In [1]:

```
!pip install efficientnet
!pip install iterative-stratification
!pip install gdown

import os
if not os.path.isfile('model_effnet_bo_087.h5'):
    !gdown https://drive.google.com/uc?id=1FXF1HymYbRf3OlThMTXAa74TRup3AhD_
if not os.path.isfile('stage_1_train.csv.zip'):
    !gdown https://drive.google.com/uc?id=10t89rZpBlwzLG-SL7owQaqBU2tpvAfmM
    !unzip stage_1_train.csv.zip
```

```
Collecting efficientnet
  Downloading https://files.pythonhosted.org/packages/97/82/f3ae07316f0461417dc54affab6e86ab188a5a22f33176d3
5271628b96e0/efficientnet-1.0.0-py3-none-any.whl (https://files.pythonhosted.org/packages/97/82/f3ae07316f04
61417dc54affab6e86ab188a5a22f33176d35271628b96e0/efficientnet-1.0.0-py3-none-any.whl)
Requirement already satisfied: scikit-image in /opt/conda/lib/python3.6/site-packages (from efficientnet)
 (0.16.2)
Requirement already satisfied: keras-applications<=1.0.8,>=1.0.7 in /opt/conda/lib/python3.6/site-packages
 (from efficientnet) (1.0.8)
Requirement already satisfied: pillow>=4.3.0 in /opt/conda/lib/python3.6/site-packages (from scikit-image->e
fficientnet) (5.4.1)
Requirement already satisfied: PyWavelets>=0.4.0 in /opt/conda/lib/python3.6/site-packages (from scikit-imag
e->efficientnet) (1.1.1)
Requirement already satisfied: networkx>=2.0 in /opt/conda/lib/python3.6/site-packages (from scikit-image->e
fficientnet) (2.4)
Requirement already satisfied: matplotlib!=3.0.0,>=2.0.0 in /opt/conda/lib/python3.6/site-packages (from sci
kit-image->efficientnet) (3.0.3)
Requirement already satisfied: imageio>=2.3.0 in /opt/conda/lib/python3.6/site-packages (from scikit-image->
efficientnet) (2.6.1)
Requirement already satisfied: scipy>=0.19.0 in /opt/conda/lib/python3.6/site-packages (from scikit-image->e
fficientnet) (1.2.1)
Requirement already satisfied: numpy>=1.9.1 in /opt/conda/lib/python3.6/site-packages (from keras-applicatio
ns<=1.0.8,>=1.0.7->efficientnet) (1.16.4)
Requirement already satisfied: h5py in /opt/conda/lib/python3.6/site-packages (from keras-applications<=1.0.
8,>=1.0.7->efficientnet) (2.9.0)
Requirement already satisfied: decorator>=4.3.0 in /opt/conda/lib/python3.6/site-packages (from networkx>=2.
0->scikit-image->efficientnet) (4.4.0)
Requirement already satisfied: cycler>=0.10 in /opt/conda/lib/python3.6/site-packages (from matplotlib!=3.0.
0,>=2.0.0->scikit-image->efficientnet) (0.10.0)
Requirement already satisfied: kiwisolver>=1.0.1 in /opt/conda/lib/python3.6/site-packages (from matplotlib!
=3.0.0,>=2.0.0->scikit-image->efficientnet) (1.1.0)
Requirement already satisfied: pyparsing!=2.0.4,!=2.1.2,!=2.1.6,>=2.0.1 in /opt/conda/lib/python3.6/site-pac
kages (from matplotlib!=3.0.0,>=2.0.0->scikit-image->efficientnet) (2.4.2)
Requirement already satisfied: python-dateutil>=2.1 in /opt/conda/lib/python3.6/site-packages (from matplotl
ib!=3.0.0,>=2.0.0->scikit-image->efficientnet) (2.8.0)
Requirement already satisfied: six in /opt/conda/lib/python3.6/site-packages (from h5py->keras-applications<
=1.0.8,>=1.0.7->efficientnet) (1.12.0)
Requirement already satisfied: setuptools in /opt/conda/lib/python3.6/site-packages (from kiwisolver>=1.0.1-
>matplotlib!=3.0.0,>=2.0.0->scikit-image->efficientnet) (41.4.0)
Installing collected packages: efficientnet
