ASSIGNMENT-3

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AI Assignment 3

Build a CNN model for Bird species

Bird species classification is the process of using machine learning and computer vision techniques to identify and categorize different species of birds based on their visual characteristics. By analyzing images of birds, models can extract features and patterns to accurately classify bird species. This classification is vital for ecological research, wildlife monitoring, and conservation efforts. Advancements in deep learning and the availability of large annotated datasets have improved the accuracy of bird species classification models. Challenges include variations in lighting, pose, and background clutter. Ongoing research focuses on methods like transfer learning and data augmentation to enhance classification performance and contribute to avian biodiversity understanding and conservation.

Dataset Link: https://www.kaggle.com/datasets/akash2907/bird-species-classification

Code:

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

# Set the paths to your dataset
train_dir = '/path/to/train'
val_dir = '/path/to/validation'
test_dir = '/path/to/test'

# Set the parameters for training
input_shape = (224, 224, 3)
num_classes = 10
batch_size = 32
epochs = 10

# Data preprocessing and augmentation
train_datagen = ImageDataGenerator(
    rescale=1./255,
    rotation_range=20,
    width_shift_range=0.2,
    height_shift_range=0.2,
    horizontal_flip=True
)

validation_datagen = ImageDataGenerator(rescale=1./255)

train_generator = train_datagen.flow_from_directory(
    train_dir,
    target_size=input_shape[:2],
    batch_size=batch_size,
    class_mode='categorical'
)
```

```
validation_generator = validation_datagen.flow_from_directory(
    val_dir,
    target_size=input_shape[:2],
    batch_size=batch_size,
    class_mode='categorical'
)

# Create the CNN model
model = tf.keras.models.Sequential([
    tf.keras.applications.VGG16(include_top=False, weights='imagenet',
input_shape=input_shape),
    tf.keras.layers.Flatten(),
    tf.keras.layers.Dense(256, activation='relu'),
    tf.keras.layers.Dropout(0.5),
    tf.keras.layers.Dense(num_classes, activation='softmax')
])

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

# Train the model
model.fit(
    train_generator,
    steps_per_epoch=train_generator.n // batch_size,
    epochs=epochs,
    validation_data=validation_generator,
    validation_steps=validation_generator.n // batch_size
)

# Evaluate the model on the test set
test_datagen = ImageDataGenerator(rescale=1./255)
test_generator = test_datagen.flow_from_directory(
    test_dir,
    target_size=input_shape[:2],
    batch_size=batch_size,
    class_mode='categorical',
    shuffle=False
)

test_loss, test_acc = model.evaluate(test_generator, verbose=2)
print(f'Test loss: {test_loss:.4f}')
print(f'Test accuracy: {test_acc:.4f}')

# Save the model
model.save('bird_species_model.h5')
```