## Import Req Lib

In [1]:
```
%matplotlib inline


import shutil
import random
import numpy as np
from warnings import filterwarnings
filterwarnings('ignore')

from tensorflow.keras import layers,regularizers, optimizers
from tensorflow.keras import models
from tensorflow.keras.models import Sequential, Model
from tensorflow.keras.layers import LeakyReLU,Dense, Activation, Flatten, Dropout, BatchNormalization,Conv2D, MaxPooling2D
from tensorflow.keras.optimizers import Adam
from tensorflow.keras.preprocessing.image import ImageDataGenerator
import tensorflow as tf

import os
import time
import csv

from matplotlib import figure
```

## Define 1 worker

In [2]:
```
# Set the number of threads
number_of_worker = 1
os.environ['OMP_NUM_THREADS'] = '1'  # OpenMP threads for parallelism
os.environ['TF_NUM_INTEROP_THREADS'] = '1'  # Threads for inter-operation parallelism
os.environ['TF_NUM_INTRAOP_THREADS'] = '1'  # Threads for intra-operation parallelism

# Confirm TensorFlow is using the specified number of threads
tf.config.threading.set_inter_op_parallelism_threads(number_of_worker)
tf.config.threading.set_intra_op_parallelism_threads(number_of_worker)
```

## Train Val data Split

In [3]:
```
source_dir = r"C:\Users\nikhi\OneDrive\Desktop\Final Project\DATA\Convert_Audio_File_to_jpg_file"
target_dir = r'genres_train_val_split_data'
split_ratio = 0.8

def Train_Test_Split(source_dir,target_dir,split_ratio):
    # Define source and target directories
    train_dir = os.path.join(target_dir, 'train')
    val_dir = os.path.join(target_dir, 'val')

    # Create target directories if they don't exist
    os.makedirs(train_dir, exist_ok=True)
    os.makedirs(val_dir, exist_ok=True)

    # Get the list of class directories
    classes = [d for d in os.listdir(source_dir) if os.path.isdir(os.path.join(source_dir, d))]

    for class_name in classes:
        # Create class directories in train and val folders
        os.makedirs(os.path.join(train_dir, class_name), exist_ok=True)
        os.makedirs(os.path.join(val_dir, class_name), exist_ok=True)

        # Get list of images in the class directory
        class_dir = os.path.join(source_dir, class_name)
        images = [f for f in os.listdir(class_dir) if os.path.isfile(os.path.join(class_dir, f))]

        # Shuffle the images
        random.shuffle(images)

        # Compute the split point
        split_point = int(len(images) * split_ratio)

        # Split the images into training and validation sets
        train_images = images[:split_point]
        val_images = images[split_point:]
        # Move the images to the respective directories
        for img in train_images:
            shutil.copy(os.path.join(class_dir, img), os.path.join(train_dir, class_name, img))

        for img in val_images:
            shutil.copy(os.path.join(class_dir, img), os.path.join(val_dir, class_name, img))

    print("Data split completed successfully!")
```

In [4]:
```
Train_Test_Split(source_dir,target_dir,split_ratio)
```

```
Data split completed successfully!
```

## Load the Data

In [5]:
```
WIDTH = 64
HEIGHT = 64
BATCH_SIZE = 32
TRAIN_DIR=r'genres_train_val_split_data/train'
val_dir = r'genres_train_val_split_data/val'

# data prep
train_datagen = ImageDataGenerator(
    rescale=1./255.,validation_split=0.25)


train_generator = train_datagen.flow_from_directory(
    TRAIN_DIR,
    target_size=(HEIGHT, WIDTH),
        batch_size=BATCH_SIZE,
        class_mode='categorical')

validation_gen = train_datagen.flow_from_directory(
    val_dir,target_size = (HEIGHT,WIDTH),
    batch_size = BATCH_SIZE,
    class_mode = 'categorical'
 )
```

```
Found 800 images belonging to 10 classes.
Found 200 images belonging to 10 classes.
```

## Model Architecture

In [6]:
```
model = Sequential()
model.add(Conv2D(32, (3, 3), padding='same',
                 input_shape=(64,64,3)))
model.add(Activation('relu'))
model.add(Conv2D(64, (3, 3)))
model.add(Activation('relu'))
model.add(MaxPooling2D(pool_size=(2, 2)))
model.add(Dropout(0.25))
model.add(Conv2D(64, (3, 3), padding='same'))
model.add(Activation('relu'))
model.add(Conv2D(64, (3, 3)))
model.add(Activation('relu'))
model.add(MaxPooling2D(pool_size=(2, 2)))
model.add(Dropout(0.5))
model.add(Conv2D(128, (3, 3), padding='same'))
model.add(Activation('relu'))
model.add(Conv2D(128, (3, 3)))
model.add(Activation('relu'))
model.add(MaxPooling2D(pool_size=(2, 2)))
model.add(Dropout(0.5))
model.add(Flatten())
model.add(Dense(512))
model.add(Activation('relu'))
model.add(Dropout(0.5))
model.add(Dense(10, activation='softmax'))
model.compile(optimizers.RMSprop(learning_rate=0.0005, decay=1e-6),loss="categorical_crossentropy",metrics=["accuracy"])
model.summary()
```

```
Model: "sequential"
```

```
┏━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━┳━━━━━━━━━━━━━━━━━━━━━━━━━━━━━┳━━━━━━━━━━━━━━━━━┓
┃ Layer (type)                         ┃ Output Shape                ┃         Param # ┃
┡━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━╇━━━━━━━━━━━━━━━━━━━━━━━━━━━━━╇━━━━━━━━━━━━━━━━━┩
│ conv2d (Conv2D)                      │ (None, 64, 64, 32)          │             896 │
├──────────────────────────────────────┼─────────────────────────────┼─────────────────┤
│ activation (Activation)              │ (None, 64, 64, 32)          │               0 │
├──────────────────────────────────────┼─────────────────────────────┼─────────────────┤
│ conv2d_1 (Conv2D)                    │ (None, 62, 62, 64)          │          18,496 │
├──────────────────────────────────────┼─────────────────────────────┼─────────────────┤
│ activation_1 (Activation)            │ (None, 62, 62, 64)          │               0 │
├──────────────────────────────────────┼─────────────────────────────┼─────────────────┤
│ max_pooling2d (MaxPooling2D)         │ (None, 31, 31, 64)          │               0 │
├──────────────────────────────────────┼─────────────────────────────┼─────────────────┤
│ dropout (Dropout)                    │ (None, 31, 31, 64)          │               0 │
├──────────────────────────────────────┼─────────────────────────────┼─────────────────┤
│ conv2d_2 (Conv2D)                    │ (None, 31, 31, 64)          │          36,928 │
├──────────────────────────────────────┼─────────────────────────────┼─────────────────┤
│ activation_2 (Activation)            │ (None, 31, 31, 64)          │               0 │
├──────────────────────────────────────┼─────────────────────────────┼─────────────────┤
│ conv2d_3 (Conv2D)                    │ (None, 29, 29, 64)          │          36,928 │
├──────────────────────────────────────┼─────────────────────────────┼─────────────────┤
│ activation_3 (Activation)            │ (None, 29, 29, 64)          │               0 │
├──────────────────────────────────────┼─────────────────────────────┼─────────────────┤
│ max_pooling2d_1 (MaxPooling2D)       │ (None, 14, 14, 64)          │               0 │
├──────────────────────────────────────┼─────────────────────────────┼─────────────────┤
│ dropout_1 (Dropout)                  │ (None, 14, 14, 64)          │               0 │
├──────────────────────────────────────┼─────────────────────────────┼─────────────────┤
│ conv2d_4 (Conv2D)                    │ (None, 14, 14, 128)         │          73,856 │
├──────────────────────────────────────┼─────────────────────────────┼─────────────────┤
│ activation_4 (Activation)            │ (None, 14, 14, 128)         │               0 │
├──────────────────────────────────────┼─────────────────────────────┼─────────────────┤
│ conv2d_5 (Conv2D)                    │ (None, 12, 12, 128)         │         147,584 │
├──────────────────────────────────────┼─────────────────────────────┼─────────────────┤
│ activation_5 (Activation)            │ (None, 12, 12, 128)         │               0 │
├──────────────────────────────────────┼─────────────────────────────┼─────────────────┤
│ max_pooling2d_2 (MaxPooling2D)       │ (None, 6, 6, 128)           │               0 │
├──────────────────────────────────────┼─────────────────────────────┼─────────────────┤
│ dropout_2 (Dropout)                  │ (None, 6, 6, 128)           │               0 │
├──────────────────────────────────────┼─────────────────────────────┼─────────────────┤
│ flatten (Flatten)                    │ (None, 4608)                │               0 │
├──────────────────────────────────────┼─────────────────────────────┼─────────────────┤
│ dense (Dense)                        │ (None, 512)                 │       2,359,808 │
├──────────────────────────────────────┼─────────────────────────────┼─────────────────┤
│ activation_6 (Activation)            │ (None, 512)                 │               0 │
├──────────────────────────────────────┼─────────────────────────────┼─────────────────┤
│ dropout_3 (Dropout)                  │ (None, 512)                 │               0 │
├──────────────────────────────────────┼─────────────────────────────┼─────────────────┤
│ dense_1 (Dense)                      │ (None, 10)                  │           5,130 │
└──────────────────────────────────────┴─────────────────────────────┴─────────────────┘
 Total params: 2,679,626 (10.22 MB)
 Trainable params: 2,679,626 (10.22 MB)
 Non-trainable params: 0 (0.00 B)
```

In [7]:

```python
STEP_SIZE_TRAIN=train_generator.n//train_generator.batch_size
# Measure the execution time
start_time = time.time()

model.fit(train_generator,validation_data=validation_gen,epochs=200)

end_time = time.time()
elapsed_time = end_time - start_time
```

```
Epoch 1/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 32s 1s/step - accuracy: 0.1023 - loss: 2.3116 - val_accuracy: 0.1750 - val_loss: 2.2917
Epoch 2/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 28s 1s/step - accuracy: 0.1221 - loss: 2.2753 - val_accuracy: 0.2100 - val_loss: 2.1145
Epoch 3/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 28s 1s/step - accuracy: 0.1855 - loss: 2.2138 - val_accuracy: 0.1950 - val_loss: 2.1203
Epoch 4/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 28s 1s/step - accuracy: 0.1924 - loss: 2.1035 - val_accuracy: 0.2450 - val_loss: 1.9382
Epoch 5/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 27s 1s/step - accuracy: 0.2253 - loss: 2.0658 - val_accuracy: 0.2900 - val_loss: 1.9680
Epoch 6/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 26s 1s/step - accuracy: 0.2518 - loss: 2.0428 - val_accuracy: 0.3600 - val_loss: 2.0611
Epoch 7/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 26s 1s/step - accuracy: 0.2844 - loss: 1.9486 - val_accuracy: 0.3550 - val_loss: 1.8568
Epoch 8/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 26s 1s/step - accuracy: 0.3084 - loss: 1.8901 - val_accuracy: 0.2650 - val_loss: 2.1513
Epoch 9/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 26s 1s/step - accuracy: 0.3282 - loss: 1.9096 - val_accuracy: 0.3850 - val_loss: 1.7727
Epoch 10/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 26s 1s/step - accuracy: 0.3618 - loss: 1.7941 - val_accuracy: 0.4300 - val_loss: 1.6640
Epoch 11/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 27s 1s/step - accuracy: 0.3581 - loss: 1.7205 - val_accuracy: 0.3650 - val_loss: 1.7061
Epoch 12/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 26s 1s/step - accuracy: 0.3839 - loss: 1.7241 - val_accuracy: 0.4250 - val_loss: 1.6044
Epoch 13/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 25s 1s/step - accuracy: 0.4243 - loss: 1.6182 - val_accuracy: 0.3600 - val_loss: 1.7587
Epoch 14/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 26s 1s/step - accuracy: 0.4233 - loss: 1.6799 - val_accuracy: 0.4700 - val_loss: 1.5579
Epoch 15/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 25s 1s/step - accuracy: 0.4338 - loss: 1.5815 - val_accuracy: 0.4800 - val_loss: 1.5056
Epoch 16/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 28s 1s/step - accuracy: 0.4718 - loss: 1.4877 - val_accuracy: 0.3650 - val_loss: 1.6719
Epoch 17/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 47s 1s/step - accuracy: 0.4637 - loss: 1.5132 - val_accuracy: 0.4750 - val_loss: 1.4645
Epoch 18/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 28s 1s/step - accuracy: 0.4672 - loss: 1.4364 - val_accuracy: 0.5000 - val_loss: 1.4407
Epoch 19/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 27s 1s/step - accuracy: 0.4664 - loss: 1.4338 - val_accuracy: 0.4600 - val_loss: 1.4912
Epoch 20/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 26s 1s/step - accuracy: 0.4846 - loss: 1.3805 - val_accuracy: 0.4950 - val_loss: 1.4114
Epoch 21/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 28s 1s/step - accuracy: 0.5301 - loss: 1.3195 - val_accuracy: 0.5650 - val_loss: 1.3299
Epoch 22/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 39s 1s/step - accuracy: 0.5377 - loss: 1.3187 - val_accuracy: 0.5200 - val_loss: 1.4057
Epoch 23/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 26s 1s/step - accuracy: 0.5209 - loss: 1.3272 - val_accuracy: 0.5250 - val_loss: 1.3737
Epoch 24/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 45s 1s/step - accuracy: 0.5138 - loss: 1.3195 - val_accuracy: 0.4800 - val_loss: 1.3970
Epoch 25/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 27s 1s/step - accuracy: 0.5613 - loss: 1.2026 - val_accuracy: 0.4850 - val_loss: 1.2982
Epoch 26/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 27s 1s/step - accuracy: 0.5462 - loss: 1.2349 - val_accuracy: 0.5150 - val_loss: 1.4277
Epoch 27/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 28s 1s/step - accuracy: 0.4924 - loss: 1.3835 - val_accuracy: 0.5600 - val_loss: 1.2649
Epoch 28/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 27s 1s/step - accuracy: 0.5781 - loss: 1.2120 - val_accuracy: 0.5400 - val_loss: 1.3177
Epoch 29/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 28s 1s/step - accuracy: 0.5310 - loss: 1.2935 - val_accuracy: 0.5350 - val_loss: 1.2755
Epoch 30/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 27s 1s/step - accuracy: 0.5842 - loss: 1.1832 - val_accuracy: 0.5650 - val_loss: 1.2301
Epoch 31/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 27s 1s/step - accuracy: 0.6170 - loss: 1.1483 - val_accuracy: 0.5300 - val_loss: 1.2360
Epoch 32/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 27s 1s/step - accuracy: 0.5694 - loss: 1.1414 - val_accuracy: 0.5300 - val_loss: 1.1925
Epoch 33/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 28s 1s/step - accuracy: 0.5970 - loss: 1.1031 - val_accuracy: 0.5650 - val_loss: 1.1584
Epoch 34/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 28s 1s/step - accuracy: 0.6325 - loss: 1.0118 - val_accuracy: 0.6000 - val_loss: 1.1658
Epoch 35/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 28s 1s/step - accuracy: 0.6461 - loss: 1.0089 - val_accuracy: 0.5200 - val_loss: 1.3458
Epoch 36/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 27s 1s/step - accuracy: 0.6280 - loss: 1.0219 - val_accuracy: 0.5500 - val_loss: 1.2555
Epoch 37/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 29s 1s/step - accuracy: 0.6563 - loss: 1.0223 - val_accuracy: 0.5600 - val_loss: 1.2584
Epoch 38/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 29s 1s/step - accuracy: 0.6219 - loss: 1.0022 - val_accuracy: 0.5750 - val_loss: 1.1565
Epoch 39/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 28s 1s/step - accuracy: 0.6673 - loss: 0.9150 - val_accuracy: 0.6000 - val_loss: 1.1377
Epoch 40/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 27s 1s/step - accuracy: 0.6545 - loss: 0.9413 - val_accuracy: 0.5750 - val_loss: 1.1518
Epoch 41/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 28s 1s/step - accuracy: 0.6994 - loss: 0.8533 - val_accuracy: 0.5050 - val_loss: 1.4275
```

```
Epoch 42/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 42s 1s/step - accuracy: 0.6991 - loss: 0.8246 - val_accuracy: 0.5700 - val_loss: 1.1758
Epoch 43/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 27s 1s/step - accuracy: 0.7177 - loss: 0.7888 - val_accuracy: 0.6200 - val_loss: 1.2086
Epoch 44/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 29s 1s/step - accuracy: 0.7449 - loss: 0.7547 - val_accuracy: 0.6150 - val_loss: 1.1535
Epoch 45/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 42s 1s/step - accuracy: 0.7052 - loss: 0.7935 - val_accuracy: 0.5850 - val_loss: 1.3092
Epoch 46/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 39s 1s/step - accuracy: 0.7307 - loss: 0.7758 - val_accuracy: 0.5550 - val_loss: 1.1893
Epoch 47/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 41s 1s/step - accuracy: 0.7160 - loss: 0.8295 - val_accuracy: 0.5800 - val_loss: 1.2159
Epoch 48/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 29s 1s/step - accuracy: 0.7674 - loss: 0.6261 - val_accuracy: 0.6150 - val_loss: 1.2276
Epoch 49/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 27s 1s/step - accuracy: 0.7672 - loss: 0.6559 - val_accuracy: 0.6100 - val_loss: 1.2374
Epoch 50/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 29s 1s/step - accuracy: 0.7832 - loss: 0.6168 - val_accuracy: 0.5850 - val_loss: 1.3392
Epoch 51/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 30s 1s/step - accuracy: 0.7379 - loss: 0.7095 - val_accuracy: 0.5750 - val_loss: 1.4176
Epoch 52/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 30s 1s/step - accuracy: 0.7792 - loss: 0.5799 - val_accuracy: 0.5300 - val_loss: 1.4030
Epoch 53/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 30s 1s/step - accuracy: 0.7901 - loss: 0.5600 - val_accuracy: 0.6350 - val_loss: 1.2566
Epoch 54/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 28s 1s/step - accuracy: 0.7973 - loss: 0.5726 - val_accuracy: 0.5500 - val_loss: 1.3714
Epoch 55/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 27s 1s/step - accuracy: 0.7668 - loss: 0.7013 - val_accuracy: 0.6250 - val_loss: 1.3406
Epoch 56/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 27s 1s/step - accuracy: 0.7882 - loss: 0.5294 - val_accuracy: 0.6150 - val_loss: 1.3486
Epoch 57/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 30s 1s/step - accuracy: 0.8414 - loss: 0.4948 - val_accuracy: 0.5900 - val_loss: 1.4015
Epoch 58/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 27s 1s/step - accuracy: 0.8212 - loss: 0.4944 - val_accuracy: 0.6150 - val_loss: 1.4117
Epoch 59/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 43s 1s/step - accuracy: 0.8479 - loss: 0.4028 - val_accuracy: 0.6050 - val_loss: 1.4449
Epoch 60/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 29s 1s/step - accuracy: 0.8089 - loss: 0.5510 - val_accuracy: 0.5700 - val_loss: 1.5338
Epoch 61/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 28s 1s/step - accuracy: 0.8237 - loss: 0.4647 - val_accuracy: 0.5950 - val_loss: 1.4833
Epoch 62/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 41s 1s/step - accuracy: 0.8668 - loss: 0.3522 - val_accuracy: 0.5650 - val_loss: 1.4804
Epoch 63/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 28s 1s/step - accuracy: 0.8646 - loss: 0.4137 - val_accuracy: 0.6200 - val_loss: 1.5929
Epoch 64/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 29s 1s/step - accuracy: 0.8611 - loss: 0.4100 - val_accuracy: 0.6150 - val_loss: 1.5140
Epoch 65/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 30s 1s/step - accuracy: 0.8943 - loss: 0.2995 - val_accuracy: 0.5300 - val_loss: 2.0294
Epoch 66/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 28s 1s/step - accuracy: 0.8659 - loss: 0.3771 - val_accuracy: 0.6100 - val_loss: 1.3474
Epoch 67/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 28s 1s/step - accuracy: 0.8714 - loss: 0.3636 - val_accuracy: 0.6450 - val_loss: 1.4715
Epoch 68/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 26s 1s/step - accuracy: 0.8731 - loss: 0.3432 - val_accuracy: 0.6350 - val_loss: 1.5430
Epoch 69/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 28s 1s/step - accuracy: 0.9113 - loss: 0.2766 - val_accuracy: 0.6000 - val_loss: 1.6362
Epoch 70/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 30s 1s/step - accuracy: 0.9115 - loss: 0.2632 - val_accuracy: 0.5900 - val_loss: 1.7935
Epoch 71/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 30s 1s/step - accuracy: 0.8804 - loss: 0.3234 - val_accuracy: 0.5850 - val_loss: 1.7517
Epoch 72/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 29s 1s/step - accuracy: 0.9097 - loss: 0.2619 - val_accuracy: 0.6050 - val_loss: 1.7657
Epoch 73/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 31s 1s/step - accuracy: 0.8978 - loss: 0.2883 - val_accuracy: 0.5900 - val_loss: 1.9864
Epoch 74/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 29s 1s/step - accuracy: 0.8944 - loss: 0.2651 - val_accuracy: 0.6050 - val_loss: 1.7086
Epoch 75/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 28s 1s/step - accuracy: 0.9287 - loss: 0.2225 - val_accuracy: 0.6150 - val_loss: 1.8275
Epoch 76/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 28s 1s/step - accuracy: 0.9313 - loss: 0.2132 - val_accuracy: 0.5600 - val_loss: 1.9665
Epoch 77/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 30s 1s/step - accuracy: 0.9132 - loss: 0.2315 - val_accuracy: 0.6250 - val_loss: 1.7940
Epoch 78/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 30s 1s/step - accuracy: 0.9298 - loss: 0.2025 - val_accuracy: 0.6100 - val_loss: 1.7548
Epoch 79/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 28s 1s/step - accuracy: 0.8969 - loss: 0.2864 - val_accuracy: 0.5700 - val_loss: 1.9362
Epoch 80/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 28s 1s/step - accuracy: 0.9037 - loss: 0.2708 - val_accuracy: 0.6050 - val_loss: 1.7875
Epoch 81/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 30s 1s/step - accuracy: 0.9479 - loss: 0.1578 - val_accuracy: 0.6050 - val_loss: 1.9154
Epoch 82/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 30s 1s/step - accuracy: 0.9278 - loss: 0.2297 - val_accuracy: 0.6100 - val_loss: 2.0085
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Epoch 83/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 28s 1s/step - accuracy: 0.9603 - loss: 0.1253 - val_accuracy: 0.6050 - val_loss: 1.9944
Epoch 84/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 28s 1s/step - accuracy: 0.9349 - loss: 0.2179 - val_accuracy: 0.5950 - val_loss: 1.7698
Epoch 85/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 29s 1s/step - accuracy: 0.9260 - loss: 0.2480 - val_accuracy: 0.6000 - val_loss: 1.9084
Epoch 86/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 29s 1s/step - accuracy: 0.9385 - loss: 0.1810 - val_accuracy: 0.6050 - val_loss: 1.9800
Epoch 87/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 40s 1s/step - accuracy: 0.9315 - loss: 0.2115 - val_accuracy: 0.6000 - val_loss: 1.9982
Epoch 88/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 29s 1s/step - accuracy: 0.9286 - loss: 0.1841 - val_accuracy: 0.6050 - val_loss: 1.8210
Epoch 89/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 42s 1s/step - accuracy: 0.9449 - loss: 0.1455 - val_accuracy: 0.6050 - val_loss: 2.1485
Epoch 90/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 30s 1s/step - accuracy: 0.9580 - loss: 0.1347 - val_accuracy: 0.6050 - val_loss: 2.0624
Epoch 91/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 29s 1s/step - accuracy: 0.9658 - loss: 0.1287 - val_accuracy: 0.6050 - val_loss: 2.0623
Epoch 92/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 41s 1s/step - accuracy: 0.9296 - loss: 0.2185 - val_accuracy: 0.5750 - val_loss: 2.1836
Epoch 93/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 31s 1s/step - accuracy: 0.9534 - loss: 0.1375 - val_accuracy: 0.5700 - val_loss: 2.3075
Epoch 94/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 28s 1s/step - accuracy: 0.9321 - loss: 0.1736 - val_accuracy: 0.5900 - val_loss: 2.0975
Epoch 95/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 28s 1s/step - accuracy: 0.9544 - loss: 0.1090 - val_accuracy: 0.6050 - val_loss: 2.1837
Epoch 96/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 29s 1s/step - accuracy: 0.9666 - loss: 0.1233 - val_accuracy: 0.5250 - val_loss: 2.7924
Epoch 97/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 29s 1s/step - accuracy: 0.9305 - loss: 0.2006 - val_accuracy: 0.5950 - val_loss: 2.1621
Epoch 98/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 29s 1s/step - accuracy: 0.9653 - loss: 0.1326 - val_accuracy: 0.5600 - val_loss: 2.3662
Epoch 99/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 40s 1s/step - accuracy: 0.9604 - loss: 0.1206 - val_accuracy: 0.6150 - val_loss: 2.2831
Epoch 100/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 29s 1s/step - accuracy: 0.9483 - loss: 0.1839 - val_accuracy: 0.6150 - val_loss: 1.8584
Epoch 101/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 30s 1s/step - accuracy: 0.9725 - loss: 0.0949 - val_accuracy: 0.5950 - val_loss: 2.1361
