Model Optimization and Tuning Phase Template

Date	27 October 2024
Team ID	739872
Project Title	Bird Species Classification
Maximum Marks	10 Marks

Model Optimization and Tuning Phase

The Model Optimization and Tuning Phase involves refining neural network models for peak performance. It includes optimized model code, fine-tuning hyperparameters, comparing performance metrics, and justifying the final model selection for enhanced predictive accuracy and efficiency.

Hyperparameter Tuning Documentation (8 Marks):

Model	Tuned Hyperparameters

Model 1	`history = model.fit(`
	`  train_generator,`
	`  validation_data=val_generator,`
	`  epochs=10  # Adjust the number of epochs as needed`
	`)`
	
	Epoch 1/10
	/usr/local/lib/python3.10/dist-packages/keras/src/trainers/data_adapters/py_dataset_adapter.py:122: UserWarning: Your `PyDatas
	self._warn_if_super_not_called()
	112/112 ━━━━━━━━━━━━━━━━━━━━ 83s 632ms/step - accuracy: 0.0166 - loss: 5.6958 - val_accuracy: 0.0166 - val_loss: 4.5540
	Epoch 2/10
	112/112 ━━━━━━━━━━━━━━━━━━━━ 69s 585ms/step - accuracy: 0.0130 - loss: 4.6233 - val_accuracy: 0.0144 - val_loss: 4.3269
	Epoch 3/10
	112/112 ━━━━━━━━━━━━━━━━━━━━ 73s 619ms/step - accuracy: 0.0160 - loss: 4.4720 - val_accuracy: 0.0354 - val_loss: 4.2408
	Epoch 4/10
	112/112 ━━━━━━━━━━━━━━━━━━━━ 68s 579ms/step - accuracy: 0.0275 - loss: 4.3779 - val_accuracy: 0.0542 - val_loss: 4.1719
	Epoch 5/10
	112/112 ━━━━━━━━━━━━━━━━━━━━ 81s 570ms/step - accuracy: 0.0286 - loss: 4.2953 - val_accuracy: 0.0619 - val_loss: 4.0097
	Epoch 6/10
	112/112 ━━━━━━━━━━━━━━━━━━━━ 69s 574ms/step - accuracy: 0.0332 - loss: 4.2008 - val_accuracy: 0.0564 - val_loss: 3.9751
	Epoch 7/10
	112/112 ━━━━━━━━━━━━━━━━━━━━ 68s 573ms/step - accuracy: 0.0379 - loss: 4.1482 - val_accuracy: 0.0531 - val_loss: 3.9572
	Epoch 8/10

```
from tensorflow.keras import layers, models
model = models.Sequential()
model.add(layers.Conv2D(32, (3, 3), activation='relu', input_shape=(224, 224, 3)))
model.add(layers.MaxPooling2D((2, 2)))
model.add(layers.Conv2D(64, (3, 3), activation='relu'))
model.add(layers.MaxPooling2D((2, 2)))
model.add(layers.Flatten())
model.add(layers.Dense(128, activation='relu'))
model.add(layers.Dropout(0.5))
model.add(layers.Dense(210, activation='softmax'))
model.summary()
```

```
/usr/local/lib/python3.10/dist-packages/keras/src/layers/convolutional/base_conv.py:107: UserWarning: Do not pass an
  super().__init__(activity_regularizer=activity_regularizer, **kwargs)
Model: "sequential_2"
```

Layer (type)	Output Shape	Param #
conv2d_3 (Conv2D)	(None, 222, 222, 32)	896
max_pooling2d_2 (MaxPooling2D)	(None, 111, 111, 32)	0
conv2d_4 (Conv2D)	(None, 109, 109, 64)	18,496
max_pooling2d_3 (MaxPooling2D)	(None, 54, 54, 64)	0
flatten_1 (Flatten)	(None, 186624)	0
dense_3 (Dense)	(None, 128)	23,888,000
dropout_1 (Dropout)	(None, 128)	0
dense_4 (Dense)	(None, 210)	27,090

```
import os

# Path to the train and validation directories
train_dir = '/content/drive/MyDrive/Bird Species Classification/manasa/train'
val_dir = '/content/drive/MyDrive/Bird Species Classification/manasa/val'

# Check the structure
print("Training Classes:", os.listdir(train_dir))
print("Validation Classes:", os.listdir(val_dir))
```

```
Training Classes: ['002.Laysan_Albatross', '001.Black_footed_Albatross', '003.Sooty_Albatross', '004.Gr
Validation Classes: ['002.Laysan_Albatross', '001.Black_footed_Albatross', '003.Sooty_Albatross', '004.
```

Final Model Selection Justification (2 Marks):

Final Model	Reasoning
Model	Preprocessing: Resizing and Normalization Data Augmentation: Random rotation, flipping, zooming Loss Function: Categorical Crossentropy

	Optimizer: Adam Optimizer Learning Rate Scheduler: ReduceLROnPlateau Epochs 10 Batch Size : 32 Evaluation Metric: Accuracy