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# Mount Google Drive (if you want to save the model to Google Drive)
from google.colab import drive
drive.mount('/content/drive')

# Import necessary libraries
import tensorflow as tf
from tensorflow.keras.preprocessing.image import ImageDataGenerator
from tensorflow.keras.models import Sequential
from tensorflow.keras.layers import Conv2D, MaxPooling2D, Flatten, Dense, Dropout
from tensorflow.keras.callbacks import ModelCheckpoint
import matplotlib.pyplot as plt

# Prepare the dataset (you can adjust the paths to your dataset)
train_dir = '/content/drive/My Drive/dataset/train'
val_dir = '/content/drive/My Drive/dataset/val'

# ImageDataGenerator for loading and augmenting images
train_datagen = ImageDataGenerator(rescale=1.0/255.0)
val_datagen = ImageDataGenerator(rescale=1.0/255.0)

train_generator = train_datagen.flow_from_directory(
    train_dir,
    target_size=(150, 150),
    batch_size=32,
    class_mode='categorical'
)

val_generator = val_datagen.flow_from_directory(
    val_dir,
    target_size=(150, 150),
    batch_size=32,
    class_mode='categorical'
)

# Build the model
model = Sequential([
    Conv2D(32, (3, 3), activation='relu', input_shape=(150, 150, 3)),
    MaxPooling2D(2, 2),
    Conv2D(64, (3, 3), activation='relu'),
    MaxPooling2D(2, 2),
    Conv2D(128, (3, 3), activation='relu'),
    MaxPooling2D(2, 2),
    Flatten(),
    Dense(512, activation='relu'),
    Dropout(0.5),
    Dense(2, activation='softmax') # Assuming two classes: healthy and diseased
])

# Compile the model
model.compile(optimizer='adam', loss='categorical_crossentropy', metrics=['accuracy'])

# Train the model with checkpoints to save the best model
checkpoint = ModelCheckpoint('best_model.keras', save_best_only=True, monitor='val_loss', mode='min')

history = model.fit(
    train_generator,
    epochs=20,
    validation_data=val_generator,
    callbacks=[checkpoint]
)

# Save the model locally in Colab
model.save('potato_leaf_disease_model.keras')

# Download the model
from google.colab import files
files.download('potato_leaf_disease_model.keras')

# Plot accuracy and loss
plt.plot(history.history['accuracy'], label='train accuracy')
plt.plot(history.history['val_accuracy'], label='val accuracy')
plt.legend()

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plt.show()

plt.plot(history.history['loss'], label='train loss')
plt.plot(history.history['val_loss'], label='val loss')
plt.legend()
plt.show()
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