

## Model Development Phase Template

Date	8 july 2024
Team ID	SWTID1720093035
Project Title	<b>TechPart Vision: Personal Computer Parts Image Classification Using EfficientNet Transfer Learning</b>
Maximum Marks	10 Marks

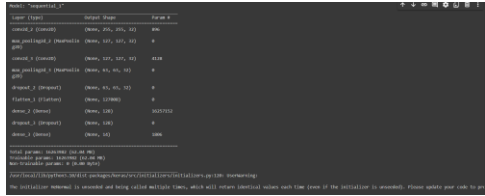
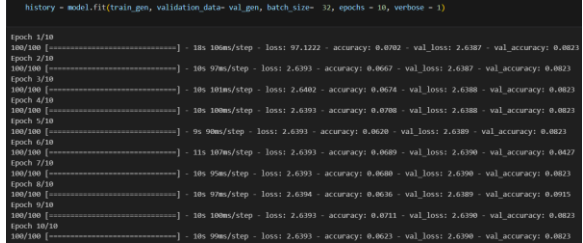
### Initial Model Training Code, Model Validation and Evaluation Report

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):

Paste the screenshot of the model training code

### Model Validation and Evaluation Report (5 marks):

Model	Summary	Training and Validation Performance Metrics
CNN		

## Efficientn etv2B1

Layer (Type)	Output Shape	Param #	Connected to
input_1 (InputLayer)	(None, 255, 255, 3)	0	[]
rescaling (Rescaling)	(None, 255, 255, 3)	0	['input_1[0][0]']
normalization (Normalization)	(None, 255, 255, 3)	0	['rescaling[0][0]']
stem_conv (Conv2D)	(None, 128, 128, 32)	864	['normalization[0][0]']
stem_bn (BatchNormalization)	(None, 128, 128, 32)	128	['stem_conv[0][0]']
stem_activation (Activation)	(None, 128, 128, 32)	0	['stem_bn[0][0]']
block1a_project_conv (Conv2D)	(None, 128, 128, 16)	4608	['stem_activation[0][0]']
block1a_project_bn (BatchNormalization)	(None, 128, 128, 16)	64	['block1a_project_conv[0][0]']
block1a_project_activation (Activation)	(None, 128, 128, 16)	0	['block1a_project_bn[0][0]']
block1b_project_conv (Conv2D)	(None, 128, 128, 16)	2304	['block1a_project_activation[0][0]']
block1b_project_bn (BatchNormalization)	(None, 128, 128, 16)	64	['block1b_project_conv[0][0]']
block1b_project_activation (Activation)	(None, 128, 128, 16)	0	['block1b_project_bn[0][0]']
block1b_drop (Dropout)	(None, 128, 128, 16)	0	['block1b_project_activation[0][0]']
block1b_add (Add)	(None, 128, 128, 16)	0	['block1b_drop[0][0]', 'block1a_project_activation[0][0]']
block2a_expand_conv (Conv2D)	(None, 64, 64, 64)	9216	['block1b_add[0][0]']
block2a_expand_bn (BatchNormalization)	(None, 64, 64, 64)	256	['block2a_expand_conv[0][0]']

block2a_expand_conv (Conv2D)	(None, 64, 64, 64)	9216	['block1b_add[0][0]']
block2a_expand_bn (BatchNormalization)	(None, 64, 64, 64)	256	['block2a_expand_conv[0][0]']
block2a_expand_activation (Activation)	(None, 64, 64, 64)	0	['block2a_expand_bn[0][0]']
block2a_project_conv (Conv2D)	(None, 64, 64, 32)	2048	['block2a_expand_activation[0][0]']
block2a_project_bn (BatchNormalization)	(None, 64, 64, 32)	128	['block2a_project_conv[0][0]']
block2b_expand_conv (Conv2D)	(None, 64, 64, 128)	36864	['block2a_project_bn[0][0]']
block2b_expand_bn (BatchNormalization)	(None, 64, 64, 128)	512	['block2b_expand_conv[0][0]']
block2b_expand_activation (Activation)	(None, 64, 64, 128)	0	['block2b_expand_bn[0][0]']
block2b_project_conv (Conv2D)	(None, 64, 64, 32)	4096	['block2b_expand_activation[0][0]']
block2b_project_bn (BatchNormalization)	(None, 64, 64, 32)	128	['block2b_project_conv[0][0]']
block2b_drop (Dropout)	(None, 64, 64, 32)	0	['block2b_project_bn[0][0]']
block2b_add (Add)	(None, 64, 64, 32)	0	['block2b_drop[0][0]', 'block2a_project_bn[0][0]']
block2c_expand_conv (Conv2D)	(None, 64, 64, 128)	36864	['block2b_add[0][0]']
block2c_expand_bn (BatchNormalization)	(None, 64, 64, 128)	512	['block2c_expand_conv[0][0]']
block2c_expand_activation (Activation)	(None, 64, 64, 128)	0	['block2c_expand_bn[0][0]']
block2c_project_conv (Conv2D)	(None, 64, 64, 32)	4096	['block2c_expand_activation[0][0]']
block2c_project_bn (BatchNormalization)	(None, 64, 64, 32)	128	['block2c_project_conv[0][0]']

block2c_project_bn (BatchNormalization)	(None, 64, 64, 32)	128	['block2c_project_conv[0][0]']
block2c_drop (Dropout)	(None, 64, 64, 32)	0	['block2c_project_bn[0][0]']
block2c_add (Add)	(None, 64, 64, 32)	0	['block2c_drop[0][0]', 'block2b_add[0][0]']
block3a_expand_conv (Conv2D)	(None, 32, 32, 128)	36864	['block2c_add[0][0]']
block3a_expand_bn (BatchNormalization)	(None, 32, 32, 128)	512	['block3a_expand_conv[0][0]']
block3a_expand_activation (Activation)	(None, 32, 32, 128)	0	['block3a_expand_bn[0][0]']
block3a_project_conv (Conv2D)	(None, 32, 32, 48)	6144	['block3a_expand_activation[0][0]']
block3a_project_bn (BatchNormalization)	(None, 32, 32, 48)	192	['block3a_project_conv[0][0]']
block3b_expand_conv (Conv2D)	(None, 32, 32, 192)	82944	['block3a_project_bn[0][0]']
block3b_expand_bn (BatchNormalization)	(None, 32, 32, 192)	768	['block3b_expand_conv[0][0]']
block3b_expand_activation (Activation)	(None, 32, 32, 192)	0	['block3b_expand_bn[0][0]']
block3b_project_conv (Conv2D)	(None, 32, 32, 48)	9216	['block3b_expand_activation[0][0]']
block3b_project_bn (BatchNormalization)	(None, 32, 32, 48)	192	['block3b_project_conv[0][0]']
block3b_drop (Dropout)	(None, 32, 32, 48)	0	['block3b_project_bn[0][0]']
block3b_add (Add)	(None, 32, 32, 48)	0	['block3b_drop[0][0]', 'block3a_project_bn[0][0]']
block3c_expand_conv (Conv2D)	(None, 32, 32, 192)	82944	['block3b_add[0][0]']
block3c_expand_bn (BatchNormalization)	(None, 32, 32, 192)	768	['block3c_expand_conv[0][0]']

```
Model fitting
+ Code + Monitor

history=model.fit(train_gen, epochs=5, verbose=1, callbacks=callbacks, validation_data=val_gen,
validation_steps=100, shuffle=True)

Epoch 1/5
100/100 [-----] - loss: 0.4206/step - loss: 0.3889 - accuracy: 0.5595 - val_loss: 2.3295 - val_accuracy: 0.7043 - lr: 0.0018
Epoch 2/5
100/100 [-----] - loss: 0.3306/step - loss: 0.3365 - accuracy: 0.8233 - val_loss: 5.8759 - val_accuracy: 0.7134 - lr: 0.0018
Epoch 3/5
100/100 [-----] - loss: 0.3346/step - loss: 0.4052 - accuracy: 0.8032 - val_loss: 4.9639 - val_accuracy: 0.7337 - lr: 0.0018
Epoch 4/5
100/100 [-----] - loss: 0.3596/step - loss: 3.8958 - accuracy: 0.9258 - val_loss: 4.3846 - val_accuracy: 0.7256 - lr: 0.0018
Epoch 5/5
100/100 [-----] - loss: 0.3706/step - loss: 3.8294 - accuracy: 0.9486 - val_loss: 3.4238 - val_accuracy: 0.7395 - lr: 0.0018
```

rmalization)			
block3c_expand_activation (Activation)	(None, 32, 32, 192)	0	['block3c_expand_bn[0][0]']
block3c_project_conv (Conv2D)	(None, 32, 32, 48)	9216	['block3c_expand_activation[0][0]']
block3c_project_bn (Batch Normalization)	(None, 32, 32, 48)	192	['block3c_project_conv[0][0]']
block3c_drop (Dropout)	(None, 32, 32, 48)	0	['block3c_project_bn[0][0]']
block3c_add (Add)	(None, 32, 32, 48)	0	['block3c_drop[0][0]', 'block3b_add[0][0]']
block4a_expand_conv (Conv2D)	(None, 32, 32, 192)	9216	['block3c_add[0][0]']
block4a_expand_bn (Batch Normalization)	(None, 32, 32, 192)	768	['block4a_expand_conv[0][0]']
block4a_expand_activation (Activation)	(None, 32, 32, 192)	0	['block4a_expand_bn[0][0]']
block4a_dconv2 (Depthwise Conv2D)	(None, 16, 16, 192)	1728	['block4a_expand_activation[0][0]']
block4a_bn (Batch Normalization)	(None, 16, 16, 192)	768	['block4a_dconv2[0][0]']
block4a_activation (Activation)	(None, 16, 16, 192)	0	['block4a_bn[0][0]']
block4a_se_squeeze (Global Average Pooling2D)	(None, 192)	0	['block4a_activation[0][0]']
block4a_se_reshape (Reshape)	(None, 1, 1, 192)	0	['block4a_se_squeeze[0][0]']
block4a_se_reduce (Conv2D)	(None, 1, 1, 12)	2316	['block4a_se_reshape[0][0]']
block4a_se_expand (Conv2D)	(None, 1, 1, 192)	2696	['block4a_se_reduce[0][0]']
block4a_se_excite (Multiply)	(None, 16, 16, 192)	0	['block4a_activation[0][0]', 'block4a_se_expand[0][0]']
block4a_project_conv (Conv2D)	(None, 16, 16, 96)	18432	['block4a_se_excite[0][0]']

