TASK1.3：彩图可以变素描

TASK 目标：本次任务的目的就是帮助你进一步强化对图像的数据化理解，并熟练掌握各种相关的代数预算。为此，请找一个有趣的图片，把它变成素描图像。具体要求是：（1）能够做出素描效果；（2）通过详细注释来解释你对每行代码的理解。

1.3、应用案例：素描画

In [1]:
```
from PIL import Image #导入库
photo=Image.open('./photos/tower.jpg') #导入照片
photo
```

Out[1]:

In [2]:
```
photogrey=photo.convert('L')   #调整灰度图像，每个像素用8个bit表示，0表示黑，255表示白，其他数字表示不同的灰度
photogrey
```

Out[2]:

In [3]:
```
import numpy as np  #导入numpy库
photogrey=np.array(photogrey)/255.0
photogrey.shape
```

Out[3]: (2976, 3968)

In [4]:
```
x,y=np.gradient(photogrey)
x.shape
```

Out[4]: (2976, 3968)

In [5]:
```
from matplotlib import pyplot as plt
plt.imshow(x)
```

Out[5]: <matplotlib.image.AxesImage at 0x7f53f7703400>

In [6]:
```
Im2=np.abs(x)*255
newIm=Image.fromarray(Im2.astype("uint8"))
newIm
```

Out[6]:

In [7]:
```
Im3=(1-np.abs(x))*255
newIm=Image.fromarray(Im3.astype('uint8'))
newIm
```

Out[7]:

In [8]:
```
Im4=(1-np.abs(x)**0.25)*255
newIm=Image.fromarray(Im4.astype('uint8'))
newIm
```

Out[8]:

In [1]:

```
from PIL import Image   #Image是PIL库中代表一个图像的类（对象）
photo=Image.open('F:/图片/与大黄.jpg')
photo
```

executed in 646ms, finished 08:19:42 2020-11-05

Out[1]:

In [2]:

```
photogrey=photo.convert('L')   # convert('L')表示转换为灰度图
photogrey
```

executed in 33ms, finished 08:20:19 2020-11-05

Out[2]:

In [3]:
```
import numpy as np
photogrey=np.array(photogrey)/255.0   #把图像格式转化为数组
photogrey.shape
```
executed in 61ms, finished 08:20:31 2020-11-05

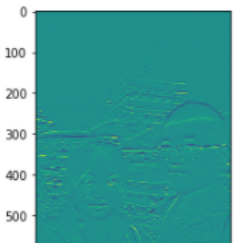
Out[3]: (640, 480)

In [4]:
```
x,y=np.gradient(photogrey)       #取图像灰度的梯度值
#返回N维数组的梯度。使用内部点中的二阶精确中心差和边界处的一阶或二阶精确边（向前或向后）差来计算梯度。
#因此，返回的渐变具有与输入数组相同的形状。
x.shape
```
executed in 27ms, finished 08:20:36 2020-11-05

Out[4]: (640, 480)

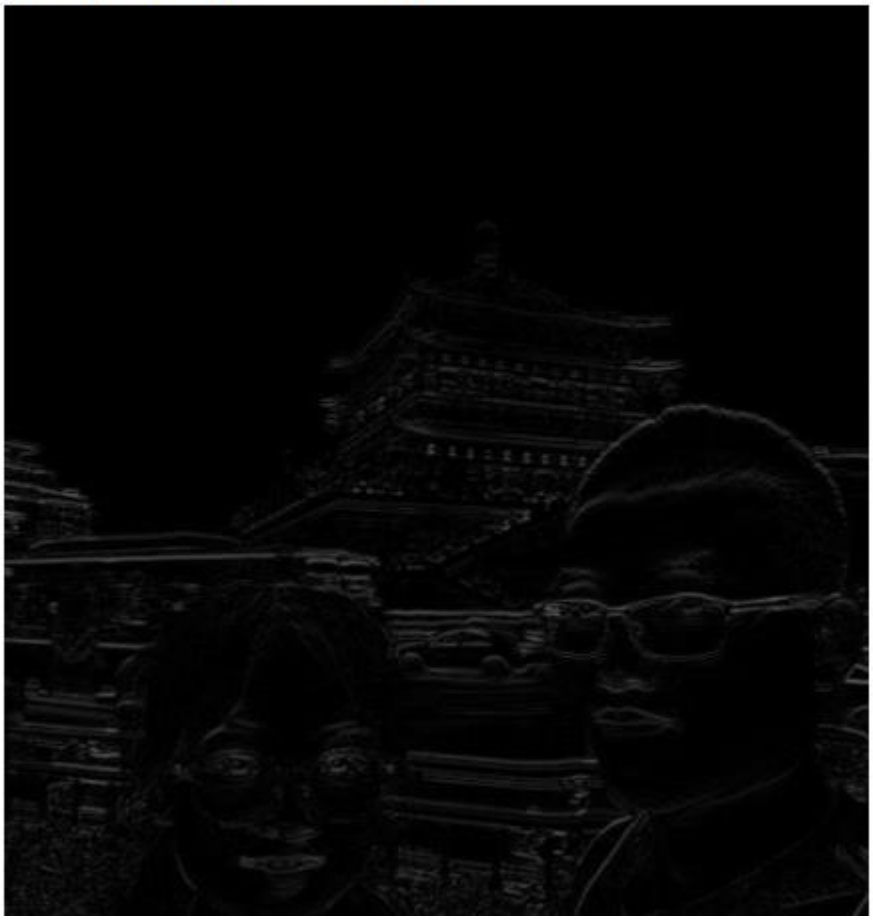
In [5]:
```
from matplotlib import pyplot as plt   #绘制蒙版
#创建图形，在图形中创建绘图区域，在绘图区域中绘制一些线条，用标签装饰绘图
plt.imshow(x)
```
executed in 2.54s, finished 08:20:46 2020-11-05

Out[5]: <matplotlib.image.AxesImage at 0x1bad3a6ffc8>



n [6]:
```
Im2=np.abs(x)*255    #取灰度图绝对值
newIm=Image.fromarray(Im2.astype("uint8"))
newIm
```
executed in 44ms, finished 08:20:57 2020-11-05

Out[6]:



In [7]:

```
Im3=(1-np.abs(x))*255    #取灰度图对立面的线条
newIm=Image.fromarray(Im3.astype('uint8'))
newIm
```

executed in 48ms, finished 08:21:12 2020-11-05

Out[7]:

In [8]:

```
Im4=(1-np.abs(x)**0.25)*255  #对其进行指数变化选材，使图像更立体一些
newIm=Image.fromarray(Im4.astype('uint8'))
newIm
```

executed in 42ms, finished 08:21:20 2020-11-05

Out[8]: