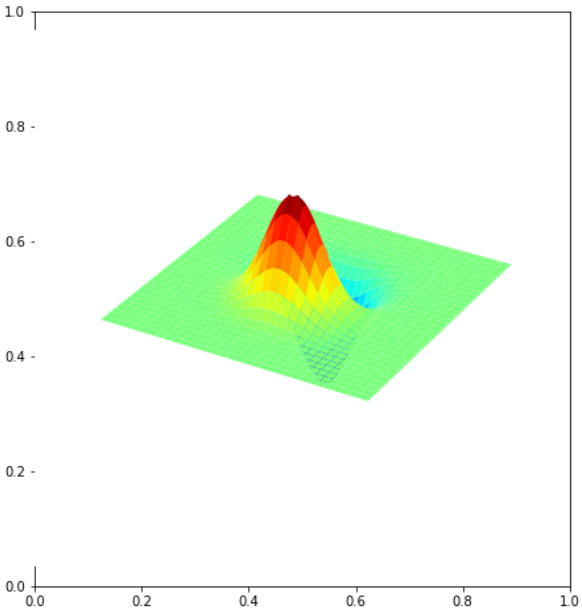
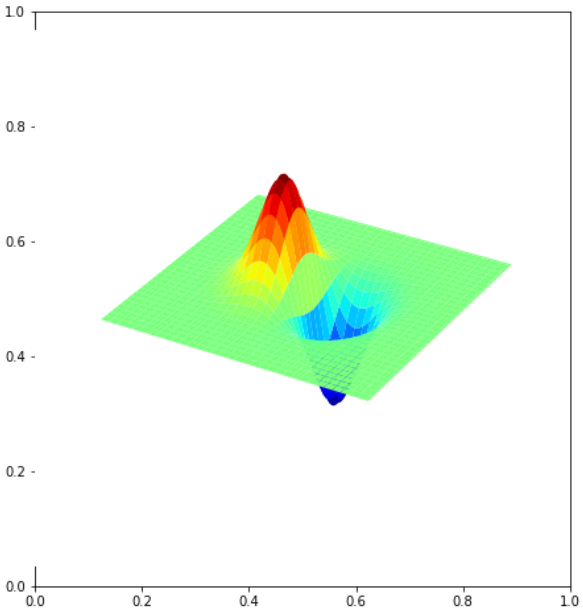
# 190432J

# Pathirana R.P.U.A.

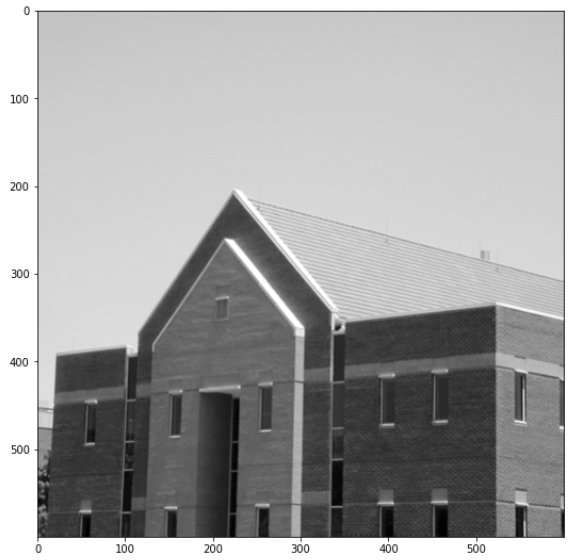
In [ ]:
```
import cv2 as cv
import matplotlib.pyplot as plt
import numpy as np
from mpl_toolkits.mplot3d import Axes3D
from matplotlib import cm

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()
```

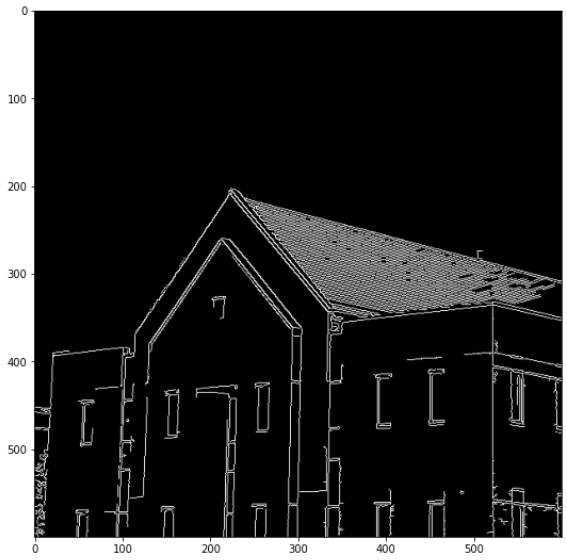


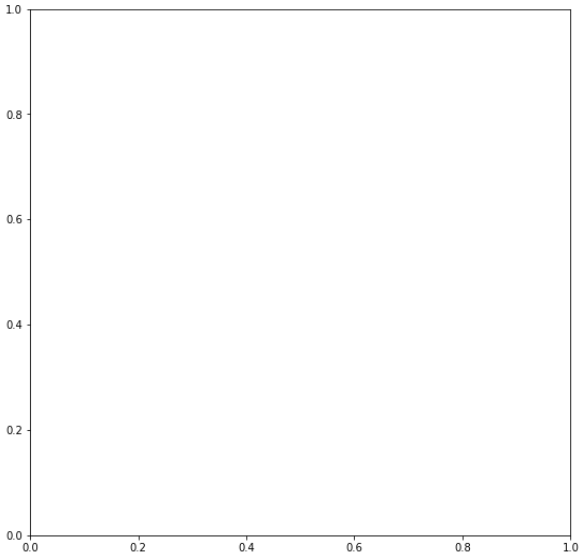



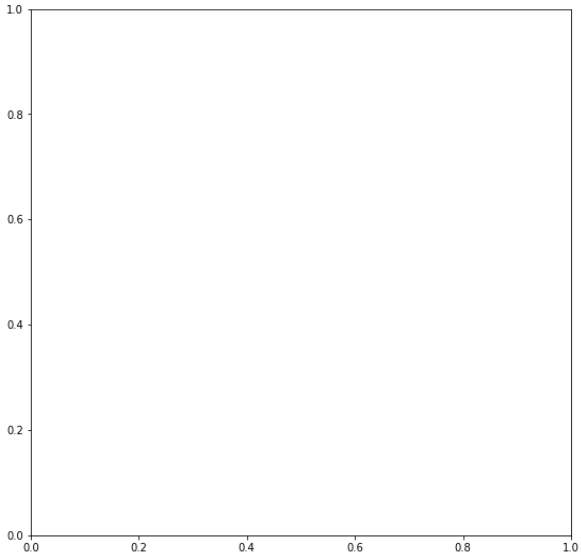

In [ ]:
```
import cv2 as cv
import matplotlib.pyplot as plt
import numpy as np

im = cv.imread('building.tif', cv.IMREAD_GRAYSCALE)
assert im is not None

edges = cv.Canny(im , 100 , 200) # image , low thesh , high thresh

fig , ax = plt.subplots(2,2, figsize = (20,20))
ax[0,0].imshow(im, cmap='gray')
ax[0,1].imshow(edges, cmap='gray')
```

