Model Development Phase Template

Date	15 March 2024
Team ID	SWTID1720436539
Project Title	SportSpecs: Unraveling Athletic Prowess with Advanced Transfer Learning for Sports
Maximum Marks	10 Marks

Initial Model Training Code, Model Validation and Evaluation Report

The initial model training code will be showcased in the future through a screenshot. The model validation and evaluation report will include a summary and training and validation performance metrics for multiple models, presented through respective screenshots.

Initial Model Training Code (5 marks):

```
vgg16.compile(loss='categorical_crossentropy',optimizer='adam',metrics=['accuracy'])
```

```
vgg16.fit(train,validation_data=test,epochs=30)
```

Model Validation and Evaluation Report (5 marks):

Model	Summary	Training and Validation Performance Metrics

Vgg16		

```
Model: "model_1"

Layer (type)                 Output Shape              Param #
=================================================================
input_2 (InputLayer)         [(None, 224, 224, 3)]     0

block1_conv1 (Conv2D)        (None, 224, 224, 64)      1792

block1_conv2 (Conv2D)        (None, 224, 224, 64)      36928

block1_pool (MaxPooling2D)   (None, 112, 112, 64)      0

block2_conv1 (Conv2D)        (None, 112, 112, 128)     73856

block2_conv2 (Conv2D)        (None, 112, 112, 128)     147584

block2_pool (MaxPooling2D)   (None, 56, 56, 128)       0

block3_conv1 (Conv2D)        (None, 56, 56, 256)       295168

block3_conv2 (Conv2D)        (None, 56, 56, 256)       590080

block3_conv3 (Conv2D)        (None, 56, 56, 256)       590080

block3_pool (MaxPooling2D)   (None, 28, 28, 256)       0
...
Total params: 17223588 (65.70 MB)
Trainable params: 2508900 (9.57 MB)
Non-trainable params: 14714688 (56.13 MB)
```

```
Epoch 1/30
844/844 [==============================] - 189s 223ms/step - loss: 3.2211 - accuracy: 0.4489 - val_loss: 1.7847 - val_accuracy: 0.6900
Epoch 2/30
844/844 [==============================] - 189s 223ms/step - loss: 1.0400 - accuracy: 0.7759 - val_loss: 1.8318 - val_accuracy: 0.6960
Epoch 3/30
844/844 [==============================] - 191s 226ms/step - loss: 0.7080 - accuracy: 0.8456 - val_loss: 1.6522 - val_accuracy: 0.7540
Epoch 4/30
844/844 [==============================] - 192s 227ms/step - loss: 0.5854 - accuracy: 0.8756 - val_loss: 1.8056 - val_accuracy: 0.7640
Epoch 5/30
844/844 [==============================] - 187s 222ms/step - loss: 0.5065 - accuracy: 0.8935 - val_loss: 2.1475 - val_accuracy: 0.7500
Epoch 6/30
844/844 [==============================] - 187s 222ms/step - loss: 0.5029 - accuracy: 0.9007 - val_loss: 1.8528 - val_accuracy: 0.7900
Epoch 7/30
844/844 [==============================] - 190s 225ms/step - loss: 0.4825 - accuracy: 0.9096 - val_loss: 2.0063 - val_accuracy: 0.7880
Epoch 8/30
844/844 [==============================] - 186s 221ms/step - loss: 0.3492 - accuracy: 0.9330 - val_loss: 1.8255 - val_accuracy: 0.8020
Epoch 9/30
844/844 [==============================] - 187s 222ms/step - loss: 0.3880 - accuracy: 0.9276 - val_loss: 2.4085 - val_accuracy: 0.7460
Epoch 10/30
844/844 [==============================] - 185s 220ms/step - loss: 0.4082 - accuracy: 0.9303 - val_loss: 2.6634 - val_accuracy: 0.7720
Epoch 11/30
844/844 [==============================] - 186s 220ms/step - loss: 0.3566 - accuracy: 0.9402 - val_loss: 2.2634 - val_accuracy: 0.8000
Epoch 12/30
844/844 [==============================] - 187s 221ms/step - loss: 0.3236 - accuracy: 0.9455 - val_loss: 2.5344 - val_accuracy: 0.7800
Epoch 13/30
...
Epoch 29/30
844/844 [==============================] - 190s 225ms/step - loss: 0.1744 - accuracy: 0.9764 - val_loss: 2.7440 - val_accuracy: 0.8200
Epoch 30/30
844/844 [==============================] - 187s 221ms/step - loss: 0.1696 - accuracy: 0.9764 - val_loss: 2.9197 - val_accuracy: 0.8240
```

Vgg19		

```
Model: "model"

Layer (type)                 Output Shape              Param #
=================================================================
input_2 (InputLayer)         [(None, 224, 224, 3)]     0

block1_conv1 (Conv2D)        (None, 224, 224, 64)      1792

block1_conv2 (Conv2D)        (None, 224, 224, 64)      36928

block1_pool (MaxPooling2D)   (None, 112, 112, 64)      0

block2_conv1 (Conv2D)        (None, 112, 112, 128)     73856

block2_conv2 (Conv2D)        (None, 112, 112, 128)     147584

block2_pool (MaxPooling2D)   (None, 56, 56, 128)       0

block3_conv1 (Conv2D)        (None, 56, 56, 256)       295168

block3_conv2 (Conv2D)        (None, 56, 56, 256)       590080

block3_conv3 (Conv2D)        (None, 56, 56, 256)       590080

block3_conv4 (Conv2D)        (None, 56, 56, 256)       590080
...
Total params: 22533284 (85.96 MB)
Trainable params: 2508900 (9.57 MB)
Non-trainable params: 20024384 (76.39 MB)
```

```
Epoch 1/10
844/844 [==============================] - 200s 229ms/step - loss: 3.6590 - accuracy: 0.4030 - val_loss: 2.4486 - val_accuracy: 0.6200
Epoch 2/10
844/844 [==============================] - 192s 228ms/step - loss: 1.3987 - accuracy: 0.7245 - val_loss: 2.0471 - val_accuracy: 0.6800
Epoch 3/10
844/844 [==============================] - 193s 229ms/step - loss: 1.0279 - accuracy: 0.7940 - val_loss: 1.9859 - val_accuracy: 0.7140
Epoch 4/10
844/844 [==============================] - 192s 227ms/step - loss: 0.8079 - accuracy: 0.8416 - val_loss: 1.8601 - val_accuracy: 0.7220
Epoch 5/10
844/844 [==============================] - 190s 225ms/step - loss: 0.8068 - accuracy: 0.8600 - val_loss: 2.0328 - val_accuracy: 0.7220
Epoch 6/10
844/844 [==============================] - 194s 230ms/step - loss: 0.6758 - accuracy: 0.8776 - val_loss: 2.7198 - val_accuracy: 0.6940
Epoch 7/10
844/844 [==============================] - 193s 229ms/step - loss: 0.6481 - accuracy: 0.8840 - val_loss: 2.0236 - val_accuracy: 0.7480
Epoch 8/10
844/844 [==============================] - 192s 227ms/step - loss: 0.5815 - accuracy: 0.9025 - val_loss: 1.9055 - val_accuracy: 0.7680
Epoch 9/10
844/844 [==============================] - 195s 231ms/step - loss: 0.5045 - accuracy: 0.9114 - val_loss: 2.5054 - val_accuracy: 0.7260
Epoch 10/10
844/844 [==============================] - 193s 228ms/step - loss: 0.4730 - accuracy: 0.9210 - val_loss: 2.5452 - val_accuracy: 0.7420
```

ResNet50		

```
Model: "model"
_____
 Layer (type)                 Output Shape          Param #     Connected to
=========================================================================================
 input_1 (InputLayer)         [(None, 224, 224, 3)]  0           []

 conv1_pad (ZeroPadding2D)    (None, 230, 230, 3)    0           ['input_1[0][0]']

 conv1_conv (Conv2D)          (None, 112, 112, 64)   9472        ['conv1_pad[0][0]']

 conv1_bn (BatchNormalizati   (None, 112, 112, 64)   256         ['conv1_conv[0][0]']
 on)

 conv1_relu (Activation)      (None, 112, 112, 64)   0           ['conv1_bn[0][0]']

 pool1_pad (ZeroPadding2D)    (None, 114, 114, 64)   0           ['conv1_relu[0][0]']

 pool1_pool (MaxPooling2D)    (None, 56, 56, 64)     0           ['pool1_pad[0][0]']

 conv2_block1_1_conv (Conv2   (None, 56, 56, 64)     4160        ['pool1_pool[0][0]']
 D)

 conv2_block1_1_bn (BatchNo   (None, 56, 56, 64)     256         ['conv2_block1_1_conv[0][0]']
 rmalization)

...
Total params: 33623012 (128.26 MB)
Trainable params: 10035300 (38.28 MB)
Non-trainable params: 23587712 (89.98 MB)
```

```
... Epoch 1/10
844/844 [==============================] - 186s 220ms/step - loss: 12.5238 - accuracy: 0.0829 - val_loss: 11.6711 - val_accuracy: 0.1040
Epoch 2/10
844/844 [==============================] - 182s 216ms/step - loss: 12.4152 - accuracy: 0.1321 - val_loss: 12.9668 - val_accuracy: 0.1460
Epoch 3/10
844/844 [==============================] - 183s 217ms/step - loss: 11.8139 - accuracy: 0.1615 - val_loss: 13.5304 - val_accuracy: 0.2020
Epoch 4/10
844/844 [==============================] - 182s 216ms/step - loss: 12.0227 - accuracy: 0.1839 - val_loss: 11.1943 - val_accuracy: 0.2040
Epoch 5/10
844/844 [==============================] - 181s 214ms/step - loss: 10.9686 - accuracy: 0.2046 - val_loss: 12.9458 - val_accuracy: 0.2260
Epoch 6/10
844/844 [==============================] - 183s 217ms/step - loss: 10.9545 - accuracy: 0.2238 - val_loss: 12.9199 - val_accuracy: 0.1920
Epoch 7/10
844/844 [==============================] - 184s 218ms/step - loss: 10.9752 - accuracy: 0.2421 - val_loss: 12.6667 - val_accuracy: 0.2080
Epoch 8/10
844/844 [==============================] - 182s 216ms/step - loss: 10.4781 - accuracy: 0.2580 - val_loss: 12.3309 - val_accuracy: 0.2260
Epoch 9/10
844/844 [==============================] - 183s 217ms/step - loss: 10.4540 - accuracy: 0.2748 - val_loss: 11.5919 - val_accuracy: 0.2820
Epoch 10/10
844/844 [==============================] - 183s 217ms/step - loss: 10.5361 - accuracy: 0.2763 - val_loss: 12.4740 - val_accuracy: 0.2080
```