```
[2]: import tensorflow as tf
import os
import numpy as np
from tensorflow.keras.applications import MobileNetV2
# from tensorflow.keras.applications import MobileNetV3Large
# from tensorflow.keras.applications import EfficientNetV2B1
from tensorflow.keras.models import Sequential
from tensorflow.keras.layers import Conv2D, MaxPooling2D, Flatten, Dense, GlobalAveragePooling2D, Dropout
from tensorflow.keras.optimizers import Adam
from tensorflow.keras.callbacks import EarlyStopping
import matplotlib.pyplot as plt
```

```
[3]: # Konfigurasi penggunaan memori GPU agar lebih efisien
gpus = tf.config.experimental.list_physical_devices('GPU')
if gpus:
    try:
        for gpu in gpus:
            tf.config.experimental.set_memory_growth(gpu, True)
    except RuntimeError as e:
        print(e)
```

```
[4]: # def _bytes_feature(value):
#     """Returns a bytes_list from a string / byte."""
#     if isinstance(value, type(tf.constant(0))):
#         value = value.numpy()
#     return tf.train.Feature(bytes_list=tf.train.BytesList(value=[value]))

# def _float_feature(value):
#     """Returns a float_list from a float / double."""
#     return tf.train.Feature(float_list=tf.train.FloatList(value=[value]))

# def _int64_feature(value):
#     """Returns an int64_list from a bool / enum / int / uint."""
#     return tf.train.Feature(int64_list=tf.train.Int64List(value=[value]))

# def serialize_example(image, label):
#     image = tf.cast(image * 255.0, tf.uint8)
#     feature = {
#         'image': _bytes_feature(tf.io.encode_jpeg(image).numpy()),
#         'label': _int64_feature(label),
#     }
#     example_proto = tf.train.Example(features=tf.train.Features(feature=feature))
#     return example_proto.SerializeToString()

# def write_tfrecords(file_path, dataset, class_names):
#     with tf.io.TFRecordWriter(file_path) as writer:
#         for image_path in dataset:
#             image = tf.io.read_file(image_path)
#             image = tf.image.decode_jpeg(image, channels=3)
#             image = tf.image.resize(image, [256, 256])
#             image /= 255.0
#             label_name = tf.strings.split(image_path, os.path.sep)[-2]
#             label = tf.argmax(tf.cast(tf.equal(class_names, label_name), tf.float32))
#             tf_example = serialize_example(image, label)
#             writer.write(tf_example)

train_dir = 'New_Plant_Diseases_Dataset(Augmented)/train'
validation_dir = 'New_Plant_Diseases_Dataset(Augmented)/valid'
class_names = np.array(sorted([item for item in os.listdir(train_dir) if os.path.isdir(os.path.join(train_dir, item))]))

# train_paths = tf.io.gfile.glob("{train_dir}/*/*")
# valid_paths = tf.io.gfile.glob("{validation_dir}/*/*")

# write_tfrecords('train256.tfrecord', train_paths, class_names)
# write_tfrecords('valid256.tfrecord', valid_paths, class_names)
```

```
[5]: def _parse_image_function(proto):
    keys_to_features = {
        'image': tf.io.FixedLenFeature([], tf.string),
        'label': tf.io.FixedLenFeature([], tf.int64),
    }
    parsed_features = tf.io.parse_single_example(proto, keys_to_features)
    image = tf.io.decode_jpeg(parsed_features['image'], channels=3)
    # image = tf.image.resize(image, [128, 128])
    image = tf.image.resize(image, [224, 224])
    image /= 255.0
    return image, parsed_features['label']

def load_dataset(file_path, batch_size):
    dataset = tf.data.TFRecordDataset(file_path)
    dataset = dataset.map(_parse_image_function, num_parallel_calls=tf.data.experimental.AUTOTUNE)
    dataset = dataset.shuffle(buffer_size=1000)
    dataset = dataset.batch(batch_size)
    dataset = dataset.prefetch(buffer_size=tf.data.experimental.AUTOTUNE)
    return dataset
```

```
[6]: def augment(image, label):
    image = tf.image.random_flip_left_right(image)
    image = tf.image.random_flip_up_down(image)
    image = tf.image.random_brightness(image, max_delta=0.1)
    return image, label
```

```
[7]: # Parameters
batch_size = 16
# img_size = (128, 128)
img_size = (224, 224)

# Load dataset from TFRecords
train_ds = load_dataset('train256.tfrecord', batch_size)
# train_ds = train_ds.map(augment, num_parallel_calls=tf.data.experimental.AUTOTUNE)
val_ds = load_dataset('valid256.tfrecord', batch_size)

# Define and compile the model
# base_model = MobileNetV2(input_shape=(128, 128, 3), include_top=False, weights='imagenet')
# base_model = MobileNetV2(input_shape=(256, 256, 3), include_top=False, weights='imagenet')
# base_model = EfficientNetB3(input_shape=(128, 128, 3), include_top=False, weights='imagenet')
# base_model = EfficientNetV2B1(input_shape=(128, 128, 3), include_top=False, weights='imagenet')


base_model = MobileNetV2(input_shape=(224, 224, 3), include_top=False, weights='imagenet')
base_model.trainable = False

model = Sequential([
    base_model,
    GlobalAveragePooling2D(),
    Dropout(0.5),
    Dense(len(class_names), activation='softmax')
])
# model = Sequential([
#     base_model,
#     GlobalAveragePooling2D(),
#     Dropout(0.5),
#     Dense(256, activation='relu', kernel_regularizer=tf.keras.regularizers.l2(0.01)),
#     Dropout(0.5),
#     Dense(len(class_names), activation='softmax')
# ])
# model = Sequential([
#     Conv2D(32, (3, 3), activation='relu', input_shape=(128, 128, 3)),
#     MaxPooling2D((2, 2)),
#     Conv2D(64, (3, 3), activation='relu'),
#     MaxPooling2D((2, 2)),
#     Conv2D(128, (3, 3), activation='relu'),
#     MaxPooling2D((2, 2)),
#     Flatten(),
#     Dense(128, activation='relu'),
#     Dropout(0.5),
#     Dense(len(class_names), activation='softmax')
# ])

model.compile(optimizer=Adam(learning_rate=0.000009),
              loss='sparse_categorical_crossentropy',
              metrics=['accuracy'])

model.summary()
```

```
Model: "sequential"
_________________________________________________________________
 Layer (type)                Output Shape              Param #
=================================================================
 mobilenetv2_1.00_224 (Funct  (None, 7, 7, 1280)       2257984
 ional)

 global_average_pooling2d (G  (None, 1280)             0
 lobalAveragePooling2D)

 dropout (Dropout)           (None, 1280)              0

 dense (Dense)               (None, 38)                48678

=================================================================
Total params: 2,306,662
Trainable params: 48,678
Non-trainable params: 2,257,984
_________________________________________________________________
```

```
[8]: # Train the model
early_stopping = EarlyStopping(monitor='val_loss', patience=5, restore_best_weights=True)
reduce_lr = tf.keras.callbacks.ReduceLROnPlateau(monitor='val_loss', factor=0.1, patience=5)
# history = model.fit(train_ds, validation_data=val_ds, epochs=50, callbacks=[early_stopping])
# history = model.fit(train_ds, validation_data=val_ds, epochs=50, callbacks=[early_stopping, reduce_lr])
# history = model.fit(train_ds, validation_data=val_ds, epochs=50)
history = model.fit(train_ds, validation_data=val_ds, epochs=200, callbacks=[reduce_lr])
```

```
Epoch 1/200
4394/4394 [==============================] - 95s 21ms/step - loss: 4.4776 - accuracy: 0.0540 - val_loss: 3.3093 - val_accuracy: 0.1103 - lr: 9.0000e-06
Epoch 2/200
4394/4394 [==============================] - 92s 21ms/step - loss: 3.0462 - accuracy: 0.2008 - val_loss: 2.8002 - val_accuracy: 0.2247 - lr: 9.0000e-06
Epoch 3/200
4394/4394 [==============================] - 92s 21ms/step - loss: 2.4873 - accuracy: 0.3173 - val_loss: 2.2962 - val_accuracy: 0.3612 - lr: 9.0000e-06
Epoch 4/200
4394/4394 [==============================] - 92s 21ms/step - loss: 2.0339 - accuracy: 0.4300 - val_loss: 1.9231 - val_accuracy: 0.4538 - lr: 9.0000e-06
Epoch 5/200
4394/4394 [==============================] - 92s 21ms/step - loss: 1.7115 - accuracy: 0.5175 - val_loss: 1.6495 - val_accuracy: 0.5243 - lr: 9.0000e-06
Epoch 6/200
4394/4394 [==============================] - 92s 21ms/step - loss: 1.4839 - accuracy: 0.5799 - val_loss: 1.4428 - val_accuracy: 0.5784 - lr: 9.0000e-06
Epoch 7/200
4394/4394 [==============================] - 92s 21ms/step - loss: 1.3049 - accuracy: 0.6292 - val_loss: 1.2818 - val_accuracy: 0.6256 - lr: 9.0000e-06
Epoch 8/200
4394/4394 [==============================] - 92s 21ms/step - loss: 1.1662 - accuracy: 0.6690 - val_loss: 1.1574 - val_accuracy: 0.6669 - lr: 9.0000e-06
Epoch 9/200
4394/4394 [==============================] - 92s 21ms/step - loss: 1.0605 - accuracy: 0.6982 - val_loss: 1.0577 - val_accuracy: 0.6945 - lr: 9.0000e-06
Epoch 10/200
4394/4394 [==============================] - 92s 21ms/step - loss: 0.9705 - accuracy: 0.7240 - val_loss: 0.9773 - val_accuracy: 0.7158 - lr: 9.0000e-06
Epoch 11/200
4394/4394 [==============================] - 92s 21ms/step - loss: 0.9031 - accuracy: 0.7428 - val_loss: 0.9056 - val_accuracy: 0.7380 - lr: 9.0000e-06
Epoch 12/200
4394/4394 [==============================] - 92s 21ms/step - loss: 0.8414 - accuracy: 0.7601 - val_loss: 0.8512 - val_accuracy: 0.7538 - lr: 9.0000e-06
Epoch 13/200
4394/4394 [==============================] - 91s 21ms/step - loss: 0.7923 - accuracy: 0.7735 - val_loss: 0.8030 - val_accuracy: 0.7679 - lr: 9.0000e-06
Epoch 14/200
4394/4394 [==============================] - 91s 21ms/step - loss: 0.7491 - accuracy: 0.7859 - val_loss: 0.7633 - val_accuracy: 0.7781 - lr: 9.0000e-06
Epoch 15/200
4394/4394 [==============================] - 92s 21ms/step - loss: 0.7124 - accuracy: 0.7948 - val_loss: 0.7272 - val_accuracy: 0.7885 - lr: 9.0000e-06
Epoch 16/200
4394/4394 [==============================] - 91s 21ms/step - loss: 0.6811 - accuracy: 0.8039 - val_loss: 0.6958 - val_accuracy: 0.7963 - lr: 9.0000e-06
Epoch 17/200
4394/4394 [==============================] - 91s 21ms/step - loss: 0.6520 - accuracy: 0.8110 - val_loss: 0.6664 - val_accuracy: 0.8044 - lr: 9.0000e-06
Epoch 18/200
4394/4394 [==============================] - 91s 21ms/step - loss: 0.6246 - accuracy: 0.8192 - val_loss: 0.6424 - val_accuracy: 0.8099 - lr: 9.0000e-06
Epoch 19/200
4394/4394 [==============================] - 91s 21ms/step - loss: 0.5990 - accuracy: 0.8272 - val_loss: 0.6210 - val_accuracy: 0.8162 - lr: 9.0000e-06
Epoch 20/200
