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

```
Drive already mounted at /content/gdrive; to attempt to forcibly remount, call drive.mou
```

```
import numpy as np
from PIL import Image, ImageDraw
import os
import time
import concurrent.futures
import pandas as pd


class luminance():

    finished = 0

    def __init__(self, path):

        self.filename_arr = []
        self.luminance_arr = []
        self.data_frame = {'File Name': self.filename_arr,
                           'Luminance': self.luminance_arr}
        self.directory = path
        # changing current working dir
        os.chdir(self.directory)


    def generate_csv_file(self):
        print('Generating .csv file')
        df = pd.DataFrame(self.data_frame)
        df.to_csv(os.path.join(os.getcwd(), 'luminance.csv'), index=False, header=True)

    def loop_over_files(self):
        print('Looping files....')
        # check if edited folder is present or not
        if os.path.isdir('edited') == False:
            os.mkdir('edited')

        ### Multi-Threading
        try:
            with concurrent.futures.ProcessPoolExecutor() as executor:
                # mapping                   ->func         ->list of file paths
                results = executor.map(self.process_file, os.listdir(os.getcwd()))

                for filename, luminance in results:
                    self.filename_arr.append(filename)
                    self.luminance_arr.append(luminance)
```

```
            except Exception as error:
                print('Exception Handling: Something wrong with {}'.format(error))
        def process_file(self, filename):

            if filename != 'edited':

                print('Processing {}.'.format(filename))

                # initializing arrays
                Rarr = np.array([])
                Garr = np.array([])
                Barr = np.array([])
                # loading image
                im = Image.open(filename)
                # converting to RGB
                rgb_im = im.convert('RGB')

                # looping every pixel
                for w in range(1, rgb_im.width):
                    for h in range(0, rgb_im.height):
                        # getting RGB
                        r, g, b = rgb_im.getpixel((w, h))
                        # appending RGB in respective arrays
                        Rarr = np.append(Rarr, r)
                        Garr = np.append(Garr, g)
                        Barr = np.append(Barr, b)

                # applying formula and averaging it
                luminance = np.average(np.sqrt( 0.299*Rarr**2 + 0.587*Garr**2 + 0.114*Barr**2 ))
                # modifing the image
                draw = ImageDraw.Draw(rgb_im)
                # defining text and it's coordinates
                draw.text((rgb_im.width //2, rgb_im.height // 4), "Luminance: {}".format(luminanc
                # saving new image in edited folder in current working dir
                new_file_name, ext = filename.split('.')
                edited_dir = os.path.join(os.getcwd(), 'edited')
                rgb_im.save(os.path.join(edited_dir, new_file_name + '(edited)' + '.' + ext))

                print('Finished {}'.format(filename))
                # Returning
                return [filename, luminance]




    if __name__ == "__main__":

        start = time.perf_counter()
        lumi_obj = luminance("/content/gdrive/My Drive/images")
        #('G:\\Mehak\\Luminance\\img\\test')
```

```
# processing files
lumi_obj.loop_over_files()
# genrating csv
lumi_obj.generate_csv_file()
# timer start
end = time.perf_counter()

print('With Muti-Processing took {0} minute(s) to process {1} images'.format((end - start
```

```
 Looping files....
 Processing 2015_00717.jpg.
 Processing 2015_00673.jpg.
 Finished 2015_00673.jpg
 Processing 2015_03044.jpg.
 Finished 2015_00717.jpg
 Finished 2015_03044.jpg
 Exception Handling: Something wrong with 'NoneType' object is not iterable
 Generating .csv file
 With Muti-Processing took 24.05931814671667 minute(s) to process 3 images
```