

```
import tensorflow as tf
from tensorflow import keras
layers = keras.layers
models = keras.models
regularizers = keras.regularizers
import numpy as np
import matplotlib.pyplot as plt
import time
```

```
# GPU + Mixed Precision setup
print("GPU Available:", tf.config.list_physical_devices('GPU'))
tf.keras.mixed_precision.set_global_policy('mixed_float16')
print("Mixed Precision Policy:", tf.keras.mixed_precision.global_policy())

GPU Available: [PhysicalDevice(name='/physical_device:GPU:0', device_type='GPU')]
Mixed Precision Policy: <DTypePolicy "mixed_float16">
```

```
# Load CIFAR-10 dataset
(x_train, y_train), (x_test, y_test) = tf.keras.datasets.cifar10.load_data()
x_train, x_test = x_train / 255.0, x_test / 255.0

BATCH_SIZE = 256
EPOCHS = 300
```

```
# ResNet block
def resnet_block(x, filters, weight_decay=0.0, dropout_rate=0.0, include_batchnorm=True):
    shortcut = x

    # First Conv2D -> BN (conditional) -> Activation -> Dropout (conditional)
    x = layers.Conv2D(filters, (3,3), padding='same', activation='relu',
                      kernel_regularizer=regularizers.l2(weight_decay))(x)
    if include_batchnorm:
        x = layers.BatchNormalization()(x)
    if dropout_rate > 0:
        x = layers.Dropout(dropout_rate)(x)

    # Second Conv2D -> BN (conditional) -> Dropout (conditional)
    x = layers.Conv2D(filters, (3,3), padding='same', activation=None,
                      kernel_regularizer=regularizers.l2(weight_decay))(x)
    if include_batchnorm:
        x = layers.BatchNormalization()(x)
    if dropout_rate > 0:
        x = layers.Dropout(dropout_rate)(x)

    # Add skip connection and apply final ReLU
    x = layers.Add()([shortcut, x])
    x = layers.ReLU()(x)
    return x
```

```
# ResNet-10 builder
def build_resnet10(weight_decay=0.0, dropout_rate=0.0, include_batchnorm=True):
    inputs = layers.Input(shape=(32,32,3))

    # Initial Conv2D -> BN (conditional) -> Dropout (conditional)
    x = layers.Conv2D(32, (3,3), padding='same', activation='relu',
                      kernel_regularizer=regularizers.l2(weight_decay))(inputs)
    if include_batchnorm:
        x = layers.BatchNormalization()(x)
    if dropout_rate > 0:
        x = layers.Dropout(dropout_rate)(x)

    # 10 ResNet Blocks
    for _ in range(10):
        # Pass the batch norm flag to the block
        x = resnet_block(x, 32,
                          weight_decay=weight_decay,
                          dropout_rate=dropout_rate,
                          include_batchnorm=include_batchnorm)

    x = layers.GlobalAveragePooling2D()(x)
    outputs = layers.Dense(10, activation='softmax', dtype='float32')(x)
```

```
return models.Model(inputs, outputs)

# Training & evaluation helper
def train_and_evaluate(model, description):
    model.compile(
        optimizer=tf.keras.optimizers.Adam(),
        loss='sparse_categorical_crossentropy',
        metrics=['accuracy']
    )

    # Print model summary for confirmation
    model.summary()

    print(f"\n===== Training: {description} =====")
    start_time = time.time()

    history = model.fit(
        x_train, y_train,
        batch_size=BATCH_SIZE,
        epochs=EPOCHS,
        validation_split=0.2,
        verbose=1
    )

    end_time = time.time()
    training_time = end_time - start_time

    test_loss, test_acc = model.evaluate(x_test, y_test, verbose=0)
    final_train_loss = history.history['loss'][-1]

    print(f"{description} - Training Time: {training_time:.2f}s, Test Accuracy: {test_acc:.4f}, Final Train Loss: {final_train_loss}")

    return history, training_time, final_train_loss, test_acc
```

```
# 2.a Baseline ResNet-10
```

```
baseline_model = build_resnet10(include_batchnorm=False)
history_baseline, time_baseline, loss_baseline, acc_baseline = train_and_evaluate(baseline_model, "Baseline (NO Regularization/
```


Model: "functional_1"

| Layer (type) | Output Shape | Param # | Connected to |
|-------------------------------|--------------------|---------|----------------------------------|
| input_layer_1 (InputLayer) | (None, 32, 32, 3) | 0 | - |
| conv2d_21 (Conv2D) | (None, 32, 32, 32) | 896 | input_layer_1[0]... |
| conv2d_22 (Conv2D) | (None, 32, 32, 32) | 9,248 | conv2d_21[0][0] |
| conv2d_23 (Conv2D) | (None, 32, 32, 32) | 9,248 | conv2d_22[0][0] |
| add_10 (Add) | (None, 32, 32, 32) | 0 | conv2d_21[0][0], conv2d_23[0][0] |
| re_lu_10 (ReLU) | (None, 32, 32, 32) | 0 | add_10[0][0] |
| conv2d_24 (Conv2D) | (None, 32, 32, 32) | 9,248 | re_lu_10[0][0] |
| conv2d_25 (Conv2D) | (None, 32, 32, 32) | 9,248 | conv2d_24[0][0] |
| add_11 (Add) | (None, 32, 32, 32) | 0 | re_lu_10[0][0], conv2d_25[0][0] |
| re_lu_11 (ReLU) | (None, 32, 32, 32) | 0 | add_11[0][0] |
| conv2d_26 (Conv2D) | (None, 32, 32, 32) | 9,248 | re_lu_11[0][0] |
| conv2d_27 (Conv2D) | (None, 32, 32, 32) | 9,248 | conv2d_26[0][0] |
| add_12 (Add) | (None, 32, 32, 32) | 0 | re_lu_11[0][0], conv2d_27[0][0] |
| re_lu_12 (ReLU) | (None, 32, 32, 32) | 0 | add_12[0][0] |
| conv2d_28 (Conv2D) | (None, 32, 32, 32) | 9,248 | re_lu_12[0][0] |
| conv2d_29 (Conv2D) | (None, 32, 32, 32) | 9,248 | conv2d_28[0][0] |
| add_13 (Add) | (None, 32, 32, 32) | 0 | re_lu_12[0][0], conv2d_29[0][0] |
| re_lu_13 (ReLU) | (None, 32, 32, 32) | 0 | add_13[0][0] |
| conv2d_30 (Conv2D) | (None, 32, 32, 32) | 9,248 | re_lu_13[0][0] |
| conv2d_31 (Conv2D) | (None, 32, 32, 32) | 9,248 | conv2d_30[0][0] |
| add_14 (Add) | (None, 32, 32, 32) | 0 | re_lu_13[0][0], conv2d_31[0][0] |
| re_lu_14 (ReLU) | (None, 32, 32, 32) | 0 | add_14[0][0] |
| conv2d_32 (Conv2D) | (None, 32, 32, 32) | 9,248 | re_lu_14[0][0] |
| conv2d_33 (Conv2D) | (None, 32, 32, 32) | 9,248 | conv2d_32[0][0] |
| add_15 (Add) | (None, 32, 32, 32) | 0 | re_lu_14[0][0], conv2d_33[0][0] |
| re_lu_15 (ReLU) | (None, 32, 32, 32) | 0 | add_15[0][0] |
| conv2d_34 (Conv2D) | (None, 32, 32, 32) | 9,248 | re_lu_15[0][0] |
| conv2d_35 (Conv2D) | (None, 32, 32, 32) | 9,248 | conv2d_34[0][0] |

| | 32) | | |
|--|--------------------|-------|---------------------------------|
| add_16 (Add) | (None, 32, 32, 32) | 0 | re_lu_15[0][0], conv2d_35[0][0] |
| re_lu_16 (ReLU) | (None, 32, 32, 32) | 0 | add_16[0][0] |
| conv2d_36 (Conv2D) | (None, 32, 32, 32) | 9,248 | re_lu_16[0][0] |
| conv2d_37 (Conv2D) | (None, 32, 32, 32) | 9,248 | conv2d_36[0][0] |
| add_17 (Add) | (None, 32, 32, 32) | 0 | re_lu_16[0][0], conv2d_37[0][0] |
| re_lu_17 (ReLU) | (None, 32, 32, 32) | 0 | add_17[0][0] |
| conv2d_38 (Conv2D) | (None, 32, 32, 32) | 9,248 | re_lu_17[0][0] |
| conv2d_39 (Conv2D) | (None, 32, 32, 32) | 9,248 | conv2d_38[0][0] |
| add_18 (Add) | (None, 32, 32, 32) | 0 | re_lu_17[0][0], conv2d_39[0][0] |
| re_lu_18 (ReLU) | (None, 32, 32, 32) | 0 | add_18[0][0] |
| conv2d_40 (Conv2D) | (None, 32, 32, 32) | 9,248 | re_lu_18[0][0] |
| conv2d_41 (Conv2D) | (None, 32, 32, 32) | 9,248 | conv2d_40[0][0] |
| add_19 (Add) | (None, 32, 32, 32) | 0 | re_lu_18[0][0], conv2d_41[0][0] |
| re_lu_19 (ReLU) | (None, 32, 32, 32) | 0 | add_19[0][0] |
| global_average_poo... (GlobalAveragePool...) | (None, 32) | 0 | re_lu_19[0][0] |
| dense_1 (Dense) | (None, 10) | 330 | global_average_p... |

Total params: 186,186 (727.29 KB)

Trainable params: 186,186 (727.29 KB)

Non-trainable params: 0 (0.00 B)

===== Training: Baseline (NO Regularization/NO BN) =====

```

Epoch 1/300
157/157 ━━━━━━━━━━ 22s 64ms/step - accuracy: 0.1801 - loss: 2.1447 - val_accuracy: 0.2954 - val_loss: 1.7604
Epoch 2/300
157/157 ━━━━━━━━ 2s 12ms/step - accuracy: 0.3165 - loss: 1.7532 - val_accuracy: 0.3798 - val_loss: 1.5996
Epoch 3/300
157/157 ━━━━━━ 2s 11ms/step - accuracy: 0.3883 - loss: 1.5909 - val_accuracy: 0.4416 - val_loss: 1.4850
Epoch 4/300
157/157 ━━━━ 2s 11ms/step - accuracy: 0.4522 - loss: 1.4607 - val_accuracy: 0.4888 - val_loss: 1.3764
Epoch 5/300
157/157 ━━━━ 2s 12ms/step - accuracy: 0.4982 - loss: 1.3549 - val_accuracy: 0.4955 - val_loss: 1.3290
Epoch 6/300
157/157 ━━━━ 2s 12ms/step - accuracy: 0.5305 - loss: 1.2755 - val_accuracy: 0.5373 - val_loss: 1.2403
Epoch 7/300
157/157 ━━━━ 2s 11ms/step - accuracy: 0.5573 - loss: 1.2006 - val_accuracy: 0.5543 - val_loss: 1.1947
Epoch 8/300
157/157 ━━━━ 2s 11ms/step - accuracy: 0.5825 - loss: 1.1428 - val_accuracy: 0.5900 - val_loss: 1.1221
Epoch 9/300
157/157 ━━━━ 2s 11ms/step - accuracy: 0.5983 - loss: 1.0972 - val_accuracy: 0.5640 - val_loss: 1.2539
Epoch 10/300
157/157 ━━━━ 2s 11ms/step - accuracy: 0.6100 - loss: 1.0770 - val_accuracy: 0.5849 - val_loss: 1.1539
Epoch 11/300
157/157 ━━━━ 2s 11ms/step - accuracy: 0.6319 - loss: 1.0049 - val_accuracy: 0.6166 - val_loss: 1.0383
Epoch 12/300
157/157 ━━━━ 2s 12ms/step - accuracy: 0.6419 - loss: 0.9799 - val_accuracy: 0.6474 - val_loss: 0.9768
Epoch 13/300
157/157 ━━━━ 2s 11ms/step - accuracy: 0.6724 - loss: 0.9134 - val_accuracy: 0.6446 - val_loss: 0.9826
Epoch 14/300
157/157 ━━━━ 2s 11ms/step - accuracy: 0.6713 - loss: 0.9117 - val_accuracy: 0.6703 - val_loss: 0.9358
Epoch 15/300
157/157 ━━━━ 2s 11ms/step - accuracy: 0.6894 - loss: 0.8662 - val_accuracy: 0.6224 - val_loss: 1.0511
Epoch 16/300
157/157 ━━━━ 2s 11ms/step - accuracy: 0.6884 - loss: 0.8697 - val_accuracy: 0.6632 - val_loss: 0.9274

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Epoch 17/300
157/157 2s 12ms/step - accuracy: 0.7045 - loss: 0.8142 - val_accuracy: 0.6682 - val_loss: 0.9206
Epoch 18/300
157/157 2s 12ms/step - accuracy: 0.7257 - loss: 0.7664 - val_accuracy: 0.6885 - val_loss: 0.8850
Epoch 19/300
157/157 2s 12ms/step - accuracy: 0.7252 - loss: 0.7677 - val_accuracy: 0.6319 - val_loss: 1.0848
Epoch 20/300
157/157 2s 12ms/step - accuracy: 0.7232 - loss: 0.7749 - val_accuracy: 0.6938 - val_loss: 0.8383
Epoch 21/300
157/157 2s 12ms/step - accuracy: 0.7419 - loss: 0.7163 - val_accuracy: 0.7094 - val_loss: 0.8264
Epoch 22/300
157/157 2s 11ms/step - accuracy: 0.7470 - loss: 0.7079 - val_accuracy: 0.6716 - val_loss: 0.9217
Epoch 23/300
157/157 2s 11ms/step - accuracy: 0.7534 - loss: 0.6929 - val_accuracy: 0.6855 - val_loss: 0.9293
Epoch 24/300
157/157 2s 11ms/step - accuracy: 0.7613 - loss: 0.6687 - val_accuracy: 0.7053 - val_loss: 0.8551
Epoch 25/300
157/157 2s 12ms/step - accuracy: 0.7655 - loss: 0.6525 - val_accuracy: 0.6859 - val_loss: 0.9363
Epoch 26/300
157/157 2s 11ms/step - accuracy: 0.7674 - loss: 0.6641 - val_accuracy: 0.7074 - val_loss: 0.8475
Epoch 27/300
157/157 2s 11ms/step - accuracy: 0.7825 - loss: 0.6135 - val_accuracy: 0.7195 - val_loss: 0.7995
Epoch 28/300
157/157 2s 11ms/step - accuracy: 0.7884 - loss: 0.5965 - val_accuracy: 0.7072 - val_loss: 0.8419
Epoch 29/300
157/157 2s 11ms/step - accuracy: 0.7924 - loss: 0.5760 - val_accuracy: 0.7285 - val_loss: 0.7737
Epoch 30/300
157/157 2s 12ms/step - accuracy: 0.7997 - loss: 0.5636 - val_accuracy: 0.7229 - val_loss: 0.8041
Epoch 31/300
157/157 2s 12ms/step - accuracy: 0.8078 - loss: 0.5370 - val_accuracy: 0.7309 - val_loss: 0.7780
Epoch 32/300
157/157 2s 11ms/step - accuracy: 0.8157 - loss: 0.5204 - val_accuracy: 0.7314 - val_loss: 0.7982
Epoch 33/300
157/157 2s 11ms/step - accuracy: 0.8118 - loss: 0.5310 - val_accuracy: 0.7286 - val_loss: 0.7983
Epoch 34/300
157/157 2s 12ms/step - accuracy: 0.8277 - loss: 0.4899 - val_accuracy: 0.7385 - val_loss: 0.7819
Epoch 35/300
157/157 2s 12ms/step - accuracy: 0.8279 - loss: 0.4773 - val_accuracy: 0.7120 - val_loss: 0.9139
Epoch 36/300
157/157 2s 12ms/step - accuracy: 0.8244 - loss: 0.4974 - val_accuracy: 0.7313 - val_loss: 0.7940
Epoch 37/300
157/157 2s 12ms/step - accuracy: 0.8357 - loss: 0.4664 - val_accuracy: 0.7031 - val_loss: 0.8883
Epoch 38/300
157/157 2s 12ms/step - accuracy: 0.8346 - loss: 0.4686 - val_accuracy: 0.7095 - val_loss: 0.9614
Epoch 39/300
157/157 2s 12ms/step - accuracy: 0.8379 - loss: 0.4497 - val_accuracy: 0.7361 - val_loss: 0.7999
Epoch 40/300
157/157 2s 11ms/step - accuracy: 0.8561 - loss: 0.3988 - val_accuracy: 0.7359 - val_loss: 0.8408
Epoch 41/300
157/157 2s 12ms/step - accuracy: 0.8526 - loss: 0.4098 - val_accuracy: 0.7288 - val_loss: 0.8685
Epoch 42/300
157/157 2s 12ms/step - accuracy: 0.8496 - loss: 0.4166 - val_accuracy: 0.7218 - val_loss: 0.8808
Epoch 43/300
157/157 2s 12ms/step - accuracy: 0.8592 - loss: 0.3930 - val_accuracy: 0.7322 - val_loss: 0.8274
Epoch 44/300
157/157 2s 12ms/step - accuracy: 0.8581 - loss: 0.3907 - val_accuracy: 0.7307 - val_loss: 0.8678
Epoch 45/300
157/157 2s 12ms/step - accuracy: 0.8720 - loss: 0.3630 - val_accuracy: 0.7322 - val_loss: 0.8669
Epoch 46/300
157/157 2s 11ms/step - accuracy: 0.8736 - loss: 0.3600 - val_accuracy: 0.7356 - val_loss: 0.9145
Epoch 47/300
157/157 2s 11ms/step - accuracy: 0.8748 - loss: 0.3506 - val_accuracy: 0.7420 - val_loss: 0.8452
Epoch 48/300
157/157 2s 11ms/step - accuracy: 0.8822 - loss: 0.3214 - val_accuracy: 0.7373 - val_loss: 0.8910
Epoch 49/300
157/157 2s 12ms/step - accuracy: 0.8792 - loss: 0.3399 - val_accuracy: 0.7262 - val_loss: 0.9374
Epoch 50/300
157/157 2s 12ms/step - accuracy: 0.8872 - loss: 0.3248 - val_accuracy: 0.7287 - val_loss: 0.9325
Epoch 51/300
157/157 2s 12ms/step - accuracy: 0.8910 - loss: 0.3029 - val_accuracy: 0.7407 - val_loss: 0.9289
Epoch 52/300
157/157 2s 12ms/step - accuracy: 0.8957 - loss: 0.2862 - val_accuracy: 0.7349 - val_loss: 0.9210
Epoch 53/300
157/157 2s 11ms/step - accuracy: 0.8906 - loss: 0.3064 - val_accuracy: 0.7148 - val_loss: 1.1201
Epoch 54/300
157/157 2s 12ms/step - accuracy: 0.8962 - loss: 0.2878 - val_accuracy: 0.7270 - val_loss: 1.0496
Epoch 55/300
157/157 2s 12ms/step - accuracy: 0.9073 - loss: 0.2618 - val_accuracy: 0.7272 - val_loss: 0.9813
Epoch 56/300
157/157 2s 12ms/step - accuracy: 0.8975 - loss: 0.2787 - val_accuracy: 0.7288 - val_loss: 1.0725
Epoch 57/300
157/157 2s 12ms/step - accuracy: 0.9003 - loss: 0.2770 - val_accuracy: 0.7342 - val_loss: 0.9964
Epoch 58/300
157/157 2s 12ms/step - accuracy: 0.9044 - loss: 0.2665 - val_accuracy: 0.7302 - val_loss: 1.0355
Epoch 59/300
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157/157 2s 12ms/step - accuracy: 0.9039 - loss: 0.2670 - val_accuracy: 0.7270 - val_loss: 1.0046
Epoch 60/300
157/157 2s 12ms/step - accuracy: 0.9070 - loss: 0.2564 - val_accuracy: 0.7277 - val_loss: 1.0542
Epoch 61/300
157/157 2s 12ms/step - accuracy: 0.9084 - loss: 0.2506 - val_accuracy: 0.7239 - val_loss: 1.0470
Epoch 62/300
157/157 2s 12ms/step - accuracy: 0.9101 - loss: 0.2471 - val_accuracy: 0.7205 - val_loss: 1.1769
Epoch 63/300
157/157 2s 12ms/step - accuracy: 0.9036 - loss: 0.2638 - val_accuracy: 0.7300 - val_loss: 1.0659
Epoch 64/300
157/157 2s 12ms/step - accuracy: 0.9172 - loss: 0.2293 - val_accuracy: 0.7346 - val_loss: 1.0353
Epoch 65/300
157/157 2s 12ms/step - accuracy: 0.9196 - loss: 0.2173 - val_accuracy: 0.7141 - val_loss: 1.1180
Epoch 66/300
157/157 2s 12ms/step - accuracy: 0.9120 - loss: 0.2397 - val_accuracy: 0.7200 - val_loss: 1.1477
Epoch 67/300
157/157 2s 12ms/step - accuracy: 0.9128 - loss: 0.2410 - val_accuracy: 0.7206 - val_loss: 1.1678
Epoch 68/300
157/157 2s 12ms/step - accuracy: 0.9139 - loss: 0.2367 - val_accuracy: 0.7361 - val_loss: 1.1524
Epoch 69/300
157/157 2s 12ms/step - accuracy: 0.9269 - loss: 0.2034 - val_accuracy: 0.7317 - val_loss: 1.2012
Epoch 70/300
157/157 2s 12ms/step - accuracy: 0.9280 - loss: 0.2043 - val_accuracy: 0.7193 - val_loss: 1.2468
Epoch 71/300
157/157 2s 12ms/step - accuracy: 0.9239 - loss: 0.2165 - val_accuracy: 0.7339 - val_loss: 1.1599
Epoch 72/300
157/157 2s 12ms/step - accuracy: 0.9321 - loss: 0.1844 - val_accuracy: 0.7145 - val_loss: 1.2793
Epoch 73/300
157/157 2s 11ms/step - accuracy: 0.9218 - loss: 0.2159 - val_accuracy: 0.7216 - val_loss: 1.1223
Epoch 74/300
157/157 2s 12ms/step - accuracy: 0.9298 - loss: 0.2017 - val_accuracy: 0.7183 - val_loss: 1.1976
Epoch 75/300
157/157 2s 12ms/step - accuracy: 0.9219 - loss: 0.2164 - val_accuracy: 0.7376 - val_loss: 1.1543
Epoch 76/300
157/157 2s 11ms/step - accuracy: 0.9382 - loss: 0.1705 - val_accuracy: 0.7298 - val_loss: 1.1811
Epoch 77/300
157/157 2s 11ms/step - accuracy: 0.9342 - loss: 0.1864 - val_accuracy: 0.7193 - val_loss: 1.1552
Epoch 78/300
157/157 2s 12ms/step - accuracy: 0.9232 - loss: 0.2140 - val_accuracy: 0.7015 - val_loss: 1.3146
Epoch 79/300
157/157 2s 11ms/step - accuracy: 0.9298 - loss: 0.1881 - val_accuracy: 0.7310 - val_loss: 1.1836
Epoch 80/300
157/157 2s 12ms/step - accuracy: 0.9292 - loss: 0.1919 - val_accuracy: 0.7399 - val_loss: 1.1929
Epoch 81/300
157/157 2s 12ms/step - accuracy: 0.9405 - loss: 0.1595 - val_accuracy: 0.7282 - val_loss: 1.2290
Epoch 82/300
157/157 2s 12ms/step - accuracy: 0.9377 - loss: 0.1760 - val_accuracy: 0.7356 - val_loss: 1.2895
Epoch 83/300
157/157 2s 12ms/step - accuracy: 0.9420 - loss: 0.1575 - val_accuracy: 0.7320 - val_loss: 1.2778
Epoch 84/300
157/157 2s 11ms/step - accuracy: 0.9405 - loss: 0.1627 - val_accuracy: 0.7335 - val_loss: 1.2033
Epoch 85/300
157/157 2s 12ms/step - accuracy: 0.9392 - loss: 0.1671 - val_accuracy: 0.7373 - val_loss: 1.2779
Epoch 86/300
157/157 2s 11ms/step - accuracy: 0.9344 - loss: 0.1813 - val_accuracy: 0.7372 - val_loss: 1.2402
Epoch 87/300
157/157 2s 12ms/step - accuracy: 0.9393 - loss: 0.1665 - val_accuracy: 0.7329 - val_loss: 1.3283
Epoch 88/300
157/157 2s 11ms/step - accuracy: 0.9331 - loss: 0.1879 - val_accuracy: 0.7286 - val_loss: 1.2148
Epoch 89/300
157/157 2s 11ms/step - accuracy: 0.9389 - loss: 0.1695 - val_accuracy: 0.7416 - val_loss: 1.1722
Epoch 90/300
157/157 2s 11ms/step - accuracy: 0.9352 - loss: 0.1804 - val_accuracy: 0.7284 - val_loss: 1.3046
Epoch 91/300
157/157 2s 11ms/step - accuracy: 0.9462 - loss: 0.1487 - val_accuracy: 0.7268 - val_loss: 1.2780
Epoch 92/300
157/157 2s 11ms/step - accuracy: 0.9491 - loss: 0.1444 - val_accuracy: 0.7315 - val_loss: 1.1667
Epoch 93/300
157/157 2s 12ms/step - accuracy: 0.9368 - loss: 0.1755 - val_accuracy: 0.7331 - val_loss: 1.2899
Epoch 94/300
157/157 2s 11ms/step - accuracy: 0.9430 - loss: 0.1597 - val_accuracy: 0.7271 - val_loss: 1.2527
Epoch 95/300
157/157 2s 12ms/step - accuracy: 0.9349 - loss: 0.1801 - val_accuracy: 0.7203 - val_loss: 1.2103
Epoch 96/300
157/157 2s 11ms/step - accuracy: 0.9263 - loss: 0.1998 - val_accuracy: 0.7219 - val_loss: 1.2940
Epoch 97/300
157/157 2s 11ms/step - accuracy: 0.9385 - loss: 0.1654 - val_accuracy: 0.7216 - val_loss: 1.4055
Epoch 98/300
157/157 2s 11ms/step - accuracy: 0.9513 - loss: 0.1398 - val_accuracy: 0.7290 - val_loss: 1.3369
Epoch 99/300
157/157 2s 12ms/step - accuracy: 0.9469 - loss: 0.1518 - val_accuracy: 0.7253 - val_loss: 1.3642
Epoch 100/300
157/157 2s 12ms/step - accuracy: 0.9480 - loss: 0.1480 - val_accuracy: 0.7243 - val_loss: 1.3676
Epoch 101/300
157/157 2s 12ms/step - accuracy: 0.9477 - loss: 0.1500 - val_accuracy: 0.7248 - val_loss: 1.3640
```

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157/157 2s 12ms/step - accuracy: 0.9528 - loss: 0.1324 - val_accuracy: 0.7248 - val_loss: 1.3049
Epoch 102/300
157/157 2s 12ms/step - accuracy: 0.9465 - loss: 0.1469 - val_accuracy: 0.7433 - val_loss: 1.2319
Epoch 103/300
157/157 2s 12ms/step - accuracy: 0.9496 - loss: 0.1464 - val_accuracy: 0.7221 - val_loss: 1.4471
Epoch 104/300
157/157 2s 12ms/step - accuracy: 0.9461 - loss: 0.1485 - val_accuracy: 0.7271 - val_loss: 1.3482
Epoch 105/300
157/157 2s 12ms/step - accuracy: 0.9279 - loss: 0.2034 - val_accuracy: 0.7304 - val_loss: 1.3873
Epoch 106/300
157/157 2s 12ms/step - accuracy: 0.9454 - loss: 0.1493 - val_accuracy: 0.7340 - val_loss: 1.3097
Epoch 107/300
157/157 2s 12ms/step - accuracy: 0.9449 - loss: 0.1518 - val_accuracy: 0.7385 - val_loss: 1.2788
Epoch 108/300
157/157 2s 11ms/step - accuracy: 0.9536 - loss: 0.1300 - val_accuracy: 0.7270 - val_loss: 1.2495
Epoch 109/300
157/157 2s 11ms/step - accuracy: 0.9483 - loss: 0.1442 - val_accuracy: 0.7354 - val_loss: 1.3444
Epoch 110/300
157/157 2s 12ms/step - accuracy: 0.9368 - loss: 0.1763 - val_accuracy: 0.7315 - val_loss: 1.3168
Epoch 111/300
157/157 2s 12ms/step - accuracy: 0.9538 - loss: 0.1307 - val_accuracy: 0.7160 - val_loss: 1.2466
Epoch 112/300
157/157 2s 12ms/step - accuracy: 0.9358 - loss: 0.1763 - val_accuracy: 0.7270 - val_loss: 1.2947
Epoch 113/300
157/157 2s 12ms/step - accuracy: 0.9425 - loss: 0.1626 - val_accuracy: 0.7385 - val_loss: 1.2145
Epoch 114/300
157/157 2s 11ms/step - accuracy: 0.9564 - loss: 0.1249 - val_accuracy: 0.7349 - val_loss: 1.3545
Epoch 115/300
157/157 2s 12ms/step - accuracy: 0.9506 - loss: 0.1368 - val_accuracy: 0.7249 - val_loss: 1.2599
Epoch 116/300
157/157 2s 12ms/step - accuracy: 0.9574 - loss: 0.1201 - val_accuracy: 0.7313 - val_loss: 1.4213
Epoch 117/300
157/157 2s 12ms/step - accuracy: 0.9440 - loss: 0.1509 - val_accuracy: 0.7334 - val_loss: 1.3656
Epoch 118/300
157/157 2s 12ms/step - accuracy: 0.9471 - loss: 0.1496 - val_accuracy: 0.7283 - val_loss: 1.3449
Epoch 119/300
157/157 2s 12ms/step - accuracy: 0.9500 - loss: 0.1387 - val_accuracy: 0.7397 - val_loss: 1.3397
Epoch 120/300
157/157 2s 11ms/step - accuracy: 0.9543 - loss: 0.1269 - val_accuracy: 0.7402 - val_loss: 1.2942
Epoch 121/300
157/157 2s 11ms/step - accuracy: 0.9504 - loss: 0.1363 - val_accuracy: 0.7311 - val_loss: 1.3275
Epoch 122/300
157/157 2s 12ms/step - accuracy: 0.9493 - loss: 0.1401 - val_accuracy: 0.7349 - val_loss: 1.3226
Epoch 123/300
157/157 2s 11ms/step - accuracy: 0.9353 - loss: 0.1798 - val_accuracy: 0.7225 - val_loss: 1.3474
Epoch 124/300
157/157 2s 12ms/step - accuracy: 0.9493 - loss: 0.1410 - val_accuracy: 0.7378 - val_loss: 1.4395
Epoch 125/300
157/157 2s 12ms/step - accuracy: 0.9485 - loss: 0.1472 - val_accuracy: 0.7464 - val_loss: 1.4473
Epoch 126/300
157/157 2s 12ms/step - accuracy: 0.9481 - loss: 0.1447 - val_accuracy: 0.7327 - val_loss: 1.3290
Epoch 127/300
157/157 2s 12ms/step - accuracy: 0.9559 - loss: 0.1251 - val_accuracy: 0.7304 - val_loss: 1.2982
Epoch 128/300
157/157 2s 11ms/step - accuracy: 0.9568 - loss: 0.1236 - val_accuracy: 0.7240 - val_loss: 1.3484
Epoch 129/300
157/157 2s 12ms/step - accuracy: 0.9490 - loss: 0.1456 - val_accuracy: 0.7382 - val_loss: 1.4657
Epoch 130/300
157/157 2s 12ms/step - accuracy: 0.9524 - loss: 0.1328 - val_accuracy: 0.7315 - val_loss: 1.4164
Epoch 131/300
157/157 2s 12ms/step - accuracy: 0.9547 - loss: 0.1290 - val_accuracy: 0.7389 - val_loss: 1.3226
Epoch 132/300
157/157 2s 12ms/step - accuracy: 0.9517 - loss: 0.1362 - val_accuracy: 0.7391 - val_loss: 1.3216
Epoch 133/300
157/157 2s 11ms/step - accuracy: 0.9536 - loss: 0.1314 - val_accuracy: 0.7405 - val_loss: 1.3704
Epoch 134/300
157/157 2s 12ms/step - accuracy: 0.9551 - loss: 0.1248 - val_accuracy: 0.7245 - val_loss: 1.5435
Epoch 135/300
157/157 2s 11ms/step - accuracy: 0.9312 - loss: 0.1931 - val_accuracy: 0.7314 - val_loss: 1.3837
Epoch 136/300
157/157 2s 12ms/step - accuracy: 0.9566 - loss: 0.1250 - val_accuracy: 0.7329 - val_loss: 1.3924
Epoch 137/300
157/157 2s 12ms/step - accuracy: 0.9539 - loss: 0.1287 - val_accuracy: 0.7363 - val_loss: 1.3505
Epoch 138/300
157/157 2s 12ms/step - accuracy: 0.9606 - loss: 0.1140 - val_accuracy: 0.7290 - val_loss: 1.4321
Epoch 139/300
157/157 2s 12ms/step - accuracy: 0.9617 - loss: 0.1098 - val_accuracy: 0.7321 - val_loss: 1.3299
Epoch 140/300
157/157 2s 12ms/step - accuracy: 0.9556 - loss: 0.1256 - val_accuracy: 0.7209 - val_loss: 1.4752
Epoch 141/300
157/157 2s 12ms/step - accuracy: 0.9395 - loss: 0.1723 - val_accuracy: 0.7381 - val_loss: 1.3587
Epoch 142/300
157/157 2s 12ms/step - accuracy: 0.9490 - loss: 0.1410 - val_accuracy: 0.7260 - val_loss: 1.2866
Epoch 143/300
157/157 2s 12ms/step - accuracy: 0.9530 - loss: 0.1312 - val_accuracy: 0.7168 - val_loss: 1.4793
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Epoch 144/300  
157/157 2s 11ms/step - accuracy: 0.9478 - loss: 0.1477 - val_accuracy: 0.7202 - val_loss: 1.4796  
Epoch 145/300  
157/157 2s 12ms/step - accuracy: 0.9480 - loss: 0.1497 - val_accuracy: 0.7271 - val_loss: 1.2877  
Epoch 146/300  
157/157 2s 12ms/step - accuracy: 0.9634 - loss: 0.1058 - val_accuracy: 0.7364 - val_loss: 1.4301  
Epoch 147/300  
157/157 2s 12ms/step - accuracy: 0.9517 - loss: 0.1368 - val_accuracy: 0.7268 - val_loss: 1.3847  
Epoch 148/300  
157/157 2s 12ms/step - accuracy: 0.9565 - loss: 0.1245 - val_accuracy: 0.7283 - val_loss: 1.3602  
Epoch 149/300  
157/157 2s 12ms/step - accuracy: 0.9659 - loss: 0.0969 - val_accuracy: 0.7283 - val_loss: 1.5000  
Epoch 150/300  
157/157 2s 12ms/step - accuracy: 0.9542 - loss: 0.1272 - val_accuracy: 0.7397 - val_loss: 1.3573  
Epoch 151/300  
157/157 2s 12ms/step - accuracy: 0.9538 - loss: 0.1262 - val_accuracy: 0.7323 - val_loss: 1.2769  
Epoch 152/300  
157/157 2s 12ms/step - accuracy: 0.9545 - loss: 0.1254 - val_accuracy: 0.7321 - val_loss: 1.4649  
Epoch 153/300  
157/157 2s 11ms/step - accuracy: 0.9501 - loss: 0.1424 - val_accuracy: 0.7383 - val_loss: 1.2941  
Epoch 154/300  
157/157 2s 12ms/step - accuracy: 0.9531 - loss: 0.1339 - val_accuracy: 0.7251 - val_loss: 1.5289  
Epoch 155/300  
157/157 2s 12ms/step - accuracy: 0.9601 - loss: 0.1146 - val_accuracy: 0.7350 - val_loss: 1.5079  
Epoch 156/300  
157/157 2s 12ms/step - accuracy: 0.9539 - loss: 0.1301 - val_accuracy: 0.7298 - val_loss: 1.4666  
Epoch 157/300  
157/157 2s 12ms/step - accuracy: 0.9564 - loss: 0.1170 - val_accuracy: 0.7359 - val_loss: 1.4088  
Epoch 158/300  
157/157 2s 11ms/step - accuracy: 0.9409 - loss: 0.1639 - val_accuracy: 0.7374 - val_loss: 1.2691  
Epoch 159/300  
157/157 2s 12ms/step - accuracy: 0.9627 - loss: 0.1065 - val_accuracy: 0.7212 - val_loss: 1.3924  
Epoch 160/300  
157/157 2s 11ms/step - accuracy: 0.9549 - loss: 0.1244 - val_accuracy: 0.7141 - val_loss: 1.4939  
Epoch 161/300  
157/157 2s 12ms/step - accuracy: 0.9423 - loss: 0.1663 - val_accuracy: 0.7190 - val_loss: 1.5542  
Epoch 162/300  
157/157 2s 12ms/step - accuracy: 0.9536 - loss: 0.1343 - val_accuracy: 0.7286 - val_loss: 1.4074  
Epoch 163/300  
157/157 2s 12ms/step - accuracy: 0.9572 - loss: 0.1179 - val_accuracy: 0.7392 - val_loss: 1.3048  
Epoch 164/300  
157/157 2s 11ms/step - accuracy: 0.9649 - loss: 0.1015 - val_accuracy: 0.7153 - val_loss: 1.5957  
Epoch 165/300  
157/157 2s 11ms/step - accuracy: 0.9502 - loss: 0.1385 - val_accuracy: 0.7362 - val_loss: 1.3621  
Epoch 166/300  
157/157 2s 12ms/step - accuracy: 0.9595 - loss: 0.1146 - val_accuracy: 0.7363 - val_loss: 1.3658  
Epoch 167/300  
157/157 2s 12ms/step - accuracy: 0.9620 - loss: 0.1072 - val_accuracy: 0.7381 - val_loss: 1.3286  
Epoch 168/300  
157/157 2s 12ms/step - accuracy: 0.9526 - loss: 0.1322 - val_accuracy: 0.7292 - val_loss: 1.4272  
Epoch 169/300  
157/157 2s 12ms/step - accuracy: 0.9483 - loss: 0.1442 - val_accuracy: 0.7367 - val_loss: 1.2891  
Epoch 170/300  
157/157 2s 12ms/step - accuracy: 0.9576 - loss: 0.1219 - val_accuracy: 0.7356 - val_loss: 1.4767  
Epoch 171/300  
157/157 2s 11ms/step - accuracy: 0.9533 - loss: 0.1297 - val_accuracy: 0.7386 - val_loss: 1.3753  
Epoch 172/300  
157/157 2s 11ms/step - accuracy: 0.9678 - loss: 0.0895 - val_accuracy: 0.7334 - val_loss: 1.5318  
Epoch 173/300  
157/157 2s 11ms/step - accuracy: 0.9497 - loss: 0.1429 - val_accuracy: 0.7385 - val_loss: 1.2536  
Epoch 174/300  
157/157 2s 12ms/step - accuracy: 0.9632 - loss: 0.1037 - val_accuracy: 0.7273 - val_loss: 1.3824  
Epoch 175/300  
157/157 2s 12ms/step - accuracy: 0.9527 - loss: 0.1349 - val_accuracy: 0.7383 - val_loss: 1.3093  
Epoch 176/300  
157/157 2s 12ms/step - accuracy: 0.9554 - loss: 0.1269 - val_accuracy: 0.7408 - val_loss: 1.3915  
Epoch 177/300  
157/157 2s 11ms/step - accuracy: 0.9594 - loss: 0.1166 - val_accuracy: 0.7405 - val_loss: 1.3501  
Epoch 178/300  
157/157 2s 12ms/step - accuracy: 0.9682 - loss: 0.0913 - val_accuracy: 0.7369 - val_loss: 1.4371  
Epoch 179/300  
157/157 2s 11ms/step - accuracy: 0.9509 - loss: 0.1387 - val_accuracy: 0.7342 - val_loss: 1.4485  
Epoch 180/300  
157/157 2s 12ms/step - accuracy: 0.9622 - loss: 0.1055 - val_accuracy: 0.7379 - val_loss: 1.3762  
Epoch 181/300  
157/157 2s 12ms/step - accuracy: 0.9618 - loss: 0.1082 - val_accuracy: 0.7378 - val_loss: 1.3806  
Epoch 182/300  
157/157 2s 11ms/step - accuracy: 0.9595 - loss: 0.1146 - val_accuracy: 0.7373 - val_loss: 1.4619  
Epoch 183/300  
157/157 2s 12ms/step - accuracy: 0.9467 - loss: 0.1497 - val_accuracy: 0.7406 - val_loss: 1.3087  
Epoch 184/300  
157/157 2s 11ms/step - accuracy: 0.9653 - loss: 0.0970 - val_accuracy: 0.7231 - val_loss: 1.3447  
Epoch 185/300  
157/157 2s 11ms/step - accuracy: 0.9457 - loss: 0.1523 - val_accuracy: 0.7405 - val_loss: 1.3975  
Epoch 186/300
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157/157 2s 12ms/step - accuracy: 0.9612 - loss: 0.1080 - val_accuracy: 0.7421 - val_loss: 1.3872
Epoch 187/300
157/157 2s 12ms/step - accuracy: 0.9584 - loss: 0.1174 - val_accuracy: 0.7427 - val_loss: 1.3900
Epoch 188/300
157/157 2s 11ms/step - accuracy: 0.9606 - loss: 0.1110 - val_accuracy: 0.7402 - val_loss: 1.4175
Epoch 189/300
157/157 2s 11ms/step - accuracy: 0.9589 - loss: 0.1210 - val_accuracy: 0.7405 - val_loss: 1.3884
Epoch 190/300
157/157 2s 12ms/step - accuracy: 0.9568 - loss: 0.1247 - val_accuracy: 0.7403 - val_loss: 1.4444
Epoch 191/300
157/157 2s 12ms/step - accuracy: 0.9626 - loss: 0.1103 - val_accuracy: 0.7342 - val_loss: 1.3485
Epoch 192/300
157/157 2s 12ms/step - accuracy: 0.9554 - loss: 0.1253 - val_accuracy: 0.7297 - val_loss: 1.5040
Epoch 193/300
157/157 2s 12ms/step - accuracy: 0.9623 - loss: 0.1086 - val_accuracy: 0.7362 - val_loss: 1.3484
Epoch 194/300
157/157 2s 11ms/step - accuracy: 0.9656 - loss: 0.0997 - val_accuracy: 0.7454 - val_loss: 1.2777
Epoch 195/300
157/157 2s 11ms/step - accuracy: 0.9590 - loss: 0.1201 - val_accuracy: 0.7373 - val_loss: 1.5229
Epoch 196/300
157/157 2s 11ms/step - accuracy: 0.9585 - loss: 0.1192 - val_accuracy: 0.7210 - val_loss: 1.4649
Epoch 197/300
157/157 2s 11ms/step - accuracy: 0.9580 - loss: 0.1221 - val_accuracy: 0.7444 - val_loss: 1.4289
Epoch 198/300
157/157 2s 12ms/step - accuracy: 0.9681 - loss: 0.0876 - val_accuracy: 0.7449 - val_loss: 1.3767
Epoch 199/300
157/157 2s 12ms/step - accuracy: 0.9607 - loss: 0.1096 - val_accuracy: 0.7326 - val_loss: 1.3452
Epoch 200/300
157/157 2s 12ms/step - accuracy: 0.9562 - loss: 0.1227 - val_accuracy: 0.7169 - val_loss: 1.3293
Epoch 201/300
157/157 2s 12ms/step - accuracy: 0.9567 - loss: 0.1207 - val_accuracy: 0.7397 - val_loss: 1.3529
Epoch 202/300
157/157 2s 12ms/step - accuracy: 0.9556 - loss: 0.1256 - val_accuracy: 0.7369 - val_loss: 1.3104
Epoch 203/300
157/157 2s 12ms/step - accuracy: 0.9653 - loss: 0.0959 - val_accuracy: 0.7321 - val_loss: 1.5271
Epoch 204/300
157/157 2s 11ms/step - accuracy: 0.9513 - loss: 0.1334 - val_accuracy: 0.7383 - val_loss: 1.3324
Epoch 205/300
157/157 2s 12ms/step - accuracy: 0.9638 - loss: 0.1003 - val_accuracy: 0.7362 - val_loss: 1.4175
Epoch 206/300
157/157 2s 12ms/step - accuracy: 0.9560 - loss: 0.1226 - val_accuracy: 0.7245 - val_loss: 1.4432
Epoch 207/300
157/157 2s 11ms/step - accuracy: 0.9592 - loss: 0.1155 - val_accuracy: 0.7318 - val_loss: 1.2923
Epoch 208/300
157/157 2s 12ms/step - accuracy: 0.9616 - loss: 0.1083 - val_accuracy: 0.7350 - val_loss: 1.4119
Epoch 209/300
157/157 2s 12ms/step - accuracy: 0.9672 - loss: 0.0929 - val_accuracy: 0.7396 - val_loss: 1.4419
Epoch 210/300
157/157 2s 12ms/step - accuracy: 0.9611 - loss: 0.1101 - val_accuracy: 0.7365 - val_loss: 1.2295
Epoch 211/300
157/157 2s 12ms/step - accuracy: 0.9650 - loss: 0.1008 - val_accuracy: 0.7403 - val_loss: 1.3578
Epoch 212/300
157/157 2s 12ms/step - accuracy: 0.9572 - loss: 0.1235 - val_accuracy: 0.7364 - val_loss: 1.4190
Epoch 213/300
157/157 2s 12ms/step - accuracy: 0.9673 - loss: 0.0956 - val_accuracy: 0.7364 - val_loss: 1.4281
Epoch 214/300
157/157 2s 12ms/step - accuracy: 0.9592 - loss: 0.1101 - val_accuracy: 0.7392 - val_loss: 1.3931
Epoch 215/300
157/157 2s 12ms/step - accuracy: 0.9553 - loss: 0.1231 - val_accuracy: 0.7486 - val_loss: 1.5315
Epoch 216/300
157/157 2s 12ms/step - accuracy: 0.9654 - loss: 0.1021 - val_accuracy: 0.7450 - val_loss: 1.4363
Epoch 217/300
157/157 2s 11ms/step - accuracy: 0.9534 - loss: 0.1333 - val_accuracy: 0.7384 - val_loss: 1.4683
Epoch 218/300
157/157 2s 12ms/step - accuracy: 0.9561 - loss: 0.1221 - val_accuracy: 0.7443 - val_loss: 1.3920
Epoch 219/300
157/157 2s 11ms/step - accuracy: 0.9596 - loss: 0.1123 - val_accuracy: 0.7265 - val_loss: 1.4240
Epoch 220/300
157/157 2s 11ms/step - accuracy: 0.9656 - loss: 0.0967 - val_accuracy: 0.7406 - val_loss: 1.3874
Epoch 221/300
157/157 2s 12ms/step - accuracy: 0.9538 - loss: 0.1260 - val_accuracy: 0.7255 - val_loss: 1.5076
Epoch 222/300
157/157 2s 12ms/step - accuracy: 0.9539 - loss: 0.1363 - val_accuracy: 0.7415 - val_loss: 1.2942
Epoch 223/300
157/157 2s 12ms/step - accuracy: 0.9665 - loss: 0.0975 - val_accuracy: 0.7396 - val_loss: 1.4361
Epoch 224/300
157/157 2s 12ms/step - accuracy: 0.9617 - loss: 0.1102 - val_accuracy: 0.7438 - val_loss: 1.3182
Epoch 225/300
157/157 2s 12ms/step - accuracy: 0.9616 - loss: 0.1071 - val_accuracy: 0.7371 - val_loss: 1.3388
Epoch 226/300
157/157 2s 11ms/step - accuracy: 0.9587 - loss: 0.1195 - val_accuracy: 0.7416 - val_loss: 1.3150
Epoch 227/300
157/157 2s 11ms/step - accuracy: 0.9640 - loss: 0.1020 - val_accuracy: 0.7423 - val_loss: 1.2860
Epoch 228/300
157/157 2s 12ms/step - accuracy: 0.9614 - loss: 0.1067 - val_accuracy: 0.7413 - val_loss: 1.5187
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12/25, 10:44 PM      Epoch 229/300      2s 12ms/step - accuracy: 0.9597 - loss: 0.1168 - val_accuracy: 0.7377 - val_loss: 1.4087
157/157      2s 12ms/step - accuracy: 0.9663 - loss: 0.0965 - val_accuracy: 0.7389 - val_loss: 1.4751
Epoch 230/300      2s 12ms/step - accuracy: 0.9654 - loss: 0.0988 - val_accuracy: 0.7289 - val_loss: 1.4413
157/157      2s 12ms/step - accuracy: 0.9597 - loss: 0.1136 - val_accuracy: 0.7302 - val_loss: 1.4829
Epoch 231/300      2s 12ms/step - accuracy: 0.9595 - loss: 0.1175 - val_accuracy: 0.7338 - val_loss: 1.3728
157/157      2s 12ms/step - accuracy: 0.9588 - loss: 0.1193 - val_accuracy: 0.7321 - val_loss: 1.5271
Epoch 232/300      2s 12ms/step - accuracy: 0.9520 - loss: 0.1352 - val_accuracy: 0.7383 - val_loss: 1.4593
157/157      2s 12ms/step - accuracy: 0.9684 - loss: 0.0890 - val_accuracy: 0.7405 - val_loss: 1.4439
Epoch 233/300      2s 12ms/step - accuracy: 0.9491 - loss: 0.1423 - val_accuracy: 0.7233 - val_loss: 1.5496
157/157      2s 11ms/step - accuracy: 0.9544 - loss: 0.1256 - val_accuracy: 0.7329 - val_loss: 1.4197
Epoch 234/300      2s 12ms/step - accuracy: 0.9488 - loss: 0.1434 - val_accuracy: 0.7382 - val_loss: 1.3073
157/157      2s 12ms/step - accuracy: 0.9576 - loss: 0.1238 - val_accuracy: 0.7396 - val_loss: 1.3926
Epoch 235/300      2s 12ms/step - accuracy: 0.9592 - loss: 0.1118 - val_accuracy: 0.7306 - val_loss: 1.5242
157/157      2s 12ms/step - accuracy: 0.9618 - loss: 0.1070 - val_accuracy: 0.7407 - val_loss: 1.3672
Epoch 236/300      2s 12ms/step - accuracy: 0.9608 - loss: 0.1105 - val_accuracy: 0.7244 - val_loss: 1.3694
157/157      2s 11ms/step - accuracy: 0.9634 - loss: 0.1081 - val_accuracy: 0.7390 - val_loss: 1.3820
Epoch 237/300      2s 12ms/step - accuracy: 0.9640 - loss: 0.1026 - val_accuracy: 0.7346 - val_loss: 1.4065
157/157      2s 12ms/step - accuracy: 0.9611 - loss: 0.1143 - val_accuracy: 0.7440 - val_loss: 1.5022
Epoch 238/300      2s 12ms/step - accuracy: 0.9679 - loss: 0.0904 - val_accuracy: 0.7301 - val_loss: 1.4192
157/157      2s 12ms/step - accuracy: 0.9461 - loss: 0.1555 - val_accuracy: 0.7451 - val_loss: 1.4030
Epoch 239/300      2s 12ms/step - accuracy: 0.9641 - loss: 0.1053 - val_accuracy: 0.7187 - val_loss: 1.4110
157/157      2s 12ms/step - accuracy: 0.9491 - loss: 0.1421 - val_accuracy: 0.7456 - val_loss: 1.4164
Epoch 240/300      2s 12ms/step - accuracy: 0.9700 - loss: 0.0890 - val_accuracy: 0.7429 - val_loss: 1.2620
157/157      2s 11ms/step - accuracy: 0.9572 - loss: 0.1213 - val_accuracy: 0.7395 - val_loss: 1.3247
Epoch 241/300      2s 12ms/step - accuracy: 0.9617 - loss: 0.1089 - val_accuracy: 0.7285 - val_loss: 1.5815
157/157      2s 12ms/step - accuracy: 0.9633 - loss: 0.1040 - val_accuracy: 0.7354 - val_loss: 1.4260
Epoch 242/300      2s 12ms/step - accuracy: 0.9650 - loss: 0.0969 - val_accuracy: 0.7257 - val_loss: 1.4904
157/157      2s 12ms/step - accuracy: 0.9534 - loss: 0.1314 - val_accuracy: 0.7184 - val_loss: 1.4257
Epoch 243/300      2s 11ms/step - accuracy: 0.9644 - loss: 0.1028 - val_accuracy: 0.7340 - val_loss: 1.4336
157/157      2s 12ms/step - accuracy: 0.9580 - loss: 0.1164 - val_accuracy: 0.7420 - val_loss: 1.3246
Epoch 244/300      2s 12ms/step - accuracy: 0.9697 - loss: 0.0906 - val_accuracy: 0.7448 - val_loss: 1.3256
157/157      2s 12ms/step - accuracy: 0.9597 - loss: 0.1147 - val_accuracy: 0.7347 - val_loss: 1.3996
Epoch 245/300      2s 12ms/step - accuracy: 0.9635 - loss: 0.1022 - val_accuracy: 0.7372 - val_loss: 1.3721
157/157      2s 11ms/step - accuracy: 0.9673 - loss: 0.0958 - val_accuracy: 0.7287 - val_loss: 1.5308
Epoch 246/300      2s 11ms/step - accuracy: 0.9549 - loss: 0.1252 - val_accuracy: 0.7358 - val_loss: 1.5319
157/157      2s 12ms/step - accuracy: 0.9604 - loss: 0.1133 - val_accuracy: 0.7408 - val_loss: 1.4539
Epoch 247/300      2s 12ms/step - accuracy: 0.9621 - loss: 0.1051 - val_accuracy: 0.7439 - val_loss: 1.3648
157/157      2s 12ms/step - accuracy: 0.9678 - loss: 0.0911 - val_accuracy: 0.7398 - val_loss: 1.3779
Epoch 248/300      2s 11ms/step - accuracy: 0.9581 - loss: 0.1225 - val_accuracy: 0.7327 - val_loss: 1.3480
157/157      2s 11ms/step - accuracy: 0.9645 - loss: 0.1007 - val_accuracy: 0.7397 - val_loss: 1.5729

```

2.b Regularization Experiments

```
# Weight Decay ( $\lambda=0.001$ ) - NO Batch Norm
wd_model = build_resnet10(weight_decay=0.001, include_batchnorm=False)
history_wd, time_wd, loss_wd, acc_wd = train_and_evaluate(wd_model, "Weight Decay ( $\lambda=0.001$ ) (NO BN)")

157/157 2s 12ms/step - accuracy: 0.9605 - loss: 0.1107 - val_accuracy: 0.7391 - val_loss: 1.4161
Epoch 275/300
157/157 2s 11ms/step - accuracy: 0.9547 - loss: 0.1287 - val_accuracy: 0.7461 - val_loss: 1.3191
Epoch 276/300
157/157 2s 11ms/step - accuracy: 0.9626 - loss: 0.1032 - val_accuracy: 0.7369 - val_loss: 1.3603
Epoch 277/300
157/157 2s 12ms/step - accuracy: 0.9546 - loss: 0.1241 - val_accuracy: 0.7491 - val_loss: 1.3815
Epoch 278/300
157/157 2s 11ms/step - accuracy: 0.9537 - loss: 0.1268 - val_accuracy: 0.7321 - val_loss: 1.5169
Epoch 279/300
157/157 2s 12ms/step - accuracy: 0.9605 - loss: 0.1116 - val_accuracy: 0.7441 - val_loss: 1.4164
Epoch 280/300
157/157 2s 12ms/step - accuracy: 0.9626 - loss: 0.1090 - val_accuracy: 0.7273 - val_loss: 1.4945
Epoch 281/300
157/157 2s 12ms/step - accuracy: 0.9641 - loss: 0.1014 - val_accuracy: 0.7208 - val_loss: 1.3874
Epoch 282/300
157/157 2s 12ms/step - accuracy: 0.9564 - loss: 0.1209 - val_accuracy: 0.7405 - val_loss: 1.4636
Epoch 283/300
157/157 2s 11ms/step - accuracy: 0.9628 - loss: 0.1022 - val_accuracy: 0.7390 - val_loss: 1.4897
Epoch 284/300
157/157 2s 11ms/step - accuracy: 0.9417 - loss: 0.1678 - val_accuracy: 0.7373 - val_loss: 1.5136
Epoch 285/300
157/157 2s 12ms/step - accuracy: 0.9620 - loss: 0.1055 - val_accuracy: 0.7387 - val_loss: 1.4355
Epoch 286/300
157/157 2s 12ms/step - accuracy: 0.9615 - loss: 0.1111 - val_accuracy: 0.7276 - val_loss: 1.3961
Epoch 287/300
157/157 2s 12ms/step - accuracy: 0.9633 - loss: 0.1043 - val_accuracy: 0.7418 - val_loss: 1.4909
Epoch 288/300
157/157 2s 12ms/step - accuracy: 0.9662 - loss: 0.0964 - val_accuracy: 0.7199 - val_loss: 1.5464
Epoch 289/300
157/157 2s 12ms/step - accuracy: 0.9539 - loss: 0.1327 - val_accuracy: 0.7428 - val_loss: 1.4522
Epoch 290/300
157/157 2s 12ms/step - accuracy: 0.9637 - loss: 0.1012 - val_accuracy: 0.7383 - val_loss: 1.2772
Epoch 291/300
157/157 2s 12ms/step - accuracy: 0.9654 - loss: 0.0982 - val_accuracy: 0.7454 - val_loss: 1.4629
Epoch 292/300
157/157 2s 12ms/step - accuracy: 0.9600 - loss: 0.1147 - val_accuracy: 0.7311 - val_loss: 1.3000
Epoch 293/300
157/157 2s 12ms/step - accuracy: 0.9574 - loss: 0.1209 - val_accuracy: 0.7404 - val_loss: 1.3602
Epoch 294/300
157/157 2s 11ms/step - accuracy: 0.9670 - loss: 0.0961 - val_accuracy: 0.7370 - val_loss: 1.4688
Epoch 295/300
157/157 2s 12ms/step - accuracy: 0.9522 - loss: 0.1364 - val_accuracy: 0.7406 - val_loss: 1.3695
Epoch 296/300
157/157 2s 12ms/step - accuracy: 0.9548 - loss: 0.1265 - val_accuracy: 0.7446 - val_loss: 1.3540
Epoch 297/300
157/157 2s 11ms/step - accuracy: 0.9648 - loss: 0.1000 - val_accuracy: 0.7365 - val_loss: 1.5532
Epoch 298/300
157/157 2s 11ms/step - accuracy: 0.9529 - loss: 0.1356 - val_accuracy: 0.7317 - val_loss: 1.6004
Epoch 299/300
157/157 2s 12ms/step - accuracy: 0.9559 - loss: 0.1218 - val_accuracy: 0.7396 - val_loss: 1.4786
Epoch 300/300
157/157 2s 12ms/step - accuracy: 0.9631 - loss: 0.1049 - val_accuracy: 0.7438 - val_loss: 1.3200
Baseline (NO Regularization/NO BN) - Training Time: 573.38s, Test Accuracy: 0.7440, Final Train Loss: 0.1191
```


Model: "functional_2"

| Layer (type) | Output Shape | Param # | Connected to |
|-------------------------------|--------------------|---------|----------------------------------|
| input_layer_2 (InputLayer) | (None, 32, 32, 3) | 0 | - |
| conv2d_42 (Conv2D) | (None, 32, 32, 32) | 896 | input_layer_2[0]... |
| conv2d_43 (Conv2D) | (None, 32, 32, 32) | 9,248 | conv2d_42[0][0] |
| conv2d_44 (Conv2D) | (None, 32, 32, 32) | 9,248 | conv2d_43[0][0] |
| add_20 (Add) | (None, 32, 32, 32) | 0 | conv2d_42[0][0], conv2d_44[0][0] |
| re_lu_20 (ReLU) | (None, 32, 32, 32) | 0 | add_20[0][0] |
| conv2d_45 (Conv2D) | (None, 32, 32, 32) | 9,248 | re_lu_20[0][0] |
| conv2d_46 (Conv2D) | (None, 32, 32, 32) | 9,248 | conv2d_45[0][0] |
| add_21 (Add) | (None, 32, 32, 32) | 0 | re_lu_20[0][0], conv2d_46[0][0] |
| re_lu_21 (ReLU) | (None, 32, 32, 32) | 0 | add_21[0][0] |
| conv2d_47 (Conv2D) | (None, 32, 32, 32) | 9,248 | re_lu_21[0][0] |
| conv2d_48 (Conv2D) | (None, 32, 32, 32) | 9,248 | conv2d_47[0][0] |
| add_22 (Add) | (None, 32, 32, 32) | 0 | re_lu_21[0][0], conv2d_48[0][0] |
| re_lu_22 (ReLU) | (None, 32, 32, 32) | 0 | add_22[0][0] |
| conv2d_49 (Conv2D) | (None, 32, 32, 32) | 9,248 | re_lu_22[0][0] |
| conv2d_50 (Conv2D) | (None, 32, 32, 32) | 9,248 | conv2d_49[0][0] |
| add_23 (Add) | (None, 32, 32, 32) | 0 | re_lu_22[0][0], conv2d_50[0][0] |
| re_lu_23 (ReLU) | (None, 32, 32, 32) | 0 | add_23[0][0] |
| conv2d_51 (Conv2D) | (None, 32, 32, 32) | 9,248 | re_lu_23[0][0] |
| conv2d_52 (Conv2D) | (None, 32, 32, 32) | 9,248 | conv2d_51[0][0] |
| add_24 (Add) | (None, 32, 32, 32) | 0 | re_lu_23[0][0], conv2d_52[0][0] |
| re_lu_24 (ReLU) | (None, 32, 32, 32) | 0 | add_24[0][0] |
| conv2d_53 (Conv2D) | (None, 32, 32, 32) | 9,248 | re_lu_24[0][0] |
| conv2d_54 (Conv2D) | (None, 32, 32, 32) | 9,248 | conv2d_53[0][0] |
| add_25 (Add) | (None, 32, 32, 32) | 0 | re_lu_24[0][0], conv2d_54[0][0] |
| re_lu_25 (ReLU) | (None, 32, 32, 32) | 0 | add_25[0][0] |
| conv2d_55 (Conv2D) | (None, 32, 32, 32) | 9,248 | re_lu_25[0][0] |
| conv2d_56 (Conv2D) | (None, 32, 32, 32) | 9,248 | conv2d_55[0][0] |

| | 32) | | |
|--|--------------------|-------|---------------------------------|
| add_26 (Add) | (None, 32, 32, 32) | 0 | re_lu_25[0][0], conv2d_56[0][0] |
| re_lu_26 (ReLU) | (None, 32, 32, 32) | 0 | add_26[0][0] |
| conv2d_57 (Conv2D) | (None, 32, 32, 32) | 9,248 | re_lu_26[0][0] |
| conv2d_58 (Conv2D) | (None, 32, 32, 32) | 9,248 | conv2d_57[0][0] |
| add_27 (Add) | (None, 32, 32, 32) | 0 | re_lu_26[0][0], conv2d_58[0][0] |
| re_lu_27 (ReLU) | (None, 32, 32, 32) | 0 | add_27[0][0] |
| conv2d_59 (Conv2D) | (None, 32, 32, 32) | 9,248 | re_lu_27[0][0] |
| conv2d_60 (Conv2D) | (None, 32, 32, 32) | 9,248 | conv2d_59[0][0] |
| add_28 (Add) | (None, 32, 32, 32) | 0 | re_lu_27[0][0], conv2d_60[0][0] |
| re_lu_28 (ReLU) | (None, 32, 32, 32) | 0 | add_28[0][0] |
| conv2d_61 (Conv2D) | (None, 32, 32, 32) | 9,248 | re_lu_28[0][0] |
| conv2d_62 (Conv2D) | (None, 32, 32, 32) | 9,248 | conv2d_61[0][0] |
| add_29 (Add) | (None, 32, 32, 32) | 0 | re_lu_28[0][0], conv2d_62[0][0] |
| re_lu_29 (ReLU) | (None, 32, 32, 32) | 0 | add_29[0][0] |
| global_average_poo... (GlobalAveragePool...) | (None, 32) | 0 | re_lu_29[0][0] |
| dense_2 (Dense) | (None, 10) | 330 | global_average_p... |

Total params: 186,186 (727.29 KB)

Trainable params: 186,186 (727.29 KB)

Non-trainable params: 0 (0.00 B)

===== Training: Weight Decay ($\lambda=0.001$) (NO BN) =====

Epoch 1/300

157/157 22s 63ms/step - accuracy: 0.1687 - loss: 2.5551 - val_accuracy: 0.2699 - val_loss: 2.0723

Epoch 2/300

157/157 2s 12ms/step - accuracy: 0.2936 - loss: 2.0053 - val_accuracy: 0.3585 - val_loss: 1.8420

Epoch 3/300

157/157 2s 11ms/step - accuracy: 0.3466 - loss: 1.8471 - val_accuracy: 0.3875 - val_loss: 1.8193

Epoch 4/300

157/157 2s 11ms/step - accuracy: 0.3891 - loss: 1.7623 - val_accuracy: 0.4052 - val_loss: 1.7396

Epoch 5/300

157/157 2s 12ms/step - accuracy: 0.4145 - loss: 1.7105 - val_accuracy: 0.4387 - val_loss: 1.6868

Epoch 6/300

157/157 2s 11ms/step - accuracy: 0.4492 - loss: 1.6202 - val_accuracy: 0.4665 - val_loss: 1.5974

Epoch 7/300

157/157 2s 11ms/step - accuracy: 0.4676 - loss: 1.5802 - val_accuracy: 0.4702 - val_loss: 1.5512

Epoch 8/300

157/157 2s 11ms/step - accuracy: 0.4865 - loss: 1.5241 - val_accuracy: 0.5082 - val_loss: 1.4729

Epoch 9/300

157/157 2s 11ms/step - accuracy: 0.5171 - loss: 1.4499 - val_accuracy: 0.4819 - val_loss: 1.5859

Epoch 10/300

157/157 2s 11ms/step - accuracy: 0.5203 - loss: 1.4536 - val_accuracy: 0.4344 - val_loss: 1.6797

Epoch 11/300

157/157 2s 11ms/step - accuracy: 0.5390 - loss: 1.4120 - val_accuracy: 0.5432 - val_loss: 1.4034

Epoch 12/300

157/157 2s 11ms/step - accuracy: 0.5529 - loss: 1.3715 - val_accuracy: 0.5337 - val_loss: 1.4508

Epoch 13/300

157/157 2s 11ms/step - accuracy: 0.5557 - loss: 1.3583 - val_accuracy: 0.5689 - val_loss: 1.3523

Epoch 14/300

157/157 2s 11ms/step - accuracy: 0.5724 - loss: 1.3291 - val_accuracy: 0.5804 - val_loss: 1.3133

Epoch 15/300

157/157 2s 11ms/step - accuracy: 0.5862 - loss: 1.2899 - val_accuracy: 0.6015 - val_loss: 1.2672

Epoch 16/300

157/157 2s 12ms/step - accuracy: 0.5991 - loss: 1.2528 - val_accuracy: 0.5976 - val_loss: 1.2746

```
Epoch 17/300
157/157 2s 11ms/step - accuracy: 0.6088 - loss: 1.2349 - val_accuracy: 0.6113 - val_loss: 1.2228
Epoch 18/300
157/157 2s 12ms/step - accuracy: 0.6155 - loss: 1.2229 - val_accuracy: 0.6148 - val_loss: 1.2298
Epoch 19/300
157/157 2s 12ms/step - accuracy: 0.6298 - loss: 1.1856 - val_accuracy: 0.6137 - val_loss: 1.2374
Epoch 20/300
157/157 2s 11ms/step - accuracy: 0.6338 - loss: 1.1688 - val_accuracy: 0.6315 - val_loss: 1.1714
Epoch 21/300
157/157 2s 11ms/step - accuracy: 0.6401 - loss: 1.1659 - val_accuracy: 0.6245 - val_loss: 1.2016
Epoch 22/300
157/157 2s 11ms/step - accuracy: 0.6519 - loss: 1.1322 - val_accuracy: 0.6541 - val_loss: 1.1107
Epoch 23/300
157/157 2s 11ms/step - accuracy: 0.6393 - loss: 1.1536 - val_accuracy: 0.6044 - val_loss: 1.2442
Epoch 24/300
157/157 2s 12ms/step - accuracy: 0.6387 - loss: 1.1666 - val_accuracy: 0.6424 - val_loss: 1.1670
Epoch 25/300
157/157 2s 11ms/step - accuracy: 0.6614 - loss: 1.1154 - val_accuracy: 0.6537 - val_loss: 1.1334
Epoch 26/300
157/157 2s 11ms/step - accuracy: 0.6639 - loss: 1.1041 - val_accuracy: 0.6407 - val_loss: 1.1901
Epoch 27/300
157/157 2s 11ms/step - accuracy: 0.6704 - loss: 1.0878 - val_accuracy: 0.5978 - val_loss: 1.3980
Epoch 28/300
157/157 2s 11ms/step - accuracy: 0.6655 - loss: 1.1128 - val_accuracy: 0.6712 - val_loss: 1.0745
Epoch 29/300
157/157 2s 11ms/step - accuracy: 0.6722 - loss: 1.0760 - val_accuracy: 0.6275 - val_loss: 1.2061
Epoch 30/300
157/157 2s 12ms/step - accuracy: 0.6754 - loss: 1.0662 - val_accuracy: 0.6185 - val_loss: 1.3115
Epoch 31/300
157/157 2s 12ms/step - accuracy: 0.6844 - loss: 1.0589 - val_accuracy: 0.6633 - val_loss: 1.1194
Epoch 32/300
157/157 2s 12ms/step - accuracy: 0.6939 - loss: 1.0281 - val_accuracy: 0.6540 - val_loss: 1.1479
Epoch 33/300
157/157 2s 12ms/step - accuracy: 0.6980 - loss: 1.0202 - val_accuracy: 0.6275 - val_loss: 1.2445
Epoch 34/300
157/157 2s 11ms/step - accuracy: 0.6932 - loss: 1.0368 - val_accuracy: 0.6691 - val_loss: 1.0910
Epoch 35/300
157/157 2s 11ms/step - accuracy: 0.6925 - loss: 1.0289 - val_accuracy: 0.6194 - val_loss: 1.2501
Epoch 36/300
157/157 2s 12ms/step - accuracy: 0.6938 - loss: 1.0298 - val_accuracy: 0.6523 - val_loss: 1.1559
Epoch 37/300
157/157 2s 11ms/step - accuracy: 0.7022 - loss: 1.0090 - val_accuracy: 0.6599 - val_loss: 1.1281
Epoch 38/300
157/157 2s 11ms/step - accuracy: 0.7018 - loss: 1.0099 - val_accuracy: 0.7043 - val_loss: 1.0124
Epoch 39/300
157/157 2s 11ms/step - accuracy: 0.7183 - loss: 0.9698 - val_accuracy: 0.6839 - val_loss: 1.0695
Epoch 40/300
157/157 2s 11ms/step - accuracy: 0.7125 - loss: 0.9892 - val_accuracy: 0.6621 - val_loss: 1.1336
Epoch 41/300
157/157 2s 11ms/step - accuracy: 0.7133 - loss: 0.9748 - val_accuracy: 0.7040 - val_loss: 1.0201
Epoch 42/300
157/157 2s 11ms/step - accuracy: 0.7275 - loss: 0.9479 - val_accuracy: 0.6247 - val_loss: 1.2489
Epoch 43/300
157/157 2s 12ms/step - accuracy: 0.7150 - loss: 0.9856 - val_accuracy: 0.6763 - val_loss: 1.1347
Epoch 44/300
157/157 2s 11ms/step - accuracy: 0.7233 - loss: 0.9645 - val_accuracy: 0.6929 - val_loss: 1.0523
Epoch 45/300
157/157 2s 11ms/step - accuracy: 0.7253 - loss: 0.9522 - val_accuracy: 0.6477 - val_loss: 1.1614
Epoch 46/300
157/157 2s 11ms/step - accuracy: 0.7215 - loss: 0.9651 - val_accuracy: 0.6568 - val_loss: 1.1890
Epoch 47/300
157/157 2s 11ms/step - accuracy: 0.7261 - loss: 0.9613 - val_accuracy: 0.7243 - val_loss: 0.9744
Epoch 48/300
157/157 2s 11ms/step - accuracy: 0.7350 - loss: 0.9317 - val_accuracy: 0.7096 - val_loss: 1.0013
Epoch 49/300
157/157 2s 12ms/step - accuracy: 0.7301 - loss: 0.9426 - val_accuracy: 0.6927 - val_loss: 1.0537
Epoch 50/300
157/157 2s 11ms/step - accuracy: 0.7349 - loss: 0.9376 - val_accuracy: 0.6884 - val_loss: 1.0750
Epoch 51/300
157/157 2s 12ms/step - accuracy: 0.7376 - loss: 0.9263 - val_accuracy: 0.6511 - val_loss: 1.2095
Epoch 52/300
157/157 2s 12ms/step - accuracy: 0.7288 - loss: 0.9491 - val_accuracy: 0.6940 - val_loss: 1.0759
Epoch 53/300
157/157 2s 11ms/step - accuracy: 0.7439 - loss: 0.9155 - val_accuracy: 0.6983 - val_loss: 1.0273
Epoch 54/300
157/157 2s 11ms/step - accuracy: 0.7343 - loss: 0.9327 - val_accuracy: 0.7199 - val_loss: 0.9961
Epoch 55/300
157/157 2s 12ms/step - accuracy: 0.7498 - loss: 0.9057 - val_accuracy: 0.6611 - val_loss: 1.1832
Epoch 56/300
157/157 2s 11ms/step - accuracy: 0.7456 - loss: 0.9129 - val_accuracy: 0.7096 - val_loss: 1.0151
Epoch 57/300
157/157 2s 11ms/step - accuracy: 0.7525 - loss: 0.8932 - val_accuracy: 0.7187 - val_loss: 0.9809
Epoch 58/300
157/157 2s 11ms/step - accuracy: 0.7506 - loss: 0.8971 - val_accuracy: 0.6843 - val_loss: 1.1145
Epoch 59/300
```

```
157/157 2s 11ms/step - accuracy: 0.7530 - loss: 0.8941 - val_accuracy: 0.7054 - val_loss: 1.0193
Epoch 60/300
157/157 2s 11ms/step - accuracy: 0.7569 - loss: 0.8825 - val_accuracy: 0.6713 - val_loss: 1.1555
Epoch 61/300
157/157 2s 11ms/step - accuracy: 0.7592 - loss: 0.8857 - val_accuracy: 0.7296 - val_loss: 0.9627
Epoch 62/300
157/157 2s 11ms/step - accuracy: 0.7560 - loss: 0.8848 - val_accuracy: 0.7124 - val_loss: 1.0243
Epoch 63/300
157/157 2s 11ms/step - accuracy: 0.7665 - loss: 0.8658 - val_accuracy: 0.7057 - val_loss: 1.0263
Epoch 64/300
157/157 2s 11ms/step - accuracy: 0.7624 - loss: 0.8624 - val_accuracy: 0.7275 - val_loss: 0.9687
Epoch 65/300
157/157 2s 11ms/step - accuracy: 0.7611 - loss: 0.8731 - val_accuracy: 0.7233 - val_loss: 0.9706
Epoch 66/300
157/157 2s 11ms/step - accuracy: 0.7683 - loss: 0.8540 - val_accuracy: 0.7313 - val_loss: 0.9769
Epoch 67/300
157/157 2s 11ms/step - accuracy: 0.7601 - loss: 0.8726 - val_accuracy: 0.7102 - val_loss: 1.0406
Epoch 68/300
157/157 2s 12ms/step - accuracy: 0.7675 - loss: 0.8558 - val_accuracy: 0.7397 - val_loss: 0.9403
Epoch 69/300
157/157 2s 11ms/step - accuracy: 0.7717 - loss: 0.8471 - val_accuracy: 0.7142 - val_loss: 1.0116
Epoch 70/300
157/157 2s 11ms/step - accuracy: 0.7679 - loss: 0.8613 - val_accuracy: 0.6848 - val_loss: 1.1221
Epoch 71/300
157/157 2s 11ms/step - accuracy: 0.7707 - loss: 0.8565 - val_accuracy: 0.7354 - val_loss: 0.9590
Epoch 72/300
157/157 2s 11ms/step - accuracy: 0.7795 - loss: 0.8333 - val_accuracy: 0.7086 - val_loss: 1.0479
Epoch 73/300
157/157 2s 11ms/step - accuracy: 0.7801 - loss: 0.8274 - val_accuracy: 0.7312 - val_loss: 0.9772
Epoch 74/300
157/157 2s 11ms/step - accuracy: 0.7748 - loss: 0.8366 - val_accuracy: 0.7135 - val_loss: 1.0172
Epoch 75/300
157/157 2s 11ms/step - accuracy: 0.7797 - loss: 0.8392 - val_accuracy: 0.7392 - val_loss: 0.9492
Epoch 76/300
157/157 2s 11ms/step - accuracy: 0.7801 - loss: 0.8365 - val_accuracy: 0.7445 - val_loss: 0.9323
Epoch 77/300
157/157 2s 11ms/step - accuracy: 0.7853 - loss: 0.8139 - val_accuracy: 0.7271 - val_loss: 0.9885
Epoch 78/300
157/157 2s 11ms/step - accuracy: 0.7884 - loss: 0.8157 - val_accuracy: 0.7372 - val_loss: 0.9544
Epoch 79/300
157/157 2s 11ms/step - accuracy: 0.7855 - loss: 0.8187 - val_accuracy: 0.7065 - val_loss: 1.0464
Epoch 80/300
157/157 2s 11ms/step - accuracy: 0.7796 - loss: 0.8370 - val_accuracy: 0.7311 - val_loss: 0.9754
Epoch 81/300
157/157 2s 11ms/step - accuracy: 0.7850 - loss: 0.8188 - val_accuracy: 0.7372 - val_loss: 0.9878
Epoch 82/300
157/157 2s 11ms/step - accuracy: 0.7924 - loss: 0.7934 - val_accuracy: 0.7350 - val_loss: 0.9598
Epoch 83/300
157/157 2s 11ms/step - accuracy: 0.7875 - loss: 0.8081 - val_accuracy: 0.6572 - val_loss: 1.2729
Epoch 84/300
157/157 2s 11ms/step - accuracy: 0.7752 - loss: 0.8493 - val_accuracy: 0.6952 - val_loss: 1.1368
Epoch 85/300
157/157 2s 12ms/step - accuracy: 0.7929 - loss: 0.8165 - val_accuracy: 0.7310 - val_loss: 0.9851
Epoch 86/300
157/157 2s 11ms/step - accuracy: 0.7956 - loss: 0.7931 - val_accuracy: 0.7323 - val_loss: 0.9750
Epoch 87/300
157/157 2s 12ms/step - accuracy: 0.7934 - loss: 0.8007 - val_accuracy: 0.7435 - val_loss: 0.9651
Epoch 88/300
157/157 2s 11ms/step - accuracy: 0.7931 - loss: 0.8131 - val_accuracy: 0.7442 - val_loss: 0.9373
Epoch 89/300
157/157 2s 11ms/step - accuracy: 0.7988 - loss: 0.7870 - val_accuracy: 0.7104 - val_loss: 1.1521
Epoch 90/300
157/157 2s 12ms/step - accuracy: 0.7908 - loss: 0.8103 - val_accuracy: 0.7109 - val_loss: 1.1312
Epoch 91/300
157/157 2s 11ms/step - accuracy: 0.7938 - loss: 0.8076 - val_accuracy: 0.7000 - val_loss: 1.1013
Epoch 92/300
157/157 2s 11ms/step - accuracy: 0.7991 - loss: 0.7934 - val_accuracy: 0.7406 - val_loss: 0.9781
Epoch 93/300
157/157 2s 12ms/step - accuracy: 0.8135 - loss: 0.7586 - val_accuracy: 0.7403 - val_loss: 0.9542
Epoch 94/300
157/157 2s 11ms/step - accuracy: 0.8013 - loss: 0.7789 - val_accuracy: 0.7344 - val_loss: 0.9905
Epoch 95/300
157/157 2s 11ms/step - accuracy: 0.8063 - loss: 0.7774 - val_accuracy: 0.7442 - val_loss: 0.9756
Epoch 96/300
157/157 2s 12ms/step - accuracy: 0.8015 - loss: 0.7846 - val_accuracy: 0.7483 - val_loss: 0.9507
Epoch 97/300
157/157 2s 11ms/step - accuracy: 0.8094 - loss: 0.7700 - val_accuracy: 0.7586 - val_loss: 0.9647
Epoch 98/300
157/157 2s 11ms/step - accuracy: 0.8138 - loss: 0.7609 - val_accuracy: 0.7480 - val_loss: 0.9560
Epoch 99/300
157/157 2s 11ms/step - accuracy: 0.8070 - loss: 0.7742 - val_accuracy: 0.7612 - val_loss: 0.9412
Epoch 100/300
157/157 2s 11ms/step - accuracy: 0.8015 - loss: 0.7940 - val_accuracy: 0.7466 - val_loss: 0.9710
Epoch 101/300
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157/157 2s 11ms/step - accuracy: 0.8148 - loss: 0.7532 - val_accuracy: 0.7413 - val_loss: 0.9873
Epoch 102/300
157/157 2s 11ms/step - accuracy: 0.8169 - loss: 0.7505 - val_accuracy: 0.7437 - val_loss: 1.0210
Epoch 103/300
157/157 2s 11ms/step - accuracy: 0.8014 - loss: 0.7939 - val_accuracy: 0.7588 - val_loss: 0.9522
Epoch 104/300
157/157 2s 11ms/step - accuracy: 0.8163 - loss: 0.7487 - val_accuracy: 0.7351 - val_loss: 0.9913
Epoch 105/300
157/157 2s 11ms/step - accuracy: 0.8150 - loss: 0.7572 - val_accuracy: 0.7333 - val_loss: 1.0083
Epoch 106/300
157/157 2s 11ms/step - accuracy: 0.8175 - loss: 0.7509 - val_accuracy: 0.7570 - val_loss: 0.9436
Epoch 107/300
157/157 2s 11ms/step - accuracy: 0.8102 - loss: 0.7623 - val_accuracy: 0.7617 - val_loss: 0.9204
Epoch 108/300
157/157 2s 11ms/step - accuracy: 0.8223 - loss: 0.7429 - val_accuracy: 0.7191 - val_loss: 1.0671
Epoch 109/300
157/157 2s 11ms/step - accuracy: 0.8107 - loss: 0.7732 - val_accuracy: 0.7499 - val_loss: 0.9572
Epoch 110/300
157/157 2s 11ms/step - accuracy: 0.8145 - loss: 0.7587 - val_accuracy: 0.7527 - val_loss: 0.9622
Epoch 111/300
157/157 2s 11ms/step - accuracy: 0.8244 - loss: 0.7371 - val_accuracy: 0.7483 - val_loss: 0.9982
Epoch 112/300
157/157 2s 12ms/step - accuracy: 0.8194 - loss: 0.7433 - val_accuracy: 0.7288 - val_loss: 1.0332
Epoch 113/300
157/157 2s 11ms/step - accuracy: 0.8166 - loss: 0.7592 - val_accuracy: 0.7396 - val_loss: 0.9912
Epoch 114/300
157/157 2s 11ms/step - accuracy: 0.8237 - loss: 0.7437 - val_accuracy: 0.7462 - val_loss: 0.9695
Epoch 115/300
157/157 2s 11ms/step - accuracy: 0.8191 - loss: 0.7460 - val_accuracy: 0.7450 - val_loss: 0.9821
Epoch 116/300
157/157 2s 11ms/step - accuracy: 0.8269 - loss: 0.7275 - val_accuracy: 0.7540 - val_loss: 0.9542
Epoch 117/300
157/157 2s 11ms/step - accuracy: 0.8304 - loss: 0.7197 - val_accuracy: 0.7092 - val_loss: 1.1649
Epoch 118/300
157/157 2s 12ms/step - accuracy: 0.8133 - loss: 0.7658 - val_accuracy: 0.7511 - val_loss: 0.9756
Epoch 119/300
157/157 2s 12ms/step - accuracy: 0.8138 - loss: 0.7622 - val_accuracy: 0.7577 - val_loss: 0.9728
Epoch 120/300
157/157 2s 11ms/step - accuracy: 0.8215 - loss: 0.7396 - val_accuracy: 0.7416 - val_loss: 1.0314
Epoch 121/300
157/157 2s 11ms/step - accuracy: 0.8192 - loss: 0.7531 - val_accuracy: 0.7448 - val_loss: 1.0213
Epoch 122/300
157/157 2s 11ms/step - accuracy: 0.8277 - loss: 0.7344 - val_accuracy: 0.7298 - val_loss: 1.0549
Epoch 123/300
157/157 2s 11ms/step - accuracy: 0.8227 - loss: 0.7416 - val_accuracy: 0.6754 - val_loss: 1.3880
Epoch 124/300
157/157 2s 11ms/step - accuracy: 0.8183 - loss: 0.7530 - val_accuracy: 0.7709 - val_loss: 0.9358
Epoch 125/300
157/157 2s 12ms/step - accuracy: 0.8320 - loss: 0.7258 - val_accuracy: 0.7551 - val_loss: 0.9626
Epoch 126/300
157/157 2s 11ms/step - accuracy: 0.8232 - loss: 0.7418 - val_accuracy: 0.7332 - val_loss: 1.0566
Epoch 127/300
157/157 2s 11ms/step - accuracy: 0.8319 - loss: 0.7225 - val_accuracy: 0.7586 - val_loss: 0.9751
Epoch 128/300
157/157 2s 11ms/step - accuracy: 0.8187 - loss: 0.7577 - val_accuracy: 0.7461 - val_loss: 1.0270
Epoch 129/300
157/157 2s 11ms/step - accuracy: 0.8412 - loss: 0.7029 - val_accuracy: 0.7490 - val_loss: 0.9908
Epoch 130/300
157/157 2s 11ms/step - accuracy: 0.8322 - loss: 0.7145 - val_accuracy: 0.7339 - val_loss: 1.0636
Epoch 131/300
157/157 2s 12ms/step - accuracy: 0.8457 - loss: 0.6924 - val_accuracy: 0.7560 - val_loss: 0.9715
Epoch 132/300
157/157 2s 11ms/step - accuracy: 0.8345 - loss: 0.7179 - val_accuracy: 0.7209 - val_loss: 1.1056
Epoch 133/300
157/157 2s 11ms/step - accuracy: 0.8323 - loss: 0.7270 - val_accuracy: 0.7619 - val_loss: 0.9790
Epoch 134/300
157/157 2s 11ms/step - accuracy: 0.8373 - loss: 0.7070 - val_accuracy: 0.7492 - val_loss: 0.9864
Epoch 135/300
157/157 2s 11ms/step - accuracy: 0.8353 - loss: 0.7083 - val_accuracy: 0.7357 - val_loss: 1.0626
Epoch 136/300
157/157 2s 11ms/step - accuracy: 0.8424 - loss: 0.6982 - val_accuracy: 0.7262 - val_loss: 1.1333
Epoch 137/300
157/157 2s 12ms/step - accuracy: 0.8403 - loss: 0.7122 - val_accuracy: 0.7444 - val_loss: 0.9978
Epoch 138/300
157/157 2s 11ms/step - accuracy: 0.8317 - loss: 0.7307 - val_accuracy: 0.7591 - val_loss: 1.0034
Epoch 139/300
157/157 2s 11ms/step - accuracy: 0.8479 - loss: 0.6895 - val_accuracy: 0.7573 - val_loss: 1.0506
Epoch 140/300
157/157 2s 11ms/step - accuracy: 0.8452 - loss: 0.6982 - val_accuracy: 0.7576 - val_loss: 0.9723
Epoch 141/300
157/157 2s 11ms/step - accuracy: 0.8420 - loss: 0.7045 - val_accuracy: 0.7540 - val_loss: 1.0009
Epoch 142/300
157/157 2s 11ms/step - accuracy: 0.8463 - loss: 0.6910 - val_accuracy: 0.7453 - val_loss: 1.0900
Epoch 143/300
157/157 2s 11ms/step - accuracy: 0.8451 - loss: 0.7003 - val_accuracy: 0.7383 - val_loss: 1.0086
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Epoch 144/300  
157/157 2s 12ms/step - accuracy: 0.8428 - loss: 0.7000 - val_accuracy: 0.7233 - val_loss: 1.0703  
Epoch 145/300  
157/157 2s 11ms/step - accuracy: 0.8365 - loss: 0.7188 - val_accuracy: 0.7565 - val_loss: 0.9849  
Epoch 146/300  
157/157 2s 11ms/step - accuracy: 0.8487 - loss: 0.6807 - val_accuracy: 0.7525 - val_loss: 1.0225  
Epoch 147/300  
157/157 2s 11ms/step - accuracy: 0.8444 - loss: 0.6997 - val_accuracy: 0.7336 - val_loss: 1.0915  
Epoch 148/300  
157/157 2s 11ms/step - accuracy: 0.8470 - loss: 0.6983 - val_accuracy: 0.7644 - val_loss: 1.0021  
Epoch 149/300  
157/157 2s 11ms/step - accuracy: 0.8452 - loss: 0.6934 - val_accuracy: 0.7622 - val_loss: 0.9801  
Epoch 150/300  
157/157 2s 12ms/step - accuracy: 0.8428 - loss: 0.7120 - val_accuracy: 0.7439 - val_loss: 1.0497  
Epoch 151/300  
157/157 2s 11ms/step - accuracy: 0.8506 - loss: 0.6849 - val_accuracy: 0.7666 - val_loss: 0.9859  
Epoch 152/300  
157/157 2s 11ms/step - accuracy: 0.8534 - loss: 0.6802 - val_accuracy: 0.7516 - val_loss: 1.0165  
Epoch 153/300  
157/157 2s 11ms/step - accuracy: 0.8426 - loss: 0.7024 - val_accuracy: 0.7689 - val_loss: 1.0103  
Epoch 154/300  
157/157 2s 11ms/step - accuracy: 0.8510 - loss: 0.6819 - val_accuracy: 0.7550 - val_loss: 1.0779  
Epoch 155/300  
157/157 2s 11ms/step - accuracy: 0.8464 - loss: 0.6944 - val_accuracy: 0.7323 - val_loss: 1.1089  
Epoch 156/300  
157/157 2s 12ms/step - accuracy: 0.8388 - loss: 0.7146 - val_accuracy: 0.7614 - val_loss: 1.0542  
Epoch 157/300  
157/157 2s 11ms/step - accuracy: 0.8540 - loss: 0.6766 - val_accuracy: 0.7417 - val_loss: 1.0916  
Epoch 158/300  
157/157 2s 11ms/step - accuracy: 0.8533 - loss: 0.6844 - val_accuracy: 0.7507 - val_loss: 1.0671  
Epoch 159/300  
157/157 2s 11ms/step - accuracy: 0.8500 - loss: 0.6808 - val_accuracy: 0.7608 - val_loss: 1.0511  
Epoch 160/300  
157/157 2s 11ms/step - accuracy: 0.8527 - loss: 0.6831 - val_accuracy: 0.7408 - val_loss: 1.1343  
Epoch 161/300  
157/157 2s 11ms/step - accuracy: 0.8598 - loss: 0.6655 - val_accuracy: 0.7537 - val_loss: 1.0095  
Epoch 162/300  
157/157 2s 11ms/step - accuracy: 0.8605 - loss: 0.6623 - val_accuracy: 0.7509 - val_loss: 1.0684  
Epoch 163/300  
157/157 2s 12ms/step - accuracy: 0.8519 - loss: 0.6852 - val_accuracy: 0.7432 - val_loss: 1.0972  
Epoch 164/300  
157/157 2s 11ms/step - accuracy: 0.8608 - loss: 0.6644 - val_accuracy: 0.7388 - val_loss: 1.1534  
Epoch 165/300  
157/157 2s 11ms/step - accuracy: 0.8593 - loss: 0.6712 - val_accuracy: 0.7634 - val_loss: 1.0293  
Epoch 166/300  
157/157 2s 11ms/step - accuracy: 0.8616 - loss: 0.6595 - val_accuracy: 0.7615 - val_loss: 1.0033  
Epoch 167/300  
157/157 2s 11ms/step - accuracy: 0.8543 - loss: 0.6766 - val_accuracy: 0.7555 - val_loss: 1.0053  
Epoch 168/300  
157/157 2s 11ms/step - accuracy: 0.8738 - loss: 0.6335 - val_accuracy: 0.7667 - val_loss: 0.9840  
Epoch 169/300  
157/157 2s 12ms/step - accuracy: 0.8598 - loss: 0.6667 - val_accuracy: 0.7334 - val_loss: 1.1408  
Epoch 170/300  
157/157 2s 11ms/step - accuracy: 0.8626 - loss: 0.6595 - val_accuracy: 0.7623 - val_loss: 1.0288  
Epoch 171/300  
157/157 2s 11ms/step - accuracy: 0.8691 - loss: 0.6483 - val_accuracy: 0.7587 - val_loss: 1.0914  
Epoch 172/300  
157/157 2s 11ms/step - accuracy: 0.8602 - loss: 0.6704 - val_accuracy: 0.7462 - val_loss: 1.0379  
Epoch 173/300  
157/157 2s 11ms/step - accuracy: 0.8604 - loss: 0.6660 - val_accuracy: 0.7646 - val_loss: 1.0476  
Epoch 174/300  
157/157 2s 11ms/step - accuracy: 0.8644 - loss: 0.6549 - val_accuracy: 0.7593 - val_loss: 1.0165  
Epoch 175/300  
157/157 2s 12ms/step - accuracy: 0.8746 - loss: 0.6371 - val_accuracy: 0.7627 - val_loss: 1.0474  
Epoch 176/300  
157/157 2s 11ms/step - accuracy: 0.8587 - loss: 0.6753 - val_accuracy: 0.7522 - val_loss: 1.0925  
Epoch 177/300  
157/157 2s 11ms/step - accuracy: 0.8580 - loss: 0.6812 - val_accuracy: 0.7723 - val_loss: 1.0137  
Epoch 178/300  
157/157 2s 11ms/step - accuracy: 0.8744 - loss: 0.6281 - val_accuracy: 0.7597 - val_loss: 1.0216  
Epoch 179/300  
157/157 2s 11ms/step - accuracy: 0.8662 - loss: 0.6567 - val_accuracy: 0.7642 - val_loss: 1.0522  
Epoch 180/300  
157/157 2s 11ms/step - accuracy: 0.8725 - loss: 0.6423 - val_accuracy: 0.7517 - val_loss: 1.1206  
Epoch 181/300  
157/157 2s 11ms/step - accuracy: 0.8690 - loss: 0.6547 - val_accuracy: 0.7539 - val_loss: 1.1208  
Epoch 182/300  
157/157 2s 11ms/step - accuracy: 0.8603 - loss: 0.6780 - val_accuracy: 0.7185 - val_loss: 1.2569  
Epoch 183/300  
157/157 2s 11ms/step - accuracy: 0.8631 - loss: 0.6677 - val_accuracy: 0.7669 - val_loss: 1.0836  
Epoch 184/300  
157/157 2s 12ms/step - accuracy: 0.8646 - loss: 0.6618 - val_accuracy: 0.7544 - val_loss: 1.0768  
Epoch 185/300  
157/157 2s 11ms/step - accuracy: 0.8787 - loss: 0.6291 - val_accuracy: 0.7454 - val_loss: 1.1761  
Epoch 186/300
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157/157 2s 11ms/step - accuracy: 0.8600 - loss: 0.6790 - val_accuracy: 0.7360 - val_loss: 1.1505
Epoch 187/300
157/157 2s 11ms/step - accuracy: 0.8683 - loss: 0.6587 - val_accuracy: 0.7421 - val_loss: 1.1136
Epoch 188/300
157/157 2s 12ms/step - accuracy: 0.8700 - loss: 0.6444 - val_accuracy: 0.7615 - val_loss: 1.0460
Epoch 189/300
157/157 2s 11ms/step - accuracy: 0.8628 - loss: 0.6723 - val_accuracy: 0.7594 - val_loss: 1.0971
Epoch 190/300
157/157 2s 11ms/step - accuracy: 0.8763 - loss: 0.6304 - val_accuracy: 0.7589 - val_loss: 1.0619
Epoch 191/300
157/157 2s 11ms/step - accuracy: 0.8723 - loss: 0.6471 - val_accuracy: 0.7564 - val_loss: 1.1000
Epoch 192/300
157/157 2s 11ms/step - accuracy: 0.8764 - loss: 0.6351 - val_accuracy: 0.7541 - val_loss: 1.1007
Epoch 193/300
157/157 2s 11ms/step - accuracy: 0.8811 - loss: 0.6258 - val_accuracy: 0.7709 - val_loss: 1.0072
Epoch 194/300
157/157 2s 12ms/step - accuracy: 0.8555 - loss: 0.6944 - val_accuracy: 0.7532 - val_loss: 1.1082
Epoch 195/300
157/157 2s 11ms/step - accuracy: 0.8794 - loss: 0.6264 - val_accuracy: 0.7444 - val_loss: 1.1672
Epoch 196/300
157/157 2s 11ms/step - accuracy: 0.8755 - loss: 0.6458 - val_accuracy: 0.7622 - val_loss: 1.0722
Epoch 197/300
157/157 2s 11ms/step - accuracy: 0.8848 - loss: 0.6198 - val_accuracy: 0.7544 - val_loss: 1.1887
Epoch 198/300
157/157 2s 11ms/step - accuracy: 0.8736 - loss: 0.6499 - val_accuracy: 0.7722 - val_loss: 1.0847
Epoch 199/300
157/157 2s 11ms/step - accuracy: 0.8875 - loss: 0.6153 - val_accuracy: 0.7504 - val_loss: 1.1450
Epoch 200/300
157/157 2s 12ms/step - accuracy: 0.8798 - loss: 0.6316 - val_accuracy: 0.7424 - val_loss: 1.1827
Epoch 201/300
157/157 2s 12ms/step - accuracy: 0.8742 - loss: 0.6504 - val_accuracy: 0.7654 - val_loss: 1.0670
Epoch 202/300
157/157 2s 11ms/step - accuracy: 0.8853 - loss: 0.6162 - val_accuracy: 0.7293 - val_loss: 1.1792
Epoch 203/300
157/157 2s 11ms/step - accuracy: 0.8682 - loss: 0.6539 - val_accuracy: 0.7630 - val_loss: 1.1420
Epoch 204/300
157/157 2s 11ms/step - accuracy: 0.8735 - loss: 0.6461 - val_accuracy: 0.7544 - val_loss: 1.1595
Epoch 205/300
157/157 2s 11ms/step - accuracy: 0.8818 - loss: 0.6293 - val_accuracy: 0.7558 - val_loss: 1.1313
Epoch 206/300
157/157 2s 12ms/step - accuracy: 0.8886 - loss: 0.6156 - val_accuracy: 0.7680 - val_loss: 1.0926
Epoch 207/300
157/157 2s 12ms/step - accuracy: 0.8801 - loss: 0.6360 - val_accuracy: 0.7323 - val_loss: 1.2549
Epoch 208/300
157/157 2s 12ms/step - accuracy: 0.8868 - loss: 0.6212 - val_accuracy: 0.7507 - val_loss: 1.1713
Epoch 209/300
157/157 2s 11ms/step - accuracy: 0.8812 - loss: 0.6344 - val_accuracy: 0.7533 - val_loss: 1.1261
Epoch 210/300
157/157 2s 11ms/step - accuracy: 0.8887 - loss: 0.6065 - val_accuracy: 0.7303 - val_loss: 1.2545
Epoch 211/300
157/157 2s 11ms/step - accuracy: 0.8697 - loss: 0.6647 - val_accuracy: 0.7501 - val_loss: 1.2195
Epoch 212/300
157/157 2s 12ms/step - accuracy: 0.8880 - loss: 0.6222 - val_accuracy: 0.7539 - val_loss: 1.1474
Epoch 213/300
157/157 2s 12ms/step - accuracy: 0.8763 - loss: 0.6457 - val_accuracy: 0.7557 - val_loss: 1.1358
Epoch 214/300
157/157 2s 12ms/step - accuracy: 0.8892 - loss: 0.6111 - val_accuracy: 0.7646 - val_loss: 1.0961
Epoch 215/300
157/157 2s 11ms/step - accuracy: 0.8909 - loss: 0.6075 - val_accuracy: 0.7627 - val_loss: 1.1326
Epoch 216/300
157/157 2s 12ms/step - accuracy: 0.8884 - loss: 0.6175 - val_accuracy: 0.7425 - val_loss: 1.1650
Epoch 217/300
157/157 2s 12ms/step - accuracy: 0.8920 - loss: 0.6068 - val_accuracy: 0.7488 - val_loss: 1.2919
Epoch 218/300
157/157 2s 11ms/step - accuracy: 0.8815 - loss: 0.6419 - val_accuracy: 0.7616 - val_loss: 1.1304
Epoch 219/300
157/157 2s 12ms/step - accuracy: 0.8929 - loss: 0.6108 - val_accuracy: 0.7440 - val_loss: 1.1881
Epoch 220/300
157/157 2s 12ms/step - accuracy: 0.8783 - loss: 0.6403 - val_accuracy: 0.7543 - val_loss: 1.1430
Epoch 221/300
157/157 2s 11ms/step - accuracy: 0.8765 - loss: 0.6592 - val_accuracy: 0.7391 - val_loss: 1.2309
Epoch 222/300
157/157 2s 11ms/step - accuracy: 0.8893 - loss: 0.6203 - val_accuracy: 0.7455 - val_loss: 1.1885
Epoch 223/300
157/157 2s 12ms/step - accuracy: 0.8959 - loss: 0.5984 - val_accuracy: 0.7624 - val_loss: 1.1729
Epoch 224/300
157/157 2s 11ms/step - accuracy: 0.8923 - loss: 0.6084 - val_accuracy: 0.7618 - val_loss: 1.1477
Epoch 225/300
157/157 2s 12ms/step - accuracy: 0.8918 - loss: 0.6080 - val_accuracy: 0.7455 - val_loss: 1.2168
Epoch 226/300
157/157 2s 12ms/step - accuracy: 0.8909 - loss: 0.6153 - val_accuracy: 0.7652 - val_loss: 1.1432
Epoch 227/300
157/157 2s 11ms/step - accuracy: 0.8976 - loss: 0.5987 - val_accuracy: 0.7307 - val_loss: 1.2321
Epoch 228/300
157/157 2s 12ms/step - accuracy: 0.8928 - loss: 0.6382 - val_accuracy: 0.7567 - val_loss: 1.1622
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Epoch 229/300
157/157 2s 12ms/step - accuracy: 0.9027 - loss: 0.5851 - val_accuracy: 0.7626 - val_loss: 1.1277
Epoch 230/300
157/157 2s 12ms/step - accuracy: 0.8972 - loss: 0.5968 - val_accuracy: 0.7647 - val_loss: 1.1156
Epoch 231/300
157/157 2s 12ms/step - accuracy: 0.8992 - loss: 0.5918 - val_accuracy: 0.7442 - val_loss: 1.2349
Epoch 232/300
157/157 2s 12ms/step - accuracy: 0.8898 - loss: 0.6160 - val_accuracy: 0.7648 - val_loss: 1.1541
Epoch 233/300
157/157 2s 11ms/step - accuracy: 0.9004 - loss: 0.5993 - val_accuracy: 0.7606 - val_loss: 1.1347
Epoch 234/300
157/157 2s 11ms/step - accuracy: 0.9007 - loss: 0.5897 - val_accuracy: 0.7590 - val_loss: 1.1610
Epoch 235/300
157/157 2s 11ms/step - accuracy: 0.8951 - loss: 0.6060 - val_accuracy: 0.7558 - val_loss: 1.1900
Epoch 236/300
157/157 2s 11ms/step - accuracy: 0.8981 - loss: 0.5945 - val_accuracy: 0.7368 - val_loss: 1.2492
Epoch 237/300
157/157 2s 11ms/step - accuracy: 0.8898 - loss: 0.6182 - val_accuracy: 0.7230 - val_loss: 1.3487
Epoch 238/300
157/157 2s 12ms/step - accuracy: 0.8961 - loss: 0.6041 - val_accuracy: 0.7677 - val_loss: 1.1397
Epoch 239/300
157/157 2s 11ms/step - accuracy: 0.8986 - loss: 0.5980 - val_accuracy: 0.7566 - val_loss: 1.2665
Epoch 240/300
157/157 2s 12ms/step - accuracy: 0.8967 - loss: 0.6014 - val_accuracy: 0.7488 - val_loss: 1.2612
Epoch 241/300
157/157 2s 11ms/step - accuracy: 0.8983 - loss: 0.5973 - val_accuracy: 0.7634 - val_loss: 1.1597
Epoch 242/300
157/157 2s 11ms/step - accuracy: 0.9054 - loss: 0.5778 - val_accuracy: 0.7449 - val_loss: 1.2298
Epoch 243/300
157/157 2s 12ms/step - accuracy: 0.9007 - loss: 0.5920 - val_accuracy: 0.7652 - val_loss: 1.1279
Epoch 244/300
157/157 2s 12ms/step - accuracy: 0.9037 - loss: 0.5816 - val_accuracy: 0.7588 - val_loss: 1.1808
Epoch 245/300
157/157 2s 12ms/step - accuracy: 0.8962 - loss: 0.6005 - val_accuracy: 0.7138 - val_loss: 1.4422
Epoch 246/300
157/157 2s 11ms/step - accuracy: 0.8774 - loss: 0.6629 - val_accuracy: 0.7281 - val_loss: 1.2152
Epoch 247/300
157/157 2s 11ms/step - accuracy: 0.8924 - loss: 0.6181 - val_accuracy: 0.7635 - val_loss: 1.1377
Epoch 248/300
157/157 2s 11ms/step - accuracy: 0.9160 - loss: 0.5576 - val_accuracy: 0.7564 - val_loss: 1.2076
Epoch 249/300
157/157 2s 12ms/step - accuracy: 0.8968 - loss: 0.6068 - val_accuracy: 0.7506 - val_loss: 1.2700
Epoch 250/300
157/157 2s 12ms/step - accuracy: 0.9057 - loss: 0.5792 - val_accuracy: 0.7500 - val_loss: 1.2248
Epoch 251/300
157/157 2s 12ms/step - accuracy: 0.8922 - loss: 0.6213 - val_accuracy: 0.7606 - val_loss: 1.2003
Epoch 252/300
157/157 2s 11ms/step - accuracy: 0.9026 - loss: 0.5885 - val_accuracy: 0.7584 - val_loss: 1.2042
Epoch 253/300
157/157 2s 11ms/step - accuracy: 0.9047 - loss: 0.5869 - val_accuracy: 0.7582 - val_loss: 1.2585
Epoch 254/300
157/157 2s 11ms/step - accuracy: 0.8978 - loss: 0.6021 - val_accuracy: 0.7538 - val_loss: 1.2549
Epoch 255/300
157/157 2s 11ms/step - accuracy: 0.9109 - loss: 0.5751 - val_accuracy: 0.7505 - val_loss: 1.1956
Epoch 256/300
157/157 2s 12ms/step - accuracy: 0.9022 - loss: 0.5920 - val_accuracy: 0.7129 - val_loss: 1.4325
Epoch 257/300
157/157 2s 12ms/step - accuracy: 0.8911 - loss: 0.6263 - val_accuracy: 0.7488 - val_loss: 1.2707
Epoch 258/300
157/157 2s 11ms/step - accuracy: 0.8995 - loss: 0.6047 - val_accuracy: 0.7649 - val_loss: 1.2033
Epoch 259/300
157/157 2s 12ms/step - accuracy: 0.9120 - loss: 0.5614 - val_accuracy: 0.7599 - val_loss: 1.1866
Epoch 260/300
157/157 2s 12ms/step - accuracy: 0.9115 - loss: 0.5727 - val_accuracy: 0.7628 - val_loss: 1.2263
Epoch 261/300
157/157 2s 12ms/step - accuracy: 0.9049 - loss: 0.5943 - val_accuracy: 0.7431 - val_loss: 1.2648
Epoch 262/300
157/157 2s 12ms/step - accuracy: 0.9044 - loss: 0.5965 - val_accuracy: 0.7596 - val_loss: 1.1995
Epoch 263/300
157/157 2s 12ms/step - accuracy: 0.8991 - loss: 0.6047 - val_accuracy: 0.7630 - val_loss: 1.1393
Epoch 264/300
157/157 2s 12ms/step - accuracy: 0.9181 - loss: 0.5570 - val_accuracy: 0.7538 - val_loss: 1.2497
Epoch 265/300
157/157 2s 12ms/step - accuracy: 0.9133 - loss: 0.5665 - val_accuracy: 0.7579 - val_loss: 1.2638
Epoch 266/300
157/157 2s 12ms/step - accuracy: 0.9127 - loss: 0.5674 - val_accuracy: 0.7225 - val_loss: 1.3380
Epoch 267/300
157/157 2s 12ms/step - accuracy: 0.9079 - loss: 0.5879 - val_accuracy: 0.7418 - val_loss: 1.3052
Epoch 268/300
157/157 2s 12ms/step - accuracy: 0.9046 - loss: 0.5883 - val_accuracy: 0.7537 - val_loss: 1.2465
Epoch 269/300
157/157 2s 11ms/step - accuracy: 0.9078 - loss: 0.5854 - val_accuracy: 0.7663 - val_loss: 1.1956
Epoch 270/300
157/157 2s 11ms/step - accuracy: 0.9182 - loss: 0.5556 - val_accuracy: 0.7327 - val_loss: 1.3054

```

Epoch 2/1/300
157/157 2s 12ms/step - accuracy: 0.9054 - loss: 0.5922 - val_accuracy: 0.7399 - val_loss: 1.3883
 Epoch 272/300
157/157 2s 11ms/step - accuracy: 0.8978 - loss: 0.6139 - val_accuracy: 0.7472 - val_loss: 1.3461
 Epoch 273/300
157/157 2s 12ms/step - accuracy: 0.9106 - loss: 0.5742 - val_accuracy: 0.7490 - val_loss: 1.2741
 Epoch 274/300
157/157 2s 11ms/step - accuracy: 0.9019 - loss: 0.6023 - val_accuracy: 0.7414 - val_loss: 1.3945
 Epoch 275/300
157/157 2s 11ms/step - accuracy: 0.9010 - loss: 0.6004 - val_accuracy: 0.7589 - val_loss: 1.2030
 Epoch 276/300
157/157 2s 12ms/step - accuracy: 0.9065 - loss: 0.5893 - val_accuracy: 0.7556 - val_loss: 1.2306
 Epoch 277/300
157/157 2s 11ms/step - accuracy: 0.9130 - loss: 0.5771 - val_accuracy: 0.7382 - val_loss: 1.3097
 Epoch 278/300
157/157 2s 12ms/step - accuracy: 0.9102 - loss: 0.5802 - val_accuracy: 0.7624 - val_loss: 1.1930
 Epoch 279/300
157/157 2s 11ms/step - accuracy: 0.9219 - loss: 0.5489 - val_accuracy: 0.7442 - val_loss: 1.3341
 Epoch 280/300
157/157 2s 12ms/step - accuracy: 0.9180 - loss: 0.5598 - val_accuracy: 0.7507 - val_loss: 1.3188
 Epoch 281/300
157/157 2s 12ms/step - accuracy: 0.9080 - loss: 0.5858 - val_accuracy: 0.7056 - val_loss: 1.3665
 Epoch 282/300
157/157 2s 12ms/step - accuracy: 0.8984 - loss: 0.6210 - val_accuracy: 0.7564 - val_loss: 1.2152
 Epoch 283/300
157/157 2s 12ms/step - accuracy: 0.9066 - loss: 0.5951 - val_accuracy: 0.7365 - val_loss: 1.3895
 Epoch 284/300
157/157 2s 12ms/step - accuracy: 0.9175 - loss: 0.5612 - val_accuracy: 0.7636 - val_loss: 1.3036
 Epoch 285/300
157/157 2s 11ms/step - accuracy: 0.9109 - loss: 0.5800 - val_accuracy: 0.7450 - val_loss: 1.3934
 Epoch 286/300
157/157 2s 12ms/step - accuracy: 0.9131 - loss: 0.5759 - val_accuracy: 0.7395 - val_loss: 1.4795
 Epoch 287/300
157/157 2s 12ms/step - accuracy: 0.9063 - loss: 0.5913 - val_accuracy: 0.7463 - val_loss: 1.2953
 Epoch 288/300
157/157 2s 12ms/step - accuracy: 0.9241 - loss: 0.5498 - val_accuracy: 0.7443 - val_loss: 1.3951
 Epoch 289/300
157/157 2s 11ms/step - accuracy: 0.9080 - loss: 0.5885 - val_accuracy: 0.7575 - val_loss: 1.3434
 Epoch 290/300
157/157 2s 11ms/step - accuracy: 0.9120 - loss: 0.5763 - val_accuracy: 0.7408 - val_loss: 1.3389
 Epoch 291/300
157/157 2s 12ms/step - accuracy: 0.9007 - loss: 0.6063 - val_accuracy: 0.7619 - val_loss: 1.2912
 Epoch 292/300
157/157 2s 11ms/step - accuracy: 0.9197 - loss: 0.5636 - val_accuracy: 0.7415 - val_loss: 1.4154
 Epoch 293/300
157/157 2s 11ms/step - accuracy: 0.8879 - loss: 0.6503 - val_accuracy: 0.7638 - val_loss: 1.2843
 Epoch 294/300
157/157 2s 12ms/step - accuracy: 0.9158 - loss: 0.5726 - val_accuracy: 0.7580 - val_loss: 1.2651
 Epoch 295/300
157/157 2s 12ms/step - accuracy: 0.9196 - loss: 0.5571 - val_accuracy: 0.7573 - val_loss: 1.2972
 Epoch 296/300
157/157 2s 11ms/step - accuracy: 0.9243 - loss: 0.5533 - val_accuracy: 0.7423 - val_loss: 1.2592
 Epoch 297/300
157/157 2s 11ms/step - accuracy: 0.8963 - loss: 0.6204 - val_accuracy: 0.7536 - val_loss: 1.2345
 Epoch 298/300
157/157 2s 11ms/step - accuracy: 0.9324 - loss: 0.5295 - val_accuracy: 0.7491 - val_loss: 1.3026
 Epoch 299/300
157/157 2s 12ms/step - accuracy: 0.9286 - loss: 0.5387 - val_accuracy: 0.7454 - val_loss: 1.2927
 Epoch 300/300
157/157 2s 12ms/step - accuracy: 0.9153 - loss: 0.5723 - val_accuracy: 0.7602 - val_loss: 1.2732
 Weight Decay ($\lambda=0.001$) (NO BN) - Training Time: 569.45s, Test Accuracy: 0.7553, Final Train Loss: 0.5704
 Model: "functional_3"

| Layer (type) | Output Shape | Param # | Connected to |
|-------------------------------|--------------------|---------|---------------------|
| input_layer_3 (InputLayer) | (None, 32, 32, 3) | 0 | - |
| conv2d_63 (Conv2D) | (None, 32, 32, 32) | 896 | input_layer_3[0]... |
| dropout (Dropout) | (None, 32, 32, 32) | 0 | conv2d_63[0][0] |
| conv2d_64 (Conv2D) | (None, 32, 32, 32) | 9,248 | dropout[0][0] |
| dropout_1 (Dropout) | (None, 32, 32, 32) | 0 | conv2d_64[0][0] |
| conv2d_65 (Conv2D) | (None, 32, 32, 32) | 9,248 | dropout_1[0][0] |
| dropout_2 (Dropout) | (None, 32, 32, 32) | 0 | conv2d_65[0][0] |

| | | | |
|----------------------|--------------------|-------|----------------------------------|
| add_30 (Add) | (None, 32, 32, 32) | 0 | dropout[0][0], dropout_2[0][0] |
| re_lu_30 (ReLU) | (None, 32, 32, 32) | 0 | add_30[0][0] |
| conv2d_66 (Conv2D) | (None, 32, 32, 32) | 9,248 | re_lu_30[0][0] |
| dropout_3 (Dropout) | (None, 32, 32, 32) | 0 | conv2d_66[0][0] |
| conv2d_67 (Conv2D) | (None, 32, 32, 32) | 9,248 | dropout_3[0][0] |
| dropout_4 (Dropout) | (None, 32, 32, 32) | 0 | conv2d_67[0][0] |
| add_31 (Add) | (None, 32, 32, 32) | 0 | re_lu_30[0][0], dropout_4[0][0] |
| re_lu_31 (ReLU) | (None, 32, 32, 32) | 0 | add_31[0][0] |
| conv2d_68 (Conv2D) | (None, 32, 32, 32) | 9,248 | re_lu_31[0][0] |
| dropout_5 (Dropout) | (None, 32, 32, 32) | 0 | conv2d_68[0][0] |
| conv2d_69 (Conv2D) | (None, 32, 32, 32) | 9,248 | dropout_5[0][0] |
| dropout_6 (Dropout) | (None, 32, 32, 32) | 0 | conv2d_69[0][0] |
| add_32 (Add) | (None, 32, 32, 32) | 0 | re_lu_31[0][0], dropout_6[0][0] |
| re_lu_32 (ReLU) | (None, 32, 32, 32) | 0 | add_32[0][0] |
| conv2d_70 (Conv2D) | (None, 32, 32, 32) | 9,248 | re_lu_32[0][0] |
| dropout_7 (Dropout) | (None, 32, 32, 32) | 0 | conv2d_70[0][0] |
| conv2d_71 (Conv2D) | (None, 32, 32, 32) | 9,248 | dropout_7[0][0] |
| dropout_8 (Dropout) | (None, 32, 32, 32) | 0 | conv2d_71[0][0] |
| add_33 (Add) | (None, 32, 32, 32) | 0 | re_lu_32[0][0], dropout_8[0][0] |
| re_lu_33 (ReLU) | (None, 32, 32, 32) | 0 | add_33[0][0] |
| conv2d_72 (Conv2D) | (None, 32, 32, 32) | 9,248 | re_lu_33[0][0] |
| dropout_9 (Dropout) | (None, 32, 32, 32) | 0 | conv2d_72[0][0] |
| conv2d_73 (Conv2D) | (None, 32, 32, 32) | 9,248 | dropout_9[0][0] |
| dropout_10 (Dropout) | (None, 32, 32, 32) | 0 | conv2d_73[0][0] |
| add_34 (Add) | (None, 32, 32, 32) | 0 | re_lu_33[0][0], dropout_10[0][0] |
| re_lu_34 (ReLU) | (None, 32, 32, 32) | 0 | add_34[0][0] |
| conv2d_74 (Conv2D) | (None, 32, 32, 32) | 9,248 | re_lu_34[0][0] |
| dropout_11 (Dropout) | (None, 32, 32, 32) | 0 | conv2d_74[0][0] |
| conv2d_75 (Conv2D) | (None, 32, 32, 32) | 9,248 | dropout_11[0][0] |

| | | | |
|---|--------------------|-------|----------------------------------|
| dropout_12 (Dropout) | (None, 32, 32, 32) | 0 | conv2d_75[0][0] |
| add_35 (Add) | (None, 32, 32, 32) | 0 | re_lu_34[0][0], dropout_12[0][0] |
| re_lu_35 (ReLU) | (None, 32, 32, 32) | 0 | add_35[0][0] |
| conv2d_76 (Conv2D) | (None, 32, 32, 32) | 9,248 | re_lu_35[0][0] |
| dropout_13 (Dropout) | (None, 32, 32, 32) | 0 | conv2d_76[0][0] |
| conv2d_77 (Conv2D) | (None, 32, 32, 32) | 9,248 | dropout_13[0][0] |
| dropout_14 (Dropout) | (None, 32, 32, 32) | 0 | conv2d_77[0][0] |
| add_36 (Add) | (None, 32, 32, 32) | 0 | re_lu_35[0][0], dropout_14[0][0] |
| re_lu_36 (ReLU) | (None, 32, 32, 32) | 0 | add_36[0][0] |
| conv2d_78 (Conv2D) | (None, 32, 32, 32) | 9,248 | re_lu_36[0][0] |
| dropout_15 (Dropout) | (None, 32, 32, 32) | 0 | conv2d_78[0][0] |
| conv2d_79 (Conv2D) | (None, 32, 32, 32) | 9,248 | dropout_15[0][0] |
| dropout_16 (Dropout) | (None, 32, 32, 32) | 0 | conv2d_79[0][0] |
| add_37 (Add) | (None, 32, 32, 32) | 0 | re_lu_36[0][0], dropout_16[0][0] |
| re_lu_37 (ReLU) | (None, 32, 32, 32) | 0 | add_37[0][0] |
| conv2d_80 (Conv2D) | (None, 32, 32, 32) | 9,248 | re_lu_37[0][0] |
| dropout_17 (Dropout) | (None, 32, 32, 32) | 0 | conv2d_80[0][0] |
| conv2d_81 (Conv2D) | (None, 32, 32, 32) | 9,248 | dropout_17[0][0] |
| dropout_18 (Dropout) | (None, 32, 32, 32) | 0 | conv2d_81[0][0] |
| add_38 (Add) | (None, 32, 32, 32) | 0 | re_lu_37[0][0], dropout_18[0][0] |
| re_lu_38 (ReLU) | (None, 32, 32, 32) | 0 | add_38[0][0] |
| conv2d_82 (Conv2D) | (None, 32, 32, 32) | 9,248 | re_lu_38[0][0] |
| dropout_19 (Dropout) | (None, 32, 32, 32) | 0 | conv2d_82[0][0] |
| conv2d_83 (Conv2D) | (None, 32, 32, 32) | 9,248 | dropout_19[0][0] |
| dropout_20 (Dropout) | (None, 32, 32, 32) | 0 | conv2d_83[0][0] |
| add_39 (Add) | (None, 32, 32, 32) | 0 | re_lu_38[0][0], dropout_20[0][0] |
| re_lu_39 (ReLU) | (None, 32, 32, 32) | 0 | add_39[0][0] |
| global_average_poo... (GlobalAveragePool...) | (None, 32) | 0 | re_lu_39[0][0] |
| dense_3 (Dense) | (None, 10) | 330 | global_average_p... |

```
Total params: 186,186 (727.29 KB)
Trainable params: 186,186 (727.29 KB)
Non-trainable params: 0 (0.00 B)

===== Training: Dropout (p=0.3) (NO BN) =====
Epoch 1/300
157/157 2s 112ms/step - accuracy: 0.1598 - loss: 2.1892 - val_accuracy: 0.1871 - val_loss: 1.9599
Epoch 2/300
157/157 2s 14ms/step - accuracy: 0.2504 - loss: 1.8974 - val_accuracy: 0.2763 - val_loss: 1.8327
Epoch 3/300
157/157 2s 14ms/step - accuracy: 0.3298 - loss: 1.7092 - val_accuracy: 0.3278 - val_loss: 1.7252
Epoch 4/300
157/157 2s 14ms/step - accuracy: 0.3863 - loss: 1.6152 - val_accuracy: 0.3692 - val_loss: 1.6277
Epoch 5/300
157/157 2s 14ms/step - accuracy: 0.4289 - loss: 1.5158 - val_accuracy: 0.4123 - val_loss: 1.5677
Epoch 6/300
157/157 2s 14ms/step - accuracy: 0.4687 - loss: 1.4204 - val_accuracy: 0.4607 - val_loss: 1.4451
Epoch 7/300
157/157 2s 14ms/step - accuracy: 0.4850 - loss: 1.3866 - val_accuracy: 0.4258 - val_loss: 1.6808
Epoch 8/300
157/157 2s 14ms/step - accuracy: 0.5050 - loss: 1.3384 - val_accuracy: 0.5069 - val_loss: 1.3528
Epoch 9/300
157/157 2s 14ms/step - accuracy: 0.5323 - loss: 1.2704 - val_accuracy: 0.5175 - val_loss: 1.3076
Epoch 10/300
157/157 2s 14ms/step - accuracy: 0.5415 - loss: 1.2361 - val_accuracy: 0.5560 - val_loss: 1.2089
Epoch 11/300
157/157 2s 14ms/step - accuracy: 0.5570 - loss: 1.2216 - val_accuracy: 0.5036 - val_loss: 1.3893
Epoch 12/300
157/157 2s 14ms/step - accuracy: 0.5732 - loss: 1.1640 - val_accuracy: 0.5195 - val_loss: 1.3896
Epoch 13/300
157/157 2s 14ms/step - accuracy: 0.5807 - loss: 1.1405 - val_accuracy: 0.5837 - val_loss: 1.1583
Epoch 14/300
157/157 2s 14ms/step - accuracy: 0.5992 - loss: 1.1082 - val_accuracy: 0.5988 - val_loss: 1.0969
Epoch 15/300
157/157 2s 14ms/step - accuracy: 0.6061 - loss: 1.0758 - val_accuracy: 0.6058 - val_loss: 1.1075
Epoch 16/300
157/157 2s 14ms/step - accuracy: 0.6162 - loss: 1.0517 - val_accuracy: 0.6128 - val_loss: 1.0664
Epoch 17/300
157/157 2s 14ms/step - accuracy: 0.6285 - loss: 1.0277 - val_accuracy: 0.5839 - val_loss: 1.1653
Epoch 18/300
157/157 2s 14ms/step - accuracy: 0.6303 - loss: 1.0167 - val_accuracy: 0.6053 - val_loss: 1.1512
Epoch 19/300
157/157 2s 14ms/step - accuracy: 0.6327 - loss: 1.0143 - val_accuracy: 0.6300 - val_loss: 1.0076
Epoch 20/300
157/157 2s 14ms/step - accuracy: 0.6422 - loss: 0.9841 - val_accuracy: 0.6185 - val_loss: 1.0651
Epoch 21/300
157/157 2s 14ms/step - accuracy: 0.6470 - loss: 0.9692 - val_accuracy: 0.6383 - val_loss: 0.9915
Epoch 22/300
157/157 2s 14ms/step - accuracy: 0.6541 - loss: 0.9597 - val_accuracy: 0.6342 - val_loss: 1.0288
Epoch 23/300
157/157 2s 14ms/step - accuracy: 0.6556 - loss: 0.9548 - val_accuracy: 0.6244 - val_loss: 1.0547
Epoch 24/300
157/157 2s 14ms/step - accuracy: 0.6625 - loss: 0.9305 - val_accuracy: 0.6409 - val_loss: 0.9967
Epoch 25/300
157/157 2s 14ms/step - accuracy: 0.6722 - loss: 0.9176 - val_accuracy: 0.6647 - val_loss: 0.9323
Epoch 26/300
157/157 2s 14ms/step - accuracy: 0.6623 - loss: 0.9282 - val_accuracy: 0.6325 - val_loss: 1.0305
Epoch 27/300
157/157 2s 14ms/step - accuracy: 0.6695 - loss: 0.9064 - val_accuracy: 0.6557 - val_loss: 0.9680
Epoch 28/300
157/157 2s 14ms/step - accuracy: 0.6768 - loss: 0.8928 - val_accuracy: 0.6341 - val_loss: 1.0379
Epoch 29/300
157/157 2s 14ms/step - accuracy: 0.6814 - loss: 0.8815 - val_accuracy: 0.6699 - val_loss: 0.9151
Epoch 30/300
157/157 2s 14ms/step - accuracy: 0.6833 - loss: 0.8703 - val_accuracy: 0.6783 - val_loss: 0.8956
Epoch 31/300
157/157 2s 14ms/step - accuracy: 0.6919 - loss: 0.8487 - val_accuracy: 0.6840 - val_loss: 0.8709
Epoch 32/300
157/157 2s 14ms/step - accuracy: 0.6972 - loss: 0.8453 - val_accuracy: 0.6909 - val_loss: 0.8862
Epoch 33/300
157/157 2s 14ms/step - accuracy: 0.6874 - loss: 0.8597 - val_accuracy: 0.6916 - val_loss: 0.8535
Epoch 34/300
157/157 2s 14ms/step - accuracy: 0.7009 - loss: 0.8310 - val_accuracy: 0.6992 - val_loss: 0.8626
Epoch 35/300
157/157 2s 14ms/step - accuracy: 0.7014 - loss: 0.8236 - val_accuracy: 0.6869 - val_loss: 0.8857
Epoch 36/300
157/157 2s 14ms/step - accuracy: 0.7081 - loss: 0.8204 - val_accuracy: 0.6742 - val_loss: 0.9500
Epoch 37/300
157/157 2s 14ms/step - accuracy: 0.7045 - loss: 0.8233 - val_accuracy: 0.7086 - val_loss: 0.8468
Epoch 38/300
157/157 2s 14ms/step - accuracy: 0.7154 - loss: 0.8030 - val_accuracy: 0.6908 - val_loss: 0.8871
Epoch 39/300
157/157 2s 14ms/step - accuracy: 0.7120 - loss: 0.7959 - val_accuracy: 0.7109 - val_loss: 0.8191
Epoch 40/300
157/157 2s 14ms/step - accuracy: 0.7174 - loss: 0.7921 - val_accuracy: 0.7112 - val_loss: 0.8524
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157/157 2s 14ms/step - accuracy: 0.7114 - loss: 0.7831 - val_accuracy: 0.7112 - val_loss: 0.8534
Epoch 41/300
157/157 2s 14ms/step - accuracy: 0.7278 - loss: 0.7658 - val_accuracy: 0.7232 - val_loss: 0.8099
Epoch 42/300
157/157 2s 14ms/step - accuracy: 0.7247 - loss: 0.7693 - val_accuracy: 0.6943 - val_loss: 0.8769
Epoch 43/300
157/157 2s 14ms/step - accuracy: 0.7216 - loss: 0.7831 - val_accuracy: 0.7129 - val_loss: 0.8350
Epoch 44/300
157/157 2s 14ms/step - accuracy: 0.7247 - loss: 0.7721 - val_accuracy: 0.7231 - val_loss: 0.7842
Epoch 45/300
157/157 2s 14ms/step - accuracy: 0.7354 - loss: 0.7466 - val_accuracy: 0.6964 - val_loss: 0.9206
Epoch 46/300
157/157 2s 14ms/step - accuracy: 0.7331 - loss: 0.7414 - val_accuracy: 0.6906 - val_loss: 0.9043
Epoch 47/300
157/157 2s 14ms/step - accuracy: 0.7325 - loss: 0.7482 - val_accuracy: 0.7196 - val_loss: 0.8172
Epoch 48/300
157/157 2s 14ms/step - accuracy: 0.7391 - loss: 0.7427 - val_accuracy: 0.7260 - val_loss: 0.7958
Epoch 49/300
157/157 2s 14ms/step - accuracy: 0.7343 - loss: 0.7433 - val_accuracy: 0.7245 - val_loss: 0.8115
Epoch 50/300
157/157 2s 14ms/step - accuracy: 0.7406 - loss: 0.7228 - val_accuracy: 0.7258 - val_loss: 0.8044
Epoch 51/300
157/157 2s 14ms/step - accuracy: 0.7488 - loss: 0.7216 - val_accuracy: 0.7401 - val_loss: 0.7668
Epoch 52/300
157/157 2s 14ms/step - accuracy: 0.7421 - loss: 0.7266 - val_accuracy: 0.7304 - val_loss: 0.7965
Epoch 53/300
157/157 2s 14ms/step - accuracy: 0.7482 - loss: 0.7097 - val_accuracy: 0.7381 - val_loss: 0.7731
Epoch 54/300
157/157 2s 14ms/step - accuracy: 0.7518 - loss: 0.6918 - val_accuracy: 0.7434 - val_loss: 0.7518
Epoch 55/300
157/157 2s 14ms/step - accuracy: 0.7518 - loss: 0.7077 - val_accuracy: 0.7352 - val_loss: 0.7740
Epoch 56/300
157/157 2s 14ms/step - accuracy: 0.7558 - loss: 0.6896 - val_accuracy: 0.7408 - val_loss: 0.7573
Epoch 57/300
157/157 2s 14ms/step - accuracy: 0.7549 - loss: 0.6861 - val_accuracy: 0.7313 - val_loss: 0.7766
Epoch 58/300
157/157 2s 14ms/step - accuracy: 0.7529 - loss: 0.6951 - val_accuracy: 0.7405 - val_loss: 0.7641
Epoch 59/300
157/157 2s 14ms/step - accuracy: 0.7564 - loss: 0.6898 - val_accuracy: 0.7421 - val_loss: 0.7610
Epoch 60/300
157/157 2s 14ms/step - accuracy: 0.7543 - loss: 0.6856 - val_accuracy: 0.7371 - val_loss: 0.7612
Epoch 61/300
157/157 2s 14ms/step - accuracy: 0.7591 - loss: 0.6827 - val_accuracy: 0.7375 - val_loss: 0.7694
Epoch 62/300
157/157 2s 14ms/step - accuracy: 0.7587 - loss: 0.6877 - val_accuracy: 0.7370 - val_loss: 0.7790
Epoch 63/300
157/157 2s 14ms/step - accuracy: 0.7633 - loss: 0.6702 - val_accuracy: 0.7447 - val_loss: 0.7547
Epoch 64/300
157/157 2s 14ms/step - accuracy: 0.7663 - loss: 0.6631 - val_accuracy: 0.7436 - val_loss: 0.7759
Epoch 65/300
157/157 2s 14ms/step - accuracy: 0.7672 - loss: 0.6622 - val_accuracy: 0.7508 - val_loss: 0.7390
Epoch 66/300
157/157 2s 14ms/step - accuracy: 0.7622 - loss: 0.6718 - val_accuracy: 0.7342 - val_loss: 0.8029
Epoch 67/300
157/157 2s 14ms/step - accuracy: 0.7620 - loss: 0.6691 - val_accuracy: 0.7340 - val_loss: 0.8010
Epoch 68/300
157/157 2s 14ms/step - accuracy: 0.7630 - loss: 0.6718 - val_accuracy: 0.7507 - val_loss: 0.7549
Epoch 69/300
157/157 2s 14ms/step - accuracy: 0.7660 - loss: 0.6627 - val_accuracy: 0.7385 - val_loss: 0.8029
Epoch 70/300
157/157 2s 14ms/step - accuracy: 0.7666 - loss: 0.6569 - val_accuracy: 0.7615 - val_loss: 0.7238
Epoch 71/300
157/157 2s 14ms/step - accuracy: 0.7710 - loss: 0.6542 - val_accuracy: 0.7598 - val_loss: 0.7183
Epoch 72/300
157/157 2s 14ms/step - accuracy: 0.7667 - loss: 0.6559 - val_accuracy: 0.7298 - val_loss: 0.8213
Epoch 73/300
157/157 2s 14ms/step - accuracy: 0.7711 - loss: 0.6557 - val_accuracy: 0.7532 - val_loss: 0.7424
Epoch 74/300
157/157 2s 14ms/step - accuracy: 0.7727 - loss: 0.6393 - val_accuracy: 0.7567 - val_loss: 0.7234
Epoch 75/300
157/157 2s 14ms/step - accuracy: 0.7706 - loss: 0.6461 - val_accuracy: 0.7340 - val_loss: 0.7961
Epoch 76/300
157/157 2s 14ms/step - accuracy: 0.7723 - loss: 0.6462 - val_accuracy: 0.7503 - val_loss: 0.7447
Epoch 77/300
157/157 2s 14ms/step - accuracy: 0.7784 - loss: 0.6286 - val_accuracy: 0.7514 - val_loss: 0.7454
Epoch 78/300
157/157 2s 14ms/step - accuracy: 0.7705 - loss: 0.6526 - val_accuracy: 0.7611 - val_loss: 0.7170
Epoch 79/300
157/157 2s 14ms/step - accuracy: 0.7794 - loss: 0.6257 - val_accuracy: 0.7340 - val_loss: 0.8154
Epoch 80/300
157/157 2s 14ms/step - accuracy: 0.7758 - loss: 0.6396 - val_accuracy: 0.7645 - val_loss: 0.7171
Epoch 81/300
157/157 2s 14ms/step - accuracy: 0.7800 - loss: 0.6355 - val_accuracy: 0.7357 - val_loss: 0.7619
Epoch 82/300
157/157 2s 14ms/step - accuracy: 0.7767 - loss: 0.6313 - val_accuracy: 0.7486 - val_loss: 0.7469
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Epoch 83/300
157/157 2s 14ms/step - accuracy: 0.7760 - loss: 0.6343 - val_accuracy: 0.7545 - val_loss: 0.7373
Epoch 84/300
157/157 2s 14ms/step - accuracy: 0.7845 - loss: 0.6167 - val_accuracy: 0.7671 - val_loss: 0.7174
Epoch 85/300
157/157 2s 14ms/step - accuracy: 0.7820 - loss: 0.6159 - val_accuracy: 0.7559 - val_loss: 0.7700
Epoch 86/300
157/157 2s 14ms/step - accuracy: 0.7753 - loss: 0.6374 - val_accuracy: 0.7453 - val_loss: 0.7563
Epoch 87/300
157/157 2s 14ms/step - accuracy: 0.7786 - loss: 0.6256 - val_accuracy: 0.7674 - val_loss: 0.6872
Epoch 88/300
157/157 2s 14ms/step - accuracy: 0.7760 - loss: 0.6273 - val_accuracy: 0.7548 - val_loss: 0.7221
Epoch 89/300
157/157 2s 14ms/step - accuracy: 0.7764 - loss: 0.6307 - val_accuracy: 0.7802 - val_loss: 0.6532
Epoch 90/300
157/157 2s 14ms/step - accuracy: 0.7855 - loss: 0.6115 - val_accuracy: 0.7634 - val_loss: 0.7197
Epoch 91/300
157/157 2s 14ms/step - accuracy: 0.7771 - loss: 0.6312 - val_accuracy: 0.7488 - val_loss: 0.7628
Epoch 92/300
157/157 2s 14ms/step - accuracy: 0.7810 - loss: 0.6087 - val_accuracy: 0.7691 - val_loss: 0.7162
Epoch 93/300
157/157 2s 14ms/step - accuracy: 0.7865 - loss: 0.5999 - val_accuracy: 0.7645 - val_loss: 0.6998
Epoch 94/300
157/157 2s 14ms/step - accuracy: 0.7836 - loss: 0.6112 - val_accuracy: 0.7477 - val_loss: 0.7698
Epoch 95/300
157/157 2s 14ms/step - accuracy: 0.7852 - loss: 0.6197 - val_accuracy: 0.7761 - val_loss: 0.6875
Epoch 96/300
157/157 2s 14ms/step - accuracy: 0.7854 - loss: 0.6035 - val_accuracy: 0.7756 - val_loss: 0.6849
Epoch 97/300
157/157 2s 14ms/step - accuracy: 0.7905 - loss: 0.5958 - val_accuracy: 0.7679 - val_loss: 0.7044
Epoch 98/300
157/157 2s 14ms/step - accuracy: 0.7887 - loss: 0.5911 - val_accuracy: 0.7439 - val_loss: 0.7715
Epoch 99/300
157/157 2s 14ms/step - accuracy: 0.7842 - loss: 0.6036 - val_accuracy: 0.7738 - val_loss: 0.6817
Epoch 100/300
157/157 2s 14ms/step - accuracy: 0.7872 - loss: 0.6037 - val_accuracy: 0.7607 - val_loss: 0.7494
Epoch 101/300
157/157 2s 14ms/step - accuracy: 0.7864 - loss: 0.6075 - val_accuracy: 0.7754 - val_loss: 0.6889
Epoch 102/300
157/157 2s 14ms/step - accuracy: 0.7882 - loss: 0.5944 - val_accuracy: 0.7576 - val_loss: 0.7281
Epoch 103/300
157/157 2s 14ms/step - accuracy: 0.7888 - loss: 0.5990 - val_accuracy: 0.7752 - val_loss: 0.6814
Epoch 104/300
157/157 2s 14ms/step - accuracy: 0.7950 - loss: 0.5847 - val_accuracy: 0.7650 - val_loss: 0.7178
Epoch 105/300
157/157 2s 14ms/step - accuracy: 0.7852 - loss: 0.6093 - val_accuracy: 0.7626 - val_loss: 0.7245
Epoch 106/300
157/157 2s 14ms/step - accuracy: 0.7913 - loss: 0.6035 - val_accuracy: 0.7535 - val_loss: 0.7294
Epoch 107/300
157/157 2s 14ms/step - accuracy: 0.7873 - loss: 0.5987 - val_accuracy: 0.7725 - val_loss: 0.7012
Epoch 108/300
157/157 2s 14ms/step - accuracy: 0.7917 - loss: 0.5875 - val_accuracy: 0.7605 - val_loss: 0.7162
Epoch 109/300
157/157 2s 14ms/step - accuracy: 0.7984 - loss: 0.5797 - val_accuracy: 0.7433 - val_loss: 0.7722
Epoch 110/300
157/157 2s 14ms/step - accuracy: 0.7918 - loss: 0.5857 - val_accuracy: 0.7814 - val_loss: 0.6851
Epoch 111/300
157/157 2s 14ms/step - accuracy: 0.7920 - loss: 0.5874 - val_accuracy: 0.7530 - val_loss: 0.7443
Epoch 112/300
157/157 2s 14ms/step - accuracy: 0.7932 - loss: 0.5803 - val_accuracy: 0.7647 - val_loss: 0.7123
Epoch 113/300
157/157 2s 14ms/step - accuracy: 0.7969 - loss: 0.5859 - val_accuracy: 0.7589 - val_loss: 0.7186
Epoch 114/300
157/157 2s 14ms/step - accuracy: 0.7949 - loss: 0.5864 - val_accuracy: 0.7705 - val_loss: 0.6806
Epoch 115/300
157/157 2s 14ms/step - accuracy: 0.7974 - loss: 0.5749 - val_accuracy: 0.7692 - val_loss: 0.7000
Epoch 116/300
157/157 2s 14ms/step - accuracy: 0.7987 - loss: 0.5701 - val_accuracy: 0.7680 - val_loss: 0.6784
Epoch 117/300
157/157 2s 14ms/step - accuracy: 0.7958 - loss: 0.5855 - val_accuracy: 0.7450 - val_loss: 0.7452
Epoch 118/300
157/157 2s 14ms/step - accuracy: 0.7946 - loss: 0.5954 - val_accuracy: 0.7709 - val_loss: 0.6875
Epoch 119/300
157/157 2s 14ms/step - accuracy: 0.7906 - loss: 0.5905 - val_accuracy: 0.7682 - val_loss: 0.6800
Epoch 120/300
157/157 2s 14ms/step - accuracy: 0.7946 - loss: 0.5859 - val_accuracy: 0.7591 - val_loss: 0.7168
Epoch 121/300
157/157 2s 14ms/step - accuracy: 0.7976 - loss: 0.5733 - val_accuracy: 0.7681 - val_loss: 0.6864
Epoch 122/300
157/157 2s 14ms/step - accuracy: 0.7986 - loss: 0.5703 - val_accuracy: 0.7580 - val_loss: 0.7275
Epoch 123/300
157/157 2s 14ms/step - accuracy: 0.7906 - loss: 0.5898 - val_accuracy: 0.7490 - val_loss: 0.7594
Epoch 124/300
157/157 2s 14ms/step - accuracy: 0.8012 - loss: 0.5718 - val_accuracy: 0.7818 - val_loss: 0.6450
Epoch 125/300
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157/157 2s 14ms/step - accuracy: 0.7969 - loss: 0.5792 - val_accuracy: 0.7509 - val_loss: 0.7601
Epoch 126/300
157/157 2s 14ms/step - accuracy: 0.7957 - loss: 0.5748 - val_accuracy: 0.7840 - val_loss: 0.6579
Epoch 127/300
157/157 2s 14ms/step - accuracy: 0.7992 - loss: 0.5751 - val_accuracy: 0.7637 - val_loss: 0.7341
Epoch 128/300
157/157 2s 14ms/step - accuracy: 0.8011 - loss: 0.5727 - val_accuracy: 0.7694 - val_loss: 0.7022
Epoch 129/300
157/157 2s 14ms/step - accuracy: 0.7911 - loss: 0.5829 - val_accuracy: 0.7693 - val_loss: 0.6950
Epoch 130/300
157/157 2s 14ms/step - accuracy: 0.7982 - loss: 0.5679 - val_accuracy: 0.7727 - val_loss: 0.6894
Epoch 131/300
157/157 2s 14ms/step - accuracy: 0.7992 - loss: 0.5666 - val_accuracy: 0.7560 - val_loss: 0.7285
Epoch 132/300
157/157 2s 14ms/step - accuracy: 0.7967 - loss: 0.5808 - val_accuracy: 0.7721 - val_loss: 0.6810
Epoch 133/300
157/157 2s 14ms/step - accuracy: 0.7945 - loss: 0.5799 - val_accuracy: 0.7709 - val_loss: 0.6849
Epoch 134/300
157/157 2s 14ms/step - accuracy: 0.7949 - loss: 0.5860 - val_accuracy: 0.7586 - val_loss: 0.7381
Epoch 135/300
157/157 2s 14ms/step - accuracy: 0.8000 - loss: 0.5677 - val_accuracy: 0.7715 - val_loss: 0.7020
Epoch 136/300
157/157 2s 14ms/step - accuracy: 0.7994 - loss: 0.5685 - val_accuracy: 0.7705 - val_loss: 0.7030
Epoch 137/300
157/157 2s 14ms/step - accuracy: 0.8039 - loss: 0.5600 - val_accuracy: 0.7620 - val_loss: 0.7037
Epoch 138/300
157/157 2s 14ms/step - accuracy: 0.7979 - loss: 0.5848 - val_accuracy: 0.7729 - val_loss: 0.7027
Epoch 139/300
157/157 2s 14ms/step - accuracy: 0.8029 - loss: 0.5607 - val_accuracy: 0.7809 - val_loss: 0.6745
Epoch 140/300
157/157 2s 14ms/step - accuracy: 0.8040 - loss: 0.5587 - val_accuracy: 0.7561 - val_loss: 0.7459
Epoch 141/300
157/157 2s 14ms/step - accuracy: 0.8020 - loss: 0.5629 - val_accuracy: 0.7703 - val_loss: 0.6975
Epoch 142/300
157/157 2s 14ms/step - accuracy: 0.7986 - loss: 0.5726 - val_accuracy: 0.7808 - val_loss: 0.7021
Epoch 143/300
157/157 2s 14ms/step - accuracy: 0.8000 - loss: 0.5634 - val_accuracy: 0.7813 - val_loss: 0.6496
Epoch 144/300
157/157 2s 14ms/step - accuracy: 0.8047 - loss: 0.5556 - val_accuracy: 0.7859 - val_loss: 0.6412
Epoch 145/300
157/157 2s 14ms/step - accuracy: 0.8014 - loss: 0.5590 - val_accuracy: 0.7817 - val_loss: 0.6555
Epoch 146/300
157/157 2s 14ms/step - accuracy: 0.8028 - loss: 0.5559 - val_accuracy: 0.7747 - val_loss: 0.6749
Epoch 147/300
157/157 2s 14ms/step - accuracy: 0.8021 - loss: 0.5594 - val_accuracy: 0.7715 - val_loss: 0.6660
Epoch 148/300
157/157 2s 14ms/step - accuracy: 0.7986 - loss: 0.5669 - val_accuracy: 0.7848 - val_loss: 0.6730
Epoch 149/300
157/157 2s 14ms/step - accuracy: 0.7963 - loss: 0.5781 - val_accuracy: 0.7758 - val_loss: 0.6766
Epoch 150/300
157/157 2s 14ms/step - accuracy: 0.7998 - loss: 0.5661 - val_accuracy: 0.7767 - val_loss: 0.6759
Epoch 151/300
157/157 2s 14ms/step - accuracy: 0.8018 - loss: 0.5573 - val_accuracy: 0.7809 - val_loss: 0.6610
Epoch 152/300
157/157 2s 14ms/step - accuracy: 0.8018 - loss: 0.5654 - val_accuracy: 0.7669 - val_loss: 0.7014
Epoch 153/300
157/157 2s 14ms/step - accuracy: 0.8032 - loss: 0.5563 - val_accuracy: 0.7822 - val_loss: 0.6808
Epoch 154/300
157/157 2s 14ms/step - accuracy: 0.7983 - loss: 0.5657 - val_accuracy: 0.7741 - val_loss: 0.6780
Epoch 155/300
157/157 2s 14ms/step - accuracy: 0.8070 - loss: 0.5415 - val_accuracy: 0.7608 - val_loss: 0.7118
Epoch 156/300
157/157 2s 14ms/step - accuracy: 0.8053 - loss: 0.5557 - val_accuracy: 0.7626 - val_loss: 0.7163
Epoch 157/300
157/157 2s 14ms/step - accuracy: 0.8068 - loss: 0.5579 - val_accuracy: 0.7842 - val_loss: 0.6493
Epoch 158/300
157/157 2s 14ms/step - accuracy: 0.8047 - loss: 0.5573 - val_accuracy: 0.7806 - val_loss: 0.6723
Epoch 159/300
157/157 2s 14ms/step - accuracy: 0.8050 - loss: 0.5566 - val_accuracy: 0.7698 - val_loss: 0.7138
Epoch 160/300
157/157 2s 14ms/step - accuracy: 0.8039 - loss: 0.5612 - val_accuracy: 0.7764 - val_loss: 0.6616
Epoch 161/300
157/157 2s 14ms/step - accuracy: 0.8041 - loss: 0.5518 - val_accuracy: 0.7848 - val_loss: 0.6603
Epoch 162/300
157/157 2s 14ms/step - accuracy: 0.8058 - loss: 0.5520 - val_accuracy: 0.7813 - val_loss: 0.6503
Epoch 163/300
157/157 2s 14ms/step - accuracy: 0.8005 - loss: 0.5610 - val_accuracy: 0.7746 - val_loss: 0.6769
Epoch 164/300
157/157 2s 14ms/step - accuracy: 0.8065 - loss: 0.5516 - val_accuracy: 0.7718 - val_loss: 0.6804
Epoch 165/300
157/157 2s 14ms/step - accuracy: 0.8097 - loss: 0.5469 - val_accuracy: 0.7695 - val_loss: 0.7098
Epoch 166/300
157/157 2s 14ms/step - accuracy: 0.7951 - loss: 0.5795 - val_accuracy: 0.7812 - val_loss: 0.6704
Epoch 167/300
157/157 2s 14ms/step - accuracy: 0.8112 - loss: 0.5384 - val_accuracy: 0.7790 - val_loss: 0.6821

