

Task4

2019 年 6 月 15 日

1 图像处理 +180776+ 胡欣毅 (Python 版)

2 5 周上课随堂任务

2.1 1. 题目清单

1. sigmoid 函数的边缘增强
2. 阶跃函数柔化后的边缘增强
3. 图像处理预告热传导方程

```
In [1]: import matplotlib.pyplot as plt
import numpy as np
%matplotlib inline
```

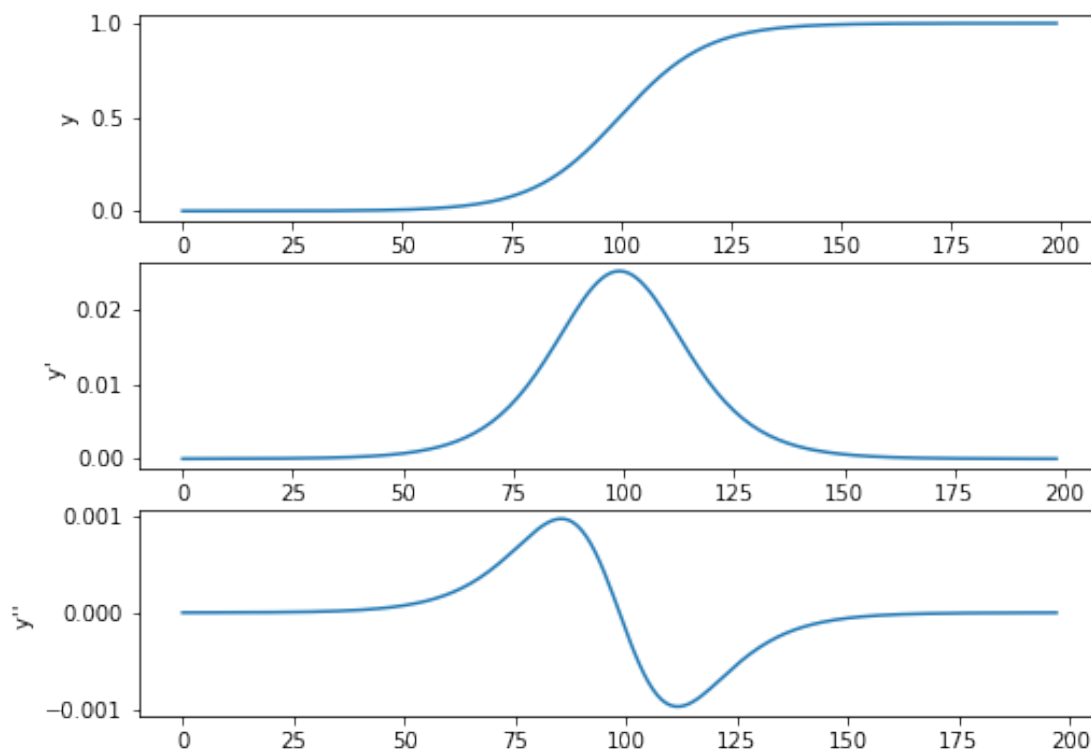
3 第一部分

```
In [2]: def sigmoid(x):
return 1. / (1. + np.exp(-x) )
```

