Importing required libraries

In [ ]:

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

Creating required function(Gaussian)

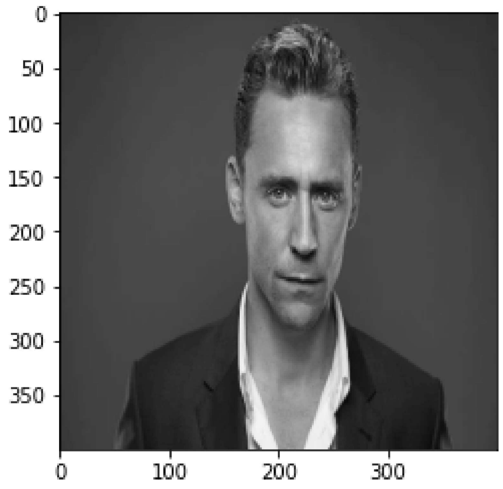
In [ ]:

```python
def _gaussian_kernel(size=5, sigma=1.0):

    shape = np.arange((-size // 2) + 1.0, (size // 2) + 1.0)
    x, y = np.meshgrid(shape, shape)
    kernel = np.exp(-(1/2) * (np.square(x) + np.square(y)) / np.square(sigma))

    return kernel / np.sum(kernel)
```

Input Image

In [ ]:

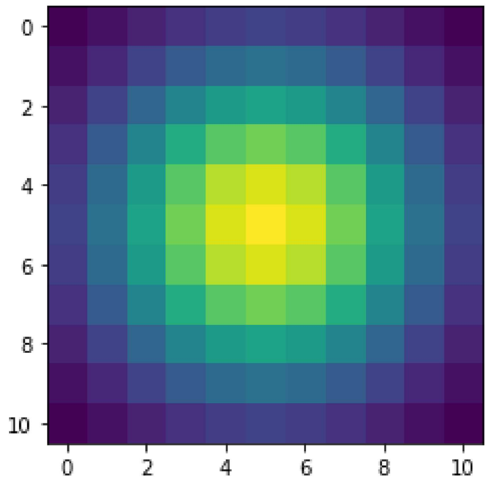
```python
path = "../img/loki.jpg"
inp_img = cv2.imread(path,cv2.IMREAD_GRAYSCALE)
img= cv2.resize(inp_img, (400, 400))

plt.imshow(img, "gray")
plt.show()
```



Generating Gaussian kernel

In [ ]:

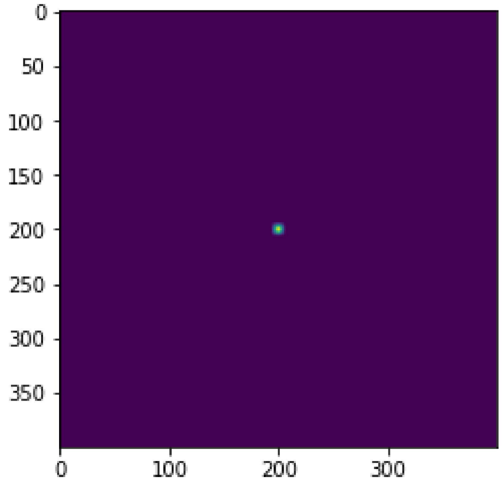
```python
kernel = _gaussian_kernel(size=11, sigma=3)
plt.imshow(kernel)
plt.show()
```



Padding Gaussian Kernel According to image

In [ ]:

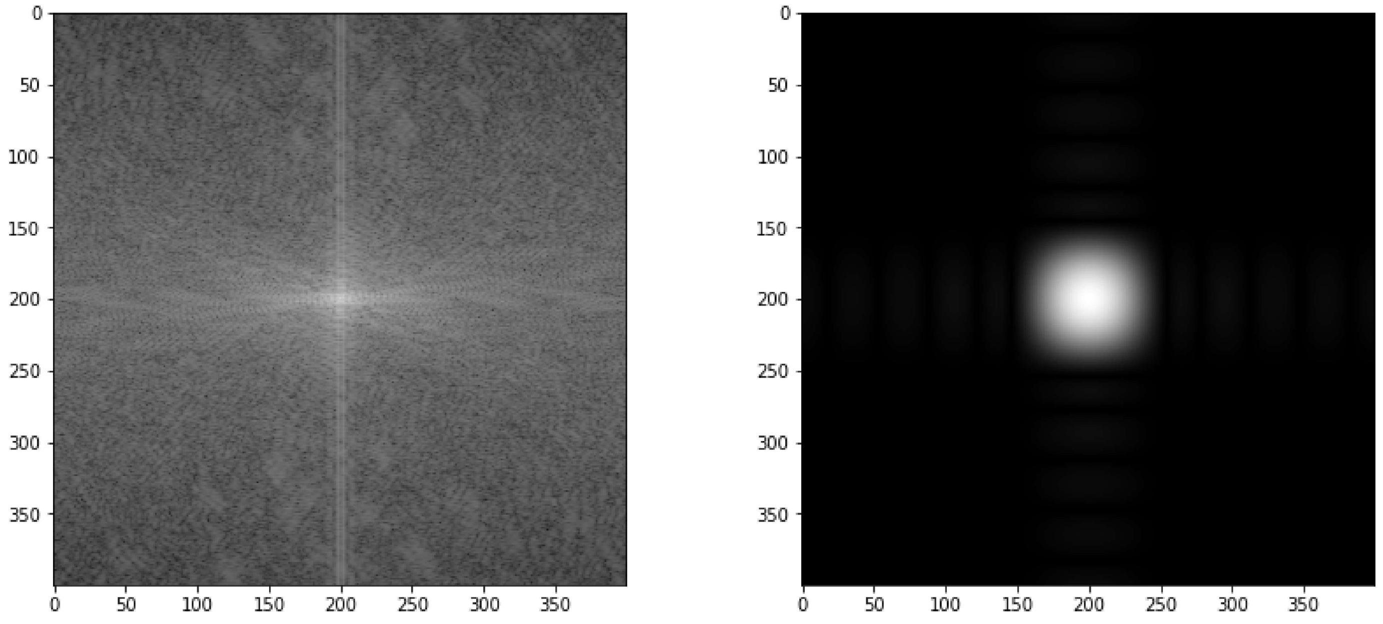
```
padding = int(img.shape[0]//2 - kernel.shape[0]//2)
padded_kernel = np.pad(kernel, (padding,padding-1), 'constant', constant_values=(0))
plt.imshow(padded_kernel)
plt.show()
```



Transforming both kernel and image into fourier domain

In [ ]:

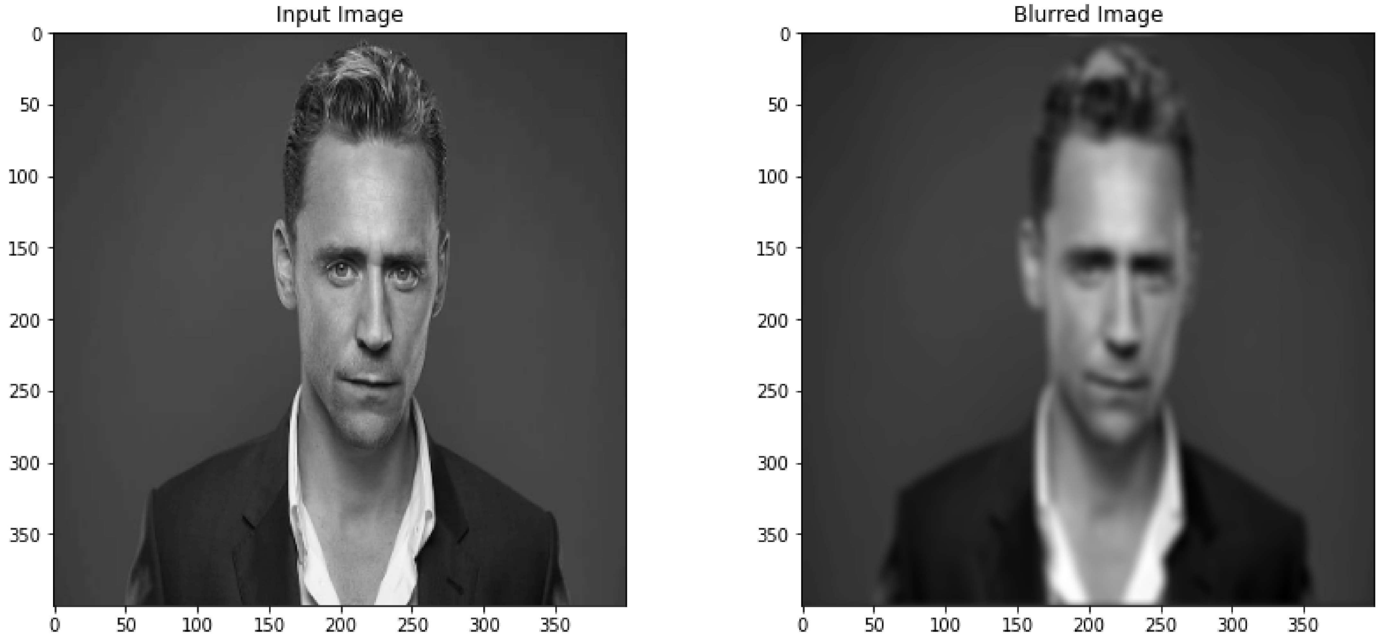
```
IMG = np.fft.fft2(img)
KERNEL = np.fft.fft2(padded_kernel)
IMG_SHIFT = np.fft.fftshift(np.log1p(np.abs(IMG)))
KERNEL_SHIFT = np.fft.fftshift(np.log1p(np.abs(KERNEL)))
figure, axis = plt.subplots(1,2, figsize=(14, 6))
axis[0].imshow(IMG_SHIFT, "gray")
axis[1].imshow(KERNEL_SHIFT, "gray")
plt.show()
```



Blurring the image with gaussian kernel

In [ ]:

```
Blurred_IMG = np.multiply(IMG,KERNEL)
B_IMG =np.fft.ifftshift( np.real(np.fft.ifft2(Blurred_IMG)))

figure, axis = plt.subplots(1,2, figsize=(14, 6))
axis[0].imshow(img, "gray")
axis[0].set_title("Input Image")

axis[1].imshow(B_IMG, "gray")

axis[1].set_title("Blurred Image")

plt.show()
```



Deconvoluting the blurred image and

transforming it back to spatial domain

In [ ]:

```
OUTPUT_IMG = np.divide(Blurred_IMG, KERNEL)
output_img = np.real(np.fft.ifft2(OUTPUT_IMG))
```

Comparing output result with input image

In [ ]:

```
figure, axis = plt.subplots(1,3, figsize=(20, 6))
axis[0].imshow(img, "gray")
axis[0].set_title("Input Image")
axis[1].imshow(B_IMG, "gray")

axis[1].set_title("Blurred Image")
axis[2].imshow(output_img, "gray")

axis[2].set_title("Output Image")

plt.show()
```