```
! sudo apt-get install pigz
```

```
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following package was automatically installed and is no longer required:
  libnvidia-common-460
Use 'sudo apt autoremove' to remove it.
The following NEW packages will be installed:
  pigz
0 upgraded, 1 newly installed, 0 to remove and 20 not upgraded.
Need to get 57.4 kB of archives.
After this operation, 259 kB of additional disk space will be used.
Get:1 http://archive.ubuntu.com/ubuntu bionic/universe amd64 pigz amd64 2.4-1 [57.4 kB]
Fetched 57.4 kB in 0s (987 kB/s)
debconf: unable to initialize frontend: Dialog
debconf: (No usable dialog-like program is installed, so the dialog based frontend cannc
debconf: falling back to frontend: Readline
debconf: unable to initialize frontend: Readline
debconf: (This frontend requires a controlling tty.)
debconf: falling back to frontend: Teletype
dpkg-preconfigure: unable to re-open stdin:
Selecting previously unselected package pigz.
(Reading database ... 155676 files and directories currently installed.)
Preparing to unpack .../archives/pigz_2.4-1_amd64.deb ...
Unpacking pigz (2.4-1) ...
Setting up pigz (2.4-1) ...
Processing triggers for man-db (2.8.3-2ubuntu0.1) ...
```

```
!nvidia-smi
```

```
Wed Aug 31 04:51:17 2022
+-----------------------------------------------------------------------------+
| NVIDIA-SMI 460.32.03    Driver Version: 460.32.03    CUDA Version: 11.2     |
|-------------------------------+----------------------+----------------------+
| GPU  Name        Persistence-M| Bus-Id        Disp.A | Volatile Uncorr. ECC |
| Fan  Temp  Perf  Pwr:Usage/Cap|         Memory-Usage | GPU-Util  Compute M. |
|                               |                      |               MIG M. |
|===============================+======================+======================|
|   0  Tesla P100-PCIE...  Off  | 00000000:00:04.0 Off |                    0 |
| N/A   41C    P0    29W / 250W |      0MiB / 16280MiB |      0%      Default |
|                               |                      |                  N/A |
+-------------------------------+----------------------+----------------------+

+-----------------------------------------------------------------------------+
| Processes:                                                                  |
|  GPU   GI   CI        PID   Type   Process name                  GPU Memory |
|        ID   ID                                                   Usage      |
|=============================================================================|
|  No running processes found                                                 |
+-----------------------------------------------------------------------------+
```

Data

```
!pip install kaggle
from google.colab import files
from datetime import datetime
api_token = files.upload()
```

```
Looking in indexes: https://pypi.org/simple, https://us-python.pkg.dev/colab-wheels/pub
Requirement already satisfied: kaggle in /usr/local/lib/python3.7/dist-packages (1.5.12)
Requirement already satisfied: tqdm in /usr/local/lib/python3.7/dist-packages (from kagg
Requirement already satisfied: urllib3 in /usr/local/lib/python3.7/dist-packages (from k
Requirement already satisfied: requests in /usr/local/lib/python3.7/dist-packages (from
Requirement already satisfied: python-slugify in /usr/local/lib/python3.7/dist-packages
Requirement already satisfied: certifi in /usr/local/lib/python3.7/dist-packages (from k
Requirement already satisfied: python-dateutil in /usr/local/lib/python3.7/dist-packages
Requirement already satisfied: six>=1.10 in /usr/local/lib/python3.7/dist-packages (from
Requirement already satisfied: text-unidecode>=1.3 in /usr/local/lib/python3.7/dist-pack
Requirement already satisfied: idna<3,>=2.5 in /usr/local/lib/python3.7/dist-packages (f
Requirement already satisfied: chardet<4,>=3.0.2 in /usr/local/lib/python3.7/dist-packag
Choose Files No file chosen Upload widget is only available when the cell has been executed in the current browser session. Please rerun this cell to enable.
```

```
!mkdir ~/.kaggle
!cp kaggle.json ~/.kaggle/
```

```
!kaggle competitions download -c 'cdiscount-image-classification-challenge' -f train.bson
```

```
Warning: Your Kaggle API key is readable by other users on this system! To fix this, you
Downloading train.bson.zip to /content
100% 47.2G/47.2G [04:37<00:00, 336MB/s]
100% 47.2G/47.2G [04:37<00:00, 183MB/s]
```

```
!kaggle competitions download -c 'cdiscount-image-classification-challenge' -f category_names
```

```
Warning: Your Kaggle API key is readable by other users on this system! To fix this, you
Downloading category_names.csv to /content
  0% 0.00/406k [00:00<?, ?B/s]
100% 406k/406k [00:00<00:00, 93.5MB/s]
```

```
!unzip /content/train.bson.zip
```

```
Archive:  /content/train.bson.zip
  inflating: train.bson
```

```
!rm /content/train.bson.zip
```

```
import bson
import numpy as np
import pandas as pd
import os
from tqdm import tqdm_notebook
from random import random
import pickle as pkl
from collections import defaultdict


out_folder_train = '/content/train'
#out_folder_validation = '/content/drive/Shareddrives/neil_rathod/cs2/Validation'
out_folder_validation = '/content/validation'
out_folder_test = '/content/test'

# Create output folders
if not os.path.exists(out_folder_train):
    os.makedirs(out_folder_train)

if not os.path.exists(out_folder_test):
    os.makedirs(out_folder_test)

if not os.path.exists(out_folder_validation):
    os.makedirs(out_folder_validation)


# Create categories folders
categories = pd.read_csv('/content/drive/Shareddrives/Case_study/cdiscount/category_names.csv


for category in tqdm_notebook(categories.index):
    os.mkdir(os.path.join(out_folder_train, str(category)))
```

```
/usr/local/lib/python3.7/dist-packages/ipykernel_launcher.py:1: TqdmDeprecationWarning:
Please use `tqdm.notebook.tqdm` instead of `tqdm.tqdm_notebook`
  """Entry point for launching an IPython kernel.
  0%|          | 0/5270 [00:00<?, ?it/s]
```

```
for category in tqdm_notebook(categories.index):
    os.mkdir(os.path.join(out_folder_validation, str(category)))
```

```
/usr/local/lib/python3.7/dist-packages/ipykernel_launcher.py:1: TqdmDeprecationWarning:
Please use `tqdm.notebook.tqdm` instead of `tqdm.tqdm_notebook`
  """Entry point for launching an IPython kernel.
  0%|          | 0/5270 [00:00<?, ?it/s]
```

```
num_product_total = 7069896
num_products_train = int(num_product_total*0.80)
num_product_validation = num_product_total - num_products_train
```

```
bar = tqdm_notebook(total=num_product_total)
cnt_train = 0
cnt_val = 0
validation_class_to_images = defaultdict(list)
train_class_to_images = defaultdict(list)
with open('/content/drive/Shareddrives/Case_study/cdiscount/train.bson', 'rb') as fbson:

    data = bson.decode_file_iter(fbson)

    for c, d in enumerate(data):
        category = d['category_id']
        _id = d['_id']
        for e, pic in enumerate(d['imgs']):
            if random() <= 0.80 :
                fname = os.path.join(out_folder_train, str(category), '{}-{}.jpg'.format(_id,
                train_class_to_images[category].append(fname)
                cnt_train +=1
            else:
                fname = os.path.join(out_folder_validation, str(category), '{}-{}.jpg'.format
                validation_class_to_images[category].append(fname)
                cnt_val +=1

            with open(fname, 'wb') as f:
                f.write(pic['picture'])

        bar.update()

print("Total number of images : {}\n \
      Number of train example : {} ({}%)\n \
      Number of validation examples : {} ({}%)".format((cnt_train+cnt_val), cnt_train, cnt_tr
```

```
/usr/local/lib/python3.7/dist-packages/ipykernel_launcher.py:5: TqdmDeprecationWarning:
Please use `tqdm.notebook.tqdm` instead of `tqdm.tqdm_notebook`
  """
  0%|          | 0/7069896 [00:00<?, ?it/s]
Total number of images : 12371293
      Number of train example : 11133762 (0.8999675296672708%)
      Number of validation examples : 1237531 (0.10003247033272916%)
```

```
! sudo apt-get install pigz
```

```
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following package was automatically installed and is no longer required:
  libnvidia-common-460
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  pigz
0 upgraded, 1 newly installed, 0 to remove and 20 not upgraded.
Need to get 57.4 kB of archives.
After this operation, 259 kB of additional disk space will be used.
```

```
Get:1 http://archive.ubuntu.com/ubuntu bionic/universe amd64 pigz amd64 2.4-1 [57.4 kB]
Fetched 57.4 kB in 1s (60.6 kB/s)
debconf: unable to initialize frontend: Dialog
debconf: (No usable dialog-like program is installed, so the dialog based frontend cannc
debconf: falling back to frontend: Readline
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debconf: (This frontend requires a controlling tty.)
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Preparing to unpack .../archives/pigz_2.4-1_amd64.deb ...
Unpacking pigz (2.4-1) ...
Setting up pigz (2.4-1) ...
Processing triggers for man-db (2.8.3-2ubuntu0.1) ...
```

```
!tar cf - /content/train | pigz > train90.tar.gz
```

```
tar: Removing leading `/' from member names
```

```
import shutil

# Source path 100006949
source = "/content/train80.tar.gz"

# Destination path
destination = "/content/drive/Shareddrives/datascience/exp/train80.tar.gz"

# Move the content of
# source to destination
dest = shutil.move(source, destination)
print('done')
```

```
done
```

```
!pigz -dc /content/drive/Shareddrives/datascience/exp/train80.tar.gz | tar xf -
```