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Epoch 168/300
157/157 2s 14ms/step - accuracy: 0.8046 - loss: 0.5519 - val_accuracy: 0.7762 - val_loss: 0.6878
Epoch 169/300
157/157 2s 14ms/step - accuracy: 0.8069 - loss: 0.5521 - val_accuracy: 0.7606 - val_loss: 0.7480
Epoch 170/300
157/157 2s 14ms/step - accuracy: 0.8044 - loss: 0.5535 - val_accuracy: 0.7594 - val_loss: 0.7364
Epoch 171/300
157/157 2s 14ms/step - accuracy: 0.8045 - loss: 0.5480 - val_accuracy: 0.7759 - val_loss: 0.6708
Epoch 172/300
157/157 2s 14ms/step - accuracy: 0.8023 - loss: 0.5643 - val_accuracy: 0.7828 - val_loss: 0.6573
Epoch 173/300
157/157 2s 14ms/step - accuracy: 0.8075 - loss: 0.5450 - val_accuracy: 0.7688 - val_loss: 0.6834
Epoch 174/300
157/157 2s 14ms/step - accuracy: 0.8036 - loss: 0.5505 - val_accuracy: 0.7798 - val_loss: 0.6629
Epoch 175/300
157/157 2s 14ms/step - accuracy: 0.8112 - loss: 0.5480 - val_accuracy: 0.7750 - val_loss: 0.6714
Epoch 176/300
157/157 2s 14ms/step - accuracy: 0.8077 - loss: 0.5486 - val_accuracy: 0.7781 - val_loss: 0.6907
Epoch 177/300
157/157 2s 14ms/step - accuracy: 0.8073 - loss: 0.5442 - val_accuracy: 0.7818 - val_loss: 0.6536
Epoch 178/300
157/157 2s 14ms/step - accuracy: 0.8082 - loss: 0.5495 - val_accuracy: 0.7724 - val_loss: 0.6800
Epoch 179/300
157/157 2s 14ms/step - accuracy: 0.8083 - loss: 0.5451 - val_accuracy: 0.7800 - val_loss: 0.6685
Epoch 180/300
157/157 2s 14ms/step - accuracy: 0.8053 - loss: 0.5538 - val_accuracy: 0.7590 - val_loss: 0.7417
Epoch 181/300
157/157 2s 14ms/step - accuracy: 0.8066 - loss: 0.5527 - val_accuracy: 0.7619 - val_loss: 0.7322
Epoch 182/300
157/157 2s 14ms/step - accuracy: 0.8063 - loss: 0.5570 - val_accuracy: 0.7542 - val_loss: 0.7488
Epoch 183/300
157/157 2s 14ms/step - accuracy: 0.8022 - loss: 0.5586 - val_accuracy: 0.7723 - val_loss: 0.6953
Epoch 184/300
157/157 2s 14ms/step - accuracy: 0.8098 - loss: 0.5422 - val_accuracy: 0.7533 - val_loss: 0.7335
Epoch 185/300
157/157 2s 14ms/step - accuracy: 0.8069 - loss: 0.5522 - val_accuracy: 0.7820 - val_loss: 0.6519
Epoch 186/300
157/157 2s 14ms/step - accuracy: 0.8047 - loss: 0.5487 - val_accuracy: 0.7706 - val_loss: 0.6915
Epoch 187/300
157/157 2s 14ms/step - accuracy: 0.8101 - loss: 0.5399 - val_accuracy: 0.7737 - val_loss: 0.6758
Epoch 188/300
157/157 2s 14ms/step - accuracy: 0.8039 - loss: 0.5513 - val_accuracy: 0.7791 - val_loss: 0.6705
Epoch 189/300
157/157 2s 14ms/step - accuracy: 0.8062 - loss: 0.5492 - val_accuracy: 0.7614 - val_loss: 0.7368
Epoch 190/300
157/157 2s 14ms/step - accuracy: 0.8035 - loss: 0.5562 - val_accuracy: 0.7718 - val_loss: 0.7024
Epoch 191/300
157/157 2s 14ms/step - accuracy: 0.8081 - loss: 0.5469 - val_accuracy: 0.7706 - val_loss: 0.6903
Epoch 192/300
157/157 2s 14ms/step - accuracy: 0.8042 - loss: 0.5513 - val_accuracy: 0.7735 - val_loss: 0.6652
Epoch 193/300
157/157 2s 14ms/step - accuracy: 0.8031 - loss: 0.5498 - val_accuracy: 0.7774 - val_loss: 0.6769
Epoch 194/300
157/157 2s 14ms/step - accuracy: 0.8119 - loss: 0.5412 - val_accuracy: 0.7749 - val_loss: 0.6865
Epoch 195/300
157/157 2s 14ms/step - accuracy: 0.8101 - loss: 0.5372 - val_accuracy: 0.7783 - val_loss: 0.6764
Epoch 196/300
157/157 2s 14ms/step - accuracy: 0.8053 - loss: 0.5501 - val_accuracy: 0.7884 - val_loss: 0.6386
Epoch 197/300
157/157 2s 14ms/step - accuracy: 0.8109 - loss: 0.5437 - val_accuracy: 0.7802 - val_loss: 0.6668
Epoch 198/300
157/157 2s 14ms/step - accuracy: 0.8077 - loss: 0.5465 - val_accuracy: 0.7783 - val_loss: 0.6879
Epoch 199/300
157/157 2s 14ms/step - accuracy: 0.8047 - loss: 0.5516 - val_accuracy: 0.7740 - val_loss: 0.6867
Epoch 200/300
157/157 2s 14ms/step - accuracy: 0.8107 - loss: 0.5342 - val_accuracy: 0.7712 - val_loss: 0.6811
Epoch 201/300
157/157 2s 14ms/step - accuracy: 0.8032 - loss: 0.5616 - val_accuracy: 0.7598 - val_loss: 0.7615
Epoch 202/300
157/157 2s 14ms/step - accuracy: 0.8044 - loss: 0.5549 - val_accuracy: 0.7656 - val_loss: 0.7137
Epoch 203/300
157/157 2s 14ms/step - accuracy: 0.8045 - loss: 0.5567 - val_accuracy: 0.7419 - val_loss: 0.7626
Epoch 204/300
157/157 2s 14ms/step - accuracy: 0.8059 - loss: 0.5473 - val_accuracy: 0.7639 - val_loss: 0.7245
Epoch 205/300
157/157 2s 14ms/step - accuracy: 0.8077 - loss: 0.5496 - val_accuracy: 0.7891 - val_loss: 0.6596
Epoch 206/300
157/157 2s 14ms/step - accuracy: 0.8061 - loss: 0.5507 - val_accuracy: 0.7653 - val_loss: 0.6995
Epoch 207/300
157/157 2s 15ms/step - accuracy: 0.8065 - loss: 0.5510 - val_accuracy: 0.7851 - val_loss: 0.6551
Epoch 208/300
157/157 2s 14ms/step - accuracy: 0.8087 - loss: 0.5425 - val_accuracy: 0.7773 - val_loss: 0.6695
Epoch 209/300
157/157 2s 14ms/step - accuracy: 0.8128 - loss: 0.5379 - val_accuracy: 0.7597 - val_loss: 0.7224

```

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Epoch 210/300  
157/157 2s 14ms/step - accuracy: 0.8094 - loss: 0.5425 - val_accuracy: 0.7604 - val_loss: 0.7442  
Epoch 211/300  
157/157 2s 14ms/step - accuracy: 0.8030 - loss: 0.5523 - val_accuracy: 0.7865 - val_loss: 0.6676  
Epoch 212/300  
157/157 2s 14ms/step - accuracy: 0.8115 - loss: 0.5371 - val_accuracy: 0.7847 - val_loss: 0.6579  
Epoch 213/300  
157/157 2s 14ms/step - accuracy: 0.8112 - loss: 0.5388 - val_accuracy: 0.7808 - val_loss: 0.6681  
Epoch 214/300  
157/157 2s 14ms/step - accuracy: 0.8039 - loss: 0.5551 - val_accuracy: 0.7778 - val_loss: 0.6755  
Epoch 215/300  
157/157 2s 14ms/step - accuracy: 0.8076 - loss: 0.5541 - val_accuracy: 0.7584 - val_loss: 0.7273  
Epoch 216/300  
157/157 2s 14ms/step - accuracy: 0.8061 - loss: 0.5469 - val_accuracy: 0.7822 - val_loss: 0.6504  
Epoch 217/300  
157/157 2s 14ms/step - accuracy: 0.8078 - loss: 0.5406 - val_accuracy: 0.7663 - val_loss: 0.7262  
Epoch 218/300  
157/157 2s 14ms/step - accuracy: 0.8050 - loss: 0.5522 - val_accuracy: 0.7752 - val_loss: 0.6877  
Epoch 219/300  
157/157 2s 14ms/step - accuracy: 0.8037 - loss: 0.5574 - val_accuracy: 0.7789 - val_loss: 0.6713  
Epoch 220/300  
157/157 2s 14ms/step - accuracy: 0.8084 - loss: 0.5406 - val_accuracy: 0.7709 - val_loss: 0.6903  
Epoch 221/300  
157/157 2s 14ms/step - accuracy: 0.8057 - loss: 0.5542 - val_accuracy: 0.7802 - val_loss: 0.6781  
Epoch 222/300  
157/157 2s 14ms/step - accuracy: 0.8052 - loss: 0.5463 - val_accuracy: 0.7760 - val_loss: 0.6881  
Epoch 223/300  
157/157 2s 14ms/step - accuracy: 0.8050 - loss: 0.5472 - val_accuracy: 0.7671 - val_loss: 0.6964  
Epoch 224/300  
157/157 2s 14ms/step - accuracy: 0.8061 - loss: 0.5501 - val_accuracy: 0.7649 - val_loss: 0.6897  
Epoch 225/300  
157/157 2s 14ms/step - accuracy: 0.8118 - loss: 0.5399 - val_accuracy: 0.7653 - val_loss: 0.7146  
Epoch 226/300  
157/157 2s 14ms/step - accuracy: 0.8081 - loss: 0.5418 - val_accuracy: 0.7715 - val_loss: 0.6719  
Epoch 227/300  
157/157 2s 14ms/step - accuracy: 0.8105 - loss: 0.5374 - val_accuracy: 0.7769 - val_loss: 0.6832  
Epoch 228/300  
157/157 2s 14ms/step - accuracy: 0.8052 - loss: 0.5490 - val_accuracy: 0.7790 - val_loss: 0.6751  
Epoch 229/300  
157/157 2s 14ms/step - accuracy: 0.8082 - loss: 0.5464 - val_accuracy: 0.7626 - val_loss: 0.7033  
Epoch 230/300  
157/157 2s 14ms/step - accuracy: 0.8094 - loss: 0.5411 - val_accuracy: 0.7659 - val_loss: 0.7033  
Epoch 231/300  
157/157 2s 14ms/step - accuracy: 0.8062 - loss: 0.5476 - val_accuracy: 0.7515 - val_loss: 0.7561  
Epoch 232/300  
157/157 2s 14ms/step - accuracy: 0.8050 - loss: 0.5548 - val_accuracy: 0.7721 - val_loss: 0.6694  
Epoch 233/300  
157/157 2s 14ms/step - accuracy: 0.8100 - loss: 0.5404 - val_accuracy: 0.7624 - val_loss: 0.7112  
Epoch 234/300  
157/157 2s 14ms/step - accuracy: 0.8120 - loss: 0.5345 - val_accuracy: 0.7702 - val_loss: 0.7189  
Epoch 235/300  
157/157 2s 14ms/step - accuracy: 0.8118 - loss: 0.5452 - val_accuracy: 0.7777 - val_loss: 0.6815  
Epoch 236/300  
157/157 2s 14ms/step - accuracy: 0.8048 - loss: 0.5574 - val_accuracy: 0.7766 - val_loss: 0.6783  
Epoch 237/300  
157/157 2s 14ms/step - accuracy: 0.8056 - loss: 0.5512 - val_accuracy: 0.7683 - val_loss: 0.6897  
Epoch 238/300  
157/157 2s 14ms/step - accuracy: 0.8051 - loss: 0.5556 - val_accuracy: 0.7705 - val_loss: 0.7133  
Epoch 239/300  
157/157 2s 14ms/step - accuracy: 0.8055 - loss: 0.5449 - val_accuracy: 0.7773 - val_loss: 0.6858  
Epoch 240/300  
157/157 2s 14ms/step - accuracy: 0.8083 - loss: 0.5564 - val_accuracy: 0.7701 - val_loss: 0.6913  
Epoch 241/300  
157/157 2s 14ms/step - accuracy: 0.8075 - loss: 0.5441 - val_accuracy: 0.7613 - val_loss: 0.7110  
Epoch 242/300  
157/157 2s 14ms/step - accuracy: 0.8072 - loss: 0.5502 - val_accuracy: 0.7667 - val_loss: 0.7403  
Epoch 243/300  
157/157 2s 14ms/step - accuracy: 0.8034 - loss: 0.5538 - val_accuracy: 0.7633 - val_loss: 0.7095  
Epoch 244/300  
157/157 2s 14ms/step - accuracy: 0.8077 - loss: 0.5447 - val_accuracy: 0.7703 - val_loss: 0.6917  
Epoch 245/300  
157/157 2s 14ms/step - accuracy: 0.8056 - loss: 0.5527 - val_accuracy: 0.7688 - val_loss: 0.7115  
Epoch 246/300  
157/157 2s 14ms/step - accuracy: 0.8069 - loss: 0.5503 - val_accuracy: 0.7623 - val_loss: 0.7172  
Epoch 247/300  
157/157 2s 14ms/step - accuracy: 0.8049 - loss: 0.5542 - val_accuracy: 0.7803 - val_loss: 0.6765  
Epoch 248/300  
157/157 2s 14ms/step - accuracy: 0.8022 - loss: 0.5613 - val_accuracy: 0.7676 - val_loss: 0.7008  
Epoch 249/300  
157/157 2s 14ms/step - accuracy: 0.8104 - loss: 0.5368 - val_accuracy: 0.7691 - val_loss: 0.6843  
Epoch 250/300  
157/157 2s 14ms/step - accuracy: 0.8098 - loss: 0.5463 - val_accuracy: 0.7565 - val_loss: 0.7362  
Epoch 251/300  
157/157 2s 14ms/step - accuracy: 0.8088 - loss: 0.5436 - val_accuracy: 0.7775 - val_loss: 0.6629  
Epoch 252/300
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157/157 2s 14ms/step - accuracy: 0.8000 - loss: 0.5614 - val_accuracy: 0.7697 - val_loss: 0.7118
Epoch 253/300
157/157 2s 14ms/step - accuracy: 0.8076 - loss: 0.5472 - val_accuracy: 0.7704 - val_loss: 0.7151
Epoch 254/300
157/157 2s 14ms/step - accuracy: 0.8067 - loss: 0.5418 - val_accuracy: 0.7841 - val_loss: 0.6764
Epoch 255/300
157/157 2s 14ms/step - accuracy: 0.8084 - loss: 0.5417 - val_accuracy: 0.7563 - val_loss: 0.7472
Epoch 256/300
157/157 2s 14ms/step - accuracy: 0.8079 - loss: 0.5418 - val_accuracy: 0.7591 - val_loss: 0.7495
Epoch 257/300
157/157 2s 14ms/step - accuracy: 0.8083 - loss: 0.5493 - val_accuracy: 0.7699 - val_loss: 0.6929
Epoch 258/300
157/157 2s 14ms/step - accuracy: 0.8068 - loss: 0.5499 - val_accuracy: 0.7522 - val_loss: 0.7525
Epoch 259/300
157/157 2s 14ms/step - accuracy: 0.8047 - loss: 0.5492 - val_accuracy: 0.7701 - val_loss: 0.6973
Epoch 260/300
157/157 2s 14ms/step - accuracy: 0.8088 - loss: 0.5467 - val_accuracy: 0.7665 - val_loss: 0.7151
Epoch 261/300
157/157 2s 14ms/step - accuracy: 0.8063 - loss: 0.5509 - val_accuracy: 0.7616 - val_loss: 0.7174
Epoch 262/300
157/157 2s 14ms/step - accuracy: 0.8102 - loss: 0.5399 - val_accuracy: 0.7668 - val_loss: 0.6989
Epoch 263/300
157/157 2s 14ms/step - accuracy: 0.8068 - loss: 0.5482 - val_accuracy: 0.7637 - val_loss: 0.7147
Epoch 264/300
157/157 2s 14ms/step - accuracy: 0.8073 - loss: 0.5387 - val_accuracy: 0.7768 - val_loss: 0.6871
Epoch 265/300
157/157 2s 14ms/step - accuracy: 0.8093 - loss: 0.5394 - val_accuracy: 0.7653 - val_loss: 0.6891
Epoch 266/300
157/157 2s 14ms/step - accuracy: 0.8116 - loss: 0.5379 - val_accuracy: 0.7615 - val_loss: 0.7204
Epoch 267/300
157/157 2s 14ms/step - accuracy: 0.8043 - loss: 0.5590 - val_accuracy: 0.7562 - val_loss: 0.7221
Epoch 268/300
157/157 2s 14ms/step - accuracy: 0.8126 - loss: 0.5343 - val_accuracy: 0.7617 - val_loss: 0.7307
Epoch 269/300
157/157 2s 14ms/step - accuracy: 0.8096 - loss: 0.5461 - val_accuracy: 0.7576 - val_loss: 0.7273
Epoch 270/300
157/157 2s 14ms/step - accuracy: 0.8109 - loss: 0.5482 - val_accuracy: 0.7623 - val_loss: 0.7078
Epoch 271/300
157/157 2s 14ms/step - accuracy: 0.8043 - loss: 0.5614 - val_accuracy: 0.7591 - val_loss: 0.7281
Epoch 272/300
157/157 2s 14ms/step - accuracy: 0.8089 - loss: 0.5413 - val_accuracy: 0.7747 - val_loss: 0.6801
Epoch 273/300
157/157 2s 14ms/step - accuracy: 0.8084 - loss: 0.5492 - val_accuracy: 0.7599 - val_loss: 0.7144
Epoch 274/300
157/157 2s 14ms/step - accuracy: 0.8040 - loss: 0.5537 - val_accuracy: 0.7770 - val_loss: 0.6755
Epoch 275/300
157/157 2s 14ms/step - accuracy: 0.8066 - loss: 0.5433 - val_accuracy: 0.7631 - val_loss: 0.7095
Epoch 276/300
157/157 2s 14ms/step - accuracy: 0.8095 - loss: 0.5497 - val_accuracy: 0.7610 - val_loss: 0.7159
Epoch 277/300
157/157 2s 14ms/step - accuracy: 0.8099 - loss: 0.5358 - val_accuracy: 0.7441 - val_loss: 0.7610
Epoch 278/300
157/157 2s 14ms/step - accuracy: 0.8082 - loss: 0.5360 - val_accuracy: 0.7690 - val_loss: 0.6835
Epoch 279/300
157/157 2s 14ms/step - accuracy: 0.8047 - loss: 0.5531 - val_accuracy: 0.7656 - val_loss: 0.7180
Epoch 280/300
157/157 2s 14ms/step - accuracy: 0.8062 - loss: 0.5522 - val_accuracy: 0.7667 - val_loss: 0.7099
Epoch 281/300
157/157 2s 14ms/step - accuracy: 0.8056 - loss: 0.5448 - val_accuracy: 0.7604 - val_loss: 0.7063
Epoch 282/300
157/157 2s 14ms/step - accuracy: 0.8030 - loss: 0.5523 - val_accuracy: 0.7713 - val_loss: 0.6878
Epoch 283/300
157/157 2s 14ms/step - accuracy: 0.8096 - loss: 0.5439 - val_accuracy: 0.7676 - val_loss: 0.6953
Epoch 284/300
157/157 2s 14ms/step - accuracy: 0.8104 - loss: 0.5435 - val_accuracy: 0.7543 - val_loss: 0.7204
Epoch 285/300
157/157 2s 14ms/step - accuracy: 0.8060 - loss: 0.5526 - val_accuracy: 0.7512 - val_loss: 0.7551
Epoch 286/300
157/157 2s 14ms/step - accuracy: 0.8057 - loss: 0.5547 - val_accuracy: 0.7513 - val_loss: 0.7414
Epoch 287/300
157/157 2s 14ms/step - accuracy: 0.8076 - loss: 0.5473 - val_accuracy: 0.7515 - val_loss: 0.7280
Epoch 288/300
157/157 2s 14ms/step - accuracy: 0.8083 - loss: 0.5442 - val_accuracy: 0.7744 - val_loss: 0.6719
Epoch 289/300
157/157 2s 14ms/step - accuracy: 0.8064 - loss: 0.5469 - val_accuracy: 0.7562 - val_loss: 0.7385
Epoch 290/300
157/157 2s 14ms/step - accuracy: 0.8032 - loss: 0.5507 - val_accuracy: 0.7578 - val_loss: 0.7342
Epoch 291/300
157/157 2s 14ms/step - accuracy: 0.8018 - loss: 0.5599 - val_accuracy: 0.7624 - val_loss: 0.7173
Epoch 292/300
157/157 2s 14ms/step - accuracy: 0.8086 - loss: 0.5493 - val_accuracy: 0.7401 - val_loss: 0.7658
Epoch 293/300
157/157 2s 14ms/step - accuracy: 0.8048 - loss: 0.5503 - val_accuracy: 0.7665 - val_loss: 0.6864
Epoch 294/300
157/157 2s 14ms/step - accuracy: 0.8161 - loss: 0.5296 - val_accuracy: 0.7571 - val_loss: 0.7235
```

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Epoch 295/300
157/157 2s 14ms/step - accuracy: 0.8058 - loss: 0.5493 - val_accuracy: 0.7734 - val_loss: 0.6878
Epoch 296/300
157/157 2s 14ms/step - accuracy: 0.8091 - loss: 0.5415 - val_accuracy: 0.7779 - val_loss: 0.6806
Epoch 297/300
157/157 2s 14ms/step - accuracy: 0.8045 - loss: 0.5629 - val_accuracy: 0.7698 - val_loss: 0.6901
Epoch 298/300
157/157 2s 14ms/step - accuracy: 0.8069 - loss: 0.5495 - val_accuracy: 0.7675 - val_loss: 0.7140
Epoch 299/300
157/157 2s 14ms/step - accuracy: 0.8097 - loss: 0.5473 - val_accuracy: 0.7525 - val_loss: 0.7406
Epoch 300/300
157/157 2s 14ms/step - accuracy: 0.8043 - loss: 0.5557 - val_accuracy: 0.7553 - val_loss: 0.7243
Dropout (p=0.3) (NO BN) - Training Time: 714.22s, Test Accuracy: 0.7520, Final Train Loss: 0.5600
Model: "functional_4"

```

| Layer (type) | Output Shape | Param # | Connected to |
|---|--------------------|---------|--|
| input_layer_4 (InputLayer) | (None, 32, 32, 3) | 0 | - |
| conv2d_84 (Conv2D) | (None, 32, 32, 32) | 896 | input_layer_4[0]... |
| batch_normalizatio... (BatchNormalizatio...) | (None, 32, 32, 32) | 128 | conv2d_84[0][0] |
| conv2d_85 (Conv2D) | (None, 32, 32, 32) | 9,248 | batch_normalizat... |
| batch_normalizatio... (BatchNormalizatio...) | (None, 32, 32, 32) | 128 | conv2d_85[0][0] |
| conv2d_86 (Conv2D) | (None, 32, 32, 32) | 9,248 | batch_normalizat... |
| batch_normalizatio... (BatchNormalizatio...) | (None, 32, 32, 32) | 128 | conv2d_86[0][0] |
| add_40 (Add) | (None, 32, 32, 32) | 0 | batch_normalizat... batch_normalizat... |
| re_lu_40 (ReLU) | (None, 32, 32, 32) | 0 | add_40[0][0] |
| conv2d_87 (Conv2D) | (None, 32, 32, 32) | 9,248 | re_lu_40[0][0] |
| batch_normalizatio... (BatchNormalizatio...) | (None, 32, 32, 32) | 128 | conv2d_87[0][0] |
| conv2d_88 (Conv2D) | (None, 32, 32, 32) | 9,248 | batch_normalizat... |
| batch_normalizatio... (BatchNormalizatio...) | (None, 32, 32, 32) | 128 | conv2d_88[0][0] |
| add_41 (Add) | (None, 32, 32, 32) | 0 | re_lu_40[0][0], batch_normalizat... |
| re_lu_41 (ReLU) | (None, 32, 32, 32) | 0 | add_41[0][0] |
| conv2d_89 (Conv2D) | (None, 32, 32, 32) | 9,248 | re_lu_41[0][0] |
| batch_normalizatio... (BatchNormalizatio...) | (None, 32, 32, 32) | 128 | conv2d_89[0][0] |
| conv2d_90 (Conv2D) | (None, 32, 32, 32) | 9,248 | batch_normalizat... |
| batch_normalizatio... (BatchNormalizatio...) | (None, 32, 32, 32) | 128 | conv2d_90[0][0] |
| add_42 (Add) | (None, 32, 32, 32) | 0 | re_lu_41[0][0], batch_normalizat... |
| re_lu_42 (ReLU) | (None, 32, 32, 32) | 0 | add_42[0][0] |
| conv2d_91 (Conv2D) | (None, 32, 32, 32) | 9,248 | re_lu_42[0][0] |
| batch_normalizatio... (BatchNormalizatio...) | (None, 32, 32, 32) | 128 | conv2d_91[0][0] |

| | | | |
|--|--------------------|-------|-------------------------------------|
| conv2d_92 (Conv2D) | (None, 32, 32, 32) | 9,248 | batch_normalizat... |
| batch_normalizatio... (BatchNormalizatio...) | (None, 32, 32, 32) | 128 | conv2d_92[0][0] |
| add_43 (Add) | (None, 32, 32, 32) | 0 | re_lu_42[0][0], batch_normalizat... |
| re_lu_43 (ReLU) | (None, 32, 32, 32) | 0 | add_43[0][0] |
| conv2d_93 (Conv2D) | (None, 32, 32, 32) | 9,248 | re_lu_43[0][0] |
| batch_normalizatio... (BatchNormalizatio...) | (None, 32, 32, 32) | 128 | conv2d_93[0][0] |
| conv2d_94 (Conv2D) | (None, 32, 32, 32) | 9,248 | batch_normalizat... |
| batch_normalizatio... (BatchNormalizatio...) | (None, 32, 32, 32) | 128 | conv2d_94[0][0] |
| add_44 (Add) | (None, 32, 32, 32) | 0 | re_lu_43[0][0], batch_normalizat... |
| re_lu_44 (ReLU) | (None, 32, 32, 32) | 0 | add_44[0][0] |
| conv2d_95 (Conv2D) | (None, 32, 32, 32) | 9,248 | re_lu_44[0][0] |
| batch_normalizatio... (BatchNormalizatio...) | (None, 32, 32, 32) | 128 | conv2d_95[0][0] |
| conv2d_96 (Conv2D) | (None, 32, 32, 32) | 9,248 | batch_normalizat... |
| batch_normalizatio... (BatchNormalizatio...) | (None, 32, 32, 32) | 128 | conv2d_96[0][0] |
| add_45 (Add) | (None, 32, 32, 32) | 0 | re_lu_44[0][0], batch_normalizat... |
| re_lu_45 (ReLU) | (None, 32, 32, 32) | 0 | add_45[0][0] |
| conv2d_97 (Conv2D) | (None, 32, 32, 32) | 9,248 | re_lu_45[0][0] |
| batch_normalizatio... (BatchNormalizatio...) | (None, 32, 32, 32) | 128 | conv2d_97[0][0] |
| conv2d_98 (Conv2D) | (None, 32, 32, 32) | 9,248 | batch_normalizat... |
| batch_normalizatio... (BatchNormalizatio...) | (None, 32, 32, 32) | 128 | conv2d_98[0][0] |
| add_46 (Add) | (None, 32, 32, 32) | 0 | re_lu_45[0][0], batch_normalizat... |
| re_lu_46 (ReLU) | (None, 32, 32, 32) | 0 | add_46[0][0] |
| conv2d_99 (Conv2D) | (None, 32, 32, 32) | 9,248 | re_lu_46[0][0] |
| batch_normalizatio... (BatchNormalizatio...) | (None, 32, 32, 32) | 128 | conv2d_99[0][0] |
| conv2d_100 (Conv2D) | (None, 32, 32, 32) | 9,248 | batch_normalizat... |
| batch_normalizatio... (BatchNormalizatio...) | (None, 32, 32, 32) | 128 | conv2d_100[0][0] |
| add_47 (Add) | (None, 32, 32, 32) | 0 | re_lu_46[0][0], batch_normalizat... |
| re_lu_47 (ReLU) | (None, 32, 32, 32) | 0 | add_47[0][0] |
| conv2d_101 (Conv2D) | (None, 32, 32, 32) | 9,248 | re_lu_47[0][0] |

| | | | |
|---|--------------------|-------|-------------------------------------|
| batch_normalizatio... (BatchNormalizatio...) | (None, 32, 32, 32) | 128 | conv2d_101[0][0] |
| conv2d_102 (Conv2D) | (None, 32, 32, 32) | 9,248 | batch_normalizat... |
| batch_normalizatio... (BatchNormalizatio...) | (None, 32, 32, 32) | 128 | conv2d_102[0][0] |
| add_48 (Add) | (None, 32, 32, 32) | 0 | re_lu_47[0][0], batch_normalizat... |
| re_lu_48 (ReLU) | (None, 32, 32, 32) | 0 | add_48[0][0] |
| conv2d_103 (Conv2D) | (None, 32, 32, 32) | 9,248 | re_lu_48[0][0] |
| batch_normalizatio... (BatchNormalizatio...) | (None, 32, 32, 32) | 128 | conv2d_103[0][0] |
| conv2d_104 (Conv2D) | (None, 32, 32, 32) | 9,248 | batch_normalizat... |
| batch_normalizatio... (BatchNormalizatio...) | (None, 32, 32, 32) | 128 | conv2d_104[0][0] |
| add_49 (Add) | (None, 32, 32, 32) | 0 | re_lu_48[0][0], batch_normalizat... |
| re_lu_49 (ReLU) | (None, 32, 32, 32) | 0 | add_49[0][0] |
| global_average_poo... (GlobalAveragePool...) | (None, 32) | 0 | re_lu_49[0][0] |
| dense_4 (Dense) | (None, 10) | 330 | global_average_p... |

Total params: 188,874 (737.79 KB)

Trainable params: 187,530 (732.54 KB)

Non-trainable params: 1,344 (5.25 KB)

===== Training: Batch Normalization ONLY =====

Epoch 1/300

157/157 40s 105ms/step - accuracy: 0.3167 - loss: 2.1538 - val_accuracy: 0.1383 - val_loss: 3.2090

Epoch 2/300

157/157 2s 15ms/step - accuracy: 0.5464 - loss: 1.2629 - val_accuracy: 0.1693 - val_loss: 3.1913

Epoch 3/300

157/157 2s 15ms/step - accuracy: 0.6330 - loss: 1.0297 - val_accuracy: 0.2801 - val_loss: 2.5674

Epoch 4/300

157/157 2s 15ms/step - accuracy: 0.6790 - loss: 0.8996 - val_accuracy: 0.5679 - val_loss: 1.2979

Epoch 5/300

157/157 2s 15ms/step - accuracy: 0.7074 - loss: 0.8239 - val_accuracy: 0.5619 - val_loss: 1.4189

Epoch 6/300

157/157 2s 15ms/step - accuracy: 0.7327 - loss: 0.7533 - val_accuracy: 0.5794 - val_loss: 1.3648

Epoch 7/300

157/157 2s 15ms/step - accuracy: 0.7578 - loss: 0.6932 - val_accuracy: 0.6814 - val_loss: 0.9524

Epoch 8/300

157/157 2s 15ms/step - accuracy: 0.7734 - loss: 0.6479 - val_accuracy: 0.5538 - val_loss: 1.5840

Epoch 9/300

157/157 2s 15ms/step - accuracy: 0.7884 - loss: 0.6019 - val_accuracy: 0.6117 - val_loss: 1.3818

Epoch 10/300

157/157 2s 15ms/step - accuracy: 0.8093 - loss: 0.5501 - val_accuracy: 0.6804 - val_loss: 0.9339

Epoch 11/300

157/157 2s 15ms/step - accuracy: 0.8144 - loss: 0.5302 - val_accuracy: 0.6866 - val_loss: 0.9414

Epoch 12/300

157/157 2s 15ms/step - accuracy: 0.8344 - loss: 0.4872 - val_accuracy: 0.6443 - val_loss: 1.1397

Epoch 13/300

157/157 2s 15ms/step - accuracy: 0.8390 - loss: 0.4623 - val_accuracy: 0.7054 - val_loss: 0.9524

Epoch 14/300

157/157 2s 15ms/step - accuracy: 0.8484 - loss: 0.4388 - val_accuracy: 0.5154 - val_loss: 2.2604

Epoch 15/300

157/157 2s 15ms/step - accuracy: 0.8618 - loss: 0.3985 - val_accuracy: 0.6976 - val_loss: 1.0224

Epoch 16/300

157/157 2s 15ms/step - accuracy: 0.8637 - loss: 0.3897 - val_accuracy: 0.6516 - val_loss: 1.3219

Epoch 17/300

157/157 2s 15ms/step - accuracy: 0.8782 - loss: 0.3613 - val_accuracy: 0.6887 - val_loss: 1.0622

Epoch 18/300

157/157 2s 15ms/step - accuracy: 0.8809 - loss: 0.3410 - val_accuracy: 0.6751 - val_loss: 1.1076

Epoch 19/300

157/157 2s 15ms/step - accuracy: 0.8866 - loss: 0.3349 - val_accuracy: 0.7085 - val_loss: 1.0459

Epoch 20/300

157/157 2s 15ms/step - accuracy: 0.8954 - loss: 0.3001 - val_accuracy: 0.6926 - val_loss: 1.1555

Epoch 21/300

157/157 2s 15ms/step - accuracy: 0.9087 - loss: 0.2702 - val_accuracy: 0.6687 - val_loss: 1.4539

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Epoch 22/300
157/157 2s 15ms/step - accuracy: 0.9125 - loss: 0.2554 - val_accuracy: 0.7333 - val_loss: 0.8936
Epoch 23/300
157/157 2s 15ms/step - accuracy: 0.9104 - loss: 0.2618 - val_accuracy: 0.6966 - val_loss: 1.2670
Epoch 24/300
157/157 2s 15ms/step - accuracy: 0.9179 - loss: 0.2379 - val_accuracy: 0.6456 - val_loss: 1.5735
Epoch 25/300
157/157 2s 15ms/step - accuracy: 0.9264 - loss: 0.2185 - val_accuracy: 0.6660 - val_loss: 1.4653
Epoch 26/300
157/157 2s 15ms/step - accuracy: 0.9255 - loss: 0.2156 - val_accuracy: 0.6827 - val_loss: 1.2561
Epoch 27/300
157/157 2s 15ms/step - accuracy: 0.9375 - loss: 0.1867 - val_accuracy: 0.6311 - val_loss: 1.4960
Epoch 28/300
157/157 2s 15ms/step - accuracy: 0.9397 - loss: 0.1787 - val_accuracy: 0.6796 - val_loss: 1.3693
Epoch 29/300
157/157 2s 15ms/step - accuracy: 0.9395 - loss: 0.1746 - val_accuracy: 0.7238 - val_loss: 1.1950
Epoch 30/300
157/157 2s 15ms/step - accuracy: 0.9433 - loss: 0.1664 - val_accuracy: 0.5768 - val_loss: 2.0399
Epoch 31/300
157/157 2s 15ms/step - accuracy: 0.9482 - loss: 0.1557 - val_accuracy: 0.7015 - val_loss: 1.2270
Epoch 32/300
157/157 2s 15ms/step - accuracy: 0.9542 - loss: 0.1367 - val_accuracy: 0.7212 - val_loss: 1.2297
Epoch 33/300
157/157 2s 15ms/step - accuracy: 0.9510 - loss: 0.1425 - val_accuracy: 0.6726 - val_loss: 1.4945
Epoch 34/300
157/157 2s 15ms/step - accuracy: 0.9545 - loss: 0.1383 - val_accuracy: 0.6384 - val_loss: 2.1604
Epoch 35/300
157/157 2s 15ms/step - accuracy: 0.9555 - loss: 0.1292 - val_accuracy: 0.7036 - val_loss: 1.2705
Epoch 36/300
157/157 2s 15ms/step - accuracy: 0.9637 - loss: 0.1110 - val_accuracy: 0.6784 - val_loss: 1.5470
Epoch 37/300
157/157 2s 15ms/step - accuracy: 0.9697 - loss: 0.0987 - val_accuracy: 0.7150 - val_loss: 1.4004
Epoch 38/300
157/157 2s 15ms/step - accuracy: 0.9665 - loss: 0.1086 - val_accuracy: 0.7254 - val_loss: 1.2495
Epoch 39/300
157/157 2s 15ms/step - accuracy: 0.9651 - loss: 0.1045 - val_accuracy: 0.7180 - val_loss: 1.3333
Epoch 40/300
157/157 2s 15ms/step - accuracy: 0.9594 - loss: 0.1147 - val_accuracy: 0.6775 - val_loss: 1.6392
Epoch 41/300
157/157 2s 15ms/step - accuracy: 0.9695 - loss: 0.0915 - val_accuracy: 0.6283 - val_loss: 2.2178
Epoch 42/300
157/157 2s 15ms/step - accuracy: 0.9728 - loss: 0.0823 - val_accuracy: 0.6575 - val_loss: 2.0536
Epoch 43/300
157/157 2s 15ms/step - accuracy: 0.9692 - loss: 0.0928 - val_accuracy: 0.6246 - val_loss: 3.3888
Epoch 44/300
157/157 2s 15ms/step - accuracy: 0.9585 - loss: 0.1168 - val_accuracy: 0.6730 - val_loss: 1.7478
Epoch 45/300
157/157 2s 15ms/step - accuracy: 0.9736 - loss: 0.0798 - val_accuracy: 0.6962 - val_loss: 1.5796
Epoch 46/300
157/157 2s 15ms/step - accuracy: 0.9700 - loss: 0.0910 - val_accuracy: 0.6713 - val_loss: 2.2203
Epoch 47/300
157/157 2s 15ms/step - accuracy: 0.9750 - loss: 0.0756 - val_accuracy: 0.7500 - val_loss: 1.1494
Epoch 48/300
157/157 2s 15ms/step - accuracy: 0.9785 - loss: 0.0672 - val_accuracy: 0.6953 - val_loss: 1.4216
Epoch 49/300
157/157 2s 15ms/step - accuracy: 0.9758 - loss: 0.0717 - val_accuracy: 0.7250 - val_loss: 1.3182
Epoch 50/300
157/157 2s 15ms/step - accuracy: 0.9643 - loss: 0.1005 - val_accuracy: 0.7124 - val_loss: 1.3418
Epoch 51/300
157/157 2s 15ms/step - accuracy: 0.9686 - loss: 0.0911 - val_accuracy: 0.7289 - val_loss: 1.3997
Epoch 52/300
157/157 2s 15ms/step - accuracy: 0.9805 - loss: 0.0612 - val_accuracy: 0.7452 - val_loss: 1.1573
Epoch 53/300
157/157 2s 15ms/step - accuracy: 0.9788 - loss: 0.0670 - val_accuracy: 0.7487 - val_loss: 1.3802
Epoch 54/300
157/157 2s 15ms/step - accuracy: 0.9784 - loss: 0.0664 - val_accuracy: 0.6741 - val_loss: 1.9752
Epoch 55/300
157/157 2s 15ms/step - accuracy: 0.9854 - loss: 0.0461 - val_accuracy: 0.7467 - val_loss: 1.3661
Epoch 56/300
157/157 2s 15ms/step - accuracy: 0.9745 - loss: 0.0745 - val_accuracy: 0.6891 - val_loss: 1.7512
Epoch 57/300
157/157 2s 15ms/step - accuracy: 0.9736 - loss: 0.0779 - val_accuracy: 0.7356 - val_loss: 1.4106
Epoch 58/300
157/157 2s 15ms/step - accuracy: 0.9706 - loss: 0.0843 - val_accuracy: 0.6962 - val_loss: 1.8480
Epoch 59/300
157/157 2s 15ms/step - accuracy: 0.9777 - loss: 0.0646 - val_accuracy: 0.7487 - val_loss: 1.3448
Epoch 60/300
157/157 2s 15ms/step - accuracy: 0.9850 - loss: 0.0477 - val_accuracy: 0.6724 - val_loss: 2.4623
Epoch 61/300
157/157 2s 15ms/step - accuracy: 0.9843 - loss: 0.0464 - val_accuracy: 0.6959 - val_loss: 2.0530
Epoch 62/300
157/157 2s 15ms/step - accuracy: 0.9766 - loss: 0.0698 - val_accuracy: 0.6619 - val_loss: 1.9563
Epoch 63/300
157/157 2s 15ms/step - accuracy: 0.9676 - loss: 0.0888 - val_accuracy: 0.7088 - val_loss: 1.6353
Epoch 64/300
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157/157 2s 15ms/step - accuracy: 0.9810 - loss: 0.0586 - val_accuracy: 0.6286 - val_loss: 3.0975
Epoch 65/300
157/157 2s 15ms/step - accuracy: 0.9722 - loss: 0.0802 - val_accuracy: 0.7466 - val_loss: 1.2677
Epoch 66/300
157/157 2s 15ms/step - accuracy: 0.9769 - loss: 0.0690 - val_accuracy: 0.7184 - val_loss: 1.8052
Epoch 67/300
157/157 2s 15ms/step - accuracy: 0.9815 - loss: 0.0534 - val_accuracy: 0.7115 - val_loss: 1.6632
Epoch 68/300
157/157 2s 15ms/step - accuracy: 0.9899 - loss: 0.0341 - val_accuracy: 0.7559 - val_loss: 1.3376
Epoch 69/300
157/157 2s 15ms/step - accuracy: 0.9937 - loss: 0.0226 - val_accuracy: 0.7529 - val_loss: 1.4053
Epoch 70/300
157/157 2s 15ms/step - accuracy: 0.9862 - loss: 0.0413 - val_accuracy: 0.7191 - val_loss: 1.5422
Epoch 71/300
157/157 2s 15ms/step - accuracy: 0.9696 - loss: 0.0869 - val_accuracy: 0.6804 - val_loss: 1.8429
Epoch 72/300
157/157 2s 15ms/step - accuracy: 0.9657 - loss: 0.0922 - val_accuracy: 0.7193 - val_loss: 1.7943
Epoch 73/300
157/157 2s 15ms/step - accuracy: 0.9849 - loss: 0.0471 - val_accuracy: 0.6950 - val_loss: 2.1254
Epoch 74/300
157/157 2s 15ms/step - accuracy: 0.9831 - loss: 0.0476 - val_accuracy: 0.7384 - val_loss: 1.5233
Epoch 75/300
157/157 2s 15ms/step - accuracy: 0.9841 - loss: 0.0489 - val_accuracy: 0.7631 - val_loss: 1.3258
Epoch 76/300
157/157 2s 15ms/step - accuracy: 0.9874 - loss: 0.0378 - val_accuracy: 0.7091 - val_loss: 1.7724
Epoch 77/300
157/157 2s 15ms/step - accuracy: 0.9838 - loss: 0.0475 - val_accuracy: 0.7758 - val_loss: 1.2765
Epoch 78/300
157/157 2s 15ms/step - accuracy: 0.9810 - loss: 0.0565 - val_accuracy: 0.7270 - val_loss: 1.8828
Epoch 79/300
157/157 2s 15ms/step - accuracy: 0.9814 - loss: 0.0510 - val_accuracy: 0.7175 - val_loss: 1.7629
Epoch 80/300
157/157 2s 15ms/step - accuracy: 0.9837 - loss: 0.0478 - val_accuracy: 0.7228 - val_loss: 1.8525
Epoch 81/300
157/157 2s 15ms/step - accuracy: 0.9883 - loss: 0.0364 - val_accuracy: 0.6619 - val_loss: 2.4864
Epoch 82/300
157/157 2s 15ms/step - accuracy: 0.9807 - loss: 0.0566 - val_accuracy: 0.6715 - val_loss: 2.0783
Epoch 83/300
157/157 2s 15ms/step - accuracy: 0.9788 - loss: 0.0602 - val_accuracy: 0.7276 - val_loss: 1.5771
Epoch 84/300
157/157 2s 15ms/step - accuracy: 0.9818 - loss: 0.0518 - val_accuracy: 0.7068 - val_loss: 1.8384
Epoch 85/300
157/157 2s 15ms/step - accuracy: 0.9725 - loss: 0.0761 - val_accuracy: 0.7081 - val_loss: 2.0521
Epoch 86/300
157/157 2s 15ms/step - accuracy: 0.9879 - loss: 0.0387 - val_accuracy: 0.7535 - val_loss: 1.4196
Epoch 87/300
157/157 2s 15ms/step - accuracy: 0.9924 - loss: 0.0239 - val_accuracy: 0.7449 - val_loss: 1.6411
Epoch 88/300
157/157 2s 15ms/step - accuracy: 0.9946 - loss: 0.0192 - val_accuracy: 0.7587 - val_loss: 1.3252
Epoch 89/300
157/157 2s 15ms/step - accuracy: 0.9945 - loss: 0.0195 - val_accuracy: 0.6838 - val_loss: 2.0476
Epoch 90/300
157/157 2s 15ms/step - accuracy: 0.9887 - loss: 0.0350 - val_accuracy: 0.6947 - val_loss: 2.1840
Epoch 91/300
157/157 2s 15ms/step - accuracy: 0.9714 - loss: 0.0836 - val_accuracy: 0.6307 - val_loss: 2.5388
Epoch 92/300
157/157 2s 15ms/step - accuracy: 0.9729 - loss: 0.0755 - val_accuracy: 0.6549 - val_loss: 2.2520
Epoch 93/300
157/157 2s 15ms/step - accuracy: 0.9857 - loss: 0.0426 - val_accuracy: 0.7310 - val_loss: 1.7233
Epoch 94/300
157/157 2s 15ms/step - accuracy: 0.9908 - loss: 0.0270 - val_accuracy: 0.7395 - val_loss: 1.5706
Epoch 95/300
157/157 2s 15ms/step - accuracy: 0.9929 - loss: 0.0228 - val_accuracy: 0.7572 - val_loss: 1.3782
Epoch 96/300
157/157 2s 15ms/step - accuracy: 0.9975 - loss: 0.0115 - val_accuracy: 0.7813 - val_loss: 1.2560
Epoch 97/300
157/157 2s 15ms/step - accuracy: 0.9995 - loss: 0.0050 - val_accuracy: 0.7933 - val_loss: 1.1784
Epoch 98/300
157/157 2s 15ms/step - accuracy: 1.0000 - loss: 0.0019 - val_accuracy: 0.8065 - val_loss: 1.0905
Epoch 99/300
157/157 2s 15ms/step - accuracy: 0.9999 - loss: 0.0019 - val_accuracy: 0.8029 - val_loss: 1.1577
Epoch 100/300
157/157 2s 15ms/step - accuracy: 0.9991 - loss: 0.0055 - val_accuracy: 0.7365 - val_loss: 1.6858
Epoch 101/300
157/157 2s 15ms/step - accuracy: 0.9909 - loss: 0.0302 - val_accuracy: 0.6148 - val_loss: 3.6582
Epoch 102/300
157/157 2s 15ms/step - accuracy: 0.9108 - loss: 0.2831 - val_accuracy: 0.6404 - val_loss: 2.2475
Epoch 103/300
157/157 2s 15ms/step - accuracy: 0.9795 - loss: 0.0602 - val_accuracy: 0.7588 - val_loss: 1.3392
Epoch 104/300
157/157 2s 15ms/step - accuracy: 0.9948 - loss: 0.0206 - val_accuracy: 0.7537 - val_loss: 1.6138
Epoch 105/300
157/157 2s 15ms/step - accuracy: 0.9981 - loss: 0.0095 - val_accuracy: 0.7900 - val_loss: 1.1229
Epoch 106/300
157/157 2s 15ms/step - accuracy: 0.9990 - loss: 0.0069 - val_accuracy: 0.7828 - val_loss: 1.1875

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Epoch 107/300  
157/157 2s 15ms/step - accuracy: 0.9999 - loss: 0.0031 - val_accuracy: 0.8024 - val_loss: 1.0698  
Epoch 108/300  
157/157 2s 15ms/step - accuracy: 1.0000 - loss: 0.0017 - val_accuracy: 0.8045 - val_loss: 1.0776  
Epoch 109/300  
157/157 2s 15ms/step - accuracy: 1.0000 - loss: 0.0013 - val_accuracy: 0.8085 - val_loss: 1.0603  
Epoch 110/300  
157/157 2s 15ms/step - accuracy: 1.0000 - loss: 0.0010 - val_accuracy: 0.8064 - val_loss: 1.0544  
Epoch 111/300  
157/157 2s 15ms/step - accuracy: 0.9996 - loss: 0.0042 - val_accuracy: 0.7969 - val_loss: 1.1679  
Epoch 112/300  
157/157 2s 15ms/step - accuracy: 1.0000 - loss: 0.0015 - val_accuracy: 0.8023 - val_loss: 1.0760  
Epoch 113/300  
157/157 2s 15ms/step - accuracy: 1.0000 - loss: 9.7875e-04 - val_accuracy: 0.8023 - val_loss: 1.1205  
Epoch 114/300  
157/157 2s 15ms/step - accuracy: 0.9999 - loss: 0.0014 - val_accuracy: 0.8031 - val_loss: 1.1092  
Epoch 115/300  
157/157 2s 15ms/step - accuracy: 1.0000 - loss: 7.6769e-04 - val_accuracy: 0.7987 - val_loss: 1.1989  
Epoch 116/300  
157/157 2s 15ms/step - accuracy: 1.0000 - loss: 6.6634e-04 - val_accuracy: 0.8055 - val_loss: 1.1194  
Epoch 117/300  
157/157 2s 15ms/step - accuracy: 1.0000 - loss: 8.0349e-04 - val_accuracy: 0.8038 - val_loss: 1.1203  
Epoch 118/300  
157/157 2s 15ms/step - accuracy: 1.0000 - loss: 5.1874e-04 - val_accuracy: 0.8074 - val_loss: 1.1445  
Epoch 119/300  
157/157 2s 15ms/step - accuracy: 0.9988 - loss: 0.0046 - val_accuracy: 0.2457 - val_loss: 23.3522  
Epoch 120/300  
157/157 2s 15ms/step - accuracy: 0.8252 - loss: 0.6286 - val_accuracy: 0.7063 - val_loss: 1.4011  
Epoch 121/300  
157/157 2s 15ms/step - accuracy: 0.9532 - loss: 0.1346 - val_accuracy: 0.7207 - val_loss: 1.3795  
Epoch 122/300  
157/157 2s 15ms/step - accuracy: 0.9856 - loss: 0.0483 - val_accuracy: 0.7344 - val_loss: 1.3609  
Epoch 123/300  
157/157 2s 15ms/step - accuracy: 0.9932 - loss: 0.0267 - val_accuracy: 0.7556 - val_loss: 1.2698  
Epoch 124/300  
157/157 2s 15ms/step - accuracy: 0.9923 - loss: 0.0276 - val_accuracy: 0.7728 - val_loss: 1.2167  
Epoch 125/300  
157/157 2s 15ms/step - accuracy: 0.9954 - loss: 0.0189 - val_accuracy: 0.7634 - val_loss: 1.3707  
Epoch 126/300  
157/157 2s 15ms/step - accuracy: 0.9969 - loss: 0.0151 - val_accuracy: 0.7589 - val_loss: 1.2842  
Epoch 127/300  
157/157 2s 15ms/step - accuracy: 0.9899 - loss: 0.0323 - val_accuracy: 0.7228 - val_loss: 1.5858  
Epoch 128/300  
157/157 2s 15ms/step - accuracy: 0.9624 - loss: 0.1060 - val_accuracy: 0.7496 - val_loss: 1.5475  
Epoch 129/300  
157/157 2s 15ms/step - accuracy: 0.9785 - loss: 0.0622 - val_accuracy: 0.7194 - val_loss: 1.6767  
Epoch 130/300  
157/157 2s 15ms/step - accuracy: 0.9958 - loss: 0.0164 - val_accuracy: 0.7857 - val_loss: 1.1906  
Epoch 131/300  
157/157 2s 15ms/step - accuracy: 0.9983 - loss: 0.0087 - val_accuracy: 0.7883 - val_loss: 1.1065  
Epoch 132/300  
157/157 2s 15ms/step - accuracy: 0.9996 - loss: 0.0038 - val_accuracy: 0.8038 - val_loss: 1.0759  
Epoch 133/300  
157/157 2s 15ms/step - accuracy: 1.0000 - loss: 0.0022 - val_accuracy: 0.8066 - val_loss: 1.0569  
Epoch 134/300  
157/157 2s 15ms/step - accuracy: 0.9998 - loss: 0.0028 - val_accuracy: 0.7901 - val_loss: 1.2245  
Epoch 135/300  
157/157 2s 15ms/step - accuracy: 0.9998 - loss: 0.0025 - val_accuracy: 0.8066 - val_loss: 1.0795  
Epoch 136/300  
157/157 2s 15ms/step - accuracy: 1.0000 - loss: 0.0012 - val_accuracy: 0.8100 - val_loss: 1.0655  
Epoch 137/300  
157/157 2s 15ms/step - accuracy: 1.0000 - loss: 9.5817e-04 - val_accuracy: 0.8076 - val_loss: 1.0621  
Epoch 138/300  
157/157 2s 15ms/step - accuracy: 0.9998 - loss: 0.0016 - val_accuracy: 0.8031 - val_loss: 1.1482  
Epoch 139/300  
157/157 2s 15ms/step - accuracy: 0.9891 - loss: 0.0359 - val_accuracy: 0.4458 - val_loss: 7.9924  
Epoch 140/300  
157/157 2s 15ms/step - accuracy: 0.9152 - loss: 0.2564 - val_accuracy: 0.7165 - val_loss: 1.4497  
Epoch 141/300  
157/157 2s 15ms/step - accuracy: 0.9846 - loss: 0.0482 - val_accuracy: 0.6913 - val_loss: 1.9197  
Epoch 142/300  
157/157 2s 15ms/step - accuracy: 0.9918 - loss: 0.0275 - val_accuracy: 0.7642 - val_loss: 1.2758  
Epoch 143/300  
157/157 2s 15ms/step - accuracy: 0.9975 - loss: 0.0118 - val_accuracy: 0.7908 - val_loss: 1.2042  
Epoch 144/300  
157/157 2s 15ms/step - accuracy: 0.9973 - loss: 0.0125 - val_accuracy: 0.7793 - val_loss: 1.2887  
Epoch 145/300  
157/157 2s 15ms/step - accuracy: 0.9994 - loss: 0.0049 - val_accuracy: 0.8027 - val_loss: 1.0543  
Epoch 146/300  
157/157 2s 15ms/step - accuracy: 0.9996 - loss: 0.0034 - val_accuracy: 0.8067 - val_loss: 1.0786  
Epoch 147/300  
157/157 2s 15ms/step - accuracy: 0.9999 - loss: 0.0018 - val_accuracy: 0.8052 - val_loss: 1.0630  
Epoch 148/300  
157/157 2s 15ms/step - accuracy: 1.0000 - loss: 0.0011 - val_accuracy: 0.8049 - val_loss: 1.0711  
Epoch 149/300
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Epoch 149/300  
157/157 2s 15ms/step - accuracy: 1.0000 - loss: 0.0010 - val_accuracy: 0.8074 - val_loss: 1.0791  
Epoch 150/300  
157/157 2s 15ms/step - accuracy: 0.9999 - loss: 0.0010 - val_accuracy: 0.8107 - val_loss: 1.0829  
Epoch 151/300  
157/157 2s 15ms/step - accuracy: 1.0000 - loss: 6.8051e-04 - val_accuracy: 0.8066 - val_loss: 1.0834  
Epoch 152/300  
157/157 2s 15ms/step - accuracy: 1.0000 - loss: 9.1270e-04 - val_accuracy: 0.8052 - val_loss: 1.1111  
Epoch 153/300  
157/157 2s 15ms/step - accuracy: 1.0000 - loss: 7.0526e-04 - val_accuracy: 0.7961 - val_loss: 1.1940  
Epoch 154/300  
157/157 2s 15ms/step - accuracy: 1.0000 - loss: 7.0649e-04 - val_accuracy: 0.8058 - val_loss: 1.0882  
Epoch 155/300  
157/157 2s 15ms/step - accuracy: 0.9999 - loss: 9.6247e-04 - val_accuracy: 0.7953 - val_loss: 1.2214  
Epoch 156/300  
157/157 2s 15ms/step - accuracy: 0.9768 - loss: 0.0834 - val_accuracy: 0.3863 - val_loss: 6.7187  
Epoch 157/300  
157/157 2s 15ms/step - accuracy: 0.9202 - loss: 0.2292 - val_accuracy: 0.7213 - val_loss: 1.2590  
Epoch 158/300  
157/157 2s 15ms/step - accuracy: 0.9842 - loss: 0.0507 - val_accuracy: 0.7358 - val_loss: 1.3416  
Epoch 159/300  
157/157 2s 15ms/step - accuracy: 0.9930 - loss: 0.0252 - val_accuracy: 0.7657 - val_loss: 1.2867  
Epoch 160/300  
157/157 2s 15ms/step - accuracy: 0.9979 - loss: 0.0117 - val_accuracy: 0.7982 - val_loss: 1.0623  
Epoch 161/300  
157/157 2s 15ms/step - accuracy: 0.9989 - loss: 0.0068 - val_accuracy: 0.8056 - val_loss: 1.0372  
Epoch 162/300  
157/157 2s 15ms/step - accuracy: 0.9997 - loss: 0.0038 - val_accuracy: 0.8026 - val_loss: 1.0470  
Epoch 163/300  
157/157 2s 15ms/step - accuracy: 1.0000 - loss: 0.0016 - val_accuracy: 0.8083 - val_loss: 1.0298  
Epoch 164/300  
157/157 2s 15ms/step - accuracy: 1.0000 - loss: 0.0014 - val_accuracy: 0.8077 - val_loss: 1.0441  
Epoch 165/300  
157/157 2s 15ms/step - accuracy: 1.0000 - loss: 0.0013 - val_accuracy: 0.8036 - val_loss: 1.1000  
Epoch 166/300  
157/157 2s 15ms/step - accuracy: 0.9999 - loss: 0.0013 - val_accuracy: 0.8069 - val_loss: 1.0654  
Epoch 167/300  
157/157 2s 15ms/step - accuracy: 1.0000 - loss: 9.4595e-04 - val_accuracy: 0.8059 - val_loss: 1.0576  
Epoch 168/300  
157/157 2s 15ms/step - accuracy: 1.0000 - loss: 9.1790e-04 - val_accuracy: 0.7972 - val_loss: 1.1319  
Epoch 169/300  
157/157 2s 15ms/step - accuracy: 1.0000 - loss: 9.4138e-04 - val_accuracy: 0.8029 - val_loss: 1.1002  
Epoch 170/300  
157/157 2s 15ms/step - accuracy: 1.0000 - loss: 7.1356e-04 - val_accuracy: 0.8055 - val_loss: 1.0865  
Epoch 171/300  
157/157 2s 15ms/step - accuracy: 1.0000 - loss: 5.4232e-04 - val_accuracy: 0.8068 - val_loss: 1.1025  
Epoch 172/300  
157/157 2s 15ms/step - accuracy: 1.0000 - loss: 5.3031e-04 - val_accuracy: 0.8064 - val_loss: 1.0984  
Epoch 173/300  
157/157 2s 15ms/step - accuracy: 1.0000 - loss: 4.6302e-04 - val_accuracy: 0.8078 - val_loss: 1.1395  
Epoch 174/300  
157/157 2s 15ms/step - accuracy: 1.0000 - loss: 3.8118e-04 - val_accuracy: 0.8062 - val_loss: 1.1234  
Epoch 175/300  
157/157 2s 15ms/step - accuracy: 1.0000 - loss: 3.8687e-04 - val_accuracy: 0.8094 - val_loss: 1.1187  
Epoch 176/300  
157/157 2s 15ms/step - accuracy: 1.0000 - loss: 3.2884e-04 - val_accuracy: 0.8062 - val_loss: 1.1374  
Epoch 177/300  
157/157 2s 15ms/step - accuracy: 1.0000 - loss: 4.0129e-04 - val_accuracy: 0.8059 - val_loss: 1.1660  
Epoch 178/300  
157/157 2s 15ms/step - accuracy: 0.9630 - loss: 0.1351 - val_accuracy: 0.4701 - val_loss: 5.4326  
Epoch 179/300  
157/157 2s 15ms/step - accuracy: 0.9283 - loss: 0.2024 - val_accuracy: 0.6762 - val_loss: 1.7317  
Epoch 180/300  
157/157 2s 15ms/step - accuracy: 0.9835 - loss: 0.0541 - val_accuracy: 0.7512 - val_loss: 1.1627  
Epoch 181/300  
157/157 2s 15ms/step - accuracy: 0.9877 - loss: 0.0395 - val_accuracy: 0.7762 - val_loss: 1.1851  
Epoch 182/300  
157/157 2s 15ms/step - accuracy: 0.9964 - loss: 0.0163 - val_accuracy: 0.7727 - val_loss: 1.2669  
Epoch 183/300  
157/157 2s 15ms/step - accuracy: 0.9983 - loss: 0.0094 - val_accuracy: 0.7959 - val_loss: 1.1020  
Epoch 184/300  
157/157 2s 15ms/step - accuracy: 0.9999 - loss: 0.0038 - val_accuracy: 0.8058 - val_loss: 1.0133  
Epoch 185/300  
157/157 2s 15ms/step - accuracy: 1.0000 - loss: 0.0023 - val_accuracy: 0.8061 - val_loss: 1.0891  
Epoch 186/300  
157/157 2s 15ms/step - accuracy: 0.9998 - loss: 0.0029 - val_accuracy: 0.7881 - val_loss: 1.1473  
Epoch 187/300  
157/157 2s 15ms/step - accuracy: 0.9999 - loss: 0.0028 - val_accuracy: 0.8077 - val_loss: 1.0876  
Epoch 188/300  
157/157 2s 15ms/step - accuracy: 1.0000 - loss: 0.0014 - val_accuracy: 0.8097 - val_loss: 1.0852  
Epoch 189/300  
157/157 2s 15ms/step - accuracy: 1.0000 - loss: 9.6265e-04 - val_accuracy: 0.8088 - val_loss: 1.0947  
Epoch 190/300  
157/157 2s 15ms/step - accuracy: 1.0000 - loss: 7.6114e-04 - val_accuracy: 0.8025 - val_loss: 1.1320  
Epoch 191/300
```

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157/157 2s 15ms/step - accuracy: 1.0000 - loss: 8.1041e-04 - val_accuracy: 0.8056 - val_loss: 1.1250
Epoch 192/300
157/157 2s 15ms/step - accuracy: 1.0000 - loss: 6.6656e-04 - val_accuracy: 0.8079 - val_loss: 1.1065
Epoch 193/300
157/157 2s 15ms/step - accuracy: 0.9997 - loss: 0.0025 - val_accuracy: 0.6920 - val_loss: 2.2946
Epoch 194/300
157/157 2s 15ms/step - accuracy: 0.9076 - loss: 0.3039 - val_accuracy: 0.5829 - val_loss: 3.0558
Epoch 195/300
157/157 2s 15ms/step - accuracy: 0.9751 - loss: 0.0735 - val_accuracy: 0.7741 - val_loss: 1.2057
Epoch 196/300
157/157 2s 15ms/step - accuracy: 0.9941 - loss: 0.0215 - val_accuracy: 0.7513 - val_loss: 1.4611
Epoch 197/300
157/157 2s 15ms/step - accuracy: 0.9972 - loss: 0.0122 - val_accuracy: 0.7850 - val_loss: 1.2017
Epoch 198/300
157/157 2s 15ms/step - accuracy: 0.9988 - loss: 0.0071 - val_accuracy: 0.8092 - val_loss: 0.9933
Epoch 199/300
157/157 2s 15ms/step - accuracy: 0.9996 - loss: 0.0036 - val_accuracy: 0.8057 - val_loss: 1.0996
Epoch 200/300
157/157 2s 15ms/step - accuracy: 1.0000 - loss: 0.0022 - val_accuracy: 0.8107 - val_loss: 1.0505
Epoch 201/300
157/157 2s 15ms/step - accuracy: 1.0000 - loss: 0.0017 - val_accuracy: 0.8123 - val_loss: 1.0744
Epoch 202/300
157/157 2s 15ms/step - accuracy: 1.0000 - loss: 0.0012 - val_accuracy: 0.8083 - val_loss: 1.0639
Epoch 203/300
157/157 2s 15ms/step - accuracy: 1.0000 - loss: 9.2067e-04 - val_accuracy: 0.8141 - val_loss: 1.0727
Epoch 204/300
157/157 2s 15ms/step - accuracy: 1.0000 - loss: 9.3039e-04 - val_accuracy: 0.8075 - val_loss: 1.1006
Epoch 205/300
157/157 2s 15ms/step - accuracy: 1.0000 - loss: 9.8858e-04 - val_accuracy: 0.8023 - val_loss: 1.1293
Epoch 206/300
157/157 2s 15ms/step - accuracy: 0.9693 - loss: 0.0911 - val_accuracy: 0.6004 - val_loss: 2.6278
Epoch 207/300
157/157 2s 15ms/step - accuracy: 0.9679 - loss: 0.0922 - val_accuracy: 0.7386 - val_loss: 1.4221
Epoch 208/300
157/157 2s 15ms/step - accuracy: 0.9943 - loss: 0.0227 - val_accuracy: 0.7513 - val_loss: 1.4918
Epoch 209/300
157/157 2s 15ms/step - accuracy: 0.9974 - loss: 0.0117 - val_accuracy: 0.7939 - val_loss: 1.1189
Epoch 210/300
157/157 2s 15ms/step - accuracy: 0.9993 - loss: 0.0053 - val_accuracy: 0.7940 - val_loss: 1.1659
Epoch 211/300
157/157 2s 15ms/step - accuracy: 0.9999 - loss: 0.0025 - val_accuracy: 0.8058 - val_loss: 1.1012
Epoch 212/300
157/157 2s 15ms/step - accuracy: 0.9999 - loss: 0.0017 - val_accuracy: 0.8064 - val_loss: 1.0783
Epoch 213/300
157/157 2s 15ms/step - accuracy: 1.0000 - loss: 0.0012 - val_accuracy: 0.8044 - val_loss: 1.0870
Epoch 214/300
157/157 2s 15ms/step - accuracy: 1.0000 - loss: 0.0011 - val_accuracy: 0.8077 - val_loss: 1.1003
Epoch 215/300
157/157 2s 15ms/step - accuracy: 0.9853 - loss: 0.0443 - val_accuracy: 0.6913 - val_loss: 1.8772
Epoch 216/300
157/157 2s 15ms/step - accuracy: 0.9613 - loss: 0.1109 - val_accuracy: 0.7590 - val_loss: 1.3855
Epoch 217/300
157/157 2s 15ms/step - accuracy: 0.9905 - loss: 0.0301 - val_accuracy: 0.7556 - val_loss: 1.3924
Epoch 218/300
157/157 2s 15ms/step - accuracy: 0.9968 - loss: 0.0126 - val_accuracy: 0.7766 - val_loss: 1.3846
Epoch 219/300
157/157 2s 15ms/step - accuracy: 0.9995 - loss: 0.0052 - val_accuracy: 0.8038 - val_loss: 1.0635
Epoch 220/300
157/157 2s 15ms/step - accuracy: 0.9998 - loss: 0.0024 - val_accuracy: 0.8072 - val_loss: 1.0958
Epoch 221/300
157/157 2s 15ms/step - accuracy: 0.9999 - loss: 0.0015 - val_accuracy: 0.8079 - val_loss: 1.0656
Epoch 222/300
157/157 2s 15ms/step - accuracy: 1.0000 - loss: 9.6418e-04 - val_accuracy: 0.8153 - val_loss: 1.0674
Epoch 223/300
157/157 2s 15ms/step - accuracy: 1.0000 - loss: 9.8417e-04 - val_accuracy: 0.8141 - val_loss: 1.0689
Epoch 224/300
157/157 2s 15ms/step - accuracy: 1.0000 - loss: 7.5076e-04 - val_accuracy: 0.8145 - val_loss: 1.0846
Epoch 225/300
157/157 2s 15ms/step - accuracy: 1.0000 - loss: 5.4684e-04 - val_accuracy: 0.8165 - val_loss: 1.0944
Epoch 226/300
157/157 2s 15ms/step - accuracy: 1.0000 - loss: 5.2386e-04 - val_accuracy: 0.8130 - val_loss: 1.0996
Epoch 227/300
157/157 2s 15ms/step - accuracy: 1.0000 - loss: 4.3681e-04 - val_accuracy: 0.8120 - val_loss: 1.1174
Epoch 228/300
157/157 2s 15ms/step - accuracy: 1.0000 - loss: 5.5962e-04 - val_accuracy: 0.8130 - val_loss: 1.1129
Epoch 229/300
157/157 2s 15ms/step - accuracy: 1.0000 - loss: 4.6954e-04 - val_accuracy: 0.8072 - val_loss: 1.1587
Epoch 230/300
157/157 2s 15ms/step - accuracy: 1.0000 - loss: 4.5505e-04 - val_accuracy: 0.8123 - val_loss: 1.1210
Epoch 231/300
157/157 2s 15ms/step - accuracy: 1.0000 - loss: 3.7682e-04 - val_accuracy: 0.8069 - val_loss: 1.1781
Epoch 232/300
157/157 2s 15ms/step - accuracy: 0.9614 - loss: 0.1321 - val_accuracy: 0.5286 - val_loss: 4.4002
Epoch 233/300
157/157 2s 15ms/step - accuracy: 0.9628 - loss: 0.1035 - val_accuracy: 0.7585 - val_loss: 1.1786
```

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Epoch 234/300
157/157 2s 15ms/step - accuracy: 0.9909 - loss: 0.0292 - val_accuracy: 0.7744 - val_loss: 1.2311
Epoch 235/300
157/157 2s 15ms/step - accuracy: 0.9980 - loss: 0.0109 - val_accuracy: 0.7892 - val_loss: 1.2048
Epoch 236/300
157/157 2s 15ms/step - accuracy: 0.9993 - loss: 0.0051 - val_accuracy: 0.8111 - val_loss: 1.0982
Epoch 237/300
157/157 2s 15ms/step - accuracy: 0.9998 - loss: 0.0028 - val_accuracy: 0.8146 - val_loss: 1.0183
Epoch 238/300
157/157 2s 15ms/step - accuracy: 1.0000 - loss: 0.0016 - val_accuracy: 0.8158 - val_loss: 1.0485
Epoch 239/300
157/157 2s 15ms/step - accuracy: 1.0000 - loss: 0.0010 - val_accuracy: 0.8126 - val_loss: 1.0489
Epoch 240/300
157/157 2s 15ms/step - accuracy: 0.9996 - loss: 0.0032 - val_accuracy: 0.7953 - val_loss: 1.1989
Epoch 241/300
157/157 2s 15ms/step - accuracy: 0.9994 - loss: 0.0035 - val_accuracy: 0.7863 - val_loss: 1.2564
Epoch 242/300
157/157 2s 15ms/step - accuracy: 0.9991 - loss: 0.0054 - val_accuracy: 0.7570 - val_loss: 1.6037
Epoch 243/300
157/157 2s 15ms/step - accuracy: 0.9636 - loss: 0.1101 - val_accuracy: 0.7190 - val_loss: 1.9297
Epoch 244/300
157/157 2s 15ms/step - accuracy: 0.9829 - loss: 0.0500 - val_accuracy: 0.7684 - val_loss: 1.2786
Epoch 245/300
157/157 2s 15ms/step - accuracy: 0.9963 - loss: 0.0142 - val_accuracy: 0.7971 - val_loss: 1.1497
Epoch 246/300
157/157 2s 15ms/step - accuracy: 0.9993 - loss: 0.0053 - val_accuracy: 0.8040 - val_loss: 1.1293
Epoch 247/300
157/157 2s 15ms/step - accuracy: 0.9998 - loss: 0.0028 - val_accuracy: 0.8018 - val_loss: 1.1578
Epoch 248/300
157/157 2s 15ms/step - accuracy: 1.0000 - loss: 0.0018 - val_accuracy: 0.8123 - val_loss: 1.0595
Epoch 249/300
157/157 2s 15ms/step - accuracy: 1.0000 - loss: 0.0013 - val_accuracy: 0.8104 - val_loss: 1.0839
Epoch 250/300
157/157 2s 15ms/step - accuracy: 1.0000 - loss: 8.5175e-04 - val_accuracy: 0.8143 - val_loss: 1.0965
Epoch 251/300
157/157 2s 15ms/step - accuracy: 1.0000 - loss: 6.7551e-04 - val_accuracy: 0.8143 - val_loss: 1.0847
Epoch 252/300
157/157 2s 15ms/step - accuracy: 0.9977 - loss: 0.0087 - val_accuracy: 0.7012 - val_loss: 2.3850
Epoch 253/300
157/157 2s 15ms/step - accuracy: 0.9561 - loss: 0.1364 - val_accuracy: 0.6512 - val_loss: 2.7538
Epoch 254/300
157/157 2s 15ms/step - accuracy: 0.9852 - loss: 0.0443 - val_accuracy: 0.7787 - val_loss: 1.2687
Epoch 255/300
157/157 2s 15ms/step - accuracy: 0.9958 - loss: 0.0147 - val_accuracy: 0.7533 - val_loss: 1.7227
Epoch 256/300
157/157 2s 15ms/step - accuracy: 0.9988 - loss: 0.0061 - val_accuracy: 0.7931 - val_loss: 1.2516
Epoch 257/300
157/157 2s 15ms/step - accuracy: 0.9995 - loss: 0.0039 - val_accuracy: 0.7915 - val_loss: 1.2485
Epoch 258/300
157/157 2s 15ms/step - accuracy: 0.9998 - loss: 0.0022 - val_accuracy: 0.8052 - val_loss: 1.1409
Epoch 259/300
157/157 2s 15ms/step - accuracy: 1.0000 - loss: 0.0011 - val_accuracy: 0.8125 - val_loss: 1.0948
Epoch 260/300
157/157 2s 15ms/step - accuracy: 0.9998 - loss: 0.0022 - val_accuracy: 0.8060 - val_loss: 1.1802
Epoch 261/300
157/157 2s 15ms/step - accuracy: 0.9999 - loss: 0.0019 - val_accuracy: 0.8102 - val_loss: 1.1382
Epoch 262/300
157/157 2s 15ms/step - accuracy: 0.9998 - loss: 0.0018 - val_accuracy: 0.7930 - val_loss: 1.2946
Epoch 263/300
157/157 2s 15ms/step - accuracy: 0.9923 - loss: 0.0251 - val_accuracy: 0.6383 - val_loss: 2.8745
Epoch 264/300
157/157 2s 15ms/step - accuracy: 0.9618 - loss: 0.1075 - val_accuracy: 0.7464 - val_loss: 1.6243
Epoch 265/300
157/157 2s 15ms/step - accuracy: 0.9903 - loss: 0.0274 - val_accuracy: 0.7739 - val_loss: 1.3294
Epoch 266/300
157/157 2s 15ms/step - accuracy: 0.9977 - loss: 0.0097 - val_accuracy: 0.7800 - val_loss: 1.2350
Epoch 267/300
157/157 2s 15ms/step - accuracy: 0.9991 - loss: 0.0051 - val_accuracy: 0.8041 - val_loss: 1.1536
Epoch 268/300
157/157 2s 15ms/step - accuracy: 0.9998 - loss: 0.0021 - val_accuracy: 0.7997 - val_loss: 1.2294
Epoch 269/300
157/157 2s 15ms/step - accuracy: 1.0000 - loss: 0.0012 - val_accuracy: 0.8124 - val_loss: 1.1137
Epoch 270/300
157/157 2s 15ms/step - accuracy: 1.0000 - loss: 7.4358e-04 - val_accuracy: 0.8110 - val_loss: 1.1295
Epoch 271/300
157/157 2s 15ms/step - accuracy: 1.0000 - loss: 5.6490e-04 - val_accuracy: 0.8124 - val_loss: 1.1133
Epoch 272/300
157/157 2s 15ms/step - accuracy: 1.0000 - loss: 5.1698e-04 - val_accuracy: 0.8118 - val_loss: 1.1173
Epoch 273/300
157/157 2s 15ms/step - accuracy: 1.0000 - loss: 4.3272e-04 - val_accuracy: 0.8126 - val_loss: 1.1304
Epoch 274/300
157/157 2s 15ms/step - accuracy: 1.0000 - loss: 4.0308e-04 - val_accuracy: 0.8126 - val_loss: 1.1475
Epoch 275/300
157/157 2s 15ms/step - accuracy: 1.0000 - loss: 4.1999e-04 - val_accuracy: 0.8133 - val_loss: 1.1531
Epoch 276/300
```

```
# Dropout (p=0.3) - NO Batch Norm
dropout_model = build_resnet10(dropout_rate=0.3, include_batchnorm=False)
history_dropout, time_dropout, loss_dropout, acc_dropout = train_and_evaluate(dropout_model, "Dropout (p=0.3) (NO BN)")

157/157 2s 15ms/step - accuracy: 1.0000 - loss: 3.2990e-04 - val_accuracy: 0.8147 - val_loss: 1.1626
Epoch 279/300
157/157 2s 15ms/step - accuracy: 1.0000 - loss: 2.5756e-04 - val_accuracy: 0.7935 - val_loss: 1.3012
Epoch 280/300
157/157 2s 15ms/step - accuracy: 0.9757 - loss: 0.0804 - val_accuracy: 0.6026 - val_loss: 3.4425
Epoch 281/300
157/157 2s 15ms/step - accuracy: 0.9677 - loss: 0.0948 - val_accuracy: 0.7445 - val_loss: 1.5795
Epoch 282/300
157/157 2s 15ms/step - accuracy: 0.9935 - loss: 0.0223 - val_accuracy: 0.7397 - val_loss: 1.6973
Epoch 283/300
157/157 2s 15ms/step - accuracy: 0.9964 - loss: 0.0150 - val_accuracy: 0.7824 - val_loss: 1.2762
Epoch 284/300
157/157 2s 15ms/step - accuracy: 0.9994 - loss: 0.0040 - val_accuracy: 0.8089 - val_loss: 1.0608
Epoch 285/300
157/157 2s 15ms/step - accuracy: 1.0000 - loss: 0.0019 - val_accuracy: 0.8094 - val_loss: 1.1273
Epoch 286/300
157/157 2s 15ms/step - accuracy: 0.9998 - loss: 0.0018 - val_accuracy: 0.8051 - val_loss: 1.1409
Epoch 287/300
157/157 2s 15ms/step - accuracy: 0.9999 - loss: 0.0013 - val_accuracy: 0.8103 - val_loss: 1.1075
Epoch 288/300
157/157 2s 15ms/step - accuracy: 1.0000 - loss: 8.5543e-04 - val_accuracy: 0.8136 - val_loss: 1.1152
Epoch 289/300
157/157 2s 15ms/step - accuracy: 1.0000 - loss: 6.7583e-04 - val_accuracy: 0.8055 - val_loss: 1.1595
Epoch 290/300
157/157 2s 15ms/step - accuracy: 0.9994 - loss: 0.0037 - val_accuracy: 0.7706 - val_loss: 1.5335
Epoch 291/300
157/157 2s 15ms/step - accuracy: 0.9993 - loss: 0.0040 - val_accuracy: 0.7336 - val_loss: 1.7695
Epoch 292/300
157/157 2s 15ms/step - accuracy: 0.9730 - loss: 0.0787 - val_accuracy: 0.7160 - val_loss: 1.8677
Epoch 293/300
157/157 2s 15ms/step - accuracy: 0.9812 - loss: 0.0533 - val_accuracy: 0.7646 - val_loss: 1.5389
Epoch 294/300
157/157 2s 15ms/step - accuracy: 0.9962 - loss: 0.0141 - val_accuracy: 0.7779 - val_loss: 1.3340
Epoch 295/300
157/157 2s 15ms/step - accuracy: 0.9987 - loss: 0.0069 - val_accuracy: 0.8005 - val_loss: 1.1909
Epoch 296/300
157/157 2s 15ms/step - accuracy: 0.9983 - loss: 0.0068 - val_accuracy: 0.7955 - val_loss: 1.2034
Epoch 297/300
157/157 2s 15ms/step - accuracy: 0.9999 - loss: 0.0023 - val_accuracy: 0.8100 - val_loss: 1.1497
Epoch 298/300
157/157 2s 15ms/step - accuracy: 1.0000 - loss: 0.0011 - val_accuracy: 0.8096 - val_loss: 1.1298
Epoch 299/300
157/157 2s 15ms/step - accuracy: 1.0000 - loss: 7.5436e-04 - val_accuracy: 0.8133 - val_loss: 1.1198
Epoch 300/300
157/157 2s 15ms/step - accuracy: 1.0000 - loss: 7.1544e-04 - val_accuracy: 0.8106 - val_loss: 1.1471
Batch Normalization ONLY - Training Time: 754.89s, Test Accuracy: 0.8099, Final Train Loss: 0.0007
```


Model: "functional_5"

| Layer (type) | Output Shape | Param # | Connected to |
|-------------------------------|--------------------|---------|---------------------------------------|
| input_layer_5 (InputLayer) | (None, 32, 32, 3) | 0 | - |
| conv2d_105 (Conv2D) | (None, 32, 32, 32) | 896 | input_layer_5[0]... |
| dropout_21 (Dropout) | (None, 32, 32, 32) | 0 | conv2d_105[0][0] |
| conv2d_106 (Conv2D) | (None, 32, 32, 32) | 9,248 | dropout_21[0][0] |
| dropout_22 (Dropout) | (None, 32, 32, 32) | 0 | conv2d_106[0][0] |
| conv2d_107 (Conv2D) | (None, 32, 32, 32) | 9,248 | dropout_22[0][0] |
| dropout_23 (Dropout) | (None, 32, 32, 32) | 0 | conv2d_107[0][0] |
| add_50 (Add) | (None, 32, 32, 32) | 0 | dropout_21[0][0], dropout_23[0][0] |
| re_lu_50 (ReLU) | (None, 32, 32, 32) | 0 | add_50[0][0] |
| conv2d_108 (Conv2D) | (None, 32, 32, 32) | 9,248 | re_lu_50[0][0] |
| dropout_24 (Dropout) | (None, 32, 32, 32) | 0 | conv2d_108[0][0] |
| conv2d_109 (Conv2D) | (None, 32, 32, 32) | 9,248 | dropout_24[0][0] |
| dropout_25 (Dropout) | (None, 32, 32, 32) | 0 | conv2d_109[0][0] |
| add_51 (Add) | (None, 32, 32, 32) | 0 | re_lu_50[0][0], dropout_25[0][0] |
| re_lu_51 (ReLU) | (None, 32, 32, 32) | 0 | add_51[0][0] |
| conv2d_110 (Conv2D) | (None, 32, 32, 32) | 9,248 | re_lu_51[0][0] |
| dropout_26 (Dropout) | (None, 32, 32, 32) | 0 | conv2d_110[0][0] |
| conv2d_111 (Conv2D) | (None, 32, 32, 32) | 9,248 | dropout_26[0][0] |
| dropout_27 (Dropout) | (None, 32, 32, 32) | 0 | conv2d_111[0][0] |
| add_52 (Add) | (None, 32, 32, 32) | 0 | re_lu_51[0][0], dropout_27[0][0] |
| re_lu_52 (ReLU) | (None, 32, 32, 32) | 0 | add_52[0][0] |
| conv2d_112 (Conv2D) | (None, 32, 32, 32) | 9,248 | re_lu_52[0][0] |
| dropout_28 (Dropout) | (None, 32, 32, 32) | 0 | conv2d_112[0][0] |
| conv2d_113 (Conv2D) | (None, 32, 32, 32) | 9,248 | dropout_28[0][0] |
| dropout_29 (Dropout) | (None, 32, 32, 32) | 0 | conv2d_113[0][0] |
| add_53 (Add) | (None, 32, 32, 32) | 0 | re_lu_52[0][0], dropout_29[0][0] |
| re_lu_53 (ReLU) | (None, 32, 32, 32) | 0 | add_53[0][0] |
| conv2d_114 (Conv2D) | (None, 32, 32, 32) | 9,248 | re_lu_53[0][0] |

| | 32) | | |
|-------------------------|-----------------------|-------|-------------------------------------|
| dropout_30 (Dropout) | (None, 32, 32, 32) | 0 | conv2d_114[0][0] |
| conv2d_115 (Conv2D) | (None, 32, 32, 32) | 9,248 | dropout_30[0][0] |
| dropout_31 (Dropout) | (None, 32, 32, 32) | 0 | conv2d_115[0][0] |
| add_54 (Add) | (None, 32, 32, 32) | 0 | re_lu_53[0][0], dropout_31[0][0] |
| re_lu_54 (ReLU) | (None, 32, 32, 32) | 0 | add_54[0][0] |
| conv2d_116 (Conv2D) | (None, 32, 32, 32) | 9,248 | re_lu_54[0][0] |
| dropout_32 (Dropout) | (None, 32, 32, 32) | 0 | conv2d_116[0][0] |
| conv2d_117 (Conv2D) | (None, 32, 32, 32) | 9,248 | dropout_32[0][0] |
| dropout_33 (Dropout) | (None, 32, 32, 32) | 0 | conv2d_117[0][0] |
| add_55 (Add) | (None, 32, 32, 32) | 0 | re_lu_54[0][0], dropout_33[0][0] |
| re_lu_55 (ReLU) | (None, 32, 32, 32) | 0 | add_55[0][0] |
| conv2d_118 (Conv2D) | (None, 32, 32, 32) | 9,248 | re_lu_55[0][0] |
| dropout_34 (Dropout) | (None, 32, 32, 32) | 0 | conv2d_118[0][0] |
| conv2d_119 (Conv2D) | (None, 32, 32, 32) | 9,248 | dropout_34[0][0] |
| dropout_35 (Dropout) | (None, 32, 32, 32) | 0 | conv2d_119[0][0] |
| add_56 (Add) | (None, 32, 32, 32) | 0 | re_lu_55[0][0], dropout_35[0][0] |
| re_lu_56 (ReLU) | (None, 32, 32, 32) | 0 | add_56[0][0] |
| conv2d_120 (Conv2D) | (None, 32, 32, 32) | 9,248 | re_lu_56[0][0] |
| dropout_36 (Dropout) | (None, 32, 32, 32) | 0 | conv2d_120[0][0] |
| conv2d_121 (Conv2D) | (None, 32, 32, 32) | 9,248 | dropout_36[0][0] |
| dropout_37 (Dropout) | (None, 32, 32, 32) | 0 | conv2d_121[0][0] |
| add_57 (Add) | (None, 32, 32, 32) | 0 | re_lu_56[0][0], dropout_37[0][0] |
| re_lu_57 (ReLU) | (None, 32, 32, 32) | 0 | add_57[0][0] |
| conv2d_122 (Conv2D) | (None, 32, 32, 32) | 9,248 | re_lu_57[0][0] |
| dropout_38 (Dropout) | (None, 32, 32, 32) | 0 | conv2d_122[0][0] |
| conv2d_123 (Conv2D) | (None, 32, 32, 32) | 9,248 | dropout_38[0][0] |
| dropout_39 (Dropout) | (None, 32, 32, 32) | 0 | conv2d_123[0][0] |
| add_58 (Add) | (None, 32, 32, 32) | 0 | re_lu_57[0][0], dropout_39[0][0] |
| re_lu_58 (ReLU) | (None, 32, 32, 32) | 0 | add_58[0][0] |

| conv2d_124 (Conv2D) | (None, 32, 32, 32) | 9,248 | re_lu_58[0][0] |
|--|--------------------|-------|----------------------------------|
| dropout_40 (Dropout) | (None, 32, 32, 32) | 0 | conv2d_124[0][0] |
| conv2d_125 (Conv2D) | (None, 32, 32, 32) | 9,248 | dropout_40[0][0] |
| dropout_41 (Dropout) | (None, 32, 32, 32) | 0 | conv2d_125[0][0] |
| add_59 (Add) | (None, 32, 32, 32) | 0 | re_lu_58[0][0], dropout_41[0][0] |
| re_lu_59 (ReLU) | (None, 32, 32, 32) | 0 | add_59[0][0] |
| global_average_poo... (GlobalAveragePool...) | (None, 32) | 0 | re_lu_59[0][0] |
| dense_5 (Dense) | (None, 10) | 330 | global_average_p... |

Total params: 186,186 (727.29 KB)

Trainable params: 186,186 (727.29 KB)

Non-trainable params: 0 (0.00 B)

===== Training: Dropout (p=0.3) (NO BN) =====

Epoch 1/300

157/157 38s 111ms/step - accuracy: 0.1186 - loss: 2.3228 - val_accuracy: 0.1934 - val_loss: 2.0861

Epoch 2/300

157/157 2s 14ms/step - accuracy: 0.2367 - loss: 1.9711 - val_accuracy: 0.2243 - val_loss: 2.0253

Epoch 3/300

157/157 2s 14ms/step - accuracy: 0.2962 - loss: 1.8122 - val_accuracy: 0.3716 - val_loss: 1.6396

Epoch 4/300

157/157 2s 14ms/step - accuracy: 0.3729 - loss: 1.6310 - val_accuracy: 0.4177 - val_loss: 1.5443

Epoch 5/300

157/157 2s 15ms/step - accuracy: 0.4231 - loss: 1.5365 - val_accuracy: 0.4567 - val_loss: 1.4766

Epoch 6/300

157/157 2s 14ms/step - accuracy: 0.4590 - loss: 1.4461 - val_accuracy: 0.4591 - val_loss: 1.4726

Epoch 7/300

157/157 2s 14ms/step - accuracy: 0.4848 - loss: 1.3773 - val_accuracy: 0.5222 - val_loss: 1.3159

Epoch 8/300

157/157 2s 14ms/step - accuracy: 0.5122 - loss: 1.3130 - val_accuracy: 0.5417 - val_loss: 1.2736

Epoch 9/300

157/157 2s 14ms/step - accuracy: 0.5272 - loss: 1.2739 - val_accuracy: 0.5574 - val_loss: 1.2148

Epoch 10/300

157/157 2s 14ms/step - accuracy: 0.5464 - loss: 1.2303 - val_accuracy: 0.5540 - val_loss: 1.2296

Epoch 11/300

157/157 2s 14ms/step - accuracy: 0.5490 - loss: 1.2275 - val_accuracy: 0.5748 - val_loss: 1.2051

Epoch 12/300

157/157 2s 14ms/step - accuracy: 0.5652 - loss: 1.1868 - val_accuracy: 0.5880 - val_loss: 1.1440

Epoch 13/300

157/157 2s 14ms/step - accuracy: 0.5774 - loss: 1.1485 - val_accuracy: 0.5978 - val_loss: 1.1180

Epoch 14/300

157/157 2s 14ms/step - accuracy: 0.5985 - loss: 1.1050 - val_accuracy: 0.5864 - val_loss: 1.1901

Epoch 15/300

157/157 2s 14ms/step - accuracy: 0.5973 - loss: 1.1099 - val_accuracy: 0.6168 - val_loss: 1.0487

Epoch 16/300

157/157 2s 14ms/step - accuracy: 0.6049 - loss: 1.0911 - val_accuracy: 0.6129 - val_loss: 1.1006

Epoch 17/300

157/157 2s 14ms/step - accuracy: 0.6179 - loss: 1.0441 - val_accuracy: 0.6137 - val_loss: 1.0747

Epoch 18/300

157/157 2s 14ms/step - accuracy: 0.6269 - loss: 1.0364 - val_accuracy: 0.6272 - val_loss: 1.0828

Epoch 19/300

157/157 2s 14ms/step - accuracy: 0.6380 - loss: 1.0005 - val_accuracy: 0.6374 - val_loss: 1.0167

Epoch 20/300

157/157 2s 14ms/step - accuracy: 0.6357 - loss: 1.0150 - val_accuracy: 0.6242 - val_loss: 1.0815

Epoch 21/300

157/157 2s 14ms/step - accuracy: 0.6423 - loss: 0.9829 - val_accuracy: 0.6391 - val_loss: 1.0132

Epoch 22/300

157/157 2s 14ms/step - accuracy: 0.6571 - loss: 0.9613 - val_accuracy: 0.6556 - val_loss: 0.9768

Epoch 23/300

157/157 2s 14ms/step - accuracy: 0.6611 - loss: 0.9434 - val_accuracy: 0.6301 - val_loss: 1.0761

Epoch 24/300

157/157 2s 14ms/step - accuracy: 0.6593 - loss: 0.9416 - val_accuracy: 0.6771 - val_loss: 0.9259

Epoch 25/300

157/157 2s 14ms/step - accuracy: 0.6689 - loss: 0.9199 - val_accuracy: 0.6451 - val_loss: 1.0332

Epoch 26/300

157/157 2s 14ms/step - accuracy: 0.6752 - loss: 0.9195 - val_accuracy: 0.6669 - val_loss: 0.9475

Epoch 27/300

157/157 2s 14ms/step - accuracy: 0.6861 - loss: 0.8914 - val_accuracy: 0.6802 - val_loss: 0.9275

Epoch 28/300

157/157 2s 14ms/step - accuracy: 0.6886 - loss: 0.8786 - val_accuracy: 0.6911 - val_loss: 0.8778
Epoch 29/300
157/157 2s 14ms/step - accuracy: 0.6877 - loss: 0.8685 - val_accuracy: 0.6809 - val_loss: 0.9180
Epoch 30/300
157/157 2s 14ms/step - accuracy: 0.6906 - loss: 0.8534 - val_accuracy: 0.6998 - val_loss: 0.8740
Epoch 31/300
157/157 2s 14ms/step - accuracy: 0.6926 - loss: 0.8616 - val_accuracy: 0.6730 - val_loss: 0.9779
Epoch 32/300
157/157 2s 15ms/step - accuracy: 0.6995 - loss: 0.8395 - val_accuracy: 0.7020 - val_loss: 0.8722
Epoch 33/300
157/157 2s 14ms/step - accuracy: 0.7058 - loss: 0.8302 - val_accuracy: 0.6914 - val_loss: 0.8944
Epoch 34/300
157/157 2s 14ms/step - accuracy: 0.7039 - loss: 0.8307 - val_accuracy: 0.6936 - val_loss: 0.9222
Epoch 35/300
157/157 2s 14ms/step - accuracy: 0.7075 - loss: 0.8179 - val_accuracy: 0.7041 - val_loss: 0.8766
Epoch 36/300
157/157 2s 14ms/step - accuracy: 0.7088 - loss: 0.8119 - val_accuracy: 0.6861 - val_loss: 0.9742
Epoch 37/300
157/157 2s 14ms/step - accuracy: 0.7071 - loss: 0.8220 - val_accuracy: 0.6925 - val_loss: 0.9060
Epoch 38/300
157/157 2s 14ms/step - accuracy: 0.7216 - loss: 0.7797 - val_accuracy: 0.7086 - val_loss: 0.8615
Epoch 39/300
157/157 2s 14ms/step - accuracy: 0.7147 - loss: 0.8003 - val_accuracy: 0.7054 - val_loss: 0.8876
Epoch 40/300
157/157 2s 14ms/step - accuracy: 0.7177 - loss: 0.7897 - val_accuracy: 0.7087 - val_loss: 0.8606
Epoch 41/300
157/157 2s 14ms/step - accuracy: 0.7192 - loss: 0.7817 - val_accuracy: 0.7017 - val_loss: 0.8819
Epoch 42/300
157/157 2s 14ms/step - accuracy: 0.7242 - loss: 0.7762 - val_accuracy: 0.7166 - val_loss: 0.8449
Epoch 43/300
157/157 2s 14ms/step - accuracy: 0.7282 - loss: 0.7649 - val_accuracy: 0.6908 - val_loss: 0.9960
Epoch 44/300
157/157 2s 14ms/step - accuracy: 0.7271 - loss: 0.7675 - val_accuracy: 0.7117 - val_loss: 0.8366
Epoch 45/300
157/157 2s 14ms/step - accuracy: 0.7303 - loss: 0.7515 - val_accuracy: 0.7125 - val_loss: 0.8228
Epoch 46/300
157/157 2s 14ms/step - accuracy: 0.7344 - loss: 0.7415 - val_accuracy: 0.6820 - val_loss: 0.9837
Epoch 47/300
157/157 2s 14ms/step - accuracy: 0.7342 - loss: 0.7493 - val_accuracy: 0.7058 - val_loss: 0.8840
Epoch 48/300
157/157 2s 14ms/step - accuracy: 0.7372 - loss: 0.7387 - val_accuracy: 0.7158 - val_loss: 0.8555
Epoch 49/300
157/157 2s 14ms/step - accuracy: 0.7354 - loss: 0.7457 - val_accuracy: 0.6978 - val_loss: 0.9194
Epoch 50/300
157/157 2s 14ms/step - accuracy: 0.7437 - loss: 0.7206 - val_accuracy: 0.7129 - val_loss: 0.8468
Epoch 51/300
157/157 2s 14ms/step - accuracy: 0.7487 - loss: 0.7160 - val_accuracy: 0.7092 - val_loss: 0.8663
Epoch 52/300
157/157 2s 14ms/step - accuracy: 0.7453 - loss: 0.7233 - val_accuracy: 0.7224 - val_loss: 0.8311
Epoch 53/300
157/157 2s 14ms/step - accuracy: 0.7525 - loss: 0.7013 - val_accuracy: 0.7320 - val_loss: 0.7923
Epoch 54/300
157/157 2s 15ms/step - accuracy: 0.7538 - loss: 0.6967 - val_accuracy: 0.7380 - val_loss: 0.7883
Epoch 55/300
157/157 2s 15ms/step - accuracy: 0.7507 - loss: 0.7062 - val_accuracy: 0.7414 - val_loss: 0.7768
Epoch 56/300
157/157 2s 15ms/step - accuracy: 0.7472 - loss: 0.7116 - val_accuracy: 0.7400 - val_loss: 0.7710
Epoch 57/300
157/157 2s 15ms/step - accuracy: 0.7533 - loss: 0.6995 - val_accuracy: 0.7264 - val_loss: 0.8319
Epoch 58/300
157/157 2s 15ms/step - accuracy: 0.7534 - loss: 0.6970 - val_accuracy: 0.7305 - val_loss: 0.8164
Epoch 59/300
157/157 2s 15ms/step - accuracy: 0.7553 - loss: 0.6866 - val_accuracy: 0.7375 - val_loss: 0.8042
Epoch 60/300
157/157 2s 15ms/step - accuracy: 0.7576 - loss: 0.6917 - val_accuracy: 0.7272 - val_loss: 0.8367
Epoch 61/300
157/157 2s 15ms/step - accuracy: 0.7520 - loss: 0.6969 - val_accuracy: 0.7471 - val_loss: 0.7807
Epoch 62/300
157/157 2s 15ms/step - accuracy: 0.7658 - loss: 0.6683 - val_accuracy: 0.7303 - val_loss: 0.8098
Epoch 63/300
157/157 2s 15ms/step - accuracy: 0.7606 - loss: 0.6830 - val_accuracy: 0.7573 - val_loss: 0.7221
Epoch 64/300
157/157 2s 15ms/step - accuracy: 0.7648 - loss: 0.6732 - val_accuracy: 0.7404 - val_loss: 0.7641
Epoch 65/300
157/157 2s 15ms/step - accuracy: 0.7623 - loss: 0.6754 - val_accuracy: 0.7448 - val_loss: 0.7709
Epoch 66/300
157/157 2s 15ms/step - accuracy: 0.7640 - loss: 0.6630 - val_accuracy: 0.7424 - val_loss: 0.7822
Epoch 67/300
157/157 2s 15ms/step - accuracy: 0.7625 - loss: 0.6749 - val_accuracy: 0.7362 - val_loss: 0.7991
Epoch 68/300
157/157 2s 15ms/step - accuracy: 0.7649 - loss: 0.6685 - val_accuracy: 0.7427 - val_loss: 0.7863
Epoch 69/300
157/157 2s 15ms/step - accuracy: 0.7695 - loss: 0.6478 - val_accuracy: 0.7326 - val_loss: 0.8263
Epoch 70/300
157/157 2s 15ms/step - accuracy: 0.7718 - loss: 0.6492 - val_accuracy: 0.7396 - val_loss: 0.8115

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Epoch 71/300
157/157 2s 15ms/step - accuracy: 0.7640 - loss: 0.6739 - val_accuracy: 0.7568 - val_loss: 0.7637
Epoch 72/300
157/157 2s 15ms/step - accuracy: 0.7696 - loss: 0.6426 - val_accuracy: 0.7423 - val_loss: 0.7776
Epoch 73/300
157/157 2s 14ms/step - accuracy: 0.7721 - loss: 0.6550 - val_accuracy: 0.7331 - val_loss: 0.8448
Epoch 74/300
157/157 2s 14ms/step - accuracy: 0.7712 - loss: 0.6533 - val_accuracy: 0.7332 - val_loss: 0.8666
Epoch 75/300
157/157 2s 14ms/step - accuracy: 0.7762 - loss: 0.6363 - val_accuracy: 0.7523 - val_loss: 0.7789
Epoch 76/300
157/157 2s 15ms/step - accuracy: 0.7722 - loss: 0.6552 - val_accuracy: 0.7191 - val_loss: 0.8441
Epoch 77/300
157/157 2s 14ms/step - accuracy: 0.7730 - loss: 0.6405 - val_accuracy: 0.7441 - val_loss: 0.7655
Epoch 78/300
157/157 2s 14ms/step - accuracy: 0.7727 - loss: 0.6428 - val_accuracy: 0.7340 - val_loss: 0.8860
Epoch 79/300
157/157 2s 14ms/step - accuracy: 0.7753 - loss: 0.6327 - val_accuracy: 0.7082 - val_loss: 0.9299
Epoch 80/300
157/157 2s 14ms/step - accuracy: 0.7723 - loss: 0.6395 - val_accuracy: 0.7204 - val_loss: 0.9587
Epoch 81/300
157/157 2s 15ms/step - accuracy: 0.7740 - loss: 0.6435 - val_accuracy: 0.7203 - val_loss: 0.8835
Epoch 82/300
157/157 2s 14ms/step - accuracy: 0.7775 - loss: 0.6300 - val_accuracy: 0.7523 - val_loss: 0.7530
Epoch 83/300
157/157 2s 15ms/step - accuracy: 0.7740 - loss: 0.6370 - val_accuracy: 0.7453 - val_loss: 0.8031
Epoch 84/300
157/157 2s 15ms/step - accuracy: 0.7779 - loss: 0.6271 - val_accuracy: 0.7481 - val_loss: 0.7760
Epoch 85/300
157/157 2s 14ms/step - accuracy: 0.7876 - loss: 0.6057 - val_accuracy: 0.7254 - val_loss: 0.8591
Epoch 86/300
157/157 2s 15ms/step - accuracy: 0.7779 - loss: 0.6265 - val_accuracy: 0.7388 - val_loss: 0.8207
Epoch 87/300
157/157 2s 14ms/step - accuracy: 0.7819 - loss: 0.6253 - val_accuracy: 0.7353 - val_loss: 0.8457
Epoch 88/300
157/157 2s 14ms/step - accuracy: 0.7804 - loss: 0.6242 - val_accuracy: 0.7452 - val_loss: 0.7877
Epoch 89/300
157/157 2s 14ms/step - accuracy: 0.7797 - loss: 0.6240 - val_accuracy: 0.7563 - val_loss: 0.7366
Epoch 90/300
157/157 2s 14ms/step - accuracy: 0.7845 - loss: 0.6088 - val_accuracy: 0.7302 - val_loss: 0.8532
Epoch 91/300
157/157 2s 15ms/step - accuracy: 0.7883 - loss: 0.6117 - val_accuracy: 0.7352 - val_loss: 0.8642
Epoch 92/300
157/157 2s 14ms/step - accuracy: 0.7834 - loss: 0.6090 - val_accuracy: 0.7621 - val_loss: 0.7367
Epoch 93/300
157/157 2s 14ms/step - accuracy: 0.7892 - loss: 0.6022 - val_accuracy: 0.7575 - val_loss: 0.7247
Epoch 94/300
157/157 2s 14ms/step - accuracy: 0.7859 - loss: 0.6072 - val_accuracy: 0.7325 - val_loss: 0.8212
Epoch 95/300
157/157 2s 14ms/step - accuracy: 0.7911 - loss: 0.5973 - val_accuracy: 0.7336 - val_loss: 0.8333
Epoch 96/300
157/157 2s 15ms/step - accuracy: 0.7811 - loss: 0.6184 - val_accuracy: 0.7526 - val_loss: 0.7571
Epoch 97/300
157/157 2s 14ms/step - accuracy: 0.7922 - loss: 0.5982 - val_accuracy: 0.7620 - val_loss: 0.7518
Epoch 98/300
157/157 2s 14ms/step - accuracy: 0.7882 - loss: 0.5976 - val_accuracy: 0.7564 - val_loss: 0.7252
Epoch 99/300
157/157 2s 14ms/step - accuracy: 0.7868 - loss: 0.6071 - val_accuracy: 0.7417 - val_loss: 0.8197
Epoch 100/300
157/157 2s 14ms/step - accuracy: 0.7914 - loss: 0.5924 - val_accuracy: 0.7691 - val_loss: 0.7036
Epoch 101/300
157/157 2s 14ms/step - accuracy: 0.7883 - loss: 0.6004 - val_accuracy: 0.7100 - val_loss: 0.9940
Epoch 102/300
157/157 2s 14ms/step - accuracy: 0.7887 - loss: 0.6046 - val_accuracy: 0.7405 - val_loss: 0.7972
Epoch 103/300
157/157 2s 14ms/step - accuracy: 0.7888 - loss: 0.6030 - val_accuracy: 0.7479 - val_loss: 0.7926
Epoch 104/300
157/157 2s 14ms/step - accuracy: 0.7881 - loss: 0.5994 - val_accuracy: 0.7379 - val_loss: 0.8050
Epoch 105/300
157/157 2s 14ms/step - accuracy: 0.7898 - loss: 0.5952 - val_accuracy: 0.7642 - val_loss: 0.7183
Epoch 106/300
157/157 2s 15ms/step - accuracy: 0.7886 - loss: 0.5929 - val_accuracy: 0.7555 - val_loss: 0.7654
Epoch 107/300
157/157 2s 14ms/step - accuracy: 0.7930 - loss: 0.5857 - val_accuracy: 0.7596 - val_loss: 0.7576
Epoch 108/300
157/157 2s 14ms/step - accuracy: 0.7883 - loss: 0.6023 - val_accuracy: 0.7620 - val_loss: 0.7358
Epoch 109/300
157/157 2s 14ms/step - accuracy: 0.7930 - loss: 0.5899 - val_accuracy: 0.7408 - val_loss: 0.7899
Epoch 110/300
157/157 2s 15ms/step - accuracy: 0.7933 - loss: 0.5849 - val_accuracy: 0.7345 - val_loss: 0.9050
Epoch 111/300
157/157 2s 15ms/step - accuracy: 0.7924 - loss: 0.5877 - val_accuracy: 0.7502 - val_loss: 0.7710
Epoch 112/300
157/157 2s 14ms/step - accuracy: 0.7965 - loss: 0.5821 - val_accuracy: 0.7664 - val_loss: 0.7178
Epoch 113/300

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Epoch 113/300  
157/157 2s 14ms/step - accuracy: 0.7944 - loss: 0.5814 - val_accuracy: 0.7434 - val_loss: 0.8375  
Epoch 114/300  
157/157 2s 14ms/step - accuracy: 0.7947 - loss: 0.5870 - val_accuracy: 0.7533 - val_loss: 0.7823  
Epoch 115/300  
157/157 2s 14ms/step - accuracy: 0.7946 - loss: 0.5829 - val_accuracy: 0.7330 - val_loss: 0.8198  
Epoch 116/300  
157/157 2s 14ms/step - accuracy: 0.7890 - loss: 0.5922 - val_accuracy: 0.7480 - val_loss: 0.7825  
Epoch 117/300  
157/157 2s 14ms/step - accuracy: 0.7903 - loss: 0.5943 - val_accuracy: 0.7567 - val_loss: 0.7399  
Epoch 118/300  
157/157 2s 14ms/step - accuracy: 0.8010 - loss: 0.5685 - val_accuracy: 0.7380 - val_loss: 0.8185  
Epoch 119/300  
157/157 2s 14ms/step - accuracy: 0.7944 - loss: 0.5890 - val_accuracy: 0.7324 - val_loss: 0.8181  
Epoch 120/300  
157/157 2s 14ms/step - accuracy: 0.7961 - loss: 0.5829 - val_accuracy: 0.7385 - val_loss: 0.8068  
Epoch 121/300  
157/157 2s 14ms/step - accuracy: 0.7996 - loss: 0.5708 - val_accuracy: 0.7612 - val_loss: 0.7469  
Epoch 122/300  
157/157 2s 14ms/step - accuracy: 0.7969 - loss: 0.5831 - val_accuracy: 0.7782 - val_loss: 0.6942  
Epoch 123/300  
157/157 2s 14ms/step - accuracy: 0.7974 - loss: 0.5823 - val_accuracy: 0.7624 - val_loss: 0.7139  
Epoch 124/300  
157/157 2s 14ms/step - accuracy: 0.8012 - loss: 0.5689 - val_accuracy: 0.7293 - val_loss: 0.8776  
Epoch 125/300  
157/157 2s 14ms/step - accuracy: 0.7942 - loss: 0.5894 - val_accuracy: 0.7624 - val_loss: 0.7257  
Epoch 126/300  
157/157 2s 14ms/step - accuracy: 0.8020 - loss: 0.5703 - val_accuracy: 0.7754 - val_loss: 0.6741  
Epoch 127/300  
157/157 2s 14ms/step - accuracy: 0.7953 - loss: 0.5736 - val_accuracy: 0.7460 - val_loss: 0.8107  
Epoch 128/300  
157/157 2s 14ms/step - accuracy: 0.7990 - loss: 0.5752 - val_accuracy: 0.7352 - val_loss: 0.8375  
Epoch 129/300  
157/157 2s 14ms/step - accuracy: 0.8022 - loss: 0.5697 - val_accuracy: 0.7640 - val_loss: 0.7094  
Epoch 130/300  
157/157 2s 14ms/step - accuracy: 0.7965 - loss: 0.5767 - val_accuracy: 0.7600 - val_loss: 0.7434  
Epoch 131/300  
157/157 2s 14ms/step - accuracy: 0.7987 - loss: 0.5706 - val_accuracy: 0.7632 - val_loss: 0.7287  
Epoch 132/300  
157/157 2s 14ms/step - accuracy: 0.7973 - loss: 0.5746 - val_accuracy: 0.7544 - val_loss: 0.7761  
Epoch 133/300  
157/157 2s 14ms/step - accuracy: 0.7979 - loss: 0.5745 - val_accuracy: 0.7560 - val_loss: 0.7520  
Epoch 134/300  
157/157 2s 14ms/step - accuracy: 0.7968 - loss: 0.5785 - val_accuracy: 0.7514 - val_loss: 0.7729  
Epoch 135/300  
157/157 2s 14ms/step - accuracy: 0.7990 - loss: 0.5704 - val_accuracy: 0.7456 - val_loss: 0.7907  
Epoch 136/300  
157/157 2s 15ms/step - accuracy: 0.8014 - loss: 0.5646 - val_accuracy: 0.7566 - val_loss: 0.7431  
Epoch 137/300  
157/157 2s 14ms/step - accuracy: 0.8045 - loss: 0.5633 - val_accuracy: 0.7306 - val_loss: 0.8452  
Epoch 138/300  
157/157 2s 14ms/step - accuracy: 0.8021 - loss: 0.5612 - val_accuracy: 0.7586 - val_loss: 0.7357  
Epoch 139/300  
157/157 2s 14ms/step - accuracy: 0.8015 - loss: 0.5626 - val_accuracy: 0.7535 - val_loss: 0.7353  
Epoch 140/300  
157/157 2s 14ms/step - accuracy: 0.8011 - loss: 0.5652 - val_accuracy: 0.7510 - val_loss: 0.7934  
Epoch 141/300  
157/157 2s 15ms/step - accuracy: 0.8051 - loss: 0.5658 - val_accuracy: 0.7541 - val_loss: 0.7735  
Epoch 142/300  
157/157 2s 14ms/step - accuracy: 0.8020 - loss: 0.5668 - val_accuracy: 0.7574 - val_loss: 0.7603  
Epoch 143/300  
157/157 2s 14ms/step - accuracy: 0.8012 - loss: 0.5696 - val_accuracy: 0.7390 - val_loss: 0.8309  
Epoch 144/300  
157/157 2s 14ms/step - accuracy: 0.7955 - loss: 0.5792 - val_accuracy: 0.7714 - val_loss: 0.7069  
Epoch 145/300  
157/157 2s 14ms/step - accuracy: 0.8034 - loss: 0.5570 - val_accuracy: 0.7363 - val_loss: 0.8262  
Epoch 146/300  
157/157 2s 14ms/step - accuracy: 0.8015 - loss: 0.5630 - val_accuracy: 0.7424 - val_loss: 0.8241  
Epoch 147/300  
157/157 2s 14ms/step - accuracy: 0.8014 - loss: 0.5667 - val_accuracy: 0.7524 - val_loss: 0.7716  
Epoch 148/300  
157/157 2s 14ms/step - accuracy: 0.7985 - loss: 0.5696 - val_accuracy: 0.7601 - val_loss: 0.7613  
Epoch 149/300  
157/157 2s 14ms/step - accuracy: 0.7986 - loss: 0.5634 - val_accuracy: 0.7555 - val_loss: 0.7549  
Epoch 150/300  
157/157 2s 14ms/step - accuracy: 0.8000 - loss: 0.5629 - val_accuracy: 0.7510 - val_loss: 0.8051  
Epoch 151/300  
157/157 2s 14ms/step - accuracy: 0.8010 - loss: 0.5712 - val_accuracy: 0.7587 - val_loss: 0.7638  
Epoch 152/300  
157/157 2s 14ms/step - accuracy: 0.7999 - loss: 0.5713 - val_accuracy: 0.7798 - val_loss: 0.6960  
Epoch 153/300  
157/157 2s 14ms/step - accuracy: 0.8021 - loss: 0.5700 - val_accuracy: 0.7434 - val_loss: 0.8060  
Epoch 154/300  
157/157 2s 14ms/step - accuracy: 0.8020 - loss: 0.5609 - val_accuracy: 0.7560 - val_loss: 0.7986  
Epoch 155/300
```

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157/157 2s 14ms/step - accuracy: 0.7993 - loss: 0.5633 - val_accuracy: 0.7468 - val_loss: 0.7487
Epoch 156/300
157/157 2s 14ms/step - accuracy: 0.8070 - loss: 0.5476 - val_accuracy: 0.7620 - val_loss: 0.7214
Epoch 157/300
157/157 2s 14ms/step - accuracy: 0.8099 - loss: 0.5415 - val_accuracy: 0.7655 - val_loss: 0.7400
Epoch 158/300
157/157 2s 14ms/step - accuracy: 0.8076 - loss: 0.5430 - val_accuracy: 0.7641 - val_loss: 0.7277
Epoch 159/300
157/157 2s 14ms/step - accuracy: 0.8027 - loss: 0.5605 - val_accuracy: 0.7619 - val_loss: 0.7336
Epoch 160/300
157/157 2s 14ms/step - accuracy: 0.8021 - loss: 0.5639 - val_accuracy: 0.7574 - val_loss: 0.7272
Epoch 161/300
157/157 2s 14ms/step - accuracy: 0.8077 - loss: 0.5463 - val_accuracy: 0.7711 - val_loss: 0.7135
Epoch 162/300
157/157 2s 15ms/step - accuracy: 0.8035 - loss: 0.5558 - val_accuracy: 0.7547 - val_loss: 0.7504
Epoch 163/300
157/157 2s 14ms/step - accuracy: 0.8035 - loss: 0.5531 - val_accuracy: 0.7650 - val_loss: 0.7297
Epoch 164/300
157/157 2s 14ms/step - accuracy: 0.8073 - loss: 0.5481 - val_accuracy: 0.7606 - val_loss: 0.7534
Epoch 165/300
157/157 2s 14ms/step - accuracy: 0.8022 - loss: 0.5594 - val_accuracy: 0.7746 - val_loss: 0.7261
Epoch 166/300
157/157 2s 14ms/step - accuracy: 0.8012 - loss: 0.5670 - val_accuracy: 0.7501 - val_loss: 0.7566
Epoch 167/300
157/157 2s 14ms/step - accuracy: 0.8051 - loss: 0.5499 - val_accuracy: 0.7585 - val_loss: 0.7593
Epoch 168/300
157/157 2s 14ms/step - accuracy: 0.8031 - loss: 0.5605 - val_accuracy: 0.7423 - val_loss: 0.8122
Epoch 169/300
157/157 2s 14ms/step - accuracy: 0.8009 - loss: 0.5641 - val_accuracy: 0.7684 - val_loss: 0.6975
Epoch 170/300
157/157 2s 14ms/step - accuracy: 0.8060 - loss: 0.5493 - val_accuracy: 0.7607 - val_loss: 0.7399
Epoch 171/300
157/157 2s 14ms/step - accuracy: 0.8074 - loss: 0.5496 - val_accuracy: 0.7733 - val_loss: 0.6897
Epoch 172/300
157/157 2s 15ms/step - accuracy: 0.8023 - loss: 0.5574 - val_accuracy: 0.7635 - val_loss: 0.7239
Epoch 173/300
157/157 2s 15ms/step - accuracy: 0.8070 - loss: 0.5495 - val_accuracy: 0.7468 - val_loss: 0.8114
Epoch 174/300
157/157 2s 14ms/step - accuracy: 0.8052 - loss: 0.5578 - val_accuracy: 0.7477 - val_loss: 0.7869
Epoch 175/300
157/157 2s 14ms/step - accuracy: 0.8014 - loss: 0.5664 - val_accuracy: 0.7618 - val_loss: 0.7310
Epoch 176/300
157/157 2s 14ms/step - accuracy: 0.8049 - loss: 0.5552 - val_accuracy: 0.7413 - val_loss: 0.7897
Epoch 177/300
157/157 2s 14ms/step - accuracy: 0.8059 - loss: 0.5497 - val_accuracy: 0.7606 - val_loss: 0.7426
Epoch 178/300
157/157 2s 14ms/step - accuracy: 0.8087 - loss: 0.5421 - val_accuracy: 0.7247 - val_loss: 0.9358
Epoch 179/300
157/157 2s 14ms/step - accuracy: 0.8013 - loss: 0.5683 - val_accuracy: 0.7695 - val_loss: 0.6980
Epoch 180/300
157/157 2s 14ms/step - accuracy: 0.8044 - loss: 0.5490 - val_accuracy: 0.7676 - val_loss: 0.7361
Epoch 181/300
157/157 2s 14ms/step - accuracy: 0.8071 - loss: 0.5563 - val_accuracy: 0.7619 - val_loss: 0.7294
Epoch 182/300
157/157 2s 14ms/step - accuracy: 0.8090 - loss: 0.5438 - val_accuracy: 0.7709 - val_loss: 0.7089
Epoch 183/300
157/157 2s 14ms/step - accuracy: 0.8083 - loss: 0.5434 - val_accuracy: 0.7749 - val_loss: 0.6783
Epoch 184/300
157/157 2s 14ms/step - accuracy: 0.8110 - loss: 0.5392 - val_accuracy: 0.7761 - val_loss: 0.6911
Epoch 185/300
157/157 2s 14ms/step - accuracy: 0.8053 - loss: 0.5588 - val_accuracy: 0.7666 - val_loss: 0.7177
Epoch 186/300
157/157 2s 14ms/step - accuracy: 0.8149 - loss: 0.5346 - val_accuracy: 0.7554 - val_loss: 0.8061
Epoch 187/300
157/157 2s 14ms/step - accuracy: 0.8011 - loss: 0.5559 - val_accuracy: 0.7410 - val_loss: 0.8229
Epoch 188/300
157/157 2s 14ms/step - accuracy: 0.8076 - loss: 0.5494 - val_accuracy: 0.7381 - val_loss: 0.8275
Epoch 189/300
157/157 2s 14ms/step - accuracy: 0.8047 - loss: 0.5510 - val_accuracy: 0.7648 - val_loss: 0.7137
Epoch 190/300
157/157 2s 14ms/step - accuracy: 0.8069 - loss: 0.5511 - val_accuracy: 0.7420 - val_loss: 0.8005
Epoch 191/300
157/157 2s 14ms/step - accuracy: 0.8078 - loss: 0.5460 - val_accuracy: 0.7564 - val_loss: 0.7601
Epoch 192/300
157/157 2s 14ms/step - accuracy: 0.8088 - loss: 0.5515 - val_accuracy: 0.7748 - val_loss: 0.6961
Epoch 193/300
157/157 2s 14ms/step - accuracy: 0.8055 - loss: 0.5442 - val_accuracy: 0.7503 - val_loss: 0.7891
Epoch 194/300
157/157 2s 14ms/step - accuracy: 0.8077 - loss: 0.5393 - val_accuracy: 0.7502 - val_loss: 0.8136
Epoch 195/300
157/157 2s 14ms/step - accuracy: 0.8084 - loss: 0.5511 - val_accuracy: 0.7615 - val_loss: 0.7504
Epoch 196/300
157/157 2s 14ms/step - accuracy: 0.8068 - loss: 0.5434 - val_accuracy: 0.7607 - val_loss: 0.7405
Epoch 197/300
157/157 2s 14ms/step - accuracy: 0.8078 - loss: 0.5515 - val_accuracy: 0.7699 - val_loss: 0.7195
```

