ECE4580_HW1

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ECE 4580 Digital Image Processing HW1 - Hiten Kothari

[13]:
```
from google.colab import drive
from skimage import io,data
from skimage.color import rgb2gray
import numpy as np
import matplotlib.pyplot as plt

drive.mount('/content/drive')
```

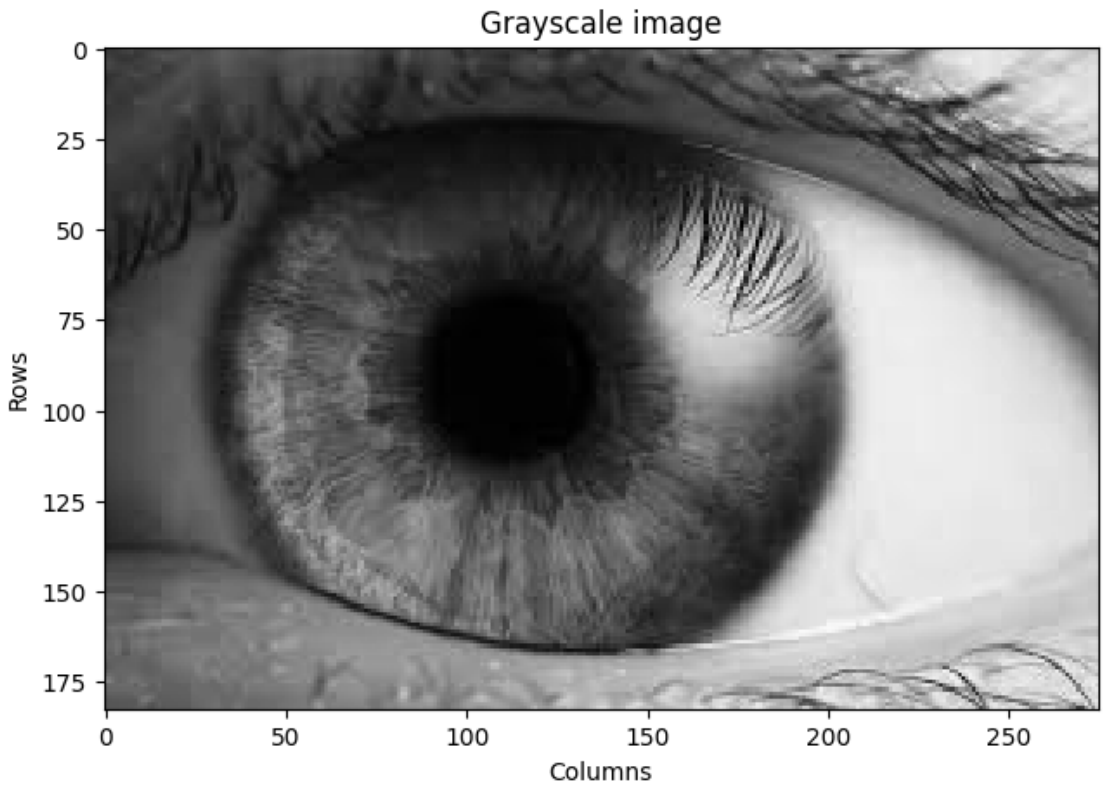
```
Drive already mounted at /content/drive; to attempt to forcibly remount, call
drive.mount("/content/drive", force_remount=True).
```

PART I: Image Operations

[14]:
```
#Reading image and printing its shapes
image= io.imread('/content/drive/MyDrive/Images/eye1.jpg')
print(f'rows: {image.shape[0]} \ncolumns: {image.shape[1]} \nplanes: {image.
  ↪shape[2]}')
rows= image.shape[0]
cols= image.shape[1]
plane = image.shape[2]
```

```
rows: 183
columns: 275
planes: 3
```

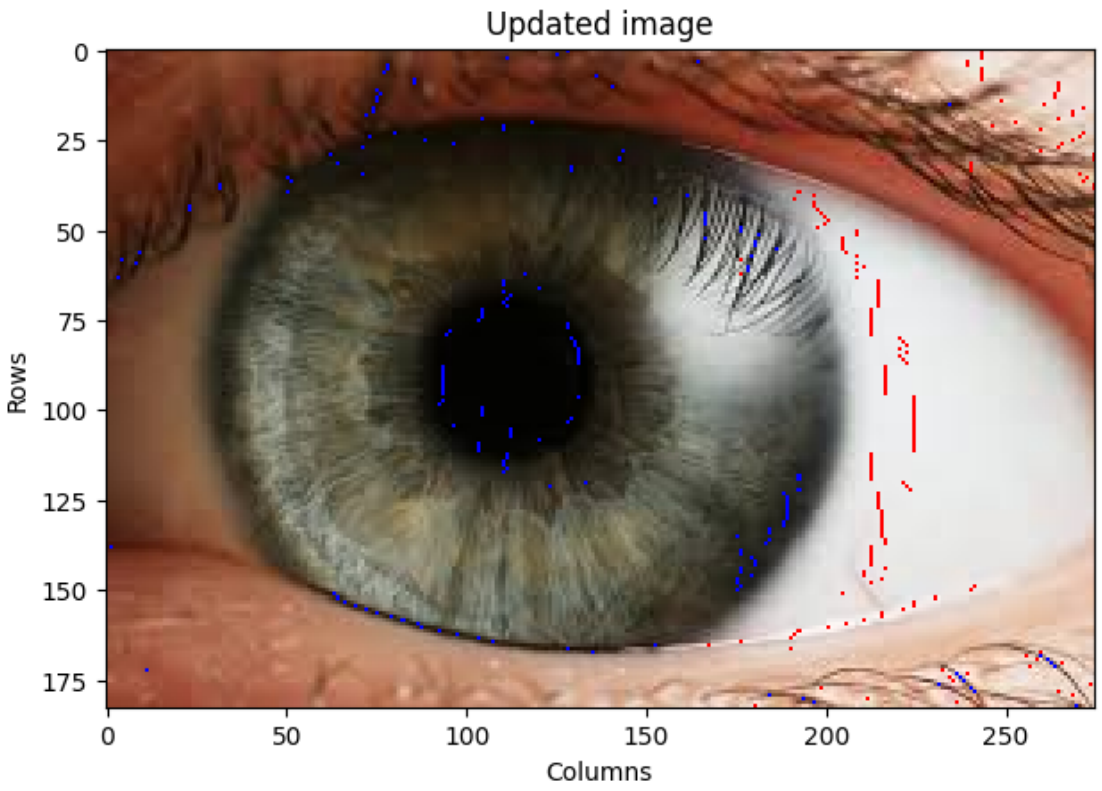
[15]:
```
#Making grayscaled image by taking mean of each pixels using vectorization
grayscale_image = np.mean(image,axis=2,keepdims=True).astype(np.uint8)
io.imshow(grayscale_image)
plt.title("Grayscale image")
plt.xlabel("Columns")
plt.ylabel("Rows")
plt.show() #using matplotlib to put captions on image
```



[16]:
```
# finding brightest and darkest pixel in each row and coloring it red and blue␣
 ↪respectively
for r in range(rows):
  brightest = np.max(grayscale_image[r][:])
  brightest_col,z = np.where(grayscale_image[r][:]==brightest)
  darkest = np.min(grayscale_image[r][:])
  darkest_col,z = np.where(grayscale_image[r][:]==darkest)
  image[r][brightest_col[0]]=[255, 0, 0]
  image[r][darkest_col[0]]=[0, 0, 255]

plt.title("Updated image")
plt.xlabel("Columns")
plt.ylabel("Rows") #using matplotlib to put captions on image
io.imshow(image)
```

[16]: <matplotlib.image.AxesImage at 0x78a1205265f0>



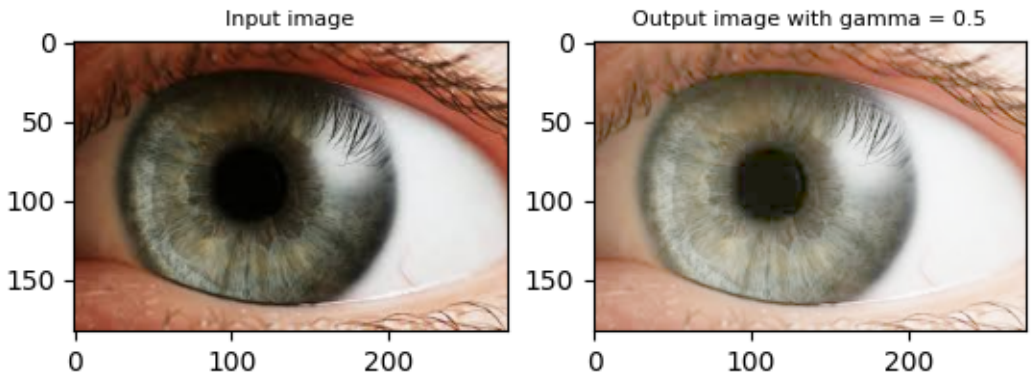
PART II: Power Law Transformation

[17]:
```
def pl_transformation(input_image, gamma):
  output_image = (((input_image.astype(float)/255)**gamma)*255).astype(np.uint8)
  return output_image
```

[18]:
```
test_image_1 = io.imread('/content/drive/MyDrive/Images/eye1.jpg')
out_1 = pl_transformation(test_image_1, 0.5)

ax = plt.subplot(121)
plt.title("Input image",fontsize=8)
plt.imshow(test_image_1)
plt.subplot(122)
plt.title("Output image with gamma = 0.5",fontsize=8)
plt.imshow(out_1)
```

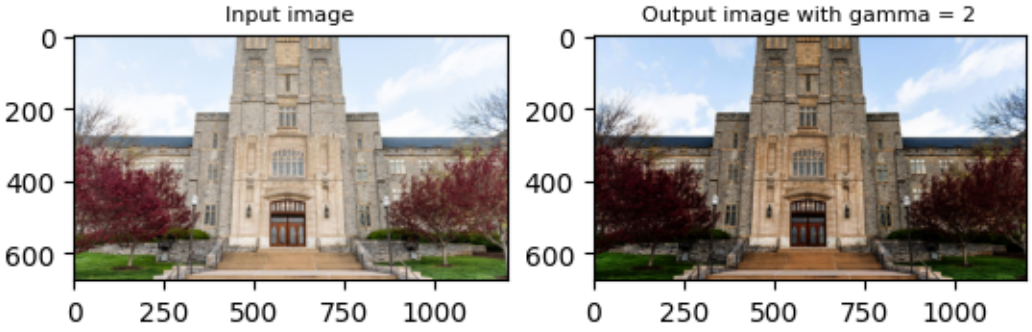
[18]:
```
<matplotlib.image.AxesImage at 0x78a1203ce620>
```



[19]:
```
test_image_2 = io.imread('/content/drive/MyDrive/Images/burruss.jpg')
out_2 = pl_transformation(test_image_2, 2)

ax = plt.subplot(121)
plt.title("Input image",fontsize=8)
plt.imshow(test_image_2)
plt.subplot(122)
plt.title("Output image with gamma = 2",fontsize=8)
plt.imshow(out_2)
```

[19]:
```
<matplotlib.image.AxesImage at 0x78a120468280>
```

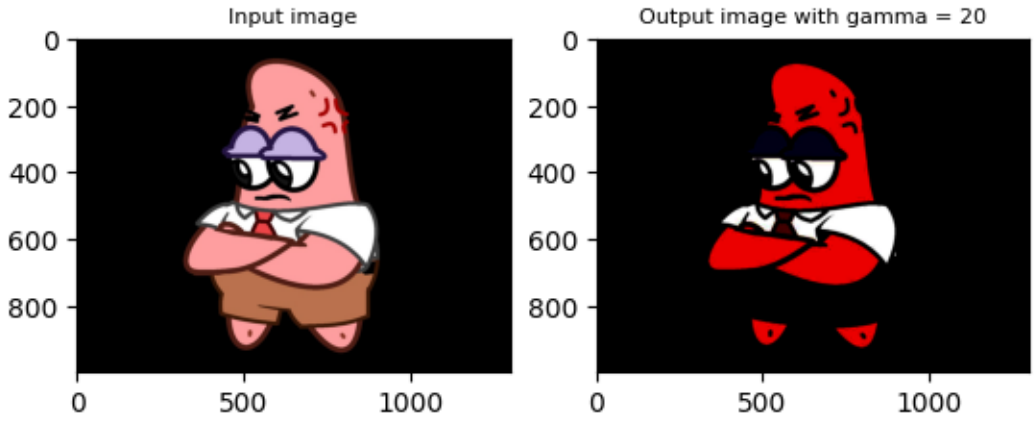


[20]:
```
test_image_3 = io.imread('/content/drive/MyDrive/Images/sad_patrick.jpeg')
out_3 = pl_transformation(test_image_3, 20)

ax = plt.subplot(121)
plt.title("Input image",fontsize=8)
plt.imshow(test_image_3)
plt.subplot(122)
plt.title("Output image with gamma = 20",fontsize=8)
```

```
plt.imshow(out_3)
```

[20]: <matplotlib.image.AxesImage at 0x78a120335c30>



Citations: 1. Burruss Hall Image: https://www.google.com/url?sa=i&url=https%3A%2F%2Fwww.cnn.com%2F20
tech-dorm-rename%2Findex.html&psig=AOvVaw1bEbevpLaKB2rzHBqX6NLe&ust=1693525903470000&source=
DJhYEDFQAAAAAdAAAAABAJ

[ ]:
```
!apt-get -qq install texlive texlive-xetex texlive-latex-extra pandoc
!pip install --quiet pypandoc
```

[21]:
```
#to generate pdf from notebook
!jupyter nbconvert --to PDF "/content/drive/MyDrive/Colab Notebooks/ECE4580_HW1.
↪ipynb"
```

```
[NbConvertApp] Converting notebook /content/drive/MyDrive/Colab
Notebooks/ECE4580_HW1.ipynb to PDF
[NbConvertApp] Support files will be in ECE4580_HW1_files/
[NbConvertApp] Making directory ./ECE4580_HW1_files
[NbConvertApp] Making directory ./ECE4580_HW1_files
[NbConvertApp] Making directory ./ECE4580_HW1_files
[NbConvertApp] Making directory ./ECE4580_HW1_files
[NbConvertApp] Making directory ./ECE4580_HW1_files
[NbConvertApp] Writing 49133 bytes to notebook.tex
[NbConvertApp] Building PDF
[NbConvertApp] Running xelatex 3 times: ['xelatex', 'notebook.tex', '-quiet']
[NbConvertApp] Running bibtex 1 time: ['bibtex', 'notebook']
[NbConvertApp] WARNING | bibtex had problems, most likely because there were no
citations
[NbConvertApp] PDF successfully created
[NbConvertApp] Writing 496536 bytes to /content/drive/MyDrive/Colab
Notebooks/ECE4580_HW1.pdf
```