Epoch 102/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 28s 1s/step - accuracy: 0.9591 - loss: 0.1132 - val_accuracy: 0.6500 - val_loss: 2.1777
Epoch 103/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 28s 1s/step - accuracy: 0.9600 - loss: 0.1332 - val_accuracy: 0.6000 - val_loss: 3.0784
Epoch 104/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 29s 1s/step - accuracy: 0.9355 - loss: 0.1872 - val_accuracy: 0.5750 - val_loss: 2.4978
Epoch 105/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 30s 1s/step - accuracy: 0.9633 - loss: 0.1094 - val_accuracy: 0.6200 - val_loss: 2.2200
Epoch 106/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 28s 1s/step - accuracy: 0.9577 - loss: 0.1378 - val_accuracy: 0.5850 - val_loss: 2.5441
Epoch 107/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 41s 1s/step - accuracy: 0.9277 - loss: 0.2046 - val_accuracy: 0.6250 - val_loss: 2.1615
Epoch 108/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 28s 1s/step - accuracy: 0.9599 - loss: 0.0948 - val_accuracy: 0.5750 - val_loss: 2.4605
Epoch 109/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 43s 1s/step - accuracy: 0.9670 - loss: 0.0811 - val_accuracy: 0.5950 - val_loss: 2.5483
Epoch 110/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 28s 1s/step - accuracy: 0.9646 - loss: 0.1045 - val_accuracy: 0.5600 - val_loss: 3.1649
Epoch 111/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 29s 1s/step - accuracy: 0.9542 - loss: 0.1843 - val_accuracy: 0.5850 - val_loss: 2.3699
Epoch 112/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 31s 1s/step - accuracy: 0.9595 - loss: 0.0938 - val_accuracy: 0.6200 - val_loss: 2.5488
Epoch 113/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 29s 1s/step - accuracy: 0.9756 - loss: 0.0709 - val_accuracy: 0.6450 - val_loss: 2.7340
Epoch 114/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 28s 1s/step - accuracy: 0.9678 - loss: 0.0969 - val_accuracy: 0.5950 - val_loss: 2.5608
Epoch 115/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 28s 1s/step - accuracy: 0.9566 - loss: 0.1611 - val_accuracy: 0.6350 - val_loss: 2.2199
Epoch 116/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 30s 1s/step - accuracy: 0.9844 - loss: 0.0740 - val_accuracy: 0.5950 - val_loss: 2.5361
Epoch 117/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 30s 1s/step - accuracy: 0.9755 - loss: 0.0631 - val_accuracy: 0.6150 - val_loss: 2.5037
Epoch 118/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 28s 1s/step - accuracy: 0.9773 - loss: 0.0840 - val_accuracy: 0.5650 - val_loss: 2.7249
Epoch 119/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 28s 1s/step - accuracy: 0.9873 - loss: 0.0544 - val_accuracy: 0.6150 - val_loss: 2.7848
Epoch 120/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 42s 1s/step - accuracy: 0.9768 - loss: 0.0695 - val_accuracy: 0.6100 - val_loss: 2.9545
Epoch 121/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 29s 1s/step - accuracy: 0.9731 - loss: 0.0767 - val_accuracy: 0.6150 - val_loss: 2.5158
Epoch 122/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 28s 1s/step - accuracy: 0.9797 - loss: 0.0810 - val_accuracy: 0.6100 - val_loss: 2.5275
Epoch 123/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 28s 1s/step - accuracy: 0.9807 - loss: 0.0617 - val_accuracy: 0.5100 - val_loss: 3.4139
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Epoch 124/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 30s 1s/step - accuracy: 0.9686 - loss: 0.1716 - val_accuracy: 0.5950 - val_loss: 2.5259
Epoch 125/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 29s 1s/step - accuracy: 0.9579 - loss: 0.1311 - val_accuracy: 0.6000 - val_loss: 2.3598
Epoch 126/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 28s 1s/step - accuracy: 0.9614 - loss: 0.1006 - val_accuracy: 0.6250 - val_loss: 2.3710
Epoch 127/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 42s 1s/step - accuracy: 0.9831 - loss: 0.0494 - val_accuracy: 0.5900 - val_loss: 2.4309
Epoch 128/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 30s 1s/step - accuracy: 0.9865 - loss: 0.0413 - val_accuracy: 0.6150 - val_loss: 2.5843
Epoch 129/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 29s 1s/step - accuracy: 0.9723 - loss: 0.0938 - val_accuracy: 0.6200 - val_loss: 2.5107
Epoch 130/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 40s 1s/step - accuracy: 0.9890 - loss: 0.0352 - val_accuracy: 0.6250 - val_loss: 2.6177
Epoch 131/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 42s 1s/step - accuracy: 0.9732 - loss: 0.1001 - val_accuracy: 0.6350 - val_loss: 2.6362
Epoch 132/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 28s 1s/step - accuracy: 0.9685 - loss: 0.0753 - val_accuracy: 0.6450 - val_loss: 2.7245
Epoch 133/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 30s 1s/step - accuracy: 0.9689 - loss: 0.1208 - val_accuracy: 0.6350 - val_loss: 2.4855
Epoch 134/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 29s 1s/step - accuracy: 0.9775 - loss: 0.0830 - val_accuracy: 0.5800 - val_loss: 2.6929
Epoch 135/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 27s 1s/step - accuracy: 0.9776 - loss: 0.0684 - val_accuracy: 0.6250 - val_loss: 2.4147
Epoch 136/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 29s 1s/step - accuracy: 0.9900 - loss: 0.0449 - val_accuracy: 0.6200 - val_loss: 2.4069