Model

```
# This Python 3 environment comes with many helpful analytics libraries installed
# It is defined by the kaggle/python docker image: https://github.com/kaggle/docker-python
# For example, here's several helpful packages to load in

import numpy as np # linear algebra
import pandas as pd # data processing, CSV file I/O (e.g. pd.read_csv)
import io
import keras
```

```
import bson                       # this is installed with the pymongo package
from imageio import imread  # or, whatever image library you prefer
import multiprocessing as mp      # will come in handy due to the size of the data
import time
import datetime as dt

import cv2
import matplotlib.pyplot as plt
from tqdm import tqdm_notebook
import concurrent.futures
from multiprocessing import cpu_count



from keras import layers
from keras.layers import Input, Dense, Conv2D, MaxPooling2D, AveragePooling2D, ZeroPadding2D,
from keras.layers import GlobalAveragePooling2D
from keras.models import Sequential
from keras.layers import Dropout, Flatten, Dense
from keras.layers.convolutional import Conv2D
from keras.layers.pooling import MaxPooling2D, GlobalAveragePooling2D, GlobalMaxPooling2D
from keras.layers import BatchNormalization
from keras.models import Model
from keras.preprocessing.image import ImageDataGenerator, array_to_img, img_to_array, load_im
from keras import backend as K
from keras.utils.data_utils import get_file
import tensorflow as tf
from sklearn.metrics import log_loss
# Input data files are available in the "../input/" directory.
# For example, running this (by clicking run or pressing Shift+Enter) will list the files in

from subprocess import check_output
print(check_output(["ls", "/content/drive/Shareddrives/Case_study/cdiscount"]).decode("utf8")

# Any results you write to the current directory are saved as output.

     category_names.csv
     inception_v3_weights_tf_dim_ordering_tf_kernels_notop.h5
     train.bson
     train_example.bson
     train_offsets.csv
     train.tar.gz
     Untitled0.ipynb
     validation.tar.gz



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

```
from keras.layers import Dense, Conv2D, MaxPool2D , Flatten
from keras.callbacks import Callback
from keras.callbacks import TensorBoard
from keras.callbacks import ModelCheckpoint
from keras.callbacks import EarlyStopping
from keras.callbacks import ReduceLROnPlateau
from keras.callbacks import LearningRateScheduler


from keras.applications.xception import Xception
from keras.applications.xception import preprocess_input
```

working

```
def lr_scheduler(epoch, lr):
    'For every 3rd epoch, decay learning rate by 5%'
    decay_rate = .97
    decay_step = 3
    if (epoch+1) % decay_step == 0 :
        return lr * decay_rate
    return lr



#import datetime, os
# Model is saved to this location
#path = os.path.abspath('/content/drive/Shareddrives/datascience/exp/model_data/')
#os.mkdir(os.path.join(path, '4thIter'))
#path = os.path.join(path, '4thIter')


#from keras.callbacks import ModelCheckpoint, CSVLogger
#import datetime, os

#filepath="/content/drive/Shareddrives/datascience/exp/model_data/weights-{epoch:02d}-{val_ac
#reduce learning rate by 10% based on validation accuracy

reduce_lr = ReduceLROnPlateau(monitor='val_acc', factor=0.1, patience=1, min_lr=0)

#ckpt = ModelCheckpoint(os.path.join(path, 'model.hdf5'), monitor = 'val_accuracy',save_freq=

#csv = CSVLogger(os.path.join(path, 'log.csv'), append = True)

lrschedule = LearningRateScheduler(lr_scheduler, verbose=0)

#logdir = os.path.join("logs", datetime.datetime.now().strftime("%Y%m%d-%H%M%S"))

checkpoints = [reduce_lr,lrschedule]
```

```
INPUT_PATH  = '/content/drive/Shareddrives/Case_study/cdiscount'
train_data_dir      = '/content/content/train'

img_width  = 180
img_height = 180
batch_size = 500



train_datagen = ImageDataGenerator(rescale=1./255,
    validation_split=0.05) # set validation split
# only rescaling
print('Time right now: ', dt.datetime.now())
start = time.time()
train_generator = train_datagen.flow_from_directory(
    train_data_dir,
    target_size=(img_height, img_width),
    batch_size=batch_size,
    class_mode='categorical',
    subset='training',
    shuffle=False) # set as training data

end = time.time()
print('Time right now: ', dt.datetime.now())
print('It took ', end-start, ' seconds to prepare train gen')
start = time.time()

validation_generator = train_datagen.flow_from_directory(
    train_data_dir, # same directory as training data
    target_size=(img_height, img_width),
    batch_size=batch_size,
    class_mode='categorical',
    subset='validation',
    shuffle=False) # set as validation data
end = time.time()

print('It took ', end-start, ' seconds to prepare valid gen')
```

```
Time right now:  2022-09-01 04:39:57.493065
Found 9405303 images belonging to 5270 classes.
Time right now:  2022-09-01 04:44:56.234417
It took  298.741060256958  seconds to prepare train gen
Found 492390 images belonging to 5270 classes.
It took  149.12905144691467  seconds to prepare valid gen
```

```
IMAGE_SIZE = [180, 180] #pre trained Xception model
model = Xception(input_shape=IMAGE_SIZE + [3], weights='imagenet', include_top=False)
```

```
Downloading data from https://storage.googleapis.com/tensorflow/keras-applications/xcept
83689472/83683744 [==============================] - 1s 0us/step
83697664/83683744 [==============================] - 1s 0us/step
```

```
#model_1
for layer in model.layers:
  layer.trainable = False
#Adding custom Layers
x = model.output
x = Conv2D(filters=512,kernel_size=(3,3),padding="same", activation="relu")(x)
x = MaxPool2D(2,2)(x)
x = Flatten()(x)
x = Dense(500, activation="relu")(x)
x = Dense(500, activation="relu")(x)
output = Dense(5270, activation="softmax")(x)
# creating the final model
model_1 = Model(inputs = model.input, outputs = output)
# compile the model
Adam = tf.keras.optimizers.Adam(lr=0.0003, beta_1=0.9, beta_2=0.999, epsilon=1e-07,amsgrad=Fa
model_1.compile(loss = "categorical_crossentropy", optimizer = Adam, metrics=["accuracy"])
```

