Importing the Image Data Generator Libraries

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

Configuring The Image Data Generator

```
#training images
train_datagen = ImageDataGenerator(
        rescale=1./255,
        shear_range=0.1,
        zoom_range=0.1,
        horizontal_flip=True)

#val images
val_datagen = ImageDataGenerator(rescale=1./255)
```

Applying the image generator to the body

```
from google.colab import drive
drive.mount('/content/drive')
```

```
body_train_set = train_datagen.flow_from_directory(
        '/content/drive/MyDrive/Dataset/Car damage/body/training',
        target_size=(224, 224),
        batch_size=10,
        class_mode='categorical')
```

```
body_val_set = val_datagen.flow_from_directory(
        '/content/drive/MyDrive/Dataset/Car damage/body/validation',
        target_size=(224, 224),
        batch_size=10,
        class_mode='categorical')
```

Applying the image generator to the level

```
level_train_set = train_datagen.flow_from_directory(
        '/content/drive/MyDrive/Dataset/Car damage/level/training',
        target_size=(224, 224),
        batch_size=10,
        class_mode='categorical')
```

```
level_val_set = val_datagen.flow_from_directory(
        '/content/drive/MyDrive/Dataset/Car damage/level/validation',
        target_size=(224, 224),
        batch_size=10,
        class_mode='categorical')
```

```
Found 175 images belonging to 3 classes.
```

```
from keras.layers import Dense, Flatten, Input
from keras.models import Model
from keras.applications.vgg16 import VGG16, preprocess_input
```

```
vgg = VGG16(input_shape=(224,224,3),weights='imagenet',include_top=False)
for layer in vgg.layers:
  layer.trainable = False
x = Flatten()(vgg.output)
prediction = Dense(3,activation='softmax')(x)
```

```
model = Model(inputs=vgg.input,outputs = prediction)
model.summary()
```

```
Model: "model_8"
_________________________________________________________________
 Layer (type)                Output Shape              Param #
=================================================================
 input_9 (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

 block4_conv1 (Conv2D)       (None, 28, 28, 512)       1180160

 block4_conv2 (Conv2D)       (None, 28, 28, 512)       2359808

 block4_conv3 (Conv2D)       (None, 28, 28, 512)       2359808

 block4_pool (MaxPooling2D)  (None, 14, 14, 512)       0

 block5_conv1 (Conv2D)       (None, 14, 14, 512)       2359808

 block5_conv2 (Conv2D)       (None, 14, 14, 512)       2359808

 block5_conv3 (Conv2D)       (None, 14, 14, 512)       2359808

 block5_pool (MaxPooling2D)  (None, 7, 7, 512)         0

 flatten_7 (Flatten)         (None, 25088)             0

 dense_7 (Dense)             (None, 3)                 75267

=================================================================
Total params: 14,789,955
Trainable params: 75,267
Non-trainable params: 14,714,688
_________________________________________________________________
```

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

```
import sys
model.fit(body_train_set,validation_data=level_val_set,epochs=25,steps_per_epoch=979//10,validation_steps=175//10)
```

```
Epoch 1/25
97/97 [==============================] - 30s 305ms/step - loss: 1.2089 - accuracy: 0.5511 - val_loss: 2.7505 - val_accuracy:
Epoch 2/25
97/97 [==============================] - 16s 166ms/step - loss: 0.6349 - accuracy: 0.7358 - val_loss: 2.7987 - val_accuracy:
Epoch 3/25
97/97 [==============================] - 16s 162ms/step - loss: 0.4991 - accuracy: 0.8163 - val_loss: 3.0798 - val_accuracy:
Epoch 4/25
97/97 [==============================] - 15s 155ms/step - loss: 0.4013 - accuracy: 0.8473 - val_loss: 3.7942 - val_accuracy:
Epoch 5/25
97/97 [==============================] - 17s 170ms/step - loss: 0.2752 - accuracy: 0.9020 - val_loss: 4.0837 - val_accuracy:
Epoch 6/25
97/97 [==============================] - 15s 158ms/step - loss: 0.2741 - accuracy: 0.8958 - val_loss: 4.5609 - val_accuracy:
Epoch 7/25
97/97 [==============================] - 15s 156ms/step - loss: 0.2568 - accuracy: 0.8989 - val_loss: 3.8147 - val_accuracy:
Epoch 8/25
97/97 [==============================] - 16s 166ms/step - loss: 0.2109 - accuracy: 0.9247 - val_loss: 4.3185 - val_accuracy:
Epoch 9/25
97/97 [==============================] - 15s 153ms/step - loss: 0.1147 - accuracy: 0.9690 - val_loss: 4.1826 - val_accuracy:
Epoch 10/25
97/97 [==============================] - 15s 156ms/step - loss: 0.0854 - accuracy: 0.9814 - val_loss: 4.5457 - val_accuracy:
Epoch 11/25
97/97 [==============================] - 16s 165ms/step - loss: 0.0958 - accuracy: 0.9794 - val_loss: 4.7053 - val_accuracy:
```

```
Epoch 12/25
97/97 [==============================] - 15s 155ms/step - loss: 0.0712 - accuracy: 0.9856 - val_loss: 4.7017 - val_accuracy:
Epoch 13/25
97/97 [==============================] - 15s 155ms/step - loss: 0.0737 - accuracy: 0.9804 - val_loss: 4.4611 - val_accuracy:
Epoch 14/25
97/97 [==============================] - 16s 164ms/step - loss: 0.0709 - accuracy: 0.9835 - val_loss: 4.8784 - val_accuracy:
Epoch 15/25
97/97 [==============================] - 15s 153ms/step - loss: 0.0544 - accuracy: 0.9856 - val_loss: 4.8973 - val_accuracy:
Epoch 16/25
97/97 [==============================] - 15s 155ms/step - loss: 0.0736 - accuracy: 0.9814 - val_loss: 4.8498 - val_accuracy:
Epoch 17/25
97/97 [==============================] - 16s 166ms/step - loss: 0.0742 - accuracy: 0.9835 - val_loss: 4.6323 - val_accuracy:
Epoch 18/25
97/97 [==============================] - 15s 154ms/step - loss: 0.0560 - accuracy: 0.9897 - val_loss: 5.4491 - val_accuracy:
Epoch 19/25
97/97 [==============================] - 15s 153ms/step - loss: 0.0984 - accuracy: 0.9773 - val_loss: 5.5454 - val_accuracy:
Epoch 20/25
97/97 [==============================] - 16s 163ms/step - loss: 0.1376 - accuracy: 0.9598 - val_loss: 6.1290 - val_accuracy:
Epoch 21/25
97/97 [==============================] - 15s 151ms/step - loss: 0.0606 - accuracy: 0.9804 - val_loss: 6.4068 - val_accuracy:
Epoch 22/25
97/97 [==============================] - 15s 150ms/step - loss: 0.0637 - accuracy: 0.9897 - val_loss: 5.5769 - val_accuracy:
Epoch 23/25
97/97 [==============================] - 16s 163ms/step - loss: 0.0573 - accuracy: 0.9814 - val_loss: 5.8019 - val_accuracy:
Epoch 24/25
97/97 [==============================] - 16s 165ms/step - loss: 0.0515 - accuracy: 0.9886 - val_loss: 5.8544 - val_accuracy:
Epoch 25/25
97/97 [==============================] - 15s 151ms/step - loss: 0.1147 - accuracy: 0.9680 - val_loss: 6.5470 - val_accuracy:
<keras.callbacks.History at 0x7fd0fc980510>
```

```
model.save('body.h5')
```

```
import sys
model.fit(level_train_set,validation_data=body_val_set,epochs=25,steps_per_epoch=979//10,validation_steps=175//10)
```

```
Epoch 1/25
97/97 [==============================] - 562s 6s/step - loss: 4.3518 - accuracy: 0.4861 - val_loss: 9.0484 - val_accuracy: 0
Epoch 2/25
97/97 [==============================] - 15s 151ms/step - loss: 2.4040 - accuracy: 0.6543 - val_loss: 10.1531 - val_accuracy
Epoch 3/25
97/97 [==============================] - 15s 152ms/step - loss: 1.5395 - accuracy: 0.7265 - val_loss: 10.5255 - val_accuracy
Epoch 4/25
97/97 [==============================] - 16s 165ms/step - loss: 1.0665 - accuracy: 0.7771 - val_loss: 10.5748 - val_accuracy
Epoch 5/25
97/97 [==============================] - 15s 155ms/step - loss: 0.6536 - accuracy: 0.8442 - val_loss: 9.3509 - val_accuracy:
Epoch 6/25
97/97 [==============================] - 15s 153ms/step - loss: 0.3836 - accuracy: 0.8958 - val_loss: 11.8252 - val_accuracy
Epoch 7/25
97/97 [==============================] - 16s 165ms/step - loss: 0.3693 - accuracy: 0.8762 - val_loss: 9.6993 - val_accuracy:
Epoch 8/25
97/97 [==============================] - 14s 149ms/step - loss: 0.3238 - accuracy: 0.9051 - val_loss: 10.2252 - val_accuracy
Epoch 9/25
97/97 [==============================] - 14s 148ms/step - loss: 0.2233 - accuracy: 0.9226 - val_loss: 10.2031 - val_accuracy
Epoch 10/25
97/97 [==============================] - 16s 164ms/step - loss: 0.2325 - accuracy: 0.9164 - val_loss: 10.4594 - val_accuracy
Epoch 11/25
97/97 [==============================] - 14s 149ms/step - loss: 0.1164 - accuracy: 0.9536 - val_loss: 9.7280 - val_accuracy:
Epoch 12/25
97/97 [==============================] - 15s 157ms/step - loss: 0.1160 - accuracy: 0.9567 - val_loss: 10.7751 - val_accuracy
Epoch 13/25
97/97 [==============================] - 16s 165ms/step - loss: 0.0914 - accuracy: 0.9618 - val_loss: 9.9549 - val_accuracy:
Epoch 14/25
97/97 [==============================] - 15s 149ms/step - loss: 0.1084 - accuracy: 0.9618 - val_loss: 9.8363 - val_accuracy:
Epoch 15/25
97/97 [==============================] - 17s 178ms/step - loss: 0.0628 - accuracy: 0.9804 - val_loss: 10.5732 - val_accuracy
Epoch 16/25
97/97 [==============================] - 16s 163ms/step - loss: 0.0987 - accuracy: 0.9628 - val_loss: 10.6590 - val_accuracy
Epoch 17/25
97/97 [==============================] - 15s 149ms/step - loss: 0.0750 - accuracy: 0.9763 - val_loss: 10.4680 - val_accuracy
Epoch 18/25
97/97 [==============================] - 14s 148ms/step - loss: 0.0949 - accuracy: 0.9608 - val_loss: 11.4751 - val_accuracy
Epoch 19/25
97/97 [==============================] - 15s 159ms/step - loss: 0.0749 - accuracy: 0.9711 - val_loss: 11.0599 - val_accuracy
Epoch 20/25
97/97 [==============================] - 14s 147ms/step - loss: 0.0776 - accuracy: 0.9690 - val_loss: 11.4265 - val_accuracy
Epoch 21/25
97/97 [==============================] - 15s 149ms/step - loss: 0.1146 - accuracy: 0.9577 - val_loss: 11.8469 - val_accuracy
Epoch 22/25
97/97 [==============================] - 15s 158ms/step - loss: 0.0687 - accuracy: 0.9680 - val_loss: 11.3898 - val_accuracy
Epoch 23/25
97/97 [==============================] - 14s 147ms/step - loss: 0.0281 - accuracy: 0.9928 - val_loss: 11.7120 - val_accuracy
Epoch 24/25
```

```
97/97 [==============================] - 14s 149ms/step - loss: 0.0237 - accuracy: 0.9928 - val_loss: 11.2648 - val_accuracy
Epoch 25/25
97/97 [==============================] - 15s 159ms/step - loss: 0.0291 - accuracy: 0.9907 - val_loss: 11.3854 - val_accuracy
<keras.callbacks.History at 0x7fd0fb5543d0>
```

```
model.save('level.h5')
```