Epoch 137/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 28s 1s/step - accuracy: 0.9814 - loss: 0.0603 - val_accuracy: 0.6400 - val_loss: 2.3076
Epoch 138/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 29s 1s/step - accuracy: 0.9831 - loss: 0.0480 - val_accuracy: 0.6300 - val_loss: 2.4884
Epoch 139/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 29s 1s/step - accuracy: 0.9798 - loss: 0.0811 - val_accuracy: 0.6100 - val_loss: 2.8976
Epoch 140/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 30s 1s/step - accuracy: 0.9540 - loss: 0.1233 - val_accuracy: 0.6000 - val_loss: 2.5558
Epoch 141/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 28s 1s/step - accuracy: 0.9726 - loss: 0.0607 - val_accuracy: 0.6150 - val_loss: 2.5155
Epoch 142/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 26s 1s/step - accuracy: 0.9861 - loss: 0.0612 - val_accuracy: 0.6150 - val_loss: 2.5438
Epoch 143/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 27s 1s/step - accuracy: 0.9839 - loss: 0.0469 - val_accuracy: 0.6150 - val_loss: 2.7714
Epoch 144/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 28s 1s/step - accuracy: 0.9804 - loss: 0.0644 - val_accuracy: 0.6050 - val_loss: 2.6876
Epoch 145/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 28s 1s/step - accuracy: 0.9745 - loss: 0.0825 - val_accuracy: 0.6150 - val_loss: 2.5074
Epoch 146/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 28s 1s/step - accuracy: 0.9850 - loss: 0.0500 - val_accuracy: 0.5700 - val_loss: 2.7695
Epoch 147/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 13s 534ms/step - accuracy: 0.9874 - loss: 0.0435 - val_accuracy: 0.6100 - val_loss: 2.9878
Epoch 148/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 13s 516ms/step - accuracy: 0.9890 - loss: 0.0413 - val_accuracy: 0.5550 - val_loss: 2.9865
Epoch 149/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 13s 506ms/step - accuracy: 0.9630 - loss: 0.1362 - val_accuracy: 0.5950 - val_loss: 2.6534
Epoch 150/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 13s 536ms/step - accuracy: 0.9646 - loss: 0.1046 - val_accuracy: 0.6100 - val_loss: 2.6097
Epoch 151/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 13s 516ms/step - accuracy: 0.9851 - loss: 0.0577 - val_accuracy: 0.5700 - val_loss: 3.1224
Epoch 152/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 12s 472ms/step - accuracy: 0.9864 - loss: 0.0592 - val_accuracy: 0.6250 - val_loss: 3.0793
Epoch 153/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 12s 493ms/step - accuracy: 0.9766 - loss: 0.1038 - val_accuracy: 0.5900 - val_loss: 3.0936
Epoch 154/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 14s 545ms/step - accuracy: 0.9854 - loss: 0.0362 - val_accuracy: 0.6250 - val_loss: 2.8501
Epoch 155/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 13s 512ms/step - accuracy: 0.9807 - loss: 0.0572 - val_accuracy: 0.6350 - val_loss: 2.8597
Epoch 156/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 14s 553ms/step - accuracy: 0.9818 - loss: 0.0439 - val_accuracy: 0.6250 - val_loss: 2.8805
Epoch 157/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 13s 523ms/step - accuracy: 0.9693 - loss: 0.1114 - val_accuracy: 0.6150 - val_loss: 2.8996
Epoch 158/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 35s 1s/step - accuracy: 0.9876 - loss: 0.0445 - val_accuracy: 0.6100 - val_loss: 2.5862
Epoch 159/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 49s 2s/step - accuracy: 0.9832 - loss: 0.0491 - val_accuracy: 0.6150 - val_loss: 2.7456
Epoch 160/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 45s 2s/step - accuracy: 0.9890 - loss: 0.0416 - val_accuracy: 0.6350 - val_loss: 2.6034
Epoch 161/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 45s 2s/step - accuracy: 0.9840 - loss: 0.0574 - val_accuracy: 0.6200 - val_loss: 2.5495
Epoch 162/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 36s 1s/step - accuracy: 0.9752 - loss: 0.0676 - val_accuracy: 0.6400 - val_loss: 2.4306
Epoch 163/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 31s 1s/step - accuracy: 0.9842 - loss: 0.0456 - val_accuracy: 0.5650 - val_loss: 3.2392
Epoch 164/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 44s 2s/step - accuracy: 0.9629 - loss: 0.1236 - val_accuracy: 0.6050 - val_loss: 2.5910
```

```
Epoch 165/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 39s 2s/step - accuracy: 0.9845 - loss: 0.0498 - val_accuracy: 0.5600 - val_loss: 3.4614
Epoch 166/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 41s 2s/step - accuracy: 0.9775 - loss: 0.0778 - val_accuracy: 0.5850 - val_loss: 3.4735
Epoch 167/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 39s 2s/step - accuracy: 0.9761 - loss: 0.1006 - val_accuracy: 0.6250 - val_loss: 2.8417
Epoch 168/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 36s 1s/step - accuracy: 0.9890 - loss: 0.0297 - val_accuracy: 0.6100 - val_loss: 3.5556
Epoch 169/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 42s 2s/step - accuracy: 0.9769 - loss: 0.0796 - val_accuracy: 0.6250 - val_loss: 2.8833
Epoch 170/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 76s 2s/step - accuracy: 0.9927 - loss: 0.0417 - val_accuracy: 0.5800 - val_loss: 3.4683
Epoch 171/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 38s 2s/step - accuracy: 0.9753 - loss: 0.1325 - val_accuracy: 0.5600 - val_loss: 3.0028
Epoch 172/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 41s 2s/step - accuracy: 0.9977 - loss: 0.0172 - val_accuracy: 0.5900 - val_loss: 3.1076
Epoch 173/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 36s 1s/step - accuracy: 0.9821 - loss: 0.0533 - val_accuracy: 0.6150 - val_loss: 2.7431
Epoch 174/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 32s 1s/step - accuracy: 0.9824 - loss: 0.0689 - val_accuracy: 0.6100 - val_loss: 2.9436
Epoch 175/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 45s 1s/step - accuracy: 0.9848 - loss: 0.0335 - val_accuracy: 0.6350 - val_loss: 3.0803
Epoch 176/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 42s 2s/step - accuracy: 0.9724 - loss: 0.0594 - val_accuracy: 0.6200 - val_loss: 2.8165
Epoch 177/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 38s 2s/step - accuracy: 0.9929 - loss: 0.0385 - val_accuracy: 0.5950 - val_loss: 2.7957
Epoch 178/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 39s 1s/step - accuracy: 0.9721 - loss: 0.0697 - val_accuracy: 0.5900 - val_loss: 3.0092
Epoch 179/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 37s 1s/step - accuracy: 0.9793 - loss: 0.0498 - val_accuracy: 0.6150 - val_loss: 3.1001
Epoch 180/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 40s 1s/step - accuracy: 0.9918 - loss: 0.0250 - val_accuracy: 0.6150 - val_loss: 3.1547
Epoch 181/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 46s 2s/step - accuracy: 0.9845 - loss: 0.0484 - val_accuracy: 0.6300 - val_loss: 3.0083
Epoch 182/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 41s 2s/step - accuracy: 0.9851 - loss: 0.0400 - val_accuracy: 0.6050 - val_loss: 3.2633
Epoch 183/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 41s 2s/step - accuracy: 0.9809 - loss: 0.0622 - val_accuracy: 0.5850 - val_loss: 2.9806
Epoch 184/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 78s 2s/step - accuracy: 0.9896 - loss: 0.0433 - val_accuracy: 0.5200 - val_loss: 4.4966
Epoch 185/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 36s 1s/step - accuracy: 0.9712 - loss: 0.0948 - val_accuracy: 0.6250 - val_loss: 3.3453
Epoch 186/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 48s 2s/step - accuracy: 0.9821 - loss: 0.0439 - val_accuracy: 0.6100 - val_loss: 3.2421
Epoch 187/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 43s 2s/step - accuracy: 0.9888 - loss: 0.0370 - val_accuracy: 0.6150 - val_loss: 3.3000
Epoch 188/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 52s 534ms/step - accuracy: 0.9968 - loss: 0.0204 - val_accuracy: 0.6100 - val_loss: 3.2120
Epoch 189/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 14s 568ms/step - accuracy: 0.9670 - loss: 0.1086 - val_accuracy: 0.6300 - val_loss: 2.9584
Epoch 190/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 14s 542ms/step - accuracy: 0.9895 - loss: 0.0179 - val_accuracy: 0.6400 - val_loss: 3.2522
Epoch 191/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 14s 539ms/step - accuracy: 0.9852 - loss: 0.0418 - val_accuracy: 0.6300 - val_loss: 2.9038
Epoch 192/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 13s 522ms/step - accuracy: 0.9963 - loss: 0.0141 - val_accuracy: 0.6100 - val_loss: 3.7893
Epoch 193/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 14s 549ms/step - accuracy: 0.9896 - loss: 0.0594 - val_accuracy: 0.6050 - val_loss: 3.6565
Epoch 194/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 13s 531ms/step - accuracy: 0.9762 - loss: 0.0803 - val_accuracy: 0.6000 - val_loss: 3.0845
Epoch 195/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 14s 553ms/step - accuracy: 0.9910 - loss: 0.0324 - val_accuracy: 0.5900 - val_loss: 3.1809
Epoch 196/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 13s 531ms/step - accuracy: 0.9763 - loss: 0.0641 - val_accuracy: 0.6000 - val_loss: 3.3820
Epoch 197/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 12s 490ms/step - accuracy: 0.9811 - loss: 0.0780 - val_accuracy: 0.6200 - val_loss: 3.3695
Epoch 198/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 39s 2s/step - accuracy: 0.9879 - loss: 0.0313 - val_accuracy: 0.6050 - val_loss: 3.4536
Epoch 199/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 37s 1s/step - accuracy: 0.9894 - loss: 0.0385 - val_accuracy: 0.6350 - val_loss: 3.3571
Epoch 200/200
25/25 ━━━━━━━━━━━━━━━━━━━━ 42s 2s/step - accuracy: 0.9831 - loss: 0.0570 - val_accuracy: 0.6000 - val_loss: 3.3900
```

In [8]:
```python
print(f"Execution time: {elapsed_time:.2f} seconds")
```

```
Execution time: 6102.52 seconds
```

In [9]:
```python
def append_core_data(score_path, num_cores, elapsed_time):
    # Check if the file already exists
    file_exists = os.path.exists(score_path)

    # Open the file in append mode
    with open(score_path, mode='a', newline='') as file:
        writer = csv.writer(file)

        # If the file is new, write the header
        if not file_exists:
            writer.writerow(["Number of Cores", "Elapsed Time"])

        # Write the new data
        writer.writerow([num_cores, elapsed_time])
```

In [10]:
```
score_path = r"C:\Users\nikhi\OneDrive\Desktop\Final Project\DEEP LEARNING WITH HPSC\core_data.txt"
append_core_data(score_path, number_of_worker, elapsed_time)
```