```
/usr/local/lib/python3.7/dist-packages/keras/optimizer_v2/adam.py:105: UserWarning: The
  super(Adam, self).__init__(name, **kwargs)
```

```
model_1.summary()
```

```
block2_sepconv2_bn (BatchNorma  (None, 87, 87, 128)  512        ['block2_sepconv2[0]
lization)

conv2d (Conv2D)                 (None, 44, 44, 128)  8192       ['block1_conv2_act[0

block2_pool (MaxPooling2D)      (None, 44, 44, 128)  0          ['block2_sepconv2_bn

batch_normalization (BatchNorm  (None, 44, 44, 128)  512        ['conv2d[0][0]']
alization)

add (Add)                       (None, 44, 44, 128)  0          ['block2_pool[0][0]'
                                                                 'batch_normalizatio

block3_sepconv1_act (Activatio  (None, 44, 44, 128)  0          ['add[0][0]']
n)

block3_sepconv1 (SeparableConv  (None, 44, 44, 256)  33920      ['block3_sepconv1_ac
2D)

block3_sepconv1_bn (BatchNorma  (None, 44, 44, 256)  1024       ['block3_sepconv1[0]
lization)

block3_sepconv2_act (Activatio  (None, 44, 44, 256)  0          ['block3_sepconv1_bn
n)

block3_sepconv2 (SeparableConv  (None, 44, 44, 256)  67840      ['block3_sepconv2_ac
2D)

block3_sepconv2_bn (BatchNorma  (None, 44, 44, 256)  1024       ['block3_sepconv2[0]
lization)
```

```
lization)

conv2d_1 (Conv2D)              (None, 22, 22, 256)  32768       ['add[0][0]']

block3_pool (MaxPooling2D)     (None, 22, 22, 256)  0           ['block3_sepconv2_bn

batch_normalization_1 (BatchNo  (None, 22, 22, 256)  1024       ['conv2d_1[0][0]']
rmalization)

add_1 (Add)                    (None, 22, 22, 256)  0           ['block3_pool[0][0]'
                                                                 'batch_normalizatio

block4_sepconv1_act (Activatio  (None, 22, 22, 256)  0          ['add_1[0][0]']
n)

block4_sepconv1 (SeparableConv  (None, 22, 22, 728)  188672     ['block4_sepconv1_ac
2D)

block4_sepconv1_bn (BatchNorma  (None, 22, 22, 728)  2912       ['block4_sepconv1[0]
lization)

block4_sepconv2_act (Activatio  (None, 22, 22, 728)  0          ['block4_sepconv1_bn
n)

block4_sepconv2 (SeparableConv  (None, 22, 22, 728)  536536     ['block4_sepconv2_ac
2D)

block4_sepconv2_bn (BatchNorma  (None, 22, 22, 728)  2912       ['block4_sepconv2[0]
lization)
```

```
# model check points causing more training time


nb_epochs=3
model_1.fit_generator(
    train_generator,
    steps_per_epoch = train_generator.samples // batch_size,
    validation_data = validation_generator,
    validation_steps = validation_generator.samples // batch_size,
    epochs = nb_epochs,
    workers = 8)
    #callbacks=checkpoints)
```

```
/usr/local/lib/python3.7/dist-packages/ipykernel_launcher.py:8: UserWarning: `Model.fit_

Epoch 1/3
31351/31351 [==============================] - 15548s 495ms/step - loss: 5.3195 - accura
Epoch 2/3
31351/31351 [==============================] - 15335s 489ms/step - loss: 4.1315 - accura
Epoch 3/3
31351/31351 [==============================] - 15314s 488ms/step - loss: 3.8113 - accura
<keras.callbacks.History at 0x7fe49dd46150>
```

```
model_1.save_weights('/content/drive/Shareddrives/datascience/exp/saved_model_weights/3epochs
print("Wights Saved")
```

```
Wights Saved
```

```
model_1.save('/content/drive/Shareddrives/datascience/exp/saved_model/3epoch_model.h5')
print("Model Saved")
```