Successfully installed efficientnet-1.0.0
Collecting iterative-stratification
  Downloading https://files.pythonhosted.org/packages/9d/79/9ba64c8c07b07b8b45d80725b2ebd7b7884701c1da34f70d
4749f7b45f9a/iterative_stratification-0.1.6-py3-none-any.whl (https://files.pythonhosted.org/packages/9d/79/
9ba64c8c07b07b8b45d80725b2ebd7b7884701c1da34f70d4749f7b45f9a/iterative_stratification-0.1.6-py3-none-any.wh
l)
Requirement already satisfied: numpy in /opt/conda/lib/python3.6/site-packages (from iterative-stratificatio
n) (1.16.4)
Requirement already satisfied: scipy in /opt/conda/lib/python3.6/site-packages (from iterative-stratificatio
n) (1.2.1)
Requirement already satisfied: scikit-learn in /opt/conda/lib/python3.6/site-packages (from iterative-strati
fication) (0.21.3)
Requirement already satisfied: joblib>=0.11 in /opt/conda/lib/python3.6/site-packages (from scikit-learn->it
erative-stratification) (0.13.2)
Installing collected packages: iterative-stratification
Successfully installed iterative-stratification-0.1.6
Collecting gdown
  Downloading https://files.pythonhosted.org/packages/b0/b4/a8e9d0b02bca6aa53087001abf064cc9992bda11bd684087
5b8098d93573/gdown-3.8.3.tar.gz (https://files.pythonhosted.org/packages/b0/b4/a8e9d0b02bca6aa53087001abf064
cc9992bda11bd6840875b8098d93573/gdown-3.8.3.tar.gz)
Requirement already satisfied: filelock in /opt/conda/lib/python3.6/site-packages (from gdown) (3.0.12)
Requirement already satisfied: requests in /opt/conda/lib/python3.6/site-packages (from gdown) (2.22.0)
Requirement already satisfied: six in /opt/conda/lib/python3.6/site-packages (from gdown) (1.12.0)
Requirement already satisfied: tqdm in /opt/conda/lib/python3.6/site-packages (from gdown) (4.36.1)
Requirement already satisfied: urllib3!=1.25.0,!=1.25.1,<1.26,>=1.21.1 in /opt/conda/lib/python3.6/site-pack
ages (from requests->gdown) (1.24.2)
Requirement already satisfied: certifi>=2017.4.17 in /opt/conda/lib/python3.6/site-packages (from requests->
gdown) (2019.9.11)
Requirement already satisfied: idna<2.9,>=2.5 in /opt/conda/lib/python3.6/site-packages (from requests->gdow
n) (2.8)
Requirement already satisfied: chardet<3.1.0,>=3.0.2 in /opt/conda/lib/python3.6/site-packages (from request
s->gdown) (3.0.4)
Building wheels for collected packages: gdown
  Building wheel for gdown (setup.py) ... done
  Created wheel for gdown: filename=gdown-3.8.3-cp36-none-any.whl size=8850 sha256=8074522793dc355a859935949
558d718048dc1dd53cb683f86216a7254e288a6
  Stored in directory: /tmp/.cache/pip/wheels/a7/9d/16/9e0bda9a327ff2cddaee8de48a27553fb1efce73133593d066
Successfully built gdown
```

```
Installing collected packages: gdown
Successfully installed gdown-3.8.3
Downloading...
From: https://drive.google.com/uc?id=1FXF1HymYbRf3OlThMTXAa74TRup3AhD_ (https://drive.google.com/uc?id=1FXF1
HymYbRf3OlThMTXAa74TRup3AhD_)
To: /kaggle/working/model_effnet_bo_087.h5
16.7MB [00:00, 71.1MB/s]
Downloading...
From: https://drive.google.com/uc?id=10t89rZpBlwzLG-SL7owQaqBU2tpvAfmM (https://drive.google.com/uc?id=10t89
rZpBlwzLG-SL7owQaqBU2tpvAfmM)
To: /kaggle/working/stage_1_train.csv.zip
15.2MB [00:00, 98.8MB/s]
Archive:  stage_1_train.csv.zip
  inflating: stage_1_train.csv
```

