# 190622R_a01

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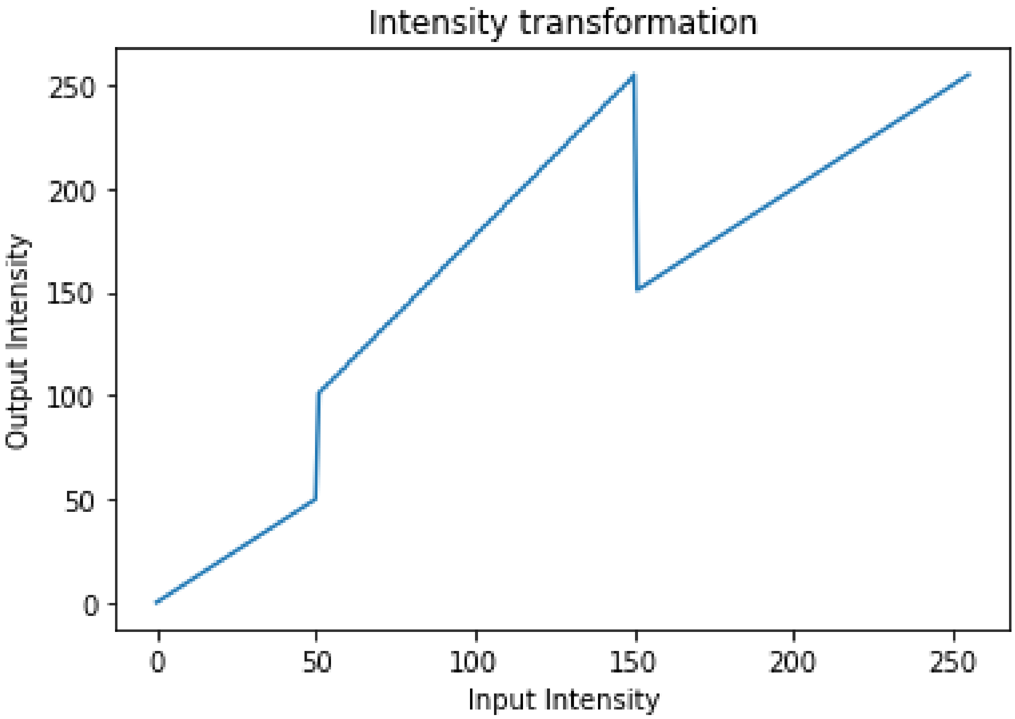
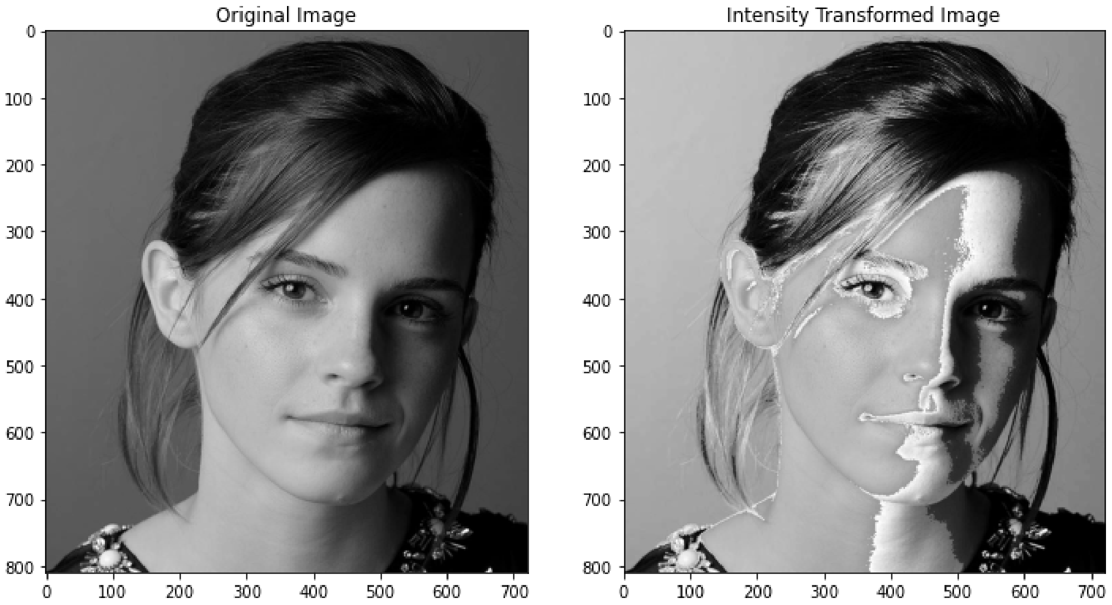
## 2 Index No. : 190622R

Question 01

[ ]:

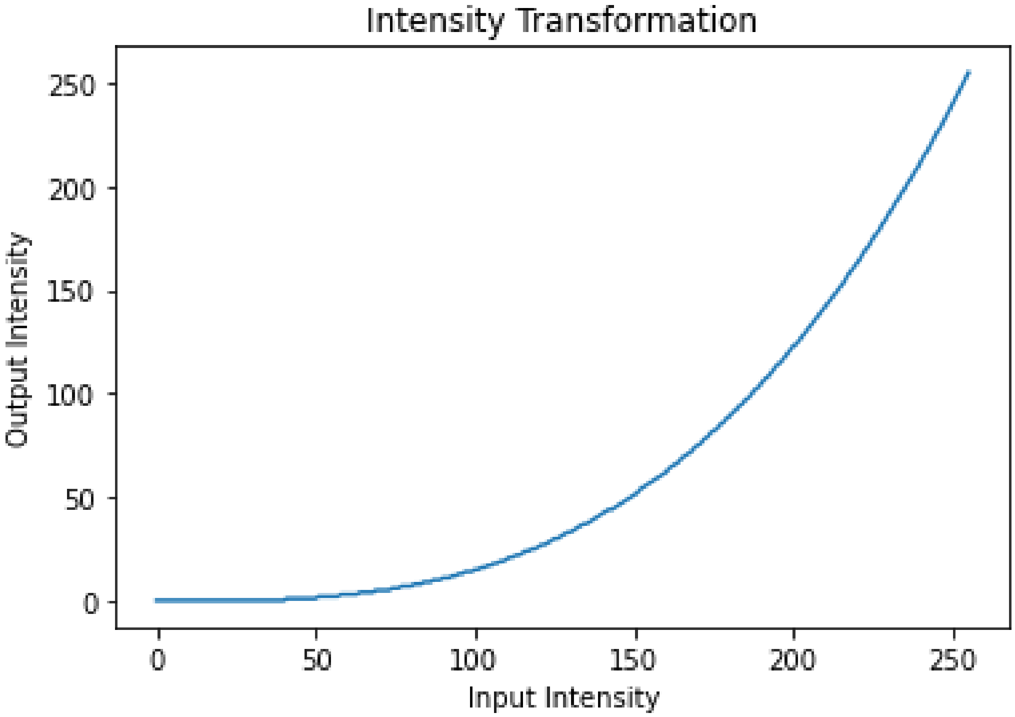
```python
import numpy as np
import cv2 as cv
import matplotlib.pyplot as plt

array_1 = np.array([ i for i in range(0,51)])
array_2 = np.array([ (155 / 100) * (i - 50) + 100 for i in range(51,151)])
array_3 = np.array([i for i in range(151,256)])
transform = np.concatenate((array_1, array_2, array_3),axis=0).astype(np.uint8)

fig, ax = plt.subplots()
ax.plot(transform)
ax.set_title("Intensity transformation")
ax.set_xlabel("Input Intensity")
ax.set_ylabel("Output Intensity")

im = cv.imread(r"emma_gray.jpg", cv.IMREAD_GRAYSCALE)
assert im is not None

transformed_image = cv.LUT(im, transform)

fig, ax = plt.subplots(1, 2, figsize=(12, 8))
ax[0].imshow(im, cmap="gray", vmin=0, vmax=255)
ax[0].set_title("Original Image")
ax[1].imshow(transformed_image, cmap="gray", vmin=0, vmax=255)
ax[1].set_title("Intensity Transformed Image")
plt.show()
```

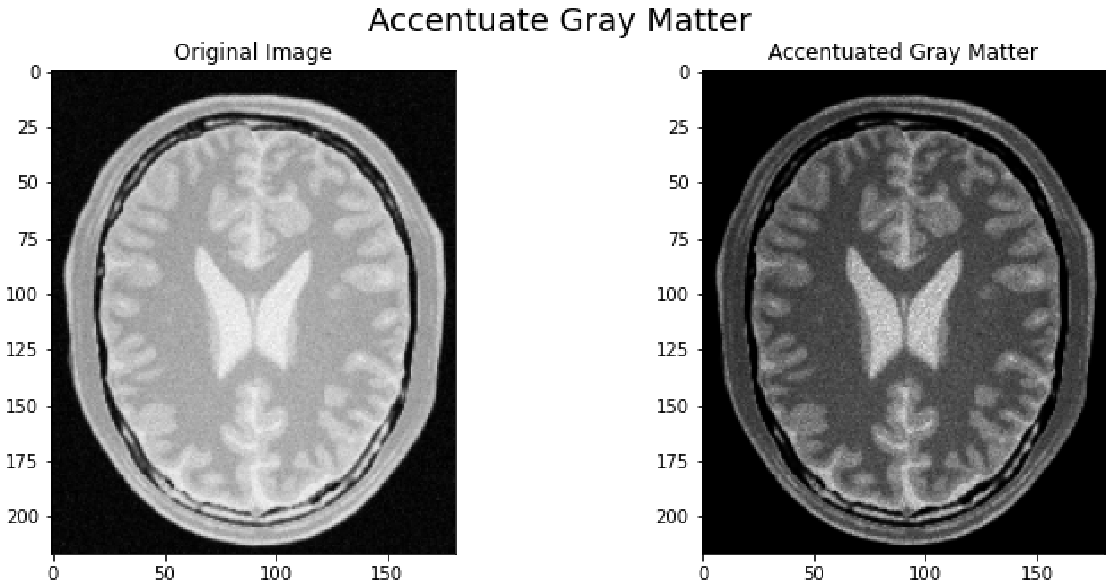

Intensity transformation
Output Intensity
Input Intensity
0
50
100
150
200
250
0
50
100
150
200
250


Original Image
Intensity Transformed Image
0
100
200
300
400
500
600
700
800

Question 02

```
[ ]: im = cv.imread(r"brain_proton_density_slice.png", cv.IMREAD_GRAYSCALE)
     assert im is not None

     # accentuate white matter
     white_transform = np.array([((i / 255) ** 3) * 255 for i in␣
      ↪range(0,256)],dtype=np.uint8)
     white_transformed_image = cv.LUT(im, white_transform)

     fig, ax = plt.subplots()
     ax.plot(white_transform)
     ax.set_title("Intensity Transformation")
     ax.set_xlabel("Input Intensity")
     ax.set_ylabel("Output Intensity")
     plt.show()

     fig, ax = plt.subplots(1, 2, figsize=(12, 5))
     fig.suptitle("Accentuate Gray Matter", fontsize=18)
     ax[0].imshow(im, cmap="gray", vmin=0, vmax=255)
     ax[0].set_title("Original Image")
     ax[1].imshow(white_transformed_image, cmap="gray", vmin=0, vmax=255)
     ax[1].set_title("Accentuated Gray Matter")
     plt.show()
```



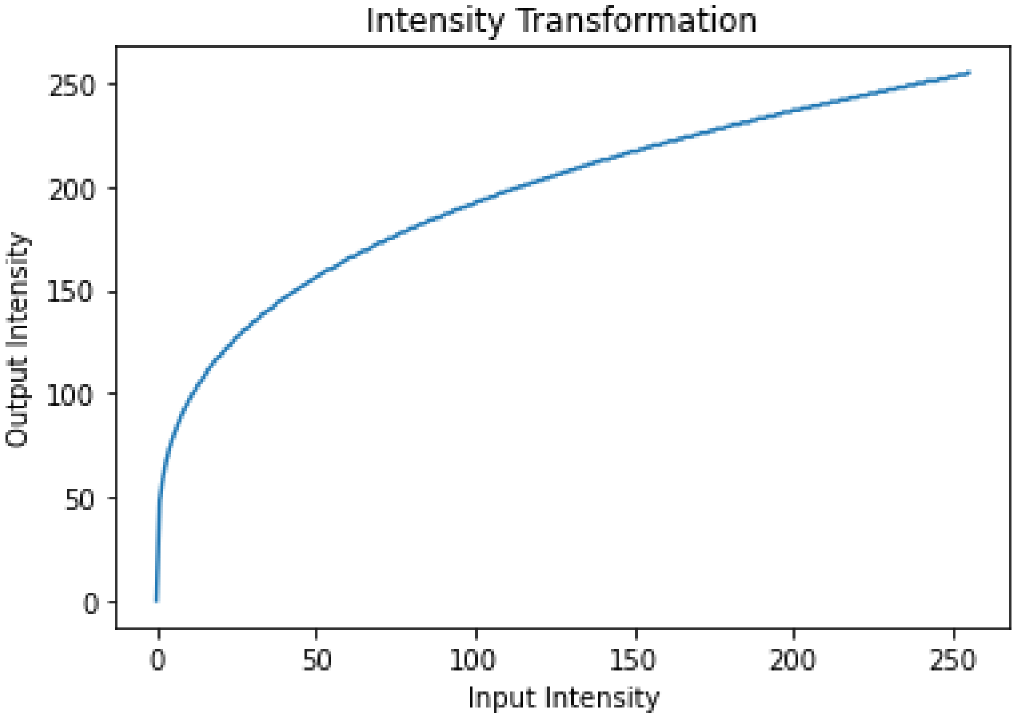


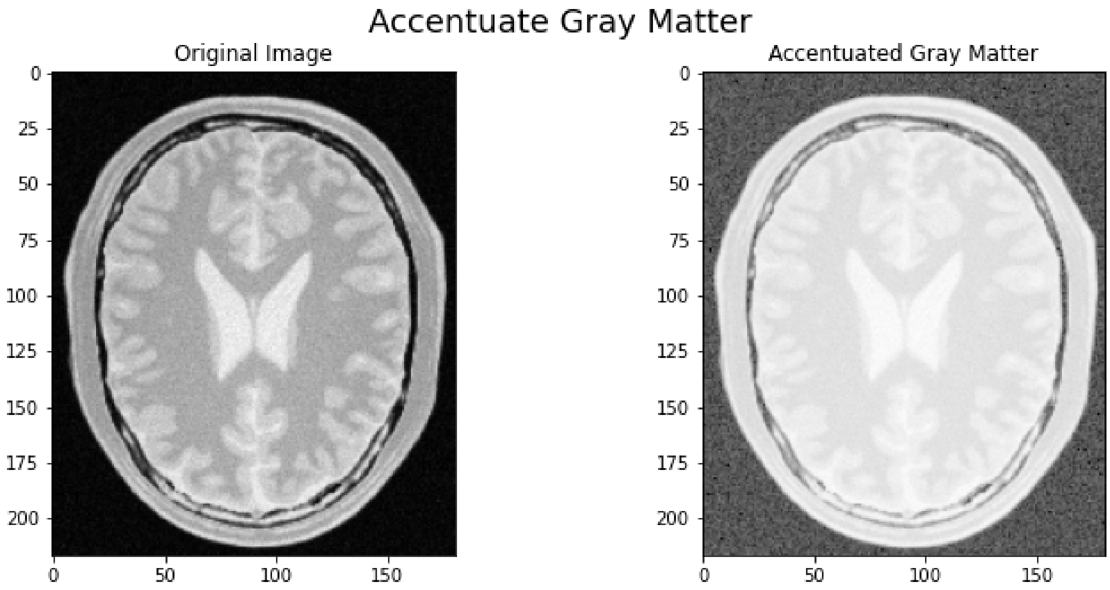
[ ]:

```
gray_transform = np.array([((i / 255) ** 0.3) * 255 for i in range(0,256)],dtype=np.uint8)
gray_transformed_image = cv.LUT(im, gray_transform)

fig, ax = plt.subplots()
ax.plot(gray_transform)
ax.set_title("Intensity Transformation")
ax.set_xlabel("Input Intensity")
ax.set_ylabel("Output Intensity")
plt.show()

fig, ax = plt.subplots(1, 2, figsize=(12, 5))
fig.suptitle("Accentuate Gray Matter", fontsize=18)
ax[0].imshow(im, cmap="gray", vmin=0, vmax=255)
ax[0].set_title("Original Image")
ax[1].imshow(gray_transformed_image, cmap="gray", vmin=0, vmax=255)
ax[1].set_title("Accentuated Gray Matter")
plt.show()
```

[ ]:

```
Text(0.5, 1.0, 'Accentuated Gray Matter')
```



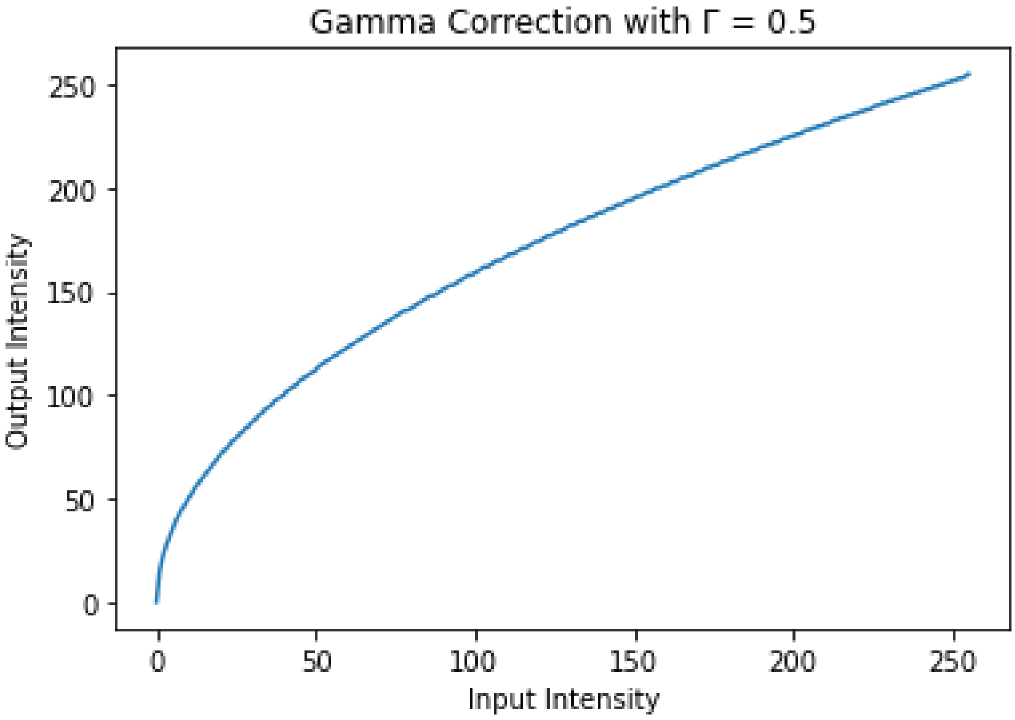


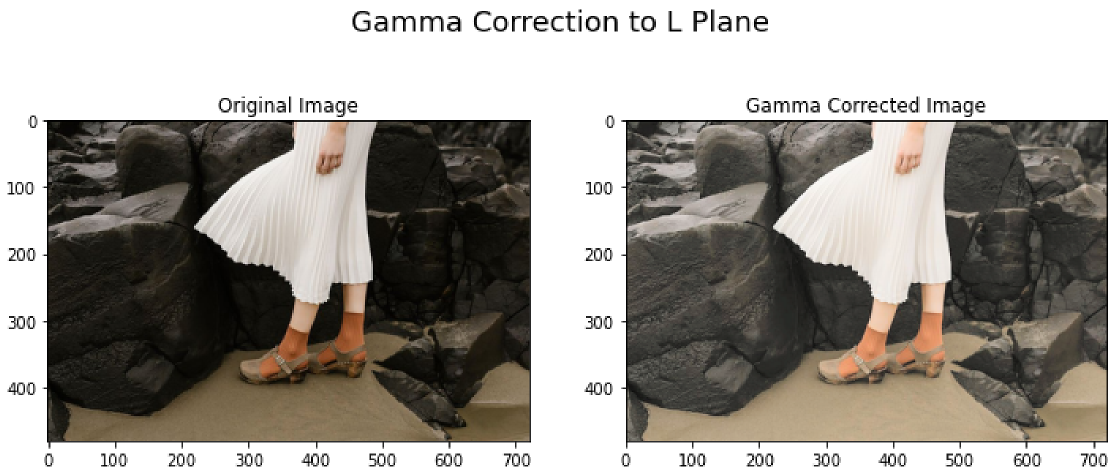
Question 03

[ ]:

```
im = cv.imread(r"highlights_and_shadows.jpg")
assert im is not None
```

```python
LAB_image = cv.cvtColor(im, cv.COLOR_BGR2LAB)
gamma = 0.5
gamma_correction = np.array([((i / 255) ** gamma) * 255 for i in range(0,256)],dtype=np.uint8)
LAB_image[:, :, 0] = cv.LUT(LAB_image[:, :, 0], gamma_correction)

fig, ax = plt.subplots()
ax.plot(gamma_correction)
ax.set_title("Gamma Correction with Γ = {}".format(gamma))
ax.set_xlabel("Input Intensity")
ax.set_ylabel("Output Intensity")
plt.show()

fig, ax = plt.subplots(1, 2, figsize=(12,5))
fig.suptitle("Gamma Correction to L Plane", fontsize=18)
ax[0].imshow(cv.cvtColor(im, cv.COLOR_BGR2RGB))
ax[0].set_title("Original Image")
ax[1].imshow(cv.cvtColor(LAB_image, cv.COLOR_LAB2RGB))
ax[1].set_title("Gamma Corrected Image")
plt.show()
```




Gamma Correction to L Plane
Original Image
Gamma Corrected Image
0
100
200
300
400
0
100
200
300
400
500
600
700