4394/4394 [==============================] - 92s 21ms/step - loss: 0.5840 - accuracy: 0.8295 - val_loss: 0.6014 - val_accuracy: 0.8206 - lr: 9.0000e-06
Epoch 21/200
4394/4394 [==============================] - 92s 21ms/step - loss: 0.5640 - accuracy: 0.8356 - val_loss: 0.5813 - val_accuracy: 0.8268 - lr: 9.0000e-06
Epoch 22/200
4394/4394 [==============================] - 92s 21ms/step - loss: 0.5453 - accuracy: 0.8403 - val_loss: 0.5662 - val_accuracy: 0.8308 - lr: 9.0000e-06
Epoch 23/200
4394/4394 [==============================] - 91s 21ms/step - loss: 0.5274 - accuracy: 0.8470 - val_loss: 0.5516 - val_accuracy: 0.8338 - lr: 9.0000e-06
Epoch 24/200
4394/4394 [==============================] - 92s 21ms/step - loss: 0.5198 - accuracy: 0.8494 - val_loss: 0.5368 - val_accuracy: 0.8378 - lr: 9.0000e-06
Epoch 25/200
4394/4394 [==============================] - 91s 21ms/step - loss: 0.5058 - accuracy: 0.8520 - val_loss: 0.5240 - val_accuracy: 0.8421 - lr: 9.0000e-06
Epoch 26/200
4394/4394 [==============================] - 91s 21ms/step - loss: 0.4940 - accuracy: 0.8547 - val_loss: 0.5113 - val_accuracy: 0.8454 - lr: 9.0000e-06
Epoch 27/200
4394/4394 [==============================] - 91s 21ms/step - loss: 0.4824 - accuracy: 0.8583 - val_loss: 0.5011 - val_accuracy: 0.8476 - lr: 9.0000e-06
Epoch 28/200
4394/4394 [==============================] - 92s 21ms/step - loss: 0.4731 - accuracy: 0.8619 - val_loss: 0.4925 - val_accuracy: 0.8499 - lr: 9.0000e-06
Epoch 29/200
4394/4394 [==============================] - 92s 21ms/step - loss: 0.4617 - accuracy: 0.8635 - val_loss: 0.4809 - val_accuracy: 0.8538 - lr: 9.0000e-06
Epoch 30/200
4394/4394 [==============================] - 92s 21ms/step - loss: 0.4534 - accuracy: 0.8653 - val_loss: 0.4727 - val_accuracy: 0.8550 - lr: 9.0000e-06
Epoch 31/200
4394/4394 [==============================] - 92s 21ms/step - loss: 0.4427 - accuracy: 0.8694 - val_loss: 0.4619 - val_accuracy: 0.8597 - lr: 9.0000e-06
Epoch 32/200
4394/4394 [==============================] - 92s 21ms/step - loss: 0.4340 - accuracy: 0.8706 - val_loss: 0.4563 - val_accuracy: 0.8606 - lr: 9.0000e-06
Epoch 33/200
4394/4394 [==============================] - 91s 21ms/step - loss: 0.4277 - accuracy: 0.8737 - val_loss: 0.4485 - val_accuracy: 0.8627 - lr: 9.0000e-06
Epoch 34/200
4394/4394 [==============================] - 92s 21ms/step - loss: 0.4212 - accuracy: 0.8730 - val_loss: 0.4415 - val_accuracy: 0.8642 - lr: 9.0000e-06
Epoch 35/200
4394/4394 [==============================] - 91s 21ms/step - loss: 0.4153 - accuracy: 0.8765 - val_loss: 0.4334 - val_accuracy: 0.8669 - lr: 9.0000e-06
Epoch 36/200
4394/4394 [==============================] - 91s 21ms/step - loss: 0.4066 - accuracy: 0.8796 - val_loss: 0.4298 - val_accuracy: 0.8680 - lr: 9.0000e-06
Epoch 37/200
4394/4394 [==============================] - 91s 21ms/step - loss: 0.4028 - accuracy: 0.8803 - val_loss: 0.4212 - val_accuracy: 0.8703 - lr: 9.0000e-06
Epoch 38/200
4394/4394 [==============================] - 91s 21ms/step - loss: 0.3935 - accuracy: 0.8852 - val_loss: 0.4149 - val_accuracy: 0.8724 - lr: 9.0000e-06
Epoch 39/200
4394/4394 [==============================] - 91s 21ms/step - loss: 0.3879 - accuracy: 0.8847 - val_loss: 0.4108 - val_accuracy: 0.8730 - lr: 9.0000e-06
Epoch 40/200
4394/4394 [==============================] - 91s 21ms/step - loss: 0.3813 - accuracy: 0.8875 - val_loss: 0.4037 - val_accuracy: 0.8756 - lr: 9.0000e-06
Epoch 41/200
4394/4394 [==============================] - 91s 21ms/step - loss: 0.3776 - accuracy: 0.8880 - val_loss: 0.4017 - val_accuracy: 0.8754 - lr: 9.0000e-06
Epoch 42/200
4394/4394 [==============================] - 91s 21ms/step - loss: 0.3764 - accuracy: 0.8883 - val_loss: 0.3944 - val_accuracy: 0.8778 - lr: 9.0000e-06
Epoch 43/200
4394/4394 [==============================] - 91s 21ms/step - loss: 0.3701 - accuracy: 0.8888 - val_loss: 0.3911 - val_accuracy: 0.8786 - lr: 9.0000e-06
Epoch 44/200
4394/4394 [==============================] - 91s 21ms/step - loss: 0.3661 - accuracy: 0.8903 - val_loss: 0.3871 - val_accuracy: 0.8802 - lr: 9.0000e-06
Epoch 45/200
4394/4394 [==============================] - 91s 21ms/step - loss: 0.3585 - accuracy: 0.8938 - val_loss: 0.3826 - val_accuracy: 0.8809 - lr: 9.0000e-06
Epoch 46/200
4394/4394 [==============================] - 91s 21ms/step - loss: 0.3556 - accuracy: 0.8931 - val_loss: 0.3778 - val_accuracy: 0.8824 - lr: 9.0000e-06
Epoch 47/200
4394/4394 [==============================] - 91s 21ms/step - loss: 0.3538 - accuracy: 0.8940 - val_loss: 0.3731 - val_accuracy: 0.8841 - lr: 9.0000e-06
Epoch 48/200
4394/4394 [==============================] - 91s 21ms/step - loss: 0.3507 - accuracy: 0.8953 - val_loss: 0.3703 - val_accuracy: 0.8845 - lr: 9.0000e-06
Epoch 49/200
4394/4394 [==============================] - 91s 21ms/step - loss: 0.3438 - accuracy: 0.8971 - val_loss: 0.3665 - val_accuracy: 0.8853 - lr: 9.0000e-06
Epoch 50/200
4394/4394 [==============================] - 91s 21ms/step - loss: 0.3426 - accuracy: 0.8979 - val_loss: 0.3622 - val_accuracy: 0.8868 - lr: 9.0000e-06
