```
# DRIVER DROWSINESS DETECTION
```

```
import numpy as np
import pandas as pd
from glob import glob
import os
import PIL
import tensorflow as tf
import pathlib
from tensorflow import keras
from tensorflow.keras import layers
from tensorflow.keras.models import Sequential
```

```
C:\Users\user\anaconda3\lib\site-packages\scipy\__init__.py:155: UserWarning: A NumPy
  warnings.warn(f"A NumPy version >={np_minversion} and <{np_maxversion}"
WARNING:tensorflow:From C:\Users\user\anaconda3\lib\site-packages\keras\src\losses.py
```

```
data_path = r"C:\Users\user\Downloads\drowsiness 1\eyes open closed"
all_faces = glob(r"C:\Users\user\Downloads\drowsiness 1\eyes open closed/*/*")
print(len(all_faces))
```

```
1452
```

```
batch_size = 64
num_classes = 2
img_height = 180
img_width = 180
```

```
train_ds = tf.keras.preprocessing.image_dataset_from_directory(data_path,
                                                               validation_split=0.25,
                                                               subset="training",
                                                               seed=123,
                                                               label_mode = 'int',
                                                               image_size=(img_height, im
                                                               batch_size=batch_size)

val_ds = tf.keras.preprocessing.image_dataset_from_directory(data_path,
                                                               validation_split=0.25,
                                                               subset="validation",
                                                               seed=123,
                                                               label_mode = 'int',
                                                               image_size=(img_height, im
                                                               batch_size=batch_size)
```

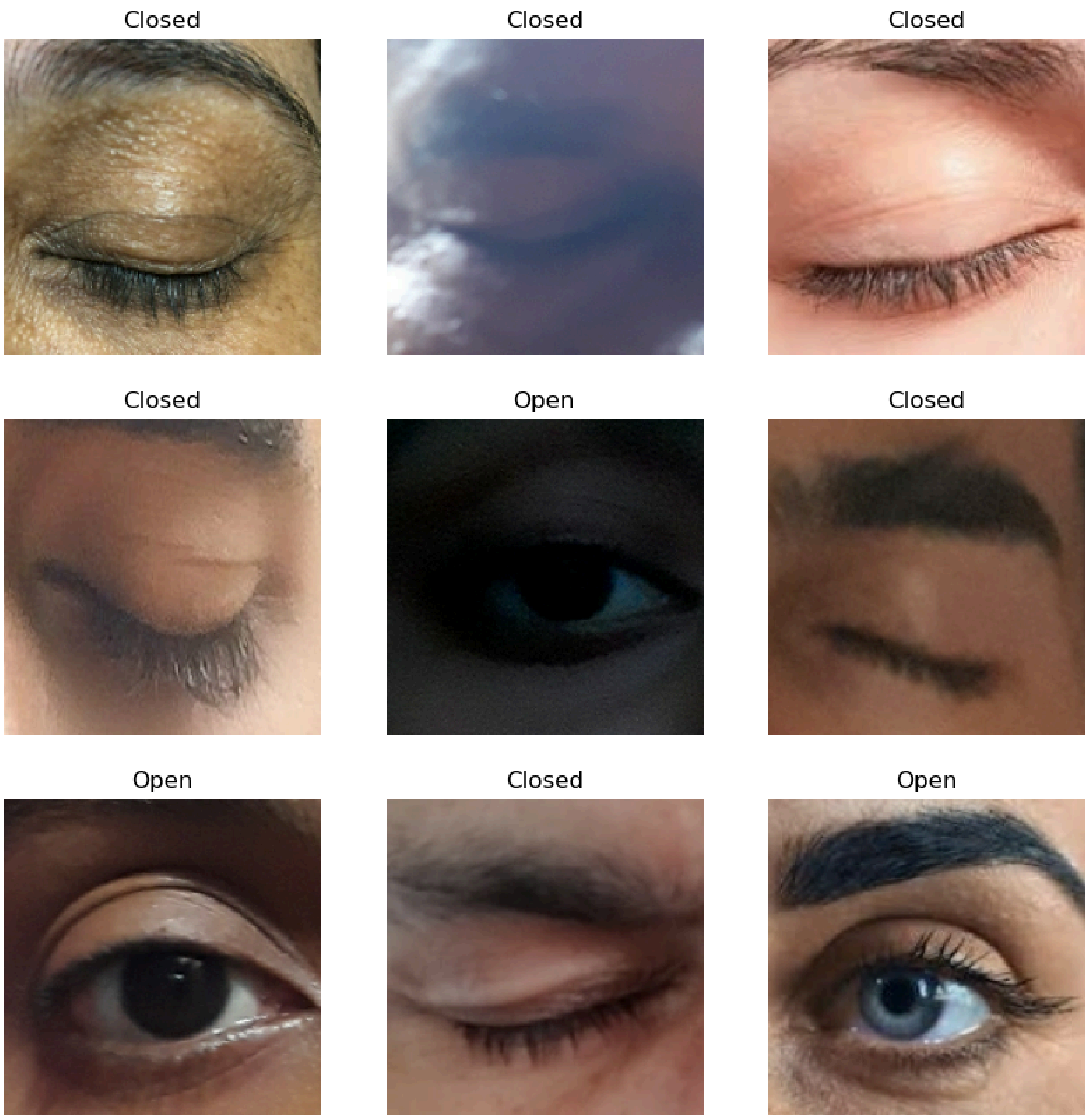
```
Found 1452 files belonging to 2 classes.
Using 1089 files for training.
Found 1452 files belonging to 2 classes.
Using 363 files for validation.
```

```
class_names = train_ds.class_names
print(class_names)
```

```
['Closed', 'Open']
```

```
import matplotlib.pyplot as plt

plt.figure(figsize=(10, 10))
for images, labels in train_ds.take(1):
    for i in range(9):
        ax = plt.subplot(3, 3, i + 1)
        ax.imshow(images[i].numpy().astype("uint8"))
        plt.title(class_names[labels[i]])
        plt.axis("off");
```



First CNN

```
model = Sequential([
                  layers.experimental.preprocessing.Rescaling(1./255, input_shape=(img_he
                  layers.Conv2D(16, 3, padding='same', activation='relu'),
                  layers.MaxPooling2D(),
                  layers.Conv2D(32, 3, padding='same', activation='relu'),
                  layers.MaxPooling2D(),
                  layers.Conv2D(64, 3, padding='same', activation='relu'),
                  layers.MaxPooling2D(),
                  layers.Dropout(0.2),
                  layers.Flatten(),
                  layers.Dense(128, activation='relu'),
                  layers.Dense(num_classes, activation = 'sigmoid')
])
```

```
WARNING:tensorflow:From C:\Users\user\anaconda3\lib\site-packages\keras\src\backend.p

WARNING:tensorflow:From C:\Users\user\anaconda3\lib\site-packages\keras\src\layers\pc
```

```
model.compile(optimizer='adam',
              loss=tf.keras.losses.SparseCategoricalCrossentropy(),
              metrics=['accuracy'])
```

```
WARNING:tensorflow:From C:\Users\user\anaconda3\lib\site-packages\keras\src\optimizer
```

```
early_stopping = tf.keras.callbacks.EarlyStopping(monitor='val_loss',
                                                  patience=3,
                                                  mode='min',
                                                  restore_best_weights=True
                                                 )


filepath = 'model_1.h5'
model_checkpoint = tf.keras.callbacks.ModelCheckpoint(filepath,
                                                      monitor="val_loss",
                                                      save_best_only=True,
                                                      save_weights_only=False,
                                                      mode="min",
                                                      save_freq="epoch",
                                                     )
```

```
epochs = 15
history = model.fit(train_ds, validation_data = val_ds, epochs = epochs,
                    verbose = 1, callbacks=[early_stopping, model_checkpoint])
```

```
5
ensorflow:From C:\Users\user\anaconda3\lib\site-packages\keras\src\utils\tf_utils.py:4

ensorflow:From C:\Users\user\anaconda3\lib\site-packages\keras\src\engine\base_layer_u

============================] - 67s 3s/step - loss: 0.7697 - accuracy: 0.6235 - val_lo
user\anaconda3\lib\site-packages\keras\src\engine\training.py:3103: UserWarning: You a
api.save_model(
5
============================] - 57s 3s/step - loss: 0.3915 - accuracy: 0.8283 - val_lo
5
============================] - 56s 3s/step - loss: 0.2062 - accuracy: 0.9229 - val_lo
5
============================] - 55s 3s/step - loss: 0.1548 - accuracy: 0.9458 - val_lo
```

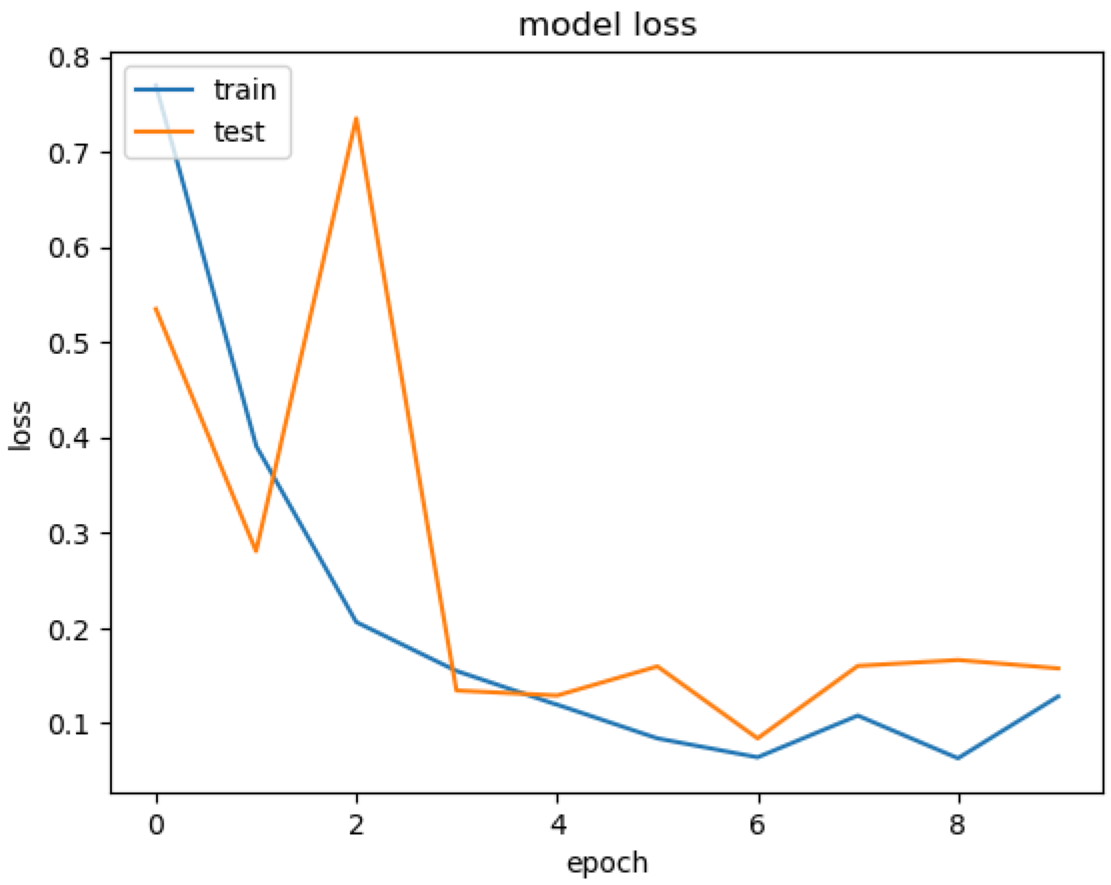
```
5
============================] - 55s 3s/step - loss: 0.1194 - accuracy: 0.9541 - val_lo
5
============================] - 56s 3s/step - loss: 0.0840 - accuracy: 0.9688 - val_lo
5
============================] - 56s 3s/step - loss: 0.0641 - accuracy: 0.9770 - val_lo
5
============================] - 54s 3s/step - loss: 0.1079 - accuracy: 0.9578 - val_lo
5
============================] - 55s 3s/step - loss: 0.0631 - accuracy: 0.9715 - val_lo
15
============================] - 55s 3s/step - loss: 0.1281 - accuracy: 0.9550 - val_lo
```

```
model1_acc = model.evaluate(val_ds)[1]
model1_acc
```

```
6/6 [==============================] - 5s 735ms/step - loss: 0.0840 - accuracy: 0.964
0.9641873240470886
```

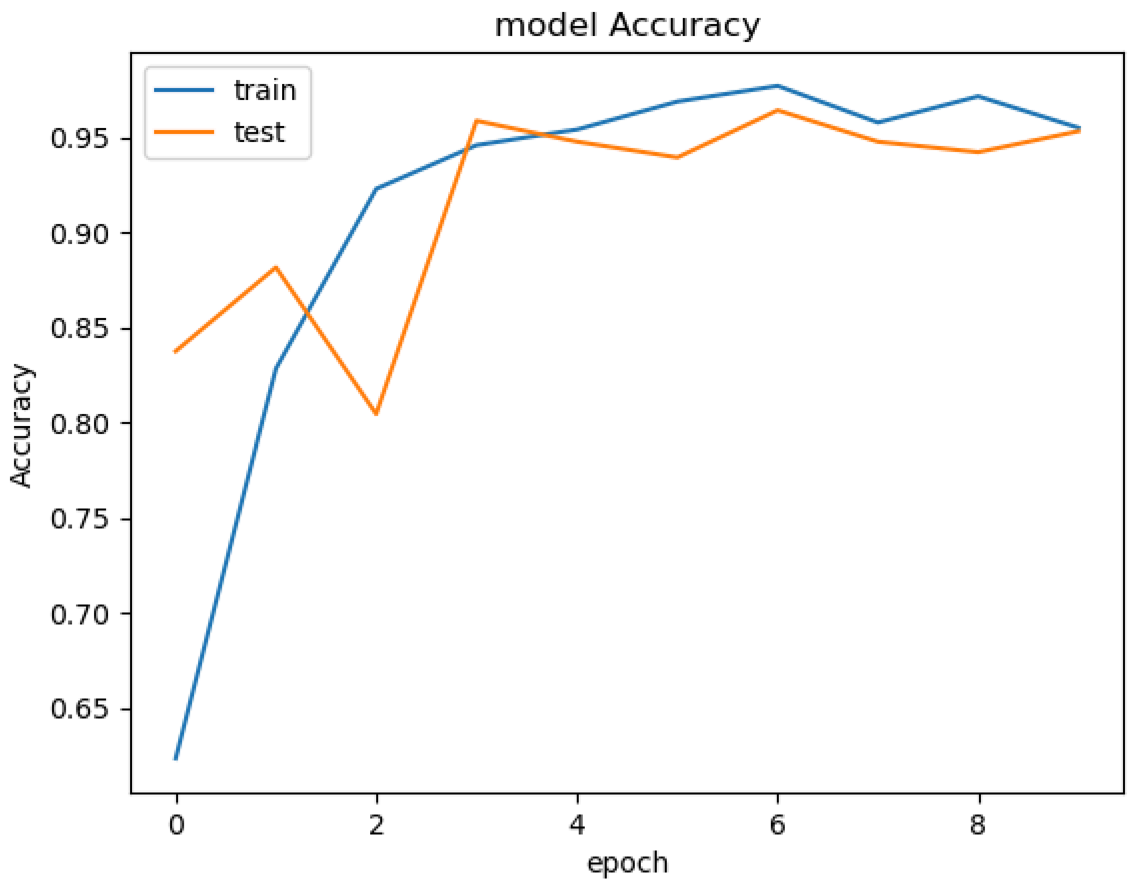
```
plt.plot(history.history['loss'])
plt.plot(history.history['val_loss'])
plt.title('model loss')
plt.ylabel('loss')

plt.xlabel('epoch')
plt.legend(['train', 'test'], loc='upper left')
plt.show()
```



```
plt.plot(history.history['accuracy'])
plt.plot(history.history['val_accuracy'])
plt.title('model Accuracy')
plt.ylabel('Accuracy')

plt.xlabel('epoch')
plt.legend(['train', 'test'], loc='upper left')
plt.show()
```



Second CNN

```
model = Sequential([
                  layers.experimental.preprocessing.Rescaling(1./255, input_shape=(img_he
                  layers.Conv2D(32, 3, padding='same', activation='relu'),
                  layers.MaxPooling2D(),
                  layers.Conv2D(64, 3, padding='same', activation='relu'),
                  layers.MaxPooling2D(),
                  layers.Conv2D(128, 3, padding='same', activation='relu'),
                  layers.MaxPooling2D(),
                  layers.Conv2D(256, 3, padding='same', activation='relu'),
                  layers.MaxPooling2D(),
                  layers.Dropout(0.2),
                  layers.Flatten(),
                  layers.Dense(128, activation='relu'),
                  layers.Dense(num_classes, activation = 'sigmoid')
])
```

```
model.compile(optimizer='adam',
              loss=tf.keras.losses.SparseCategoricalCrossentropy(),
              metrics=['accuracy'])
```

```
early_stopping = tf.keras.callbacks.EarlyStopping(monitor='val_loss',
                                                  patience=3,
                                                  mode='min',
                                                  restore_best_weights=True
                                                 )


filepath = 'model_2.h5'
model_checkpoint = tf.keras.callbacks.ModelCheckpoint(filepath,
                                                      monitor="val_loss",
                                                      save_best_only=True,
                                                      save_weights_only=False,
                                                      mode="min",
                                                      save_freq="epoch",
                                                     )
```

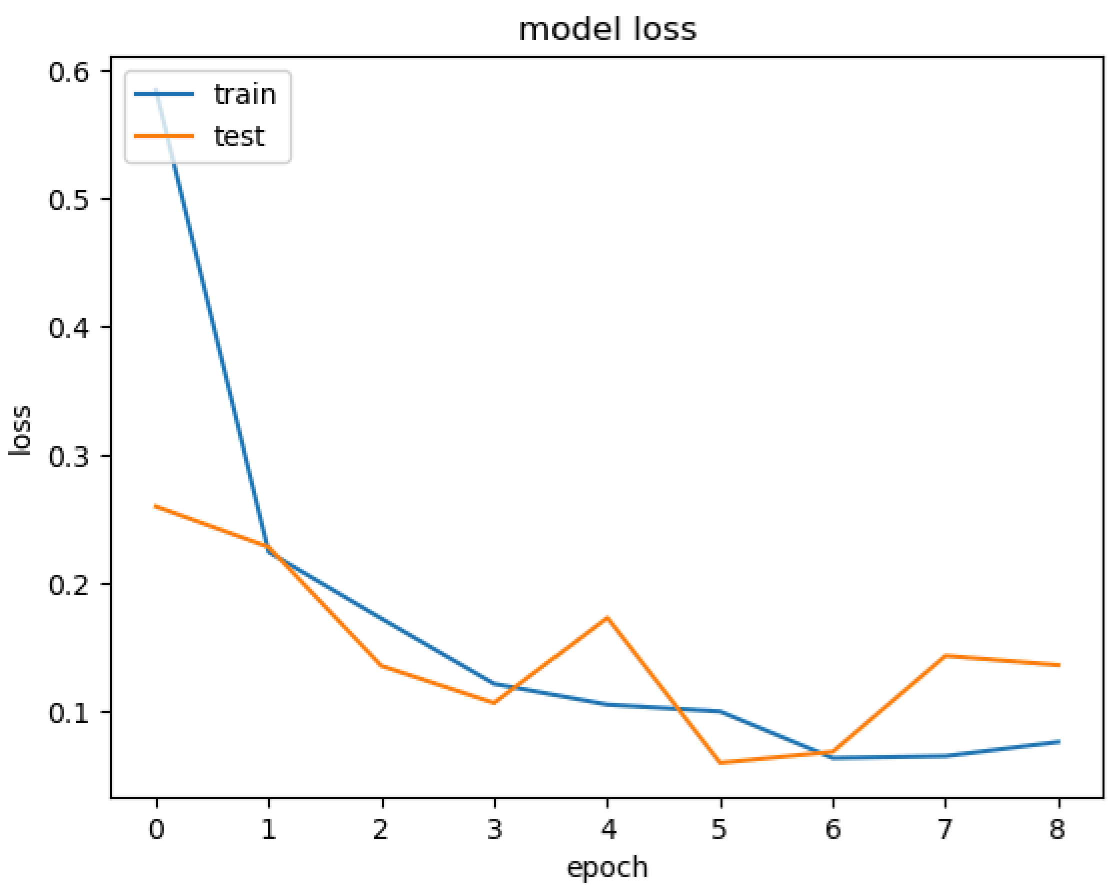
```
epochs = 15
history = model.fit(train_ds, validation_data = val_ds, epochs = epochs,
                    verbose = 1, callbacks=[early_stopping, model_checkpoint])
```

```
Epoch 1/15
18/18 [==============================] - 201s 11s/step - loss: 0.5844 - accuracy: 0.7
Epoch 2/15
18/18 [==============================] - 196s 11s/step - loss: 0.2246 - accuracy: 0.9
Epoch 3/15
18/18 [==============================] - 197s 11s/step - loss: 0.1727 - accuracy: 0.9
Epoch 4/15
18/18 [==============================] - 196s 11s/step - loss: 0.1217 - accuracy: 0.9
Epoch 5/15
18/18 [==============================] - 200s 11s/step - loss: 0.1055 - accuracy: 0.9
Epoch 6/15
18/18 [==============================] - 198s 11s/step - loss: 0.1002 - accuracy: 0.9
Epoch 7/15
18/18 [==============================] - 196s 11s/step - loss: 0.0638 - accuracy: 0.9
Epoch 8/15
18/18 [==============================] - 197s 11s/step - loss: 0.0653 - accuracy: 0.9
Epoch 9/15
18/18 [==============================] - 198s 11s/step - loss: 0.0764 - accuracy: 0.9
```

```
model2_acc = model.evaluate(val_ds)[1]
model2_acc
```

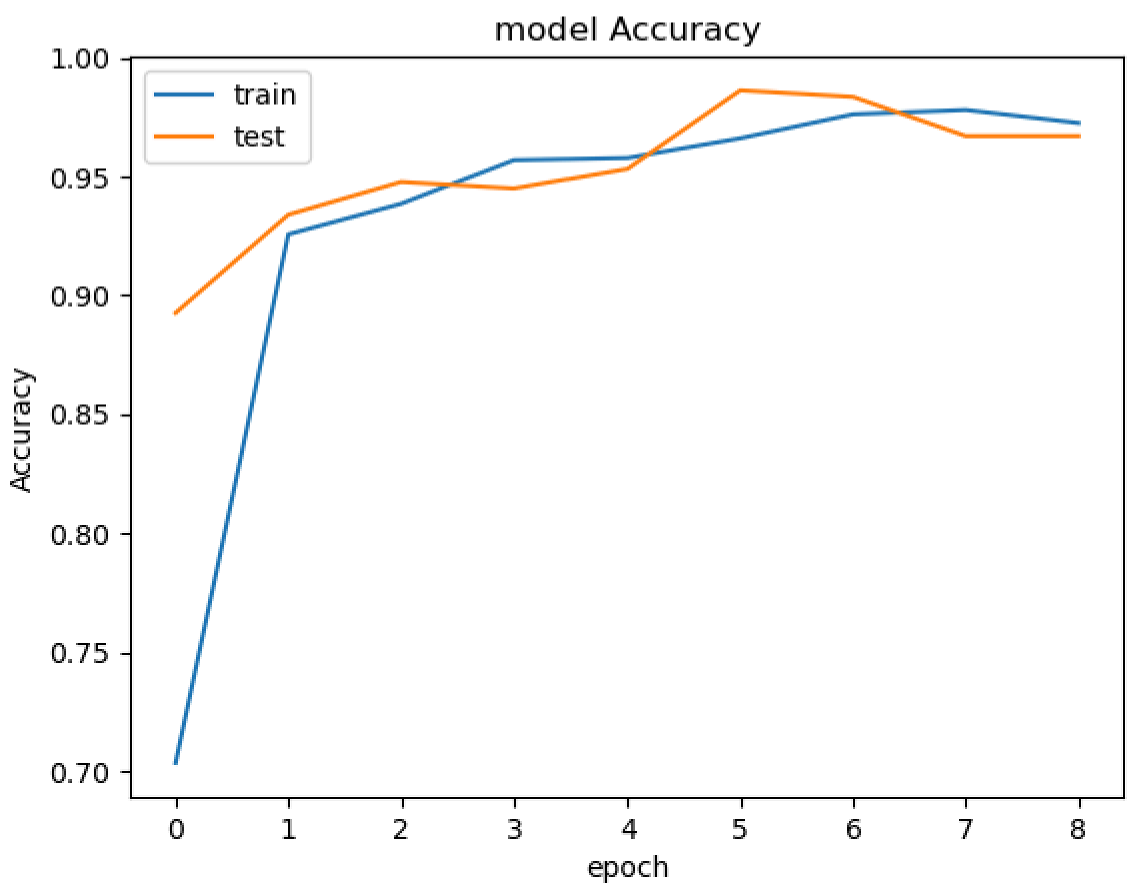
```
6/6 [==============================] - 24s 4s/step - loss: 0.0600 - accuracy: 0.9862
0.9862259030342102
```

```
plt.plot(history.history['loss'])
plt.plot(history.history['val_loss'])
plt.title('model loss')
plt.ylabel('loss')
plt.xlabel('epoch')
plt.legend(['train', 'test'], loc='upper left')
plt.show()
```



```
plt.plot(history.history['accuracy'])
plt.plot(history.history['val_accuracy'])
plt.title('model Accuracy')
plt.ylabel('Accuracy')

plt.xlabel('epoch')
plt.legend(['train', 'test'], loc='upper left')
plt.show()
```



Third CNN

```
model = Sequential([
                  layers.experimental.preprocessing.Rescaling(1./255, input_shape=(img_he
                  layers.Conv2D(32, 3, padding='same', activation='relu'),
                  layers.MaxPooling2D(),
                  layers.Conv2D(64, 3, padding='same', activation='relu'),
                  layers.MaxPooling2D(),
                  layers.Conv2D(128, 3, padding='same', activation='relu'),
                  layers.MaxPooling2D(),
                  layers.Dropout(0.2),
                  layers.Conv2D(256, 3, padding='same', activation='relu'),
                  layers.MaxPooling2D(),
                  layers.Dropout(0.2),
                  layers.Conv2D(512, 3, padding='same', activation='relu'),
                  layers.MaxPooling2D(),
                  layers.Dropout(0.2),
                  layers.Flatten(),
