ICE472: Digital Speech & Image Processing

Summer 2020

Experiment 2: Basic Image Manipulations in Python

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Assignment:

(1) Running this notebook and producing the outputs.

Library Imports

```
import skimage                         # Imort the Scikit-image Library
from skimage import data               # For loading data from skimage library
import matplotlib.pyplot as plt        # For plotting the image
from skimage import io                 # For I/O Operations
from skimage.transform import resize  # Resize Function
```

Lets load a sample camera image from the scikit image **data** library and store it into a variable called **camera**

```
camera = data.camera()
```

Lets check the type of the image using the function **type()**. Usually images are stored as **numpy.ndarray** format.

```
type(camera)
```

```
numpy.ndarray
```

The dimensions/spatial resolution of the image is returned by the attribute image.**shape**

```
camera.shape
```

```
(512, 512)
```

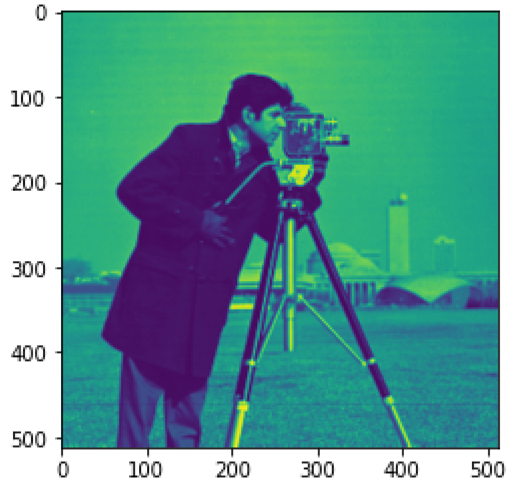
Lets check what actually comprises the image? The pixel values.

```
camera
```

```
array([[156, 157, 160, ..., 152, 152, 152],
       [156, 157, 159, ..., 152, 152, 152],
       [158, 157, 156, ..., 152, 152, 152],
       ...,
       [121, 123, 126, ..., 121, 113, 111],
       [121, 123, 126, ..., 121, 113, 111],
       [121, 123, 126, ..., 121, 113, 111]], dtype=uint8)
```

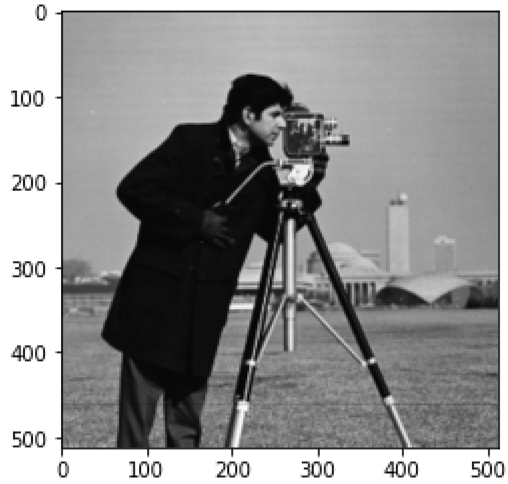
Let's visualize the image using **plt.imshow()** function followed by the function **plt.show()**

```
plt.imshow(camera)
plt.show()
```



Since this is a black and white image, the function **imshow()** needs an argument **cmap = 'gray'** to render it properly.

```
plt.imshow(camera, cmap = 'gray')
plt.show()
```



Let's Read a color image

You can read in the image by uploading the image 'hello.png' to the **Files** Tab on the left. Then read the image using the **io.imread()** function.

```
hello = io.imread('hello.png')
```

If you are unable to upload files (mobile users), You can use a link to load the image. Here the image link is: https://raw.githubusercontent.com/suhailnajeeb/ete-ice-472/master/experiment-1/hello.png

```
hello = io.imread('https://raw.githubusercontent.com/suhailnajeeb/ete-ice-472/master/experime
```

```
type(hello)
```

```
numpy.ndarray
```

```
hello.shape
```

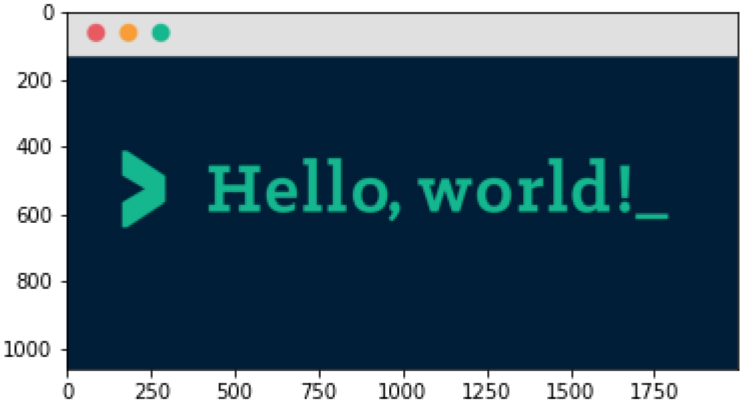
```
(1062, 2000, 3)
```

As you can see, the last value of the **shape** i.e. the dimension of the matrix **hello** is 3, which indicates that this is a color image. Let's also take a look at the image:

```
hello
```

```
array([[[224, 224, 224],
        [224, 224, 224],
        [224, 224, 224],
        ...,
        [224, 224, 224],
        [224, 224, 224],
        [224, 224, 224]],

       [[224, 224, 224],
        [224, 224, 224],
        [224, 224, 224],
        ...,
        [224, 224, 224],
        [224, 224, 224],
        [224, 224, 224]],

       [[224, 224, 224],
        [224, 224, 224],
        [224, 224, 224],
        ...,
        [224, 224, 224],
        [224, 224, 224],
        [224, 224, 224]],

       ...,

       [[  0,  30,  56],
        [  0,  30,  56],
        [  0,  30,  56],
        ...,
        [  0,  30,  56],
        [  0,  30,  56],
        [  0,  30,  56]],

       [[  0,  30,  56],
        [  0,  30,  56],
        [  0,  30,  56],
        ...,
        [  0,  30,  56],
        [  0,  30,  56],
        [  0,  30,  56]],

       [[  0,  30,  56],
        [  0,  30,  56],
        [  0,  30,  56],
        ...,
        [  0,  30,  56],
        [  0,  30,  56],
```

```
plt.imshow(hello)
plt.show()
```



Resizing Image:

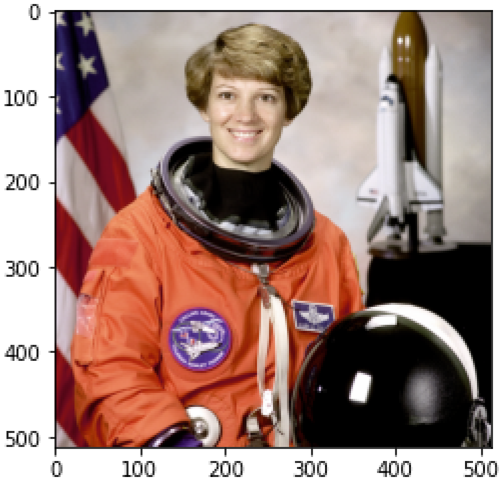
```
astro_img = data.astronaut()
```

```
astro_img.shape
```

```
(512, 512, 3)
```

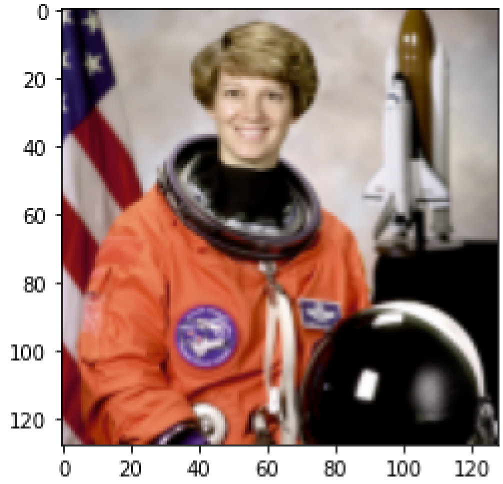
```
plt.imshow(astro_img)
```

```
<matplotlib.image.AxesImage at 0x7f23959e5ba8>
```



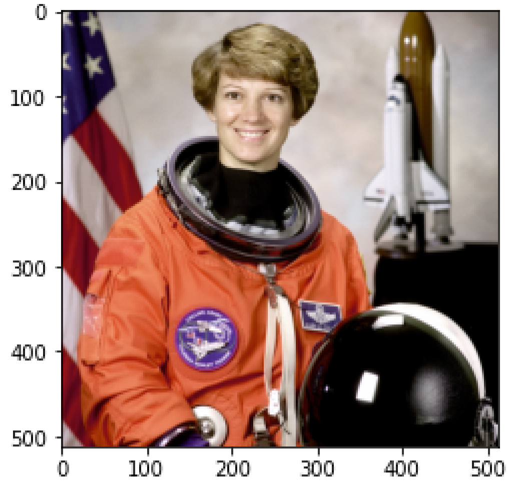
the **resize** function is used to resize the image to a certain new shape. For example, here we resize the image to the new shape: **(128, 128, 3)**

```
resized_img = resize(astro_img, (128, 128, 3))
plt.imshow(resized_img)
plt.show()
```



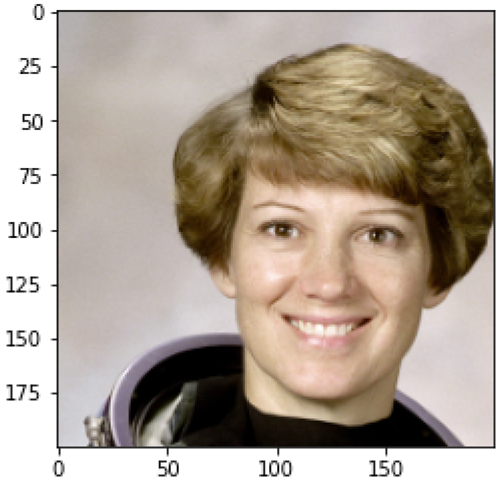
Slicing/Cropping an Image:

```
plt.imshow(astro_img)
plt.show()
```



We can also crop an image file using its **indices**. For example, `img[0:200, 100:300]` crops the image from 0 to 200 pixels along x axis and 100 to 300 along y axis.

```
cropped_img = astro_img[0:200, 100:300]
plt.imshow(cropped_img)
plt.show()
```



Storing Image to File:

The **io.imsave()** function is used to store the image. The first argument is the file name & the second argument is the image array to be stored.

```
io.imsave('astro_face.jpg', cropped_img)
```

(2) Choose any image you wish (you can either upload the image file or you can load it with a link) and perform the following operations:

Solution to Problem (2):

```
import skimage
from skimage import data
import matplotlib.pyplot as plt
from skimage import io
from skimage.transform import resize
```

Loading the image into python

```
flower = io.imread('flower.jpg')
```

Checking the shape of the image

```
flower.shape
```

```
(650, 1000, 3)
```

Displaying the image

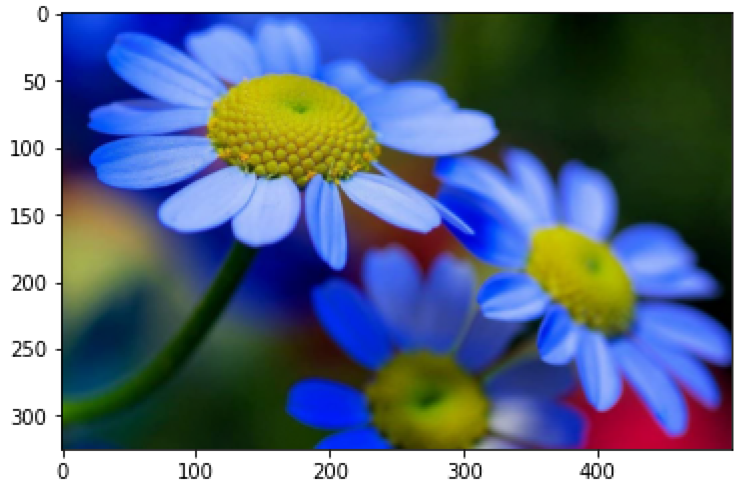
```
plt.imshow(flower)
plt.show()
```

Resizing the image into 1/2 of its original shape

```
resized_flower = resize(flower, (flower.shape[0]//2, flower.shape[1]//2, 3))
```

Showing the image on screen

```
plt.imshow(resized_flower)
plt.show()
```

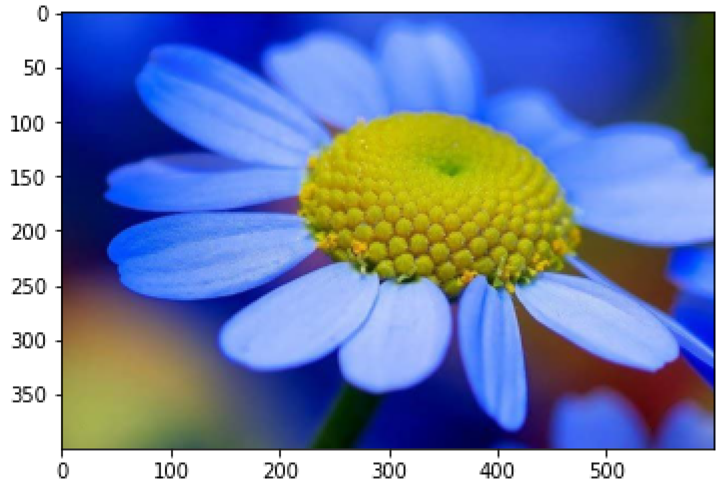


Croping a portion of the image

```
cropped_flower = flower[0:400, 0:600]
```

Showing the cropped image on screen

```
plt.imshow(cropped_flower)
plt.show()
```



Saving the image into an image file named 'output.jpg'

```
io.imsave('output.jpg', cropped_flower)
```

Discussion:

In this experiment, I have learn about basic image manipulations in python. I have learn the python libraries for image manipulation. I have learn how to load a sample image from scikit image data library, upload image and use a link to load image. I learn how to see the shape of the image where I can see either the image is 2-dimentional or 3-dimentional. If it is 2-dimentional then it is black & white image and if it is 3-dimentional then it is color image. I also have learn how to resize, crop, visualize and save an image. At last, now I can do any kind of image manipulations in python.