Epoch 51/200
4394/4394 [==============================] - 91s 21ms/step - loss: 0.3401 - accuracy: 0.8979 - val_loss: 0.3587 - val_accuracy: 0.8880 - lr: 9.0000e-06
Epoch 52/200
4394/4394 [==============================] - 91s 21ms/step - loss: 0.3363 - accuracy: 0.8991 - val_loss: 0.3548 - val_accuracy: 0.8895 - lr: 9.0000e-06
Epoch 53/200
4394/4394 [==============================] - 92s 21ms/step - loss: 0.3342 - accuracy: 0.9003 - val_loss: 0.3534 - val_accuracy: 0.8890 - lr: 9.0000e-06
Epoch 54/200
4394/4394 [==============================] - 93s 21ms/step - loss: 0.3307 - accuracy: 0.8989 - val_loss: 0.3506 - val_accuracy: 0.8903 - lr: 9.0000e-06
Epoch 55/200
4394/4394 [==============================] - 92s 21ms/step - loss: 0.3273 - accuracy: 0.9018 - val_loss: 0.3487 - val_accuracy: 0.8908 - lr: 9.0000e-06
Epoch 56/200
4394/4394 [==============================] - 91s 21ms/step - loss: 0.3261 - accuracy: 0.9018 - val_loss: 0.3447 - val_accuracy: 0.8920 - lr: 9.0000e-06
Epoch 57/200
4394/4394 [==============================] - 92s 21ms/step - loss: 0.3227 - accuracy: 0.9032 - val_loss: 0.3429 - val_accuracy: 0.8920 - lr: 9.0000e-06
Epoch 58/200
4394/4394 [==============================] - 92s 21ms/step - loss: 0.3200 - accuracy: 0.9039 - val_loss: 0.3381 - val_accuracy: 0.8939 - lr: 9.0000e-06
Epoch 59/200
4394/4394 [==============================] - 92s 21ms/step - loss: 0.3181 - accuracy: 0.9051 - val_loss: 0.3364 - val_accuracy: 0.8949 - lr: 9.0000e-06
Epoch 60/200
4394/4394 [==============================] - 92s 21ms/step - loss: 0.3145 - accuracy: 0.9053 - val_loss: 0.3342 - val_accuracy: 0.8949 - lr: 9.0000e-06
Epoch 61/200
4394/4394 [==============================] - 93s 21ms/step - loss: 0.3166 - accuracy: 0.9039 - val_loss: 0.3310 - val_accuracy: 0.8961 - lr: 9.0000e-06
Epoch 62/200
4394/4394 [==============================] - 93s 21ms/step - loss: 0.3085 - accuracy: 0.9070 - val_loss: 0.3298 - val_accuracy: 0.8954 - lr: 9.0000e-06
Epoch 63/200
4394/4394 [==============================] - 92s 21ms/step - loss: 0.3082 - accuracy: 0.9071 - val_loss: 0.3265 - val_accuracy: 0.8971 - lr: 9.0000e-06
Epoch 64/200
4394/4394 [==============================] - 91s 21ms/step - loss: 0.3062 - accuracy: 0.9062 - val_loss: 0.3252 - val_accuracy: 0.8969 - lr: 9.0000e-06
Epoch 65/200
4394/4394 [==============================] - 92s 21ms/step - loss: 0.3075 - accuracy: 0.9070 - val_loss: 0.3224 - val_accuracy: 0.8985 - lr: 9.0000e-06
Epoch 66/200
4394/4394 [==============================] - 91s 21ms/step - loss: 0.3023 - accuracy: 0.9091 - val_loss: 0.3202 - val_accuracy: 0.8988 - lr: 9.0000e-06
Epoch 67/200
4394/4394 [==============================] - 92s 21ms/step - loss: 0.2997 - accuracy: 0.9101 - val_loss: 0.3165 - val_accuracy: 0.9002 - lr: 9.0000e-06
Epoch 68/200
4394/4394 [==============================] - 92s 21ms/step - loss: 0.2965 - accuracy: 0.9108 - val_loss: 0.3158 - val_accuracy: 0.9001 - lr: 9.0000e-06
Epoch 69/200
4394/4394 [==============================] - 92s 21ms/step - loss: 0.2965 - accuracy: 0.9102 - val_loss: 0.3138 - val_accuracy: 0.9010 - lr: 9.0000e-06
Epoch 70/200
4394/4394 [==============================] - 91s 21ms/step - loss: 0.2956 - accuracy: 0.9091 - val_loss: 0.3104 - val_accuracy: 0.9015 - lr: 9.0000e-06
Epoch 71/200
4394/4394 [==============================] - 92s 21ms/step - loss: 0.2906 - accuracy: 0.9114 - val_loss: 0.3111 - val_accuracy: 0.9010 - lr: 9.0000e-06
Epoch 72/200
4394/4394 [==============================] - 92s 21ms/step - loss: 0.2908 - accuracy: 0.9119 - val_loss: 0.3083 - val_accuracy: 0.9022 - lr: 9.0000e-06
Epoch 73/200
4394/4394 [==============================] - 92s 21ms/step - loss: 0.2893 - accuracy: 0.9115 - val_loss: 0.3073 - val_accuracy: 0.9026 - lr: 9.0000e-06
Epoch 74/200
4394/4394 [==============================] - 92s 21ms/step - loss: 0.2888 - accuracy: 0.9126 - val_loss: 0.3060 - val_accuracy: 0.9027 - lr: 9.0000e-06
Epoch 75/200
4394/4394 [==============================] - 92s 21ms/step - loss: 0.2838 - accuracy: 0.9148 - val_loss: 0.3047 - val_accuracy: 0.9028 - lr: 9.0000e-06
Epoch 76/200
4394/4394 [==============================] - 91s 21ms/step - loss: 0.2858 - accuracy: 0.9137 - val_loss: 0.3008 - val_accuracy: 0.9045 - lr: 9.0000e-06
Epoch 77/200
4394/4394 [==============================] - 91s 21ms/step - loss: 0.2810 - accuracy: 0.9149 - val_loss: 0.2980 - val_accuracy: 0.9054 - lr: 9.0000e-06
Epoch 78/200
4394/4394 [==============================] - 92s 21ms/step - loss: 0.2798 - accuracy: 0.9158 - val_loss: 0.2993 - val_accuracy: 0.9047 - lr: 9.0000e-06
Epoch 79/200
4394/4394 [==============================] - 91s 21ms/step - loss: 0.2783 - accuracy: 0.9154 - val_loss: 0.2977 - val_accuracy: 0.9050 - lr: 9.0000e-06
Epoch 80/200
4394/4394 [==============================] - 92s 21ms/step - loss: 0.2781 - accuracy: 0.9149 - val_loss: 0.2944 - val_accuracy: 0.9062 - lr: 9.0000e-06
Epoch 81/200
4394/4394 [==============================] - 92s 21ms/step - loss: 0.2762 - accuracy: 0.9156 - val_loss: 0.2921 - val_accuracy: 0.9071 - lr: 9.0000e-06