In [2]:

```
!ls
```

```
__notebook__.ipynb  model_effnet_bo_087.h5  stage_1_train.csv.zip
__output__.json     stage_1_train.csv
```

In [3]:

```
import numpy as np
import pandas as pd
import pydicom
import os
import glob
import random
import cv2
import tensorflow as tf
from math import ceil, floor
from tqdm import tqdm
from imgaug import augmenters as iaa
import matplotlib.pyplot as plt
from math import ceil, floor
import keras
import keras.backend as K
from keras.callbacks import Callback, ModelCheckpoint
from keras.layers import Dense, Flatten, Dropout
from keras.models import Model, load_model
from keras.utils import Sequence
from keras.losses import binary_crossentropy
from keras.optimizers import Adam
```

```
Using TensorFlow backend.
```

In [4]:

```
HEIGHT = 256
WIDTH = 256
CHANNELS = 3
SHAPE = (HEIGHT, WIDTH, CHANNELS)
input_folder = '../input/rsna-intracranial-hemorrhage-detection/rsna-intracranial-hemorrhage-detection/'
path_train_img = input_folder + 'stage_2_train/'
path_test_img = input_folder + 'stage_2_test/'
```

In [5]:

```
train_df = pd.read_csv('stage_1_train.csv')
train_df.head()
```

Out[5]:

	ID	Label
0	ID_63eb1e259_epidural	0
1	ID_63eb1e259_intraparenchymal	0
2	ID_63eb1e259_intraventricular	0
3	ID_63eb1e259_subarachnoid	0
4	ID_63eb1e259_subdural	0

In [6]:

```
# extract subtype
train_df['sub_type'] = train_df['ID'].apply(lambda x: x.split('_')[-1])
# extract filename
train_df['file_name'] = train_df['ID'].apply(lambda x: '_'.join(x.split('_')[:2]) + '.dcm')
train_df.head()
```

Out[6]:

	ID	Label	sub_type	file_name
0	ID_63eb1e259_epidural	0	epidural	ID_63eb1e259.dcm
1	ID_63eb1e259_intraparenchymal	0	intraparenchymal	ID_63eb1e259.dcm
2	ID_63eb1e259_intraventricular	0	intraventricular	ID_63eb1e259.dcm
3	ID_63eb1e259_subarachnoid	0	subarachnoid	ID_63eb1e259.dcm
4	ID_63eb1e259_subdural	0	subdural	ID_63eb1e259.dcm

In [7]:

```
train_df.shape
```

Out[7]:

```
(4045572, 4)
```

In [8]:

```
# remove duplicates
train_df.drop_duplicates(['Label', 'sub_type', 'file_name'], inplace=True)
train_df.shape
```

Out[8]:

```
(4045548, 4)
```

In [9]:

```
print("Number of train images availabe:", len(os.listdir(path_train_img)))
```

```
Number of train images availabe: 752803
```

In [10]:

```
train_final_df = pd.pivot_table(train_df.drop(columns='ID'), index="file_name", \
                                columns="sub_type", values="Label")
train_final_df.head()
```

Out[10]:

sub_type	any	epidural	intraparenchymal	intraventricular	subarachnoid	subdural
file_name						
ID_000039fa0.dcm	0	0	0	0	0	0
ID_00005679d.dcm	0	0	0	0	0	0
ID_00008ce3c.dcm	0	0	0	0	0	0
ID_0000950d7.dcm	0	0	0	0	0	0
ID_0000aee4b.dcm	0	0	0	0	0	0

In [11]:

```
train_final_df.shape
```

Out[11]:

```
(674258, 6)
```

In [12]:

```
# Invalid image ID_6431af929.dcm
train_final_df.drop('ID_6431af929.dcm', inplace=True)
```

In [13]:

```
import efficientnet.keras as efn
from iterstrat.ml_stratifiers import MultilabelStratifiedShuffleSplit
```

In [14]:

```
def get_corrected_bsb_window(dcm, window_center, window_width):
    #------ Correct Dicom Image ------------#
    if (dcm.BitsStored == 12) and (dcm.PixelRepresentation == 0) and (int(dcm.RescaleIntercept) > -100):
        x = dcm.pixel_array + 1000
        px_mode = 4096
        x[x>=px_mode] = x[x>=px_mode] - px_mode
        dcm.PixelData = x.tobytes()
        dcm.RescaleIntercept = -1000

    #------ Windowing ----------------------#
    img = dcm.pixel_array * dcm.RescaleSlope + dcm.RescaleIntercept
    img_min = window_center - window_width // 2
    img_max = window_center + window_width // 2
    img = np.clip(img, img_min, img_max)
    return img

def get_rgb_image(img):
    brain_img = get_corrected_bsb_window(img, 40, 80)
    subdural_img = get_corrected_bsb_window(img, 80, 200)
    soft_img = get_corrected_bsb_window(img, 40, 380)

    brain_img = (brain_img - 0) / 80
    subdural_img = (subdural_img - (-20)) / 200
    soft_img = (soft_img - (-150)) / 380
    bsb_img = np.array([brain_img, subdural_img, soft_img]).transpose(1,2,0)

    return bsb_img

def _read(path, desired_size=(WIDTH, HEIGHT)):

    dcm = pydicom.dcmread(path)

    try:
        img = get_rgb_image(dcm)
    except:
        img = np.zeros(desired_size)


    img = cv2.resize(img, desired_size[:2], interpolation=cv2.INTER_LINEAR)

    return img
```

In [15]:

```
_read(path_train_img + 'ID_ffff922b9.dcm', (128, 128)).shape
```

Out[15]:

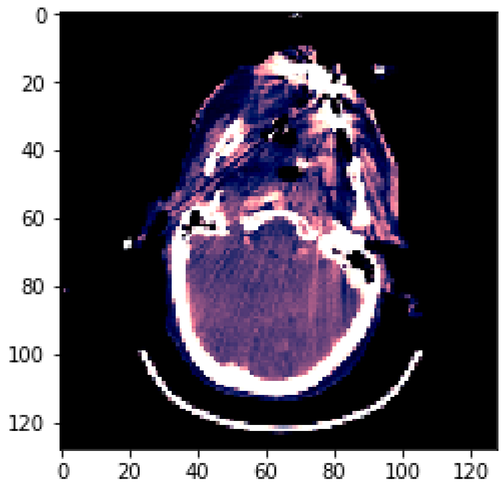
```
(128, 128, 3)
```

In [16]:

```
plt.imshow(
    _read(path_train_img + 'ID_ffff922b9.dcm', (128, 128))
)
```

Out[16]:

```
<matplotlib.image.AxesImage at 0x7f7b19c2dba8>
```



In [17]:

```
# Augmentations
# Flip Left Right
# Cropping
sometimes = lambda aug: iaa.Sometimes(0.25, aug)
augmentation = iaa.Sequential([
                                iaa.Fliplr(0.25),
                                sometimes(iaa.Crop(px=(0, 25), keep_size = True,
                                                   sample_independently = False))
                            ], random_order = True)
```

In [18]:

```
# Train Data Generator
class TrainDataGenerator(keras.utils.Sequence):

    def __init__(self, dataset, labels, batch_size=16, img_size=(512, 512), img_dir = path_train_img, \
             augment = False, *args, **kwargs):
        self.dataset = dataset
        self.ids = dataset.index
        self.labels = labels
        self.batch_size = batch_size
        self.img_size = img_size
        self.img_dir = img_dir
        self.augment = augment
        self.on_epoch_end()

    def __len__(self):
        return int(ceil(len(self.ids) / self.batch_size))

    def __getitem__(self, index):
        indices = self.indices[index*self.batch_size:(index+1)*self.batch_size]
        X, Y = self.__data_generation(indices)
        return X, Y

    def augmentor(self, image):
        augment_img = augmentation
        image_aug = augment_img.augment_image(image)
        return image_aug

    def on_epoch_end(self):
        self.indices = np.arange(len(self.ids))
        np.random.shuffle(self.indices)

    def __data_generation(self, indices):
        X = np.empty((self.batch_size, *self.img_size, 3))
        Y = np.empty((self.batch_size, 6), dtype=np.float32)

        for i, index in enumerate(indices):
            ID = self.ids[index]
            image = _read(self.img_dir + ID, self.img_size)
            if self.augment:
                X[i,] = self.augmentor(image)
            else:
                X[i,] = image
            Y[i,] = self.labels.iloc[index].values
        return X, Y

class TestDataGenerator(keras.utils.Sequence):
    def __init__(self, ids, labels, batch_size = 5, img_size = (512, 512), img_dir = path_test_img, \
             *args, **kwargs):
        self.ids = ids
        self.labels = labels
        self.batch_size = batch_size
        self.img_size = img_size
        self.img_dir = img_dir
        self.on_epoch_end()

    def __len__(self):
        return int(ceil(len(self.ids) / self.batch_size))

    def __getitem__(self, index):
        indices = self.indices[index*self.batch_size:(index+1)*self.batch_size]
        list_IDs_temp = [self.ids[k] for k in indices]
        X = self.__data_generation(list_IDs_temp)
        return X

    def on_epoch_end(self):
        self.indices = np.arange(len(self.ids))

    def __data_generation(self, list_IDs_temp):
        X = np.empty((self.batch_size, *self.img_size, 3))
        for i, ID in enumerate(list_IDs_temp):
            image = _read(self.img_dir + ID, self.img_size)
            X[i,] = image
        return X
```

In [19]:

```
# load test set
test_df = pd.read_csv(input_folder + 'stage_2_sample_submission.csv')
test_df.head()
```

Out[19]:

	ID	Label
0	ID_0fbf6a978_epidural	0.5
1	ID_0fbf6a978_intraparenchymal	0.5
2	ID_0fbf6a978_intraventricular	0.5
3	ID_0fbf6a978_subarachnoid	0.5
4	ID_0fbf6a978_subdural	0.5

In [20]:

```
# extract subtype
test_df['sub_type'] = test_df['ID'].apply(lambda x: x.split('_')[-1])
# extract filename
test_df['file_name'] = test_df['ID'].apply(lambda x: '_'.join(x.split('_')[:2]) + '.dcm')

test_df = pd.pivot_table(test_df.drop(columns='ID'), index="file_name", \
                                columns="sub_type", values="Label")
test_df.head()

test_df.shape
```

Out[20]:

```
(121232, 6)
```

In [21]:

```
test_df.head()
```

Out[21]:

sub_type	**any**	**epidural**	**intraparenchymal**	**intraventricular**	**subarachnoid**	**subdural**
file_name						
ID_000000e27.dcm	0.5	0.5	0.5	0.5	0.5	0.5
ID_000009146.dcm	0.5	0.5	0.5	0.5	0.5	0.5
ID_00007b8cb.dcm	0.5	0.5	0.5	0.5	0.5	0.5
ID_000134952.dcm	0.5	0.5	0.5	0.5	0.5	0.5
ID_000176f2a.dcm	0.5	0.5	0.5	0.5	0.5	0.5

In [22]:

```
# https://github.com/trent-b/iterative-stratification
# Mutlilabel stratification
splits = MultilabelStratifiedShuffleSplit(n_splits=1, test_size=0.2, random_state=12345)
file_names = train_final_df.index
labels = train_final_df.values
# Lets take only the first split
split = next(splits.split(file_names, labels))
train_idx = split[0]
valid_idx = split[1]
submission_predictions = []
len(train_idx), len(valid_idx)
```

Out[22]:

```
(539405, 134852)
```

In [23]:

```
# train data generator
data_generator_train = TrainDataGenerator(train_final_df.iloc[train_idx],
                                                train_final_df.iloc[train_idx],
                                                128,
                                                (WIDTH, HEIGHT),
                                                augment=False)

# validation data generator
data_generator_val = TrainDataGenerator(train_final_df.iloc[valid_idx],
                                            train_final_df.iloc[valid_idx],
                                            128,
                                            (WIDTH, HEIGHT),
                                            augment=False)


data_generator_test = TestDataGenerator(test_df.index, None,
                                            128,
                                            (WIDTH, HEIGHT),
                                            augment=False)
```

In [24]:

```
len(data_generator_train), len(data_generator_val), len(data_generator_test)
```

Out[24]:

```
(4215, 1054, 948)
```

In [25]:

```
from keras import backend as K

def weighted_log_loss(y_true, y_pred):
    """
    Can be used as the loss function in model.compile()
    ---------------------------------------------------
    """

    class_weights = np.array([2., 1., 1., 1., 1., 1.])

    eps = K.epsilon()

    y_pred = K.clip(y_pred, eps, 1.0-eps)

    out = -(         y_true  * K.log(      y_pred) * class_weights
            + (1.0 - y_true) * K.log(1.0 - y_pred) * class_weights)

    return K.mean(out, axis=-1)


def _normalized_weighted_average(arr, weights=None):
    """
    A simple Keras implementation that mimics that of
    numpy.average(), specifically for this competition
    """

    if weights is not None:
        scl = K.sum(weights)
        weights = K.expand_dims(weights, axis=1)
        return K.sum(K.dot(arr, weights), axis=1) / scl
    return K.mean(arr, axis=1)


def weighted_loss(y_true, y_pred):
    """
    Will be used as the metric in model.compile()
    ---------------------------------------------

    Similar to the custom loss function 'weighted_log_loss()' above
    but with normalized weights, which should be very similar
    to the official competition metric:
        https://www.kaggle.com/kambarakun/lb-probe-weights-n-of-positives-scoring
    and hence:
        sklearn.metrics.log_loss with sample weights
    """

    class_weights = K.variable([2., 1., 1., 1., 1., 1.])

    eps = K.epsilon()

    y_pred = K.clip(y_pred, eps, 1.0-eps)

    loss = -(        y_true  * K.log(      y_pred)
            + (1.0 - y_true) * K.log(1.0 - y_pred))

    loss_samples = _normalized_weighted_average(loss, class_weights)

    return K.mean(loss_samples)


def weighted_log_loss_metric(trues, preds):
    """
    Will be used to calculate the log loss
    of the validation set in PredictionCheckpoint()
    ------------------------------------------
    """
    class_weights = [2., 1., 1., 1., 1., 1.]

    epsilon = 1e-7

    preds = np.clip(preds, epsilon, 1-epsilon)
    loss = trues * np.log(preds) + (1 - trues) * np.log(1 - preds)
    loss_samples = np.average(loss, axis=1, weights=class_weights)

    return - loss_samples.mean()
```