rmalization)			
block4b_expand_bn (Batch Normalization)	(None, 16, 16, 384)	1536	['block4a_project_conv[0][0]']
block4b_expand_activation (Activation)	(None, 16, 16, 384)	0	['block4b_expand_bn[0][0]']
block4b_dconv2 (Depthwise Conv2D)	(None, 16, 16, 384)	3456	['block4b_expand_activation[0][0]']
block4b_bn (Batch Normalization)	(None, 16, 16, 384)	1536	['block4b_dconv2[0][0]']
block4b_activation (Activation)	(None, 16, 16, 384)	0	['block4b_bn[0][0]']
block4b_se_squeeze (Global Average Pooling2D)	(None, 384)	0	['block4b_activation[0][0]']
block4b_se_reshape (Reshape)	(None, 1, 1, 384)	0	['block4b_se_squeeze[0][0]']
block4b_se_reduce (Conv2D)	(None, 1, 1, 24)	9240	['block4b_se_reshape[0][0]']
block4b_se_expand (Conv2D)	(None, 1, 1, 384)	9600	['block4b_se_reduce[0][0]']
block4b_se_excite (Multiply)	(None, 16, 16, 384)	0	['block4b_activation[0][0]', 'block4b_se_expand[0][0]']
block4b_project_conv (Conv2D)	(None, 16, 16, 96)	36864	['block4b_se_excite[0][0]']
block4b_project_bn (Batch Normalization)	(None, 16, 16, 96)	384	['block4b_project_conv[0][0]']
block4b_drop (Dropout)	(None, 16, 16, 96)	0	['block4b_project_bn[0][0]']
block4b_add (Add)	(None, 16, 16, 96)	0	['block4b_drop[0][0]', 'block4a_project_bn[0][0]']
block4c_expand_conv (Conv2D)	(None, 16, 16, 384)	36864	['block4b_add[0][0]']
block4c_expand_bn (Batch Normalization)	(None, 16, 16, 384)	1536	['block4c_expand_conv[0][0]']
block4c_expand_activation (Activation)	(None, 16, 16, 384)	0	['block4c_expand_bn[0][0]']
block4c_dconv2 (Depthwise Conv2D)	(None, 16, 16, 384)	3456	['block4c_expand_activation[0][0]']

rmalization)			
block4d_se_squeeze (Global Average Pooling2D)	(None, 384)	0	['block4c_activation[0][0]']
block4d_se_reshape (Reshape)	(None, 1, 1, 384)	0	['block4d_se_squeeze[0][0]']
block4d_se_reduce (Conv2D)	(None, 1, 1, 24)	9240	['block4d_se_reshape[0][0]']
block4d_se_expand (Conv2D)	(None, 1, 1, 384)	9600	['block4d_se_reduce[0][0]']
block4d_se_excite (Multiply)	(None, 16, 16, 384)	0	['block4c_activation[0][0]', 'block4d_se_expand[0][0]']
block4d_project_conv (Conv2D)	(None, 16, 16, 96)	36864	['block4d_se_excite[0][0]']
block4d_project_bn (Batch Normalization)	(None, 16, 16, 96)	384	['block4d_project_conv[0][0]']
block4d_drop (Dropout)	(None, 16, 16, 96)	0	['block4d_project_bn[0][0]']
block4d_add (Add)	(None, 16, 16, 96)	0	['block4d_drop[0][0]', 'block4b_add[0][0]']
block4d_expand_conv (Conv2D)	(None, 16, 16, 384)	36864	['block4d_add[0][0]']
block4d_expand_bn (Batch Normalization)	(None, 16, 16, 384)	1536	['block4d_expand_conv[0][0]']
block4d_expand_activation (Activation)	(None, 16, 16, 384)	0	['block4d_expand_bn[0][0]']
block4d_dconv2 (Depthwise Conv2D)	(None, 16, 16, 384)	3456	['block4d_expand_activation[0][0]']
block4d_bn (Batch Normalization)	(None, 16, 16, 384)	1536	['block4d_dconv2[0][0]']
block4d_activation (Activation)	(None, 16, 16, 384)	0	['block4d_bn[0][0]']
block4d_se_squeeze (Global Average Pooling2D)	(None, 384)	0	['block4d_activation[0][0]']
block4d_se_reshape (Reshape)	(None, 1, 1, 384)	0	['block4d_se_squeeze[0][0]']
block4d_se_reduce (Conv2D)	(None, 1, 1, 24)	9240	['block4d_se_reshape[0][0]']

block4d_se_expand (Conv2D)	(None, 1, 1, 384)	9680	['block4d_se_reduce[0][0]']
block4d_se_excite (Multipl y)	(None, 16, 16, 384)	0	['block4d_activation[0][0]', 'block4d_se_expand[0][0]']
block4d_project_conv (conv 2D)	(None, 16, 16, 96)	36804	['block4d_se_excite[0][0]']
block4d_project_bn (BatchN ormalization)	(None, 16, 16, 96)	384	['block4d_project_conv[0][0]']
block4d_drop (Dropout)	(None, 16, 16, 96)	0	['block4d_project_bn[0][0]']
block4d_add (Add)	(None, 16, 16, 96)	0	['block4d_drop[0][0]', 'block4d_add[0][0]']
block5a_expand_conv (Conv2 D)	(None, 16, 16, 576)	55296	['block4d_add[0][0]']
block5a_expand_bn (BatchN ormalization)	(None, 16, 16, 576)	2304	['block5a_expand_conv[0][0]']
block5a_expand_activation (Activation)	(None, 16, 16, 576)	0	['block5a_expand_bn[0][0]']
block5a_dwconv2 (Depthwise conv2D)	(None, 16, 16, 576)	5184	['block5a_expand_activation[0] [0]']
block5a_bn (BatchNormaliza tion)	(None, 16, 16, 576)	2304	['block5a_dwconv2[0][0]']
block5a_activation (Activa tion)	(None, 16, 16, 576)	0	['block5a_bn[0][0]']
block5a_se_squeeze (Global AveragePooling2D)	(None, 576)	0	['block5a_activation[0][0]']
block5a_se_reshape (Reshap e)	(None, 1, 1, 576)	0	['block5a_se_squeeze[0][0]']
block5a_se_reduce (Conv2D)	(None, 1, 1, 24)	13848	['block5a_se_reshape[0][0]']
block5a_se_expand (Conv2D)	(None, 1, 1, 576)	14400	['block5a_se_reduce[0][0]']
block5a_se_excite (Multipl y)	(None, 16, 16, 576)	0	['block5a_activation[0][0]', 'block5a_se_expand[0][0]']
block5a_project_conv (conv 2D)	(None, 16, 16, 112)	64512	['block5a_se_excite[0][0]']

block5a_project_bn (BatchN ormalization)	(None, 16, 16, 112)	448	['block5a_project_conv[0][0]']
block5b_expand_conv (Conv2 D)	(None, 16, 16, 672)	75264	['block5a_project_bn[0][0]']
block5b_expand_bn (BatchN ormalization)	(None, 16, 16, 672)	2688	['block5b_expand_conv[0][0]']
block5b_expand_activation (Activation)	(None, 16, 16, 672)	0	['block5b_expand_bn[0][0]']
block5b_dwconv2 (Depthwise conv2D)	(None, 16, 16, 672)	6048	['block5b_expand_activation[0] [0]']
block5b_bn (BatchNormaliza tion)	(None, 16, 16, 672)	2688	['block5b_dwconv2[0][0]']
block5b_activation (Activa tion)	(None, 16, 16, 672)	0	['block5b_bn[0][0]']
block5b_se_squeeze (Global AveragePooling2D)	(None, 672)	0	['block5b_activation[0][0]']
block5b_se_reshape (Reshap e)	(None, 1, 1, 672)	0	['block5b_se_squeeze[0][0]']
block5b_se_reduce (Conv2D)	(None, 1, 1, 28)	18844	['block5b_se_reshape[0][0]']
block5b_se_expand (Conv2D)	(None, 1, 1, 672)	19488	['block5b_se_reduce[0][0]']
block5b_se_excite (Multipl y)	(None, 16, 16, 672)	0	['block5b_activation[0][0]', 'block5b_se_expand[0][0]']
block5b_project_conv (conv 2D)	(None, 16, 16, 112)	75264	['block5b_se_excite[0][0]']
block5b_project_bn (BatchN ormalization)	(None, 16, 16, 112)	448	['block5b_project_conv[0][0]']
block5b_drop (Dropout)	(None, 16, 16, 112)	0	['block5b_project_bn[0][0]']
block5b_add (Add)	(None, 16, 16, 112)	0	['block5b_drop[0][0]', 'block5a_project_bn[0][0]']
block5c_expand_conv (Conv2 D)	(None, 16, 16, 672)	75264	['block5b_add[0][0]']
block5c_expand_bn (BatchN ormalization)	(None, 16, 16, 672)	2688	['block5c_expand_conv[0][0]']

block5c_activation (Activa tion)	(None, 16, 16, 672)	0	['block5c_bn[0][0]']
block5c_se_squeeze (Global AveragePooling2D)	(None, 672)	0	['block5c_activation[0][0]']
block5c_se_reshape (Reshap e)	(None, 1, 1, 672)	0	['block5c_se_squeeze[0][0]']
block5c_se_reduce (Conv2D)	(None, 1, 1, 28)	18844	['block5c_se_reshape[0][0]']
block5c_se_expand (Conv2D)	(None, 1, 1, 672)	19488	['block5c_se_reduce[0][0]']
block5c_se_excite (Multipl y)	(None, 16, 16, 672)	0	['block5c_activation[0][0]', 'block5c_se_expand[0][0]']
block5c_project_conv (conv 2D)	(None, 16, 16, 112)	75264	['block5c_se_excite[0][0]']
block5c_project_bn (BatchN ormalization)	(None, 16, 16, 112)	448	['block5c_project_conv[0][0]']
block5c_drop (Dropout)	(None, 16, 16, 112)	0	['block5c_project_bn[0][0]']
block5c_add (Add)	(None, 16, 16, 112)	0	['block5c_drop[0][0]', 'block5b_add[0][0]']
block5d_expand_conv (Conv2 D)	(None, 16, 16, 672)	75264	['block5c_add[0][0]']
block5d_expand_bn (BatchN ormalization)	(None, 16, 16, 672)	2688	['block5d_expand_conv[0][0]']
block5d_expand_activation (Activation)	(None, 16, 16, 672)	0	['block5d_expand_bn[0][0]']
block5d_dwconv2 (Depthwise conv2D)	(None, 16, 16, 672)	6048	['block5d_expand_activation[0] [0]']
block5d_bn (BatchNormaliza tion)	(None, 16, 16, 672)	2688	['block5d_dwconv2[0][0]']
block5d_activation (Activa tion)	(None, 16, 16, 672)	0	['block5d_bn[0][0]']
block5d_se_squeeze (Global AveragePooling2D)	(None, 672)	0	['block5d_activation[0][0]']

blockse_activation (Activation)	(None, 16, 16, 672)	0	['blockse_bn[0][0]']
blockse_se_squeeze (Global AveragePooling2D)	(None, 672)	0	['blockse_activation[0][0]']
blockse_se_reshape (Reshape)	(None, 1, 1, 672)	0	['blockse_se_squeeze[0][0]']
blockse_se_reduce (Conv2D)	(None, 1, 1, 28)	18844	['blockse_se_reshape[0][0]']
blockse_se_expand (Conv2D)	(None, 1, 1, 672)	19488	['blockse_se_reduce[0][0]']
blockse_se_excite (Multiply)	(None, 16, 16, 672)	0	['blockse_activation[0][0]', 'blockse_se_expand[0][0]']
blockse_project_conv (Conv2D)	(None, 16, 16, 112)	75264	['blockse_se_excite[0][0]']
blockse_project_bn (Batch Normalization)	(None, 16, 16, 112)	448	['blockse_project_conv[0][0]']
blockse_drop (Dropout)	(None, 16, 16, 112)	0	['blockse_project_bn[0][0]']
blockse_add (Add)	(None, 16, 16, 112)	0	['blockse_drop[0][0]', 'blockse_add[0][0]']
blocksf_expand_conv (Conv2D)	(None, 16, 16, 672)	75264	['blockse_add[0][0]']
blocksf_expand_bn (Batch Normalization)	(None, 16, 16, 672)	2688	['blocksf_expand_conv[0][0]']
blocksf_expand_activation (Activation)	(None, 16, 16, 672)	0	['blocksf_expand_bn[0][0]']
blocksf_deconv2 (Depthwise Conv2D)	(None, 16, 16, 672)	6048	['blocksf_expand_activation[0][0]']
blocksf_bn (Batch Normalization)	(None, 16, 16, 672)	2688	['blocksf_deconv2[0][0]']
blocksf_activation (Activation)	(None, 16, 16, 672)	0	['blocksf_bn[0][0]']
blocksf_se_squeeze (Global AveragePooling2D)	(None, 672)	0	['blocksf_activation[0][0]']
blocksf_se_reshape (Reshape)	(None, 1, 1, 672)	0	['blocksf_se_squeeze[0][0]']
blocksf_drop (Dropout)	(None, 16, 16, 112)	0	['blocksf_project_bn[0][0]']
blocksf_add (Add)	(None, 16, 16, 112)	0	['blocksf_drop[0][0]', 'blockse_add[0][0]']
blocksa_expand_conv (Conv2D)	(None, 16, 16, 672)	75264	['blocksf_add[0][0]']
blocksa_expand_bn (Batch Normalization)	(None, 16, 16, 672)	2688	['blocksa_expand_conv[0][0]']
blocksa_expand_activation (Activation)	(None, 16, 16, 672)	0	['blocksa_expand_bn[0][0]']
blocksa_deconv2 (Depthwise Conv2D)	(None, 8, 8, 672)	6048	['blocksa_expand_activation[0][0]']
blocksa_bn (Batch Normalization)	(None, 8, 8, 672)	2688	['blocksa_deconv2[0][0]']
blocksa_activation (Activation)	(None, 8, 8, 672)	0	['blocksa_bn[0][0]']
blocksa_se_squeeze (Global AveragePooling2D)	(None, 672)	0	['blocksa_activation[0][0]']
blocksa_se_reshape (Reshape)	(None, 1, 1, 672)	0	['blocksa_se_squeeze[0][0]']
blocksa_se_reduce (Conv2D)	(None, 1, 1, 28)	18844	['blocksa_se_reshape[0][0]']
blocksa_se_expand (Conv2D)	(None, 1, 1, 672)	19488	['blocksa_se_reduce[0][0]']
blocksa_se_excite (Multiply)	(None, 8, 8, 672)	0	['blocksa_activation[0][0]', 'blocksa_se_expand[0][0]']
blocksa_project_conv (Conv2D)	(None, 8, 8, 192)	129024	['blocksa_se_excite[0][0]']
blocksa_project_bn (Batch Normalization)	(None, 8, 8, 192)	768	['blocksa_project_conv[0][0]']
blocksb_expand_conv (Conv2D)	(None, 8, 8, 1152)	221184	['blocksa_project_bn[0][0]']
blocksb_expand_bn (Batch Normalization)	(None, 8, 8, 1152)	4608	['blocksb_expand_conv[0][0]']
blocksb_expand_activation (Activation)	(None, 8, 8, 1152)	0	['blocksb_expand_bn[0][0]']
blocksb_deconv2 (Depthwise Conv2D)	(None, 8, 8, 1152)	10368	['blocksb_expand_activation[0][0]']
blocksb_bn (Batch Normalization)	(None, 8, 8, 1152)	4608	['blocksb_deconv2[0][0]']
blocksb_activation (Activation)	(None, 8, 8, 1152)	0	['blocksb_bn[0][0]']
blocksb_se_squeeze (Global AveragePooling2D)	(None, 1152)	0	['blocksb_activation[0][0]']
blocksb_se_reshape (Reshape)	(None, 1, 1, 1152)	0	['blocksb_se_squeeze[0][0]']
blocksb_se_reduce (Conv2D)	(None, 1, 1, 48)	55344	['blocksb_se_reshape[0][0]']
blocksb_se_expand (Conv2D)	(None, 1, 1, 1152)	56448	['blocksb_se_reduce[0][0]']
blocksb_se_excite (Multiply)	(None, 8, 8, 1152)	0	['blocksb_activation[0][0]', 'blocksb_se_expand[0][0]']
blocksb_project_conv (Conv2D)	(None, 8, 8, 192)	221184	['blocksb_se_excite[0][0]']
blocksb_project_bn (Batch Normalization)	(None, 8, 8, 192)	768	['blocksb_project_conv[0][0]']
blocksb_drop (Dropout)	(None, 8, 8, 192)	0	['blocksb_project_bn[0][0]']
blocksb_add (Add)	(None, 8, 8, 192)	0	['blocksb_drop[0][0]', 'blocksa_project_bn[0][0]']
blocksc_expand_conv (Conv2D)	(None, 8, 8, 1152)	221184	['blocksb_add[0][0]']
blocksc_expand_bn (Batch Normalization)	(None, 8, 8, 1152)	4608	['blocksc_expand_conv[0][0]']
blocksc_expand_activation (Activation)	(None, 8, 8, 1152)	0	['blocksc_expand_bn[0][0]']
blocksc_deconv2 (Depthwise Conv2D)	(None, 8, 8, 1152)	10368	['blocksc_expand_activation[0][0]']
blocksc_bn (Batch Normalization)	(None, 8, 8, 1152)	4608	['blocksc_deconv2[0][0]']
blocksc_activation (Activation)	(None, 8, 8, 1152)	0	['blocksc_bn[0][0]']

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tion)
blockc_se_squeeze (Global
AveragePooling2D) (None, 1152) 0 ['blockc_activation[0][0]']
blockc_se_reshape (Reshap
e) (None, 1, 1, 1152) 0 ['blockc_se_squeeze[0][0]']
blockc_se_reduce (Conv2D) (None, 1, 1, 48) 55344 ['blockc_se_reshape[0][0]']
blockc_se_expand (Conv2D) (None, 1, 1, 1152) 56448 ['blockc_se_reduce[0][0]']
blockc_se_excite (Multipl
y) (None, 8, 8, 1152) 0 ['blockc_activation[0][0]',
'blockc_se_expand[0][0]']
blockc_project_conv (Conv
2D) (None, 8, 8, 192) 221184 ['blockc_se_excite[0][0]']
blockc_project_bn (BatchN
ormalization) (None, 8, 8, 192) 768 ['blockc_project_conv[0][0]']
blockc_drop (Dropout) (None, 8, 8, 192) 0 ['blockc_project_bn[0][0]']
blockc_add (Add) (None, 8, 8, 192) 0 ['blockc_drop[0][0]',
'blockc_add[0][0]']
blockcd_expand_conv (Conv2
D) (None, 8, 8, 1152) 221184 ['blockc_add[0][0]']
blockcd_expand_bn (BatchN
ormalization) (None, 8, 8, 1152) 4608 ['blockcd_expand_conv[0][0]']
blockcd_expand_activation
(Activation) (None, 8, 8, 1152) 0 ['blockcd_expand_bn[0][0]']
blockcd_dconv2 (Depthwise
Conv2D) (None, 8, 8, 1152) 10368 ['blockcd_expand_activation[0]
[0]']
blockcd_bn (BatchNormaliza
tion) (None, 8, 8, 1152) 4608 ['blockcd_dconv2[0][0]']
blockcd_activation (Activa
tion) (None, 8, 8, 1152) 0 ['blockcd_bn[0][0]']
blockcd_se_squeeze (Global
AveragePooling2D) (None, 1152) 0 ['blockcd_activation[0][0]']
blockcd_se_reshape (Reshap
e) (None, 1, 1, 1152) 0 ['blockcd_se_squeeze[0][0]']

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blockcd_se_reduce (Conv2D) (None, 1, 1, 48) 55344 ['blockcd_se_reshape[0][0]']
blockcd_se_expand (Conv2D) (None, 1, 1, 1152) 56448 ['blockcd_se_reduce[0][0]']
blockcd_se_excite (Multipl
y) (None, 8, 8, 1152) 0 ['blockcd_activation[0][0]',
'blockcd_se_expand[0][0]']
blockcd_project_conv (Conv
2D) (None, 8, 8, 192) 221184 ['blockcd_se_excite[0][0]']
blockcd_project_bn (BatchN
ormalization) (None, 8, 8, 192) 768 ['blockcd_project_conv[0][0]']
blockcd_drop (Dropout) (None, 8, 8, 192) 0 ['blockcd_project_bn[0][0]']
blockcd_add (Add) (None, 8, 8, 192) 0 ['blockcd_drop[0][0]',
'blockcd_add[0][0]']
blockcd_expand_conv (Conv2
D) (None, 8, 8, 1152) 221184 ['blockcd_add[0][0]']
blockcd_expand_bn (BatchN
ormalization) (None, 8, 8, 1152) 4608 ['blockcd_expand_conv[0][0]']
blockcd_expand_activation
(Activation) (None, 8, 8, 1152) 0 ['blockcd_expand_bn[0][0]']
blockcd_dconv2 (Depthwise
Conv2D) (None, 8, 8, 1152) 10368 ['blockcd_expand_activation[0]
[0]']
blockcd_bn (BatchNormaliza
tion) (None, 8, 8, 1152) 4608 ['blockcd_dconv2[0][0]']
blockcd_activation (Activa
tion) (None, 8, 8, 1152) 0 ['blockcd_bn[0][0]']
blockcd_se_squeeze (Global
AveragePooling2D) (None, 1152) 0 ['blockcd_activation[0][0]']
blockcd_se_reshape (Reshap
e) (None, 1, 1, 1152) 0 ['blockcd_se_squeeze[0][0]']
blockcd_se_reduce (Conv2D) (None, 1, 1, 48) 55344 ['blockcd_se_reshape[0][0]']
blockcd_se_expand (Conv2D) (None, 1, 1, 1152) 56448 ['blockcd_se_reduce[0][0]']
blockcd_se_excite (Multipl
y) (None, 8, 8, 1152) 0 ['blockcd_activation[0][0]',
'blockcd_se_expand[0][0]']

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block1_se_squeeze (Global
AveragePooling2D)      (None, 1152)      0      ['block1_activation[0][0]']
block1_se_reshape (Reshap
e)                      (None, 1, 1, 1152)  0      ['block1_se_squeeze[0][0]']
block1_se_reduce (Conv2D) (None, 1, 1, 48)      55344    ['block1_se_reshape[0][0]']
block1_se_expand (Conv2D) (None, 1, 1, 1152)    56448    ['block1_se_reduce[0][0]']
block1_se_excite (Multipl
y)                      (None, 8, 8, 1152)  0      ['block1_activation[0][0]',
'block1_se_expand[0][0]']
block1_project_conv (Conv
2D)                     (None, 8, 8, 192)  221184   ['block1_se_excite[0][0]']
block1_project_bn (BatchN
ormalization)           (None, 8, 8, 192)  768      ['block1_project_conv[0][0]']
block1_drop (Dropout)    (None, 8, 8, 192)  0      ['block1_project_bn[0][0]']
block1_add (Add)         (None, 8, 8, 192)  0      ['block1_drop[0][0]',
'block1b_add[0][0]']
top_conv (Conv2D)        (None, 8, 8, 1280)  245760   ['block1_add[0][0]']
top_bn (BatchNormalization) (None, 8, 8, 1280)  5120     ['top_conv[0][0]']
top_activation (Activation) (None, 8, 8, 1280)  0      ['top_bn[0][0]']
max_pool (GlobalMaxPooling
2D)                     (None, 1280)  0      ['top_activation[0][0]']
batch_normalization (Batch
Normalization)          (None, 1280)  5120     ['max_pool[0][0]']
dense_4 (Dense)          (None, 256)      327936   ['batch_normalization[0][0]']
dropout_4 (Dropout)      (None, 256)      0      ['dense_4[0][0]']
dense_5 (Dense)          (None, 14)        3598     ['dropout_4[0][0]']

-----
Total params: 726778 (27.72 MB)
Trainable params: 719416 (27.44 MB)
Non-trainable params: 7362 (287.62 KB)

```

Model: "functional\_1"

Layer (type)	Output Shape	Param #
input_layer_2 (InputLayer)	(None, 256, 256, 3)	0
block1_conv1 (Conv2D)	(None, 256, 256, 64)	16,640
block1_conv2 (Conv2D)	(None, 256, 256, 64)	96,960
block1_pool (MaxPooling2D)	(None, 128, 128, 64)	0
block2_conv1 (Conv2D)	(None, 128, 128, 128)	73,856
block2_conv2 (Conv2D)	(None, 128, 128, 128)	167,104
block2_pool (MaxPooling2D)	(None, 64, 64, 128)	0
block3_conv1 (Conv2D)	(None, 64, 64, 256)	368,000
block3_conv2 (Conv2D)	(None, 64, 64, 256)	508,000
block3_conv3 (Conv2D)	(None, 64, 64, 256)	508,000
block3_conv4 (Conv2D)	(None, 64, 64, 256)	508,000
block3_pool (MaxPooling2D)	(None, 32, 32, 256)	0
block4_conv1 (Conv2D)	(None, 32, 32, 512)	1,108,000
block4_conv2 (Conv2D)	(None, 32, 32, 512)	2,308,000
block4_conv3 (Conv2D)	(None, 32, 32, 512)	2,308,000
block4_conv4 (Conv2D)	(None, 32, 32, 512)	2,308,000
block4_pool (MaxPooling2D)	(None, 16, 16, 512)	0
block5_conv1 (Conv2D)	(None, 16, 16, 512)	2,308,000
block5_conv2 (Conv2D)	(None, 16, 16, 512)	2,308,000
block5_conv3 (Conv2D)	(None, 16, 16, 512)	2,308,000
block5_conv4 (Conv2D)	(None, 16, 16, 512)	2,308,000
block5_pool (MaxPooling2D)	(None, 8, 8, 512)	0
global_average_pooling2d_2 (GlobalAveragePooling2D)	(None, 512)	0
dense_3 (Dense)	(None, 1000)	512,512
dense_4 (Dense)	(None, 10)	10,510

Total params: 10,348,000 (78.45 MB)  
Trainable params: 10,348,000 (78.45 MB)  
Non-trainable params: 0 (0.00 MB)

Vgg19

```

Epoch 1/100
1000/1000 [====] - 1s 240ms/step - loss: 1.9350 - accuracy: 0.4119 - val_loss: 1.6138 - val_accuracy: 0.4939
Epoch 2/100
1000/1000 [====] - 1s 168ms/step - loss: 1.2726 - accuracy: 0.6358 - val_loss: 1.4323 - val_accuracy: 0.5279
Epoch 3/100
1000/1000 [====] - 1s 166ms/step - loss: 1.0994 - accuracy: 0.6745 - val_loss: 1.3614 - val_accuracy: 0.5293
Epoch 4/100
1000/1000 [====] - 1s 168ms/step - loss: 0.9502 - accuracy: 0.7149 - val_loss: 1.2746 - val_accuracy: 0.5323
Epoch 5/100
1000/1000 [====] - 1s 170ms/step - loss: 0.8302 - accuracy: 0.7399 - val_loss: 1.2126 - val_accuracy: 0.5328
Epoch 6/100
1000/1000 [====] - 1s 170ms/step - loss: 0.8194 - accuracy: 0.7491 - val_loss: 1.2617 - val_accuracy: 0.4961
Epoch 7/100
1000/1000 [====] - 1s 162ms/step - loss: 0.7642 - accuracy: 0.7335 - val_loss: 1.2791 - val_accuracy: 0.4843
Epoch 8/100
1000/1000 [====] - 1s 176ms/step - loss: 0.7988 - accuracy: 0.7082 - val_loss: 1.1557 - val_accuracy: 0.4958
Epoch 9/100
1000/1000 [====] - 1s 170ms/step - loss: 0.6643 - accuracy: 0.8055 - val_loss: 1.1021 - val_accuracy: 0.4988
Epoch 10/100
1000/1000 [====] - 1s 170ms/step - loss: 0.6898 - accuracy: 0.8121 - val_loss: 1.1118 - val_accuracy: 0.4972
Epoch 11/100
1000/1000 [====] - 1s 170ms/step - loss: 0.5527 - accuracy: 0.8199 - val_loss: 1.1421 - val_accuracy: 0.4867
Epoch 12/100
1000/1000 [====] - 1s 172ms/step - loss: 0.5879 - accuracy: 0.8556 - val_loss: 1.1081 - val_accuracy: 0.4882
Epoch 13/100
1000/1000 [====] - 1s 170ms/step - loss: 0.4727 - accuracy: 0.8678 - val_loss: 1.0488 - val_accuracy: 0.5015
Epoch 14/100
1000/1000 [====] - 1s 174ms/step - loss: 0.4554 - accuracy: 0.8804 - val_loss: 1.0371 - val_accuracy: 0.4941
Epoch 15/100
1000/1000 [====] - 1s 176ms/step - loss: 0.4713 - accuracy: 0.8875 - val_loss: 1.0591 - val_accuracy: 0.4955
Epoch 16/100
1000/1000 [====] - 1s 172ms/step - loss: 0.3863 - accuracy: 0.8875 - val_loss: 1.0591 - val_accuracy: 0.4955
Epoch 17/100
1000/1000 [====] - 1s 172ms/step - loss: 0.3099 - accuracy: 0.8972 - val_loss: 1.0086 - val_accuracy: 0.4941
Epoch 18/100
1000/1000 [====] - 1s 172ms/step - loss: 0.3448 - accuracy: 0.8968 - val_loss: 1.0468 - val_accuracy: 0.4938
Epoch 19/100
1000/1000 [====] - 1s 170ms/step - loss: 0.3099 - accuracy: 0.9171 - val_loss: 1.0086 - val_accuracy: 0.4955
Epoch 20/100
1000/1000 [====] - 1s 168ms/step - loss: 0.3867 - accuracy: 0.9129 - val_loss: 1.0124 - val_accuracy: 0.4880

```