Excercise -04

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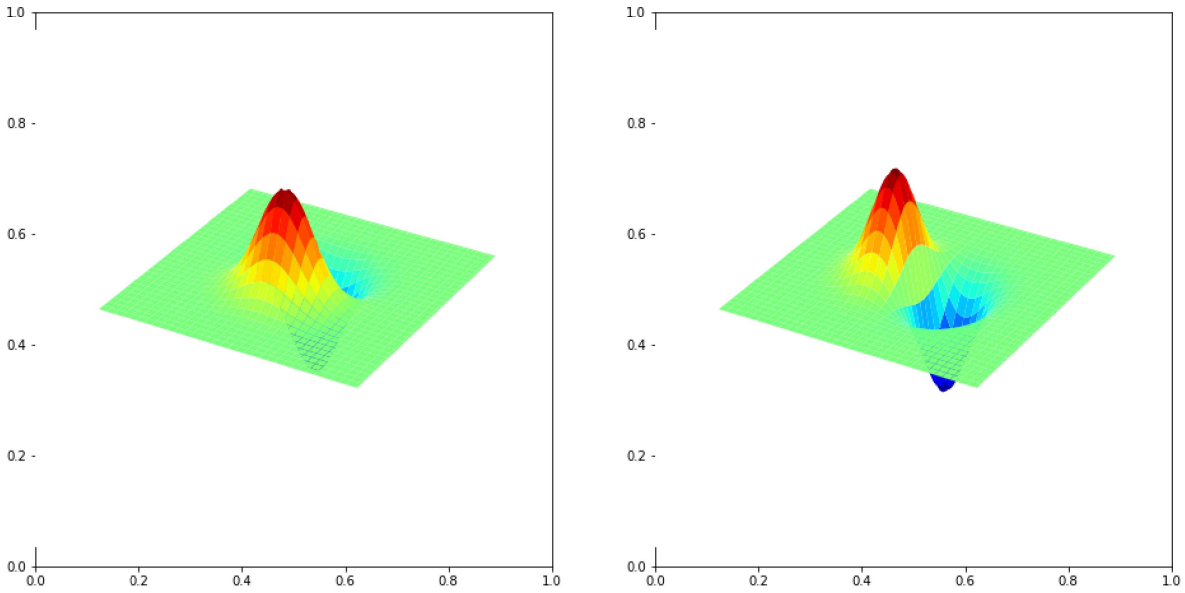
QUESTION-01

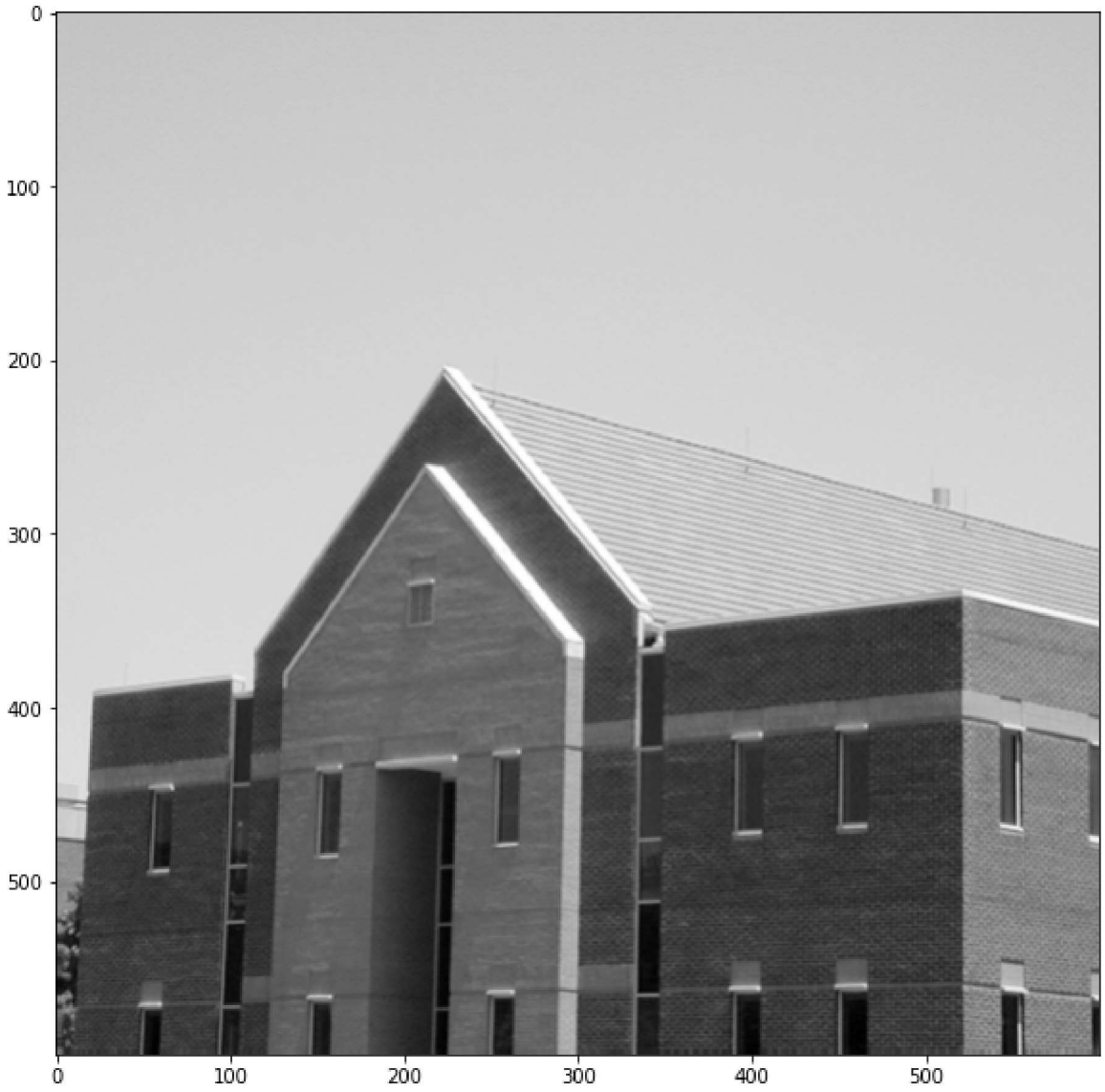
In [ ]:
```
import cv2 as cv
import matplotlib.pyplot as plt
import numpy as np
from mpl_toolkits.mplot3d import  Axes3D
from matplotlib import cm

fig,ax=plt.subplots(1,2,figsize=(16,8))
ax1=fig.add_subplot(121,projection='3d')
ax2=fig.add_subplot(122,projection='3d')

delta=0.1
xx,yy =np.meshgrid(np.arange(-5,5+delta,delta),np.arange(-5,5+delta,delta))

sigma =1;
g= np.exp(-(xx**2 +yy**2)/(2*sigma**2))
g/=np.sum(g)

sobel_v =np.array([[-1,-2,-1],[0,0,0],[1,2,1]],dtype=np.float32)
g_x=cv.filter2D(g,-1,sobel_v)
sobel_h =np.array([[-1,0,1],[-2,0,2],[-1,0,1]],dtype=np.float32)
g_y=cv.filter2D(g,-1,sobel_h)

surf1=ax1.plot_surface(xx,yy,g_x,cmap=cm.jet,linewidth=0,antialiased=True)
surf2=ax2.plot_surface(xx,yy,g_y,cmap=cm.jet,linewidth=0,antialiased=True)

ax1.axis('off')
ax2.axis('off')
plt.show()
```

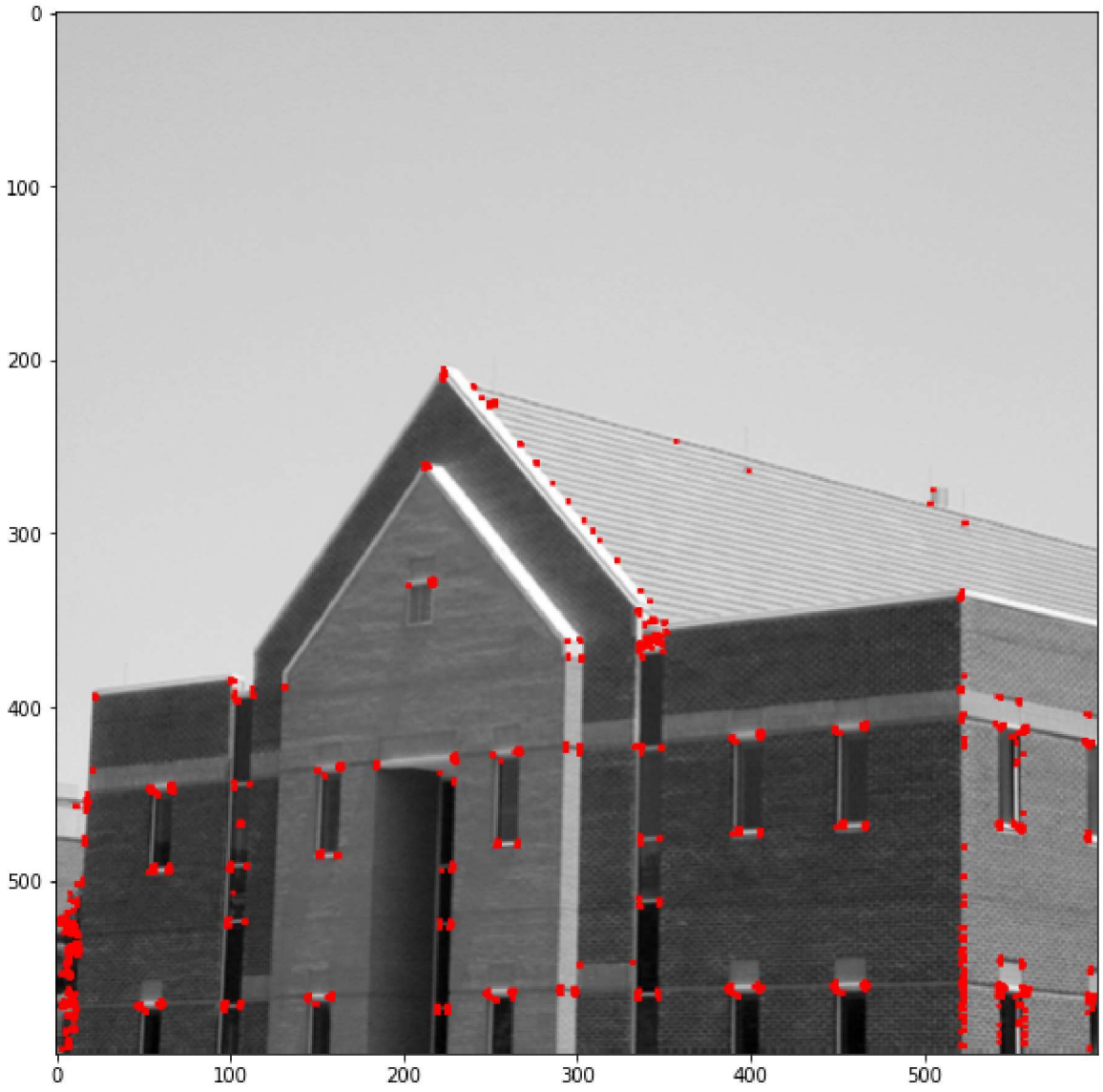



QUESTION-02

In [ ]:
```
img = cv.imread("building.tif")
plt.figure(figsize=(10,10))
plt.imshow(img)
plt.show()
```

```
gray = cv.cvtColor(img,cv.COLOR_BGR2GRAY)
gray = np.float32(gray)
dst = cv.cornerHarris(gray,2,3,0.04)
#result is dilated for marking the corners, not important
dst = cv.dilate(dst,None)
# Threshold for an optimal value, it may vary depending on the image.
img[dst>0.01*dst.max()]=[0,0,255]

plt.figure(figsize=(10,10))
plt.imshow(cv.cvtColor(img,cv.COLOR_BGR2RGB))

plt.show()
```