In [26]:

```
base_model =  efn.EfficientNetB0(weights = 'imagenet', include_top = False, \
                                 pooling = 'avg', input_shape = (HEIGHT, WIDTH, 3))
x = base_model.output
x = Dropout(0.125)(x)
output_layer = Dense(6, activation = 'sigmoid')(x)
model = Model(inputs=base_model.input, outputs=output_layer)
model.compile(optimizer = Adam(lr = 0.0001), loss = 'binary_crossentropy', metrics = ['acc'])
model.load_weights('model_effnet_bo_087.h5')
model.summary()
```

```
Downloading data from https://github.com/Callidior/keras-applications/releases/download/efficientnet/effic
ientnet-b0_weights_tf_dim_ordering_tf_kernels_autoaugment_notop.h5 (https://github.com/Callidior/keras-app
lications/releases/download/efficientnet/efficientnet-b0_weights_tf_dim_ordering_tf_kernels_autoaugment_no
top.h5)
16809984/16804768 [==============================] - 0s 0us/step
Model: "model_1"
__________________________________________________________________________________________________
Layer (type)                    Output Shape         Param #     Connected to
==================================================================================================
input_1 (InputLayer)            (None, 256, 256, 3)  0
__________________________________________________________________________________________________
stem_conv (Conv2D)              (None, 128, 128, 32) 864         input_1[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_dwconv (DepthwiseConv2D (None, 128, 128, 32) 288         stem_activation[0][0]
__________________________________________________________________________________________________
block1a_bn (BatchNormalization) (None, 128, 128, 32) 128         block1a_dwconv[0][0]
```

In [27]:

```
import joblib
```

In [28]:

```
def get_scores(data_gen, file_name='scores.pkl'):
    scores = model.evaluate_generator(data_gen, verbose=1)
    joblib.dump(scores, file_name)
    print(f"Loss: {scores[0]} and Accuracy: {scores[1]*100}")
```

In [29]:

```
get_scores(data_gen=data_generator_train, file_name='train_scores.pkl')
```

```
4215/4215 [==============================] - 9113s 2s/step
Loss: 0.03487127274274826 and Accuracy: 94.0958321094513
```

In [30]:

```
get_scores(data_gen=data_generator_val, file_name='val_scores.pkl')
```

```
1054/1054 [==============================] - 2257s 2s/step
Loss: 0.18287695944309235 and Accuracy: 94.08394694328308
```

In [31]:

```
test_preds = model.predict_generator(data_generator_test, verbose=1)
```

```
948/948 [==============================] - 2091s 2s/step
```

In [32]:

```
test_preds[:5]
```

Out[32]:

```
array([[6.1310172e-02, 8.7240338e-04, 2.7319193e-03, 4.8130751e-04,
        1.6119182e-03, 3.6428809e-02],
       [2.5629997e-06, 4.7683716e-07, 5.9604645e-08, 0.0000000e+00,
        3.2186508e-06, 1.4901161e-06],
       [3.1926930e-03, 2.0837784e-04, 8.2939863e-05, 1.0672212e-04,
        5.0994754e-04, 2.1046698e-03],
       [1.7616540e-02, 9.5963478e-05, 1.5140772e-03, 8.2284212e-04,
        2.4288595e-03, 1.0744154e-02],
       [1.5471071e-02, 6.6035986e-04, 2.0802021e-04, 5.2440166e-04,
        1.3437271e-03, 2.4896264e-02]], dtype=float32)
```

In [33]:

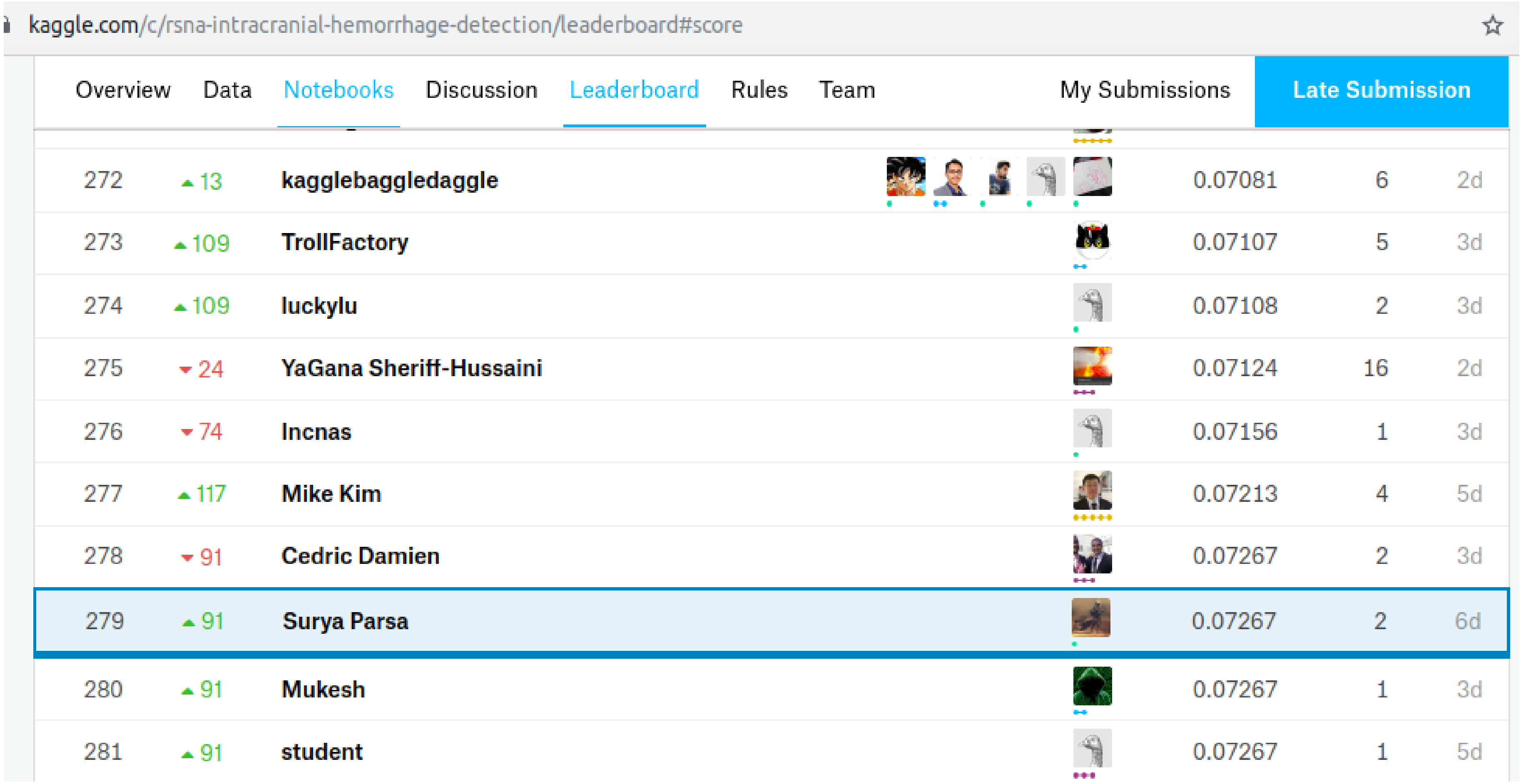
```
test_preds.shape
```

Out[33]:

```
(121344, 6)
```

As test labels are not disclosed as part of competetion and we only get the score after submitting the file.

Private leaderboard score



272	▲ 13	kagglebaggledaggle	0.07081	6	2d
273	▲ 109	TrollFactory	0.07107	5	3d
274	▲ 109	luckylu	0.07108	2	3d
275	▼ 24	YaGana Sheriff-Hussaini	0.07124	16	2d
276	▼ 74	Incnas	0.07156	1	3d
277	▲ 117	Mike Kim	0.07213	4	5d
278	▼ 91	Cedric Damien	0.07267	2	3d
279	▲ 91	Surya Parsa	0.07267	2	6d
280	▲ 91	Mukesh	0.07267	1	3d
281	▲ 91	student	0.07267	1	5d