

Model Development Phase Template

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| Date | 7 th July 2024 |
| Team ID | SWTID1720521440 |
| Project Title | Dog Breed Identification Using Transfer Learning |
| 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.

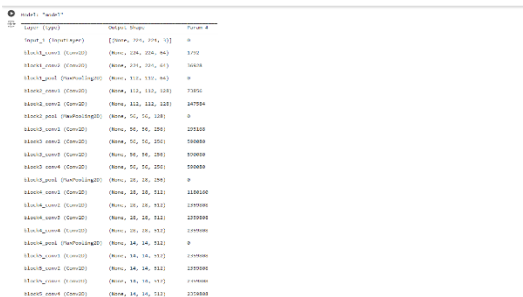
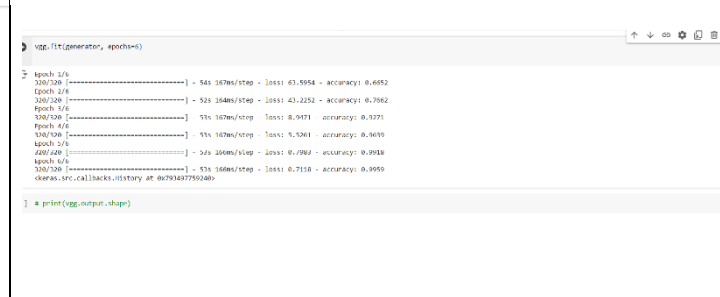
Initial Model Training Code (5 marks):

```
Image_size=(224, 224, 3)
# The first two values, 224 and 224, represent the height and width of the image, respectively. This means the image has a resolution of 224 pixels in height and 224 pixels in width.
# The third value, 3, represents the number of color channels in the image. In this case, 3 indicates that the image is in RGB (Red, Green, Blue) color space.
# Each pixel in the image is represented by three values corresponding to the intensity of red, green, and blue channels, respectively.

# *****
vgg=VGG19(input_shape=Image_size, weights='imagenet', include_top=False)

Downloading data from https://storage.googleapis.com/tensorflow/keras-applications/vgg19/vgg19_weights_tf_dim_ordering_tf_kernels_notop.h5
80134624/80134624 [=====] - 4s 0us/step
```

Model Validation and Evaluation Report (5 marks):

| Model | Summary | Training and Validation Performance Metrics | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------------------------|--|---|--------------|---------|----------------------|---------------------|---|------------------------|----------------------|------|------------------------------------|--------------------|---|------------------------|--------------------|-------|------------------------------------|--------------------|---|------------------------|-----------------------|-------|------------------------------------|---------------------|---|------------------------|---------------------|--------|------------------------------------|---------------------|---|------------------------|-----------------------|-------|------------------------------------|---------------------|---|------------------------|---------------------|--------|------------------------------------|---------------------|---|------------------------|-----------------------|---------|------------------------------------|-----------------------|---|------------------------|-----------------------|---------|------------------------------------|---------------------|---|------------------------|---------------------|---------|------------------------------------|---------------------|---|------------------------|-----------------------|-------|------------------------------------|---------------------|---|------------------------|---------------------|--------|------------------------------------|---------------------|---|--|
| Model 1 |  <table border="1"> <thead> <tr> <th>Layer (type)</th> <th>Output Shape</th> <th>Param #</th> </tr> </thead> <tbody> <tr> <td>Input_1 (InputLayer)</td> <td>(None, 224, 224, 3)</td> <td>0</td> </tr> <tr> <td>Block1_conv2d (Conv2D)</td> <td>(None, 104, 104, 64)</td> <td>5120</td> </tr> <tr> <td>Block1_maxpooling2d (MaxPooling2D)</td> <td>(None, 52, 52, 64)</td> <td>0</td> </tr> <tr> <td>Block1_conv2d (Conv2D)</td> <td>(None, 52, 52, 64)</td> <td>16384</td> </tr> <tr> <td>Block1_maxpooling2d (MaxPooling2D)</td> <td>(None, 26, 26, 64)</td> <td>0</td> </tr> <tr> <td>Block2_conv2d (Conv2D)</td> <td>(None, 112, 112, 128)</td> <td>73856</td> </tr> <tr> <td>Block2_maxpooling2d (MaxPooling2D)</td> <td>(None, 56, 56, 128)</td> <td>0</td> </tr> <tr> <td>Block2_conv2d (Conv2D)</td> <td>(None, 56, 56, 128)</td> <td>262144</td> </tr> <tr> <td>Block2_maxpooling2d (MaxPooling2D)</td> <td>(None, 28, 28, 128)</td> <td>0</td> </tr> <tr> <td>Block3_conv2d (Conv2D)</td> <td>(None, 112, 112, 128)</td> <td>73856</td> </tr> <tr> <td>Block3_maxpooling2d (MaxPooling2D)</td> <td>(None, 56, 56, 128)</td> <td>0</td> </tr> <tr> <td>Block3_conv2d (Conv2D)</td> <td>(None, 56, 56, 128)</td> <td>262144</td> </tr> <tr> <td>Block3_maxpooling2d (MaxPooling2D)</td> <td>(None, 28, 28, 128)</td> <td>0</td> </tr> <tr> <td>Block4_conv2d (Conv2D)</td> <td>(None, 224, 224, 128)</td> <td>1105920</td> </tr> <tr> <td>Block4_maxpooling2d (MaxPooling2D)</td> <td>(None, 112, 112, 128)</td> <td>0</td> </tr> <tr> <td>Block4_conv2d (Conv2D)</td> <td>(None, 112, 112, 128)</td> <td>2203904</td> </tr> <tr> <td>Block4_maxpooling2d (MaxPooling2D)</td> <td>(None, 56, 56, 128)</td> <td>0</td> </tr> <tr> <td>Block4_conv2d (Conv2D)</td> <td>(None, 56, 56, 128)</td> <td>2203904</td> </tr> <tr> <td>Block4_maxpooling2d (MaxPooling2D)</td> <td>(None, 28, 28, 128)</td> <td>0</td> </tr> <tr> <td>Block5_conv2d (Conv2D)</td> <td>(None, 112, 112, 128)</td> <td>73856</td> </tr> <tr> <td>Block5_maxpooling2d (MaxPooling2D)</td> <td>(None, 56, 56, 128)</td> <td>0</td> </tr> <tr> <td>Block5_conv2d (Conv2D)</td> <td>(None, 56, 56, 128)</td> <td>262144</td> </tr> <tr> <td>Block5_maxpooling2d (MaxPooling2D)</td> <td>(None, 28, 28, 128)</td> <td>0</td> </tr> </tbody> </table> | Layer (type) | Output Shape | Param # | Input_1 (InputLayer) | (None, 224, 224, 3) | 0 | Block1_conv2d (Conv2D) | (None, 104, 104, 64) | 5120 | Block1_maxpooling2d (MaxPooling2D) | (None, 52, 52, 64) | 0 | Block1_conv2d (Conv2D) | (None, 52, 52, 64) | 16384 | Block1_maxpooling2d (MaxPooling2D) | (None, 26, 26, 64) | 0 | Block2_conv2d (Conv2D) | (None, 112, 112, 128) | 73856 | Block2_maxpooling2d (MaxPooling2D) | (None, 56, 56, 128) | 0 | Block2_conv2d (Conv2D) | (None, 56, 56, 128) | 262144 | Block2_maxpooling2d (MaxPooling2D) | (None, 28, 28, 128) | 0 | Block3_conv2d (Conv2D) | (None, 112, 112, 128) | 73856 | Block3_maxpooling2d (MaxPooling2D) | (None, 56, 56, 128) | 0 | Block3_conv2d (Conv2D) | (None, 56, 56, 128) | 262144 | Block3_maxpooling2d (MaxPooling2D) | (None, 28, 28, 128) | 0 | Block4_conv2d (Conv2D) | (None, 224, 224, 128) | 1105920 | Block4_maxpooling2d (MaxPooling2D) | (None, 112, 112, 128) | 0 | Block4_conv2d (Conv2D) | (None, 112, 112, 128) | 2203904 | Block4_maxpooling2d (MaxPooling2D) | (None, 56, 56, 128) | 0 | Block4_conv2d (Conv2D) | (None, 56, 56, 128) | 2203904 | Block4_maxpooling2d (MaxPooling2D) | (None, 28, 28, 128) | 0 | Block5_conv2d (Conv2D) | (None, 112, 112, 128) | 73856 | Block5_maxpooling2d (MaxPooling2D) | (None, 56, 56, 128) | 0 | Block5_conv2d (Conv2D) | (None, 56, 56, 128) | 262144 | Block5_maxpooling2d (MaxPooling2D) | (None, 28, 28, 128) | 0 |  <pre>vgg.fit(generator, epochs=5) Epoch 1/5 1500/1500 [=====] - 5s1 167ms/step - loss: 0.75954 - accuracy: 0.6552 Epoch 2/5 1500/1500 [=====] - 5s2 164ms/step - loss: 0.72152 - accuracy: 0.7062 Epoch 3/5 1500/1500 [=====] - 5s1 167ms/step - loss: 0.69171 - accuracy: 0.7371 Epoch 4/5 1500/1500 [=====] - 5s1 167ms/step - loss: 0.63611 - accuracy: 0.7655 Epoch 5/5 200/200 [=====] - 5s4 160ms/step - loss: 0.49812 - accuracy: 0.8918 1500/1500 [=====] - 5s1 160ms/step - loss: 0.7118 - accuracy: 0.7655 clear_vfc_callbacks: history at 60793637760380] # print(vgg.output_shape)</pre> |
| Layer (type) | Output Shape | Param # | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Input_1 (InputLayer) | (None, 224, 224, 3) | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Block1_conv2d (Conv2D) | (None, 104, 104, 64) | 5120 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Block1_maxpooling2d (MaxPooling2D) | (None, 52, 52, 64) | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Block1_conv2d (Conv2D) | (None, 52, 52, 64) | 16384 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Block1_maxpooling2d (MaxPooling2D) | (None, 26, 26, 64) | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Block2_conv2d (Conv2D) | (None, 112, 112, 128) | 73856 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Block2_maxpooling2d (MaxPooling2D) | (None, 56, 56, 128) | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Block2_conv2d (Conv2D) | (None, 56, 56, 128) | 262144 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Block2_maxpooling2d (MaxPooling2D) | (None, 28, 28, 128) | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Block3_conv2d (Conv2D) | (None, 112, 112, 128) | 73856 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Block3_maxpooling2d (MaxPooling2D) | (None, 56, 56, 128) | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Block3_conv2d (Conv2D) | (None, 56, 56, 128) | 262144 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Block3_maxpooling2d (MaxPooling2D) | (None, 28, 28, 128) | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Block4_conv2d (Conv2D) | (None, 224, 224, 128) | 1105920 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Block4_maxpooling2d (MaxPooling2D) | (None, 112, 112, 128) | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Block4_conv2d (Conv2D) | (None, 112, 112, 128) | 2203904 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Block4_maxpooling2d (MaxPooling2D) | (None, 56, 56, 128) | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Block4_conv2d (Conv2D) | (None, 56, 56, 128) | 2203904 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Block4_maxpooling2d (MaxPooling2D) | (None, 28, 28, 128) | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Block5_conv2d (Conv2D) | (None, 112, 112, 128) | 73856 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Block5_maxpooling2d (MaxPooling2D) | (None, 56, 56, 128) | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Block5_conv2d (Conv2D) | (None, 56, 56, 128) | 262144 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Block5_maxpooling2d (MaxPooling2D) | (None, 28, 28, 128) | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