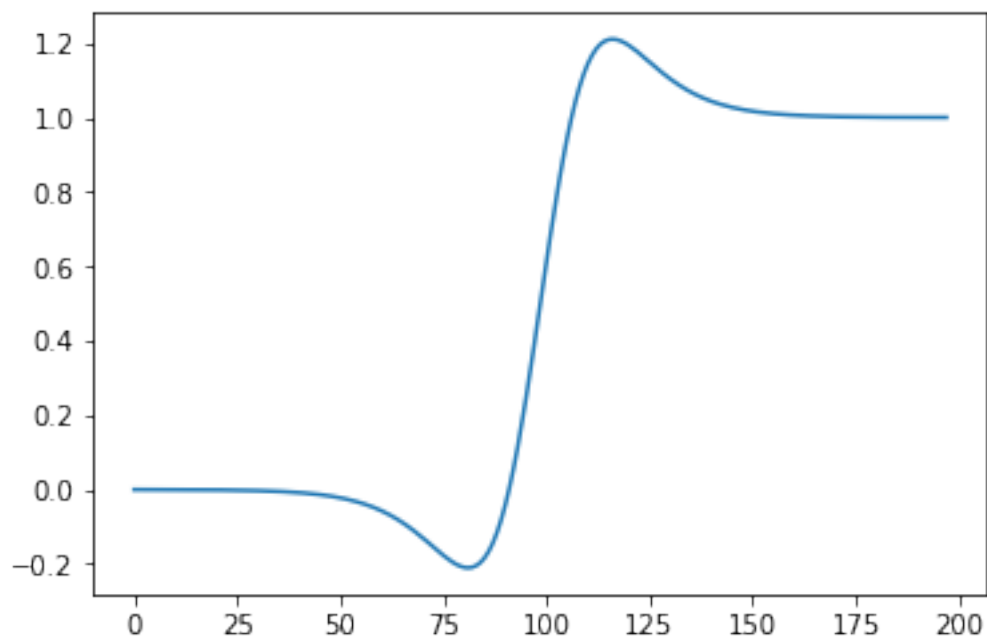
```
In [3]: x = np.linspace(-10,10,200)
y = sigmoid(x)
dy = np.diff(y)
ddy = np.diff(dy)
```

```
In [4]: plt.figure(figsize=(8,6))
plt.subplot(311)
plt.plot(y)
plt.ylabel("y")
plt.subplot(312)
```

```
plt.plot(dy)
plt.ylabel("y' ")
plt.subplot(313)
plt.plot(ddy)
plt.ylabel("y'' ")
plt.savefig("../ddf.png")
plt.show()
```



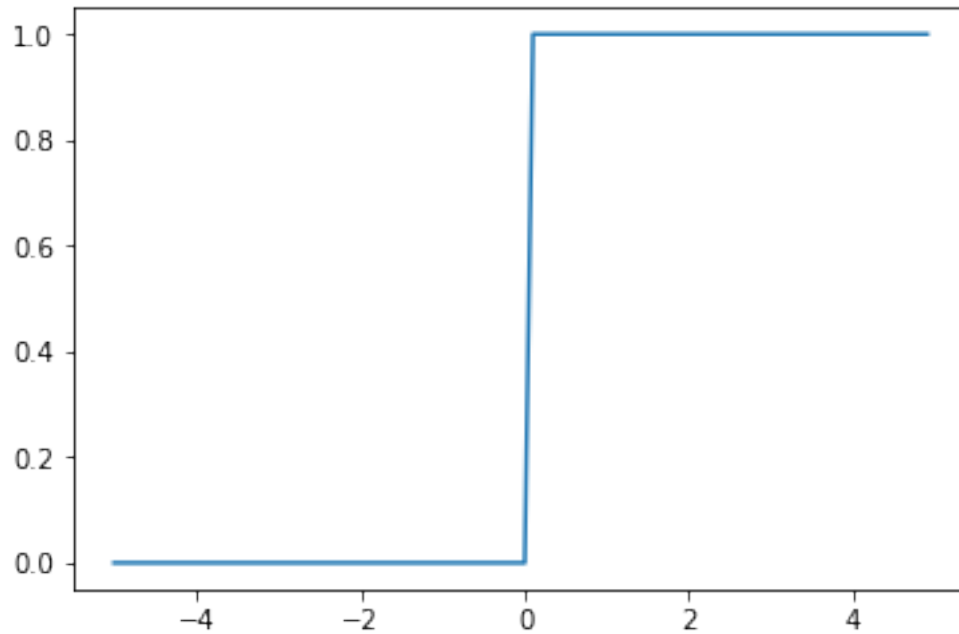
```
In [5]: lamb = 400
        out = y[1:-1] - lamb * ddy
        plt.figure()
        plt.plot(out)
        plt.show()
```



4 第二部分

```
In [6]: def step_function(x):  
        return np.array(x > 0, dtype=np.int)
```

```
In [7]: X = np.arange(-5.0, 5.0, 0.1)  
        Y = step_function(X)  
        plt.plot(X, Y)  
        plt.show()
```

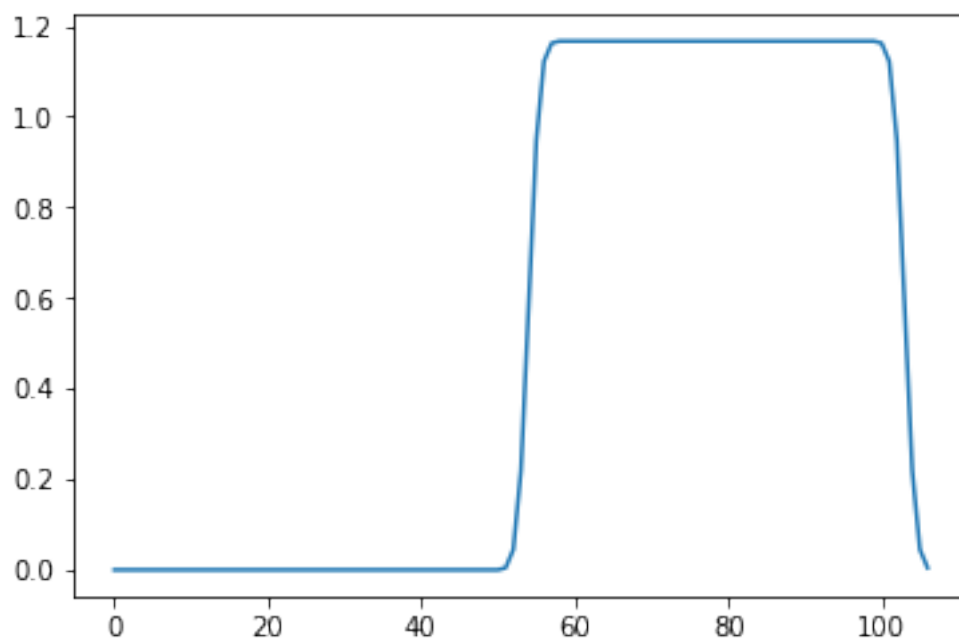


```
In [8]: sigma = 1.
```

```
In [9]: def gaosi(sigma,x):  
        return np.exp(-x**2/(2*sigma**2) )/(np.sqrt(2*np.pi)*sigma)
```

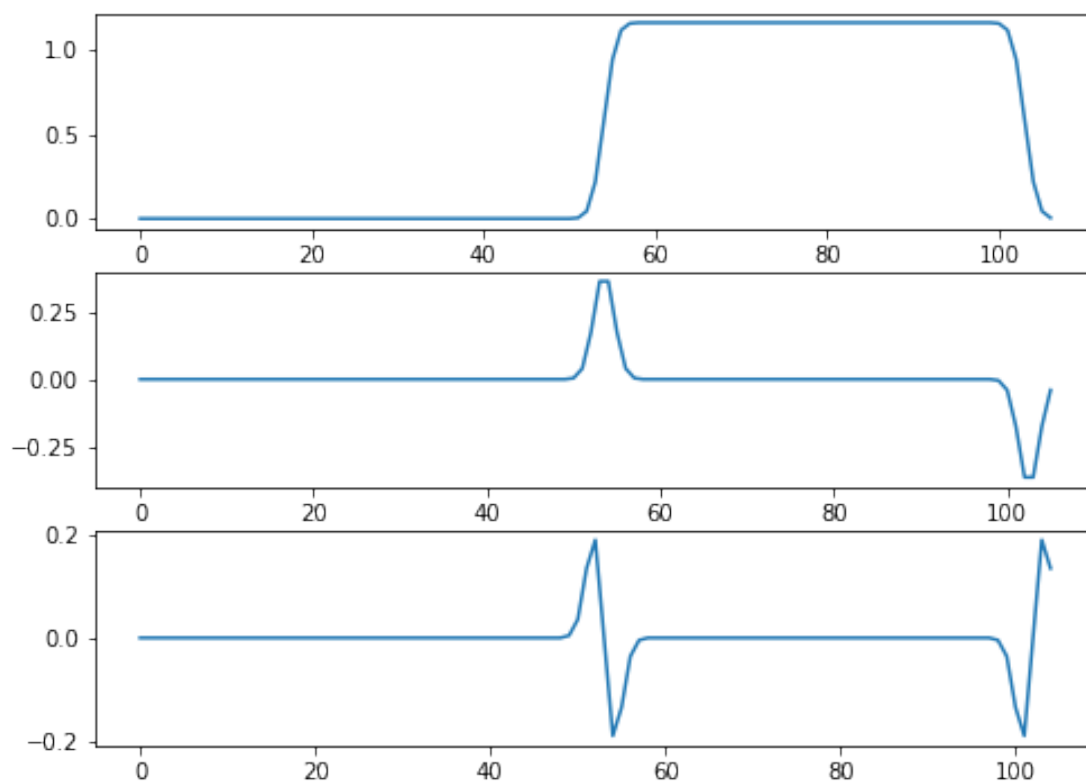
```
In [10]: import scipy.signal  
gaosi_filter = gaosi(sigma, np.linspace(-3*sigma,3*sigma, 8*sigma ) )  
  
out = scipy.signal.convolve(Y,gaosi_filter)  
plt.figure()  
plt.plot(out)  
plt.show()
```