Out[ ]:
```
<matplotlib.image.AxesImage at 0x1b2bfc53b50>
```



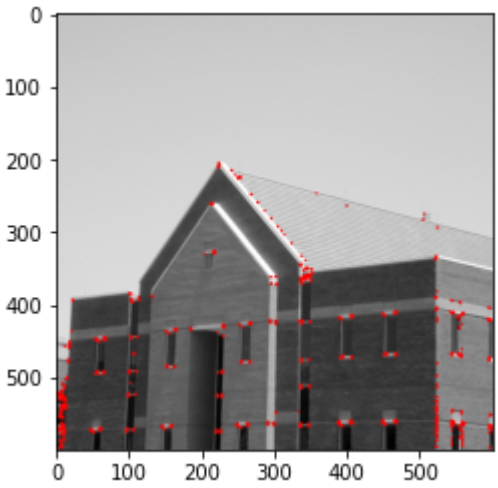



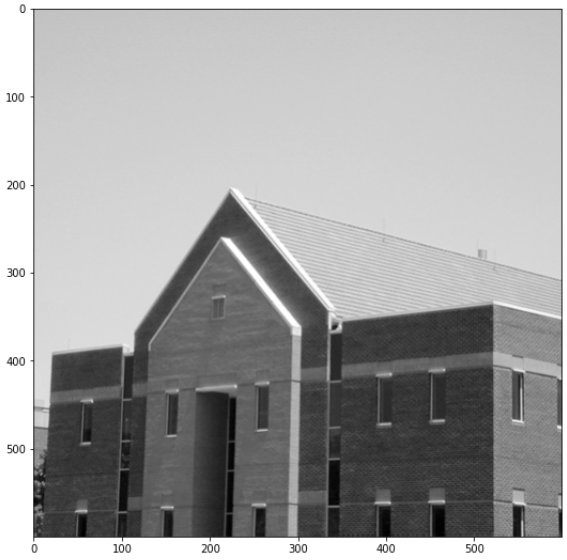



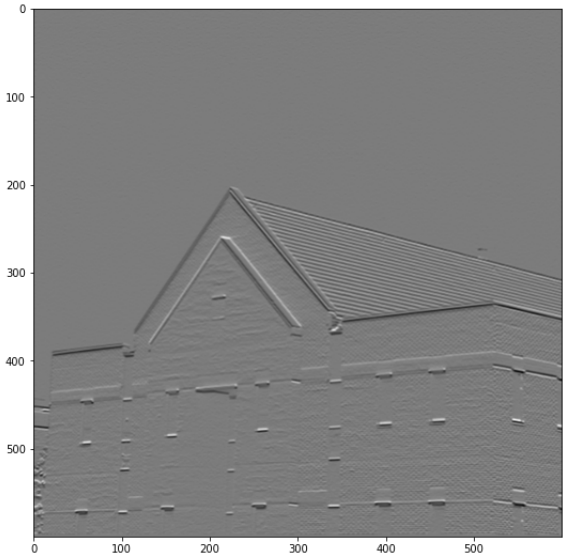

In [ ]:
```
import cv2 as cv
import matplotlib.pyplot as plt
import numpy as np

im = cv.imread('building.tif', cv.IMREAD_COLOR)
assert im is not None
gray = cv.cvtColor(im, cv.COLOR_BGR2GRAY)
gray = np.float32(gray)

dst = cv.cornerHarris(gray,2,3,0.04)

dst = cv.dilate(dst , None)
im[dst>0.01*dst.max()] = [0,0,255]

fig , ax = plt.subplots()
ax.imshow(cv.cvtColor(im,cv.COLOR_BGR2RGB ))
```

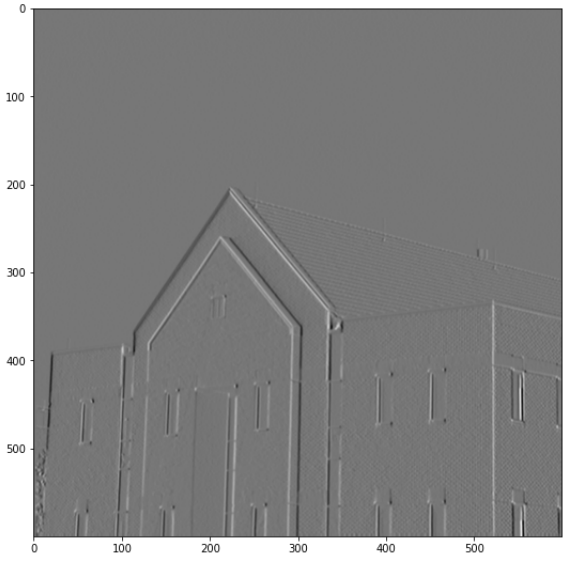
Out[ ]:
```
<matplotlib.image.AxesImage at 0x1b2c5abec80>
```

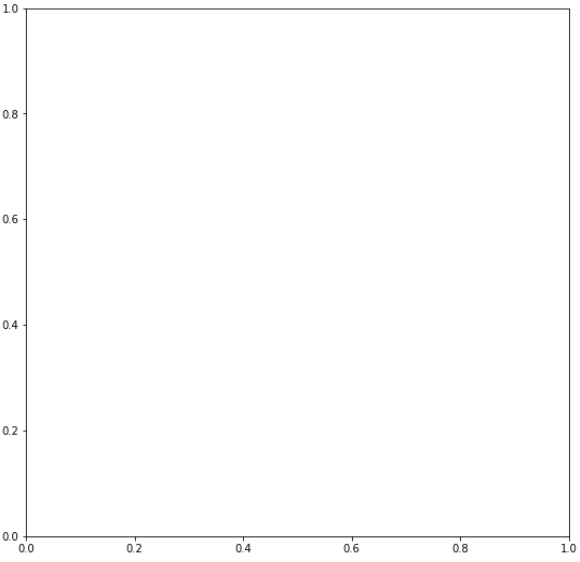



In [ ]:
```
import cv2 as cv
import matplotlib.pyplot as plt
import numpy as np
from skimage.feature import peak_local_max

img = cv.imread('building.tif', cv.IMREAD_COLOR)
assert im is not None



I=cv.cvtColor(img,cv.COLOR_BGR2GRAY)
I=np.float32(I)

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

sigma=3
ksize=7

m11=cv.GaussianBlur(Ix*Iy,(ksize,ksize),sigma)
m12=cv.GaussianBlur(Ix*Iy,(ksize,ksize),sigma)
m21=m12
m22=cv.GaussianBlur(Ix*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(img,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=plt.cm.jet)
plt.show()
```


0
100
200
300
400
500
0
100
200
300
400
500


0
100
200
300
400
500
0
100
200
300
400
500


0
100
200
300
400
500
0
100
200
300
400
500


1.0
0.8
0.6
0.4
0.2
0.0
0.0
0.2
0.4
0.6
0.8
1.0

In [ ]: