Untitled

October 14, 2022

[1]:
```
# Load libs
import os
import PIL.Image

import numpy as np
import pandas as pd
import seaborn
import matplotlib.pyplot as plt

from tensorflow.keras.preprocessing.image import ImageDataGenerator,␣
 ↪img_to_array

from tensorflow.keras.layers import Dense, Dropout, GlobalAveragePooling2D,␣
 ↪Input, Rescaling
from tensorflow.keras.losses import SparseCategoricalCrossentropy
from tensorflow.keras.models import Model
from tensorflow.keras.optimizers import Adam
from tensorflow.keras.callbacks import EarlyStopping, ModelCheckpoint
from tensorflow.keras.applications import MobileNetV3Small
```

```
2022-10-14 21:13:24.187679: I tensorflow/core/util/util.cc:169] oneDNN custom
operations are on. You may see slightly different numerical results due to
floating-point round-off errors from different computation orders. To turn them
off, set the environment variable `TF_ENABLE_ONEDNN_OPTS=0`.
2022-10-14 21:13:24.244628: W
tensorflow/stream_executor/platform/default/dso_loader.cc:64] Could not load
dynamic library 'libcudart.so.11.0'; dlerror: libcudart.so.11.0: cannot open
shared object file: No such file or directory
2022-10-14 21:13:24.244646: I tensorflow/stream_executor/cuda/cudart_stub.cc:29]
Ignore above cudart dlerror if you do not have a GPU set up on your machine.
```

[3]:
```
# Create a list of image pathes
images = []
for i, j, s in os.walk("."):
    print(i)
    for im in s:
        images.append(i+"/"+im)
```

```
.
./.ipynb_checkpoints
./data
./data/Sandal
./data/Boot
./data/Shoe
./mobnet
./mobnet/assets
./mobnet/variables
```

[4]:
```
# Check number of imgs
len(images)
```

[4]:
```
15006
```

[5]:
```
df = pd.DataFrame(
    data = {"paths": images[2:], "ctg": [p.split("/")[2] for p in images[2:]]},
)
df.head()
```

[5]:

	paths	ctg
0	./data/Sandal/Sandal (3877).jpg	Sandal
1	./data/Sandal/Sandal (3032).jpg	Sandal
2	./data/Sandal/Sandal (1653).jpg	Sandal
3	./data/Sandal/Sandal (1008).jpg	Sandal
4	./data/Sandal/Sandal (2139).jpg	Sandal

[6]:
```
# Shuffle it
df = df.sample(frac = 1).reset_index()
```

[7]:
```
# Show some examples of imgs
fig = plt.figure(figsize = (14, 9))
for i in range(20):
    plt.subplot(5, 4, i+1)
    img = PIL.Image.open(df.loc[i, "paths"])
    plt.imshow(img)
    plt.axis("off")
    plt.title(df.loc[i, "ctg"])
    plt.rcParams["figure.facecolor"] = "white"
    img.close()
```

[8]:
```
batch_size = 32
```

1 Image data augmentation

[9]:
```
data_gen = ImageDataGenerator(
    zoom_range = [0.8, 1.3],
    width_shift_range = 0.2,
    horizontal_flip = True,
    rotation_range = 20,
    validation_split = 0.25
)
```

[10]:
```
# create a train data generator
train_data = data_gen.flow_from_directory(
    "data",
    target_size=(256, 256),
    batch_size = batch_size,
    shuffle = True,
    class_mode = "binary",
    subset = "training"
```

```
)
```

```
Found 11250 images belonging to 3 classes.
```

[11]:
```
# create a validation data generator
val_data = data_gen.flow_from_directory(
    "data",
    target_size=(256, 256),
    batch_size = batch_size,
    shuffle = False,
    class_mode = "binary",
    subset = "validation"

)
```

```
Found 3750 images belonging to 3 classes.
```

[12]:
```
def transfer_learn(premade):
    x = GlobalAveragePooling2D()(premade.output)
    x = Dense(1024, activation = "relu")(x)
    x = Dropout(0.2)(x)
    x = Dense(512, activation = "relu")(x)
    x = Dropout(0.2)(x)
    out = Dense(3, activation = "softmax")(x)
    return Model(inputs = premade.input, outputs = out)
```

[13]:
```
# load pretrained mobilenet
mobilenet = MobileNetV3Small(
    include_top = False,
    input_shape = (256, 256, 3),
    weights = "imagenet"
)
mobilenet.trainable = False
```

```
WARNING:tensorflow:`input_shape` is undefined or non-square, or `rows` is not
224. Weights for input shape (224, 224) will be loaded as the default.

2022-10-14 21:13:27.941337: E
tensorflow/stream_executor/cuda/cuda_driver.cc:271] failed call to cuInit:
CUDA_ERROR_COMPAT_NOT_SUPPORTED_ON_DEVICE: forward compatibility was attempted
on non supported HW
2022-10-14 21:13:27.941386: I
tensorflow/stream_executor/cuda/cuda_diagnostics.cc:169] retrieving CUDA
diagnostic information for host: sady
2022-10-14 21:13:27.941395: I
tensorflow/stream_executor/cuda/cuda_diagnostics.cc:176] hostname: sady
2022-10-14 21:13:27.941520: I
tensorflow/stream_executor/cuda/cuda_diagnostics.cc:200] libcuda reported
```

```
version is: 515.76.0
2022-10-14 21:13:27.941551: I
tensorflow/stream_executor/cuda/cuda_diagnostics.cc:204] kernel reported version
is: 515.65.1
2022-10-14 21:13:27.941560: E
tensorflow/stream_executor/cuda/cuda_diagnostics.cc:313] kernel version 515.65.1
does not match DSO version 515.76.0 -- cannot find working devices in this
configuration
2022-10-14 21:13:27.941952: I tensorflow/core/platform/cpu_feature_guard.cc:193]
This TensorFlow binary is optimized with oneAPI Deep Neural Network Library
(oneDNN) to use the following CPU instructions in performance-critical
operations:  AVX2 AVX512F AVX512_VNNI FMA
To enable them in other operations, rebuild TensorFlow with the appropriate
compiler flags.
```

[14]:
```
# get our final model
model1 = transfer_learn(mobilenet)
```

[15]:
```
epochs = 100
```

[16]:
```
model1.compile(
    optimizer = Adam(learning_rate = 0.001),
    loss = SparseCategoricalCrossentropy(from_logits = False),
    metrics=["accuracy"]
)
```

[17]:
```
callbacks = [EarlyStopping(monitor = "val_accuracy", patience = 2, min_delta =␣
↪0.01),
             ModelCheckpoint("mobnet", monitor = "val_accuracy")]
```

[18]:
```
# Train it
history = model1.fit(
    train_data,
    validation_data = val_data,
    batch_size = batch_size,
    epochs = epochs,
    callbacks = callbacks
)
```

```
Epoch 1/100
352/352 [==============================] - ETA: 0s - loss: 0.2446 - accuracy:
0.9043

WARNING:absl:Found untraced functions such as _jit_compiled_convolution_op,
_jit_compiled_convolution_op, _jit_compiled_convolution_op,
_jit_compiled_convolution_op, _jit_compiled_convolution_op while saving (showing
5 of 52). These functions will not be directly callable after loading.

INFO:tensorflow:Assets written to: mobnet/assets
```

```
INFO:tensorflow:Assets written to: mobnet/assets

352/352 [==============================] - 223s 625ms/step - loss: 0.2446 -
accuracy: 0.9043 - val_loss: 0.1361 - val_accuracy: 0.9507
Epoch 2/100
352/352 [==============================] - ETA: 0s - loss: 0.1505 - accuracy:
0.9460

WARNING:absl:Found untraced functions such as _jit_compiled_convolution_op,
_jit_compiled_convolution_op, _jit_compiled_convolution_op,
_jit_compiled_convolution_op, _jit_compiled_convolution_op while saving (showing
5 of 52). These functions will not be directly callable after loading.

INFO:tensorflow:Assets written to: mobnet/assets

INFO:tensorflow:Assets written to: mobnet/assets

352/352 [==============================] - 226s 641ms/step - loss: 0.1505 -
accuracy: 0.9460 - val_loss: 0.1315 - val_accuracy: 0.9475
Epoch 3/100
352/352 [==============================] - ETA: 0s - loss: 0.1298 - accuracy:
0.9534

WARNING:absl:Found untraced functions such as _jit_compiled_convolution_op,
_jit_compiled_convolution_op, _jit_compiled_convolution_op,
_jit_compiled_convolution_op, _jit_compiled_convolution_op while saving (showing
5 of 52). These functions will not be directly callable after loading.

INFO:tensorflow:Assets written to: mobnet/assets

INFO:tensorflow:Assets written to: mobnet/assets

352/352 [==============================] - 224s 636ms/step - loss: 0.1298 -
accuracy: 0.9534 - val_loss: 0.1800 - val_accuracy: 0.9395
```

1.1 Evaluate model

[19]:
```
from sklearn.metrics import confusion_matrix, classification_report
```

[20]:
```
y_pred = model1.predict(val_data, 32)
y_pred = np.argmax(y_pred, axis = 1)
y_pred
```

```
118/118 [==============================] - 54s 450ms/step
```

[20]:
```
array([0, 0, 0, …, 2, 2, 2])
```

[21]:
```
y_true = val_data.classes
y_true
```

[21]:
```
array([0, 0, 0, …, 2, 2, 2], dtype=int32)
```

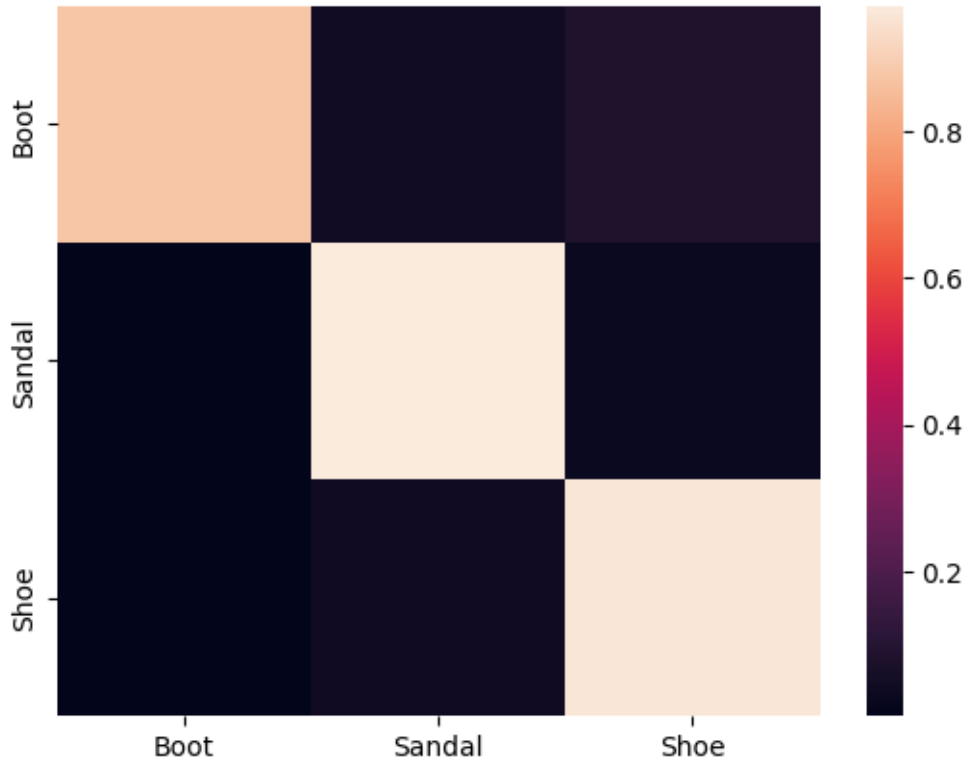
[22]:
```
lbls = val_data.class_indices.keys()
```

[23]:
```
cm = confusion_matrix(y_true, y_pred, normalize = "true")
```

[24]:
```
cm
```

[24]:
```
array([[0.8768, 0.0456, 0.0776],
       [0.0024, 0.972 , 0.0256],
       [0.0016, 0.04  , 0.9584]])
```

[25]:
```
lbls = val_data.class_indices.keys()
seaborn.heatmap(cm, xticklabels = lbls, yticklabels=lbls)
plt.show()
```



[26]:
```
val_data.class_indices
```

[26]:
```
{'Boot': 0, 'Sandal': 1, 'Shoe': 2}
```

[27]:
```
print(
    classification_report(y_true, y_pred, target_names = val_data.class_indices.
 ↪keys())
)
```

```
              precision    recall  f1-score   support

        Boot       1.00      0.88      0.93      1250
      Sandal       0.92      0.97      0.94      1250
        Shoe       0.90      0.96      0.93      1250

    accuracy                           0.94      3750
   macro avg       0.94      0.94      0.94      3750
weighted avg       0.94      0.94      0.94      3750
```

[ ]: