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AAYUSH SHAH · 1MO AGO · 14 VIEWS



# cifar-10 | transfer learning trial 2

Python · CIFAR-10 - Object Recognition in Images



Notebook Data Logs Comments (0) Settings



Competition Notebook

CIFAR-10 - Object Recognition in Images

Run

5541.7s - GPU

🕒 Version 2 of 2



In [1]:

```
import numpy as np # linear algebra
import pandas as pd # data processing, CSV file I/O (e.g. pd.read_csv)
import os
from tensorflow import keras
import tensorflow as tf
from keras.layers import Dense, Conv2D, MaxPooling2D, Activation, BatchNormalization, Flatten, GlobalAveragePooling2D, Dropout
from keras.utils.np_utils import to_categorical
from keras.preprocessing.image import ImageDataGenerator
from keras.callbacks import ReduceLROnPlateau
from keras.applications.xception import Xception, preprocess_input
```

In [2]:

```
!pip install py7zr
```

```
Collecting py7zr
  Downloading py7zr-0.18.3-py3-none-any.whl (76 kB)
    ██████████| 76 kB 562 kB/s
Collecting multivolumefile>=0.2.3
  Downloading multivolumefile-0.2.3-py3-none-any.whl (17 kB)
Collecting pycryptodomex<=3.6.6
  Downloading pycryptodomex-3.14.1-cp35-abi3-manylinux2010_x86_64.whl (2.0 MB)
    ██████████| 2.0 MB 1.1 MB/s
Collecting zipfile-deflate64>=0.2.0
  Downloading zipfile_deflate64-0.2.0-cp37-cp37m-manylinux_2_17_x86_64.manylinux2014_x86_64.whl (43 kB)
    ██████████| 43 kB 1.1 MB/s
Requirement already satisfied: texttable in /opt/conda/lib/python3.7/site-packages (from py7zr) (1.6.4)
Collecting pyppmd<0.19.0,>=0.18.1
  Downloading pyppmd-0.18.2-cp37-cp37m-manylinux_2_17_x86_64.manylinux2014_x86_64.whl (131 kB)
    ██████████| 131 kB 40.6 MB/s
Collecting pybcj>=0.5.0
  Downloading pybcj-0.5.1-cp37-cp37m-manylinux_2_17_x86_64.manylinux2014_x86_64.whl (57 kB)
    ██████████| 57 kB 3.9 MB/s
Collecting pyzstd>=0.14.4
  Downloading pyzstd-0.15.2-cp37-cp37m-manylinux_2_17_x86_64.manylinux2014_x86_64.whl (2.4 MB)
    ██████████| 2.4 MB 15.1 MB/s
Collecting brotli>=1.0.9
  Downloading Brotli-1.0.9-cp37-cp37m-manylinux1_x86_64.whl (357 kB)
    ██████████| 357 kB 33.2 MB/s
Requirement already satisfied: importlib-metadata in /opt/conda/lib/python3.7/site-packages (from py7zr) (4.11.3)
Requirement already satisfied: zipp>=0.5 in /opt/conda/lib/python3.7/site-packages (from importlib-metadata->py7zr) (3.6.0)
Requirement already satisfied: typing-extensions>=3.6.4 in /opt/conda/lib/python3.7/site-packages (from importlib-metadata->py7zr) (4.1.1)
Installing collected packages: zipfile-deflate64, pyzstd, pyppmd, pycryptodomex, pybcj, multivolumefile, brotli, py7zr
Successfully installed brotli-1.0.9 multivolumefile-0.2.3 py7zr-0.18.3 pybcj-0.5.1 pycryptodomex-3.14.1 pyppmd-0.18.2 pyzstd-0.15.2 zipfile-deflate64-0.2.0
WARNING: Running pip as the 'root' user can result in broken permissions and conflicting behaviour with the system package
```

manager. It is recommended to use a virtual environment instead: <https://pip.pypa.io/warnings/venv>

```
In [3]:  
from py7zr import unpack_7zarchive  
import shutil  
  
shutil.register_unpack_format('7zip',[ '.7z'],unpack_7zarchive) #Run for first time only
```

```
In [4]: shutil.unpack_archive('../input/cifar-10/train.7z', '/kaggle/temp/')
```

```
In [5]: train_labels = pd.read_csv("../input/cifar-10/trainLabels.csv", header="infer")  
  
classes = train_labels['label'].unique()  
print(classes)
```

```
['frog' 'truck' 'deer' 'automobile' 'bird' 'horse' 'ship' 'cat' 'dog'  
 'airplane']
```

```
for class1 in classes:
    path_train = os.path.join(parent_path_train, class1)
    if not os.path.exists(path_train):
        os.mkdir(path_train)
    path_valid = os.path.join(parent_path_valid, class1)
    if not os.path.exists(path_valid):
        os.mkdir(path_valid)

for (int_id, row) in train_labels.iterrows():
    id = str(row["id"]) + ".png"
    source_path = os.path.join(parent_path_train, id)

    p=np.random.random()
    if p<=0.8:
        target_path = os.path.join(parent_path_train, row['id'] + ".png")
        os.replace(source_path, target_path)
    else:
        target_path = os.path.join(parent_path_valid, row['id'] + ".png")
        os.replace(source_path, target_path)
```

```
In [7]: !ls /kaggle/temp/valid
```

airplane automobile bird cat deer dog frog horse ship truck  
airplane automobile bird cat deer dog frog horse ship truck

```
In [8]:  
xception_wo_top=Xception(include_top=False, input_shape=(291,291,3), weights='imagenet')  
xception_wo_top.summary()  
  
for layer in xception_wo_top.layers:  
    layer.trainable=True
```

```
2022-04-07 18:23:58.702514: I tensorflow/stream_executor/cuda/cuda_gpu_executor.cc:937] successful NUMA node read from SysFS had negative value (-1), but there must be at least one NUMA node, so returning NUMA node zero
2022-04-07 18:23:58.843733: I tensorflow/stream_executor/cuda/cuda_gpu_executor.cc:937] successful NUMA node read from SysFS had negative value (-1), but there must be at least one NUMA node, so returning NUMA node zero
2022-04-07 18:23:58.845092: I tensorflow/stream_executor/cuda/cuda_gpu_executor.cc:937] successful NUMA node read from SysFS had negative value (-1), but there must be at least one NUMA node, so returning NUMA node zero
```

```
2022-04-07 18:23:58.849083: I tensorflow/core/platform/cpu_feature_guard.cc:142] This TensorFlow binary is optimized with oneAPI Deep Neural Network Library (oneDNN) to use the following CPU instructions in performance-critical operations: AVX2 FMA
To enable them in other operations, rebuild TensorFlow with the appropriate compiler flags.
2022-04-07 18:23:58.850905: I tensorflow/stream_executor/cuda/cuda_gpu_executor.cc:937] successful NUMA node read from SysFS had negative value (-1), but there must be at least one NUMA node, so returning NUMA node zero
2022-04-07 18:23:58.852410: I tensorflow/stream_executor/cuda/cuda_gpu_executor.cc:937] successful NUMA node read from SysFS had negative value (-1), but there must be at least one NUMA node, so returning NUMA node zero
2022-04-07 18:23:58.853944: I tensorflow/stream_executor/cuda/cuda_gpu_executor.cc:937] successful NUMA node read from SysFS had negative value (-1), but there must be at least one NUMA node, so returning NUMA node zero
2022-04-07 18:24:01.888871: I tensorflow/stream_executor/cuda/cuda_gpu_executor.cc:937] successful NUMA node read from SysFS had negative value (-1), but there must be at least one NUMA node, so returning NUMA node zero
2022-04-07 18:24:01.890382: I tensorflow/stream_executor/cuda/cuda_gpu_executor.cc:937] successful NUMA node read from SysFS had negative value (-1), but there must be at least one NUMA node, so returning NUMA node zero
2022-04-07 18:24:01.891831: I tensorflow/stream_executor/cuda/cuda_gpu_executor.cc:937] successful NUMA node read from SysFS had negative value (-1), but there must be at least one NUMA node, so returning NUMA node zero
2022-04-07 18:24:01.893385: I tensorflow/core/common_runtime/gpu/gpu_device.cc:1510] Created device /job:localhost/replica:0/task:0/device:GPU:0 with 15403 MB memory: -> device: 0, name: Tesla P100-PCIE-16GB, pci bus id: 0000:00:04.0, compute capability: 6.0
```

```
Downloading data from https://storage.googleapis.com/tensorflow/keras-applications/xception/xception_weights_tf_dim_orderin
g_tf_kernels_notop.h5
83689472/83683744 [=====] - 3s 0us/step
83697664/83683744 [=====] - 3s 0us/step
Model: "xception"
```

Layer (type)	Output Shape	Param #	Connected to
<hr/>			
input_1 (InputLayer)	[None, 291, 291, 3]	0	
<hr/>			
block1_conv1 (Conv2D)	(None, 145, 145, 32)	864	input_1[0][0]
<hr/>			
block1_conv1_bn (BatchNormaliza	(None, 145, 145, 32)	128	block1_conv1[0][0]
<hr/>			
block1_conv1_act (Activation)	(None, 145, 145, 32)	0	block1_conv1_bn[0][0]
<hr/>			
block1_conv2 (Conv2D)	(None, 143, 143, 64)	18432	block1_conv1_act[0][0]
<hr/>			
block1_conv2_bn (BatchNormaliza	(None, 143, 143, 64)	256	block1_conv2[0][0]
<hr/>			
block1_conv2_act (Activation)	(None, 143, 143, 64)	0	block1_conv2_bn[0][0]
<hr/>			
block2_sepconv1 (SeparableConv2	(None, 143, 143, 128)	8768	block1_conv2_act[0][0]
<hr/>			
block2_sepconv1_bn (BatchNormal	(None, 143, 143, 128)	512	block2_sepconv1[0][0]
<hr/>			
block2_sepconv2_act (Activation	(None, 143, 143, 128)	0	block2_sepconv1_bn[0][0]
<hr/>			
block2_sepconv2 (SeparableConv2	(None, 143, 143, 128)	17536	block2_sepconv2_act[0][0]
<hr/>			
block2_sepconv2_bn (BatchNormal	(None, 143, 143, 128)	512	block2_sepconv2[0][0]
<hr/>			
conv2d (Conv2D)	(None, 72, 72, 128)	8192	block2_sepconv2_act[0][0]
<hr/>			
block2_pool (MaxPooling2D)	(None, 72, 72, 128)	0	conv2d[0][0]
<hr/>			
batch_normalization (BatchNorma	(None, 72, 72, 128)	512	block2_pool[0][0]
<hr/>			
add (Add)	(None, 72, 72, 128)	0	batch_normalization[0][0]
<hr/>			
block3_sepconv1_act (Activation	(None, 72, 72, 128)	0	add[0][0]
<hr/>			
block3_sepconv1 (SeparableConv2	(None, 72, 72, 256)	33920	block3_sepconv1_act[0][0]
<hr/>			
block3_sepconv1_bn (BatchNormal	(None, 72, 72, 256)	1024	block3_sepconv1[0][0]
<hr/>			
block3_sepconv2_act (Activation	(None, 72, 72, 256)	0	block3_sepconv1_bn[0][0]
<hr/>			
block3_sepconv2 (SeparableConv2	(None, 72, 72, 256)	67840	block3_sepconv2_act[0][0]
<hr/>			
block3_sepconv2_bn (BatchNormal	(None, 72, 72, 256)	1024	block3_sepconv2[0][0]

conv2d_1 (Conv2D)	(None, 36, 36, 256)	32768	add[0][0]
block3_pool (MaxPooling2D)	(None, 36, 36, 256)	0	block3_sepconv2_bn[0][0]
batch_normalization_1 (BatchNor	(None, 36, 36, 256)	1024	conv2d_1[0][0]
add_1 (Add)	(None, 36, 36, 256)	0	block3_pool[0][0] batch_normalization_1[0][0]
block4_sepconv1_act (Activation	(None, 36, 36, 256)	0	add_1[0][0]
block4_sepconv1 (SeparableConv2	(None, 36, 36, 728)	188672	block4_sepconv1_act[0][0]
block4_sepconv1_bn (BatchNormal	(None, 36, 36, 728)	2912	block4_sepconv1[0][0]
block4_sepconv2_act (Activation	(None, 36, 36, 728)	0	block4_sepconv1_bn[0][0]
block4_sepconv2 (SeparableConv2	(None, 36, 36, 728)	536536	block4_sepconv2_act[0][0]
block4_sepconv2_bn (BatchNormal	(None, 36, 36, 728)	2912	block4_sepconv2[0][0]
conv2d_2 (Conv2D)	(None, 18, 18, 728)	186368	add_1[0][0]
block4_pool (MaxPooling2D)	(None, 18, 18, 728)	0	block4_sepconv2_bn[0][0]
batch_normalization_2 (BatchNor	(None, 18, 18, 728)	2912	conv2d_2[0][0]
add_2 (Add)	(None, 18, 18, 728)	0	block4_pool[0][0] batch_normalization_2[0][0]
block5_sepconv1_act (Activation	(None, 18, 18, 728)	0	add_2[0][0]
block5_sepconv1 (SeparableConv2	(None, 18, 18, 728)	536536	block5_sepconv1_act[0][0]
block5_sepconv1_bn (BatchNormal	(None, 18, 18, 728)	2912	block5_sepconv1[0][0]
block5_sepconv2_act (Activation	(None, 18, 18, 728)	0	block5_sepconv1_bn[0][0]
block5_sepconv2 (SeparableConv2	(None, 18, 18, 728)	536536	block5_sepconv2_act[0][0]
block5_sepconv2_bn (BatchNormal	(None, 18, 18, 728)	2912	block5_sepconv2[0][0]
block5_sepconv3_act (Activation	(None, 18, 18, 728)	0	block5_sepconv2_bn[0][0]
block5_sepconv3 (SeparableConv2	(None, 18, 18, 728)	536536	block5_sepconv3_act[0][0]
block5_sepconv3_bn (BatchNormal	(None, 18, 18, 728)	2912	block5_sepconv3[0][0]
add_3 (Add)	(None, 18, 18, 728)	0	block5_sepconv3_bn[0][0] add_2[0][0]
block6_sepconv1_act (Activation	(None, 18, 18, 728)	0	add_3[0][0]
block6_sepconv1 (SeparableConv2	(None, 18, 18, 728)	536536	block6_sepconv1_act[0][0]
block6_sepconv1_bn (BatchNormal	(None, 18, 18, 728)	2912	block6_sepconv1[0][0]
block6_sepconv2_act (Activation	(None, 18, 18, 728)	0	block6_sepconv1_bn[0][0]
block6_sepconv2 (SeparableConv2	(None, 18, 18, 728)	536536	block6_sepconv2_act[0][0]
block6_sepconv2_bn (BatchNormal	(None, 18, 18, 728)	2912	block6_sepconv2[0][0]
block6_sepconv3_act (Activation	(None, 18, 18, 728)	0	block6_sepconv2_bn[0][0]
block6_sepconv3 (SeparableConv2	(None, 18, 18, 728)	536536	block6_sepconv3_act[0][0]
block6_sepconv3_bn (BatchNormal	(None, 18, 18, 728)	2912	block6_sepconv3[0][0]
add_4 (Add)	(None, 18, 18, 728)	0	block6_sepconv3_bn[0][0] add_3[0][0]

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-----  
block7_sepconv1_act (Activation (None, 18, 18, 728) 0 add_4[0][0]  
-----  
block7_sepconv1 (SeparableConv2 (None, 18, 18, 728) 536536 block7_sepconv1_act[0][0]  
-----  
block7_sepconv1_bn (BatchNormal (None, 18, 18, 728) 2912 block7_sepconv1[0][0]  
-----  
block7_sepconv2_act (Activation (None, 18, 18, 728) 0 block7_sepconv1_bn[0][0]  
-----  
block7_sepconv2 (SeparableConv2 (None, 18, 18, 728) 536536 block7_sepconv2_act[0][0]  
-----  
block7_sepconv2_bn (BatchNormal (None, 18, 18, 728) 2912 block7_sepconv2[0][0]  
-----  
block7_sepconv3_act (Activation (None, 18, 18, 728) 0 block7_sepconv2_bn[0][0]  
-----  
block7_sepconv3 (SeparableConv2 (None, 18, 18, 728) 536536 block7_sepconv3_act[0][0]  
-----  
block7_sepconv3_bn (BatchNormal (None, 18, 18, 728) 2912 block7_sepconv3[0][0]  
-----  
add_5 (Add) (None, 18, 18, 728) 0 block7_sepconv3_bn[0][0]  
add_4[0][0]  
-----  
block8_sepconv1_act (Activation (None, 18, 18, 728) 0 add_5[0][0]  
-----  
block8_sepconv1 (SeparableConv2 (None, 18, 18, 728) 536536 block8_sepconv1_act[0][0]  
-----  
block8_sepconv1_bn (BatchNormal (None, 18, 18, 728) 2912 block8_sepconv1[0][0]  
-----  
block8_sepconv2_act (Activation (None, 18, 18, 728) 0 block8_sepconv1_bn[0][0]  
-----  
block8_sepconv2 (SeparableConv2 (None, 18, 18, 728) 536536 block8_sepconv2_act[0][0]  
-----  
block8_sepconv2_bn (BatchNormal (None, 18, 18, 728) 2912 block8_sepconv2[0][0]  
-----  
block8_sepconv3_act (Activation (None, 18, 18, 728) 0 block8_sepconv2_bn[0][0]  
-----  
block8_sepconv3 (SeparableConv2 (None, 18, 18, 728) 536536 block8_sepconv3_act[0][0]  
-----  
block8_sepconv3_bn (BatchNormal (None, 18, 18, 728) 2912 block8_sepconv3[0][0]  
-----  
add_6 (Add) (None, 18, 18, 728) 0 block8_sepconv3_bn[0][0]  
add_5[0][0]  
-----  
block9_sepconv1_act (Activation (None, 18, 18, 728) 0 add_6[0][0]  
-----  
block9_sepconv1 (SeparableConv2 (None, 18, 18, 728) 536536 block9_sepconv1_act[0][0]  
-----  
block9_sepconv1_bn (BatchNormal (None, 18, 18, 728) 2912 block9_sepconv1[0][0]  
-----  
block9_sepconv2_act (Activation (None, 18, 18, 728) 0 block9_sepconv1_bn[0][0]  
-----  
block9_sepconv2 (SeparableConv2 (None, 18, 18, 728) 536536 block9_sepconv2_act[0][0]  
-----  
block9_sepconv2_bn (BatchNormal (None, 18, 18, 728) 2912 block9_sepconv2[0][0]  
-----  
block9_sepconv3_act (Activation (None, 18, 18, 728) 0 block9_sepconv2_bn[0][0]  
-----  
block9_sepconv3 (SeparableConv2 (None, 18, 18, 728) 536536 block9_sepconv3_act[0][0]  
-----  
block9_sepconv3_bn (BatchNormal (None, 18, 18, 728) 2912 block9_sepconv3[0][0]  
-----  
add_7 (Add) (None, 18, 18, 728) 0 block9_sepconv3_bn[0][0]  
add_6[0][0]  
-----  
block10_sepconv1_act (Activatio (None, 18, 18, 728) 0 add_7[0][0]  
-----  
block10_sepconv1 (SeparableConv (None, 18, 18, 728) 536536 block10_sepconv1_act[0][0]  
-----  
block10_sepconv1_bn (BatchNorma (None, 18, 18, 728) 2912 block10_sepconv1[0][0]  
-----  
block10_sepconv2_act (Activatio (None, 18, 18, 728) 0 block10_sepconv1_bn[0][0]  
-----  
block10_sepconv2 (SeparableConv (None, 18, 18, 728) 536536 block10_sepconv2_act[0][0]
```

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-----  
block10_sepconv2_bn (BatchNorma (None, 18, 18, 728) 2912      block10_sepconv2[0][0]  
-----  
block10_sepconv3_act (Activatio (None, 18, 18, 728) 0        block10_sepconv2_bn[0][0]  
-----  
block10_sepconv3 (SeparableConv (None, 18, 18, 728) 536536    block10_sepconv3_act[0][0]  
-----  
block10_sepconv3_bn (BatchNorma (None, 18, 18, 728) 2912      block10_sepconv3[0][0]  
-----  
add_8 (Add)          (None, 18, 18, 728) 0        block10_sepconv3_bn[0][0]  
                  add_7[0][0]  
-----  
block11_sepconv1_act (Activatio (None, 18, 18, 728) 0        add_8[0][0]  
-----  
block11_sepconv1 (SeparableConv (None, 18, 18, 728) 536536    block11_sepconv1_act[0][0]  
-----  
block11_sepconv1_bn (BatchNorma (None, 18, 18, 728) 2912      block11_sepconv1[0][0]  
-----  
block11_sepconv2_act (Activatio (None, 18, 18, 728) 0        block11_sepconv1_bn[0][0]  
-----  
block11_sepconv2 (SeparableConv (None, 18, 18, 728) 536536    block11_sepconv2_act[0][0]  
-----  
block11_sepconv2_bn (BatchNorma (None, 18, 18, 728) 2912      block11_sepconv2[0][0]  
-----  
block11_sepconv3_act (Activatio (None, 18, 18, 728) 0        block11_sepconv2_bn[0][0]  
-----  
block11_sepconv3 (SeparableConv (None, 18, 18, 728) 536536    block11_sepconv3_act[0][0]  
-----  
block11_sepconv3_bn (BatchNorma (None, 18, 18, 728) 2912      block11_sepconv3[0][0]  
-----  
add_9 (Add)          (None, 18, 18, 728) 0        block11_sepconv3_bn[0][0]  
                  add_8[0][0]  
-----  
block12_sepconv1_act (Activatio (None, 18, 18, 728) 0        add_9[0][0]  
-----  
block12_sepconv1 (SeparableConv (None, 18, 18, 728) 536536    block12_sepconv1_act[0][0]  
-----  
block12_sepconv1_bn (BatchNorma (None, 18, 18, 728) 2912      block12_sepconv1[0][0]  
-----  
block12_sepconv2_act (Activatio (None, 18, 18, 728) 0        block12_sepconv1_bn[0][0]  
-----  
block12_sepconv2 (SeparableConv (None, 18, 18, 728) 536536    block12_sepconv2_act[0][0]  
-----  
block12_sepconv2_bn (BatchNorma (None, 18, 18, 728) 2912      block12_sepconv2[0][0]  
-----  
block12_sepconv3_act (Activatio (None, 18, 18, 728) 0        block12_sepconv2_bn[0][0]  
-----  
block12_sepconv3 (SeparableConv (None, 18, 18, 728) 536536    block12_sepconv3_act[0][0]  
-----  
block12_sepconv3_bn (BatchNorma (None, 18, 18, 728) 2912      block12_sepconv3[0][0]  
-----  
add_10 (Add)          (None, 18, 18, 728) 0        block12_sepconv3_bn[0][0]  
                  add_9[0][0]  
-----  
block13_sepconv1_act (Activatio (None, 18, 18, 728) 0        add_10[0][0]  
-----  
block13_sepconv1 (SeparableConv (None, 18, 18, 728) 536536    block13_sepconv1_act[0][0]  
-----  
block13_sepconv1_bn (BatchNorma (None, 18, 18, 728) 2912      block13_sepconv1[0][0]  
-----  
block13_sepconv2_act (Activatio (None, 18, 18, 728) 0        block13_sepconv1_bn[0][0]  
-----  
block13_sepconv2 (SeparableConv (None, 18, 18, 1024) 752024    block13_sepconv2_act[0][0]  
-----  
block13_sepconv2_bn (BatchNorma (None, 18, 18, 1024) 4096      block13_sepconv2[0][0]  
-----  
conv2d_3 (Conv2D)     (None, 9, 9, 1024) 745472      add_10[0][0]  
-----  
block13_pool (MaxPooling2D) (None, 9, 9, 1024) 0        block13_sepconv2_bn[0][0]  
-----  
batch_normalization_3 (BatchNor (None, 9, 9, 1024) 4096      conv2d_3[0][0]  
-----
```

```

add_11 (Add)           (None, 9, 9, 1024)  0      block13_pool[0][0]
                        batch_normalization_3[0][0]

-----
block14_sepconv1 (SeparableConv (None, 9, 9, 1536) 1582080 add_11[0][0]

-----
block14_sepconv1_bn (BatchNorma (None, 9, 9, 1536) 6144    block14_sepconv1[0][0]

-----
block14_sepconv1_act (Activatio (None, 9, 9, 1536) 0       block14_sepconv1_bn[0][0]

-----
block14_sepconv2 (SeparableConv (None, 9, 9, 2048) 3159552 block14_sepconv1_act[0][0]

-----
block14_sepconv2_bn (BatchNorma (None, 9, 9, 2048) 8192    block14_sepconv2[0][0]

-----
block14_sepconv2_act (Activatio (None, 9, 9, 2048) 0       block14_sepconv2_bn[0][0]
=====
Total params: 20,861,480
Trainable params: 20,806,952
Non-trainable params: 54,528
-----
```

