  
1/1 [=====] - 0s 53ms/step - loss: 15709.3135 - acc:  
0.6744 - recall: 0.9630 - precision: 0.6667  
Epoch 15/90  
1/1 [=====] - 0s 58ms/step - loss: 24209.3516 - acc:  
0.5581 - recall: 0.5556 - precision: 0.6818  
Epoch 16/90  
1/1 [=====] - 0s 141ms/step - loss: 160337.2344 - ac  
cc: 0.4651 - recall: 0.4815 - precision: 0.5909  
Epoch 17/90  
1/1 [=====] - 0s 159ms/step - loss: 4879.2109 - acc:  
0.4651 - recall: 0.5185 - precision: 0.5833  
Epoch 18/90  
1/1 [=====] - 0s 49ms/step - loss: 3383.2275 - acc:  
0.5116 - recall: 0.5185 - precision: 0.6364  
Epoch 19/90  
1/1 [=====] - 0s 85ms/step - loss: 2411.8979 - acc:  
0.5116 - recall: 0.5556 - precision: 0.6250  
Epoch 20/90  
1/1 [=====] - 0s 49ms/step - loss: 2652.2864 - acc:  
0.4884 - recall: 0.4815 - precision: 0.6190  
Epoch 21/90
```

```
1/1 [=====] - 0s 49ms/step - loss: 1187.5565 - acc: 0.5349 - recall: 0.6667 - precision: 0.6207
Epoch 22/90
1/1 [=====] - 0s 77ms/step - loss: 471.9899 - acc: 0.6279 - recall: 0.9259 - precision: 0.6410
Epoch 23/90
1/1 [=====] - 0s 129ms/step - loss: 31.6439 - acc: 0.5349 - recall: 0.7037 - precision: 0.6129
Epoch 24/90
1/1 [=====] - 0s 53ms/step - loss: 1.2069 - acc: 0.5349 - recall: 0.7037 - precision: 0.6129
Epoch 25/90
1/1 [=====] - 0s 49ms/step - loss: 3965.6904 - acc: 0.6279 - recall: 1.0000 - precision: 0.6279
Epoch 26/90
1/1 [=====] - 0s 61ms/step - loss: 1.0852 - acc: 0.6279 - recall: 0.7407 - precision: 0.6897
Epoch 27/90
1/1 [=====] - 0s 50ms/step - loss: 0.9262 - acc: 0.6047 - recall: 0.6296 - precision: 0.7083
Epoch 28/90
1/1 [=====] - 0s 53ms/step - loss: 0.7466 - acc: 0.6512 - recall: 0.5556 - precision: 0.8333
Epoch 29/90
1/1 [=====] - 0s 57ms/step - loss: 0.9656 - acc: 0.4884 - recall: 0.4074 - precision: 0.6471
Epoch 30/90
1/1 [=====] - 0s 49ms/step - loss: 0.8534 - acc: 0.4884 - recall: 0.3704 - precision: 0.6667
Epoch 31/90
1/1 [=====] - 0s 244ms/step - loss: 4270.3882 - acc: 0.6279 - recall: 1.0000 - precision: 0.6279
Epoch 32/90
1/1 [=====] - 0s 51ms/step - loss: 15168.1035 - acc: 0.6279 - recall: 0.9630 - precision: 0.6341
Epoch 33/90
1/1 [=====] - 0s 48ms/step - loss: 309997.5312 - acc: 0.6047 - recall: 0.9630 - precision: 0.6190
Epoch 34/90
1/1 [=====] - 0s 53ms/step - loss: 2267872.2500 - acc: 0.4884 - recall: 0.7778 - precision: 0.5676
Epoch 35/90
1/1 [=====] - 0s 49ms/step - loss: 1.2491 - acc: 0.3721 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 36/90
1/1 [=====] - 0s 49ms/step - loss: 772736.6250 - acc: 0.2791 - recall: 0.3333 - precision: 0.4091
Epoch 37/90
1/1 [=====] - 0s 49ms/step - loss: 52123.8711 - acc: 0.4884 - recall: 0.4074 - precision: 0.6471
Epoch 38/90
1/1 [=====] - 0s 49ms/step - loss: 957.5767 - acc: 0.5116 - recall: 0.5926 - precision: 0.6154
Epoch 39/90
1/1 [=====] - 0s 48ms/step - loss: 93.4769 - acc: 0.5349 - recall: 0.3333 - precision: 0.8182
Epoch 40/90
1/1 [=====] - 0s 48ms/step - loss: 443.9156 - acc: 0.4186 - recall: 0.1111 - precision: 0.7500
Epoch 41/90
```

```
1/1 [=====] - 0s 130ms/step - loss: 876.3087 - acc: 0.3488 - recall: 0.0370 - precision: 0.3333
Epoch 42/90
1/1 [=====] - 0s 74ms/step - loss: 1640.6953 - acc: 0.3488 - recall: 0.0741 - precision: 0.4000
Epoch 43/90
1/1 [=====] - 0s 49ms/step - loss: 421.4956 - acc: 0.4186 - recall: 0.0741 - precision: 1.0000
Epoch 44/90
1/1 [=====] - 0s 48ms/step - loss: 200.5118 - acc: 0.4884 - recall: 0.1852 - precision: 1.0000
Epoch 45/90
1/1 [=====] - 0s 50ms/step - loss: 3808.6772 - acc: 0.3256 - recall: 0.1111 - precision: 0.3750
Epoch 46/90
1/1 [=====] - 0s 49ms/step - loss: 42067.0781 - acc: 0.4419 - recall: 0.1481 - precision: 0.8000
Epoch 47/90
1/1 [=====] - 0s 49ms/step - loss: 681.1676 - acc: 0.3953 - recall: 0.0370 - precision: 1.0000
Epoch 48/90
1/1 [=====] - 0s 49ms/step - loss: 591.6533 - acc: 0.4186 - recall: 0.0741 - precision: 1.0000
Epoch 49/90
1/1 [=====] - 0s 50ms/step - loss: 332.2113 - acc: 0.4186 - recall: 0.0741 - precision: 1.0000
Epoch 50/90
1/1 [=====] - 0s 50ms/step - loss: 881.1666 - acc: 0.4419 - recall: 0.1481 - precision: 0.8000
Epoch 51/90
1/1 [=====] - 0s 48ms/step - loss: 1.0171 - acc: 0.4884 - recall: 0.1852 - precision: 1.0000
Epoch 52/90
1/1 [=====] - 0s 49ms/step - loss: 1976.8014 - acc: 0.4651 - recall: 0.2222 - precision: 0.7500
Epoch 53/90
1/1 [=====] - 0s 49ms/step - loss: 466.3270 - acc: 0.4186 - recall: 0.1111 - precision: 0.7500
Epoch 54/90
1/1 [=====] - 0s 77ms/step - loss: 264.8191 - acc: 0.3721 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 55/90
1/1 [=====] - 0s 49ms/step - loss: 483.3594 - acc: 0.3721 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 56/90
1/1 [=====] - 0s 50ms/step - loss: 561.9315 - acc: 0.3721 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 57/90
1/1 [=====] - 0s 48ms/step - loss: 589.7657 - acc: 0.3953 - recall: 0.0370 - precision: 1.0000
Epoch 58/90
1/1 [=====] - 0s 49ms/step - loss: 479.6606 - acc: 0.3953 - recall: 0.0370 - precision: 1.0000
Epoch 59/90
1/1 [=====] - 0s 50ms/step - loss: 94.8252 - acc: 0.4186 - recall: 0.0741 - precision: 1.0000
Epoch 60/90
1/1 [=====] - 0s 49ms/step - loss: 0.7595 - acc: 0.4651 - recall: 0.1481 - precision: 1.0000
Epoch 61/90
```

```
1/1 [=====] - 0s 138ms/step - loss: 1319.6528 - acc: 0.3256 - recall: 0.0370 - precision: 0.2500
Epoch 62/90
1/1 [=====] - 0s 49ms/step - loss: 45.8119 - acc: 0.3953 - recall: 0.0741 - precision: 0.6667
Epoch 63/90
1/1 [=====] - 0s 50ms/step - loss: 0.7603 - acc: 0.3953 - recall: 0.0370 - precision: 1.0000
Epoch 64/90
1/1 [=====] - 0s 48ms/step - loss: 0.7418 - acc: 0.3953 - recall: 0.0370 - precision: 1.0000
Epoch 65/90
1/1 [=====] - 0s 49ms/step - loss: 0.7274 - acc: 0.3953 - recall: 0.0370 - precision: 1.0000
Epoch 66/90
1/1 [=====] - 0s 48ms/step - loss: 0.7169 - acc: 0.3953 - recall: 0.0370 - precision: 1.0000
Epoch 67/90
1/1 [=====] - 0s 49ms/step - loss: 0.7101 - acc: 0.3953 - recall: 0.0370 - precision: 1.0000
Epoch 68/90
1/1 [=====] - 0s 49ms/step - loss: 0.7066 - acc: 0.3953 - recall: 0.0370 - precision: 1.0000
Epoch 69/90
1/1 [=====] - 0s 49ms/step - loss: 999.2829 - acc: 0.3256 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 70/90
1/1 [=====] - 0s 49ms/step - loss: 0.7070 - acc: 0.3953 - recall: 0.0370 - precision: 1.0000
Epoch 71/90
1/1 [=====] - 0s 49ms/step - loss: 0.7225 - acc: 0.3721 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 72/90
1/1 [=====] - 0s 49ms/step - loss: 34.5575 - acc: 0.3488 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 73/90
1/1 [=====] - 0s 48ms/step - loss: 0.7288 - acc: 0.3721 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 74/90
1/1 [=====] - 0s 49ms/step - loss: 0.7322 - acc: 0.6279 - recall: 1.0000 - precision: 0.6279
Epoch 75/90
1/1 [=====] - 0s 48ms/step - loss: 0.7353 - acc: 0.6279 - recall: 1.0000 - precision: 0.6279
Epoch 76/90
1/1 [=====] - 0s 49ms/step - loss: 0.7378 - acc: 0.6279 - recall: 1.0000 - precision: 0.6279
Epoch 77/90
1/1 [=====] - 0s 50ms/step - loss: 0.7396 - acc: 0.6279 - recall: 1.0000 - precision: 0.6279
Epoch 78/90
1/1 [=====] - 0s 49ms/step - loss: 0.7407 - acc: 0.6279 - recall: 1.0000 - precision: 0.6279
Epoch 79/90
1/1 [=====] - 0s 48ms/step - loss: 0.7409 - acc: 0.6279 - recall: 1.0000 - precision: 0.6279
Epoch 80/90
1/1 [=====] - 0s 48ms/step - loss: 0.7404 - acc: 0.6279 - recall: 1.0000 - precision: 0.6279
Epoch 81/90
```

```
1/1 [=====] - 0s 48ms/step - loss: 0.7392 - acc: 0.62
79 - recall: 1.0000 - precision: 0.6279
Epoch 82/90
1/1 [=====] - 0s 50ms/step - loss: 0.7376 - acc: 0.62
79 - recall: 1.0000 - precision: 0.6279
Epoch 83/90
1/1 [=====] - 0s 49ms/step - loss: 0.7356 - acc: 0.62
79 - recall: 1.0000 - precision: 0.6279
Epoch 84/90
1/1 [=====] - 0s 49ms/step - loss: 0.7333 - acc: 0.62
79 - recall: 1.0000 - precision: 0.6279
Epoch 85/90
1/1 [=====] - 0s 50ms/step - loss: 0.7310 - acc: 0.62
79 - recall: 1.0000 - precision: 0.6279
Epoch 86/90
1/1 [=====] - 0s 49ms/step - loss: 0.7287 - acc: 0.37
21 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 87/90
1/1 [=====] - 0s 49ms/step - loss: 0.7266 - acc: 0.37
21 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 88/90
1/1 [=====] - 0s 49ms/step - loss: 0.7248 - acc: 0.37
21 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 89/90
1/1 [=====] - 0s 48ms/step - loss: 0.7232 - acc: 0.37
21 - recall: 0.0000e+00 - precision: 0.0000e+00
Epoch 90/90
1/1 [=====] - 0s 49ms/step - loss: 0.7220 - acc: 0.37
21 - recall: 0.0000e+00 - precision: 0.0000e+00
2023-03-29 01:11:21.217960: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
1/1 [=====] - 0s 277ms/step
2/2 [=====] - 0s 180ms/step
Epoch 1/90
2023-03-29 01:11:22.307677: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
```

```
1/1 [=====] - 2s 2s/step - loss: 0.6944 - acc: 0.4531
- recall: 0.4545 - precision: 0.6452
Epoch 2/90
1/1 [=====] - 0s 281ms/step - loss: 0.6958 - acc: 0.5
625 - recall: 0.6136 - precision: 0.7105
Epoch 3/90
1/1 [=====] - 0s 272ms/step - loss: 0.6960 - acc: 0.4
375 - recall: 0.3409 - precision: 0.6818
Epoch 4/90
1/1 [=====] - 0s 273ms/step - loss: 0.6900 - acc: 0.3
750 - recall: 0.1818 - precision: 0.6667
Epoch 5/90
1/1 [=====] - 0s 371ms/step - loss: 0.6865 - acc: 0.4
688 - recall: 0.2955 - precision: 0.8125
Epoch 6/90
1/1 [=====] - 0s 262ms/step - loss: 0.6821 - acc: 0.4
219 - recall: 0.2273 - precision: 0.7692
Epoch 7/90
1/1 [=====] - 0s 180ms/step - loss: 0.6950 - acc: 0.4
062 - recall: 0.2273 - precision: 0.7143
Epoch 8/90
1/1 [=====] - 0s 189ms/step - loss: 0.6917 - acc: 0.4
375 - recall: 0.3409 - precision: 0.6818
Epoch 9/90
1/1 [=====] - 0s 75ms/step - loss: 0.6947 - acc: 0.57
81 - recall: 0.6364 - precision: 0.7179
Epoch 10/90
1/1 [=====] - 0s 149ms/step - loss: 0.6644 - acc: 0.7
031 - recall: 0.7045 - precision: 0.8378
Epoch 11/90
1/1 [=====] - 0s 182ms/step - loss: 0.6871 - acc: 0.5
625 - recall: 0.6136 - precision: 0.7105
Epoch 12/90
1/1 [=====] - 0s 73ms/step - loss: 0.6522 - acc: 0.64
06 - recall: 0.6364 - precision: 0.8000
Epoch 13/90
1/1 [=====] - 0s 179ms/step - loss: 0.6321 - acc: 0.6
719 - recall: 0.5682 - precision: 0.9259
Epoch 14/90
1/1 [=====] - 0s 159ms/step - loss: 0.6289 - acc: 0.5
938 - recall: 0.5000 - precision: 0.8462
Epoch 15/90
1/1 [=====] - 0s 72ms/step - loss: 0.5867 - acc: 0.67
19 - recall: 0.6364 - precision: 0.8485
Epoch 16/90
1/1 [=====] - 0s 103ms/step - loss: 0.5863 - acc: 0.7
031 - recall: 0.6818 - precision: 0.8571
Epoch 17/90
1/1 [=====] - 0s 75ms/step - loss: 0.5541 - acc: 0.71
88 - recall: 0.6818 - precision: 0.8824
Epoch 18/90
1/1 [=====] - 0s 148ms/step - loss: 0.5710 - acc: 0.7
500 - recall: 0.7500 - precision: 0.8684
Epoch 19/90
1/1 [=====] - 0s 179ms/step - loss: 0.5342 - acc: 0.7
969 - recall: 0.7955 - precision: 0.8974
Epoch 20/90
1/1 [=====] - 0s 68ms/step - loss: 0.5307 - acc: 0.82
81 - recall: 0.8636 - precision: 0.8837
Epoch 21/90
```

```
1/1 [=====] - 0s 67ms/step - loss: 0.4654 - acc: 0.82
81 - recall: 0.8182 - precision: 0.9231
Epoch 22/90
1/1 [=====] - 0s 67ms/step - loss: 0.4173 - acc: 0.84
38 - recall: 0.8182 - precision: 0.9474
Epoch 23/90
1/1 [=====] - 0s 68ms/step - loss: 0.4329 - acc: 0.81
25 - recall: 0.7727 - precision: 0.9444
Epoch 24/90
1/1 [=====] - 0s 117ms/step - loss: 0.4672 - acc: 0.8
281 - recall: 0.8409 - precision: 0.9024
Epoch 25/90
1/1 [=====] - 0s 163ms/step - loss: 0.3407 - acc: 0.8
594 - recall: 0.8182 - precision: 0.9730
Epoch 26/90
1/1 [=====] - 0s 143ms/step - loss: 0.3965 - acc: 0.8
281 - recall: 0.7727 - precision: 0.9714
Epoch 27/90
1/1 [=====] - 0s 71ms/step - loss: 0.3112 - acc: 0.90
62 - recall: 0.8864 - precision: 0.9750
Epoch 28/90
1/1 [=====] - 0s 66ms/step - loss: 0.3099 - acc: 0.87
50 - recall: 0.8636 - precision: 0.9500
Epoch 29/90
1/1 [=====] - 0s 70ms/step - loss: 0.3003 - acc: 0.84
38 - recall: 0.7727 - precision: 1.0000
Epoch 30/90
1/1 [=====] - 0s 67ms/step - loss: 0.2738 - acc: 0.85
94 - recall: 0.7955 - precision: 1.0000
Epoch 31/90
1/1 [=====] - 0s 151ms/step - loss: 0.2434 - acc: 0.9
375 - recall: 0.9773 - precision: 0.9348
Epoch 32/90
1/1 [=====] - 0s 69ms/step - loss: 0.2342 - acc: 0.90
62 - recall: 0.9091 - precision: 0.9524
Epoch 33/90
1/1 [=====] - 0s 97ms/step - loss: 0.2939 - acc: 0.82
81 - recall: 0.7727 - precision: 0.9714
Epoch 34/90
1/1 [=====] - 0s 67ms/step - loss: 0.1636 - acc: 0.96
88 - recall: 0.9773 - precision: 0.9773
Epoch 35/90
1/1 [=====] - 0s 69ms/step - loss: 0.1833 - acc: 0.93
75 - recall: 0.9318 - precision: 0.9762
Epoch 36/90
1/1 [=====] - 0s 146ms/step - loss: 0.2174 - acc: 0.8
906 - recall: 0.8409 - precision: 1.0000
Epoch 37/90
1/1 [=====] - 0s 68ms/step - loss: 0.0974 - acc: 0.96
88 - recall: 0.9545 - precision: 1.0000
Epoch 38/90
1/1 [=====] - 0s 67ms/step - loss: 0.1187 - acc: 0.95
31 - recall: 0.9318 - precision: 1.0000
Epoch 39/90
1/1 [=====] - 0s 68ms/step - loss: 0.1834 - acc: 0.95
31 - recall: 0.9773 - precision: 0.9556
Epoch 40/90
1/1 [=====] - 0s 154ms/step - loss: 0.0870 - acc: 0.9
531 - recall: 0.9318 - precision: 1.0000
Epoch 41/90
```

```
1/1 [=====] - 0s 271ms/step - loss: 0.0947 - acc: 0.9531 - recall: 0.9318 - precision: 1.0000
Epoch 42/90
1/1 [=====] - 0s 67ms/step - loss: 0.0777 - acc: 0.9688 - recall: 0.9545 - precision: 1.0000
Epoch 43/90
1/1 [=====] - 0s 66ms/step - loss: 0.0721 - acc: 0.9844 - recall: 0.9773 - precision: 1.0000
Epoch 44/90
1/1 [=====] - 0s 69ms/step - loss: 0.0636 - acc: 0.9844 - recall: 0.9773 - precision: 1.0000
Epoch 45/90
1/1 [=====] - 0s 67ms/step - loss: 0.0614 - acc: 0.9844 - recall: 0.9773 - precision: 1.0000
Epoch 46/90
1/1 [=====] - 0s 68ms/step - loss: 0.0844 - acc: 0.9688 - recall: 0.9545 - precision: 1.0000
Epoch 47/90
1/1 [=====] - 0s 66ms/step - loss: 0.0678 - acc: 0.9688 - recall: 0.9545 - precision: 1.0000
Epoch 48/90
1/1 [=====] - 0s 67ms/step - loss: 0.0513 - acc: 1.0000 - recall: 1.0000 - precision: 1.0000
Epoch 49/90
1/1 [=====] - 0s 68ms/step - loss: 0.0100 - acc: 1.0000 - recall: 1.0000 - precision: 1.0000
Epoch 50/90
1/1 [=====] - 0s 67ms/step - loss: 0.0454 - acc: 0.9688 - recall: 0.9773 - precision: 0.9773
Epoch 51/90
1/1 [=====] - 0s 67ms/step - loss: 0.0375 - acc: 0.9844 - recall: 0.9773 - precision: 1.0000
Epoch 52/90
1/1 [=====] - 0s 68ms/step - loss: 0.0499 - acc: 0.9844 - recall: 0.9773 - precision: 1.0000
Epoch 53/90
1/1 [=====] - 0s 67ms/step - loss: 0.0314 - acc: 0.9844 - recall: 0.9773 - precision: 1.0000
Epoch 54/90
1/1 [=====] - 0s 67ms/step - loss: 0.1122 - acc: 0.9531 - recall: 0.9773 - precision: 0.9556
Epoch 55/90
1/1 [=====] - 0s 68ms/step - loss: 0.0360 - acc: 0.9688 - recall: 0.9545 - precision: 1.0000
Epoch 56/90
1/1 [=====] - 0s 68ms/step - loss: 0.0816 - acc: 0.9688 - recall: 0.9545 - precision: 1.0000
Epoch 57/90
1/1 [=====] - 0s 69ms/step - loss: 0.1352 - acc: 0.9688 - recall: 0.9545 - precision: 1.0000
Epoch 58/90
1/1 [=====] - 0s 67ms/step - loss: 0.0393 - acc: 0.9844 - recall: 0.9773 - precision: 1.0000
Epoch 59/90
1/1 [=====] - 0s 68ms/step - loss: 0.1108 - acc: 0.9531 - recall: 0.9773 - precision: 0.9556
Epoch 60/90
1/1 [=====] - 0s 67ms/step - loss: 0.0347 - acc: 0.9844 - recall: 0.9773 - precision: 1.0000
Epoch 61/90
```

```
1/1 [=====] - 0s 68ms/step - loss: 0.0711 - acc: 0.95
31 - recall: 0.9318 - precision: 1.0000
Epoch 62/90
1/1 [=====] - 0s 68ms/step - loss: 0.0544 - acc: 0.95
31 - recall: 0.9318 - precision: 1.0000
Epoch 63/90
1/1 [=====] - 0s 70ms/step - loss: 0.0197 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 64/90
1/1 [=====] - 0s 68ms/step - loss: 0.0258 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 65/90
1/1 [=====] - 0s 75ms/step - loss: 0.0407 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 66/90
1/1 [=====] - 0s 71ms/step - loss: 0.0235 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 67/90
1/1 [=====] - 0s 73ms/step - loss: 0.0161 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 68/90
1/1 [=====] - 0s 77ms/step - loss: 0.0178 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 69/90
1/1 [=====] - 0s 85ms/step - loss: 0.0084 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 70/90
1/1 [=====] - 0s 93ms/step - loss: 0.0068 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 71/90
1/1 [=====] - 0s 102ms/step - loss: 0.0091 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 72/90
1/1 [=====] - 0s 101ms/step - loss: 0.0124 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 73/90
1/1 [=====] - 0s 97ms/step - loss: 0.0036 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 74/90
1/1 [=====] - 0s 92ms/step - loss: 0.0021 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 75/90
1/1 [=====] - 0s 88ms/step - loss: 0.0074 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 76/90
1/1 [=====] - 0s 86ms/step - loss: 0.0012 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 77/90
1/1 [=====] - 0s 82ms/step - loss: 0.0028 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 78/90
1/1 [=====] - 0s 82ms/step - loss: 0.0057 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 79/90
1/1 [=====] - 0s 82ms/step - loss: 0.0079 - acc: 1.00
00 - recall: 1.0000 - precision: 1.0000
Epoch 80/90
1/1 [=====] - 0s 87ms/step - loss: 2.3600e-04 - acc:
1.0000 - recall: 1.0000 - precision: 1.0000
Epoch 81/90
```

```
1/1 [=====] - 0s 82ms/step - loss: 3.5170e-04 - acc: 1.0000 - recall: 1.0000 - precision: 1.0000
Epoch 82/90
1/1 [=====] - 0s 85ms/step - loss: 0.0036 - acc: 1.0000 - recall: 1.0000 - precision: 1.0000
Epoch 83/90
1/1 [=====] - 0s 85ms/step - loss: 0.0012 - acc: 1.0000 - recall: 1.0000 - precision: 1.0000
Epoch 84/90
1/1 [=====] - 0s 86ms/step - loss: 0.0139 - acc: 0.9844 - recall: 0.9773 - precision: 1.0000
Epoch 85/90
1/1 [=====] - 0s 89ms/step - loss: 1.2406e-04 - acc: 1.0000 - recall: 1.0000 - precision: 1.0000
Epoch 86/90
1/1 [=====] - 0s 90ms/step - loss: 0.0012 - acc: 1.0000 - recall: 1.0000 - precision: 1.0000
Epoch 87/90
1/1 [=====] - 0s 84ms/step - loss: 8.1455e-04 - acc: 1.0000 - recall: 1.0000 - precision: 1.0000
Epoch 88/90
1/1 [=====] - 0s 84ms/step - loss: 0.0093 - acc: 1.0000 - recall: 1.0000 - precision: 1.0000
Epoch 89/90
1/1 [=====] - 0s 84ms/step - loss: 0.0198 - acc: 0.9844 - recall: 1.0000 - precision: 0.9778
Epoch 90/90
1/1 [=====] - 0s 84ms/step - loss: 5.1338e-04 - acc: 1.0000 - recall: 1.0000 - precision: 1.0000
```

In [104...]:

```
print("Best: %f using %s" % (gs_3.best_score_, gs_3.best_params_))

Best: 0.719336 using {'learning_rate': 0.001}
```

This .001 is the defult learning rate, nothing modifications and additons will be done.
The results will be same as Model Iteration 5.

Transfer Learning

Using pretrained models from another problem and using them on another problem

- **VGG19 Pre-Trained Model**
This method has faster training speed, fewer training samples per time, and higher accuracy
- **Feature Extraction without augmented data**
- **Feature Extraction with augmented data**
- **Fine Tuning**

In [133...]:

```
#The imagenet weights are downloaded from online
cnn_base = VGG19(weights="imagenet",
                  include_top=False,
                  input_shape=(224, 224, 3))
```

```
In [134... #Creating the model layer architecture including cnn_base (19 layers)
model_8 = models.Sequential()
model_8.add(cnn_base)
model_8.add(layers.Flatten())
model_8.add(layers.Dense(132, activation='relu'))
model_8.add(layers.Dense(1, activation='sigmoid'))
```