/home/huxinyi/miniconda3/envs/hxy/lib/python3.6/site-packages/ipykernel_launcher.py:2: Deprecat

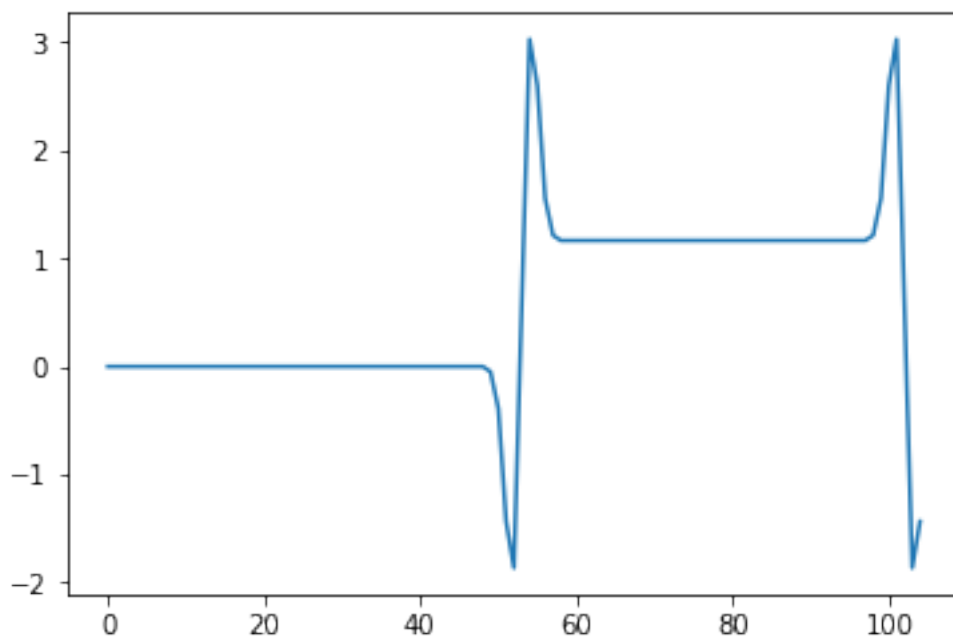


```
In [11]: dout = np.diff(out)
         ddout = np.diff(dout)
```

```
In [12]: plt.figure(figsize=(8,6))
         plt.subplot(311)
         plt.plot(out)
         plt.subplot(312)
         plt.plot(dout)
         plt.subplot(313)
         plt.plot(ddout)
         plt.show()
```



```
In [13]: lambd = 11
         result = out[1:-1] - lambd * ddout
         plt.figure()
         plt.plot(result)
         plt.show()
```



4.1 拓展

高斯函数

$$-3\sigma 3\sigma$$

占据大部分能量

```
In [14]: sga = 1.
          xx = np.linspace(-3*sga,3*sga,int(6*sga+1))
          gaosi(sga,xx).sum()
```

```
Out[14]: 0.9997293592899715
```

```
In [15]: def conv_func(a, b, conv=True):
          if a.shape > b.shape:
              return conv_func( b, a)

          # Convert to np.array type
          a, b = list(map(np.array, [a, b]))

          # 反转
```

```

    if conv:
        a = a[::-1]
    res = []
    min_len, max_len = len(a), len(b)

    output_length = max_len + min_len - 1
    tmp = np.hstack((np.zeros(min_len-1), b, np.zeros(min_len-1)))

    # For each point, get the total sum of element-wise multiplication
    for i in range(output_length):
        val = np.sum(a * tmp[i:min_len+i])
        res.append(val)
    return np.array(res, dtype=a.dtype)

conv_func(Y,gaosi_filter) = out

```

4.2 图像处理预告

热力学传导方程

$$\frac{\partial f}{\partial t} = \frac{1}{2} \frac{\partial^2 f}{\partial x^2}$$

图像模糊恢复

$$f(x, t) = f(x, 0) + t \frac{\partial f}{\partial t} = f(x, 0) + \frac{t}{2} \frac{\partial^2 f}{\partial x^2}$$

5 图像处理 +180776+ 胡欣毅 (C++ 版)

C++