                  layers.Dense(256, activation='relu'),
                  layers.Dropout(0.2),
                  layers.Dense(128, activation = 'relu'),
                  layers.Dense(num_classes, activation = 'sigmoid')
])
```

```
model.compile(optimizer='adam',
              loss=tf.keras.losses.SparseCategoricalCrossentropy(),
              metrics=['accuracy'])
```

```
early_stopping = tf.keras.callbacks.EarlyStopping(monitor='val_loss',
                                                  patience=3,
                                                  mode='min',
                                                  restore_best_weights=True
                                                 )

filepath = 'model_3.h5'
model_checkpoint = tf.keras.callbacks.ModelCheckpoint(filepath,
                                                      monitor="val_loss",
                                                      save_best_only=True,
                                                      save_weights_only=False,
                                                      mode="min",
                                                      save_freq="epoch",
                                                     )
```

```
epochs = 15
history = model.fit(train_ds, validation_data = val_ds, epochs = epochs,
                    verbose = 1, callbacks=[early_stopping, model_checkpoint])
```

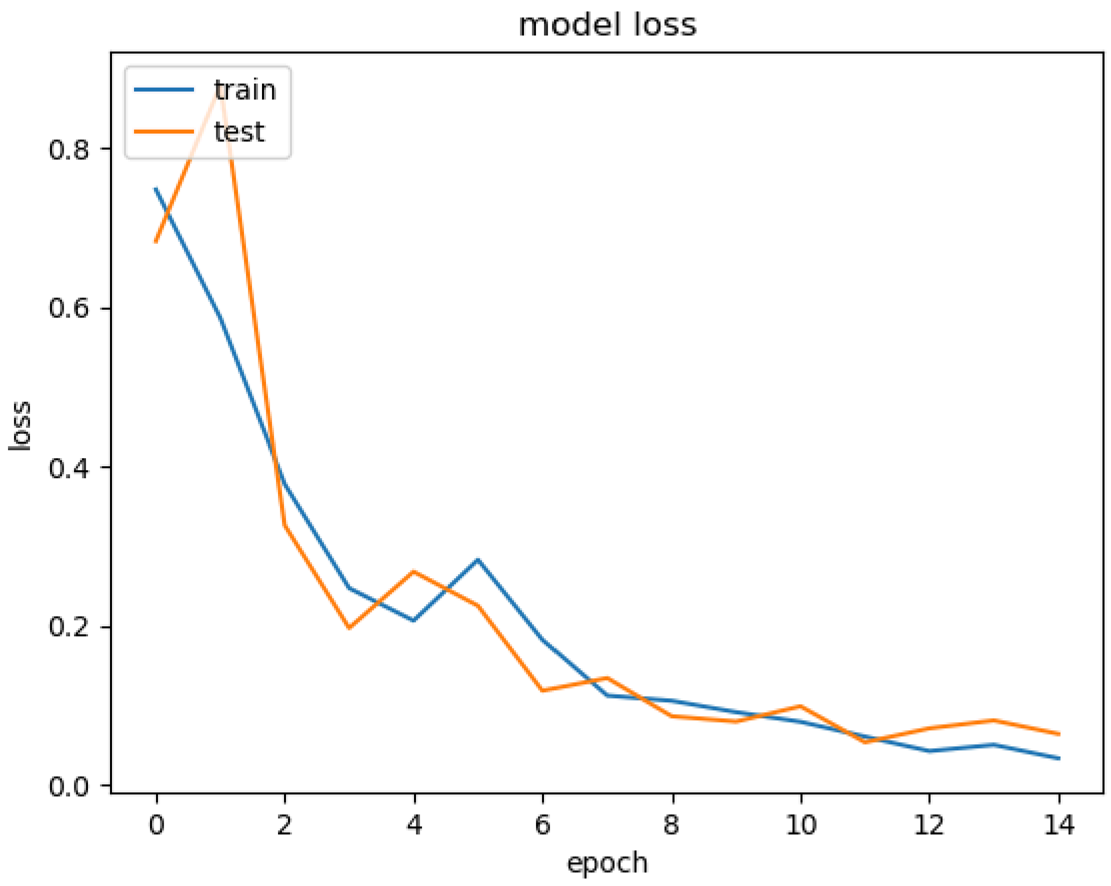
```
Epoch 1/15
18/18 [==============================] - 264s 14s/step - loss: 0.7472 - accuracy: 0.5
Epoch 2/15
18/18 [==============================] - 249s 14s/step - loss: 0.5860 - accuracy: 0.6
Epoch 3/15
18/18 [==============================] - 247s 14s/step - loss: 0.3777 - accuracy: 0.8
Epoch 4/15
18/18 [==============================] - 245s 14s/step - loss: 0.2471 - accuracy: 0.9
Epoch 5/15
18/18 [==============================] - 245s 14s/step - loss: 0.2063 - accuracy: 0.9
Epoch 6/15
18/18 [==============================] - 245s 14s/step - loss: 0.2828 - accuracy: 0.9
Epoch 7/15
18/18 [==============================] - 245s 14s/step - loss: 0.1822 - accuracy: 0.9
Epoch 8/15
18/18 [==============================] - 243s 14s/step - loss: 0.1122 - accuracy: 0.9
Epoch 9/15
18/18 [==============================] - 245s 14s/step - loss: 0.1057 - accuracy: 0.9
Epoch 10/15
18/18 [==============================] - 249s 14s/step - loss: 0.0914 - accuracy: 0.9
Epoch 11/15
18/18 [==============================] - 246s 14s/step - loss: 0.0793 - accuracy: 0.9
Epoch 12/15
18/18 [==============================] - 244s 14s/step - loss: 0.0607 - accuracy: 0.9
Epoch 13/15
18/18 [==============================] - 244s 14s/step - loss: 0.0425 - accuracy: 0.9
Epoch 14/15
18/18 [==============================] - 244s 14s/step - loss: 0.0503 - accuracy: 0.9
Epoch 15/15
18/18 [==============================] - 243s 13s/step - loss: 0.0335 - accuracy: 0.9
```

```
model3_acc = model.evaluate(val_ds)[1]
model3_acc
```

```
6/6 [==============================] - 30s 5s/step - loss: 0.0535 - accuracy: 0.9862
0.9862259030342102
```

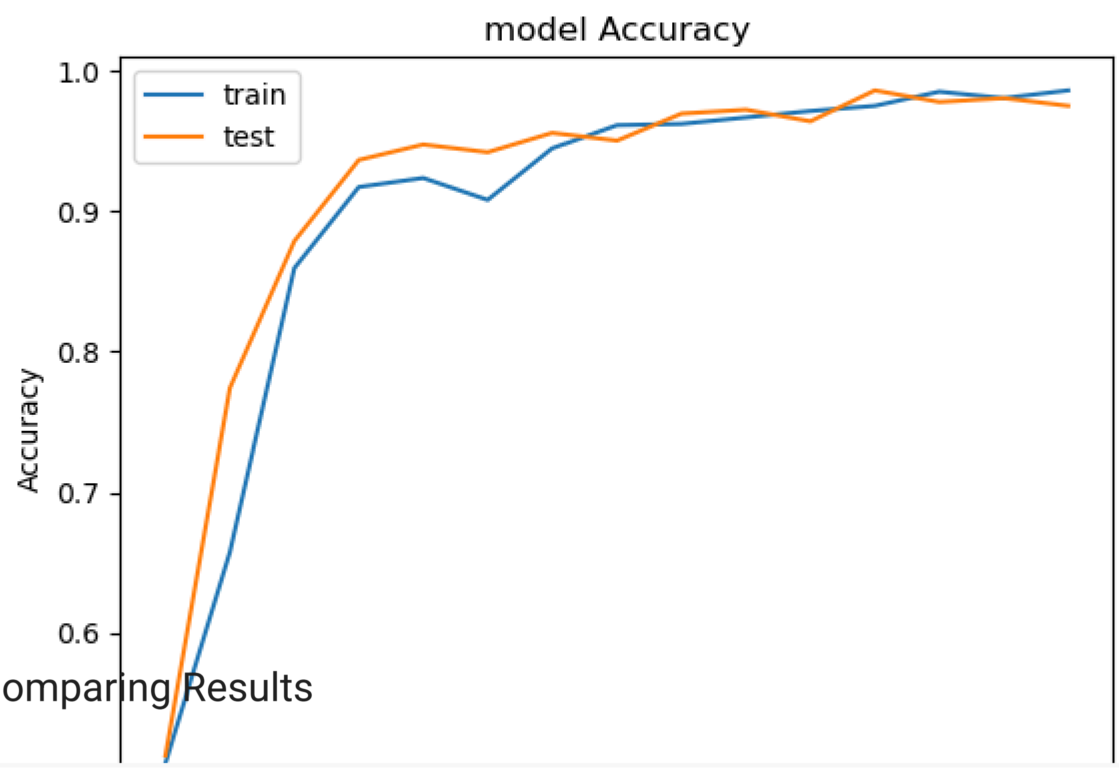
```
plt.plot(history.history['loss'])
plt.plot(history.history['val_loss'])
plt.title('model loss')
plt.ylabel('loss')

plt.xlabel('epoch')
plt.legend(['train', 'test'], loc='upper left')
plt.show()
```



```
plt.plot(history.history['accuracy'])
plt.plot(history.history['val_accuracy'])
plt.title('model Accuracy')
plt.ylabel('Accuracy')

plt.xlabel('epoch')
plt.legend(['train', 'test'], loc='upper left')
plt.show()
```



Comparing Results