The Project

1. This is a project with minimal scaffolding. Expect to use the the discussion forums to gain insights! It's not cheating to ask others for opinions or perspectives!
2. Be inquisitive, try out new things.
3. Use the previous modules for insights into how to complete the functions! You'll have to combine Pillow, OpenCV, and Pytesseract
4. There are hints provided in Coursera, feel free to explore the hints if needed. Each hint provide progressively more details on how to solve the issue. This project is intended to be comprehensive and difficult if you do it without the hints.

The Assignment

Take a ZIP file (https://en.wikipedia.org/wiki/Zip_(file_format)) of images and process them, using a library built into python (https://docs.python.org/3/library/zipfile.html) that you need to learn how to use. A ZIP file takes several different files and compresses them, thus saving space, into one single file. The files in the ZIP file we provide are newspaper images (like you saw in week 3). Your task is to write python code which allows one to search through the images looking for the occurrences of keywords and faces. E.g. if you search for "pizza" it will return a contact sheet of all of the faces which were located on the newspaper page which mentions "pizza". This will test your ability to learn a new (library (https://docs.python.org/3/library/zipfile.html)), your ability to use OpenCV to detect faces, your ability to use tesseract to do optical character recognition, and your ability to use PIL to composite images together into contact sheets.

Each page of the newspapers is saved as a single PNG image in a file called images.zip (./readonly/images.zip). These newspapers are in english, and contain a variety of stories, advertisements and images. Note: This file is fairly large (~200 MB) and may take some time to work with, I would encourage you to use small_img.zip (./readonly/small_img.zip) for testing.

Here's an example of the output expected. Using the small_img.zip (./readonly/small_img.zip) file, if I search for the string "Christopher" I should see the following image:

```
Results found in file a-0.png
```

```
Results found in file a-3.png
```

If I were to use the [images.zip (./readonly/images.zip)](./readonly/images.zip) file and search for "Mark" I should see the following image (note that there are times when there are no faces on a page, but a word is found!):

```
Results found in file a-0.png
```

```
Results found in file a-1.png
```

```
Results found in file a-10.png
But there were no faces in that file!
Results found in file a-13.png
```

```
Results found in file a-2.png
```

```
Results found in file a-3.png
```

```
Results found in file a-8.png
But there were no faces in that file!
```

Note: That big file can take some time to process - for me it took nearly ten minutes! Use the small one for testing.

In [1]:

```
import zipfile

from PIL import Image, ImageDraw
import pytesseract
import cv2 as cv
```

```
import cv2 as cv
import numpy as np

# loading the face detection classifier
face_cascade = cv.CascadeClassifier('readonly/haarcascade_frontalfa

# This stores each page as a png image in a dictionary with key=nam

file_name = 'readonly/images.zip'
def page_images(file):
    img_dict = {}

    with zipfile.ZipFile(file) as zips:
        namelist = zips.namelist()
        file = zipfile.ZipFile.extractall(zips)
        for name in namelist:
            image = Image.open(name)
            img_dict[name] = image


    return(img_dict)

print(page_images(file_name))

#for key in page_images(file_name):
#    display(page_images(file_name)[key])
```

```
{'a-0.png': <PIL.PngImagePlugin.PngImageFile image mod
e=RGB size=3600x6300 at 0x7FF867D13828>, 'a-1.png': <P
IL.PngImagePlugin.PngImageFile image mode=RGB size=360
0x6300 at 0x7FF867C92A90>, 'a-10.png': <PIL.PngImagePl
ugin.PngImageFile image mode=RGB size=6300x3600 at 0x7
FF867C1F080>, 'a-11.png': <PIL.PngImagePlugin.PngImage

File image mode=RGB size=3150x3600 at 0x7FF867C1F4A8>,
'a-12.png': <PIL.PngImagePlugin.PngImageFile image mod
e=RGB size=3150x3600 at 0x7FF867C1F518>, 'a-13.png': <
PIL.PngImagePlugin.PngImageFile image mode=RGB size=31
50x3600 at 0x7FF867C1F588>, 'a-2.png': <PIL.PngImagePl
ugin.PngImageFile image mode=RGB size=3600x6300 at 0x7
FF867C1F5F8>, 'a-3.png': <PIL.PngImagePlugin.PngImageF
ile image mode=RGB size=7200x6300 at 0x7FF867C1F668>,
'a-4.png': <PIL.PngImagePlugin.PngImageFile image mode
=RGB size=3600x6300 at 0x7FF867C1F6D8>, 'a-5.png': <PI
L.PngImagePlugin.PngImageFile image mode=RGB size=3600
```

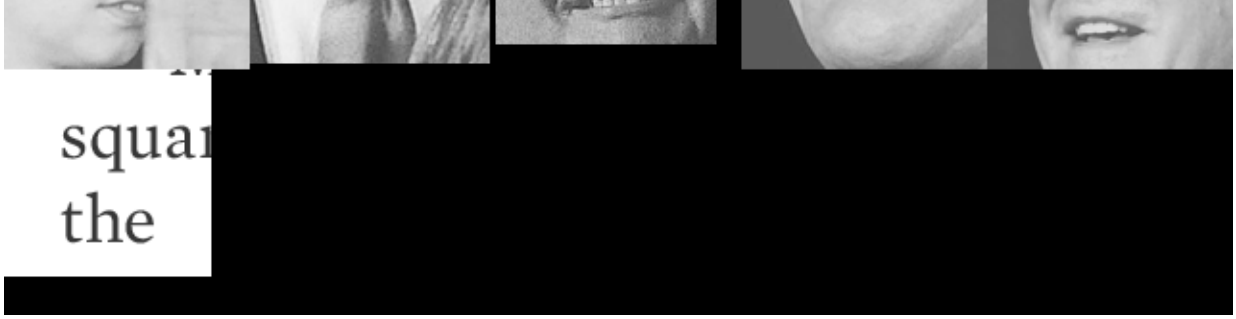
```
x6300 at 0x7FF867C1F748>, 'a-6.png': <PIL.PngImagePlug
in.PngImageFile image mode=RGB size=3600x6300 at 0x7FF
867C1F7B8>, 'a-7.png': <PIL.PngImagePlugin.PngImageFil
e image mode=RGB size=3150x3600 at 0x7FF867C1F828>, 'a
-8.png': <PIL.PngImagePlugin.PngImageFile image mode=R
GB size=3150x3600 at 0x7FF867C1F898>, 'a-9.png': <PIL.
PngImagePlugin.PngImageFile image mode=RGB size=3150x3
600 at 0x7FF867C1F908>}
```

In [2]:

```
# Convert all images to strings for a search function to work so th

keyword = 'Mark' #input("Please enter search term: ")
print(keyword)

for key in page_images(file_name):
    text = pytesseract.image_to_string(page_images(file_name)[key])

    images = []

# New dict with images appended to list from selection
    if keyword in text:
        image_d = page_images(file_name)
        image_1 = image_d[key]
        img = np.asarray(image_1)

        gray = cv.cvtColor(img, cv.COLOR_BGR2GRAY)

        faces = face_cascade.detectMultiScale(img,1.15)

        new_data = gray.astype(np.uint8)
        pil_img=Image.fromarray(new_data, mode='L')

        accum = 0
        for r in faces:
            rec = faces.tolist()[accum]
            accum += 1
            crop = pil_img.crop((rec[0],rec[1],rec[0]+rec[2],rec[1]
            images.append(crop)


        first_image=images[0]
        thumbs = []
        size = 128, 128
```

```
        for i in images:
            thumbs.append(i.thumbnail(size))

        if len(images) % 5 == 0:
            rows = len(images)//5
        else:
            rows = len(images)//5 + 1

        contact_sheet=Image.new(first_image.mode, (128 * 5,rows*128

        width = 128
        height = 128
        current_location_w = 0
        current_location_h = 0
        count = 0
        for img in images:
    # Paste the current image into the contact sheet
            contact_sheet.paste(img, (current_location_w, current_l
    # Update the current_location counter
            if count <= 4:
                current_location_w = current_location_w + width

                count += 1
            else:
                count = 0
                current_location_w = 0
                current_location_h = current_location_h + height
        print(f"Results found in {key}")
        display(contact_sheet)

print('proceed')
```

```
Mark
Results found in a-0.png
```



In [ ]:

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