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Epoch 198/300
157/157 2s 14ms/step - accuracy: 0.8073 - loss: 0.5451 - val_accuracy: 0.7645 - val_loss: 0.7307
Epoch 199/300
157/157 2s 14ms/step - accuracy: 0.8084 - loss: 0.5418 - val_accuracy: 0.7788 - val_loss: 0.6614
Epoch 200/300
157/157 2s 14ms/step - accuracy: 0.8088 - loss: 0.5450 - val_accuracy: 0.7670 - val_loss: 0.7145
Epoch 201/300
157/157 2s 14ms/step - accuracy: 0.8122 - loss: 0.5417 - val_accuracy: 0.7541 - val_loss: 0.7760
Epoch 202/300
157/157 2s 14ms/step - accuracy: 0.8048 - loss: 0.5568 - val_accuracy: 0.7722 - val_loss: 0.7205
Epoch 203/300
157/157 2s 14ms/step - accuracy: 0.8120 - loss: 0.5365 - val_accuracy: 0.7665 - val_loss: 0.7044
Epoch 204/300
157/157 2s 14ms/step - accuracy: 0.8078 - loss: 0.5473 - val_accuracy: 0.7514 - val_loss: 0.7637
Epoch 205/300
157/157 2s 14ms/step - accuracy: 0.8068 - loss: 0.5563 - val_accuracy: 0.7735 - val_loss: 0.7068
Epoch 206/300
157/157 2s 14ms/step - accuracy: 0.8098 - loss: 0.5496 - val_accuracy: 0.7630 - val_loss: 0.7261
Epoch 207/300
157/157 2s 15ms/step - accuracy: 0.8064 - loss: 0.5509 - val_accuracy: 0.7454 - val_loss: 0.7755
Epoch 208/300
157/157 2s 14ms/step - accuracy: 0.8108 - loss: 0.5368 - val_accuracy: 0.7827 - val_loss: 0.6667
Epoch 209/300
157/157 2s 14ms/step - accuracy: 0.8099 - loss: 0.5404 - val_accuracy: 0.7507 - val_loss: 0.7974
Epoch 210/300
157/157 2s 14ms/step - accuracy: 0.8056 - loss: 0.5481 - val_accuracy: 0.7668 - val_loss: 0.7273
Epoch 211/300
157/157 2s 14ms/step - accuracy: 0.8062 - loss: 0.5445 - val_accuracy: 0.7563 - val_loss: 0.7316
Epoch 212/300
157/157 2s 14ms/step - accuracy: 0.8094 - loss: 0.5408 - val_accuracy: 0.7541 - val_loss: 0.7651
Epoch 213/300
157/157 2s 14ms/step - accuracy: 0.8105 - loss: 0.5438 - val_accuracy: 0.7618 - val_loss: 0.7256
Epoch 214/300
157/157 2s 14ms/step - accuracy: 0.8106 - loss: 0.5388 - val_accuracy: 0.7531 - val_loss: 0.7612
Epoch 215/300
157/157 2s 14ms/step - accuracy: 0.8064 - loss: 0.5432 - val_accuracy: 0.7553 - val_loss: 0.7524
Epoch 216/300
157/157 2s 14ms/step - accuracy: 0.8061 - loss: 0.5502 - val_accuracy: 0.7554 - val_loss: 0.7773
Epoch 217/300
157/157 2s 14ms/step - accuracy: 0.8107 - loss: 0.5347 - val_accuracy: 0.7457 - val_loss: 0.7721
Epoch 218/300
157/157 2s 14ms/step - accuracy: 0.8116 - loss: 0.5437 - val_accuracy: 0.7364 - val_loss: 0.8048
Epoch 219/300
157/157 2s 14ms/step - accuracy: 0.8060 - loss: 0.5522 - val_accuracy: 0.7478 - val_loss: 0.7630
Epoch 220/300
157/157 2s 14ms/step - accuracy: 0.8085 - loss: 0.5441 - val_accuracy: 0.7759 - val_loss: 0.6918
Epoch 221/300
157/157 2s 14ms/step - accuracy: 0.8083 - loss: 0.5507 - val_accuracy: 0.7724 - val_loss: 0.7013
Epoch 222/300
157/157 2s 14ms/step - accuracy: 0.8148 - loss: 0.5330 - val_accuracy: 0.7557 - val_loss: 0.7697
Epoch 223/300
157/157 2s 14ms/step - accuracy: 0.8064 - loss: 0.5453 - val_accuracy: 0.7588 - val_loss: 0.7413
Epoch 224/300
157/157 2s 14ms/step - accuracy: 0.8105 - loss: 0.5390 - val_accuracy: 0.7687 - val_loss: 0.7054
Epoch 225/300
157/157 2s 14ms/step - accuracy: 0.8075 - loss: 0.5482 - val_accuracy: 0.7639 - val_loss: 0.7197
Epoch 226/300
157/157 2s 14ms/step - accuracy: 0.8037 - loss: 0.5481 - val_accuracy: 0.7543 - val_loss: 0.7591
Epoch 227/300
157/157 2s 14ms/step - accuracy: 0.8099 - loss: 0.5413 - val_accuracy: 0.7621 - val_loss: 0.7287
Epoch 228/300
157/157 2s 14ms/step - accuracy: 0.8090 - loss: 0.5377 - val_accuracy: 0.7683 - val_loss: 0.7172
Epoch 229/300
157/157 2s 14ms/step - accuracy: 0.8066 - loss: 0.5437 - val_accuracy: 0.7508 - val_loss: 0.7788
Epoch 230/300
157/157 2s 14ms/step - accuracy: 0.8074 - loss: 0.5518 - val_accuracy: 0.7562 - val_loss: 0.7517
Epoch 231/300
157/157 2s 14ms/step - accuracy: 0.8060 - loss: 0.5539 - val_accuracy: 0.7628 - val_loss: 0.7147
Epoch 232/300
157/157 2s 15ms/step - accuracy: 0.8045 - loss: 0.5468 - val_accuracy: 0.7540 - val_loss: 0.7525
Epoch 233/300
157/157 2s 14ms/step - accuracy: 0.8067 - loss: 0.5574 - val_accuracy: 0.7510 - val_loss: 0.7446
Epoch 234/300
157/157 2s 14ms/step - accuracy: 0.8087 - loss: 0.5461 - val_accuracy: 0.7521 - val_loss: 0.7404
Epoch 235/300
157/157 2s 14ms/step - accuracy: 0.8143 - loss: 0.5349 - val_accuracy: 0.7444 - val_loss: 0.8166
Epoch 236/300
157/157 2s 14ms/step - accuracy: 0.8078 - loss: 0.5499 - val_accuracy: 0.7606 - val_loss: 0.7170
Epoch 237/300
157/157 2s 14ms/step - accuracy: 0.8092 - loss: 0.5406 - val_accuracy: 0.7561 - val_loss: 0.8094
Epoch 238/300
157/157 2s 14ms/step - accuracy: 0.8103 - loss: 0.5402 - val_accuracy: 0.7524 - val_loss: 0.7791
Epoch 239/300
157/157 2s 14ms/step - accuracy: 0.8052 - loss: 0.5554 - val_accuracy: 0.7390 - val_loss: 0.8180
Epoch 240/300
```

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Epoch 240/300  
157/157 2s 14ms/step - accuracy: 0.8093 - loss: 0.5366 - val_accuracy: 0.7623 - val_loss: 0.7644  
Epoch 241/300  
157/157 2s 14ms/step - accuracy: 0.8041 - loss: 0.5482 - val_accuracy: 0.7575 - val_loss: 0.7277  
Epoch 242/300  
157/157 2s 14ms/step - accuracy: 0.8010 - loss: 0.5590 - val_accuracy: 0.7573 - val_loss: 0.7414  
Epoch 243/300  
157/157 2s 14ms/step - accuracy: 0.8134 - loss: 0.5382 - val_accuracy: 0.7638 - val_loss: 0.7121  
Epoch 244/300  
157/157 2s 14ms/step - accuracy: 0.8103 - loss: 0.5422 - val_accuracy: 0.7532 - val_loss: 0.7605  
Epoch 245/300  
157/157 2s 14ms/step - accuracy: 0.8061 - loss: 0.5529 - val_accuracy: 0.7637 - val_loss: 0.7251  
Epoch 246/300  
157/157 2s 14ms/step - accuracy: 0.8059 - loss: 0.5487 - val_accuracy: 0.7571 - val_loss: 0.7806  
Epoch 247/300  
157/157 2s 15ms/step - accuracy: 0.8063 - loss: 0.5530 - val_accuracy: 0.7544 - val_loss: 0.7573  
Epoch 248/300  
157/157 2s 14ms/step - accuracy: 0.8085 - loss: 0.5441 - val_accuracy: 0.7670 - val_loss: 0.7028  
Epoch 249/300  
157/157 2s 14ms/step - accuracy: 0.8100 - loss: 0.5461 - val_accuracy: 0.7830 - val_loss: 0.6618  
Epoch 250/300  
157/157 2s 14ms/step - accuracy: 0.8052 - loss: 0.5528 - val_accuracy: 0.7581 - val_loss: 0.7740  
Epoch 251/300  
157/157 2s 14ms/step - accuracy: 0.8083 - loss: 0.5482 - val_accuracy: 0.7689 - val_loss: 0.7140  
Epoch 252/300  
157/157 2s 15ms/step - accuracy: 0.8044 - loss: 0.5461 - val_accuracy: 0.7566 - val_loss: 0.7405  
Epoch 253/300  
157/157 2s 14ms/step - accuracy: 0.8070 - loss: 0.5518 - val_accuracy: 0.7548 - val_loss: 0.7663  
Epoch 254/300  
157/157 2s 14ms/step - accuracy: 0.8107 - loss: 0.5373 - val_accuracy: 0.7662 - val_loss: 0.7130  
Epoch 255/300  
157/157 2s 14ms/step - accuracy: 0.8072 - loss: 0.5501 - val_accuracy: 0.7495 - val_loss: 0.7814  
Epoch 256/300  
157/157 2s 14ms/step - accuracy: 0.8058 - loss: 0.5501 - val_accuracy: 0.7412 - val_loss: 0.8186  
Epoch 257/300  
157/157 2s 15ms/step - accuracy: 0.8080 - loss: 0.5443 - val_accuracy: 0.7562 - val_loss: 0.7299  
Epoch 258/300  
157/157 2s 14ms/step - accuracy: 0.8059 - loss: 0.5515 - val_accuracy: 0.7623 - val_loss: 0.7229  
Epoch 259/300  
157/157 2s 14ms/step - accuracy: 0.8064 - loss: 0.5577 - val_accuracy: 0.7738 - val_loss: 0.6878  
Epoch 260/300  
157/157 2s 14ms/step - accuracy: 0.8063 - loss: 0.5517 - val_accuracy: 0.7384 - val_loss: 0.8570  
Epoch 261/300  
157/157 2s 14ms/step - accuracy: 0.8040 - loss: 0.5591 - val_accuracy: 0.7702 - val_loss: 0.7026  
Epoch 262/300  
157/157 2s 14ms/step - accuracy: 0.8089 - loss: 0.5460 - val_accuracy: 0.7471 - val_loss: 0.7900  
Epoch 263/300  
157/157 2s 14ms/step - accuracy: 0.8030 - loss: 0.5696 - val_accuracy: 0.7349 - val_loss: 0.8240  
Epoch 264/300  
157/157 2s 14ms/step - accuracy: 0.8055 - loss: 0.5539 - val_accuracy: 0.7689 - val_loss: 0.7087  
Epoch 265/300  
157/157 2s 14ms/step - accuracy: 0.8073 - loss: 0.5470 - val_accuracy: 0.7576 - val_loss: 0.7384  
Epoch 266/300  
157/157 2s 14ms/step - accuracy: 0.8139 - loss: 0.5284 - val_accuracy: 0.7251 - val_loss: 0.8566  
Epoch 267/300  
157/157 2s 15ms/step - accuracy: 0.8065 - loss: 0.5462 - val_accuracy: 0.7230 - val_loss: 0.8570  
Epoch 268/300  
157/157 2s 14ms/step - accuracy: 0.7984 - loss: 0.5623 - val_accuracy: 0.7328 - val_loss: 0.8430  
Epoch 269/300  
157/157 2s 14ms/step - accuracy: 0.8104 - loss: 0.5473 - val_accuracy: 0.7386 - val_loss: 0.8006  
Epoch 270/300  
157/157 2s 14ms/step - accuracy: 0.8049 - loss: 0.5511 - val_accuracy: 0.7500 - val_loss: 0.7619  
Epoch 271/300  
157/157 2s 14ms/step - accuracy: 0.8048 - loss: 0.5527 - val_accuracy: 0.7413 - val_loss: 0.7867  
Epoch 272/300  
157/157 2s 14ms/step - accuracy: 0.8052 - loss: 0.5533 - val_accuracy: 0.7502 - val_loss: 0.7534  
Epoch 273/300  
157/157 2s 14ms/step - accuracy: 0.8128 - loss: 0.5378 - val_accuracy: 0.7627 - val_loss: 0.7177  
Epoch 274/300  
157/157 2s 14ms/step - accuracy: 0.8050 - loss: 0.5499 - val_accuracy: 0.7459 - val_loss: 0.7841  
Epoch 275/300  
157/157 2s 14ms/step - accuracy: 0.8078 - loss: 0.5525 - val_accuracy: 0.7563 - val_loss: 0.7357  
Epoch 276/300  
157/157 2s 14ms/step - accuracy: 0.8103 - loss: 0.5412 - val_accuracy: 0.7670 - val_loss: 0.7050  
Epoch 277/300  
157/157 2s 14ms/step - accuracy: 0.8056 - loss: 0.5494 - val_accuracy: 0.7557 - val_loss: 0.7384  
Epoch 278/300  
157/157 2s 14ms/step - accuracy: 0.8072 - loss: 0.5461 - val_accuracy: 0.7412 - val_loss: 0.7901  
Epoch 279/300  
157/157 2s 14ms/step - accuracy: 0.8034 - loss: 0.5520 - val_accuracy: 0.7389 - val_loss: 0.7889  
Epoch 280/300  
157/157 2s 14ms/step - accuracy: 0.8056 - loss: 0.5494 - val_accuracy: 0.7544 - val_loss: 0.7540  
Epoch 281/300  
157/157 2s 14ms/step - accuracy: 0.8063 - loss: 0.5503 - val_accuracy: 0.7704 - val_loss: 0.7014  
Epoch 282/300
```

```
# Batch Normalization
bn_model = build_resnet10(include_batchnorm=True)
history_bn, time_bn, loss_bn, acc_bn = train_and_evaluate(bn_model, "Batch Normalization ONLY")

Epoch 285/300
157/157 2s 14ms/step - accuracy: 0.7990 - loss: 0.5677 - val_accuracy: 0.7501 - val_loss: 0.7482
Epoch 286/300
157/157 2s 14ms/step - accuracy: 0.8080 - loss: 0.5473 - val_accuracy: 0.7451 - val_loss: 0.7513
Epoch 287/300
157/157 2s 14ms/step - accuracy: 0.8070 - loss: 0.5460 - val_accuracy: 0.7409 - val_loss: 0.8246
Epoch 288/300
157/157 2s 14ms/step - accuracy: 0.7993 - loss: 0.5658 - val_accuracy: 0.7789 - val_loss: 0.6629
Epoch 289/300
157/157 2s 14ms/step - accuracy: 0.8110 - loss: 0.5450 - val_accuracy: 0.7250 - val_loss: 0.8034
Epoch 290/300
157/157 2s 14ms/step - accuracy: 0.8016 - loss: 0.5609 - val_accuracy: 0.7693 - val_loss: 0.7051
Epoch 291/300
157/157 2s 14ms/step - accuracy: 0.8044 - loss: 0.5585 - val_accuracy: 0.7570 - val_loss: 0.7419
Epoch 292/300
157/157 2s 14ms/step - accuracy: 0.8073 - loss: 0.5503 - val_accuracy: 0.7385 - val_loss: 0.7612
Epoch 293/300
157/157 2s 15ms/step - accuracy: 0.8009 - loss: 0.5597 - val_accuracy: 0.7574 - val_loss: 0.7214
Epoch 294/300
157/157 2s 14ms/step - accuracy: 0.8055 - loss: 0.5538 - val_accuracy: 0.7625 - val_loss: 0.7263
Epoch 295/300
157/157 2s 14ms/step - accuracy: 0.8043 - loss: 0.5574 - val_accuracy: 0.7620 - val_loss: 0.7237
Epoch 296/300
157/157 2s 14ms/step - accuracy: 0.8108 - loss: 0.5411 - val_accuracy: 0.7567 - val_loss: 0.7441
Epoch 297/300
157/157 2s 14ms/step - accuracy: 0.8086 - loss: 0.5438 - val_accuracy: 0.7536 - val_loss: 0.7471
Epoch 298/300
157/157 2s 14ms/step - accuracy: 0.8026 - loss: 0.5583 - val_accuracy: 0.7149 - val_loss: 0.8765
Epoch 299/300
157/157 2s 14ms/step - accuracy: 0.8049 - loss: 0.5544 - val_accuracy: 0.7569 - val_loss: 0.7248
Epoch 300/300
157/157 2s 14ms/step - accuracy: 0.8107 - loss: 0.5462 - val_accuracy: 0.7591 - val_loss: 0.7109
Dropout (p=0.3) (NO BN) - Training Time: 723.35s, Test Accuracy: 0.7642, Final Train Loss: 0.5547
```


Model: "functional_6"

| Layer (type) | Output Shape | Param # | Connected to |
|---|--------------------|---------|--|
| input_layer_6 (InputLayer) | (None, 32, 32, 3) | 0 | - |
| conv2d_126 (Conv2D) | (None, 32, 32, 32) | 896 | input_layer_6[0]... |
| batch_normalizatio... (BatchNormalizatio...) | (None, 32, 32, 32) | 128 | conv2d_126[0][0] |
| conv2d_127 (Conv2D) | (None, 32, 32, 32) | 9,248 | batch_normalizat... |
| batch_normalizatio... (BatchNormalizatio...) | (None, 32, 32, 32) | 128 | conv2d_127[0][0] |
| conv2d_128 (Conv2D) | (None, 32, 32, 32) | 9,248 | batch_normalizat... |
| batch_normalizatio... (BatchNormalizatio...) | (None, 32, 32, 32) | 128 | conv2d_128[0][0] |
| add_60 (Add) | (None, 32, 32, 32) | 0 | batch_normalizat... batch_normalizat... |
| re_lu_60 (ReLU) | (None, 32, 32, 32) | 0 | add_60[0][0] |
| conv2d_129 (Conv2D) | (None, 32, 32, 32) | 9,248 | re_lu_60[0][0] |
| batch_normalizatio... (BatchNormalizatio...) | (None, 32, 32, 32) | 128 | conv2d_129[0][0] |
| conv2d_130 (Conv2D) | (None, 32, 32, 32) | 9,248 | batch_normalizat... |
| batch_normalizatio... (BatchNormalizatio...) | (None, 32, 32, 32) | 128 | conv2d_130[0][0] |
| add_61 (Add) | (None, 32, 32, 32) | 0 | re_lu_60[0][0], batch_normalizat... |
| re_lu_61 (ReLU) | (None, 32, 32, 32) | 0 | add_61[0][0] |
| conv2d_131 (Conv2D) | (None, 32, 32, 32) | 9,248 | re_lu_61[0][0] |
| batch_normalizatio... (BatchNormalizatio...) | (None, 32, 32, 32) | 128 | conv2d_131[0][0] |
| conv2d_132 (Conv2D) | (None, 32, 32, 32) | 9,248 | batch_normalizat... |
| batch_normalizatio... (BatchNormalizatio...) | (None, 32, 32, 32) | 128 | conv2d_132[0][0] |
| add_62 (Add) | (None, 32, 32, 32) | 0 | re_lu_61[0][0], batch_normalizat... |
| re_lu_62 (ReLU) | (None, 32, 32, 32) | 0 | add_62[0][0] |
| conv2d_133 (Conv2D) | (None, 32, 32, 32) | 9,248 | re_lu_62[0][0] |
| batch_normalizatio... (BatchNormalizatio...) | (None, 32, 32, 32) | 128 | conv2d_133[0][0] |
| conv2d_134 (Conv2D) | (None, 32, 32, 32) | 9,248 | batch_normalizat... |
| batch_normalizatio... (BatchNormalizatio...) | (None, 32, 32, 32) | 128 | conv2d_134[0][0] |
| add_63 (Add) | (None, 32, 32, 32) | 0 | re_lu_62[0][0], batch_normalizat... |
| re_lu_63 (ReLU) | (None, 32, 32, 32) | 0 | add_63[0][0] |
| conv2d_135 (Conv2D) | (None, 32, 32, | 9,248 | re_lu_63[0][0] |

| | | | |
|---|-----------------------|-------|--|
| | 32) | | |
| batch_normalizatio... (BatchNormalizatio...) | (None, 32, 32, 32) | 128 | conv2d_135[0][0] |
| conv2d_136 (Conv2D) | (None, 32, 32, 32) | 9,248 | batch_normalizat... |
| batch_normalizatio... (BatchNormalizatio...) | (None, 32, 32, 32) | 128 | conv2d_136[0][0] |
| add_64 (Add) | (None, 32, 32, 32) | 0 | re_lu_63[0][0], batch_normalizat... |
| re_lu_64 (ReLU) | (None, 32, 32, 32) | 0 | add_64[0][0] |
| conv2d_137 (Conv2D) | (None, 32, 32, 32) | 9,248 | re_lu_64[0][0] |
| batch_normalizatio... (BatchNormalizatio...) | (None, 32, 32, 32) | 128 | conv2d_137[0][0] |
| conv2d_138 (Conv2D) | (None, 32, 32, 32) | 9,248 | batch_normalizat... |
| batch_normalizatio... (BatchNormalizatio...) | (None, 32, 32, 32) | 128 | conv2d_138[0][0] |
| add_65 (Add) | (None, 32, 32, 32) | 0 | re_lu_64[0][0], batch_normalizat... |
| re_lu_65 (ReLU) | (None, 32, 32, 32) | 0 | add_65[0][0] |
| conv2d_139 (Conv2D) | (None, 32, 32, 32) | 9,248 | re_lu_65[0][0] |
| batch_normalizatio... (BatchNormalizatio...) | (None, 32, 32, 32) | 128 | conv2d_139[0][0] |
| conv2d_140 (Conv2D) | (None, 32, 32, 32) | 9,248 | batch_normalizat... |
| batch_normalizatio... (BatchNormalizatio...) | (None, 32, 32, 32) | 128 | conv2d_140[0][0] |
| add_66 (Add) | (None, 32, 32, 32) | 0 | re_lu_65[0][0], batch_normalizat... |
| re_lu_66 (ReLU) | (None, 32, 32, 32) | 0 | add_66[0][0] |
| conv2d_141 (Conv2D) | (None, 32, 32, 32) | 9,248 | re_lu_66[0][0] |
| batch_normalizatio... (BatchNormalizatio...) | (None, 32, 32, 32) | 128 | conv2d_141[0][0] |
| conv2d_142 (Conv2D) | (None, 32, 32, 32) | 9,248 | batch_normalizat... |
| batch_normalizatio... (BatchNormalizatio...) | (None, 32, 32, 32) | 128 | conv2d_142[0][0] |
| add_67 (Add) | (None, 32, 32, 32) | 0 | re_lu_66[0][0], batch_normalizat... |
| re_lu_67 (ReLU) | (None, 32, 32, 32) | 0 | add_67[0][0] |
| conv2d_143 (Conv2D) | (None, 32, 32, 32) | 9,248 | re_lu_67[0][0] |
| batch_normalizatio... (BatchNormalizatio...) | (None, 32, 32, 32) | 128 | conv2d_143[0][0] |
| conv2d_144 (Conv2D) | (None, 32, 32, 32) | 9,248 | batch_normalizat... |
| batch_normalizatio... (BatchNormalizatio...) | (None, 32, 32, 32) | 128 | conv2d_144[0][0] |
| add_68 (Add) | (None, 32, 32, 32) | 0 | re_lu_67[0][0], batch_normalizat... |
| re_lu_68 (ReLU) | (None, 32, 32, 32) | 0 | add_68[0][0] |

| conv2d_145 (Conv2D) | (None, 32, 32, 32) | 9,248 | re_lu_68[0][0] |
|--|--------------------|-------|-------------------------------------|
| batch_normalizatio... (BatchNormalizatio...) | (None, 32, 32, 32) | 128 | conv2d_145[0][0] |
| conv2d_146 (Conv2D) | (None, 32, 32, 32) | 9,248 | batch_normalizat... |
| batch_normalizatio... (BatchNormalizatio...) | (None, 32, 32, 32) | 128 | conv2d_146[0][0] |
| add_69 (Add) | (None, 32, 32, 32) | 0 | re_lu_68[0][0], batch_normalizat... |
| re_lu_69 (ReLU) | (None, 32, 32, 32) | 0 | add_69[0][0] |
| global_average_poo... (GlobalAveragePool...) | (None, 32) | 0 | re_lu_69[0][0] |
| dense_6 (Dense) | (None, 10) | 330 | global_average_p... |

Total params: 188,874 (737.79 KB)

Trainable params: 187,530 (732.54 KB)

Non-trainable params: 1,344 (5.25 KB)

===== Training: Batch Normalization ONLY =====

Epoch 1/300

157/157 41s 106ms/step - accuracy: 0.3315 - loss: 1.9332 - val_accuracy: 0.0955 - val_loss: 4.0915

Epoch 2/300

157/157 2s 15ms/step - accuracy: 0.5728 - loss: 1.1908 - val_accuracy: 0.1766 - val_loss: 3.1871

Epoch 3/300

157/157 2s 15ms/step - accuracy: 0.6484 - loss: 0.9857 - val_accuracy: 0.4818 - val_loss: 1.5088

Epoch 4/300

157/157 2s 15ms/step - accuracy: 0.6876 - loss: 0.8806 - val_accuracy: 0.6036 - val_loss: 1.1607

Epoch 5/300

157/157 2s 15ms/step - accuracy: 0.7238 - loss: 0.7858 - val_accuracy: 0.5117 - val_loss: 1.7510

Epoch 6/300

157/157 2s 15ms/step - accuracy: 0.7485 - loss: 0.7183 - val_accuracy: 0.5439 - val_loss: 1.6188

Epoch 7/300

157/157 2s 15ms/step - accuracy: 0.7711 - loss: 0.6621 - val_accuracy: 0.6408 - val_loss: 1.1821

Epoch 8/300

157/157 2s 15ms/step - accuracy: 0.7947 - loss: 0.6049 - val_accuracy: 0.5797 - val_loss: 1.5469

Epoch 9/300

157/157 2s 15ms/step - accuracy: 0.8045 - loss: 0.5668 - val_accuracy: 0.5611 - val_loss: 1.6449

Epoch 10/300

157/157 2s 15ms/step - accuracy: 0.8183 - loss: 0.5261 - val_accuracy: 0.5801 - val_loss: 1.4427

Epoch 11/300

157/157 2s 15ms/step - accuracy: 0.8245 - loss: 0.5140 - val_accuracy: 0.6710 - val_loss: 1.1836

Epoch 12/300

157/157 2s 15ms/step - accuracy: 0.8374 - loss: 0.4704 - val_accuracy: 0.6949 - val_loss: 1.0173

Epoch 13/300

157/157 2s 15ms/step - accuracy: 0.8470 - loss: 0.4488 - val_accuracy: 0.6793 - val_loss: 1.1072

Epoch 14/300

157/157 2s 15ms/step - accuracy: 0.8579 - loss: 0.4186 - val_accuracy: 0.6600 - val_loss: 1.0535

Epoch 15/300

157/157 2s 15ms/step - accuracy: 0.8655 - loss: 0.3946 - val_accuracy: 0.5972 - val_loss: 1.6679

Epoch 16/300

157/157 2s 15ms/step - accuracy: 0.8735 - loss: 0.3747 - val_accuracy: 0.6313 - val_loss: 1.7152

Epoch 17/300

157/157 2s 15ms/step - accuracy: 0.8811 - loss: 0.3509 - val_accuracy: 0.6751 - val_loss: 1.1884

Epoch 18/300

157/157 2s 15ms/step - accuracy: 0.8900 - loss: 0.3294 - val_accuracy: 0.5868 - val_loss: 1.6211

Epoch 19/300

157/157 2s 15ms/step - accuracy: 0.8968 - loss: 0.3046 - val_accuracy: 0.6570 - val_loss: 1.4378

Epoch 20/300

157/157 2s 15ms/step - accuracy: 0.9044 - loss: 0.2877 - val_accuracy: 0.7249 - val_loss: 0.9386

Epoch 21/300

157/157 2s 15ms/step - accuracy: 0.9078 - loss: 0.2705 - val_accuracy: 0.6819 - val_loss: 1.1702

Epoch 22/300

157/157 2s 15ms/step - accuracy: 0.9130 - loss: 0.2518 - val_accuracy: 0.7077 - val_loss: 1.0941

Epoch 23/300

157/157 2s 15ms/step - accuracy: 0.9213 - loss: 0.2317 - val_accuracy: 0.7111 - val_loss: 1.0937

Epoch 24/300

157/157 2s 15ms/step - accuracy: 0.9248 - loss: 0.2241 - val_accuracy: 0.7287 - val_loss: 1.0757

Epoch 25/300

157/157 2s 15ms/step - accuracy: 0.9330 - loss: 0.2019 - val_accuracy: 0.6906 - val_loss: 1.3989

Epoch 26/300

157/157 2s 15ms/step - accuracy: 0.9345 - loss: 0.1972 - val_accuracy: 0.7193 - val_loss: 1.1095

Epoch 27/300

157/157 2s 15ms/step - accuracy: 0.9417 - loss: 0.1743 - val_accuracy: 0.6638 - val_loss: 1.7046

Epoch 28/300

157/157 2s 15ms/step - accuracy: 0.9405 - loss: 0.1802 - val_accuracy: 0.7070 - val_loss: 1.3795
Epoch 29/300
157/157 2s 15ms/step - accuracy: 0.9401 - loss: 0.1704 - val_accuracy: 0.7534 - val_loss: 0.9514
Epoch 30/300
157/157 2s 15ms/step - accuracy: 0.9490 - loss: 0.1539 - val_accuracy: 0.6961 - val_loss: 1.1961
Epoch 31/300
157/157 2s 15ms/step - accuracy: 0.9513 - loss: 0.1432 - val_accuracy: 0.7464 - val_loss: 1.0312
Epoch 32/300
157/157 2s 15ms/step - accuracy: 0.9492 - loss: 0.1493 - val_accuracy: 0.7051 - val_loss: 1.3315
Epoch 33/300
157/157 2s 15ms/step - accuracy: 0.9548 - loss: 0.1341 - val_accuracy: 0.6266 - val_loss: 2.0272
Epoch 34/300
157/157 2s 15ms/step - accuracy: 0.9589 - loss: 0.1229 - val_accuracy: 0.6614 - val_loss: 1.5058
Epoch 35/300
157/157 2s 15ms/step - accuracy: 0.9560 - loss: 0.1292 - val_accuracy: 0.6506 - val_loss: 1.7515
Epoch 36/300
157/157 2s 15ms/step - accuracy: 0.9645 - loss: 0.1077 - val_accuracy: 0.6768 - val_loss: 1.5743
Epoch 37/300
157/157 2s 15ms/step - accuracy: 0.9691 - loss: 0.0932 - val_accuracy: 0.6947 - val_loss: 1.4652
Epoch 38/300
157/157 2s 15ms/step - accuracy: 0.9643 - loss: 0.1045 - val_accuracy: 0.7057 - val_loss: 1.4173
Epoch 39/300
157/157 2s 15ms/step - accuracy: 0.9571 - loss: 0.1235 - val_accuracy: 0.7167 - val_loss: 1.3424
Epoch 40/300
157/157 2s 15ms/step - accuracy: 0.9658 - loss: 0.1005 - val_accuracy: 0.6847 - val_loss: 1.5622
Epoch 41/300
157/157 2s 15ms/step - accuracy: 0.9715 - loss: 0.0852 - val_accuracy: 0.7292 - val_loss: 1.1827
Epoch 42/300
157/157 2s 15ms/step - accuracy: 0.9719 - loss: 0.0856 - val_accuracy: 0.7455 - val_loss: 1.1037
Epoch 43/300
157/157 2s 15ms/step - accuracy: 0.9632 - loss: 0.1037 - val_accuracy: 0.7164 - val_loss: 1.4169
Epoch 44/300
157/157 2s 15ms/step - accuracy: 0.9730 - loss: 0.0808 - val_accuracy: 0.7483 - val_loss: 1.0466
Epoch 45/300
157/157 2s 15ms/step - accuracy: 0.9736 - loss: 0.0818 - val_accuracy: 0.7436 - val_loss: 1.1713
Epoch 46/300
157/157 2s 15ms/step - accuracy: 0.9729 - loss: 0.0815 - val_accuracy: 0.7492 - val_loss: 1.2028
Epoch 47/300
157/157 2s 15ms/step - accuracy: 0.9674 - loss: 0.0930 - val_accuracy: 0.6861 - val_loss: 1.8582
Epoch 50/300
157/157 2s 15ms/step - accuracy: 0.9671 - loss: 0.0955 - val_accuracy: 0.6846 - val_loss: 1.7820
Epoch 51/300
157/157 2s 15ms/step - accuracy: 0.9789 - loss: 0.0652 - val_accuracy: 0.7218 - val_loss: 1.5135
Epoch 52/300
157/157 2s 15ms/step - accuracy: 0.9807 - loss: 0.0599 - val_accuracy: 0.6788 - val_loss: 1.8175
Epoch 53/300
157/157 2s 15ms/step - accuracy: 0.9860 - loss: 0.0490 - val_accuracy: 0.6545 - val_loss: 2.1946
Epoch 54/300
157/157 2s 15ms/step - accuracy: 0.9692 - loss: 0.0878 - val_accuracy: 0.6610 - val_loss: 2.1243
Epoch 55/300
157/157 2s 15ms/step - accuracy: 0.9657 - loss: 0.0986 - val_accuracy: 0.6752 - val_loss: 2.3510
Epoch 56/300
157/157 2s 15ms/step - accuracy: 0.9741 - loss: 0.0742 - val_accuracy: 0.6708 - val_loss: 2.0792
Epoch 57/300
157/157 2s 15ms/step - accuracy: 0.9838 - loss: 0.0495 - val_accuracy: 0.6742 - val_loss: 2.0759
Epoch 58/300
157/157 2s 15ms/step - accuracy: 0.9868 - loss: 0.0408 - val_accuracy: 0.7354 - val_loss: 1.5003
Epoch 59/300
157/157 2s 15ms/step - accuracy: 0.9885 - loss: 0.0389 - val_accuracy: 0.6398 - val_loss: 2.6083
Epoch 60/300
157/157 2s 15ms/step - accuracy: 0.9768 - loss: 0.0665 - val_accuracy: 0.6345 - val_loss: 2.6495
Epoch 61/300
157/157 2s 15ms/step - accuracy: 0.9781 - loss: 0.0661 - val_accuracy: 0.7480 - val_loss: 1.1802
Epoch 62/300
157/157 2s 15ms/step - accuracy: 0.9804 - loss: 0.0583 - val_accuracy: 0.6689 - val_loss: 2.0994
Epoch 63/300
157/157 2s 15ms/step - accuracy: 0.9794 - loss: 0.0615 - val_accuracy: 0.7546 - val_loss: 1.5228
Epoch 64/300
157/157 2s 15ms/step - accuracy: 0.9842 - loss: 0.0496 - val_accuracy: 0.6989 - val_loss: 1.9005
Epoch 65/300
157/157 2s 15ms/step - accuracy: 0.9851 - loss: 0.0461 - val_accuracy: 0.6643 - val_loss: 2.2964
Epoch 66/300
157/157 2s 15ms/step - accuracy: 0.9820 - loss: 0.0522 - val_accuracy: 0.7006 - val_loss: 2.3109
Epoch 67/300
157/157 2s 15ms/step - accuracy: 0.9825 - loss: 0.0515 - val_accuracy: 0.6867 - val_loss: 2.1029
Epoch 68/300
157/157 2s 15ms/step - accuracy: 0.9794 - loss: 0.0608 - val_accuracy: 0.7038 - val_loss: 1.8345
Epoch 69/300
157/157 2s 15ms/step - accuracy: 0.9747 - loss: 0.0705 - val_accuracy: 0.6941 - val_loss: 2.0008
Epoch 70/300
157/157 2s 15ms/step - accuracy: 0.9850 - loss: 0.0447 - val_accuracy: 0.6432 - val_loss: 2.6889

```

-- -- -- -- -- Epoch 71/300
157/157 2s 15ms/step - accuracy: 0.9836 - loss: 0.0503 - val_accuracy: 0.7231 - val_loss: 1.4809
Epoch 72/300
157/157 2s 15ms/step - accuracy: 0.9835 - loss: 0.0493 - val_accuracy: 0.7043 - val_loss: 1.9119
Epoch 73/300
157/157 2s 15ms/step - accuracy: 0.9872 - loss: 0.0394 - val_accuracy: 0.7100 - val_loss: 1.6350
Epoch 74/300
157/157 2s 15ms/step - accuracy: 0.9838 - loss: 0.0485 - val_accuracy: 0.6798 - val_loss: 1.9425
Epoch 75/300
157/157 2s 15ms/step - accuracy: 0.9820 - loss: 0.0540 - val_accuracy: 0.7522 - val_loss: 1.4427
Epoch 76/300
157/157 2s 15ms/step - accuracy: 0.9834 - loss: 0.0472 - val_accuracy: 0.7035 - val_loss: 1.9962
Epoch 77/300
157/157 2s 15ms/step - accuracy: 0.9843 - loss: 0.0468 - val_accuracy: 0.6615 - val_loss: 2.3743
Epoch 78/300
157/157 2s 15ms/step - accuracy: 0.9844 - loss: 0.0461 - val_accuracy: 0.7224 - val_loss: 1.5315
Epoch 79/300
157/157 2s 15ms/step - accuracy: 0.9775 - loss: 0.0645 - val_accuracy: 0.6697 - val_loss: 1.9943
Epoch 80/300
157/157 2s 15ms/step - accuracy: 0.9811 - loss: 0.0554 - val_accuracy: 0.7022 - val_loss: 2.0457
Epoch 81/300
157/157 2s 15ms/step - accuracy: 0.9827 - loss: 0.0520 - val_accuracy: 0.6808 - val_loss: 1.8660
Epoch 82/300
157/157 2s 15ms/step - accuracy: 0.9904 - loss: 0.0306 - val_accuracy: 0.7626 - val_loss: 1.4200
Epoch 83/300
157/157 2s 15ms/step - accuracy: 0.9938 - loss: 0.0228 - val_accuracy: 0.7603 - val_loss: 1.2671
Epoch 84/300
157/157 2s 15ms/step - accuracy: 0.9928 - loss: 0.0257 - val_accuracy: 0.6506 - val_loss: 2.9035
Epoch 85/300
157/157 2s 15ms/step - accuracy: 0.9842 - loss: 0.0439 - val_accuracy: 0.7210 - val_loss: 1.8485
Epoch 86/300
157/157 2s 15ms/step - accuracy: 0.9761 - loss: 0.0682 - val_accuracy: 0.7399 - val_loss: 1.7434
Epoch 87/300
157/157 2s 15ms/step - accuracy: 0.9827 - loss: 0.0483 - val_accuracy: 0.7122 - val_loss: 2.0444
Epoch 88/300
157/157 2s 15ms/step - accuracy: 0.9893 - loss: 0.0341 - val_accuracy: 0.7598 - val_loss: 1.2796
Epoch 89/300
157/157 2s 15ms/step - accuracy: 0.9903 - loss: 0.0288 - val_accuracy: 0.7506 - val_loss: 1.6343
Epoch 90/300
157/157 2s 15ms/step - accuracy: 0.9861 - loss: 0.0413 - val_accuracy: 0.7132 - val_loss: 1.8339
Epoch 91/300
157/157 2s 15ms/step - accuracy: 0.9850 - loss: 0.0443 - val_accuracy: 0.7258 - val_loss: 1.8246
Epoch 92/300
157/157 2s 15ms/step - accuracy: 0.9786 - loss: 0.0624 - val_accuracy: 0.6980 - val_loss: 2.0241
Epoch 93/300
157/157 2s 15ms/step - accuracy: 0.9907 - loss: 0.0309 - val_accuracy: 0.7481 - val_loss: 1.4990
Epoch 94/300
157/157 2s 15ms/step - accuracy: 0.9940 - loss: 0.0193 - val_accuracy: 0.7054 - val_loss: 2.0927
Epoch 95/300
157/157 2s 15ms/step - accuracy: 0.9828 - loss: 0.0500 - val_accuracy: 0.6862 - val_loss: 2.0524
Epoch 96/300
157/157 2s 15ms/step - accuracy: 0.9784 - loss: 0.0595 - val_accuracy: 0.7437 - val_loss: 1.6509
Epoch 97/300
157/157 2s 15ms/step - accuracy: 0.9869 - loss: 0.0394 - val_accuracy: 0.7417 - val_loss: 1.5203
Epoch 98/300
157/157 2s 15ms/step - accuracy: 0.9915 - loss: 0.0276 - val_accuracy: 0.7097 - val_loss: 1.7495
Epoch 99/300
157/157 2s 15ms/step - accuracy: 0.9916 - loss: 0.0257 - val_accuracy: 0.7251 - val_loss: 2.0936
Epoch 100/300
157/157 2s 15ms/step - accuracy: 0.9911 - loss: 0.0250 - val_accuracy: 0.6709 - val_loss: 2.2549
Epoch 101/300
157/157 2s 15ms/step - accuracy: 0.9909 - loss: 0.0284 - val_accuracy: 0.7308 - val_loss: 1.9323
Epoch 102/300
157/157 2s 15ms/step - accuracy: 0.9881 - loss: 0.0379 - val_accuracy: 0.6578 - val_loss: 3.3882
Epoch 103/300
157/157 2s 15ms/step - accuracy: 0.9855 - loss: 0.0416 - val_accuracy: 0.6642 - val_loss: 2.1575
Epoch 104/300
157/157 2s 15ms/step - accuracy: 0.9827 - loss: 0.0514 - val_accuracy: 0.6038 - val_loss: 3.4862
Epoch 105/300
157/157 2s 15ms/step - accuracy: 0.9841 - loss: 0.0495 - val_accuracy: 0.6666 - val_loss: 2.5506
Epoch 106/300
157/157 2s 15ms/step - accuracy: 0.9837 - loss: 0.0498 - val_accuracy: 0.7450 - val_loss: 1.6792
Epoch 107/300
157/157 2s 15ms/step - accuracy: 0.9930 - loss: 0.0219 - val_accuracy: 0.7598 - val_loss: 1.4786
Epoch 108/300
157/157 2s 15ms/step - accuracy: 0.9939 - loss: 0.0190 - val_accuracy: 0.7298 - val_loss: 1.8930
Epoch 109/300
157/157 2s 15ms/step - accuracy: 0.9929 - loss: 0.0213 - val_accuracy: 0.6838 - val_loss: 2.2332
Epoch 110/300
157/157 2s 15ms/step - accuracy: 0.9946 - loss: 0.0196 - val_accuracy: 0.7719 - val_loss: 1.5333
Epoch 111/300
157/157 2s 15ms/step - accuracy: 0.9898 - loss: 0.0308 - val_accuracy: 0.7314 - val_loss: 1.5888
Epoch 112/300
157/157 2s 15ms/step - accuracy: 0.9815 - loss: 0.0520 - val_accuracy: 0.7318 - val_loss: 1.7005
Epoch 113/300

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Epoch 114/300  
157/157 ━━━━━━━━ 2s 15ms/step - accuracy: 0.9779 - loss: 0.0650 - val_accuracy: 0.7004 - val_loss: 2.0603  
Epoch 115/300  
157/157 ━━━━━━━━ 2s 15ms/step - accuracy: 0.9827 - loss: 0.0501 - val_accuracy: 0.7411 - val_loss: 1.5406  
Epoch 116/300  
157/157 ━━━━━━━━ 2s 15ms/step - accuracy: 0.9918 - loss: 0.0248 - val_accuracy: 0.7596 - val_loss: 1.5641  
Epoch 117/300  
157/157 ━━━━━━━━ 2s 15ms/step - accuracy: 0.9922 - loss: 0.0246 - val_accuracy: 0.7298 - val_loss: 1.7974  
Epoch 118/300  
157/157 ━━━━━━━━ 2s 15ms/step - accuracy: 0.9928 - loss: 0.0236 - val_accuracy: 0.7643 - val_loss: 1.5272  
Epoch 119/300  
157/157 ━━━━━━━━ 2s 15ms/step - accuracy: 0.9946 - loss: 0.0181 - val_accuracy: 0.7449 - val_loss: 1.8777  
Epoch 120/300  
157/157 ━━━━━━━━ 2s 15ms/step - accuracy: 0.9887 - loss: 0.0333 - val_accuracy: 0.6929 - val_loss: 2.0985  
Epoch 121/300  
157/157 ━━━━━━━━ 2s 15ms/step - accuracy: 0.9919 - loss: 0.0266 - val_accuracy: 0.6923 - val_loss: 2.0971
```