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

```
Drive already mounted at /content/drive; to attempt to forcibly remount, call drive.mount("/content/drive", force_remount=True).
```

```
import pandas as pd
import os

# Define paths
train_path = '/content/drive/MyDrive/Data/train'
validation_path = '/content/drive/MyDrive/Data/valid'
test_path = '/content/drive/MyDrive/Data/test'

# Load annotations and create DataFrame
def load_annotations(folder_path):
    annotations_path = os.path.join(folder_path, '_annotations.csv')
    df = pd.read_csv(annotations_path)
    df['filename'] = df['filename'].apply(lambda x: os.path.join(folder_path, x))
    return df

train_df = load_annotations(train_path)
validation_df = load_annotations(validation_path)
test_df = load_annotations(test_path)

print("Training DataFrame:")
print(train_df.head())

print("Validation DataFrame:")
print(validation_df.head())

print("Test DataFrame:")
print(test_df.head())
```

```
Training DataFrame:
                                            filename  width  height class  \
0  /content/drive/MyDrive/Data/train/ST_20190917_...    416     416  mask
1  /content/drive/MyDrive/Data/train/ST_20190917_...    416     416  mask
2  /content/drive/MyDrive/Data/train/ST_20190917_...    416     416  mask
3  /content/drive/MyDrive/Data/train/ST_20190917_...    416     416  mask
4  /content/drive/MyDrive/Data/train/ST_20190917_...    416     416  mask

   xmin  ymin  xmax  ymax
0   336    71   402   121
1   245    69   294   121
2   161    69   209   121
3   140   128   216   214
4   275   129   345   211
Validation DataFrame:
                                            filename  width  height class  \
0  /content/drive/MyDrive/Data/valid/1197620896_j...    416     416  mask
1  /content/drive/MyDrive/Data/valid/1197620896_j...    416     416  mask
2  /content/drive/MyDrive/Data/valid/1197620896_j...    416     416  mask
3  /content/drive/MyDrive/Data/valid/1197620896_j...    416     416  mask
4  /content/drive/MyDrive/Data/valid/1197620896_j...    416     416  mask

   xmin  ymin  xmax  ymax
0    78   220   111   250
1   274    89   326   155
2   216    63   277   137
3   155    93   203   153
4    84    93   121   137
Test DataFrame:
                                            filename  width  height class  \
0  /content/drive/MyDrive/Data/test/w1240-p16x9-f...    416     416  mask
1  /content/drive/MyDrive/Data/test/1539151332471...    416     416  mask
2  /content/drive/MyDrive/Data/test/1224331650_g_...    416     416  mask
3  /content/drive/MyDrive/Data/test/1224331650_g_...    416     416  mask
4  /content/drive/MyDrive/Data/test/1224331650_g_...    416     416  mask

   xmin  ymin  xmax  ymax
0   105    92   318   311
1   157    26   248   146
2   221    16   410   184
3   247   225   384   379
4    32    15   152   130
```

```
from tensorflow.keras.preprocessing.image import ImageDataGenerator

# Image data generator with rescaling
datagen = ImageDataGenerator(rescale=1./255)

# Training generator
train_generator = datagen.flow_from_dataframe(
    dataframe=train_df,
    x_col='filename',
    y_col='class',
    target_size=(224, 224),
    batch_size=32,
    class_mode='binary'
)

# Validation generator
validation_generator = datagen.flow_from_dataframe(
    dataframe=validation_df,
    x_col='filename',
    y_col='class',
    target_size=(224, 224),
    batch_size=32,
    class_mode='binary'
)

# Testing generator
test_generator = datagen.flow_from_dataframe(
    dataframe=test_df,
    x_col='filename',
    y_col='class',
    target_size=(224, 224),
    batch_size=32,
    class_mode='binary',
    shuffle=False  # Ensure order is preserved
)
```

```
Found 696 validated image filenames belonging to 2 classes.
Found 162 validated image filenames belonging to 2 classes.
Found 96 validated image filenames belonging to 2 classes.
```

```
from tensorflow.keras.models import Sequential
from tensorflow.keras.layers import Conv2D, MaxPooling2D, Flatten, Dense, Dropout

def build_cnn():
    model = Sequential([
        Conv2D(32, (3, 3), activation='relu', input_shape=(224, 224, 3)),
        MaxPooling2D((2, 2)),
        Conv2D(64, (3, 3), activation='relu'),
        MaxPooling2D((2, 2)),
        Flatten(),
        Dense(128, activation='relu'),
        Dropout(0.5),
        Dense(1, activation='sigmoid')
    ])
    model.compile(optimizer='adam', loss='binary_crossentropy', metrics=['accuracy'])
    return model

cnn_model = build_cnn()
```

```
/usr/local/lib/python3.10/dist-packages/keras/src/layers/convolutional/base_conv.py:107: UserWarning: Do not pass an `input_shape`/`
  super().__init__(activity_regularizer=activity_regularizer, **kwargs)
```

```
from tensorflow.keras.applications import DenseNet121, ResNet50, InceptionV3
from tensorflow.keras.layers import GlobalAveragePooling2D, Dense, Dropout
from tensorflow.keras.models import Model
from tensorflow.keras.optimizers import Adam

def create_pretrained_model(base_model):
    for layer in base_model.layers:
        layer.trainable = False  # Freeze pre-trained layers

    x = base_model.output
    x = GlobalAveragePooling2D()(x)
    x = Dense(128, activation='relu')(x)
    x = Dropout(0.5)(x)
    predictions = Dense(1, activation='sigmoid')(x)

    model = Model(inputs=base_model.input, outputs=predictions)
```

```
        model.compile(optimizer=Adam(learning_rate=0.001),
                      loss='binary_crossentropy',
                      metrics=['accuracy'])
        return model

densenet_model = create_pretrained_model(DenseNet121(weights='imagenet', include_top=False, input_shape=(224, 224, 3)))
resnet_model = create_pretrained_model(ResNet50(weights='imagenet', include_top=False, input_shape=(224, 224, 3)))
inception_model = create_pretrained_model(InceptionV3(weights='imagenet', include_top=False, input_shape=(224, 224, 3)))



!pip install --upgrade tensorflow
!pip install --upgrade keras
```

```
Requirement already satisfied: tensorflow in /usr/local/lib/python3.10/dist-packages (2.17.1)
Collecting tensorflow
  Downloading tensorflow-2.18.0-cp310-cp310-manylinux_2_17_x86_64.manylinux2014_x86_64.whl.metadata (4.1 kB)
Requirement already satisfied: absl-py>=1.0.0 in /usr/local/lib/python3.10/dist-packages (from tensorflow) (1.4.0)
Requirement already satisfied: astunparse>=1.6.0 in /usr/local/lib/python3.10/dist-packages (from tensorflow) (1.6.3)
Requirement already satisfied: flatbuffers>=24.3.25 in /usr/local/lib/python3.10/dist-packages (from tensorflow) (24.3.25)
Requirement already satisfied: gast!=0.5.0,!=0.5.1,!=0.5.2,>=0.2.1 in /usr/local/lib/python3.10/dist-packages (from tensorflow) (0.6
Requirement already satisfied: google-pasta>=0.1.1 in /usr/local/lib/python3.10/dist-packages (from tensorflow) (0.2.0)
Requirement already satisfied: libclang>=13.0.0 in /usr/local/lib/python3.10/dist-packages (from tensorflow) (18.1.1)
Requirement already satisfied: opt-einsum>=2.3.2 in /usr/local/lib/python3.10/dist-packages (from tensorflow) (3.4.0)
Requirement already satisfied: packaging in /usr/local/lib/python3.10/dist-packages (from tensorflow) (24.2)
Requirement already satisfied: protobuf!=4.21.0,!=4.21.1,!=4.21.2,!=4.21.3,!=4.21.4,!=4.21.5,<6.0.0dev,>=3.20.3 in /usr/local/lib/py
Requirement already satisfied: requests<3,>=2.21.0 in /usr/local/lib/python3.10/dist-packages (from tensorflow) (2.32.3)
Requirement already satisfied: setuptools in /usr/local/lib/python3.10/dist-packages (from tensorflow) (75.1.0)
Requirement already satisfied: six>=1.12.0 in /usr/local/lib/python3.10/dist-packages (from tensorflow) (1.16.0)
Requirement already satisfied: termcolor>=1.1.0 in /usr/local/lib/python3.10/dist-packages (from tensorflow) (2.5.0)
Requirement already satisfied: typing-extensions>=3.6.6 in /usr/local/lib/python3.10/dist-packages (from tensorflow) (4.12.2)
Requirement already satisfied: wrapt>=1.11.0 in /usr/local/lib/python3.10/dist-packages (from tensorflow) (1.16.0)
Requirement already satisfied: grpcio<2.0,>=1.24.3 in /usr/local/lib/python3.10/dist-packages (from tensorflow) (1.68.0)
Collecting tensorboard<2.19,>=2.18 (from tensorflow)
  Downloading tensorboard-2.18.0-py3-none-any.whl.metadata (1.6 kB)
Requirement already satisfied: keras>=3.5.0 in /usr/local/lib/python3.10/dist-packages (from tensorflow) (3.5.0)
Requirement already satisfied: numpy<2.1.0,>=1.26.0 in /usr/local/lib/python3.10/dist-packages (from tensorflow) (1.26.4)
Requirement already satisfied: h5py>=3.11.0 in /usr/local/lib/python3.10/dist-packages (from tensorflow) (3.12.1)
Requirement already satisfied: ml-dtypes<0.5.0,>=0.4.0 in /usr/local/lib/python3.10/dist-packages (from tensorflow) (0.4.1)
Requirement already satisfied: tensorflow-io-gcs-filesystem>=0.23.1 in /usr/local/lib/python3.10/dist-packages (from tensorflow) (0
Requirement already satisfied: wheel<1.0,>=0.23.0 in /usr/local/lib/python3.10/dist-packages (from astunparse>=1.6.0->tensorflow) (0
Requirement already satisfied: rich in /usr/local/lib/python3.10/dist-packages (from keras>=3.5.0->tensorflow) (13.9.4)
Requirement already satisfied: namex in /usr/local/lib/python3.10/dist-packages (from keras>=3.5.0->tensorflow) (0.0.8)
Requirement already satisfied: optree in /usr/local/lib/python3.10/dist-packages (from keras>=3.5.0->tensorflow) (0.13.1)
Requirement already satisfied: charset-normalizer<4,>=2 in /usr/local/lib/python3.10/dist-packages (from requests<3,>=2.21.0->tensor
Requirement already satisfied: idna<4,>=2.5 in /usr/local/lib/python3.10/dist-packages (from requests<3,>=2.21.0->tensorflow) (3.10
Requirement already satisfied: urllib3<3,>=1.21.1 in /usr/local/lib/python3.10/dist-packages (from requests<3,>=2.21.0->tensorflow)
Requirement already satisfied: certifi>=2017.4.17 in /usr/local/lib/python3.10/dist-packages (from requests<3,>=2.21.0->tensorflow)
Requirement already satisfied: markdown>=2.6.8 in /usr/local/lib/python3.10/dist-packages (from tensorboard<2.19,>=2.18->tensorflow
Requirement already satisfied: tensorboard-data-server<0.8.0,>=0.7.0 in /usr/local/lib/python3.10/dist-packages (from tensorboard<2
Requirement already satisfied: werkzeug>=1.0.1 in /usr/local/lib/python3.10/dist-packages (from tensorboard<2.19,>=2.18->tensorflow
Requirement already satisfied: MarkupSafe>=2.1.1 in /usr/local/lib/python3.10/dist-packages (from werkzeug>=1.0.1->tensorboard<2.19,
Requirement already satisfied: markdown-it-py>=2.2.0 in /usr/local/lib/python3.10/dist-packages (from rich->keras>=3.5.0->tensorflow
Requirement already satisfied: pygments<3.0.0,>=2.13.0 in /usr/local/lib/python3.10/dist-packages (from rich->keras>=3.5.0->tensorfl
Requirement already satisfied: mdurl~=0.1 in /usr/local/lib/python3.10/dist-packages (from markdown-it-py>=2.2.0->rich->keras>=3.5.0
Downloading tensorflow-2.18.0-cp310-cp310-manylinux_2_17_x86_64.manylinux2014_x86_64.whl (615.3 MB)
   ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 615.3/615.3 MB 920.9 kB/s eta 0:00:00
Downloading tensorboard-2.18.0-py3-none-any.whl (5.5 MB)
   ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 5.5/5.5 MB 71.2 MB/s eta 0:00:00
Installing collected packages: tensorboard, tensorflow
  Attempting uninstall: tensorboard
    Found existing installation: tensorboard 2.17.1
    Uninstalling tensorboard-2.17.1:
      Successfully uninstalled tensorboard-2.17.1
  Attempting uninstall: tensorflow
    Found existing installation: tensorflow 2.17.1
    Uninstalling tensorflow-2.17.1:
      Successfully uninstalled tensorflow-2.17.1
ERROR: pip's dependency resolver does not currently take into account all the packages that are installed. This behaviour is the sou
tf-keras 2.17.0 requires tensorflow<2.18,>=2.17, but you have tensorflow 2.18.0 which is incompatible.
Successfully installed tensorboard-2.18.0 tensorflow-2.18.0
WARNING: The following packages were previously imported in this runtime:
  [tensorflow]
You must restart the runtime in order to use newly installed versions.
```

RESTART SESSION

```
Requirement already satisfied: keras in /usr/local/lib/python3.10/dist-packages (3.5.0)
Collecting keras
  Downloading keras-3.6.0-py3-none-any.whl.metadata (5.8 kB)
Requirement already satisfied: absl-py in /usr/local/lib/python3.10/dist-packages (from keras) (1.4.0)
Requirement already satisfied: numpy in /usr/local/lib/python3.10/dist-packages (from keras) (1.26.4)
Requirement already satisfied: rich in /usr/local/lib/python3.10/dist-packages (from keras) (13.9.4)
Requirement already satisfied: namex in /usr/local/lib/python3.10/dist-packages (from keras) (0.0.8)
Requirement already satisfied: h5py in /usr/local/lib/python3.10/dist-packages (from keras) (3.12.1)
Requirement already satisfied: optree in /usr/local/lib/python3.10/dist-packages (from keras) (0.13.1)
Requirement already satisfied: ml-dtypes in /usr/local/lib/python3.10/dist-packages (from keras) (0.4.1)
Requirement already satisfied: packaging in /usr/local/lib/python3.10/dist-packages (from keras) (24.2)
Requirement already satisfied: typing-extensions>=4.5.0 in /usr/local/lib/python3.10/dist-packages (from optree->keras) (4.12.2)
Requirement already satisfied: markdown-it-py>=2.2.0 in /usr/local/lib/python3.10/dist-packages (from rich->keras) (3.0.0)
Requirement already satisfied: pygments<3.0.0,>=2.13.0 in /usr/local/lib/python3.10/dist-packages (from rich->keras) (2.18.0)
Requirement already satisfied: mdurl~=0.1 in /usr/local/lib/python3.10/dist-packages (from markdown-it-py>=2.2.0->rich->keras) (0.1
Downloading keras-3.6.0-py3-none-any.whl (1.2 MB)
   ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 1.2/1.2 MB 18.1 MB/s eta 0:00:00
Installing collected packages: keras
  Attempting uninstall: keras
    Found existing installation: keras 3.5.0
    Uninstalling keras-3.5.0:
      Successfully uninstalled keras-3.5.0
ERROR: pip's dependency resolver does not currently take into account all the packages that are installed. This behaviour is the sou
tf-keras 2.17.0 requires tensorflow<2.18,>=2.17, but you have tensorflow 2.18.0 which is incompatible.
Successfully installed keras-3.6.0
WARNING: The following packages were previously imported in this runtime:
  [keras]
You must restart the runtime in order to use newly installed versions
```

You must restart the runtime in order to use newly installed versions.

RESTART SESSION

```
def train_model(model, train_gen, val_gen, epochs=10):
    history = model.fit(
        train_gen,
        epochs=epochs,
        validation_data=val_gen
    )
    return history

print("Training CNN...")
cnn_history = train_model(cnn_model, train_generator, validation_generator)

print("Training DenseNet...")
densenet_history = train_model(densenet_model, train_generator, validation_generator)

print("Training ResNet...")
resnet_history = train_model(resnet_model, train_generator, validation_generator)

print("Training InceptionNet...")
inception_history = train_model(inception_model, train_generator, validation_generator)
```

```
22/22 ━━━━━━━━━━━━━━━━━━━━ 167s 8s/step - accuracy: 0.8364 - loss: 0.4131 - val_accuracy: 0.8765 - val_loss: 0.4178
Epoch 4/10
22/22 ━━━━━━━━━━━━━━━━━━━━ 168s 8s/step - accuracy: 0.8463 - loss: 0.3913 - val_accuracy: 0.8765 - val_loss: 0.4546
Epoch 5/10
22/22 ━━━━━━━━━━━━━━━━━━━━ 167s 8s/step - accuracy: 0.8500 - loss: 0.4015 - val_accuracy: 0.8765 - val_loss: 0.4808
Epoch 6/10
22/22 ━━━━━━━━━━━━━━━━━━━━ 174s 8s/step - accuracy: 0.8530 - loss: 0.3419 - val_accuracy: 0.8765 - val_loss: 0.5269
Epoch 7/10
22/22 ━━━━━━━━━━━━━━━━━━━━ 167s 8s/step - accuracy: 0.8483 - loss: 0.4054 - val_accuracy: 0.8765 - val_loss: 0.4818
Epoch 8/10
22/22 ━━━━━━━━━━━━━━━━━━━━ 176s 8s/step - accuracy: 0.8548 - loss: 0.3619 - val_accuracy: 0.8765 - val_loss: 0.4742
Epoch 9/10
22/22 ━━━━━━━━━━━━━━━━━━━━ 168s 8s/step - accuracy: 0.8551 - loss: 0.3747 - val_accuracy: 0.8765 - val_loss: 0.4652
Epoch 10/10
22/22 ━━━━━━━━━━━━━━━━━━━━ 176s 8s/step - accuracy: 0.8514 - loss: 0.3829 - val_accuracy: 0.8765 - val_loss: 0.4761
Training ResNet...
Epoch 1/10
22/22 ━━━━━━━━━━━━━━━━━━━━ 180s 8s/step - accuracy: 0.6731 - loss: 0.7765 - val_accuracy: 0.8765 - val_loss: 0.4160
Epoch 2/10
22/22 ━━━━━━━━━━━━━━━━━━━━ 168s 8s/step - accuracy: 0.8192 - loss: 0.4894 - val_accuracy: 0.8765 - val_loss: 0.3932
Epoch 3/10
22/22 ━━━━━━━━━━━━━━━━━━━━ 177s 8s/step - accuracy: 0.8408 - loss: 0.4414 - val_accuracy: 0.8765 - val_loss: 0.4482
Epoch 4/10
22/22 ━━━━━━━━━━━━━━━━━━━━ 183s 8s/step - accuracy: 0.8117 - loss: 0.4939 - val_accuracy: 0.8765 - val_loss: 0.3942
Epoch 5/10
22/22 ━━━━━━━━━━━━━━━━━━━━ 169s 8s/step - accuracy: 0.8288 - loss: 0.4666 - val_accuracy: 0.8765 - val_loss: 0.4026
Epoch 6/10
22/22 ━━━━━━━━━━━━━━━━━━━━ 169s 8s/step - accuracy: 0.8162 - loss: 0.4779 - val_accuracy: 0.8765 - val_loss: 0.3864
Epoch 7/10
22/22 ━━━━━━━━━━━━━━━━━━━━ 169s 8s/step - accuracy: 0.8173 - loss: 0.4804 - val_accuracy: 0.8765 - val_loss: 0.3810
Epoch 8/10
22/22 ━━━━━━━━━━━━━━━━━━━━ 168s 8s/step - accuracy: 0.8221 - loss: 0.4706 - val_accuracy: 0.8765 - val_loss: 0.4045
Epoch 9/10
22/22 ━━━━━━━━━━━━━━━━━━━━ 168s 8s/step - accuracy: 0.8453 - loss: 0.4358 - val_accuracy: 0.8765 - val_loss: 0.4216
Epoch 10/10
22/22 ━━━━━━━━━━━━━━━━━━━━ 169s 8s/step - accuracy: 0.8257 - loss: 0.4613 - val_accuracy: 0.8765 - val_loss: 0.4003
Training InceptionNet...
Epoch 1/10
22/22 ━━━━━━━━━━━━━━━━━━━━ 127s 5s/step - accuracy: 0.7479 - loss: 0.6385 - val_accuracy: 0.8765 - val_loss: 0.4421
Epoch 2/10
22/22 ━━━━━━━━━━━━━━━━━━━━ 115s 5s/step - accuracy: 0.8348 - loss: 0.4501 - val_accuracy: 0.8765 - val_loss: 0.4392
Epoch 3/10
22/22 ━━━━━━━━━━━━━━━━━━━━ 113s 5s/step - accuracy: 0.8332 - loss: 0.4397 - val_accuracy: 0.8765 - val_loss: 0.4299
Epoch 4/10
22/22 ━━━━━━━━━━━━━━━━━━━━ 115s 5s/step - accuracy: 0.8466 - loss: 0.3850 - val_accuracy: 0.8765 - val_loss: 0.4234
Epoch 5/10
22/22 ━━━━━━━━━━━━━━━━━━━━ 140s 5s/step - accuracy: 0.8802 - loss: 0.3597 - val_accuracy: 0.8765 - val_loss: 0.4488
Epoch 6/10
22/22 ━━━━━━━━━━━━━━━━━━━━ 115s 5s/step - accuracy: 0.8251 - loss: 0.4247 - val_accuracy: 0.8765 - val_loss: 0.4437
Epoch 7/10
22/22 ━━━━━━━━━━━━━━━━━━━━ 140s 5s/step - accuracy: 0.8501 - loss: 0.3792 - val_accuracy: 0.8765 - val_loss: 0.4393
Epoch 8/10
22/22 ━━━━━━━━━━━━━━━━━━━━ 133s 6s/step - accuracy: 0.8009 - loss: 0.4183 - val_accuracy: 0.8765 - val_loss: 0.4444
Epoch 9/10
22/22 ━━━━━━━━━━━━━━━━━━━━ 133s 6s/step - accuracy: 0.8543 - loss: 0.3460 - val_accuracy: 0.8765 - val_loss: 0.4428
Epoch 10/10
22/22 ━━━━━━━━━━━━━━━━━━━━ 133s 6s/step - accuracy: 0.8468 - loss: 0.3637 - val_accuracy: 0.8765 - val_loss: 0.4525
```

```
# Evaluate models
cnn_eval = cnn_model.evaluate(test_generator)
densenet_eval = densenet_model.evaluate(test_generator)
```

```
resnet_eval = resnet_model.evaluate(test_generator)
inception_eval = inception_model.evaluate(test_generator)

# Print accuracy
print(f"CNN Accuracy: {cnn_eval[1]*100:.2f}%")
print(f"DenseNet Accuracy: {densenet_eval[1]*100:.2f}%")
print(f"ResNet Accuracy: {resnet_eval[1]*100:.2f}%")
print(f"InceptionNet Accuracy: {inception_eval[1]*100:.2f}%")
```

```
3/3 ━━━━━━━━━━━━━━━━━━━━ 4s 1s/step - accuracy: 0.9583 - loss: 0.2193
3/3 ━━━━━━━━━━━━━━━━━━━━ 18s 6s/step - accuracy: 0.9583 - loss: 0.2077
3/3 ━━━━━━━━━━━━━━━━━━━━ 20s 6s/step - accuracy: 0.9583 - loss: 0.2863
3/3 ━━━━━━━━━━━━━━━━━━━━ 12s 4s/step - accuracy: 0.9583 - loss: 0.2060
CNN Accuracy: 94.79%
DenseNet Accuracy: 94.79%
ResNet Accuracy: 94.79%
InceptionNet Accuracy: 94.79%
```

```
import matplotlib.pyplot as plt

def plot_history(history, model_name):
    plt.figure(figsize=(12, 4))

    # Plot accuracy
    plt.subplot(1, 2, 1)
    plt.plot(history.history['accuracy'], label='Train Accuracy')
    plt.plot(history.history['val_accuracy'], label='Validation Accuracy')
    plt.title(f'{model_name} Accuracy')
    plt.legend()

    # Plot loss
    plt.subplot(1, 2, 2)
    plt.plot(history.history['loss'], label='Train Loss')
    plt.plot(history.history['val_loss'], label='Validation Loss')
    plt.title(f'{model_name} Loss')
    plt.legend()

    plt.show()

# Plot histories
plot_history(cnn_history, 'CNN')
plot_history(densenet_history, 'DenseNet')
plot_history(resnet_history, 'ResNet')
plot_history(inception_history, 'InceptionNet')
```