```
Model Saved
```

```
from keras.models import load_model
demo = load_model('/content/drive/Shareddrives/datascience/exp/saved_model/3epoch_model.h5')
```

```
nb_epochs=1
demo.fit_generator(
    train_generator,
    steps_per_epoch = train_generator.samples // batch_size,
    validation_data = validation_generator,
    validation_steps = validation_generator.samples // batch_size,
    epochs = nb_epochs,
    workers = 8)
    #callbacks=checkpoints)
```

```
/usr/local/lib/python3.7/dist-packages/ipykernel_launcher.py:8: UserWarning: `Model.fit_

31351/31351 [==============================] - 15421s 492ms/step - loss: 3.6183 - accura
<keras.callbacks.History at 0x7fe3ddc69fd0>
```

```
model_1.save_weights('/content/drive/Shareddrives/datascience/exp/saved_model_weights/4epochs
print("Wights Saved")
```

```
Wights Saved
```

```
model_1.save('/content/drive/Shareddrives/datascience/exp/saved_model/4epoch_model.h5')
print("Model Saved")
```

```
Model Saved
```

increased batch size from 300 to 500 and decreased lr rate from 0.0003 to 0.0002

```
from keras.models import load_model
demo = load_model('/content/drive/Shareddrives/datascience/exp/saved_model/4epoch_model.h5')
```

```
#keras.backend.set_value(model.optimizer.lr, .0002)
```

```
nb_epochs = 3
model_1.fit_generator(
    train_generator,
    steps_per_epoch = train_generator.samples // batch_size,
    validation_data = validation_generator,
    validation_steps = validation_generator.samples // batch_size,
    epochs = nb_epochs,
    workers = 8)
    #callbacks=checkpoints)
```

```
/usr/local/lib/python3.7/dist-packages/ipykernel_launcher.py:8: UserWarning: `Model.fit_

Epoch 1/3
18810/18810 [==============================] - 15532s 826ms/step - loss: 3.4561 - accura
Epoch 2/3
18810/18810 [==============================] - 15661s 832ms/step - loss: 3.3842 - accura
Epoch 3/3
18810/18810 [==============================] - 15606s 830ms/step - loss: 3.3291 - accura
<keras.callbacks.History at 0x7f5d6f673490>
```

```
model_1.save_weights('/content/drive/Shareddrives/datascience/exp/saved_model_weights/7epochs
print("Wights Saved")
```

```
Wights Saved
```

```
model_1.save('/content/drive/Shareddrives/datascience/exp/saved_model/7epoch_model.h5')
print("Model Saved")
```

```
Model Saved
```

Double-click (or enter) to edit

```
from keras.models import load_model
demo = load_model('/content/drive/Shareddrives/datascience/exp/saved_model/7epoch_model.h5')
```

```
keras.backend.set_value(demo.optimizer.lr, 0.00003)
```

```
nb_epochs = 1
demo.fit_generator(
    train_generator,
    steps_per_epoch = train_generator.samples // batch_size,
    validation_data = validation_generator,
    validation_steps = validation_generator.samples // batch_size,
    epochs = nb_epochs,
    workers = 8)
    #callbacks=checkpoints)
```

```
/usr/local/lib/python3.7/dist-packages/ipykernel_launcher.py:8: UserWarning: `Model.fit_

18810/18810 [==============================] - 15648s 832ms/step - loss: 3.2789 - accura
<keras.callbacks.History at 0x7f616af49310>
```

```
demo.save_weights('/content/drive/Shareddrives/datascience/exp/saved_model_weights/8epochs.h5
print("Wights Saved")
```

```
Wights Saved
```

```
demo.save('/content/drive/Shareddrives/datascience/exp/saved_model/8epoch_model.h5')
print("Model Saved")
```

```
Model Saved
```

Double-click (or enter) to edit

```
from keras.models import load_model
demo = load_model('/content/drive/Shareddrives/datascience/exp/saved_model/8epoch_model.h5')
```