```
In [135... cnn_base.summary()
```

Model: "vgg19"

Layer (type)	Output Shape	Param #
<hr/>		
input_3 (InputLayer)	[(None, 224, 224, 3)]	0
block1_conv1 (Conv2D)	(None, 224, 224, 64)	1792
block1_conv2 (Conv2D)	(None, 224, 224, 64)	36928
block1_pool (MaxPooling2D)	(None, 112, 112, 64)	0
block2_conv1 (Conv2D)	(None, 112, 112, 128)	73856
block2_conv2 (Conv2D)	(None, 112, 112, 128)	147584
block2_pool (MaxPooling2D)	(None, 56, 56, 128)	0
block3_conv1 (Conv2D)	(None, 56, 56, 256)	295168
block3_conv2 (Conv2D)	(None, 56, 56, 256)	590080
block3_conv3 (Conv2D)	(None, 56, 56, 256)	590080
block3_conv4 (Conv2D)	(None, 56, 56, 256)	590080
block3_pool (MaxPooling2D)	(None, 28, 28, 256)	0
block4_conv1 (Conv2D)	(None, 28, 28, 512)	1180160
block4_conv2 (Conv2D)	(None, 28, 28, 512)	2359808
block4_conv3 (Conv2D)	(None, 28, 28, 512)	2359808
block4_conv4 (Conv2D)	(None, 28, 28, 512)	2359808
block4_pool (MaxPooling2D)	(None, 14, 14, 512)	0
block5_conv1 (Conv2D)	(None, 14, 14, 512)	2359808
block5_conv2 (Conv2D)	(None, 14, 14, 512)	2359808
block5_conv3 (Conv2D)	(None, 14, 14, 512)	2359808
block5_conv4 (Conv2D)	(None, 14, 14, 512)	2359808
block5_pool (MaxPooling2D)	(None, 7, 7, 512)	0
<hr/>		
Total params:	20,024,384	
Trainable params:	20,024,384	
Non-trainable params:	0	

In [136...]

`model_8.summary()`

```
Model: "sequential_144"
```

Layer (type)	Output Shape	Param #
vgg19 (Functional)	(None, 7, 7, 512)	20024384
flatten_144 (Flatten)	(None, 25088)	0
dense_377 (Dense)	(None, 132)	3311748
dense_378 (Dense)	(None, 1)	133
<hr/>		
Total params: 23,336,265		
Trainable params: 23,336,265		
Non-trainable params: 0		

```
In [137...]: # You can check whether a layer is trainable (or alter its setting) through the
for layer in model_8.layers:
    print(layer.name, layer.trainable)

# Similarly, you can check how many trainable weights are in the model
print(len(model_8.trainable_weights))
```

vgg19 True
flatten_144 True
dense_377 True
dense_378 True
36

```
In [138...]: # Freeze the model
cnn_base.trainable = False
```

```
In [139...]: # You can check whether a layer is trainable (or alter its setting) through the
for layer in model_8.layers:
    print(layer.name, layer.trainable)

# Similarly, you can check how many trainable weights are in the model
print(len(model_8.trainable_weights))
```

vgg19 False
flatten_144 True
dense_377 True
dense_378 True
4

```
In [140...]: model_8.compile(loss='binary_crossentropy',
                    optimizer= "adam",
                    metrics=[ "acc", "Recall", "Precision"]
                    )
```

```
In [141...]: #Copying model before trained for Augmented Data Fitting
model_9 = model_8
```

```
In [142...]: #Fitting with regular training data
history8 = model_8.fit(train_gen,batch_size=128,
                      epochs=90,
                      verbose = 2,
```

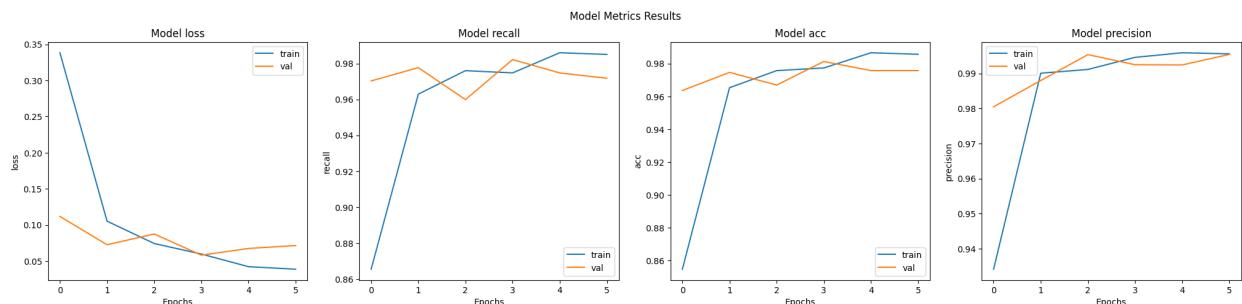
```
        class_weight=class_weights,
        validation_data=val_gen,
        callbacks = es) #stopping early because of time resources
```

```
Epoch 1/90
2023-03-29 01:53:09.670361: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
2023-03-29 01:53:36.163388: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
68/68 - 34s - loss: 0.3384 - acc: 0.8548 - recall: 0.8654 - precision: 0.9341
- val_loss: 0.1117 - val_acc: 0.9636 - val_recall: 0.9703 - val_precision: 0.9
805 - 34s/epoch - 496ms/step
Epoch 2/90
68/68 - 29s - loss: 0.1052 - acc: 0.9653 - recall: 0.9629 - precision: 0.9901
- val_loss: 0.0725 - val_acc: 0.9746 - val_recall: 0.9777 - val_precision: 0.9
880 - 29s/epoch - 432ms/step
Epoch 3/90
68/68 - 30s - loss: 0.0742 - acc: 0.9757 - recall: 0.9760 - precision: 0.9911
- val_loss: 0.0874 - val_acc: 0.9669 - val_recall: 0.9599 - val_precision: 0.9
954 - 30s/epoch - 442ms/step
Epoch 4/90
68/68 - 30s - loss: 0.0597 - acc: 0.9773 - recall: 0.9748 - precision: 0.9946
- val_loss: 0.0581 - val_acc: 0.9813 - val_recall: 0.9822 - val_precision: 0.9
925 - 30s/epoch - 448ms/step
Epoch 5/90
68/68 - 32s - loss: 0.0422 - acc: 0.9866 - recall: 0.9860 - precision: 0.9959
- val_loss: 0.0674 - val_acc: 0.9757 - val_recall: 0.9747 - val_precision: 0.9
924 - 32s/epoch - 464ms/step
Epoch 6/90
68/68 - 30s - loss: 0.0386 - acc: 0.9857 - recall: 0.9850 - precision: 0.9956
- val_loss: 0.0714 - val_acc: 0.9757 - val_recall: 0.9718 - val_precision: 0.9
954 - 30s/epoch - 442ms/step
Epoch 6: early stopping
```

In [143]:

```
print("Model 8 with augmented data :\n")
eval_metrics(history8)
```

Model 8 with augmented data :



In [144]:

```
train_labels, train_predictions = predict_results(model_8,train_gen_aug)
val_labels, val_predictions = predict_results(model_8,val_gen)
```

```
2023-03-29 02:00:48.631176: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
```

```
4/4 [=====] - 1s 170ms/step
```

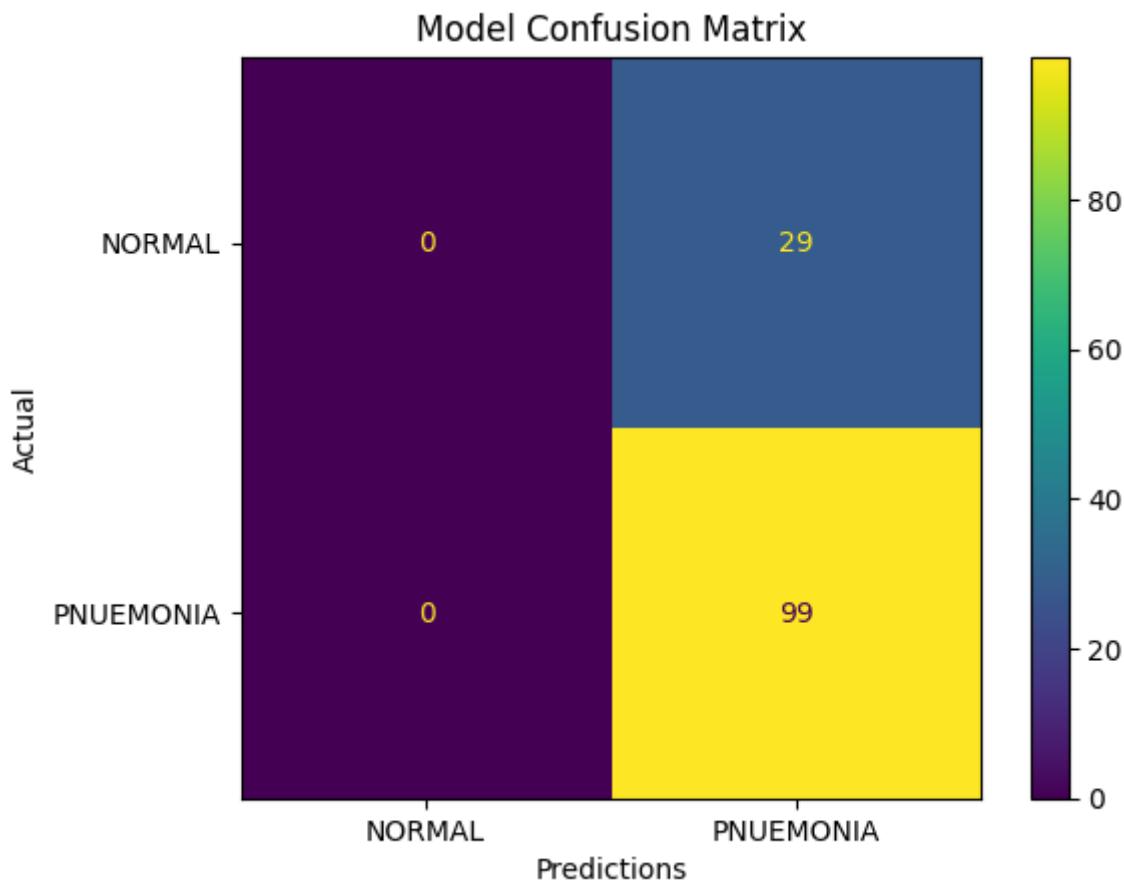
```
1/1 [=====] - 0s 20ms/step
```

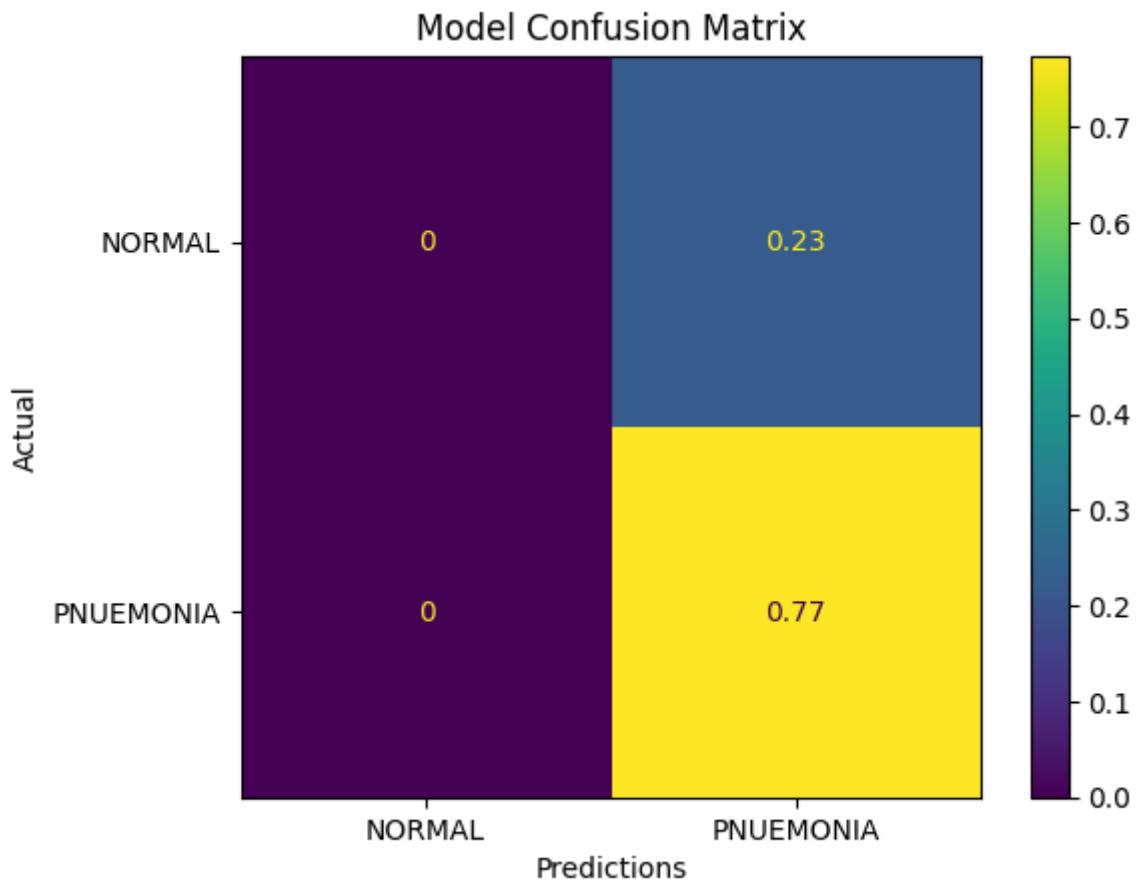
In [145]:

```
#Printing regular and normalized Confusion Matrices
print("Training Confusion Matrices:\n")
conf_matrix(train_labels,train_predictions, None)
```

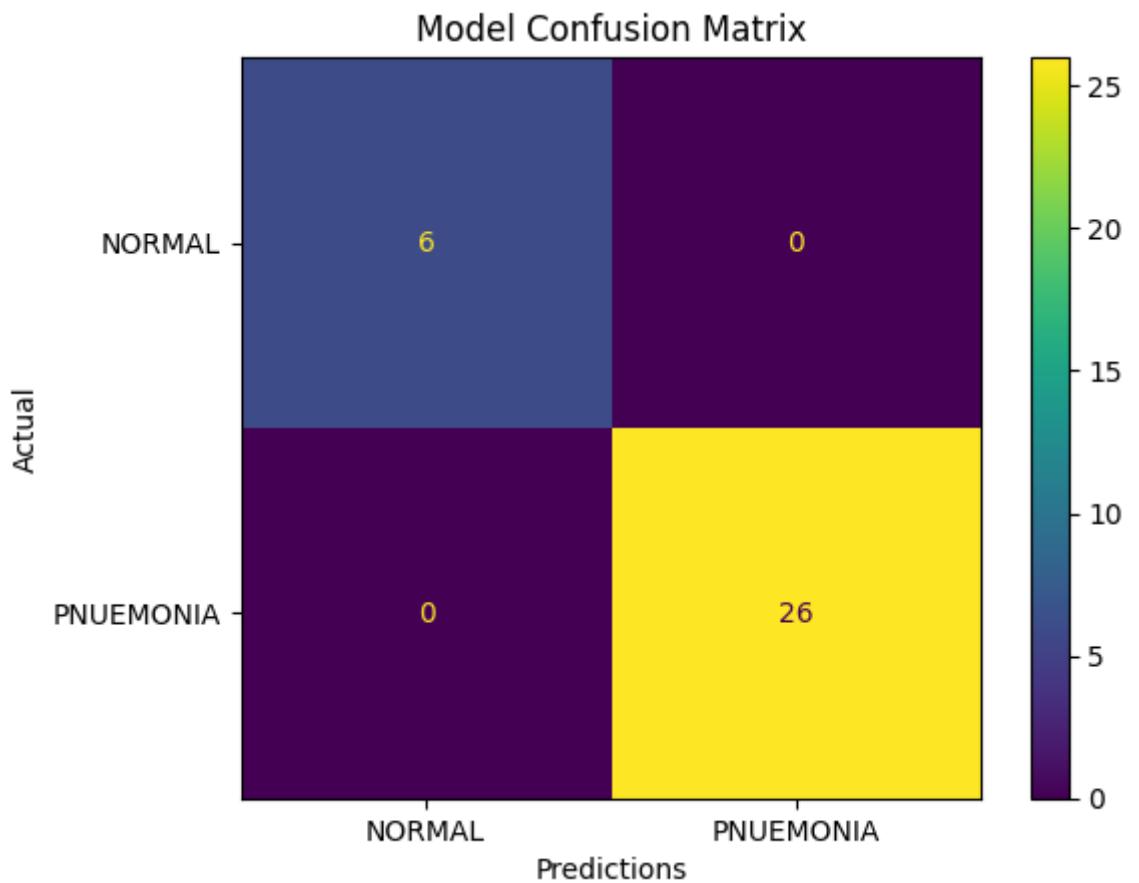
```
conf_matrix(train_labels,train_predictions, "all")
print("Validation Confusion Matrices:\n")
conf_matrix(val_labels, val_predictions, None)
conf_matrix(val_labels, val_predictions, "all")
```

Training Confusion Matrices:

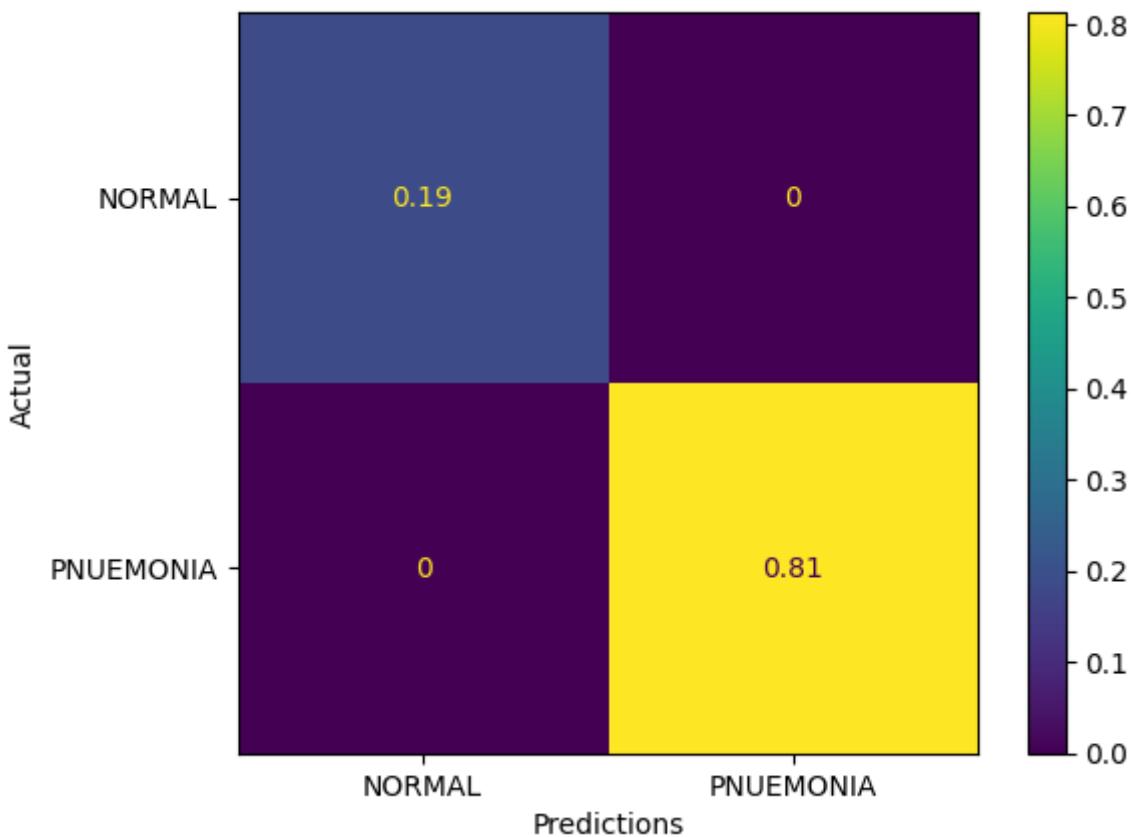




Validation Confusion Matrices:



Model Confusion Matrix



In [146...]

```
#Training Classification Report
print("Training Classificaiton Report:\n")
eval_report(train_labels,train_predictions,train_gen_aug,history8)
```

Training Classificaiton Report:

	precision	recall	f1-score	support
0.0	0.00	0.00	0.00	29
1.0	0.77	1.00	0.87	99
accuracy			0.77	128
macro avg	0.39	0.50	0.44	128
weighted avg	0.60	0.77	0.67	128

```
34/34 [=====] - 42s 1s/step - loss: 1.7944 - acc: 0.7
422 - recall: 1.0000 - precision: 0.7422
Loss: 1.7944
```

In [148...]

```
#Training Classification Report
print("Validation Classificaiton Report:\n")
eval_report(val_labels,val_predictions,val_gen,history8)
```

Validation Classification Report:

	precision	recall	f1-score	support
0.0	1.00	1.00	1.00	6
1.0	1.00	1.00	1.00	26
accuracy			1.00	32
macro avg	1.00	1.00	1.00	32
weighted avg	1.00	1.00	1.00	32

```
29/29 [=====] - 5s 174ms/step - loss: 0.0714 - acc: 0.9757 - recall: 0.9718 - precision: 0.9954
Loss: 0.0714
```

Transfer Model 10 Evaluation

The model is one of top models. The validation data performed better than the training data score. There were no wrong predictions on the validation data and the loss is much less than the training set.

Transfer Model 9 w/ Augmented Data

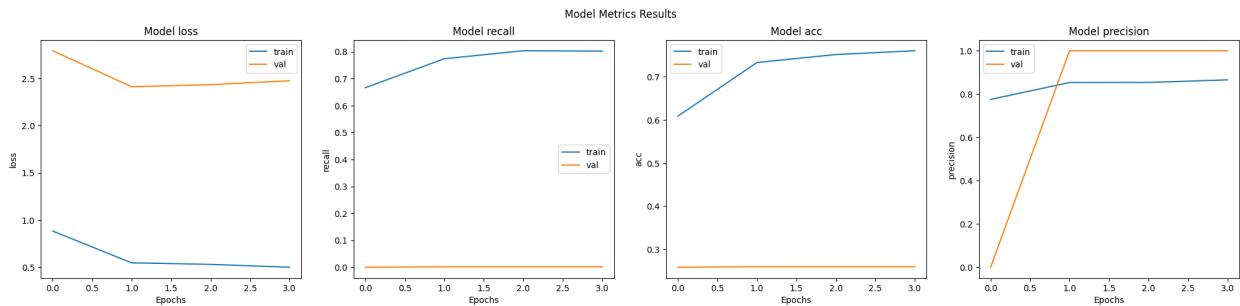
In [149...]

```
#Fitting with augmented data
history9 = model_9.fit(train_gen_aug,batch_size=128,
                       epochs=90,
                       verbose = 2,
                       class_weight=class_weights,
                       validation_data=val_gen,
                       callbacks = es) #stopping early because of time resources
```

```
Epoch 1/90
34/34 - 47s - loss: 0.8832 - acc: 0.6090 - recall: 0.6664 - precision: 0.7753
- val_loss: 2.7920 - val_acc: 0.2580 - val_recall: 0.0000e+00 - val_precision:
0.0000e+00 - 47s/epoch - 1s/step
Epoch 2/90
34/34 - 49s - loss: 0.5470 - acc: 0.7334 - recall: 0.7738 - precision: 0.8533
- val_loss: 2.4111 - val_acc: 0.2591 - val_recall: 0.0015 - val_precision: 1.0
000 - 49s/epoch - 1s/step
Epoch 3/90
34/34 - 48s - loss: 0.5309 - acc: 0.7519 - recall: 0.8034 - precision: 0.8537
- val_loss: 2.4328 - val_acc: 0.2591 - val_recall: 0.0015 - val_precision: 1.0
000 - 48s/epoch - 1s/step
Epoch 4/90
34/34 - 47s - loss: 0.5006 - acc: 0.7607 - recall: 0.8022 - precision: 0.8655
- val_loss: 2.4747 - val_acc: 0.2591 - val_recall: 0.0015 - val_precision: 1.0
000 - 47s/epoch - 1s/step
Epoch 4: early stopping
```

In [150...]

```
print("Model 9 w augmented data :\n")
eval_metrics(history9)
```

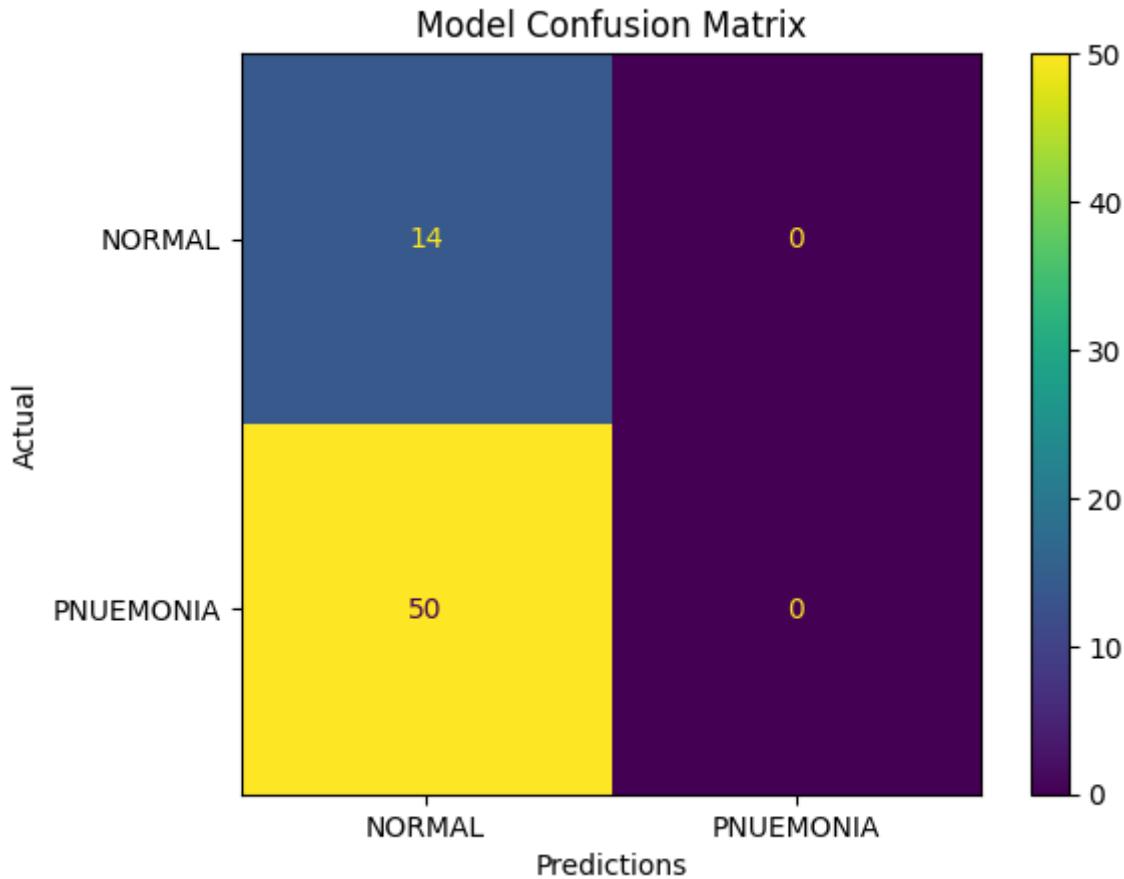
Model 9 w augmented data :

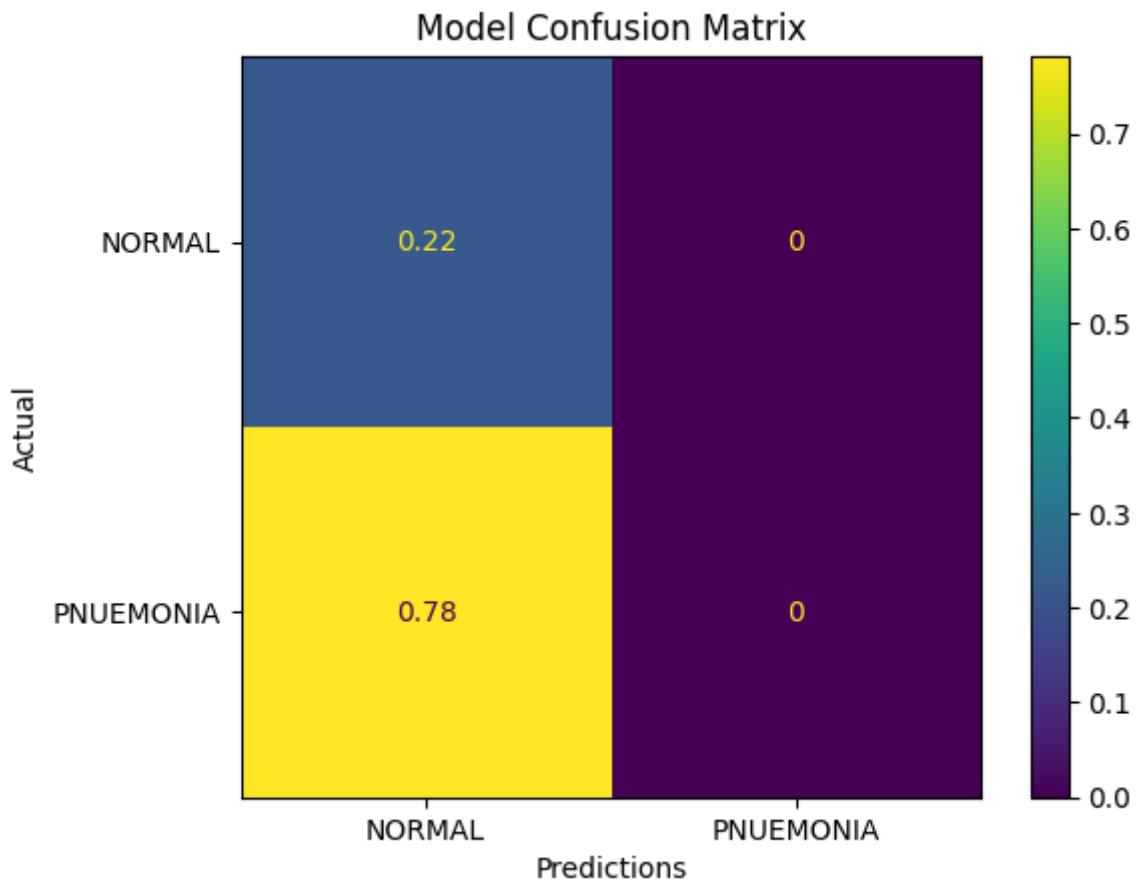
```
In [151]: train_labels, train_predictions = predict_results(model_9,train_gen)
val_labels, val_predictions = predict_results(model_9,val_gen)
```

```
2/2 [=====] - 1s 1s/step
1/1 [=====] - 0s 18ms/step
```

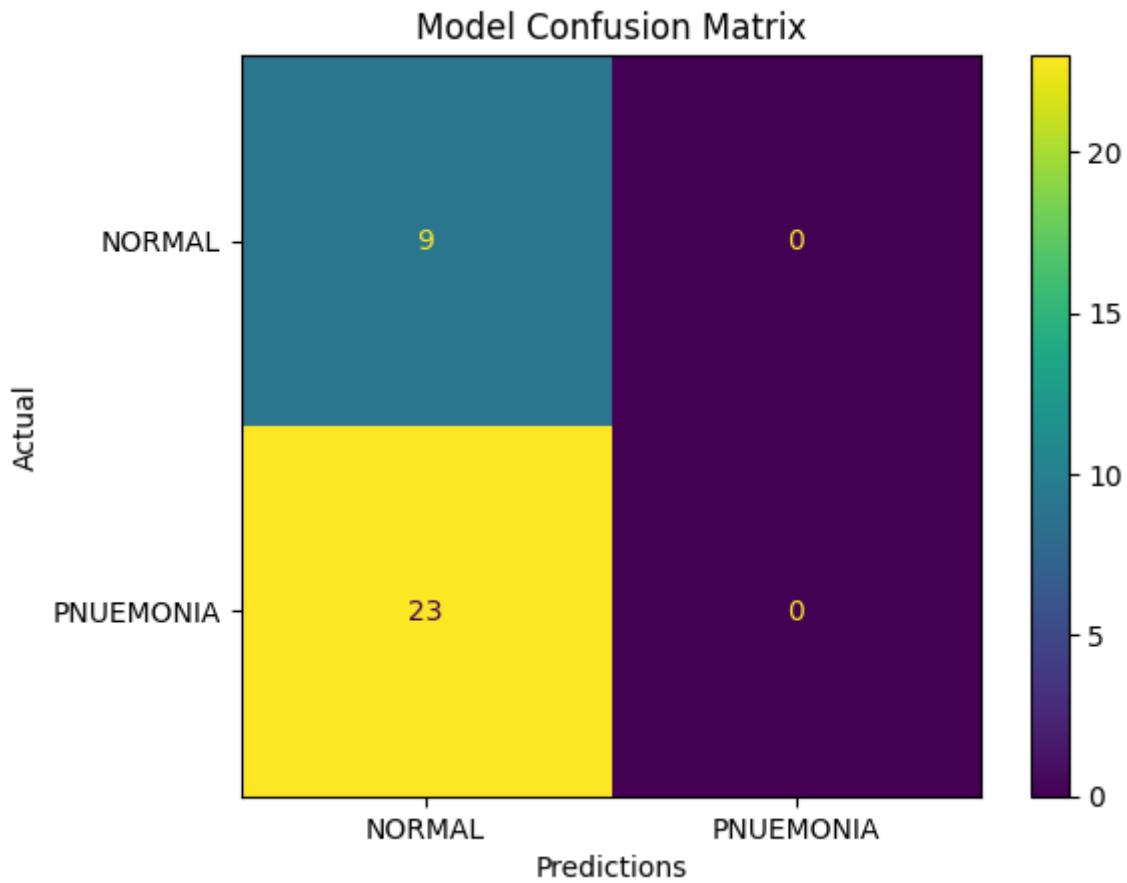
```
In [152]: #Printing regular and normalized Confusion Matrices
print("Training Confusion Matrices:\n")
conf_matrix(train_labels,train_predictions, None)
conf_matrix(train_labels,train_predictions, "all")
print("Validation Confusion Matrices:\n")
conf_matrix(val_labels, val_predictions, None)
conf_matrix(val_labels, val_predictions, "all")
```

Training Confusion Matrices:

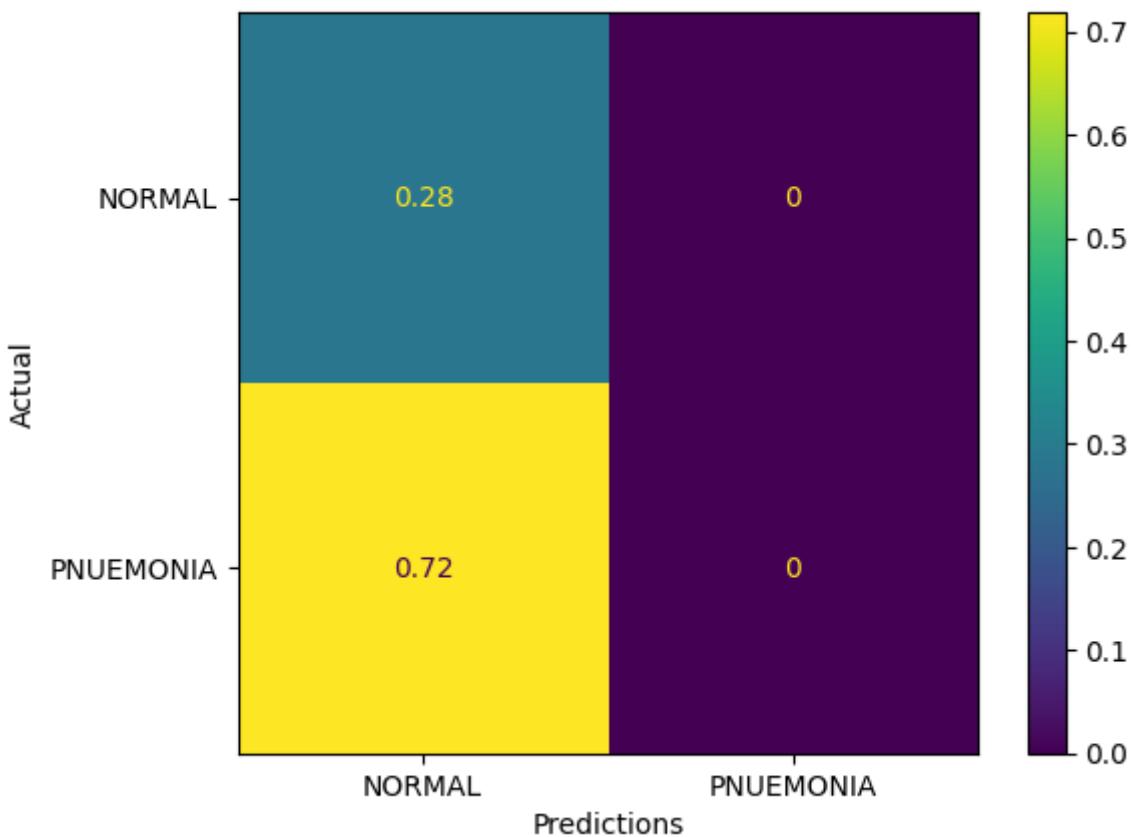




Validation Confusion Matrices:



Model Confusion Matrix



In [153...]

```
#Training Classification Report
print("Training Classificaiton Report:\n")
eval_report(train_labels,train_predictions,train_gen,history9)
```

Training Classificaiton Report:

	precision	recall	f1-score	support
0.0	0.22	1.00	0.36	14
1.0	0.00	0.00	0.00	50
accuracy			0.22	64
macro avg	0.11	0.50	0.18	64
weighted avg	0.05	0.22	0.08	64

```
68/68 [=====] - 25s 363ms/step - loss: 2.4967 - acc: 0.2603 - recall: 0.0034 - precision: 1.0000
Loss: 2.4967
```

In [154...]

```
#Training Classification Report
print("Validation Classificaiton Report:\n")
eval_report(val_labels,val_predictions,val_gen,history9)
```

Validation Classification Report:

	precision	recall	f1-score	support
0.0	0.28	1.00	0.44	9
1.0	0.00	0.00	0.00	23
accuracy			0.28	32
macro avg	0.14	0.50	0.22	32
weighted avg	0.08	0.28	0.12	32

```
29/29 [=====] - 5s 180ms/step - loss: 2.4747 - acc: 0.2591 - recall: 0.0015 - precision: 1.0000
Loss: 2.4747
```

Transfer Model 9 Evaluation

The Transfer VGG19 model with augmented data was the worst so far. For the validation data there were mostly FN and some TNs. Pneumonia was not detected.

Models trained on the augmented training data will not be used.

Transfer Model 10 w/ Fine Tuning

Removing a dense layer from the pre trained model

```
In [155...]: #Copying the models to fine tune
model_10 = model_8
cnn_base_tuned = cnn_base
```

```
In [156...]: model_10.summary()
```

```
Model: "sequential_144"
```

Layer (type)	Output Shape	Param #
vgg19 (Functional)	(None, 7, 7, 512)	20024384
flatten_144 (Flatten)	(None, 25088)	0
dense_377 (Dense)	(None, 132)	3311748
dense_378 (Dense)	(None, 1)	133

```
Total params: 23,336,265
```

```
Trainable params: 3,311,881
```

```
Non-trainable params: 20,024,384
```

```
In [157]: cnn_base_tuned.trainable = True
```

```
In [158]: cnn_base_tuned.summary()
```

Model: "vgg19"

Layer (type)	Output Shape	Param #
<hr/>		
input_3 (InputLayer)	[None, 224, 224, 3]	0
block1_conv1 (Conv2D)	(None, 224, 224, 64)	1792
block1_conv2 (Conv2D)	(None, 224, 224, 64)	36928
block1_pool (MaxPooling2D)	(None, 112, 112, 64)	0
block2_conv1 (Conv2D)	(None, 112, 112, 128)	73856
block2_conv2 (Conv2D)	(None, 112, 112, 128)	147584
block2_pool (MaxPooling2D)	(None, 56, 56, 128)	0
block3_conv1 (Conv2D)	(None, 56, 56, 256)	295168
block3_conv2 (Conv2D)	(None, 56, 56, 256)	590080
block3_conv3 (Conv2D)	(None, 56, 56, 256)	590080
block3_conv4 (Conv2D)	(None, 56, 56, 256)	590080
block3_pool (MaxPooling2D)	(None, 28, 28, 256)	0
block4_conv1 (Conv2D)	(None, 28, 28, 512)	1180160
block4_conv2 (Conv2D)	(None, 28, 28, 512)	2359808
block4_conv3 (Conv2D)	(None, 28, 28, 512)	2359808
block4_conv4 (Conv2D)	(None, 28, 28, 512)	2359808
block4_pool (MaxPooling2D)	(None, 14, 14, 512)	0
block5_conv1 (Conv2D)	(None, 14, 14, 512)	2359808
block5_conv2 (Conv2D)	(None, 14, 14, 512)	2359808
block5_conv3 (Conv2D)	(None, 14, 14, 512)	2359808
block5_conv4 (Conv2D)	(None, 14, 14, 512)	2359808
block5_pool (MaxPooling2D)	(None, 7, 7, 512)	0
<hr/>		
Total params: 20,024,384		
Trainable params: 20,024,384		
Non-trainable params: 0		

Removing one of the last layers from the pretrained model

```
In [161... cnn_base_tuned.trainable = True
set_trainable = False
for layer in cnn_base_tuned.layers:
    if layer.name == 'block5_conv1':
        set_trainable = True
    if set_trainable:
        layer.trainable = True
    else:
        layer.trainable = False
```

```
In [162... model_10.compile(loss='binary_crossentropy',
                        optimizer= "adam",
                        metrics=["acc", "Recall", "Precision"]
                      )
```

```
In [163... history10 = model_10.fit(train_gen,batch_size=128,
                           epochs=90,
                           verbose = 2,
                           class_weight=class_weights,
                           validation_data=val_gen,
                           callbacks = es) #stopping early because of time resources
```

Epoch 1/90

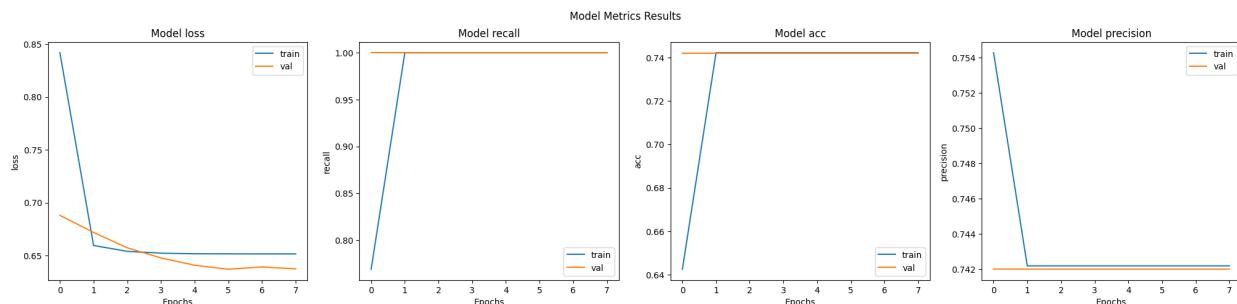
```
2023-03-29 02:18:07.842665: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
2023-03-29 02:18:35.048026: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
```

```
68/68 - 34s - loss: 0.8418 - acc: 0.6425 - recall: 0.7688 - precision: 0.7543
- val_loss: 0.6880 - val_acc: 0.7420 - val_recall: 1.0000 - val_precision: 0.7
420 - 34s/epoch - 498ms/step
Epoch 2/90
68/68 - 33s - loss: 0.6596 - acc: 0.7422 - recall: 1.0000 - precision: 0.7422
- val_loss: 0.6719 - val_acc: 0.7420 - val_recall: 1.0000 - val_precision: 0.7
420 - 33s/epoch - 482ms/step
Epoch 3/90
68/68 - 33s - loss: 0.6540 - acc: 0.7422 - recall: 1.0000 - precision: 0.7422
- val_loss: 0.6574 - val_acc: 0.7420 - val_recall: 1.0000 - val_precision: 0.7
420 - 33s/epoch - 490ms/step
Epoch 4/90
68/68 - 33s - loss: 0.6523 - acc: 0.7422 - recall: 1.0000 - precision: 0.7422
- val_loss: 0.6478 - val_acc: 0.7420 - val_recall: 1.0000 - val_precision: 0.7
420 - 33s/epoch - 486ms/step
Epoch 5/90
68/68 - 33s - loss: 0.6517 - acc: 0.7422 - recall: 1.0000 - precision: 0.7422
- val_loss: 0.6409 - val_acc: 0.7420 - val_recall: 1.0000 - val_precision: 0.7
420 - 33s/epoch - 490ms/step
Epoch 6/90
68/68 - 34s - loss: 0.6517 - acc: 0.7422 - recall: 1.0000 - precision: 0.7422
- val_loss: 0.6371 - val_acc: 0.7420 - val_recall: 1.0000 - val_precision: 0.7
420 - 34s/epoch - 497ms/step
Epoch 7/90
68/68 - 33s - loss: 0.6516 - acc: 0.7422 - recall: 1.0000 - precision: 0.7422
- val_loss: 0.6393 - val_acc: 0.7420 - val_recall: 1.0000 - val_precision: 0.7
420 - 33s/epoch - 487ms/step
Epoch 8/90
68/68 - 32s - loss: 0.6516 - acc: 0.7422 - recall: 1.0000 - precision: 0.7422
- val_loss: 0.6374 - val_acc: 0.7420 - val_recall: 1.0000 - val_precision: 0.7
420 - 32s/epoch - 476ms/step
Epoch 8: early stopping
```

In [164...]:

```
print("Model 9 w/o augmented data :\n")
eval_metrics(history10)
```

Model 9 w/o augmented data :



In [165...]:

```
train_labels, train_predictions = predict_results(model_10, train_gen)
val_labels, val_predictions = predict_results(model_10, val_gen)
```

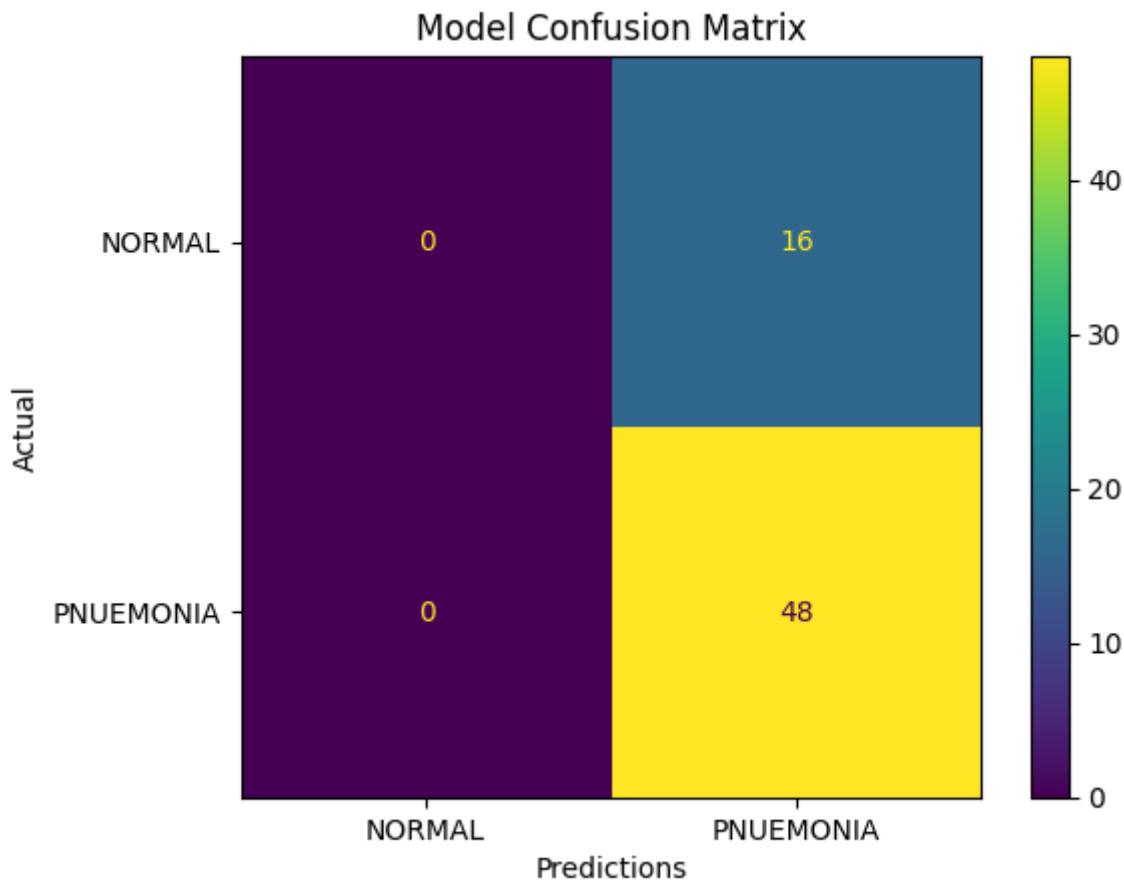
```
2023-03-29 02:23:10.612843: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.
2/2 [=====] - 1s 96ms/step
1/1 [=====] - 0s 20ms/step
```

In [166...]:

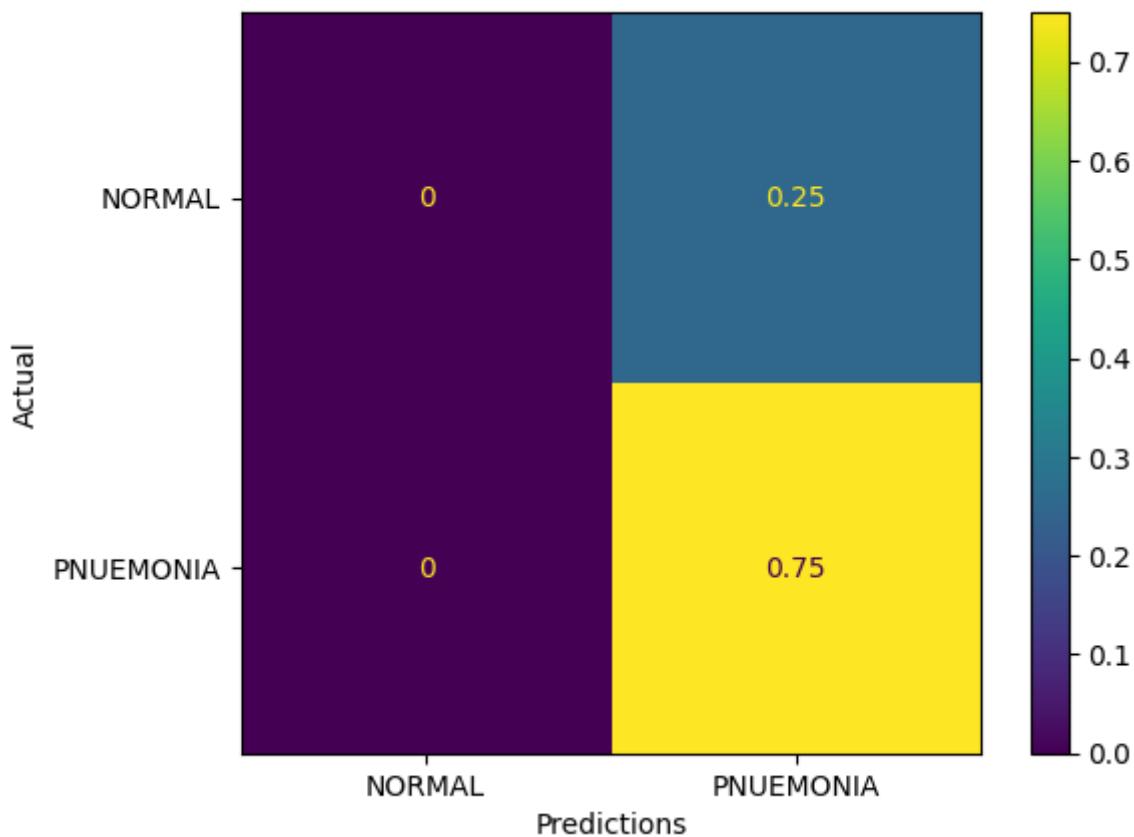
```
#Printing regular and normalized Confusion Matrices
print("Training Confusion Matrices:\n")
conf_matrix(train_labels,train_predictions, None)
conf_matrix(train_labels,train_predictions, "all")
```

```
print("Validation Confusion Matrices:\n")
conf_matrix(val_labels, val_predictions, None)
conf_matrix(val_labels, val_predictions, "all")
```

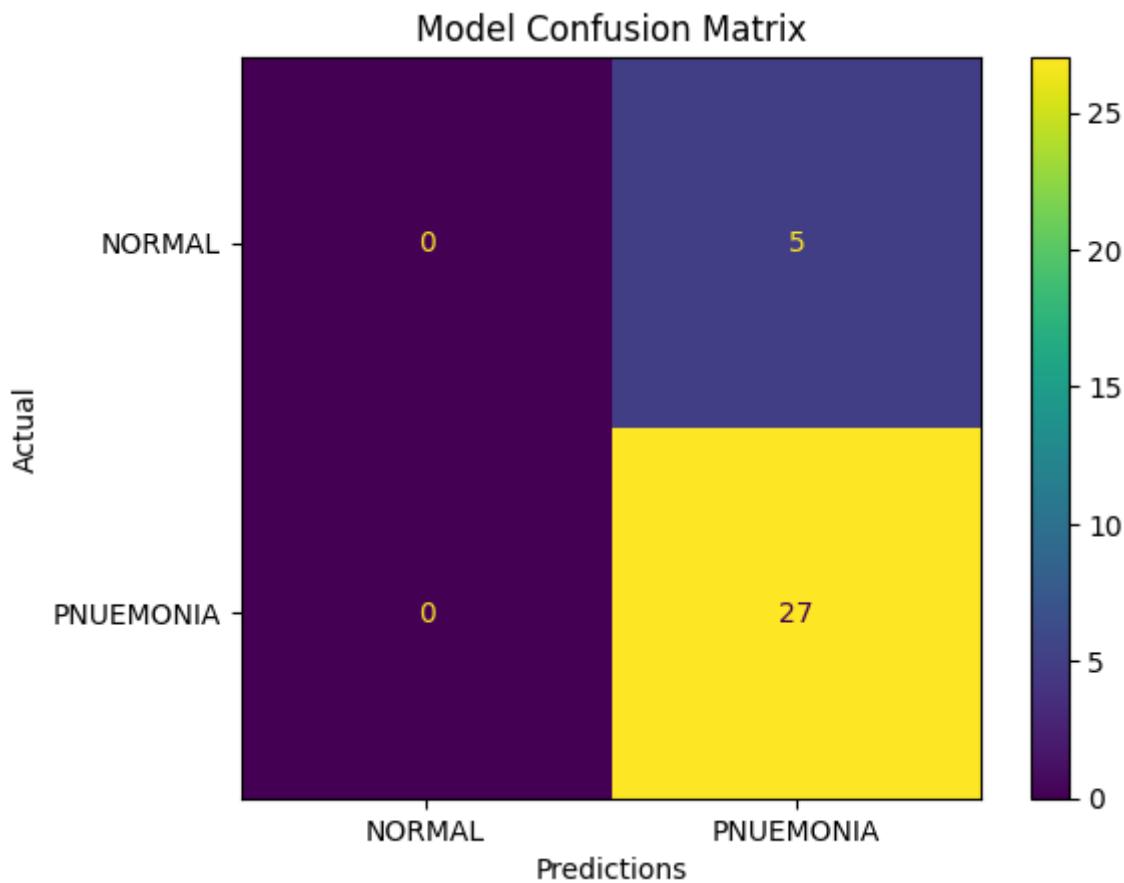
Training Confusion Matrices:



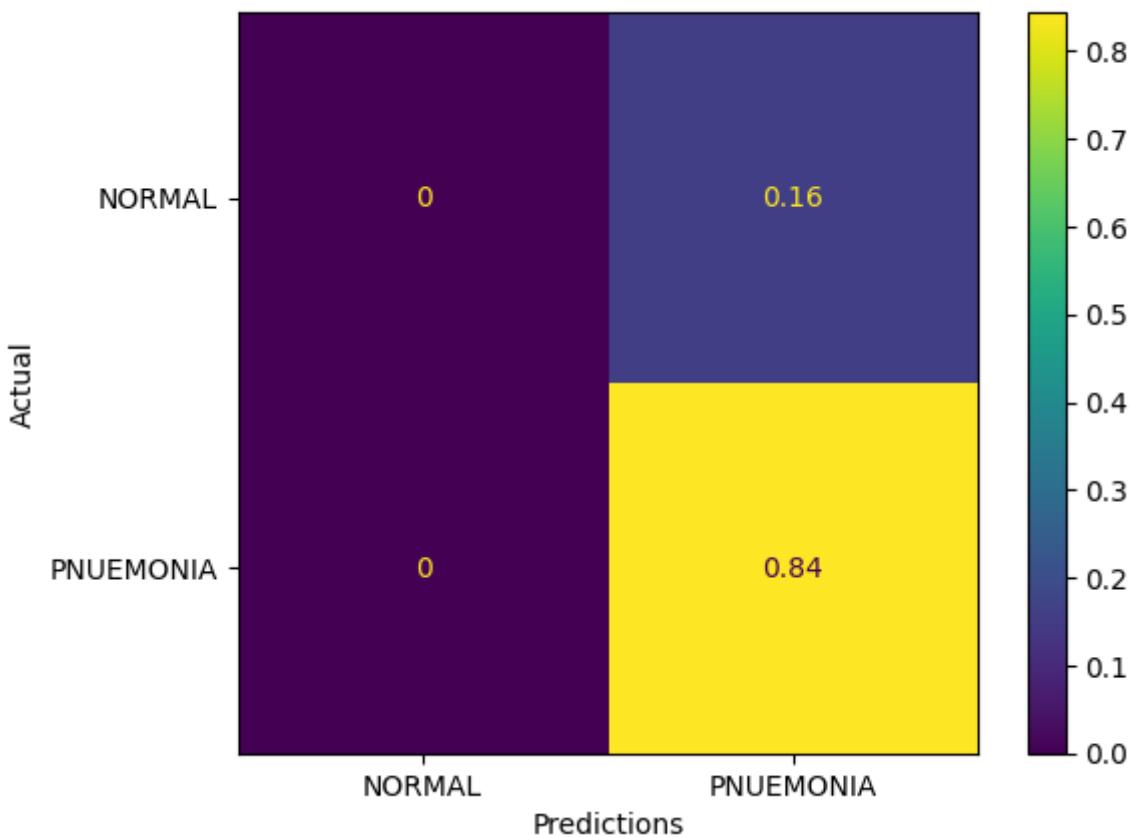
Model Confusion Matrix



Validation Confusion Matrices:



Model Confusion Matrix



In [167...]

```
#Training Classification Report
print("Training Classificaiton Report:\n")
eval_report(train_labels,train_predictions,train_gen,history10)
```

Training Classificaiton Report:

	precision	recall	f1-score	support
0.0	0.00	0.00	0.00	16
1.0	0.75	1.00	0.86	48
accuracy			0.75	64
macro avg	0.38	0.50	0.43	64
weighted avg	0.56	0.75	0.64	64

```
68/68 [=====] - 25s 359ms/step - loss: 0.6374 - acc: 0.7422 - recall: 1.0000 - precision: 0.7422
Loss: 0.6374
```

In [168...]

```
#Training Classification Report
print("Validation Classificaiton Report:\n")
eval_report(val_labels,val_predictions,val_gen,history10)
```

Validation Classification Report:

	precision	recall	f1-score	support
0.0	0.00	0.00	0.00	5
1.0	0.84	1.00	0.92	27
accuracy			0.84	32
macro avg	0.42	0.50	0.46	32
weighted avg	0.71	0.84	0.77	32

```
29/29 [=====] - 6s 187ms/step - loss: 0.6374 - acc: 0.7420 - recall: 1.0000 - precision: 0.7420
Loss: 0.6374
```

Transfer Model 10 Evaluation

The fine tuning effort of the model made it drastically worse. The Loss of both training and validation was extremely high. The recall and f1score on the Normal data is a 0. This model will not work.

Final Model

Best Model

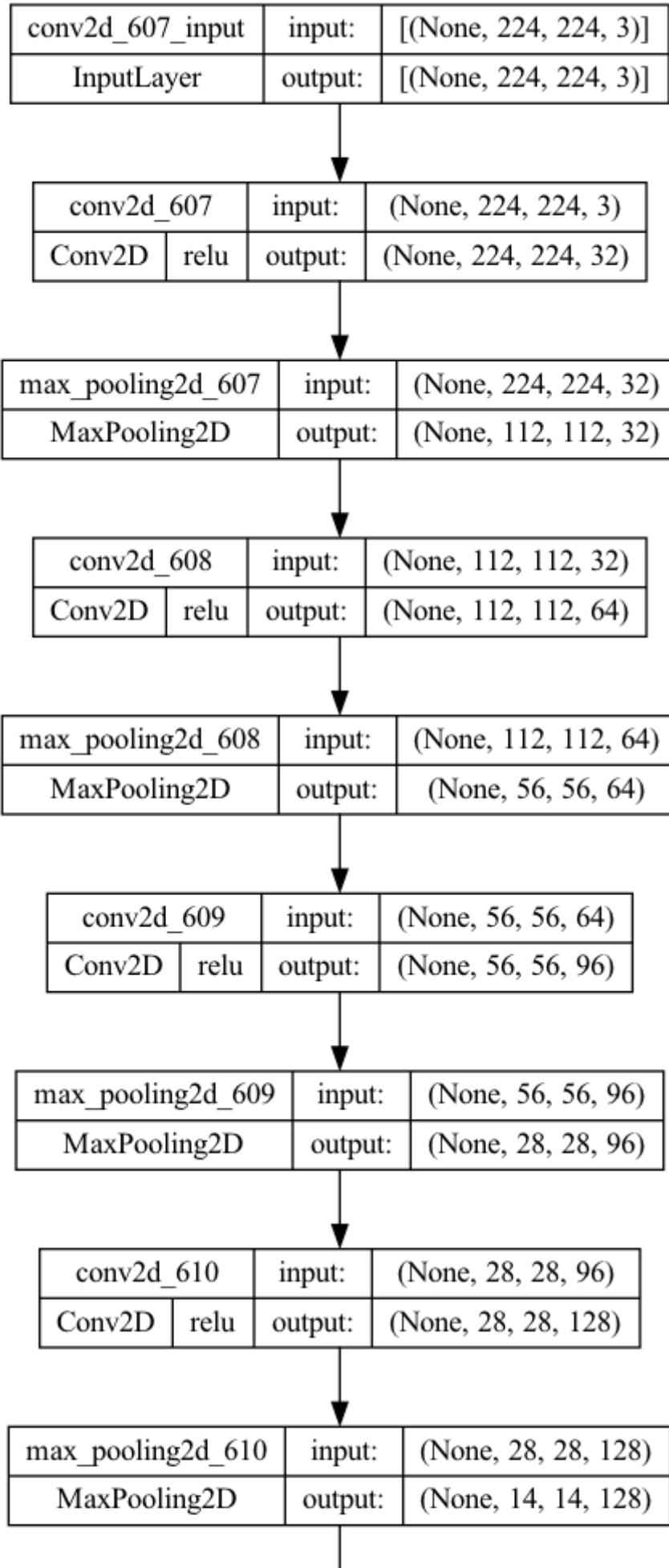
The top 3 models listed all had metrics list around 1, the main differences are the loss metrics for the validation data. Based on this information, Model 5 will be chosen

- Model 1 (Baseline) - Loss: .0865
- Model 5 (4 Conv2D Layers, 3 Dense Layers, Batchsize = 128, Epoch = 90, Dropout = .5, classweight) - Loss: .06
- Model 9 (VGG19 Model w/ Feature Extraction) - Loss: .0714

In [362...]

```
#Plotting model architecture
plot_model(model_5, show_shapes=True, show_layer_names=True, show_layer_activat
```

Out[362]:



In [31]...

```
#Saving Model 5
save_file("model_5",model_5)
```

WARNING:absl:Found untraced functions such as _jit_compiled_convolution_op, _jit_compiled_convolution_op, _jit_compiled_convolution_op, _jit_compiled_convolution_op while saving (showing 4 of 4). These functions will not be directly callable after loading.

Prediction

Using the chosen model and test data to predict

In [199]...

```
#Test data previously generated in preprocessing step, Batch Size = 624
test_labels, test_predictions = predict_results(model_5,test_gen)
```

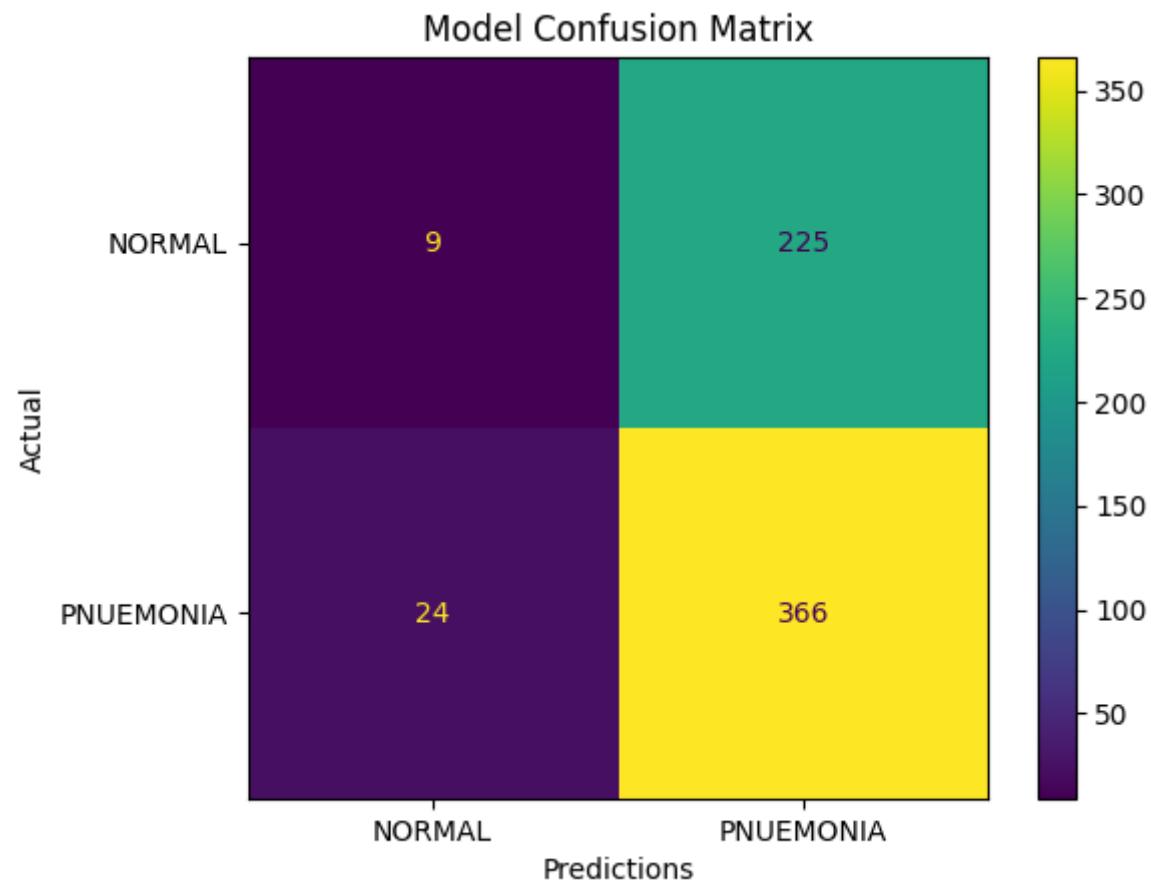
2023-03-29 03:13:04.013530: I tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:113] Plugin optimizer for device_type GPU is enabled.

20/20 [=====] - 1s 31ms/step

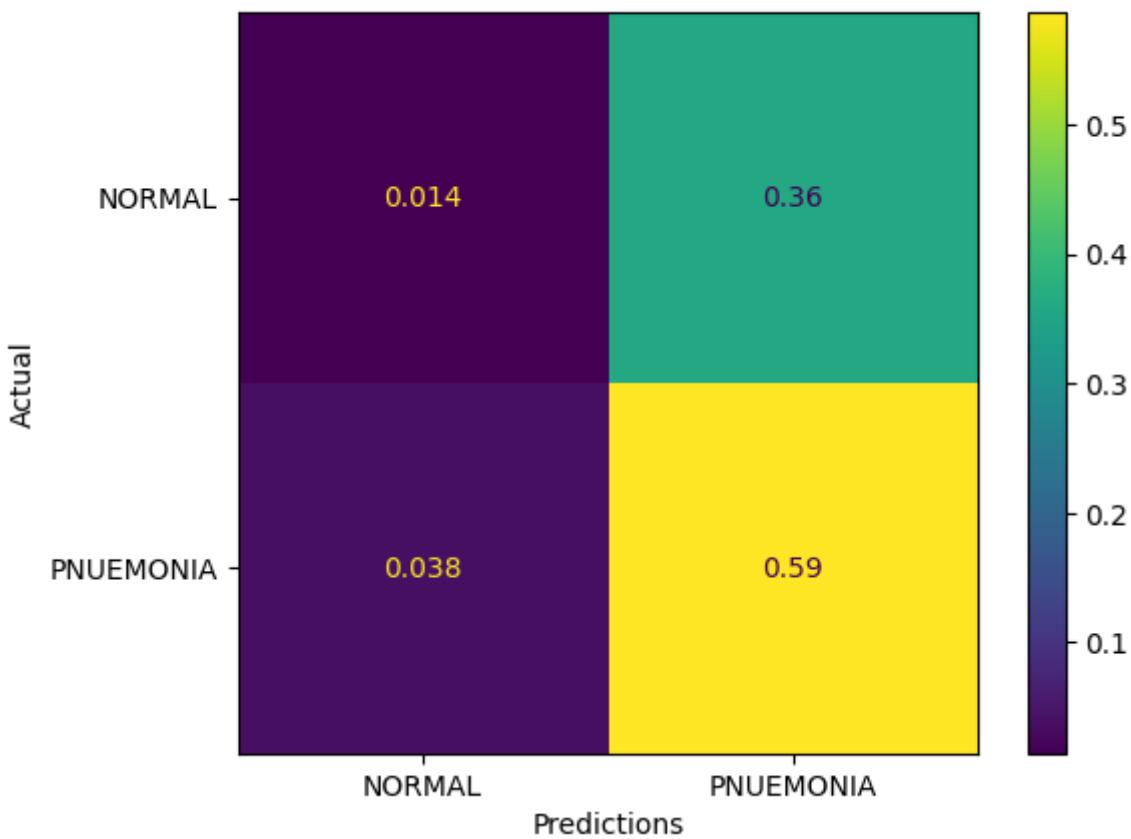
In [203]:

```
print("Test Confusion Matrices:\n")
conf_matrix(test_labels, test_predictions, None)
conf_matrix(test_labels, test_predictions, "all")
```

Test Confusion Matrices:



Model Confusion Matrix



```
In [290]: test_pred_round = np.round(test_predictions,0)
classification_report(test_labels,test_pred_round, output_dict=True)
```

```
Out[290]: {'0.0': {'precision': 0.2727272727272727,
'recall': 0.038461538461538464,
'f1-score': 0.06741573033707866,
'support': 234},
'1.0': {'precision': 0.6192893401015228,
'recall': 0.9384615384615385,
'f1-score': 0.746177370030581,
'support': 390},
'accuracy': 0.6009615384615384,
'macro avg': {'precision': 0.44600830641439776,
'recall': 0.48846153846153845,
'f1-score': 0.4067965501838299,
'support': 624},
'weighted avg': {'precision': 0.489328564836179,
'recall': 0.6009615384615384,
'f1-score': 0.4916417551455176,
'support': 624}}
```

```
In [217]: #Evaluating Model With Training Data
test_results = model_5.evaluate(test_gen, return_dict= True)
test_results
```

```
1/1 [=====] - 6s 6s/step - loss: 0.6837 - acc: 0.6010
- recall: 0.9385 - precision: 0.6193
Out[217]: {'loss': 0.6836573481559753,
'acc': 0.6009615659713745,
'recall': 0.9384615421295166,
'precision': 0.6192893981933594}
```

The model doesn't perform as well on the test data as it did on the training and validation data.

From the 624 Data pieces:

- .59% True Positive (366)

- .014% True Negative (9)

- .04% False Negative (24)

- .36% False Positive (225)

Normal:

- Recall:.04

- F1-Score:.07

Pneumonia:

- Recall:.94

- F1-Score:.75

- Loss:.68
- Accuracy:.6

Model Explainer

The Lime Module will outline images and support explanation by highlighting important areas

In [259...]

```
def img_array_pred(y_label, x_image_array,model,num):
    """ Inputing the data set and model to retrieve an image and prediction
    Lime Explainer module"""

    #num = np.random.randint(0,20) If want to later generate random pictures

    label = y_label[num]
    img = x_image_array[num]

    # Get Model Prediction
    pred = model.predict(np.array([img]))
    pred_round = np.round(pred,0)

    # Print True and Predicted Image
    if pred_round == 0:
        print('Image predicted as Normal (0)')
    else:
        print('Image predicted as Pneumonia (1)')

    if label == 0:
        print('Image is Normal (0)')
```

```

    else:
        print('Image is Pneumonia (1)')

    print(f"Image Index {num} was chosen.")

    return array_to_img(img)

```

Analysis of True Positive Image

In [358]:

```
#Prints Prediction, True Label, Associate Predicted Image and Index
img = img_array_pred(y_test, x_test, model_5, 300)
img
```

```
1/1 [=====] - 0s 11ms/step
Image predicted as Pneumonia (1)
Image is Pneumonia (1)!
Image Index 300 was chosen.
```

Out[358]:



In [265]:

```
explainer = lime_image.LimeImageExplainer()
```

In [266]:

```
explanation = explainer.explain_instance(x_test[300].astype('double'), model_5,
                                         top_labels=3, hide_color=0, num_samples=1000)
```

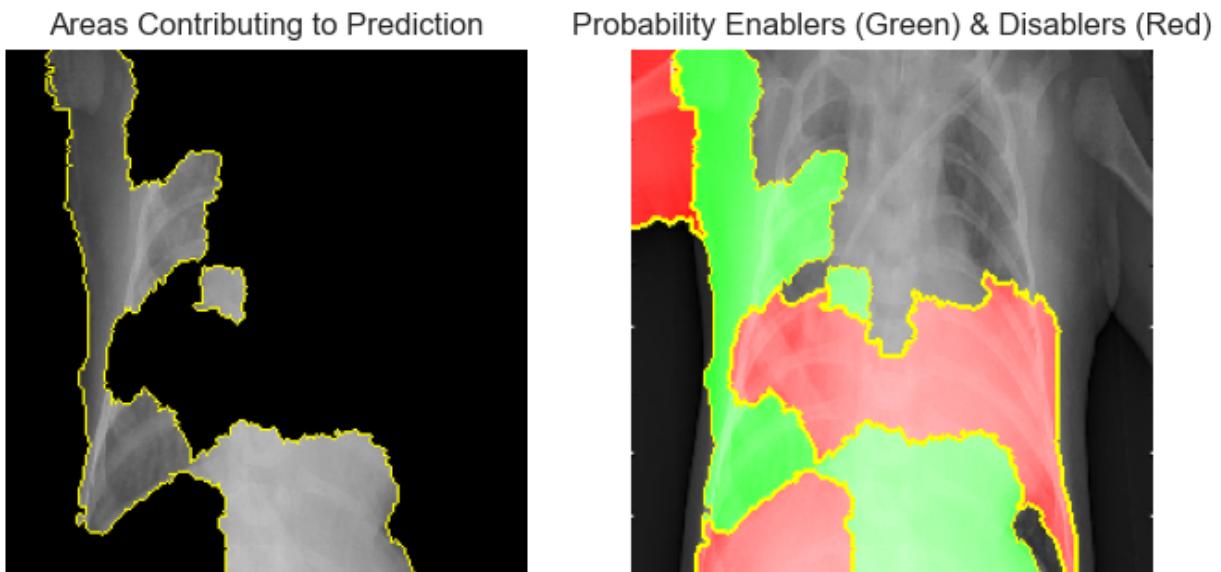
```
0% | 0/1000 [00:00<?, ?it/s]
20/20 [=====] - 1s 50ms/step
12/12 [=====] - 0s 33ms/step
```

In [353]:

```
temp_1, mask_1 = explanation.get_image_and_mask(explanation.top_labels[0], positive=True)
temp_2, mask_2 = explanation.get_image_and_mask(explanation.top_labels[0], positive=False)
```

In [395]:

```
fig, axes = plt.subplots(1, 2, figsize=(8, 8))
axes[0].imshow(mark_boundaries(temp_1, mask_1))
axes[0].set_title("Areas Contributing to Prediction")
axes[1].imshow(mark_boundaries(temp_2, mask_2))
axes[1].set_title("Probability Enablers (Green) & Disablers (Red)")
axes[0].axis('off')
axes[1].axis('off')
plt.savefig('images/Lime_TP.png')
```



Analysis of False Positive Image

```
img2 = img_array_pred(y_test, X_test, model_5, 581)
```

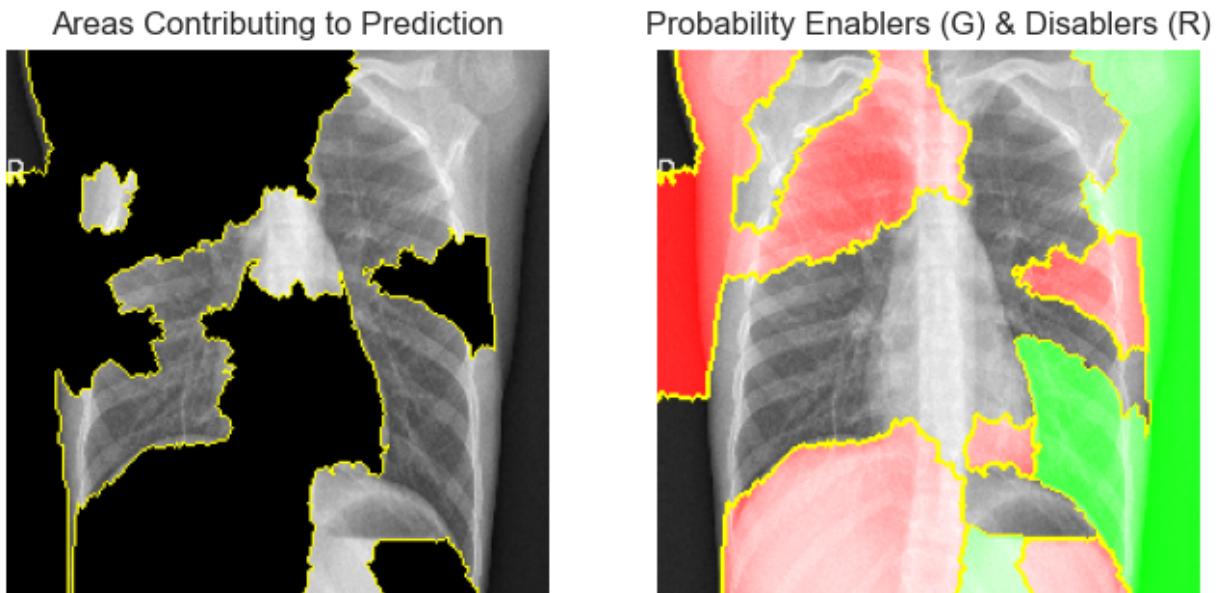
```
img2
```

```
In [348...]: explainer = lime_image.LimeImageExplainer()  
explanation2 = explainer.explain_instance(X_test[1].astype  
("double"), model_5.predict,  
top_labels=3, hide_color=None, num_sam
```

0% | 0/1000 [00:00<?, ?it/s]


```
In [351]: temp_12, mask_12 = explanation2.get_image_and_mask(explanation.top_labels[0], 1)
temp_22, mask_22 = explanation2.get_image_and_mask(explanation.top_labels[0], 2)
```

```
In [394]: fig, axes = plt.subplots(1,2,figsize=(8,8))
axes[0].imshow(mark_boundaries(temp_12, mask_12))
axes[0].set_title("Areas Contributing to Prediction")
axes[1].imshow(mark_boundaries(temp_22, mask_22))
axes[1].set_title("Probability Enablers (G) & Disablers (R)")
axes[0].axis('off')
axes[1].axis('off')
plt.savefig('images/Lime_FN.png')
```



The model seems like it best with edges, the center areas decrease the percentage of guessing correctly.

```
In [ ]: #Calculating end time
end = datetime.datetime.now()
duration = end - original_start
print('Notebook model execution: {}'.format(duration))
```

Conclusion

Reccommendation

The intended use was to correctly identify Normal or Pneumonia diagnosis. The primary goal was to minimize False Negative diagnosis (identifying Normal when Pneumonia is present).

Hospital:

- Usage: The model is best as a learning tool and not an official diagnosis.
- Strategy: Use the model as an initial reviewer of the images.
- Staffing: The model is best used with a doctor, not standalone.

Technical:

- Scope, review and process images more beforehand
- Visualize the activation functions to see better what areas the model layers are diagnosing
- Iterate model improvement with with augmented data
- Visually inspect the images that were FN and FP.

Limitations

Hospital:

- **Important image areas**
- **Radiologist SME knowledge**

Technical:

- **Hardware and Software Compatibility (Modeling on M2 GPU Laptop)**
- **Hyperparameter optimization limits**
- **Blackbox of Hidden Layers**