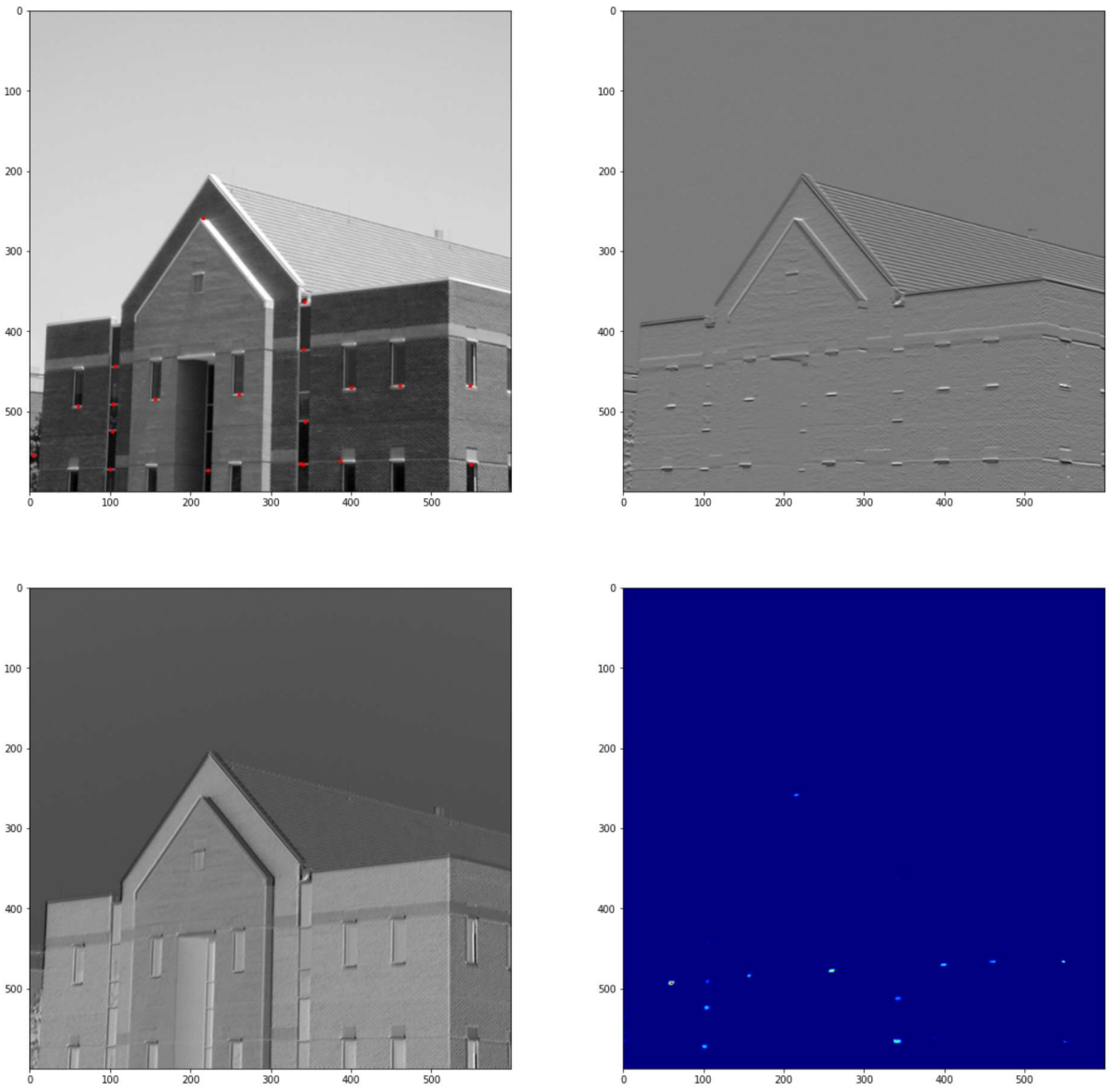



QUESTION-03

In [ ]:
```
from skimage.feature import peak_local_max

im =cv.imread('building.tif',cv.IMREAD_COLOR)

I = cv.cvtColor(im,cv.COLOR_BGR2GRAY)
I = np.float32(I)
sobel_v = np.array([[-1,-2,-1],[0,0,0],[1,2,1]],dtype=np.float32)
sobel_h = np.array([[-1,0,-1],[-2,0,2],[-1,0,1]],dtype=np.float32)

Ix = cv.filter2D(I, -1 ,sobel_v)
Iy = cv.filter2D(I, -1 ,sobel_h)

sigma =3
ksize =7

m11 = cv.GaussianBlur(Ix*Ix,(ksize,ksize),sigma)
m12 = cv.GaussianBlur(Iy*Iy,(ksize,ksize),sigma)

m21 = m12

m22 = cv.GaussianBlur(Iy*Iy,(ksize,ksize),sigma)

det = m11*m22 -m12*m21
trace = m11+m22
alpha = 0.04
```

```
R = det - alpha*trace**2

R[R<1e8]=0
coordinates = peak_local_max(R,min_distance =2)

fig ,ax =plt.subplots(2,2,figsize=(20,20))
ax[0,0].imshow(im,cmap='gray')
ax[0,0].plot(coordinates[:,1],coordinates[:,0],'r.')
ax[0,1].imshow(Ix+127,cmap='gray')
ax[1,0].imshow(Iy+127,cmap = 'gray')
ax[1,1].imshow(R+127,cmap=cm.jet)
```

Out[ ]: <matplotlib.image.AxesImage at 0x1f0ca9b7400>



QUESTION-04

In [ ]:
```
img = cv.imread('building.tif',0)
edges = cv.Canny(img,100,200)
plt.figure(figsize=(10,10))
plt.subplot(121),plt.imshow(img,cmap = 'gray')
plt.figure(figsize=(10,10))
plt.title('Original Image'), plt.xticks([]), plt.yticks([])
plt.subplot(122),plt.imshow(edges,cmap = 'gray')


plt.title('Edge Image'), plt.xticks([]), plt.yticks([])
```

Out[ ]: (Text(0.5, 1.0, 'Edge Image'), ([], []), ([], []))