Epoch 82/200
4394/4394 [==============================] - 92s 21ms/step - loss: 0.2766 - accuracy: 0.9148 - val_loss: 0.2920 - val_accuracy: 0.9068 - lr: 9.0000e-06
Epoch 83/200
4394/4394 [==============================] - 92s 21ms/step - loss: 0.2748 - accuracy: 0.9169 - val_loss: 0.2900 - val_accuracy: 0.9078 - lr: 9.0000e-06
Epoch 84/200
4394/4394 [==============================] - 92s 21ms/step - loss: 0.2736 - accuracy: 0.9162 - val_loss: 0.2894 - val_accuracy: 0.9074 - lr: 9.0000e-06
Epoch 85/200
4394/4394 [==============================] - 91s 21ms/step - loss: 0.2702 - accuracy: 0.9179 - val_loss: 0.2882 - val_accuracy: 0.9083 - lr: 9.0000e-06
Epoch 86/200
4394/4394 [==============================] - 91s 21ms/step - loss: 0.2682 - accuracy: 0.9196 - val_loss: 0.2883 - val_accuracy: 0.9080 - lr: 9.0000e-06
Epoch 87/200
4394/4394 [==============================] - 91s 21ms/step - loss: 0.2703 - accuracy: 0.9172 - val_loss: 0.2846 - val_accuracy: 0.9091 - lr: 9.0000e-06
Epoch 88/200
4394/4394 [==============================] - 91s 21ms/step - loss: 0.2676 - accuracy: 0.9180 - val_loss: 0.2841 - val_accuracy: 0.9092 - lr: 9.0000e-06
Epoch 89/200
4394/4394 [==============================] - 91s 21ms/step - loss: 0.2695 - accuracy: 0.9179 - val_loss: 0.2817 - val_accuracy: 0.9107 - lr: 9.0000e-06
Epoch 90/200
4394/4394 [==============================] - 91s 21ms/step - loss: 0.2631 - accuracy: 0.9194 - val_loss: 0.2824 - val_accuracy: 0.9097 - lr: 9.0000e-06
Epoch 91/200
4394/4394 [==============================] - 91s 21ms/step - loss: 0.2648 - accuracy: 0.9193 - val_loss: 0.2798 - val_accuracy: 0.9109 - lr: 9.0000e-06
Epoch 92/200
4394/4394 [==============================] - 92s 21ms/step - loss: 0.2647 - accuracy: 0.9183 - val_loss: 0.2801 - val_accuracy: 0.9103 - lr: 9.0000e-06
Epoch 93/200
4394/4394 [==============================] - 91s 21ms/step - loss: 0.2650 - accuracy: 0.9194 - val_loss: 0.2784 - val_accuracy: 0.9108 - lr: 9.0000e-06
Epoch 94/200
4394/4394 [==============================] - 91s 21ms/step - loss: 0.2619 - accuracy: 0.9199 - val_loss: 0.2771 - val_accuracy: 0.9108 - lr: 9.0000e-06
Epoch 95/200
4394/4394 [==============================] - 91s 21ms/step - loss: 0.2597 - accuracy: 0.9213 - val_loss: 0.2758 - val_accuracy: 0.9115 - lr: 9.0000e-06
Epoch 96/200
4394/4394 [==============================] - 91s 21ms/step - loss: 0.2572 - accuracy: 0.9218 - val_loss: 0.2733 - val_accuracy: 0.9122 - lr: 9.0000e-06
Epoch 97/200
4394/4394 [==============================] - 91s 21ms/step - loss: 0.2607 - accuracy: 0.9188 - val_loss: 0.2738 - val_accuracy: 0.9114 - lr: 9.0000e-06
Epoch 98/200
4394/4394 [==============================] - 91s 21ms/step - loss: 0.2596 - accuracy: 0.9205 - val_loss: 0.2730 - val_accuracy: 0.9123 - lr: 9.0000e-06
Epoch 99/200
4394/4394 [==============================] - 91s 21ms/step - loss: 0.2551 - accuracy: 0.9214 - val_loss: 0.2704 - val_accuracy: 0.9129 - lr: 9.0000e-06
Epoch 100/200
4394/4394 [==============================] - 92s 21ms/step - loss: 0.2581 - accuracy: 0.9206 - val_loss: 0.2698 - val_accuracy: 0.9132 - lr: 9.0000e-06
Epoch 101/200
4394/4394 [==============================] - 92s 21ms/step - loss: 0.2576 - accuracy: 0.9209 - val_loss: 0.2699 - val_accuracy: 0.9131 - lr: 9.0000e-06
Epoch 102/200
4394/4394 [==============================] - 91s 21ms/step - loss: 0.2548 - accuracy: 0.9225 - val_loss: 0.2694 - val_accuracy: 0.9128 - lr: 9.0000e-06
Epoch 103/200
4394/4394 [==============================] - 91s 21ms/step - loss: 0.2521 - accuracy: 0.9228 - val_loss: 0.2671 - val_accuracy: 0.9136 - lr: 9.0000e-06
Epoch 104/200
4394/4394 [==============================] - 91s 21ms/step - loss: 0.2518 - accuracy: 0.9234 - val_loss: 0.2677 - val_accuracy: 0.9133 - lr: 9.0000e-06
Epoch 105/200
4394/4394 [==============================] - 91s 21ms/step - loss: 0.2503 - accuracy: 0.9231 - val_loss: 0.2665 - val_accuracy: 0.9138 - lr: 9.0000e-06
Epoch 106/200
4394/4394 [==============================] - 92s 21ms/step - loss: 0.2498 - accuracy: 0.9232 - val_loss: 0.2650 - val_accuracy: 0.9138 - lr: 9.0000e-06
Epoch 107/200
4394/4394 [==============================] - 92s 21ms/step - loss: 0.2497 - accuracy: 0.9234 - val_loss: 0.2638 - val_accuracy: 0.9146 - lr: 9.0000e-06
Epoch 108/200
4394/4394 [==============================] - 92s 21ms/step - loss: 0.2489 - accuracy: 0.9236 - val_loss: 0.2628 - val_accuracy: 0.9148 - lr: 9.0000e-06
Epoch 109/200
4394/4394 [==============================] - 91s 21ms/step - loss: 0.2493 - accuracy: 0.9226 - val_loss: 0.2614 - val_accuracy: 0.9152 - lr: 9.0000e-06
Epoch 110/200
4394/4394 [==============================] - 91s 21ms/step - loss: 0.2472 - accuracy: 0.9244 - val_loss: 0.2622 - val_accuracy: 0.9148 - lr: 9.0000e-06
Epoch 111/200
4394/4394 [==============================] - 92s 21ms/step - loss: 0.2471 - accuracy: 0.9235 - val_loss: 0.2601 - val_accuracy: 0.9155 - lr: 9.0000e-06
Epoch 112/200
4394/4394 [==============================] - 92s 21ms/step - loss: 0.2468 - accuracy: 0.9230 - val_loss: 0.2597 - val_accuracy: 0.9158 - lr: 9.0000e-06
Epoch 113/200
4394/4394 [==============================] - 91s 21ms/step - loss: 0.2463 - accuracy: 0.9247 - val_loss: 0.2590 - val_accuracy: 0.9158 - lr: 9.0000e-06
Epoch 114/200
4394/4394 [==============================] - 91s 21ms/step - loss: 0.2436 - accuracy: 0.9247 - val_loss: 0.2579 - val_accuracy: 0.9163 - lr: 9.0000e-06
Epoch 115/200
4394/4394 [==============================] - 91s 21ms/step - loss: 0.2434 - accuracy: 0.9254 - val_loss: 0.2566 - val_accuracy: 0.9169 - lr: 9.0000e-06
Epoch 116/200
4394/4394 [==============================] - 91s 21ms/step - loss: 0.2432 - accuracy: 0.9251 - val_loss: 0.2563 - val_accuracy: 0.9162 - lr: 9.0000e-06
Epoch 117/200
4394/4394 [==============================] - 91s 21ms/step - loss: 0.2439 - accuracy: 0.9248 - val_loss: 0.2556 - val_accuracy: 0.9169 - lr: 9.0000e-06
Epoch 118/200
4394/4394 [==============================] - 91s 21ms/step - loss: 0.2429 - accuracy: 0.9249 - val_loss: 0.2550 - val_accuracy: 0.9172 - lr: 9.0000e-06
Epoch 119/200
4394/4394 [==============================] - 91s 21ms/step - loss: 0.2418 - accuracy: 0.9256 - val_loss: 0.2543 - val_accuracy: 0.9173 - lr: 9.0000e-06
Epoch 120/200
4394/4394 [==============================] - 91s 21ms/step - loss: 0.2418 - accuracy: 0.9252 - val_loss: 0.2538 - val_accuracy: 0.9173 - lr: 9.0000e-06
Epoch 121/200
4394/4394 [==============================] - 91s 21ms/step - loss: 0.2389 - accuracy: 0.9265 - val_loss: 0.2527 - val_accuracy: 0.9178 - lr: 9.0000e-06
Epoch 122/200
4394/4394 [==============================] - 91s 21ms/step - loss: 0.2385 - accuracy: 0.9270 - val_loss: 0.2528 - val_accuracy: 0.9177 - lr: 9.0000e-06
Epoch 123/200
4394/4394 [==============================] - 91s 21ms/step - loss: 0.2381 - accuracy: 0.9265 - val_loss: 0.2514 - val_accuracy: 0.9179 - lr: 9.0000e-06
Epoch 124/200
4394/4394 [==============================] - 91s 21ms/step - loss: 0.2406 - accuracy: 0.9265 - val_loss: 0.2501 - val_accuracy: 0.9188 - lr: 9.0000e-06
Epoch 125/200
4394/4394 [==============================] - 91s 21ms/step - loss: 0.2388 - accuracy: 0.9258 - val_loss: 0.2502 - val_accuracy: 0.9189 - lr: 9.0000e-06
Epoch 126/200
4394/4394 [==============================] - 91s 21ms/step - loss: 0.2401 - accuracy: 0.9261 - val_loss: 0.2483 - val_accuracy: 0.9192 - lr: 9.0000e-06
Epoch 127/200
4394/4394 [==============================] - 91s 21ms/step - loss: 0.2369 - accuracy: 0.9267 - val_loss: 0.2478 - val_accuracy: 0.9193 - lr: 9.0000e-06
Epoch 128/200
4394/4394 [==============================] - 91s 21ms/step - loss: 0.2371 - accuracy: 0.9262 - val_loss: 0.2465 - val_accuracy: 0.9202 - lr: 9.0000e-06
Epoch 129/200
4394/4394 [==============================] - 91s 21ms/step - loss: 0.2357 - accuracy: 0.9265 - val_loss: 0.2467 - val_accuracy: 0.9202 - lr: 9.0000e-06
Epoch 130/200
4394/4394 [==============================] - 91s 21ms/step - loss: 0.2378 - accuracy: 0.9271 - val_loss: 0.2455 - val_accuracy: 0.9204 - lr: 9.0000e-06
Epoch 131/200
4394/4394 [==============================] - 91s 21ms/step - loss: 0.2340 - accuracy: 0.9271 - val_loss: 0.2438 - val_accuracy: 0.9208 - lr: 9.0000e-06
Epoch 132/200
4394/4394 [==============================] - 91s 21ms/step - loss: 0.2330 - accuracy: 0.9283 - val_loss: 0.2437 - val_accuracy: 0.9206 - lr: 9.0000e-06
Epoch 133/200
4394/4394 [==============================] - 90s 21ms/step - loss: 0.2321 - accuracy: 0.9289 - val_loss: 0.2460 - val_accuracy: 0.9197 - lr: 9.0000e-06
Epoch 134/200
4394/4394 [==============================] - 91s 21ms/step - loss: 0.2343 - accuracy: 0.9268 - val_loss: 0.2427 - val_accuracy: 0.9211 - lr: 9.0000e-06
Epoch 135/200
4394/4394 [==============================] - 91s 21ms/step - loss: 0.2308 - accuracy: 0.9279 - val_loss: 0.2433 - val_accuracy: 0.9205 - lr: 9.0000e-06
Epoch 136/200
4394/4394 [==============================] - 91s 21ms/step - loss: 0.2321 - accuracy: 0.9283 - val_loss: 0.2408 - val_accuracy: 0.9216 - lr: 9.0000e-06
Epoch 137/200
4394/4394 [==============================] - 91s 21ms/step - loss: 0.2300 - accuracy: 0.9296 - val_loss: 0.2419 - val_accuracy: 0.9211 - lr: 9.0000e-06
Epoch 138/200
4394/4394 [==============================] - 92s 21ms/step - loss: 0.2315 - accuracy: 0.9280 - val_loss: 0.2408 - val_accuracy: 0.9212 - lr: 9.0000e-06
Epoch 139/200
4394/4394 [==============================] - 91s 21ms/step - loss: 0.2306 - accuracy: 0.9288 - val_loss: 0.2396 - val_accuracy: 0.9224 - lr: 9.0000e-06
Epoch 140/200
4394/4394 [==============================] - 92s 21ms/step - loss: 0.2295 - accuracy: 0.9290 - val_loss: 0.2398 - val_accuracy: 0.9217 - lr: 9.0000e-06
Epoch 141/200
4394/4394 [==============================] - 92s 21ms/step - loss: 0.2273 - accuracy: 0.9291 - val_loss: 0.2384 - val_accuracy: 0.9228 - lr: 9.0000e-06
Epoch 142/200
4394/4394 [==============================] - 92s 21ms/step - loss: 0.2305 - accuracy: 0.9288 - val_loss: 0.2381 - val_accuracy: 0.9221 - lr: 9.0000e-06
Epoch 143/200
4394/4394 [==============================] - 92s 21ms/step - loss: 0.2270 - accuracy: 0.9302 - val_loss: 0.2386 - val_accuracy: 0.9223 - lr: 9.0000e-06
Epoch 144/200
4394/4394 [==============================] - 91s 21ms/step - loss: 0.2270 - accuracy: 0.9291 - val_loss: 0.2366 - val_accuracy: 0.9228 - lr: 9.0000e-06
Epoch 145/200
4394/4394 [==============================] - 91s 21ms/step - loss: 0.2285 - accuracy: 0.9284 - val_loss: 0.2366 - val_accuracy: 0.9228 - lr: 9.0000e-06
Epoch 146/200
4394/4394 [==============================] - 91s 21ms/step - loss: 0.2262 - accuracy: 0.9296 - val_loss: 0.2364 - val_accuracy: 0.9230 - lr: 9.0000e-06
Epoch 147/200
4394/4394 [==============================] - 91s 21ms/step - loss: 0.2240 - accuracy: 0.9297 - val_loss: 0.2369 - val_accuracy: 0.9229 - lr: 9.0000e-06
Epoch 148/200
4394/4394 [==============================] - 92s 21ms/step - loss: 0.2258 - accuracy: 0.9295 - val_loss: 0.2349 - val_accuracy: 0.9238 - lr: 9.0000e-06
Epoch 149/200
4394/4394 [==============================] - 92s 21ms/step - loss: 0.2246 - accuracy: 0.9302 - val_loss: 0.2355 - val_accuracy: 0.9228 - lr: 9.0000e-06
Epoch 150/200
4394/4394 [==============================] - 92s 21ms/step - loss: 0.2257 - accuracy: 0.9303 - val_loss: 0.2345 - val_accuracy: 0.9232 - lr: 9.0000e-06
Epoch 151/200
4394/4394 [==============================] - 92s 21ms/step - loss: 0.2249 - accuracy: 0.9298 - val_loss: 0.2346 - val_accuracy: 0.9232 - lr: 9.0000e-06
Epoch 152/200
4394/4394 [==============================] - 91s 21ms/step - loss: 0.2256 - accuracy: 0.9293 - val_loss: 0.2328 - val_accuracy: 0.9236 - lr: 9.0000e-06
Epoch 153/200
4394/4394 [==============================] - 92s 21ms/step - loss: 0.2261 - accuracy: 0.9295 - val_loss: 0.2337 - val_accuracy: 0.9232 - lr: 9.0000e-06
Epoch 154/200
4394/4394 [==============================] - 91s 21ms/step - loss: 0.2234 - accuracy: 0.9310 - val_loss: 0.2328 - val_accuracy: 0.9235 - lr: 9.0000e-06
Epoch 155/200
4394/4394 [==============================] - 92s 21ms/step - loss: 0.2223 - accuracy: 0.9315 - val_loss: 0.2336 - val_accuracy: 0.9231 - lr: 9.0000e-06
Epoch 156/200
4394/4394 [==============================] - 92s 21ms/step - loss: 0.2212 - accuracy: 0.9307 - val_loss: 0.2312 - val_accuracy: 0.9240 - lr: 9.0000e-06
Epoch 157/200
4394/4394 [==============================] - 92s 21ms/step - loss: 0.2227 - accuracy: 0.9302 - val_loss: 0.2304 - val_accuracy: 0.9245 - lr: 9.0000e-06
Epoch 158/200
4394/4394 [==============================] - 92s 21ms/step - loss: 0.2200 - accuracy: 0.9309 - val_loss: 0.2289 - val_accuracy: 0.9251 - lr: 9.0000e-06
Epoch 159/200
4394/4394 [==============================] - 92s 21ms/step - loss: 0.2211 - accuracy: 0.9305 - val_loss: 0.2318 - val_accuracy: 0.9239 - lr: 9.0000e-06
Epoch 160/200
4394/4394 [==============================] - 91s 21ms/step - loss: 0.2213 - accuracy: 0.9311 - val_loss: 0.2309 - val_accuracy: 0.9239 - lr: 9.0000e-06
Epoch 161/200
4394/4394 [==============================] - 91s 21ms/step - loss: 0.2205 - accuracy: 0.9317 - val_loss: 0.2297 - val_accuracy: 0.9245 - lr: 9.0000e-06
Epoch 162/200
4394/4394 [==============================] - 91s 21ms/step - loss: 0.2198 - accuracy: 0.9314 - val_loss: 0.2286 - val_accuracy: 0.9254 - lr: 9.0000e-06
Epoch 163/200
4394/4394 [==============================] - 91s 21ms/step - loss: 0.2194 - accuracy: 0.9308 - val_loss: 0.2280 - val_accuracy: 0.9254 - lr: 9.0000e-06
Epoch 164/200
4394/4394 [==============================] - 92s 21ms/step - loss: 0.2193 - accuracy: 0.9318 - val_loss: 0.2282 - val_accuracy: 0.9261 - lr: 9.0000e-06
Epoch 165/200
4394/4394 [==============================] - 92s 21ms/step - loss: 0.2184 - accuracy: 0.9322 - val_loss: 0.2260 - val_accuracy: 0.9259 - lr: 9.0000e-06
Epoch 166/200
4394/4394 [==============================] - 92s 21ms/step - loss: 0.2199 - accuracy: 0.9301 - val_loss: 0.2266 - val_accuracy: 0.9260 - lr: 9.0000e-06
Epoch 167/200
4394/4394 [==============================] - 92s 21ms/step - loss: 0.2192 - accuracy: 0.9322 - val_loss: 0.2264 - val_accuracy: 0.9256 - lr: 9.0000e-06
Epoch 168/200
4394/4394 [==============================] - 92s 21ms/step - loss: 0.2171 - accuracy: 0.9331 - val_loss: 0.2262 - val_accuracy: 0.9259 - lr: 9.0000e-06
Epoch 169/200
4394/4394 [==============================] - 92s 21ms/step - loss: 0.2166 - accuracy: 0.9319 - val_loss: 0.2258 - val_accuracy: 0.9261 - lr: 9.0000e-06
Epoch 170/200
4394/4394 [==============================] - 91s 21ms/step - loss: 0.2198 - accuracy: 0.9300 - val_loss: 0.2241 - val_accuracy: 0.9270 - lr: 9.0000e-06
Epoch 171/200
4394/4394 [==============================] - 91s 21ms/step - loss: 0.2175 - accuracy: 0.9325 - val_loss: 0.2258 - val_accuracy: 0.9260 - lr: 9.0000e-06
Epoch 172/200
4394/4394 [==============================] - 91s 21ms/step - loss: 0.2178 - accuracy: 0.9314 - val_loss: 0.2241 - val_accuracy: 0.9266 - lr: 9.0000e-06
Epoch 173/200
4394/4394 [==============================] - 92s 21ms/step - loss: 0.2167 - accuracy: 0.9327 - val_loss: 0.2239 - val_accuracy: 0.9261 - lr: 9.0000e-06
Epoch 174/200
4394/4394 [==============================] - 91s 21ms/step - loss: 0.2175 - accuracy: 0.9324 - val_loss: 0.2239 - val_accuracy: 0.9269 - lr: 9.0000e-06
Epoch 175/200
4394/4394 [==============================] - 92s 21ms/step - loss: 0.2166 - accuracy: 0.9322 - val_loss: 0.2239 - val_accuracy: 0.9264 - lr: 9.0000e-06
Epoch 176/200
4394/4394 [==============================] - 91s 21ms/step - loss: 0.2146 - accuracy: 0.9328 - val_loss: 0.2228 - val_accuracy: 0.9272 - lr: 9.0000e-06
Epoch 177/200
4394/4394 [==============================] - 92s 21ms/step - loss: 0.2140 - accuracy: 0.9323 - val_loss: 0.2223 - val_accuracy: 0.9268 - lr: 9.0000e-06
Epoch 178/200
4394/4394 [==============================] - 92s 21ms/step - loss: 0.2152 - accuracy: 0.9322 - val_loss: 0.2231 - val_accuracy: 0.9268 - lr: 9.0000e-06
Epoch 179/200
4394/4394 [==============================] - 93s 21ms/step - loss: 0.2153 - accuracy: 0.9322 - val_loss: 0.2207 - val_accuracy: 0.9281 - lr: 9.0000e-06
Epoch 180/200
4394/4394 [==============================] - 92s 21ms/step - loss: 0.2137 - accuracy: 0.9330 - val_loss: 0.2212 - val_accuracy: 0.9276 - lr: 9.0000e-06
Epoch 181/200
4394/4394 [==============================] - 92s 21ms/step - loss: 0.2139 - accuracy: 0.9330 - val_loss: 0.2216 - val_accuracy: 0.9276 - lr: 9.0000e-06
Epoch 182/200
4394/4394 [==============================] - 92s 21ms/step - loss: 0.2152 - accuracy: 0.9331 - val_loss: 0.2204 - val_accuracy: 0.9278 - lr: 9.0000e-06
Epoch 183/200
4394/4394 [==============================] - 92s 21ms/step - loss: 0.2156 - accuracy: 0.9325 - val_loss: 0.2200 - val_accuracy: 0.9280 - lr: 9.0000e-06
Epoch 184/200
4394/4394 [==============================] - 92s 21ms/step - loss: 0.2138 - accuracy: 0.9328 - val_loss: 0.2169 - val_accuracy: 0.9295 - lr: 9.0000e-06
Epoch 185/200
4394/4394 [==============================] - 92s 21ms/step - loss: 0.2129 - accuracy: 0.9334 - val_loss: 0.2183 - val_accuracy: 0.9286 - lr: 9.0000e-06
Epoch 186/200
4394/4394 [==============================] - 92s 21ms/step - loss: 0.2115 - accuracy: 0.9342 - val_loss: 0.2209 - val_accuracy: 0.9279 - lr: 9.0000e-06
Epoch 187/200
4394/4394 [==============================] - 93s 21ms/step - loss: 0.2150 - accuracy: 0.9320 - val_loss: 0.2196 - val_accuracy: 0.9282 - lr: 9.0000e-06
Epoch 188/200
4394/4394 [==============================] - 91s 21ms/step - loss: 0.2142 - accuracy: 0.9326 - val_loss: 0.2178 - val_accuracy: 0.9291 - lr: 9.0000e-06
Epoch 189/200
4394/4394 [==============================] - 92s 21ms/step - loss: 0.2128 - accuracy: 0.9327 - val_loss: 0.2185 - val_accuracy: 0.9286 - lr: 9.0000e-06
Epoch 190/200
4394/4394 [==============================] - 92s 21ms/step - loss: 0.2671 - accuracy: 0.9124 - val_loss: 0.2012 - val_accuracy: 0.9364 - lr: 9.0000e-07
Epoch 191/200
4394/4394 [==============================] - 91s 21ms/step - loss: 0.2518 - accuracy: 0.9175 - val_loss: 0.1907 - val_accuracy: 0.9417 - lr: 9.0000e-07
Epoch 192/200
4394/4394 [==============================] - 91s 21ms/step - loss: 0.2439 - accuracy: 0.9214 - val_loss: 0.1848 - val_accuracy: 0.9438 - lr: 9.0000e-07
Epoch 193/200
4394/4394 [==============================] - 91s 21ms/step - loss: 0.2407 - accuracy: 0.9241 - val_loss: 0.1815 - val_accuracy: 0.9459 - lr: 9.0000e-07
Epoch 194/200
4394/4394 [==============================] - 94s 21ms/step - loss: 0.2356 - accuracy: 0.9239 - val_loss: 0.1796 - val_accuracy: 0.9461 - lr: 9.0000e-07
Epoch 195/200
4394/4394 [==============================] - 95s 22ms/step - loss: 0.2397 - accuracy: 0.9236 - val_loss: 0.1786 - val_accuracy: 0.9464 - lr: 9.0000e-07
Epoch 196/200
4394/4394 [==============================] - 95s 22ms/step - loss: 0.2364 - accuracy: 0.9251 - val_loss: 0.1780 - val_accuracy: 0.9466 - lr: 9.0000e-07
Epoch 197/200
4394/4394 [==============================] - 95s 22ms/step - loss: 0.2346 - accuracy: 0.9253 - val_loss: 0.1777 - val_accuracy: 0.9470 - lr: 9.0000e-07
Epoch 198/200
4394/4394 [==============================] - 93s 21ms/step - loss: 0.2328 - accuracy: 0.9257 - val_loss: 0.1775 - val_accuracy: 0.9467 - lr: 9.0000e-07
Epoch 199/200
4394/4394 [==============================] - 92s 21ms/step - loss: 0.2334 - accuracy: 0.9258 - val_loss: 0.1774 - val_accuracy: 0.9468 - lr: 9.0000e-07
Epoch 200/200
4394/4394 [==============================] - 92s 21ms/step - loss: 0.2354 - accuracy: 0.9247 - val_loss: 0.1773 - val_accuracy: 0.9472 - lr: 9.0000e-07
```

```
[9]: # # Evaluate the model
# loss, accuracy = model.evaluate(val_ds)
# print(f'Validation accuracy: {accuracy}')
```

```
[10]: # Plot training & validation accuracy values
plt.figure(figsize=(8, 6))
plt.plot(history.history['accuracy'])
plt.plot(history.history['val_accuracy'])
plt.title('Model accuracy')
plt.ylabel('Accuracy')
plt.xlabel('Epoch')
plt.legend(['Train', 'Validation'], loc='upper left')
plt.show()
```



```
[11]: model.save('plant_disease_MobileNetV2(input256)(noaugment)(lr0.000009(reducelr)).h5')
```

```
[ ]:
```