In [9]:

```

classifier = Sequential()
classifier.add(xception_wo_top)
classifier.add(GlobalAveragePooling2D())
classifier.add(Dropout(0.3))
classifier.add(Dense(10,activation='softmax'))

classifier.compile(loss='categorical_crossentropy', optimizer='adam', metrics=['accuracy'])
classifier.summary()

for i in classifier.layers:
    print(i.trainable)
```

Model: "sequential"

```

Layer (type)          Output Shape         Param #
=====
xception (Functional) (None, 9, 9, 2048) 20861480
-----
global_average_pooling2d (G1 (None, 2048) 0
-----
dropout (Dropout)     (None, 2048)        0
-----
dense (Dense)         (None, 10)          20490
=====

Total params: 20,881,970
Trainable params: 20,827,442
Non-trainable params: 54,528
-----
```

True  
True  
True  
True

In [10]:

```
reduceLROnPlateau=ReduceLROnPlateau(monitor='val_acc', patience=3, verbose=1, factor=0.5, min_lr=0.00001)
```

In [11]:

```

train_datagen = ImageDataGenerator(featurewise_center=False,
                                    samplewise_center=False,
                                    featurewise_std_normalization=False,
                                    samplewise_std_normalization=False,
                                    zca_whitening=False,
                                    rotation_range=10,
                                    zoom_range=0.1,
                                    width_shift_range=0.1,
                                    height_shift_range=0.1,
                                    horizontal_flip=False,
                                    vertical_flip=False,
                                    preprocessing_function=preprocess_input,
                                    rescale=None)
```

```

valid_datagen = ImageDataGenerator(preprocessing_function=preprocess_input)

train_generator = train_datagen.flow_from_directory(directory='/kaggle/temp/train/',
                                                    shuffle=True, target_size=(192,192),
                                                    batch_size=128)
valid_generator = valid_datagen.flow_from_directory(directory='/kaggle/temp/valid/',
                                                    shuffle=True, target_size=(192,192),
                                                    batch_size=128)

```

Found 40204 images belonging to 10 classes.  
 Found 9796 images belonging to 10 classes.

```
In [12]: classifier.fit(train_generator,
                      epochs=8,
                      validation_data=valid_generator,
                      callbacks=[reduceLROnPlateau],
                      steps_per_epoch=train_generator.n//train_generator.batch_size,
                      validation_steps= valid_generator.n//valid_generator.batch_size,
                      workers=8,
                      use_multiprocessing=True)
```

2022-04-07 18:24:12.433276: I tensorflow/compiler/mlir/mlir\_graph\_optimization\_pass.cc:185] None of the MLIR Optimization Passes are enabled (registered 2)

Epoch 1/8

2022-04-07 18:24:30.603893: I tensorflow/stream\_executor/cuda/cuda\_dnn.cc:369] Loaded cuDNN version 8005  
 2022-04-07 18:24:36.938027: W tensorflow/core/common\_runtime/bfc\_allocator.cc:272] Allocator (GPU\_0\_bfc) ran out of memory trying to allocate 3.68GiB with freed\_by\_count=0. The caller indicates that this is not a failure, but may mean that there could be performance gains if more memory were available.  
 2022-04-07 18:24:37.421063: W tensorflow/core/common\_runtime/bfc\_allocator.cc:272] Allocator (GPU\_0\_bfc) ran out of memory trying to allocate 3.42GiB with freed\_by\_count=0. The caller indicates that this is not a failure, but may mean that there could be performance gains if more memory were available.  
 2022-04-07 18:24:37.437242: W tensorflow/core/common\_runtime/bfc\_allocator.cc:272] Allocator (GPU\_0\_bfc) ran out of memory trying to allocate 3.82GiB with freed\_by\_count=0. The caller indicates that this is not a failure, but may mean that there could be performance gains if more memory were available.

314/314 [=====] - 488s 1s/step - loss: 0.3845 - accuracy: 0.8746 - val\_loss: 0.4049 - val\_accuracy: 0.8721  
 Epoch 2/8  
 314/314 [=====] - 477s 1s/step - loss: 0.2007 - accuracy: 0.9326 - val\_loss: 0.2700 - val\_accuracy: 0.9153  
 Epoch 3/8  
 314/314 [=====] - 484s 2s/step - loss: 0.1502 - accuracy: 0.9495 - val\_loss: 0.2894 - val\_accuracy: 0.9052  
 Epoch 4/8  
 314/314 [=====] - 487s 2s/step - loss: 0.1275 - accuracy: 0.9581 - val\_loss: 0.2698 - val\_accuracy: 0.9186  
 Epoch 5/8  
 314/314 [=====] - 485s 2s/step - loss: 0.1138 - accuracy: 0.9626 - val\_loss: 0.2562 - val\_accuracy: 0.9233  
 Epoch 6/8  
 314/314 [=====] - 483s 2s/step - loss: 0.0908 - accuracy: 0.9697 - val\_loss: 0.3566 - val\_accuracy: 0.9010  
 Epoch 7/8  
 314/314 [=====] - 488s 2s/step - loss: 0.0779 - accuracy: 0.9744 - val\_loss: 0.2684 - val\_accuracy: 0.9205  
 Epoch 8/8  
 314/314 [=====] - 488s 2s/step - loss: 0.0713 - accuracy: 0.9760 - val\_loss: 0.2645 - val\_accuracy: 0.9245

```
Out[12]: <keras.callbacks.History at 0x7f7bc00245d0>
```

```
In [13]: shutil.unpack_archive('/kaggle/input/cifar-10/test.7z','/kaggle/temp/test')
```

```
In [14]: shutil.unregister_unpack_format('7zip')

In [15]: test_datagen = ImageDataGenerator(preprocessing_function=preprocess_input)

test_gen = test_datagen.flow_from_directory(directory='/kaggle/temp/test', target_size=(192,192), batch_size=64, class_mode=None, shuffle=False)

Found 300000 images belonging to 1 classes.

In [16]: test_gen.reset()
predictions_vecs = classifier.predict(test_gen)

predictions_final = np.argmax(predictions_vecs, axis=1)

In [17]: print(type(train_generator.class_indices))
print(train_generator.class_indices)

classes = {value:key for (key,value) in train_generator.class_indices.items()}
print(classes)

predicted_classes=np.empty(shape=300000,dtype=np.dtype('U20'))

ind=0
for i in predictions_final.tolist():
    predicted_classes[ind]=classes[i]
    ind=ind+1

filenames_wo_ext = []
for fname in test_gen.filenames:
    filenames_wo_ext.append(int(fname.split(sep="/")[1].split(sep=".")[0])-1)

predicted_classes_final = np.empty(shape=300000,dtype=np.dtype('U20'))
predicted_classes_final[filenames_wo_ext]=predicted_classes

<class 'dict'>
{'airplane': 0, 'automobile': 1, 'bird': 2, 'cat': 3, 'deer': 4, 'dog': 5, 'frog': 6, 'horse': 7, 'ship': 8, 'truck': 9}
{0: 'airplane', 1: 'automobile', 2: 'bird', 3: 'cat', 4: 'deer', 5: 'dog', 6: 'frog', 7: 'horse', 8: 'ship', 9: 'truck'}
```

```
In [18]: sub = pd.read_csv('../input/cifar-10/sampleSubmission.csv', header='infer')
sub.info()

<class 'pandas.core.frame.DataFrame'>
RangeIndex: 300000 entries, 0 to 299999
Data columns (total 2 columns):
 #   Column  Non-Null Count  Dtype  
 ---  -- 
 0   id      300000 non-null  int64  
 1   label   300000 non-null  object 
dtypes: int64(1), object(1)
memory usage: 4.6+ MB
```

```
In [19]: sub['label'] = predicted_classes_final
sub.to_csv('19BCE226_submission.csv', index=False)
```

## License

This Notebook has been released under the Apache 2.0 open source license.

## Continue exploring



Data

1 input and 1 output



Logs

5541.7 second run - successful



Comments

0 comments