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| | <pre> Keras generator summary (memory: 100.0 MB) ----- Layer (type) Output Shape Param # ----- batch_normalization (Batch Normalization) [None, 16, 16, 64] 256000 batch_normalization (Batch Normalization) [None, 16, 16, 64] 256000 batch_normalization (Batch Normalization) [None, 1, 1, 1, 128] 0 activation (Activation) [None, 12800] 0 dense (Dense) [None, 1280] 326400 ----- total params: 736000 (28.47 MB) trainable params: 736000 (28.47 MB) non-trainable params: 0 (0.0 MB) ----- [1] vgg.compile(optimizer='adam', loss='categorical_crossentropy', metrics=['accuracy']) </pre> | |
| | <pre> > vgg.fit(generator, epochs=5) 5 Epoch 1/5 150/150 [=====] - 541 167ms/step - loss: 63.5954 - accuracy: 0.6952 Epoch 2/5 150/150 [=====] - 521 164ms/step - loss: 43.2152 - accuracy: 0.7962 Epoch 3/5 150/150 [=====] - 531 167ms/step - loss: 8.0471 - accuracy: 0.9271 Epoch 4/5 150/150 [=====] - 531 167ms/step - loss: 5.1261 - accuracy: 0.9699 Epoch 5/5 150/150 [=====] - 341 166ms/step - loss: 0.1964 - accuracy: 0.9938 Epoch 6/5 150/150 [=====] - 331 166ms/step - loss: 0.7118 - accuracy: 0.9959 <keras.src.callbacks.history at 0x7931d77502d0> [1] # print(egg.output.shape) </pre> | |
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