

第七次作业

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- 1 自己写一个图形符号圆圈，并用该符号画图（数据随机生成即可）。

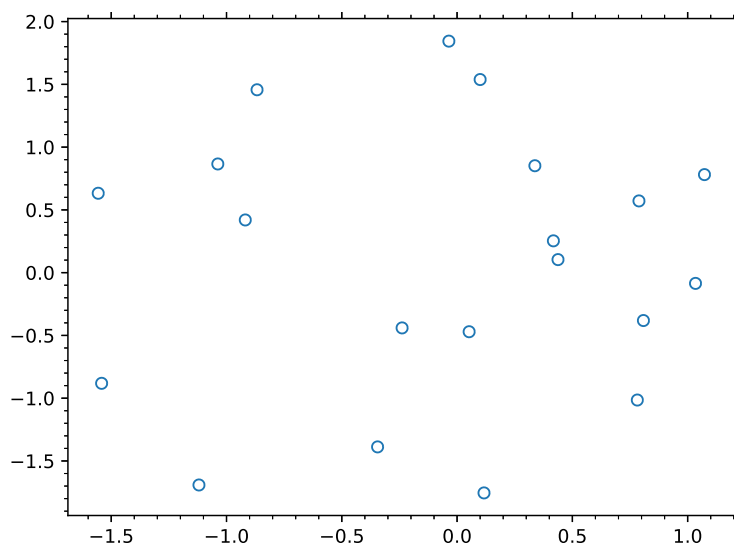
生成 0 到 2π 之间表示角度的数组，并用其计算出多个顶点。其围成的多边形在边数足够多时即可作为圆。代码如下：

[circle_marker.py](#)

```
1 import matplotlib.pyplot as plt
2 import numpy as np
3
4 #Random xs and ys
5 xs = np.random.normal(size=20)
6 ys = np.random.normal(size=20)
7
8 #Verts of a polygon
9 ts = np.linspace(0, 2*np.pi, 20, endpoint=True)
10 vxs = np.cos(ts)[:, np.newaxis]
11 vys = np.sin(ts)[:, np.newaxis]
12 verts = np.concatenate((vxs, vys), axis=1)
13
14 plt.plot(xs, ys, linestyle='none', marker=verts, markerfacecolor='none')
15 #Or:
16 #plt.plot(xs, ys, linestyle='none', marker='o', markerfacecolor='none')
17
18 plt.minorticks_on()
19 plt.tick_params(which='both',
20                 top=True,
21                 right=True)
22 plt.savefig('circle-marker.eps', format='eps')
```

生成图片如下：

[circle-marker.eps](#)



无输入或输出文件。

2 编写和查找外部程序实现画图展示双方向的误差棒图。

在每个坐标点处另外画出作为误差棒的线段即可。代码如下：

[errorbar.py](#)

```

1 import numpy as np
2 import matplotlib.pyplot as plt
3
4 def myerrorbar(x, y=None, xerr=None, yerr=None, **kwargs):
5     '''
6     myerrorbar([x,] y, xerr=None, yerr=None, **kwargs)
7
8     args:
9         x, y: array-like or scalar
10             List of coordinata. x and y should have same size.
11             *x* value is optional. If not given, they default to
12             ``[0, ..., N-1]``
13
14         xerr, yerr: array-like, optional
15             Err values of each x, y. Should have same size
16             as x and y, or be None.
17
18         kwargs:
19             See matplotlib.pyplot.plot.
20 
```

```

21     returns:
22         Same as matplotlib.pyplot.plot(x, y, **kwargs)
23
24     '''
25     #If no x is given, y is on x's position.
26     if y is None:
27         y = x
28         x = np.arange(y.size)
29
30     ret = plt.plot(x, y, **kwargs)
31     color = ret[0].get_color()
32
33     #x errors.
34     if xerr is not None:
35         for i in range(x.size):
36             plt.plot([x[i]-xerr[i], x[i]+xerr[i]],
37                     [y[i], y[i]],
38                     color=color)
39
40     #y errors.
41     if yerr is not None:
42         for i in range(x.size):
43             plt.plot([x[i], x[i]],
44                     [y[i]-yerr[i], y[i]+yerr[i]],
45                     color=color)
46
47     return ret

```

matplotlib.pyplot.errorbar 支持双向误差棒，可直接调用。

[test.py](#)

```

1 from errorbar import myerrorbar
2 import matplotlib.pyplot as plt
3 import numpy as np
4
5 xs = np.arange(10)
6 ys = xs**2
7
8 err_xs = 0.05 * xs
9 err_ys = 0.05 * ys
10
11 #Self-implied.

```

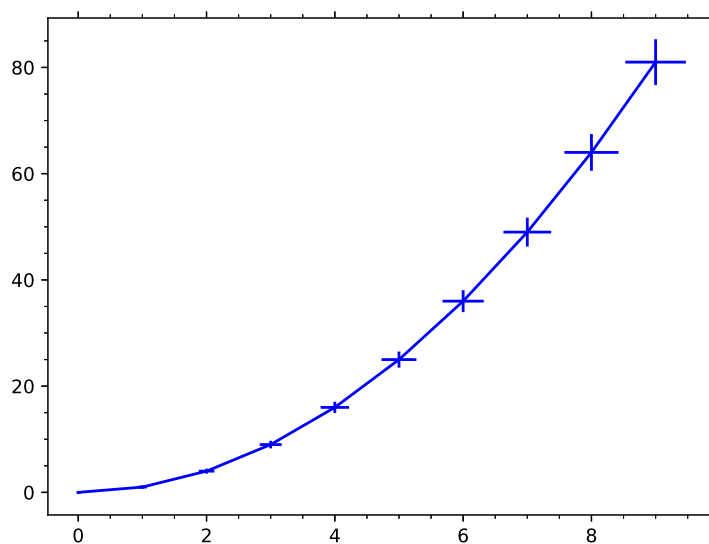
```

12 my, = myerrorbar(xs, ys, xerr=err_xs,
13                 yerr=err_ys, color='blue')
14 plt.minorticks_on()
15 plt.tick_params(which='both',
16                 top=True,
17                 right=True)
18 plt.savefig('my.eps', format='eps')
19 my.remove()
20 #Call matplotlib function
21 plt.errorbar(xs, ys, xerr=err_xs, yerr=err_ys,
22             capsize=2, color='blue', ecolor='blue')
23 plt.savefig('lib.eps', format='eps')

```

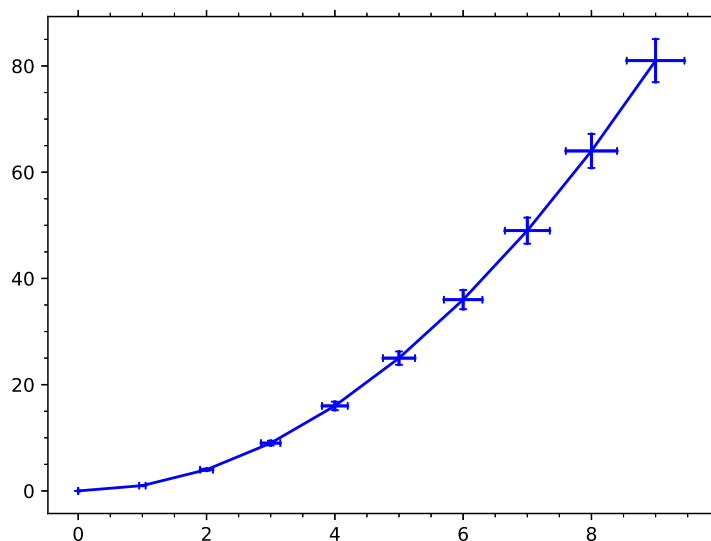
调用自编误差棒函数效果如下：

[my.eps](#)



调用 matplotlib 函数效果如下：

[lib.eps](#)



自编函数未画出误差棒端点的短线。本程序无标准流输入、输出文件。

3 读入数据，等值线制图展示 D_{xx} 在 $\alpha - E_k$ 平面内的分布。

数据格式参照老师课件中的程序读入。用 `matplotlib.pyplot.pcolormesh` 做图。（李星宇说画这个，可是等值线不是不填色的那种吗？）代码如下：

[test.py](#)

```

1 import matplotlib.colors as colors
2 import matplotlib.pyplot as plt
3 import numpy as np
4 from scipy.io import FortranFile
5
6 #Read file, according to codes given in the slides
7 f = FortranFile('COEFF_DAY.DAT', 'r')
8 nx = f.read_ints()[0]
9 ny = f.read_ints()[0]
10 xy = f.read_reals(dtype=np.float32)
11 x = xy[:nx]
12 y = xy[nx:]
13 bdxx = f.read_reals(dtype=np.float32).reshape((nx, ny))
14 bdyx = f.read_reals(dtype=np.float32).reshape((nx, ny))
15 bdyx = f.read_reals(dtype=np.float32).reshape((nx, ny))
16 X, Y = np.meshgrid(x, y)
17 f.close()
18
19 bdyx = bdyx / Y**2
20 bdxx = bdxx / Y

```

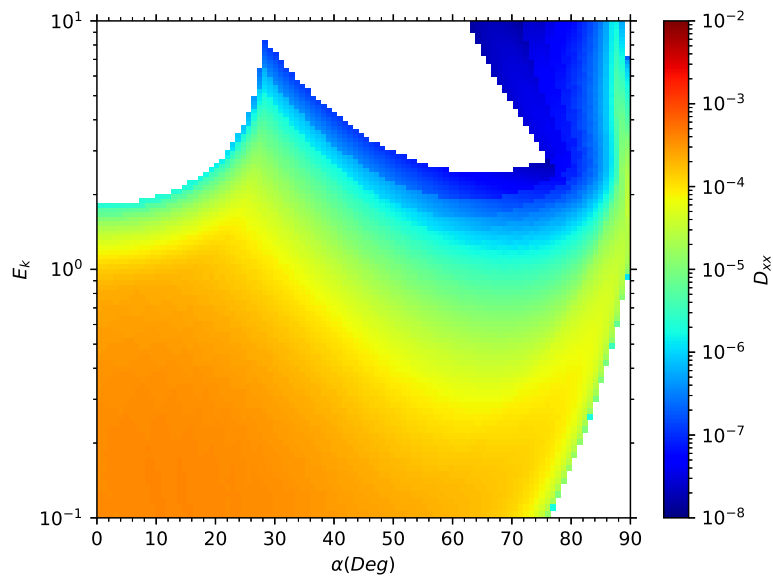
```

21
22 alpha = x/np.pi*180
23 Ek = 0.511*(np.sqrt(Y*Y+1)-1)
24
25 #Just plot.
26 norm = colors.LogNorm(vmin=1e-8, vmax=1e-2)
27 plt.pcolormesh(alpha, Ek, bdx, cmap='jet', norm=norm)
28 plt.xlabel(r'$\alpha$ (Deg)')
29 plt.ylabel(r'$E_k$')
30 plt.yscale('log')
31 plt.minorticks_on()
32 plt.tick_params(which='both',
33                 top=True,
34                 right=True)
35 cbar = plt.colorbar()
36 cbar.ax.set_ylabel(r'$D_{xx}$')
37 cbar.ax.set_yscale('log')
38 plt.savefig('color.eps', format='eps')

```

图如下:

[color.eps](#)



无标准流上的输入、输出。