```
nb_epochs = 4
demo.fit_generator(
    train_generator,
    steps_per_epoch = train_generator.samples // batch_size,
    validation_data = validation_generator,
    validation_steps = validation_generator.samples // batch_size,
    epochs = nb_epochs,
    workers = 8)
    #callbacks=checkpoints)
```

```
/usr/local/lib/python3.7/dist-packages/ipykernel_launcher.py:8: UserWarning: `Model.fit_

Epoch 1/4
18810/18810 [==============================] - 15609s 829ms/step - loss: 3.2323 - accura
Epoch 2/4
18810/18810 [==============================] - 15583s 828ms/step - loss: 3.1911 - accura
Epoch 3/4
18810/18810 [==============================] - 15575s 828ms/step - loss: 3.1507 - accura
Epoch 4/4
18421/18810 [============================>.] - ETA: 5:05 - loss: 3.1128 - accuracy: 0.47
```

```
demo.save_weights('/content/drive/Shareddrives/datascience/exp/saved_model_weights/12epochs.h
print("Wights Saved")
```

```
demo.save('/content/drive/Shareddrives/datascience/exp/saved_model/12epoch_model.h5')
print("Model Saved")
```

Double-click (or enter) to edit

```
from keras.models import load_model
demo = load_model('/content/drive/Shareddrives/datascience/exp/saved_model/12epoch_model.h5')
```

```
#keras.backend.set_value(demo.optimizer.lr, .000003)
```

```
nb_epochs = 3
demo.fit_generator(
    train_generator,
    steps_per_epoch = train_generator.samples // batch_size,
    validation_data = validation_generator,
    validation_steps = validation_generator.samples // batch_size,
    epochs = nb_epochs,
    workers = 8,
    callbacks=[reduce_lr,lrschedule])
```

```
/lib/python3.7/dist-packages/ipykernel_launcher.py:9: UserWarning: `Model.fit_generator`
e__ == '__main__':

0 [==============================] - 15474s 822ms/step - loss: 3.0735 - accuracy: 0.4794

0 [==============================] - 15101s 803ms/step - loss: 3.0379 - accuracy: 0.4826

0 [==============================] - 14826s 788ms/step - loss: 3.0031 - accuracy: 0.4863
lbacks.History at 0x7f14a7975990>
```

```
demo.save_weights('/content/drive/Shareddrives/datascience/exp/saved_model_weights/15epochs.h
print("Wights Saved")
```

```
Wights Saved
```

```
demo.save('/content/drive/Shareddrives/datascience/exp/saved_model/15epoch_model.h5',include_
print("Model Saved")
```

```
Model Saved
```

```
keras.backend.set_value(demo.optimizer.lr, 0.000003)
```

```
nb_epochs = 2
demo.fit_generator(
    train_generator,
    steps_per_epoch = train_generator.samples // batch_size,
    validation_data = validation_generator,
    validation_steps = validation_generator.samples // batch_size,
    epochs = nb_epochs
```

```
    epochs = nb_epochs,
    workers = 8,
    callbacks=[reduce_lr,lrschedule])
```

```
/usr/local/lib/python3.7/dist-packages/ipykernel_launcher.py:9: UserWarning: `Model.fit_
  if __name__ == '__main__':
Epoch 1/2
18810/18810 [==============================] - ETA: 0s - loss: 2.9423 - accuracy: 0.4926
18810/18810 [==============================] - 15068s 801ms/step - loss: 2.9423 - accura
Epoch 2/2
18810/18810 [==============================] - ETA: 0s - loss: 2.9345 - accuracy: 0.4929
18810/18810 [==============================] - 15218s 809ms/step - loss: 2.9345 - accura
<keras.callbacks.History at 0x7f142a6b4290>
```

```
demo.save('/content/drive/Shareddrives/datascience/exp/saved_model/17epoch_model.h5',include_
print("Model Saved")
```

```
Model Saved
```

Colab paid products - Cancel contracts here

1h 53m 33s completed at 12:57 AM