

# 0. Less 2?

## Contents

- MacB3-Handon
- handon matplotlib chp 4
- hand-on ch 4
- handon-c5
- handob ch6
- handon-ch7
- hanon-c8
- Handon C9
- handon-10 colors
- handon-11-pyqt5
- handon-c12 qt version
- handon-c13
- handon 18 covid

...

**In case of doubt ... it is just a hobby not for  
“production”**

```{tableofcontents}

```

[Skip to main content](#)

```{contents}

:local:

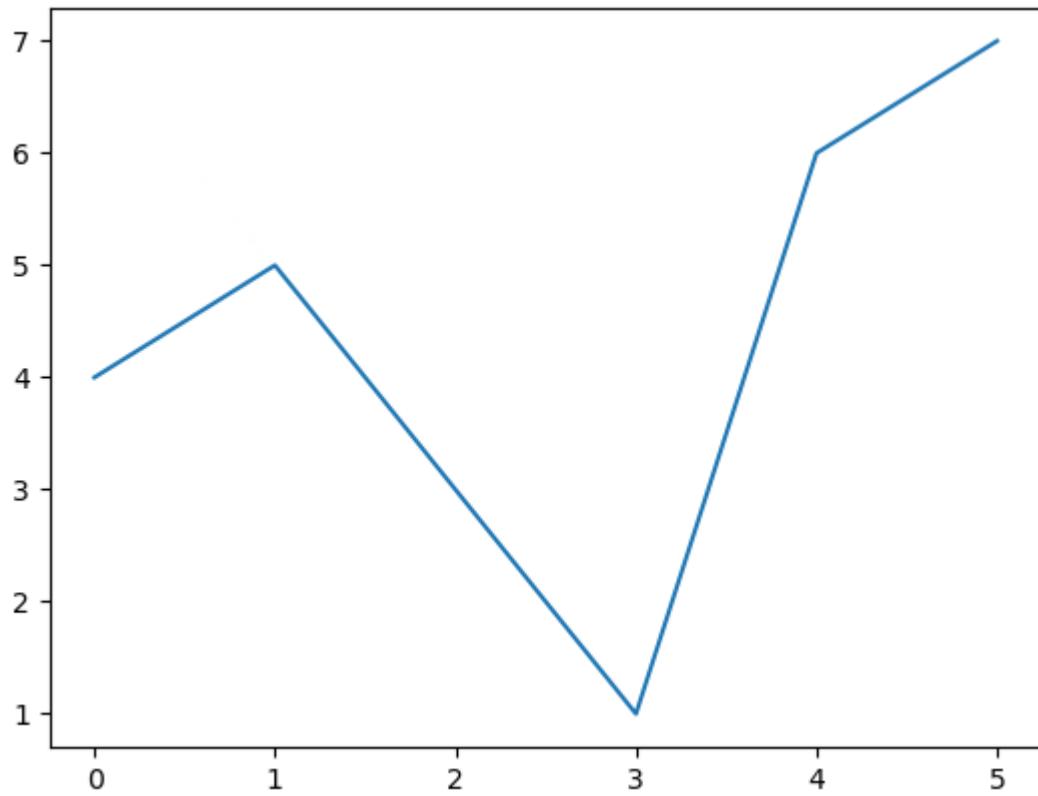
```

## MacB3-Handon

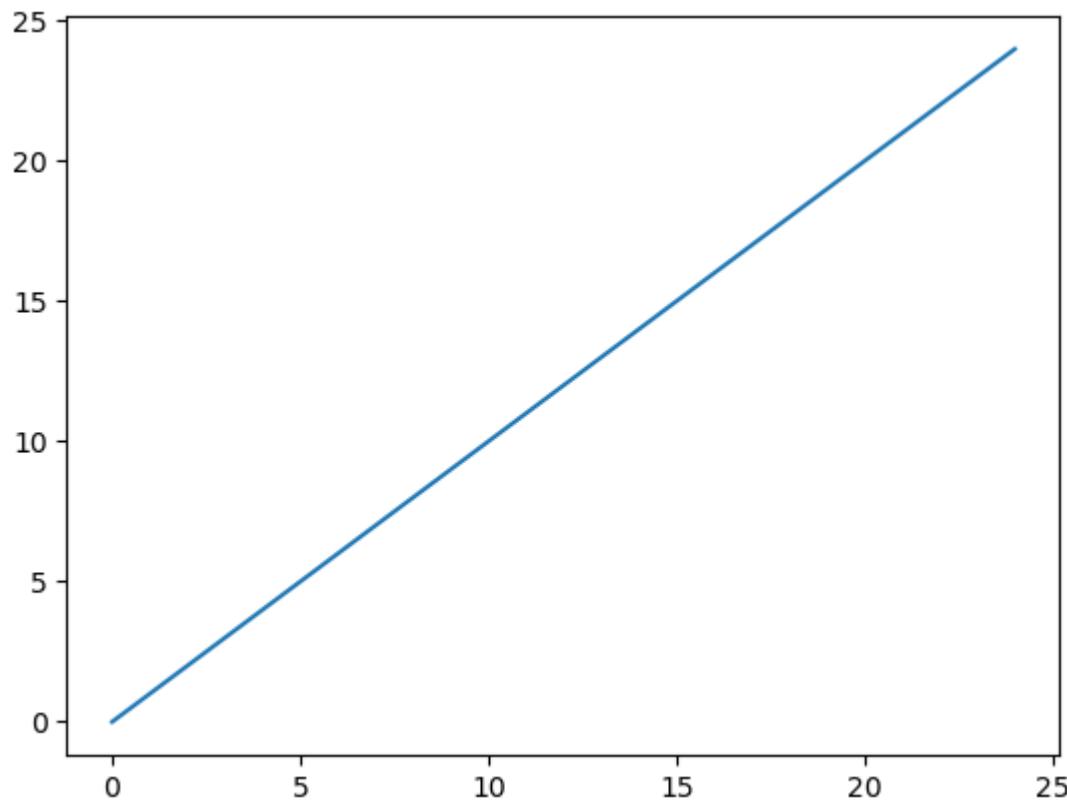
### handon matplotlib chp 4

### hand-on ch 4

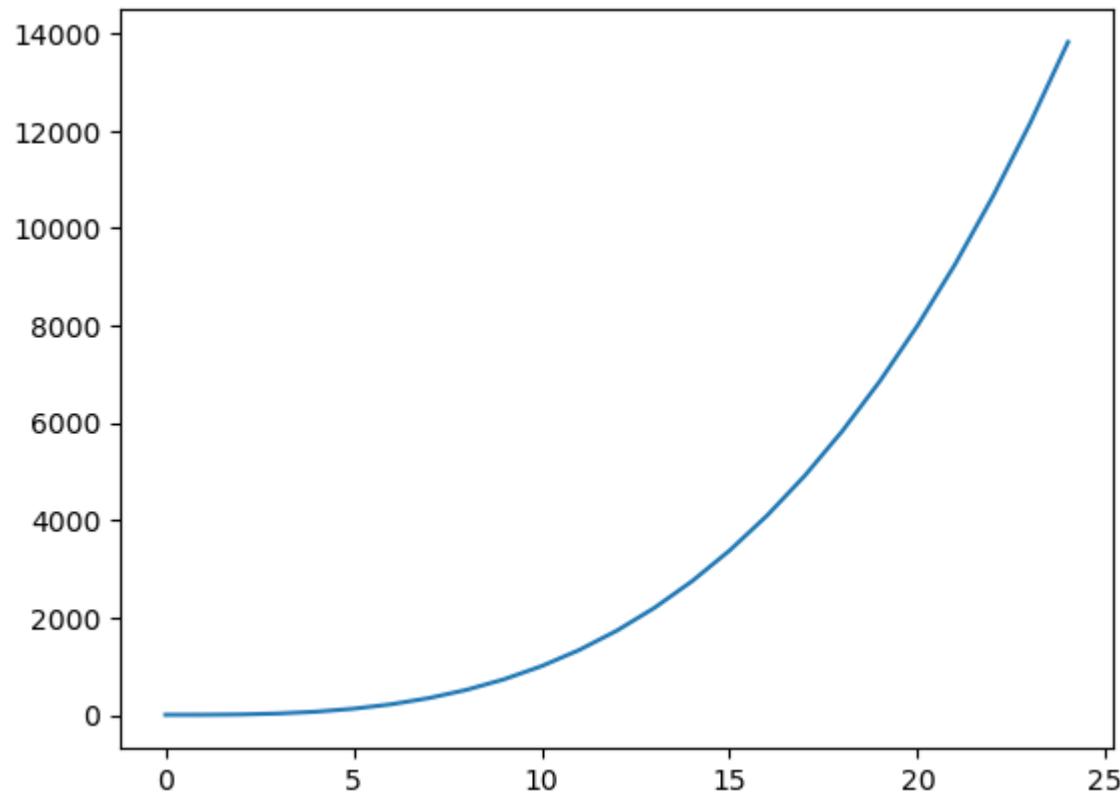
```
%matplotlib inline
import matplotlib.pyplot as plt
x = [4, 5, 3, 1, 6, 7]
plt.plot(x)
plt.show()
```



```
import numpy as np  
x = np.arange(25)  
plt.plot(x)  
plt.show()
```

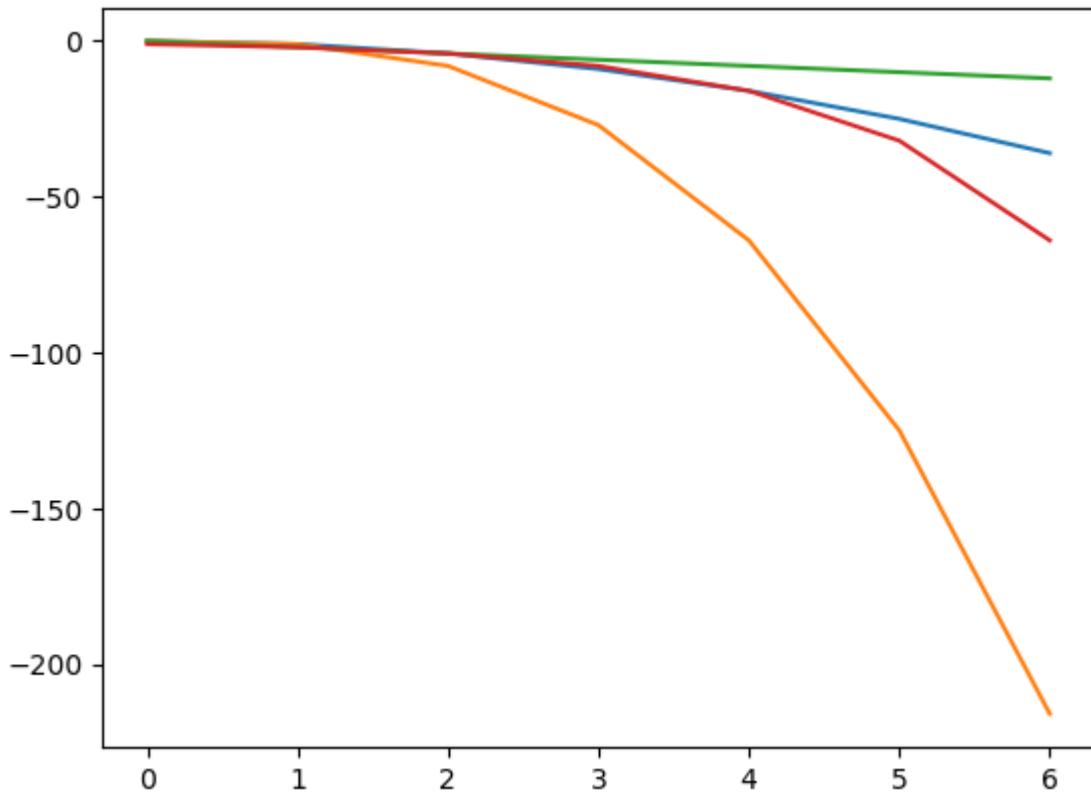


```
plt.plot(x, [(y**3 + 1) for y in x])
plt.show()
```

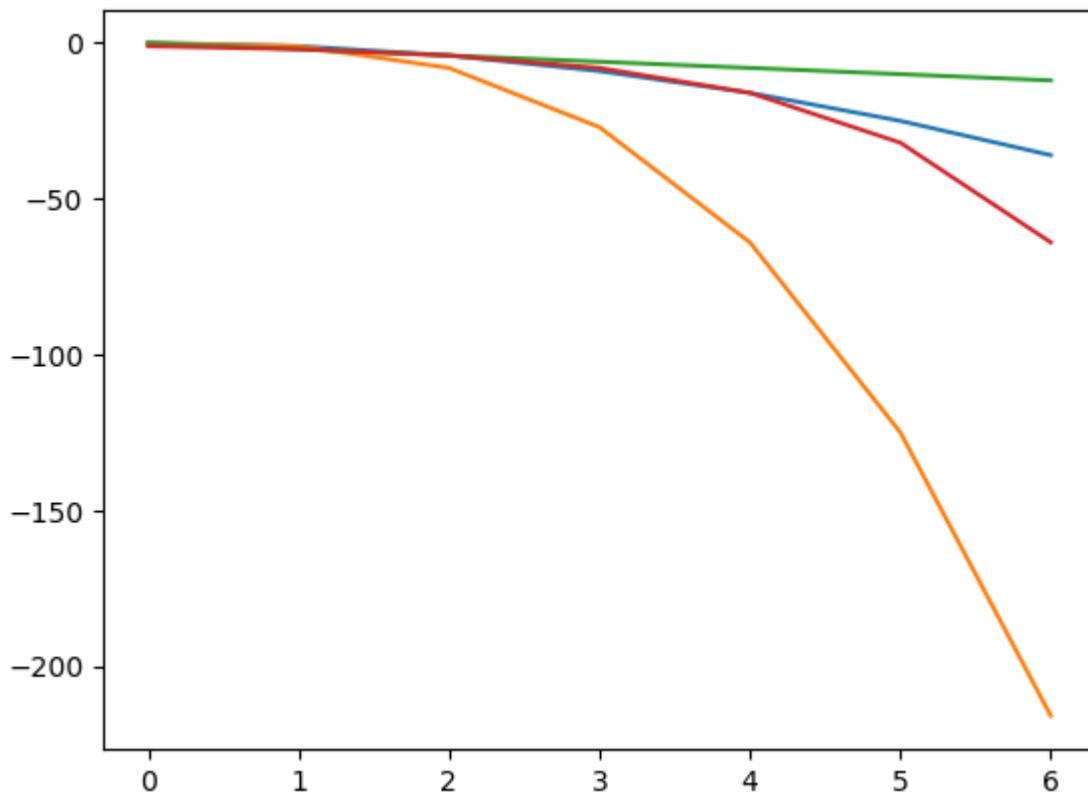


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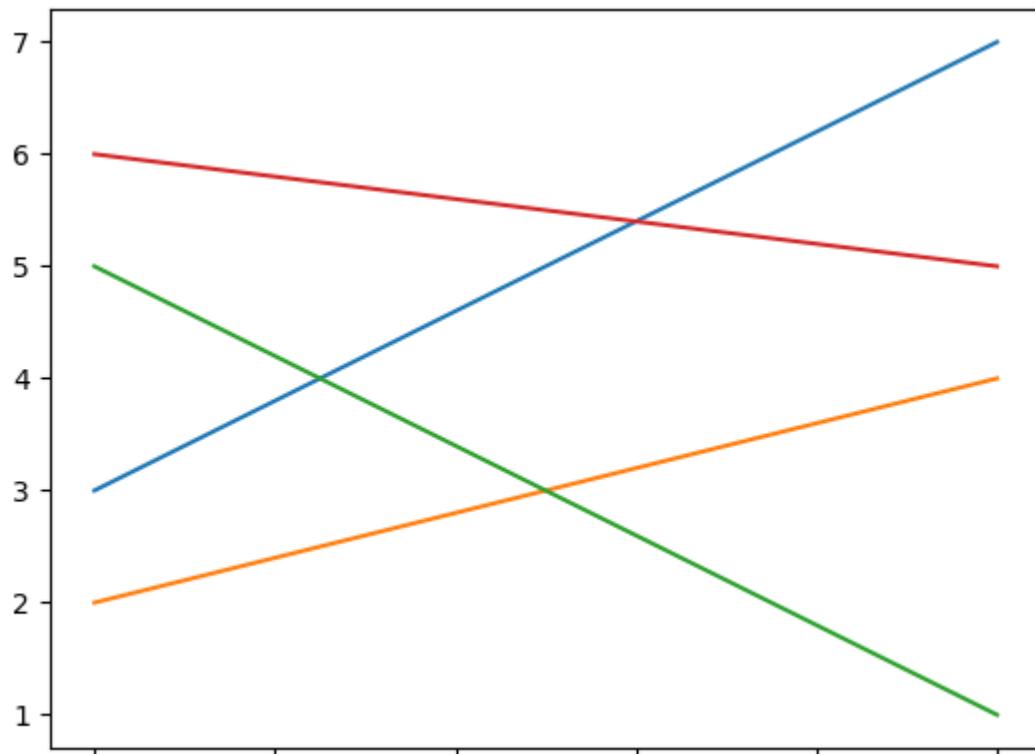
```
%matplotlib inline
import numpy as np
import matplotlib.pyplot as plt
x = np.arange(7)
plt.plot(x, -x**2)
plt.plot(x, -x**3)
plt.plot(x, -2*x)
plt.plot(x, -2**x)
plt.show()
# Figure 4-4 show
```



```
plt.plot(x, -x**2, x, -x**3,
          x, -2*x, x, -2**x)
plt.show()
```



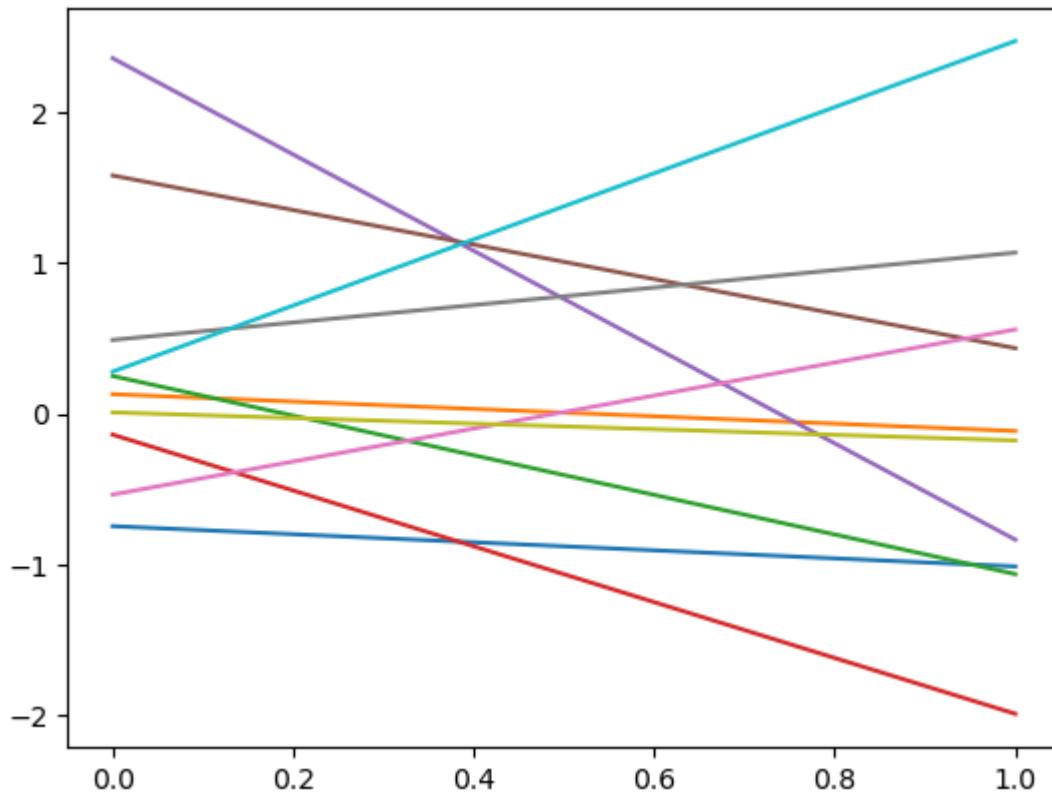
```
x = np.array([[3, 2, 5, 6], [7, 4, 1, 5]])
plt.plot(x)
plt.show()
```



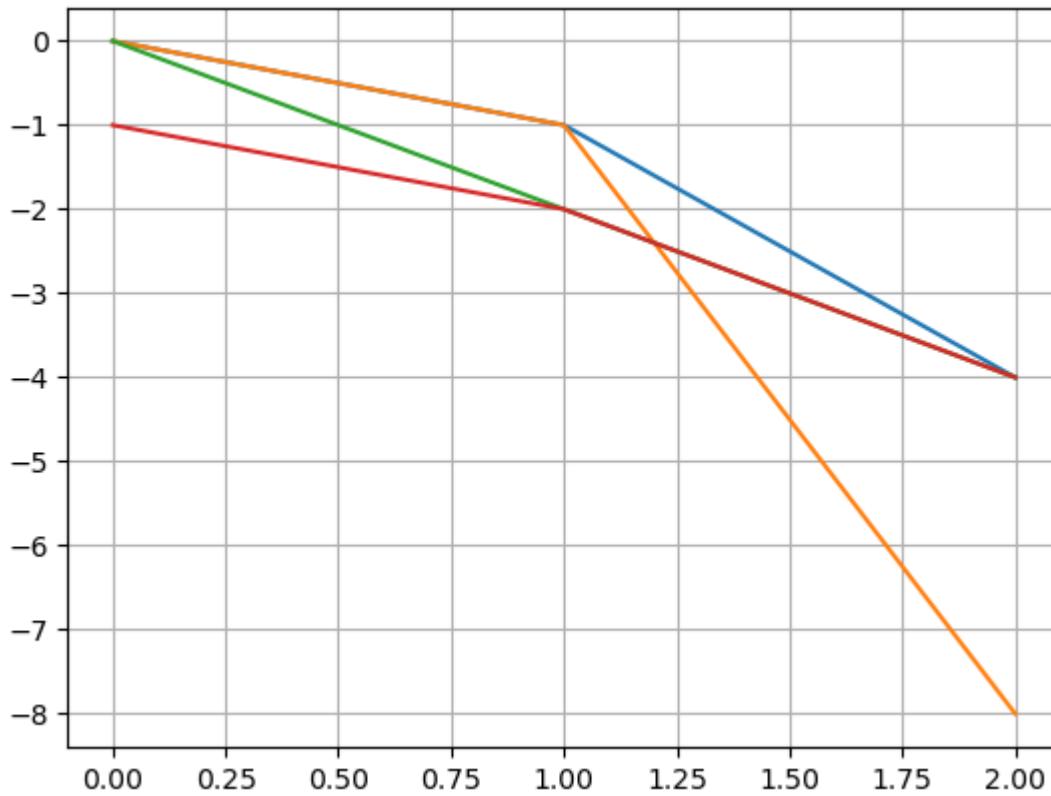
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```
data = np.random.randn(2, 10)
print(data)
plt.plot([data[0], data[1]])
plt.show()
```

```
[[ -0.7479604   0.12826749   0.24919842  -0.14024651   2.35946967   1.5806702
 -0.53840079   0.48841377   0.00743891   0.27796956]
 [ -1.01535661  -0.11613507  -1.066472    -1.99410208  -0.83761332   0.43382355
  0.55810608   1.06848151  -0.17880948   2.47351774]]
```

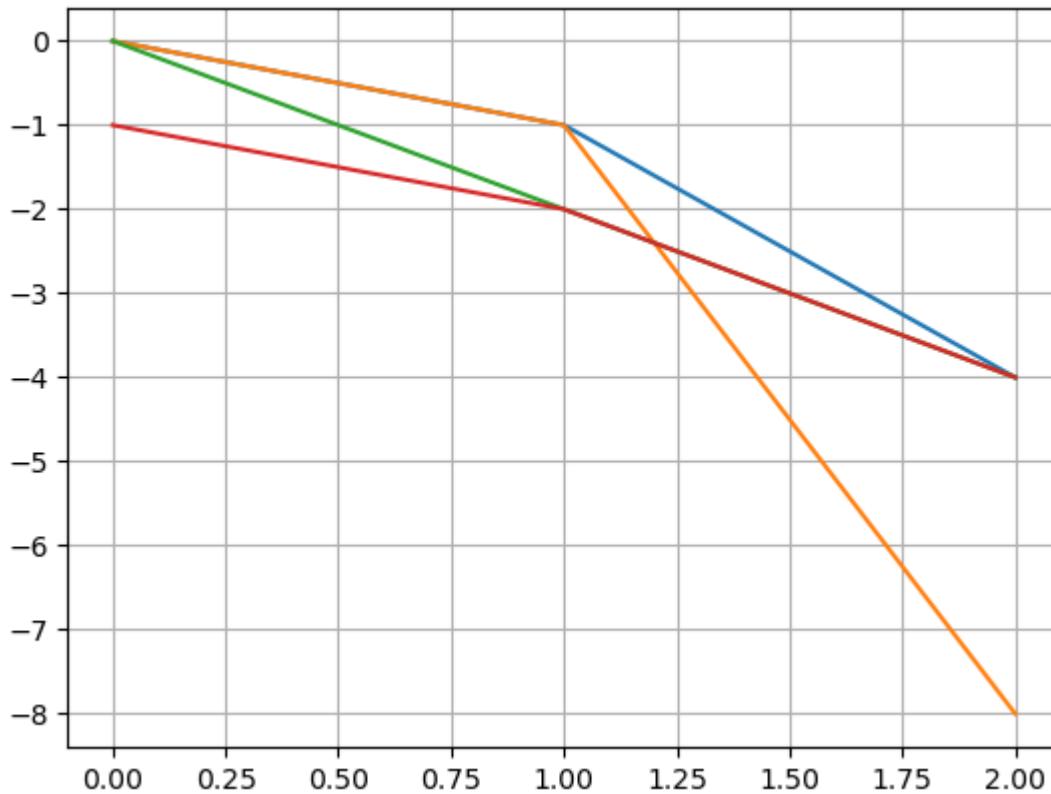


```
x = np.arange(3)
plt.plot(x, -x**2, x, -x**3, x, -2*x, x, -2**x)
plt.grid(True)
plt.savefig('img/handon-c4-test.png')
plt.show()
```



```
x = np.arange(3)
plt.plot(x, -x**2, x, -x**3, x, -2*x, x, -2**x)
plt.grid(True)
print(plt.axis())
plt.show()
```

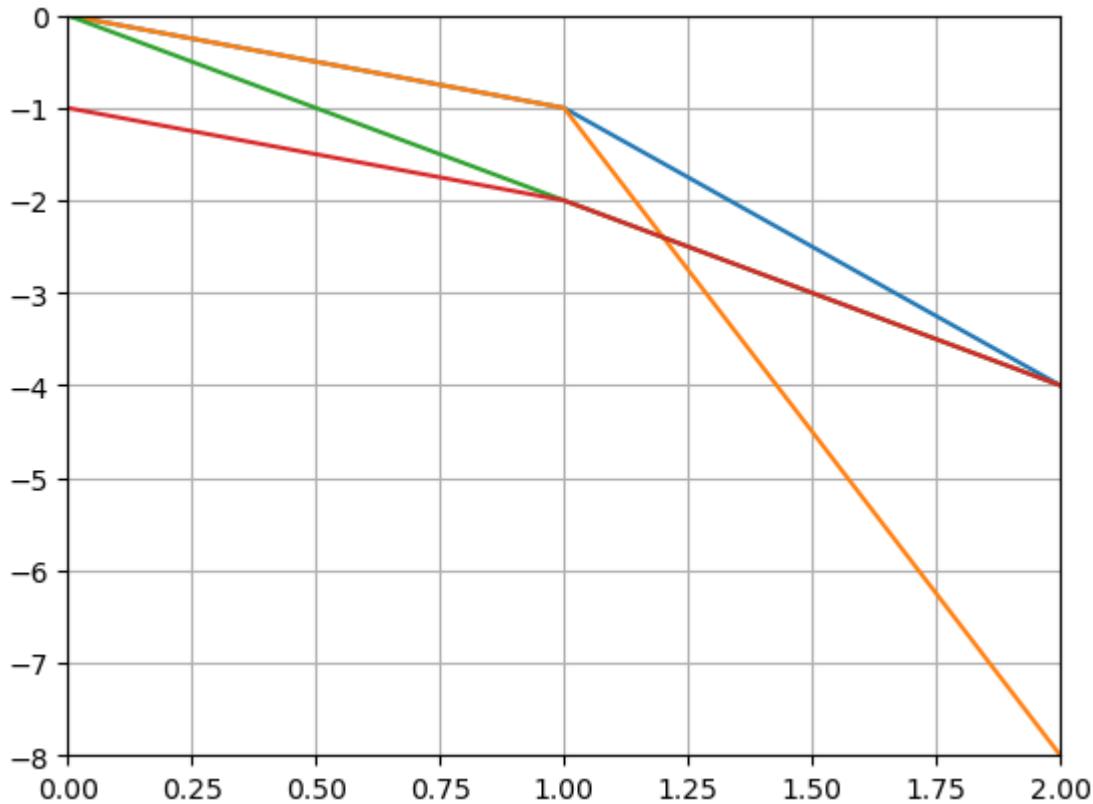
(-0.1, 2.1, -8.4, 0.4)



```
x = np.arange(3)
plt.plot(x, -x**2, x, -x**3, x, -2*x, x, -2**x)
plt.grid(True)
plt.axis([0, 2, -8, 0])
print(plt.axis())
plt.show()
```

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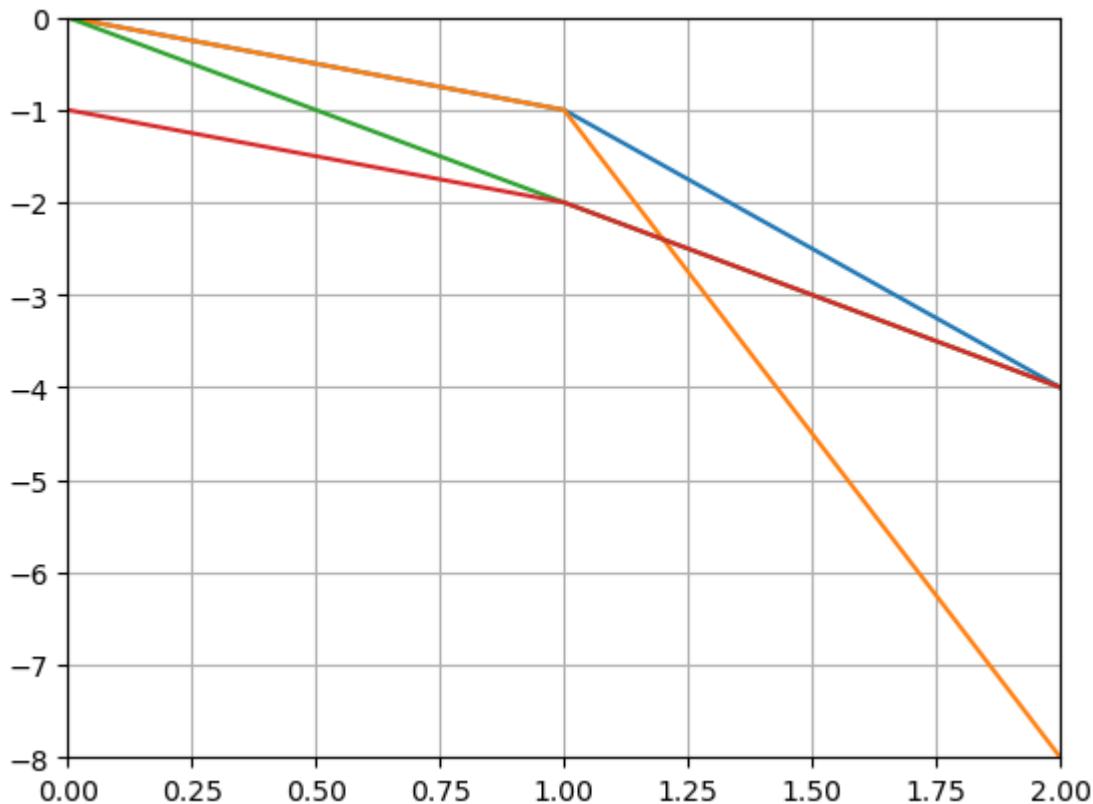
(0.0, 2.0, -8.0, 0.0)



```
x = np.arange(3)
plt.plot(x, -x**2, x, -x**3, x, -2*x, x, -2**x)
plt.grid(True)
plt.xlim([0, 2])
plt.ylim([-8, 0])
print(plt.axis())
plt.show()
```

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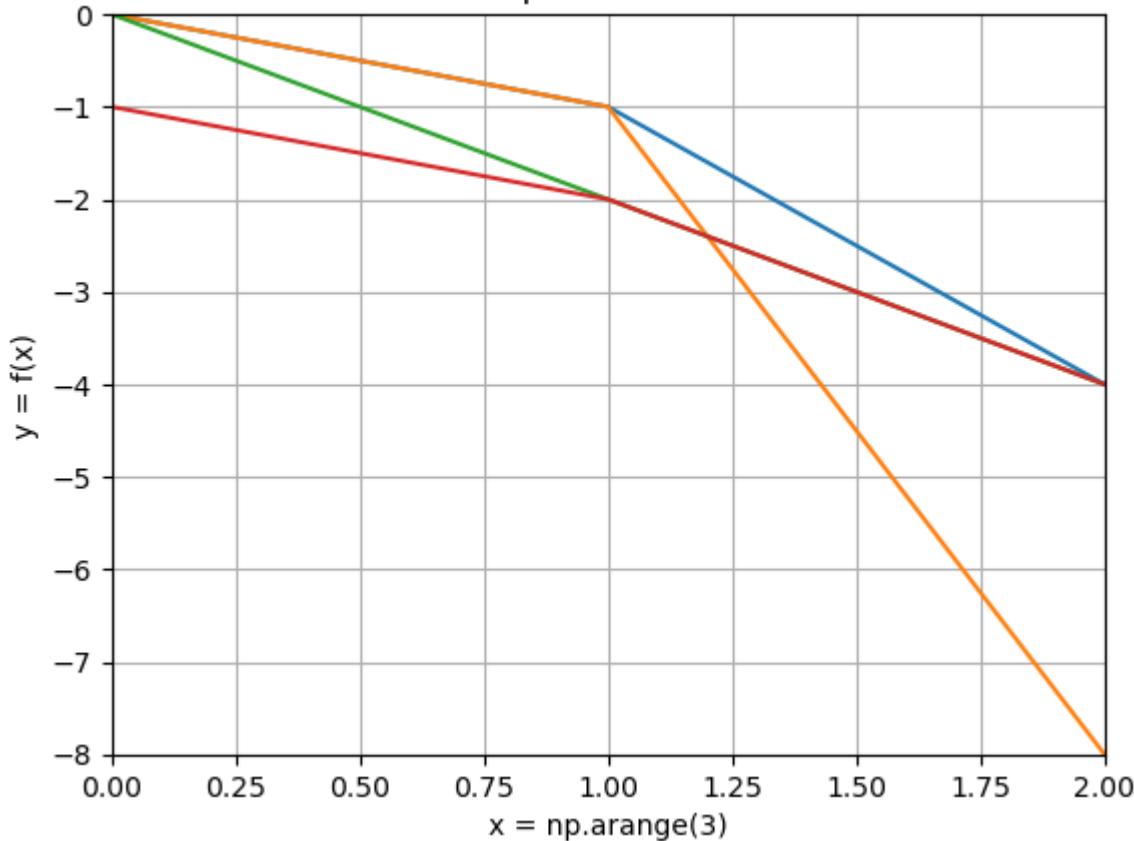
(0.0, 2.0, -8.0, 0.0)



```
x = np.arange(3)
plt.plot(x, -x**2, x, -x**3, x, -2*x, x, -2**x)
plt.grid(True)
plt.xlabel('x = np.arange(3)')
plt.xlim([0, 2])
plt.ylabel('y = f(x)')
plt.ylim([-8, 0])
plt.title('Simple Plot Demo')
plt.show()
```

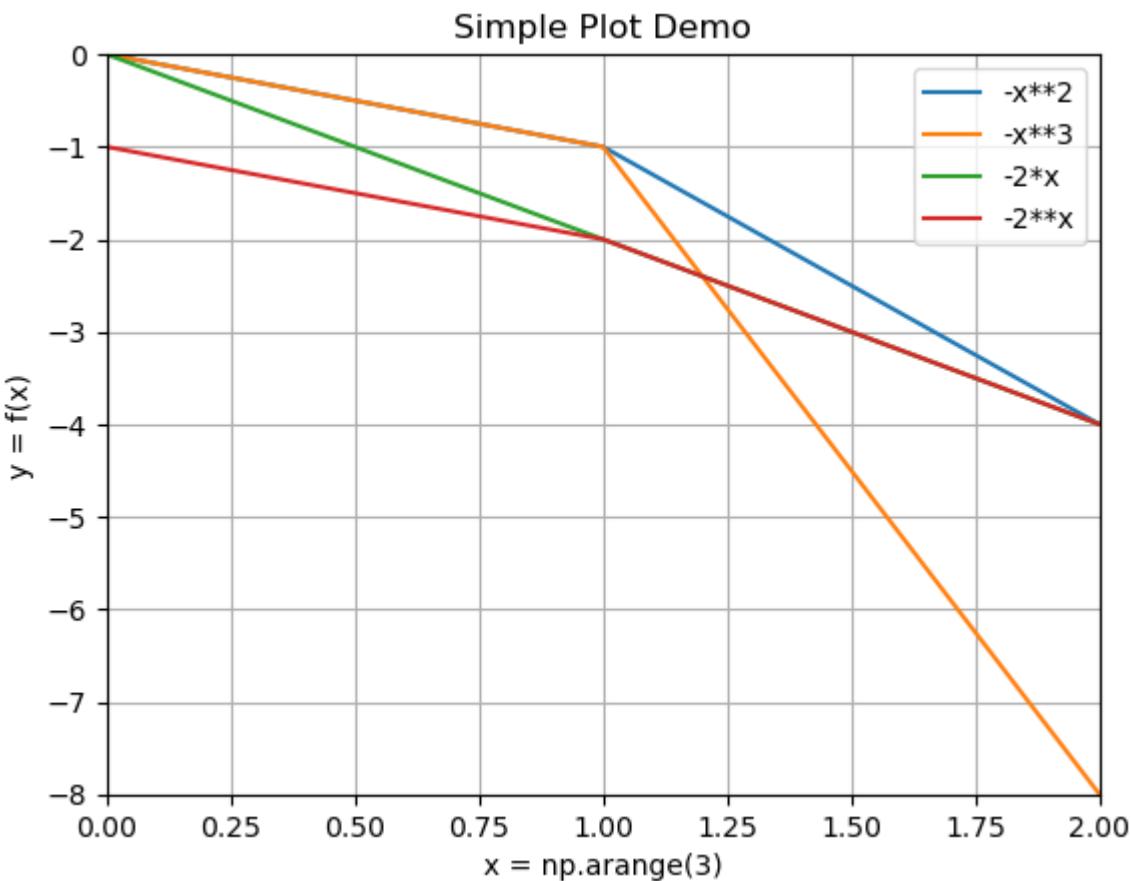
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## Simple Plot Demo



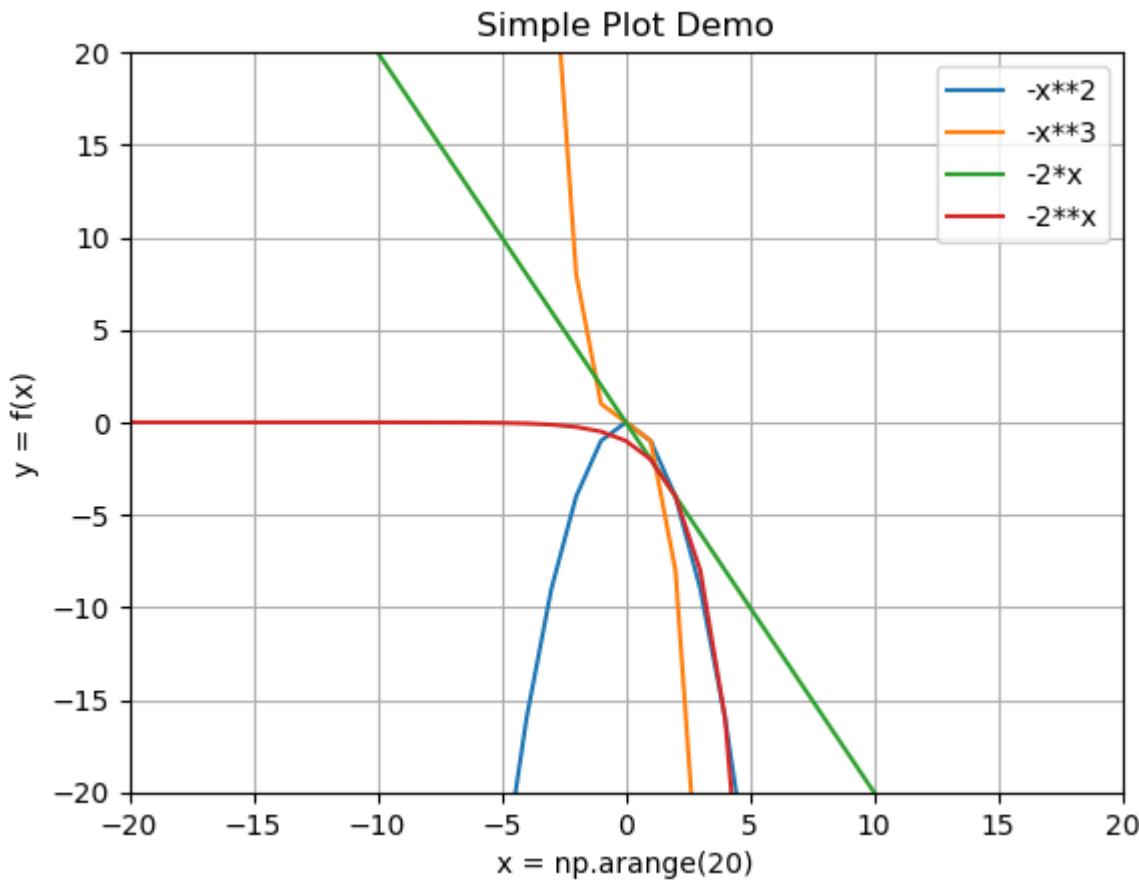
```
x = np.arange(3)
plt.plot(x, -x**2, label='-x**2')
plt.plot(x, -x**3, label='-x**3')
plt.plot(x, -2*x, label='-2*x')
plt.plot(x, -2**x, label='-2**x')
plt.legend()
plt.grid(True)
plt.xlabel('x = np.arange(3)')
plt.xlim([0, 2])
plt.ylabel('y = f(x)')
plt.ylim([-8, 0])
plt.title('Simple Plot Demo')
plt.show()
```

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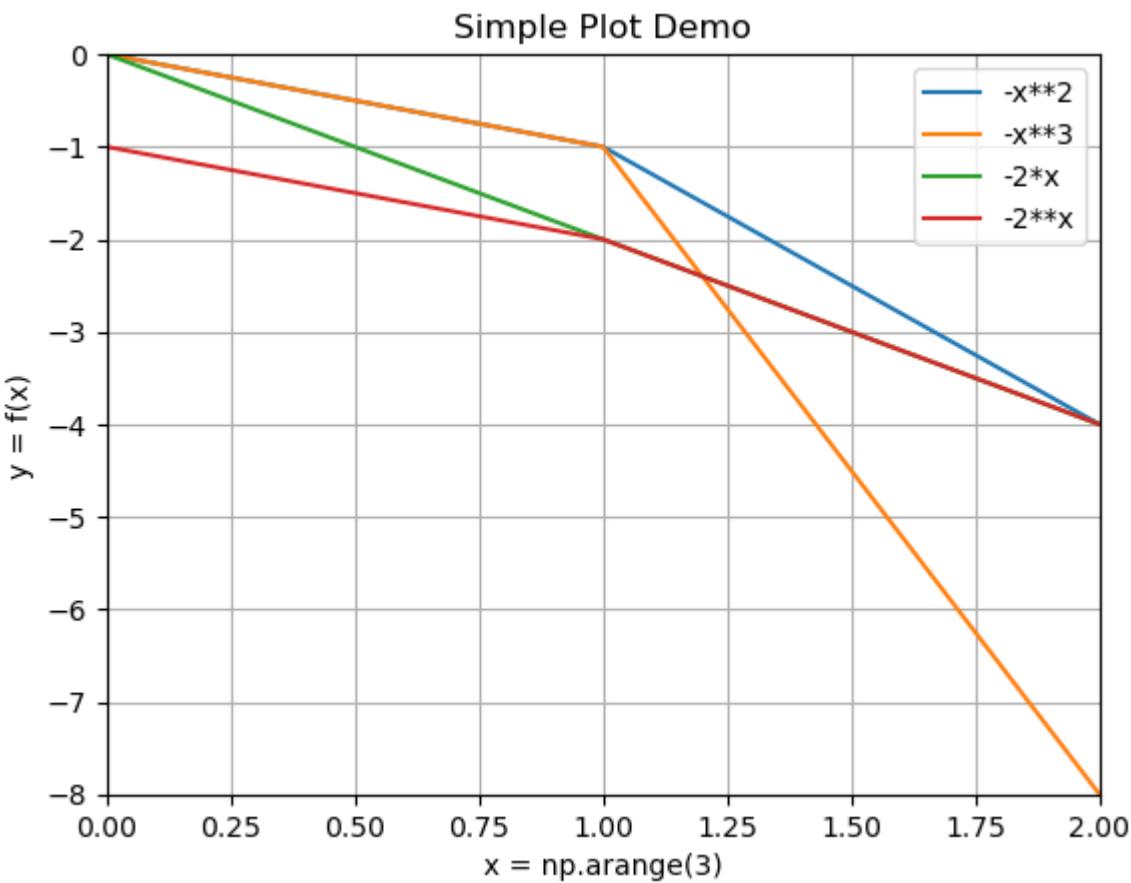


```
# dennis trying a bit

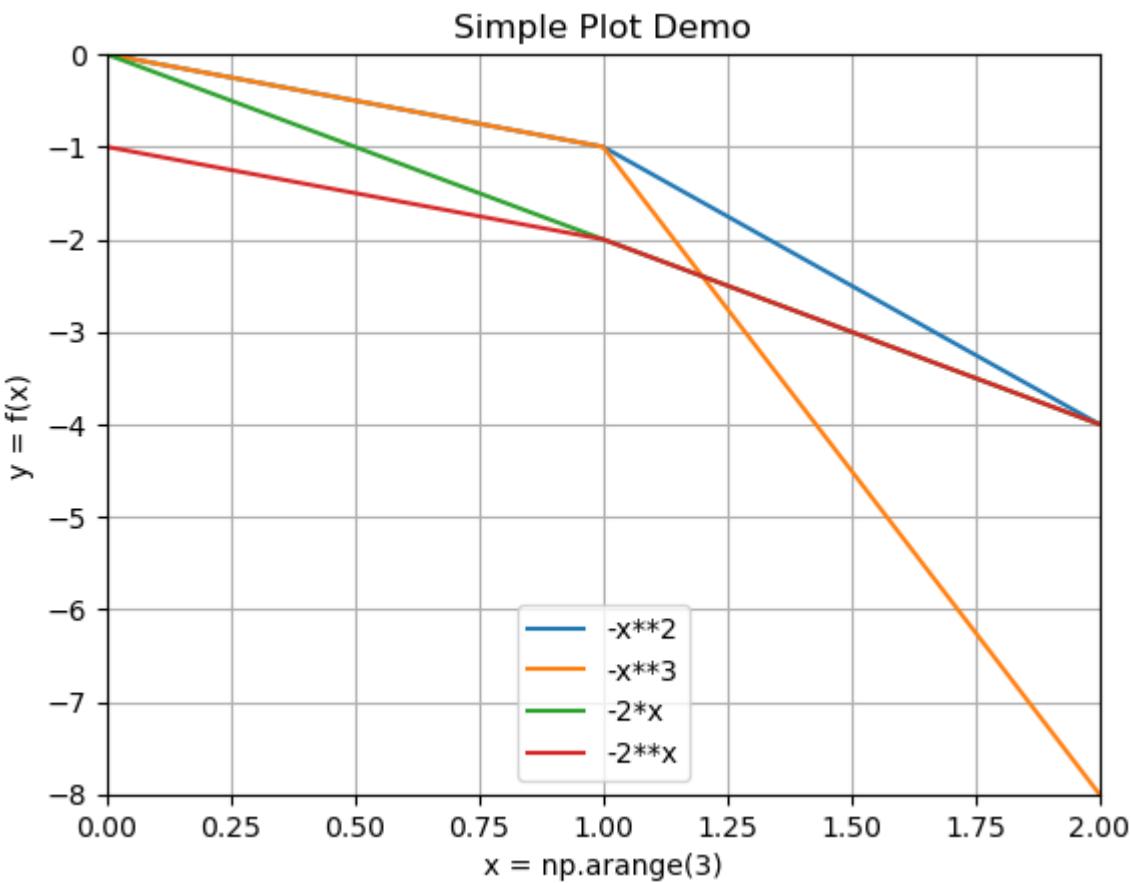
x = np.arange(-20, 20, dtype=float)
plt.plot(x, -x**2, label='-x**2')
plt.plot(x, -x**3, label='-x**3')
plt.plot(x, -2*x, label='-2*x')
plt.plot(x, -2**x, label='-2**x')
plt.legend()
plt.grid(True)
plt.xlabel('x = np.arange(20)')
plt.xlim([-20, 20])
plt.ylabel('y = f(x)')
plt.ylim([-20,20])
plt.title('Simple Plot Demo')
plt.show()
```



```
x = np.arange(3)
plt.plot(x, -x**2, x, -x**3, x, -2*x, x, -2**x)
plt.legend(['-x**2', '-x**3', '-2*x', '-2**x'])
plt.grid(True)
plt.xlabel('x = np.arange(3)')
plt.xlim([0, 2])
plt.ylabel('y = f(x)')
plt.ylim([-8, 0])
plt.title('Simple Plot Demo')
plt.show()
```

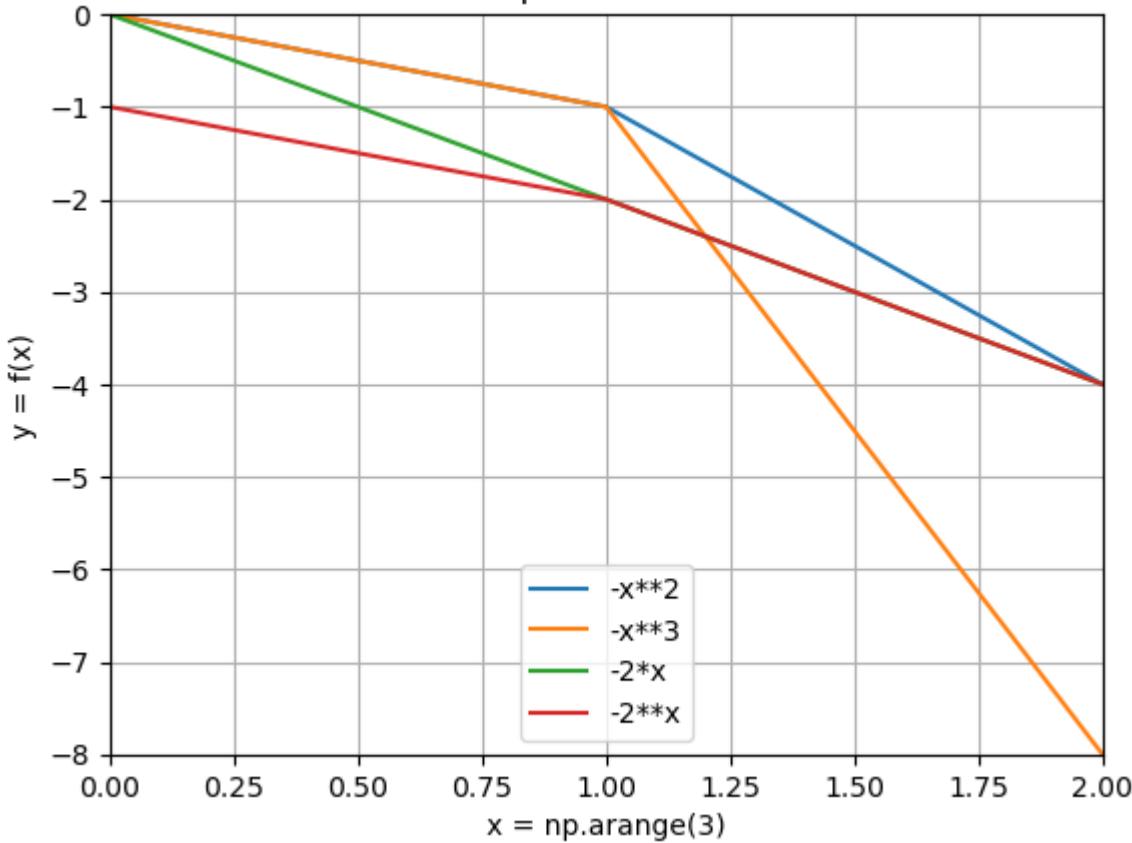


```
x = np.arange(3)
plt.plot(x, -x**2, x, -x**3, x, -2*x, x, -2**x)
plt.legend(['-x**2', '-x**3', '-2*x', '-2**x'],
          loc='lower center')
plt.grid(True)
plt.xlabel('x = np.arange(3)')
plt.xlim([0, 2])
plt.ylabel('y = f(x)')
plt.ylim([-8, 0])
plt.title('Simple Plot Demo')
plt.show()
```

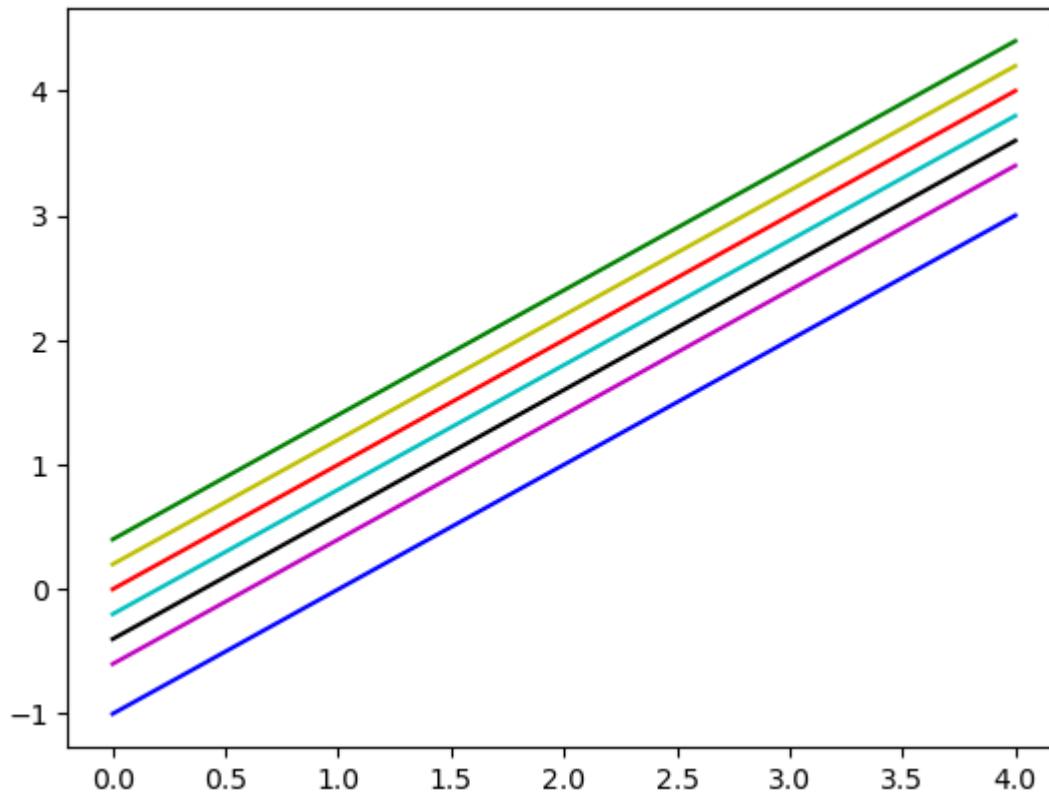


```
x = np.arange(3)
plt.plot(x, -x**2, x, -x**3, x, -2*x, x, -2**x)
plt.legend(['-x**2', '-x**3', '-2*x', '-2**x'],
          loc='lower center')
plt.grid(True)
plt.xlabel('x = np.arange(3)')
plt.xlim([0, 2])
plt.ylabel('y = f(x)')
plt.ylim([-8, 0])
plt.title('Simple Plot Demo')
plt.savefig('img/handon-c4-test-4-66.png')
plt.show()
```

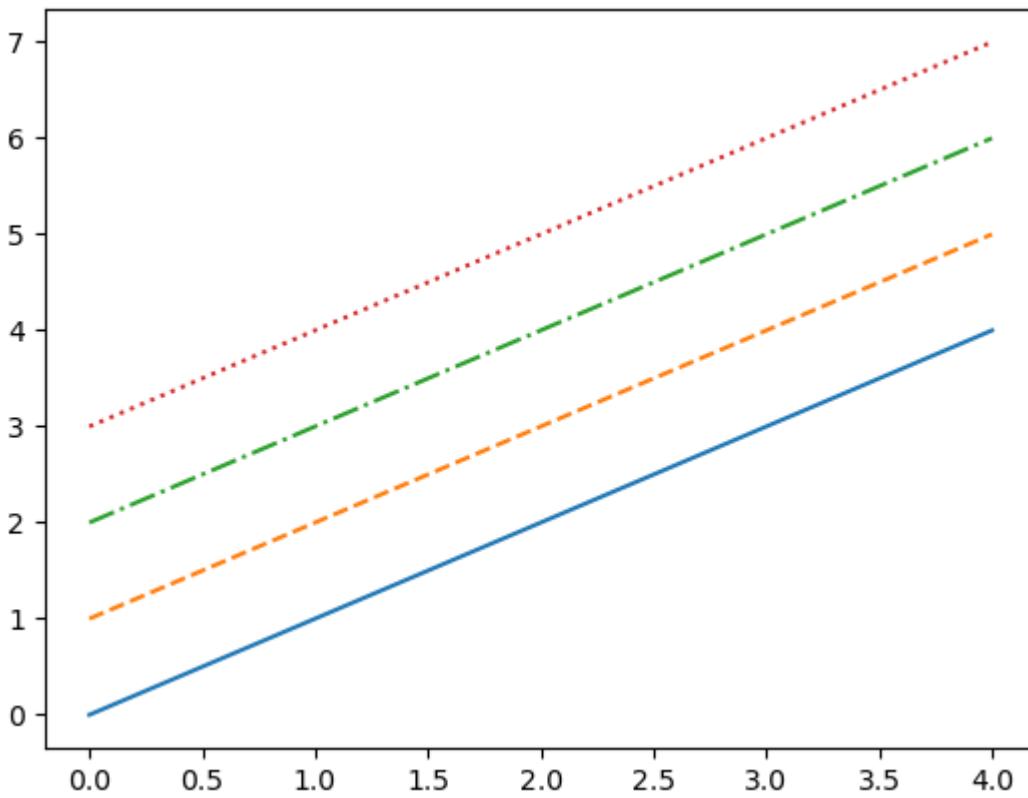
## Simple Plot Demo



```
%matplotlib inline
import matplotlib.pyplot as plt
import numpy as np
x = np.arange(5)
y= x
plt.plot(x, y+0.4, 'g')
plt.plot(x, y+0.2, 'y')
plt.plot(x, y+0.0, 'r')
plt.plot(x, y-0.2, 'c')
plt.plot(x, y-0.4, 'k')
plt.plot(x, y-0.6, 'm')
plt.plot(x, y-0.8, 'w') # w on w issues
plt.plot(x, y-1.0, 'b')
plt.show()
```



```
plt.plot(x, y, '-.', x, y+1, '--', x, y+2, '-.', x, y+3, ':')
```

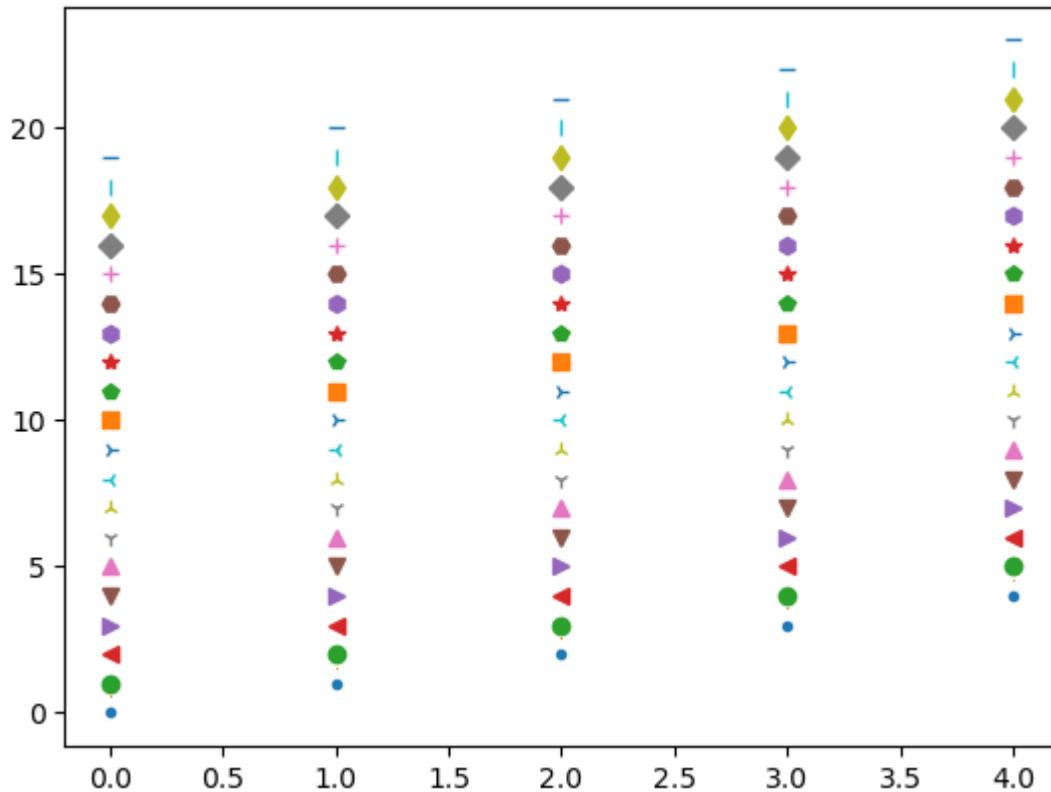


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```

plt.plot(x, y, '.')
plt.plot(x, y+0.5, '|', '|')
plt.plot(x, y+1, 'o')
plt.plot(x, y+2, '<')
plt.plot(x, y+3, '>')
plt.plot(x, y+4, 'v')
plt.plot(x, y+5, '^')
plt.plot(x, y+6, '1')
plt.plot(x, y+7, '2')
plt.plot(x, y+8, '3')
plt.plot(x, y+9, '4')
plt.plot(x, y+10, 's')
plt.plot(x, y+11, 'p')
plt.plot(x, y+12, '*')
plt.plot(x, y+13, 'h')
plt.plot(x, y+14, 'H')
plt.plot(x, y+15, '+')
plt.plot(x, y+16, 'D')
plt.plot(x, y+17, 'd')
plt.plot(x, y+18, '|')
plt.plot(x, y+19, '_')
plt.show()

```

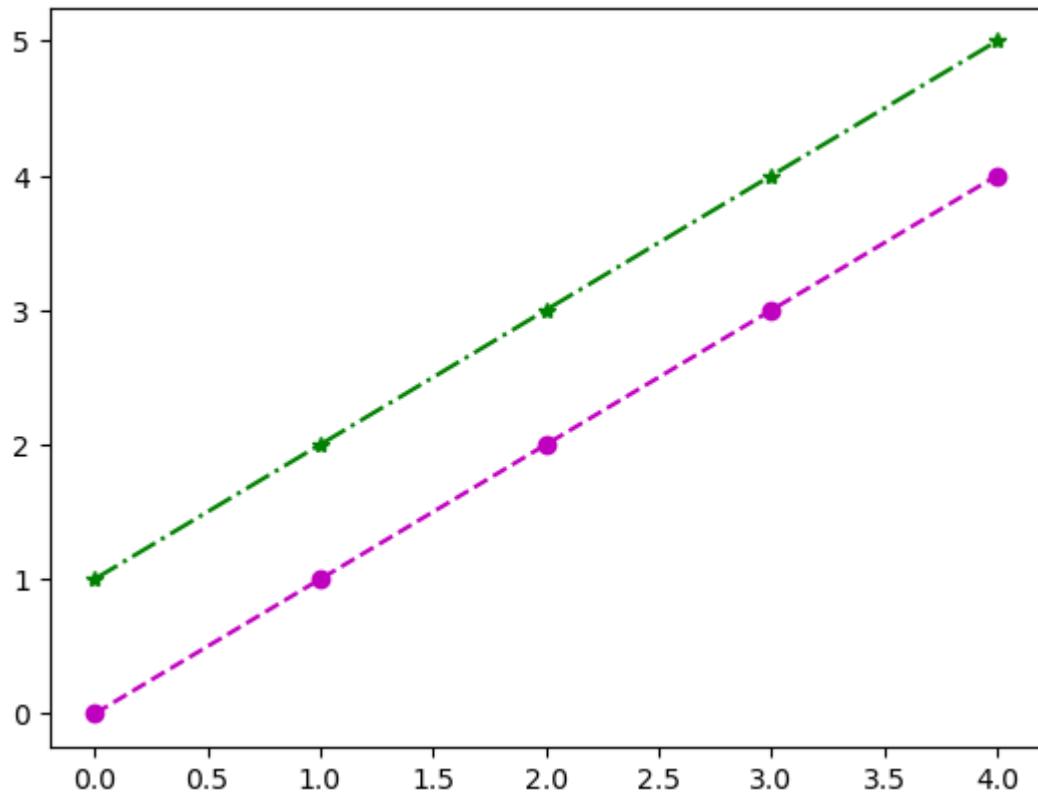


```

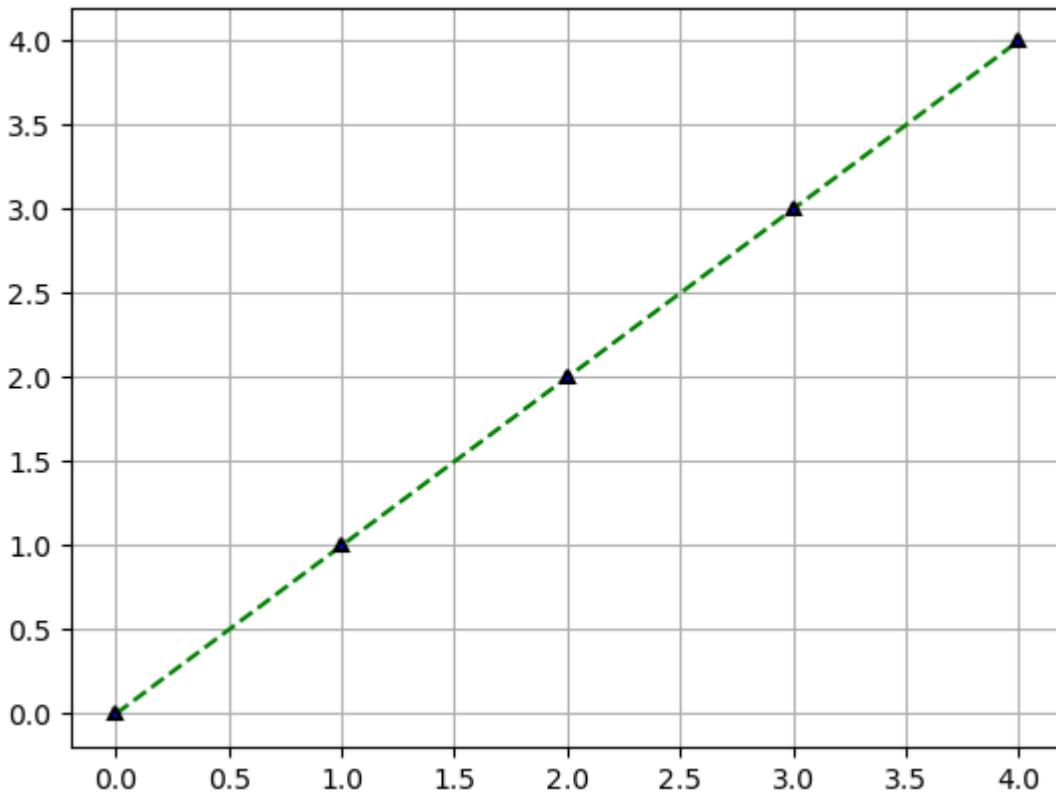
# (for colors, markers, and line styles)
plt.plot(x, y, 'mo--')
plt.plot(x, y+1, 'a*-.')

```

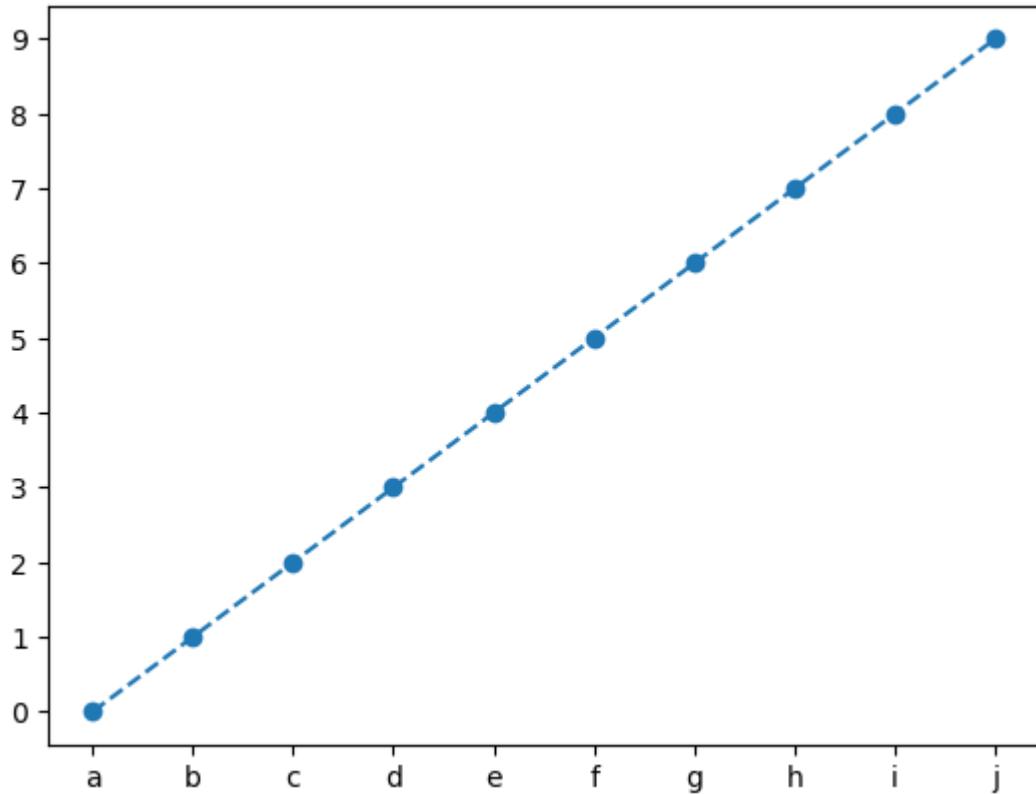
[Skip to main content](#)



```
plt.plot(x, y, color='g', linestyle='--', linewidth=1.5,
          marker='^', markerfacecolor='b', markeredgecolor='k',
          markeredgewidth=1.5, markersize=5)
plt.grid(True)
plt.show()
```



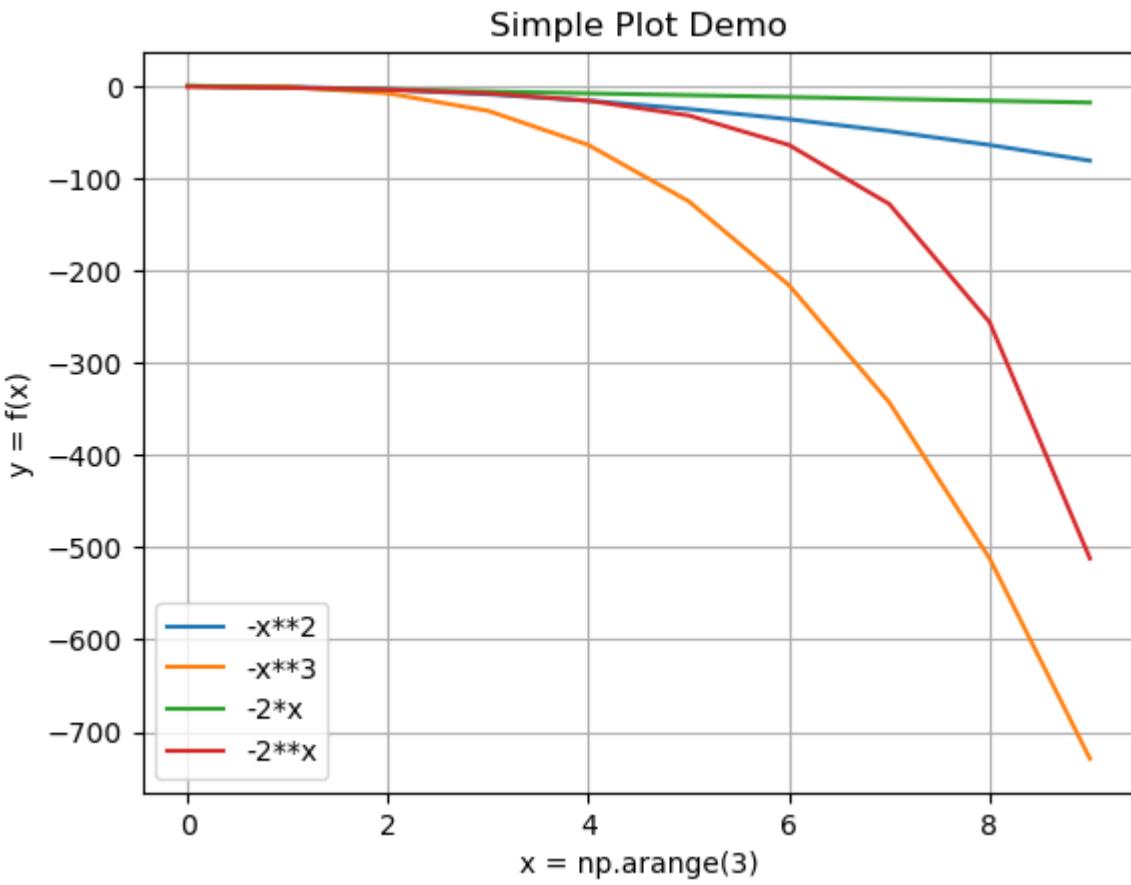
```
x = y = np.arange(10)
plt.plot(x, y, 'o--')
plt.xticks(range(len(x)), ['a', 'b', 'c', 'd', 'e', 'f', 'g', 'h', 'i', 'j'])
plt.yticks(range(0, 10, 1))
plt.show()
```



## 4-p71 oo style

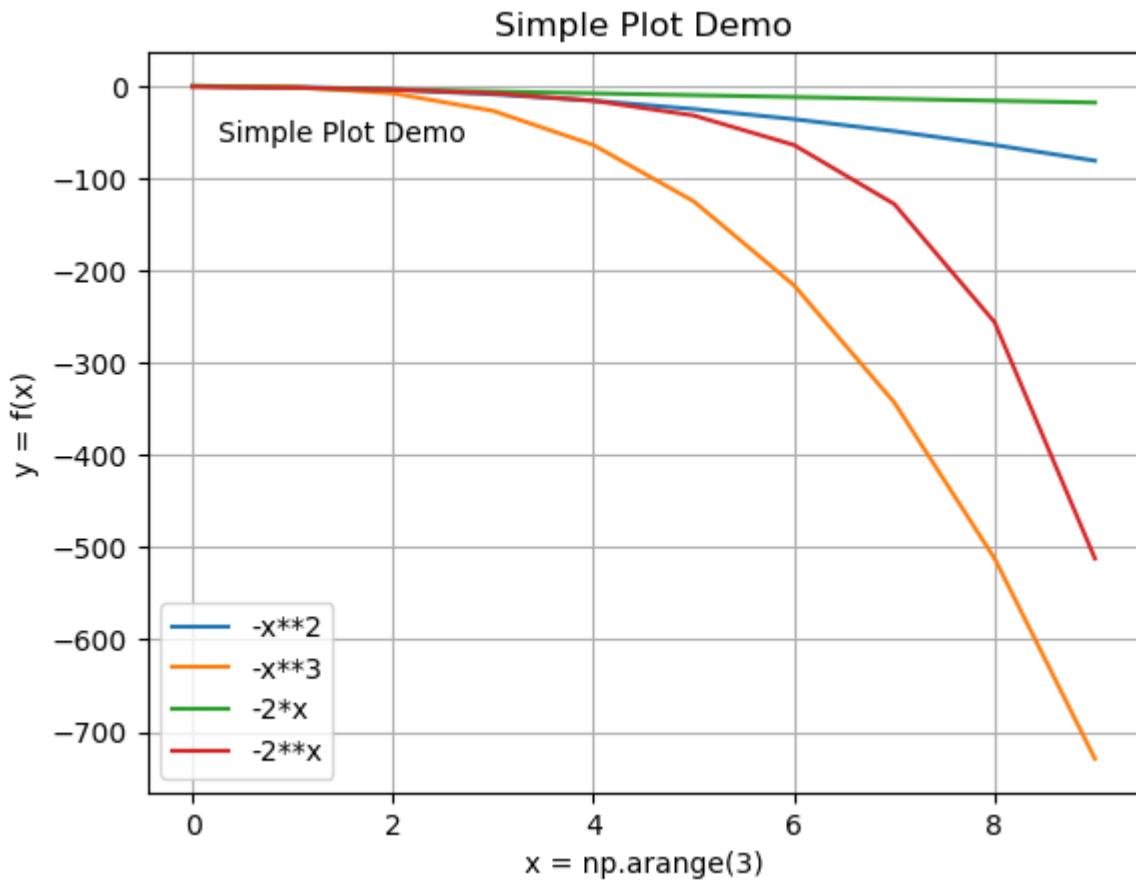
```
fig, ax = plt.subplots()
ax.plot(x, -x**2, label='-x**2')
ax.plot(x, -x**3, label='-x**3')
ax.plot(x, -2*x, label='-2*x')
ax.plot(x, -2**x, label='-2**x')
ax.set_xlabel('x = np.arange(3)')
ax.set_ylabel('y = f(x)')
ax.set_title('Simple Plot Demo')
ax.legend()
ax.grid(True)
plt.show()
```

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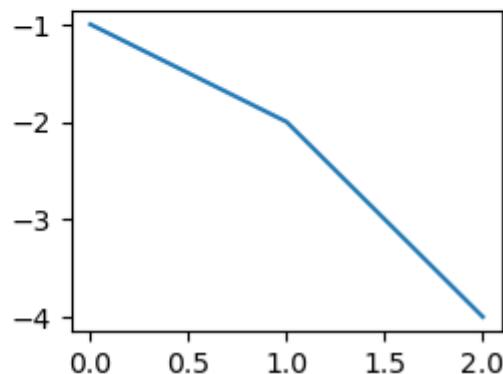
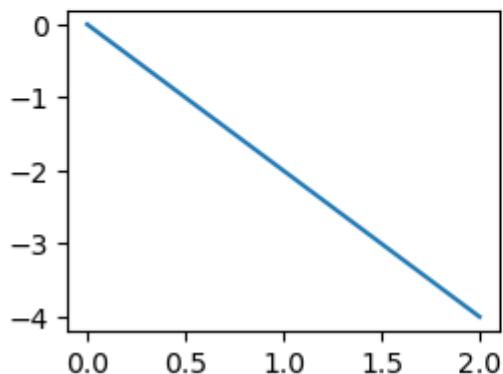
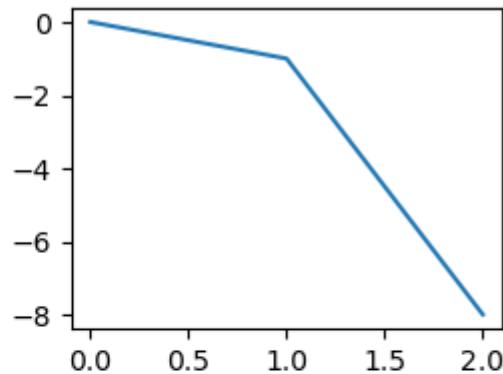
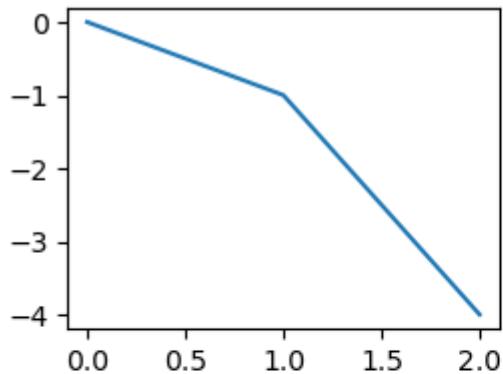
```
fig, ax = plt.subplots()
ax.plot(x, -x**2, label='-x**2')
ax.plot(x, -x**3, label='-x**3')
ax.plot(x, -2*x, label='-2*x')
ax.plot(x, -2**x, label='-2**x')
ax.set_xlabel('x = np.arange(3)')
ax.set_ylabel('y = f(x)')
ax.set_title('Simple Plot Demo')
ax.legend()
ax.grid(True)
ax.text(0.25, -60, "Simple Plot Demo")
plt.show()
```

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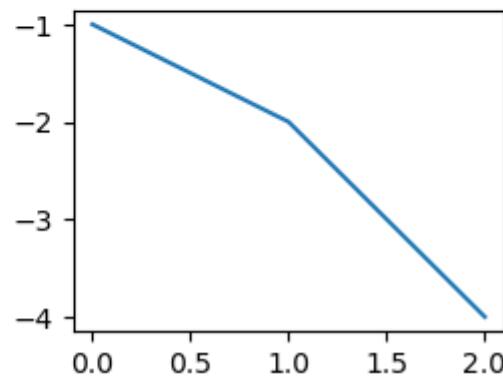
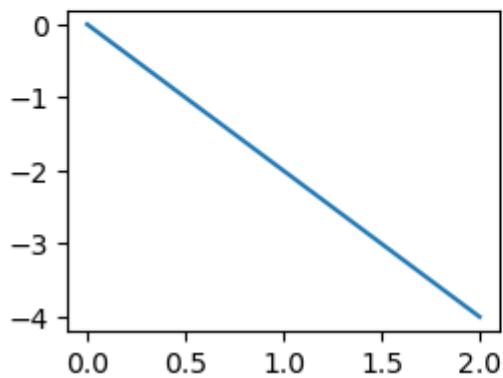
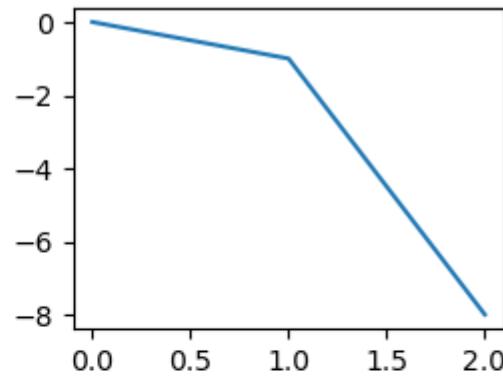
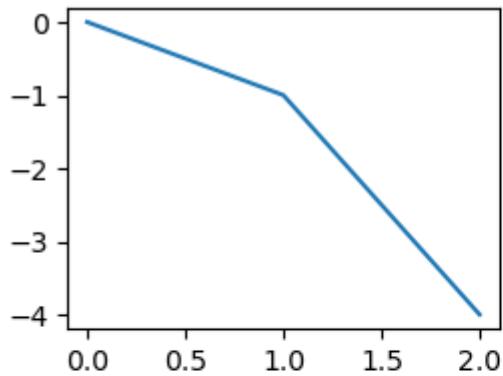


## 4-73 subplot

```
x = np.arange(3)
plt.subplots_adjust(wspace=0.3, hspace=0.3)
plt.subplot(2, 2, 1)
plt.plot(x, -x**2)
plt.subplot(2, 2, 2)
plt.plot(x, -x**3)
plt.subplot(2, 2, 3)
plt.plot(x, -2*x)
plt.subplot(2, 2, 4)
plt.plot(x, -2**x)
plt.show()
```



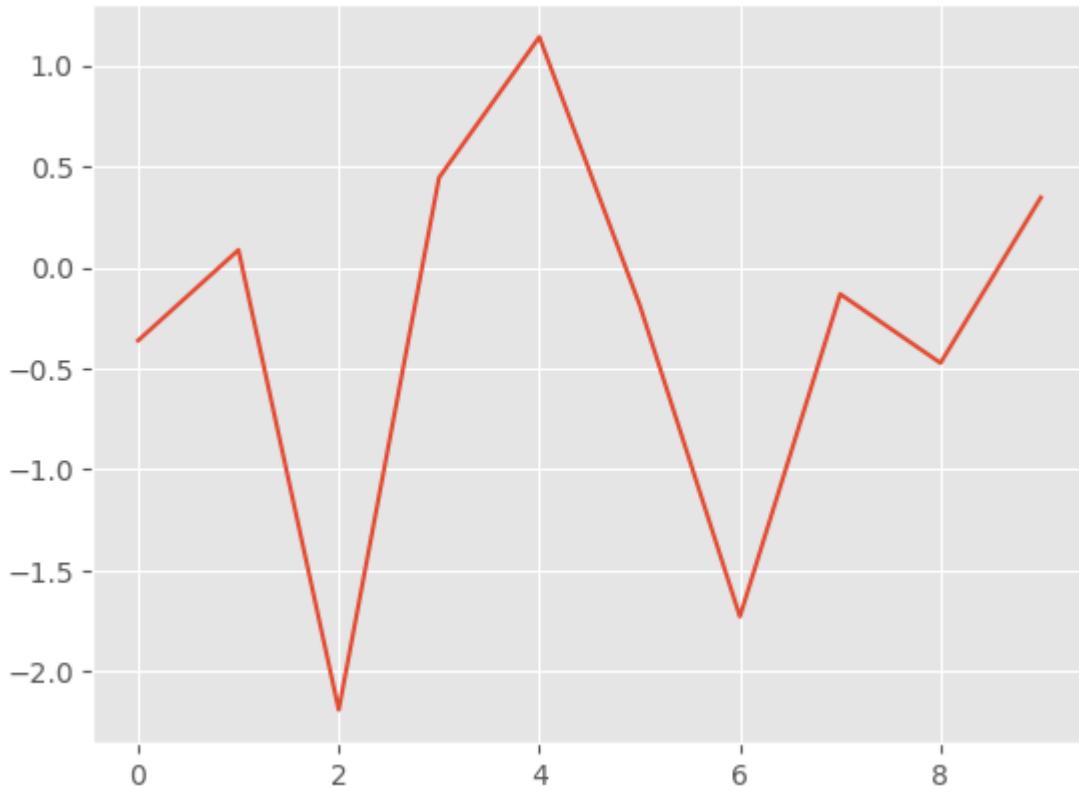
```
fig, axs = plt.subplots(2, 2)
plt.subplots_adjust(wspace=0.3, hspace=0.3)
axs[0, 0].plot(x, -x**2)
axs[0, 1].plot(x, -x**3)
axs[1, 0].plot(x, -2*x)
axs[1, 1].plot(x, -2*x*x)
plt.show()
```



## handon-c5

```
%matplotlib inline
import matplotlib.pyplot as plt
import numpy as np
plt.style.use('ggplot')
data = np.random.randn(10)
print(data)
# Let's visualize it now:
plt.plot(data)
plt.show()
```

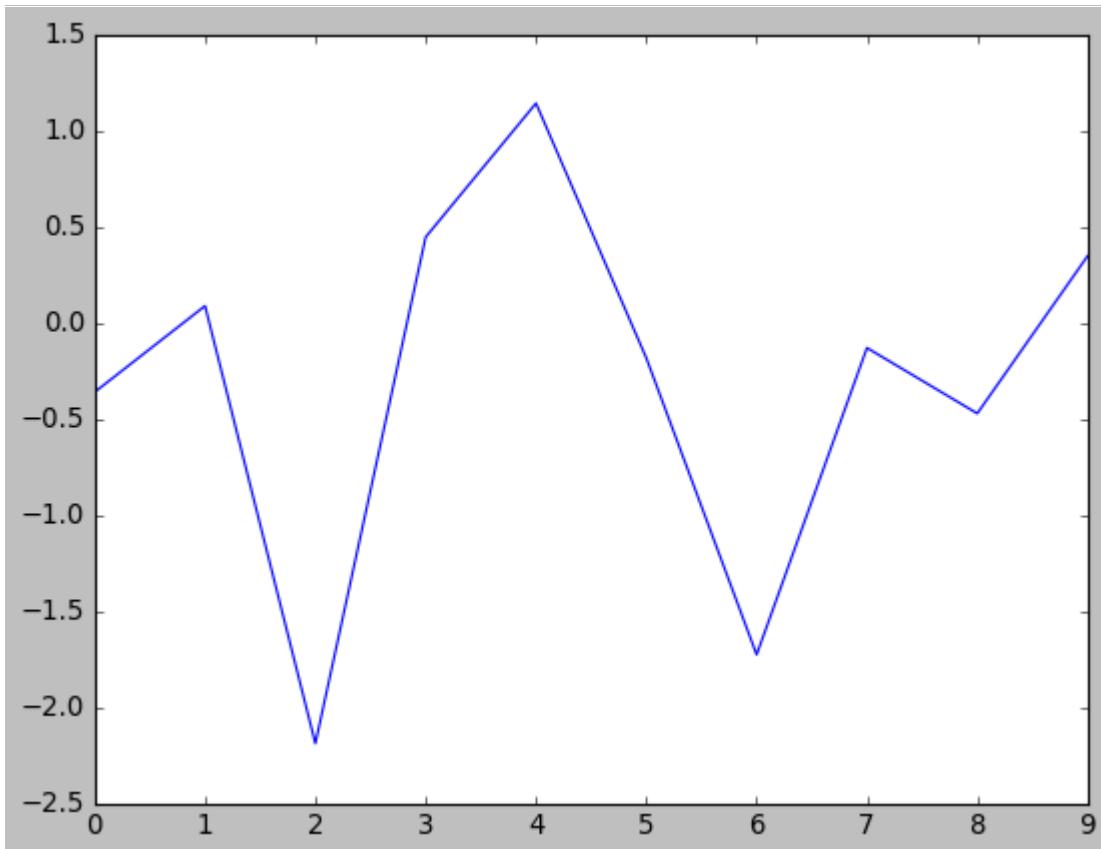
```
[ -0.36180994  0.08624858 -2.18999836  0.44432251  1.14042698 -0.18488702
 -1.72815245 -0.13200888 -0.47319565  0.34591366]
```



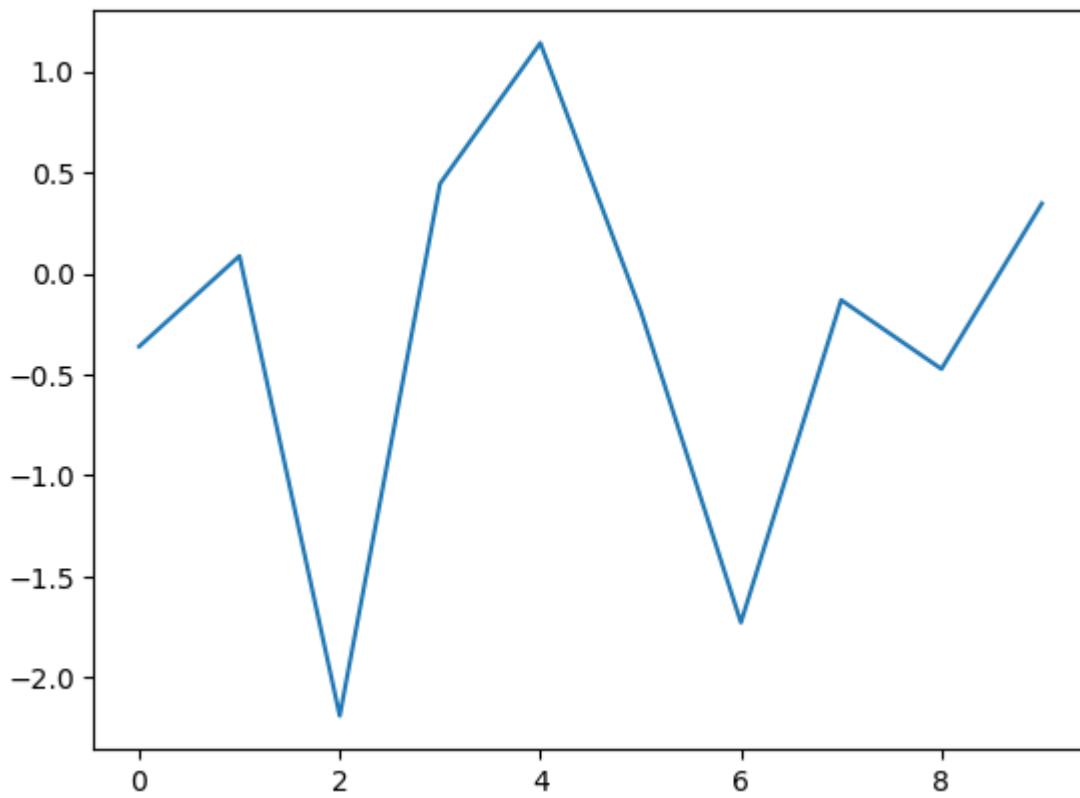
```
print(plt.style.available)
```

```
['Solarize_Light2', '_classic_test_patch', '_mpl-gallery', '_mpl-gallery-nogrid', 'bmh'
```

```
plt.style.use('classic')
plt.plot(data)
plt.show()
```

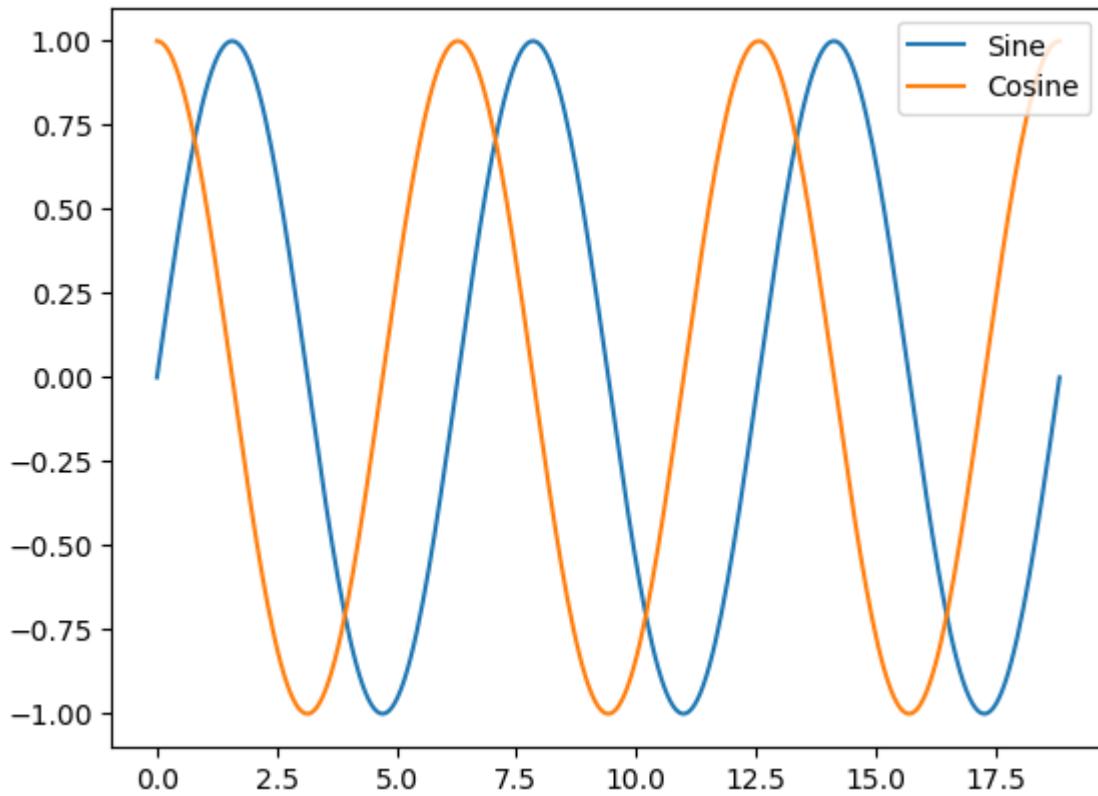


```
plt.style.use('default')
#Let's show the data with the following:
plt.plot(data)
plt.show()
```

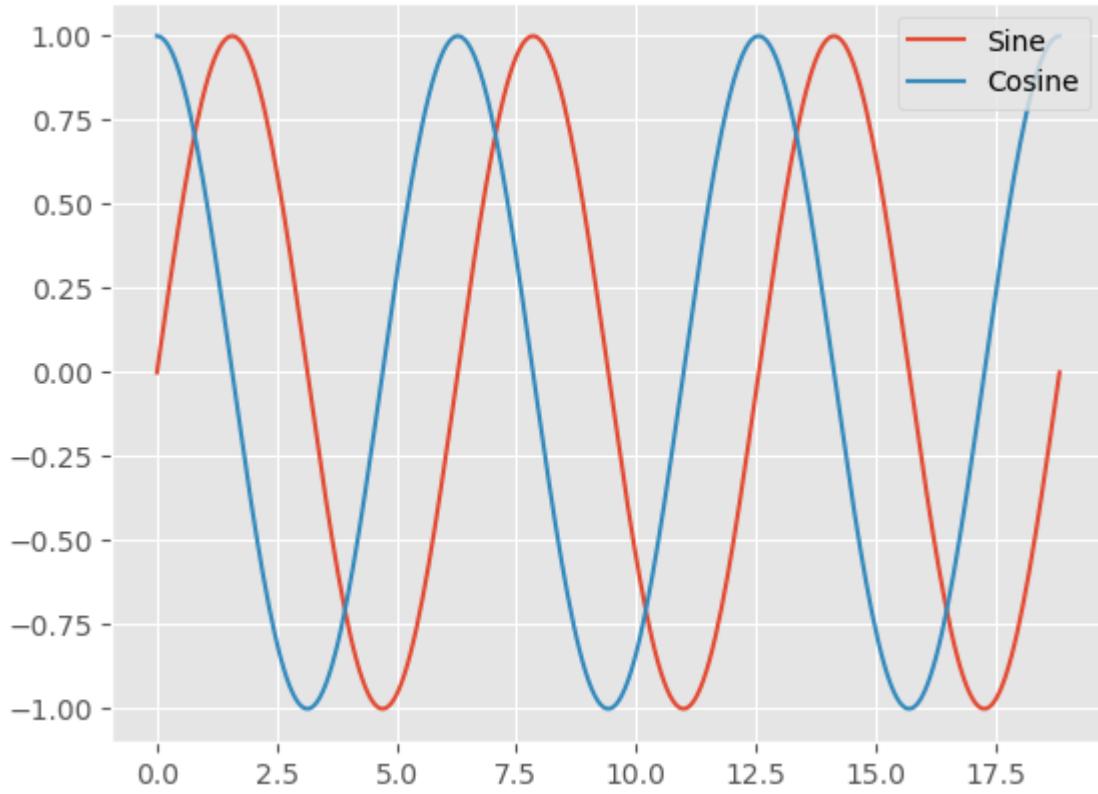


```
n= 3
data = np.linspace(0, 2*n*np.pi, 300)
# n * 2pi
def sinusoidal(sty):
    plt.style.use(sty)
    fig, ax = plt.subplots()
    ax.plot(data, np.sin(data), label='Sine')
    ax.plot(data, np.cos(data), label='Cosine')
    ax.legend()
```

```
sinusoidal('default')
plt.show()
```

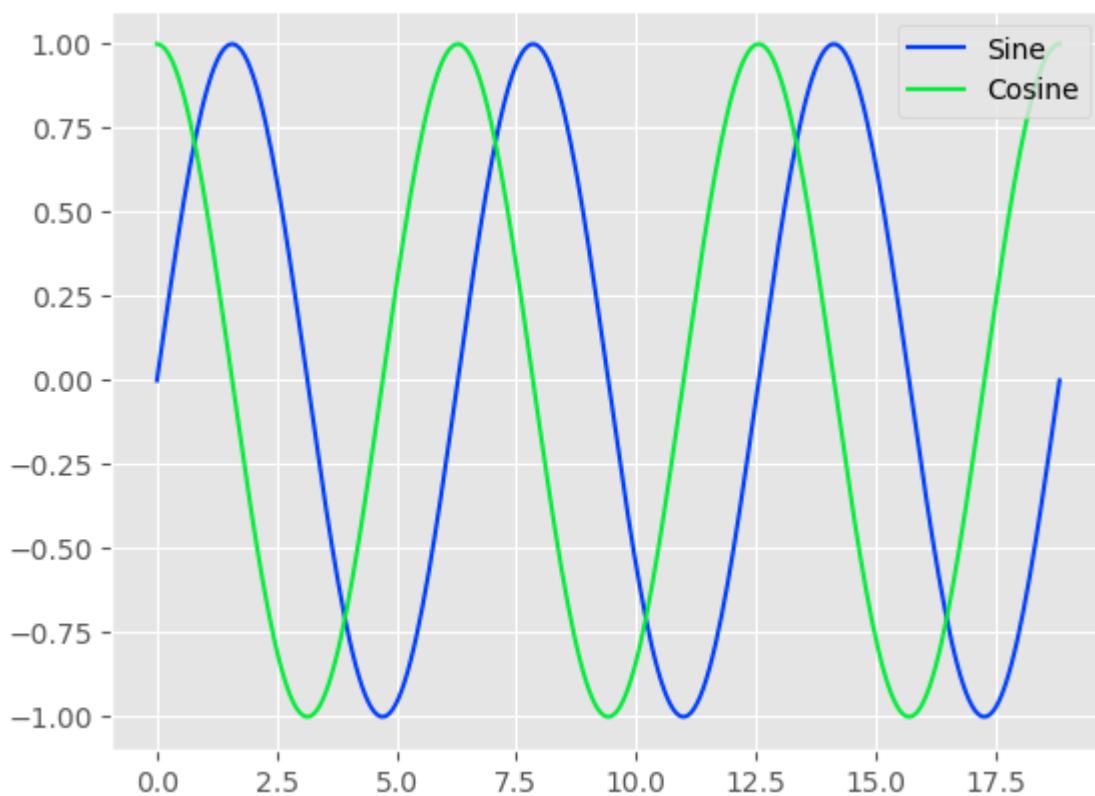


```
sinusoidal('ggplot')
plt.show()
```



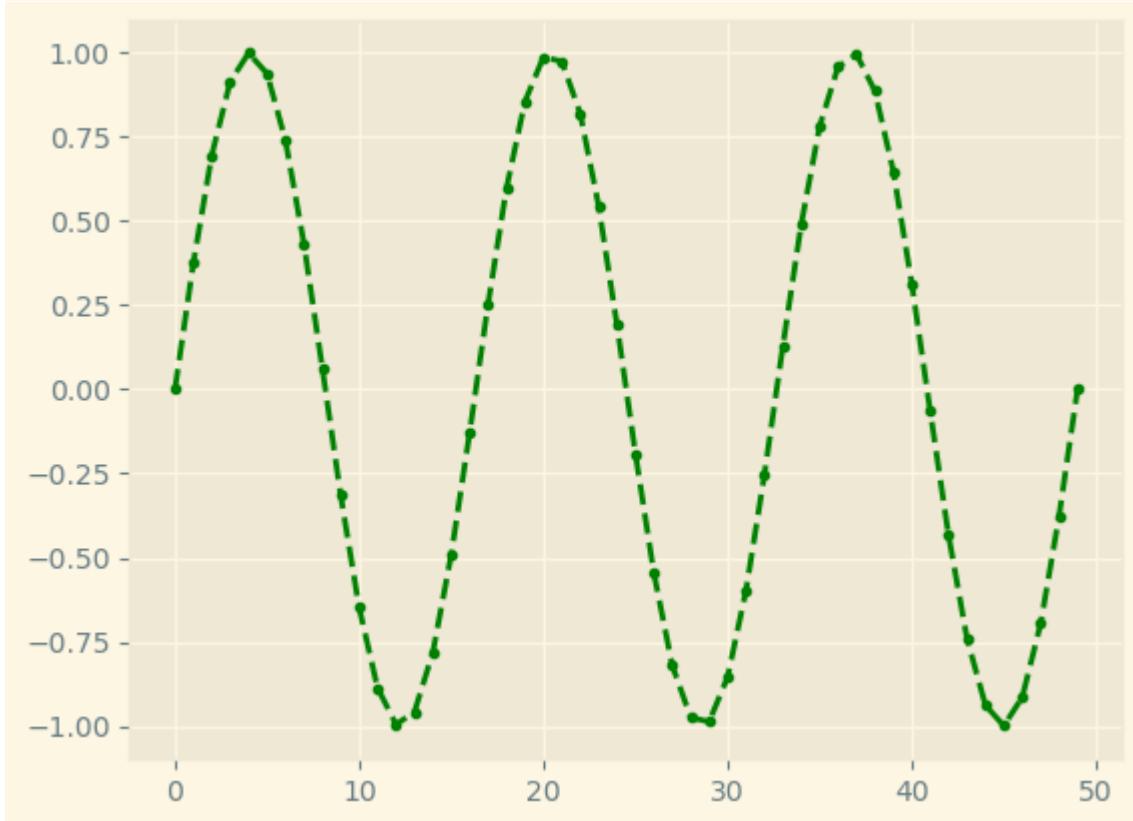
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```
sinusoidal('seaborn-v0_8-bright') #('seaborn')
plt.show()
```



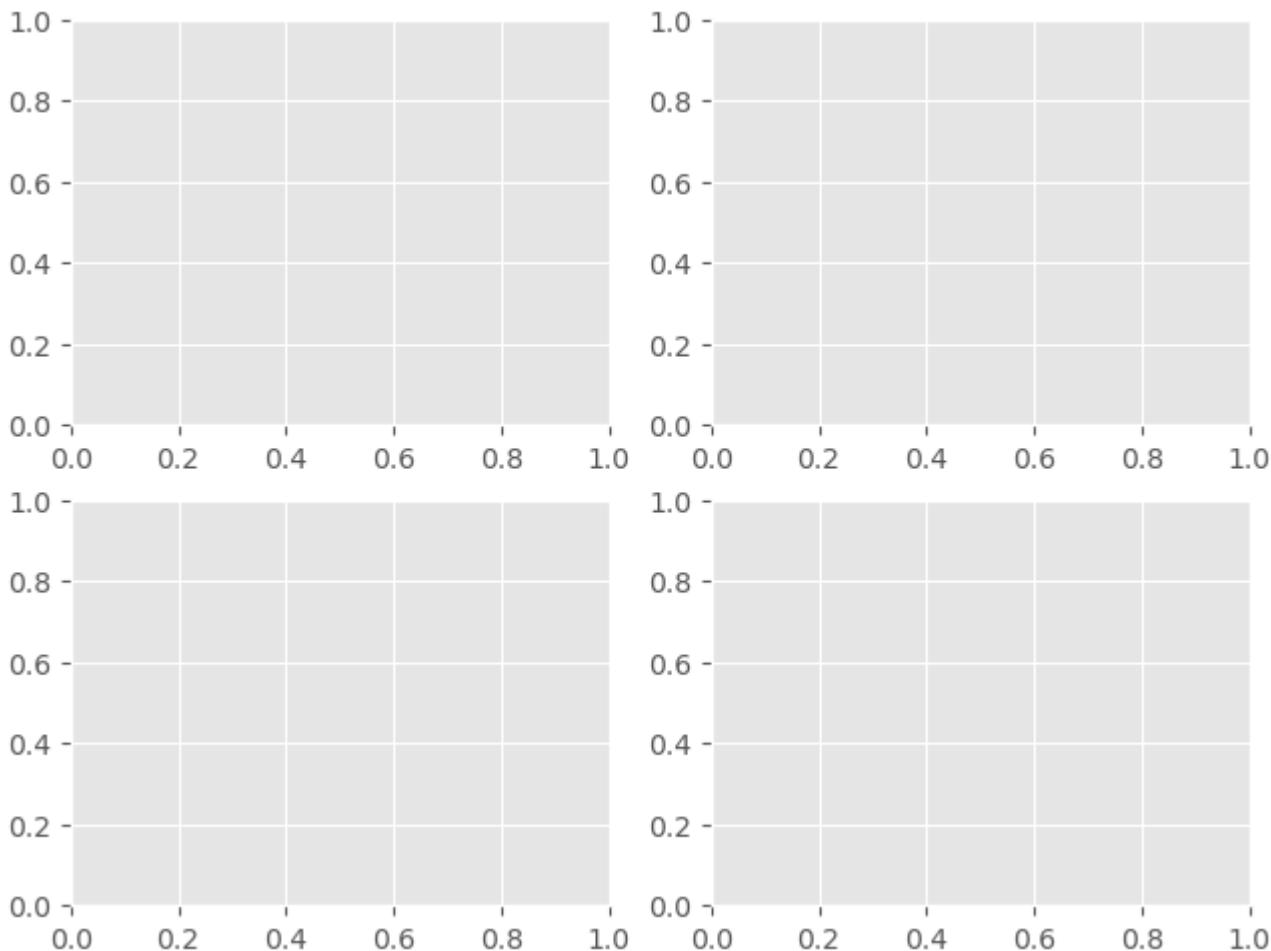
```
with plt.style.context('Solarize_Light2'):
    data = np.linspace(0, 6 * np.pi)
    plt.plot(np.sin(data), 'g--')
    plt.show()
```

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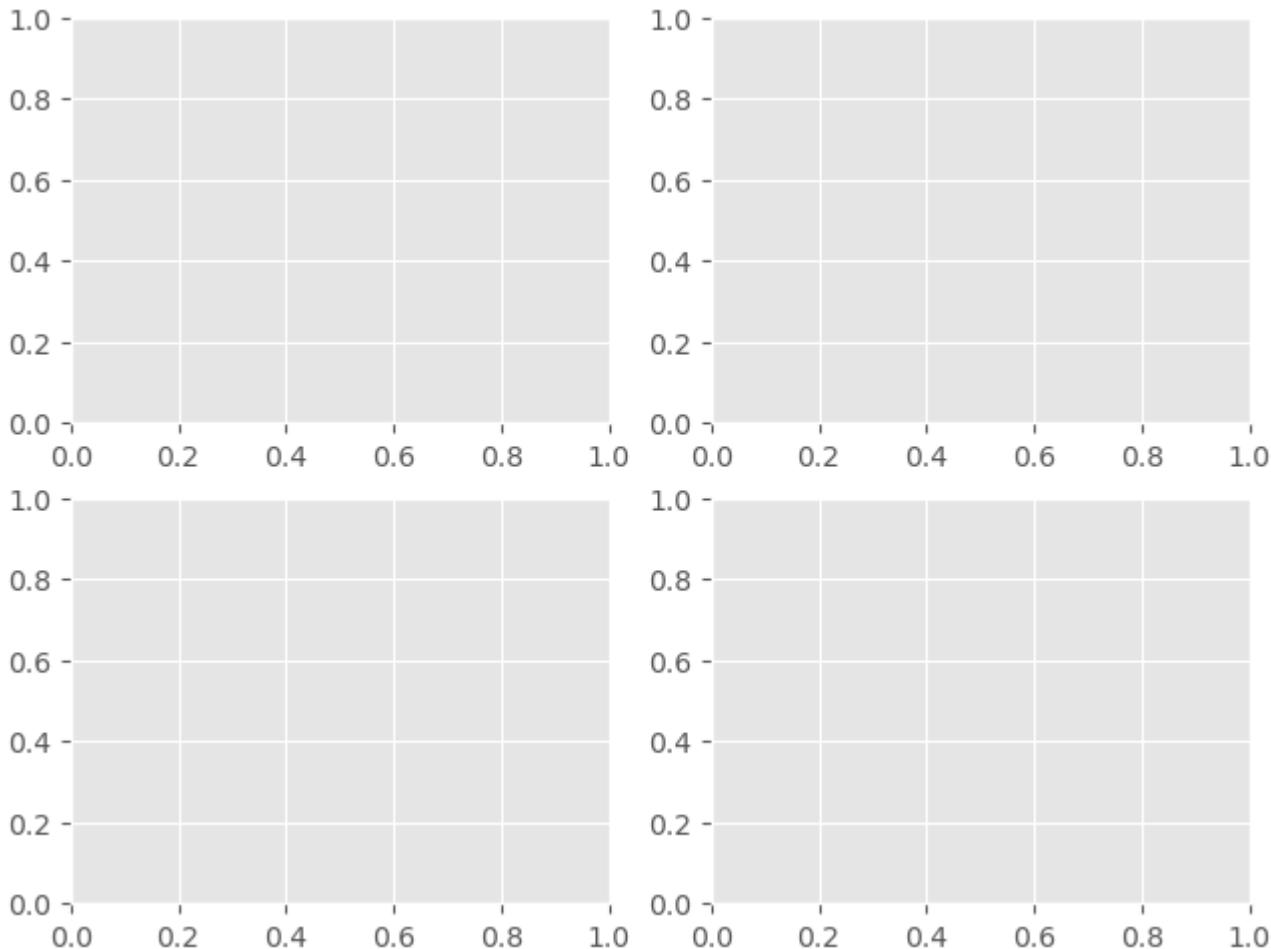


```
#plt.style.use('default')
```

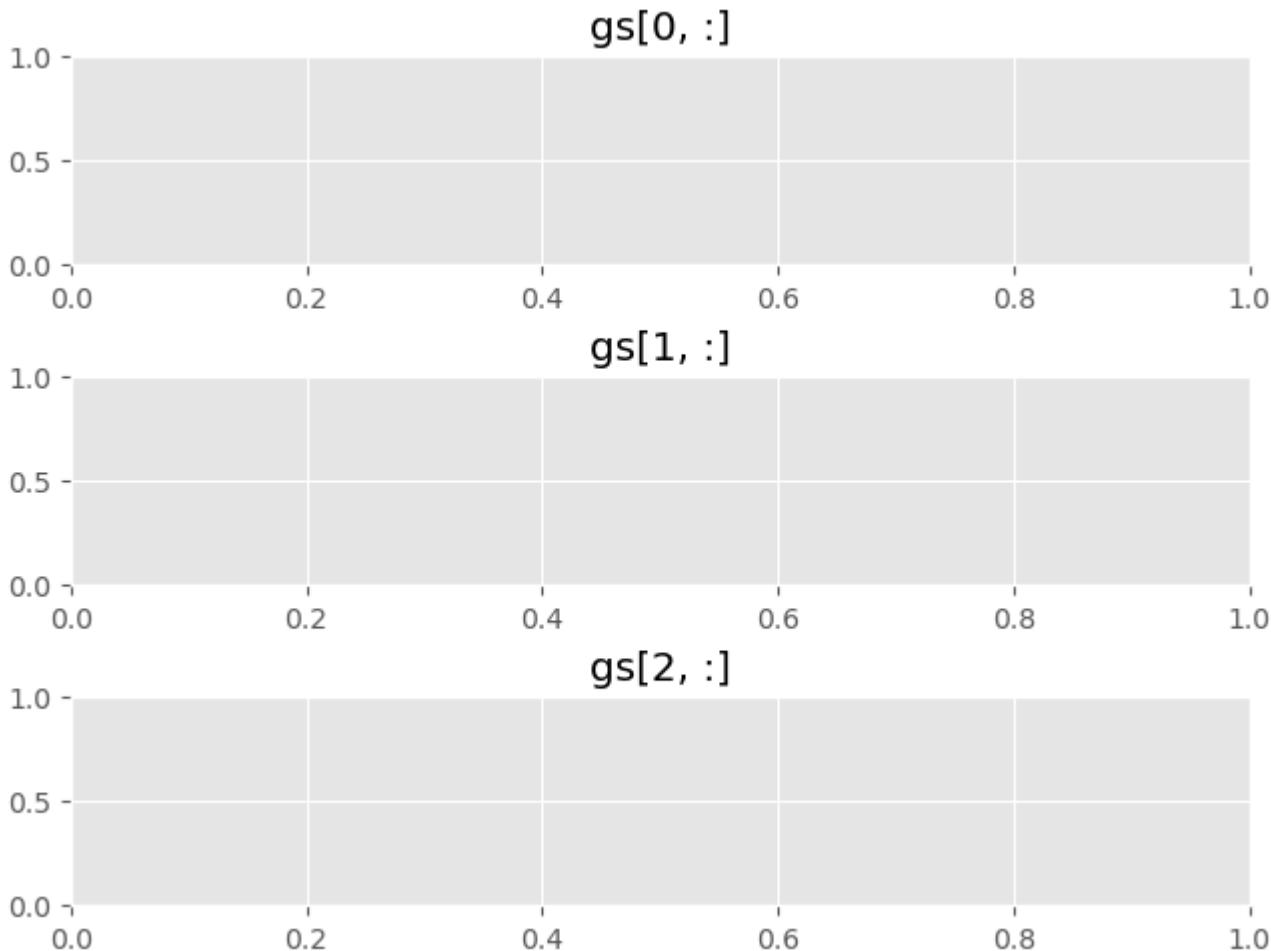
```
fig, axs = plt.subplots(ncols=2, nrows=2, constrained_layout=True)
plt.show()
```



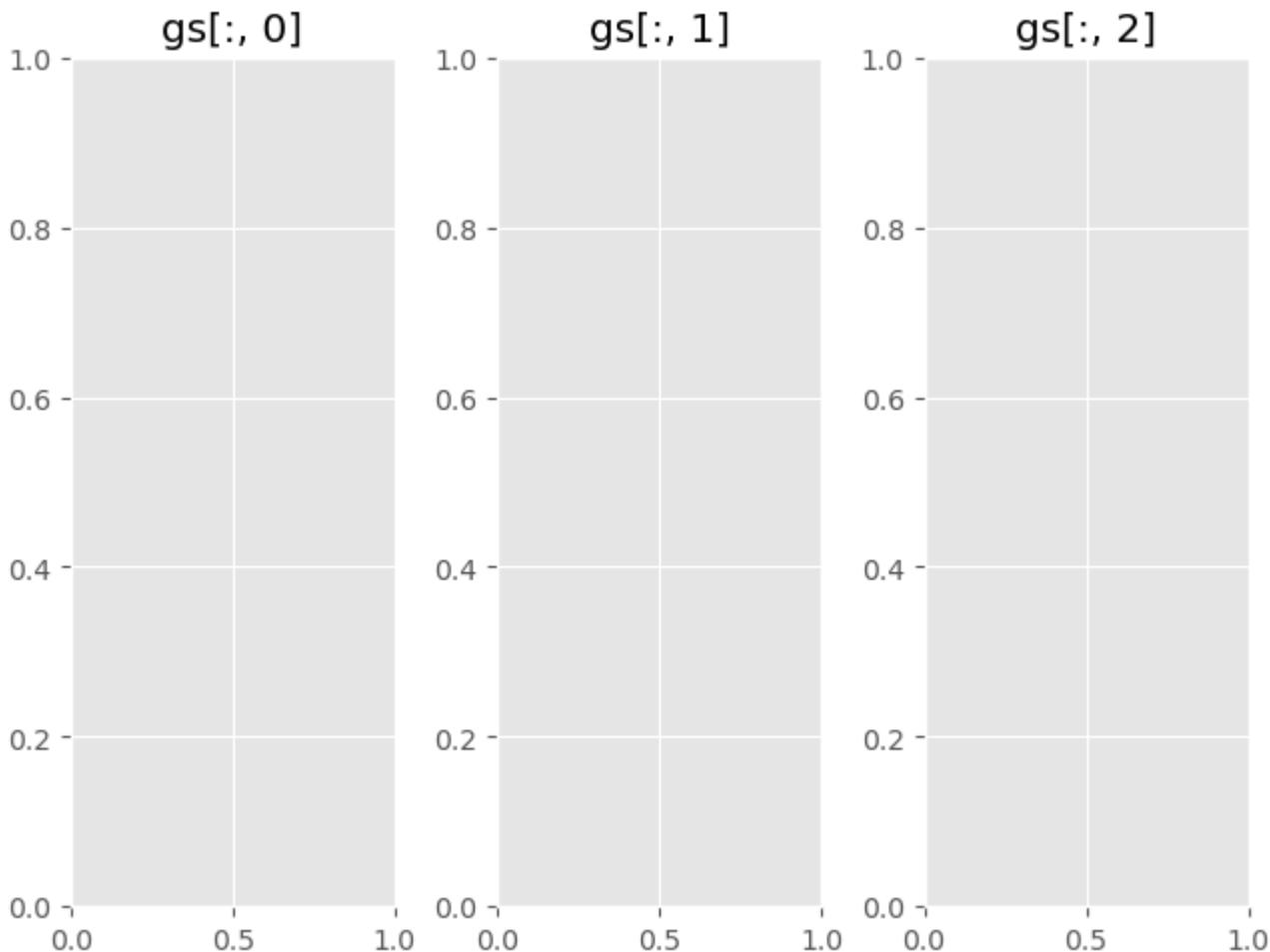
```
import matplotlib.gridspec as gridspec
fig = plt.figure(constrained_layout=True)
specs = gridspec.GridSpec(ncols=2, nrows=2, figure=fig)
ax1 = fig.add_subplot(specs[0, 0])
ax2 = fig.add_subplot(specs[0, 1])
ax3 = fig.add_subplot(specs[1, 0])
ax4 = fig.add_subplot(specs[1, 1])
plt.show()
```



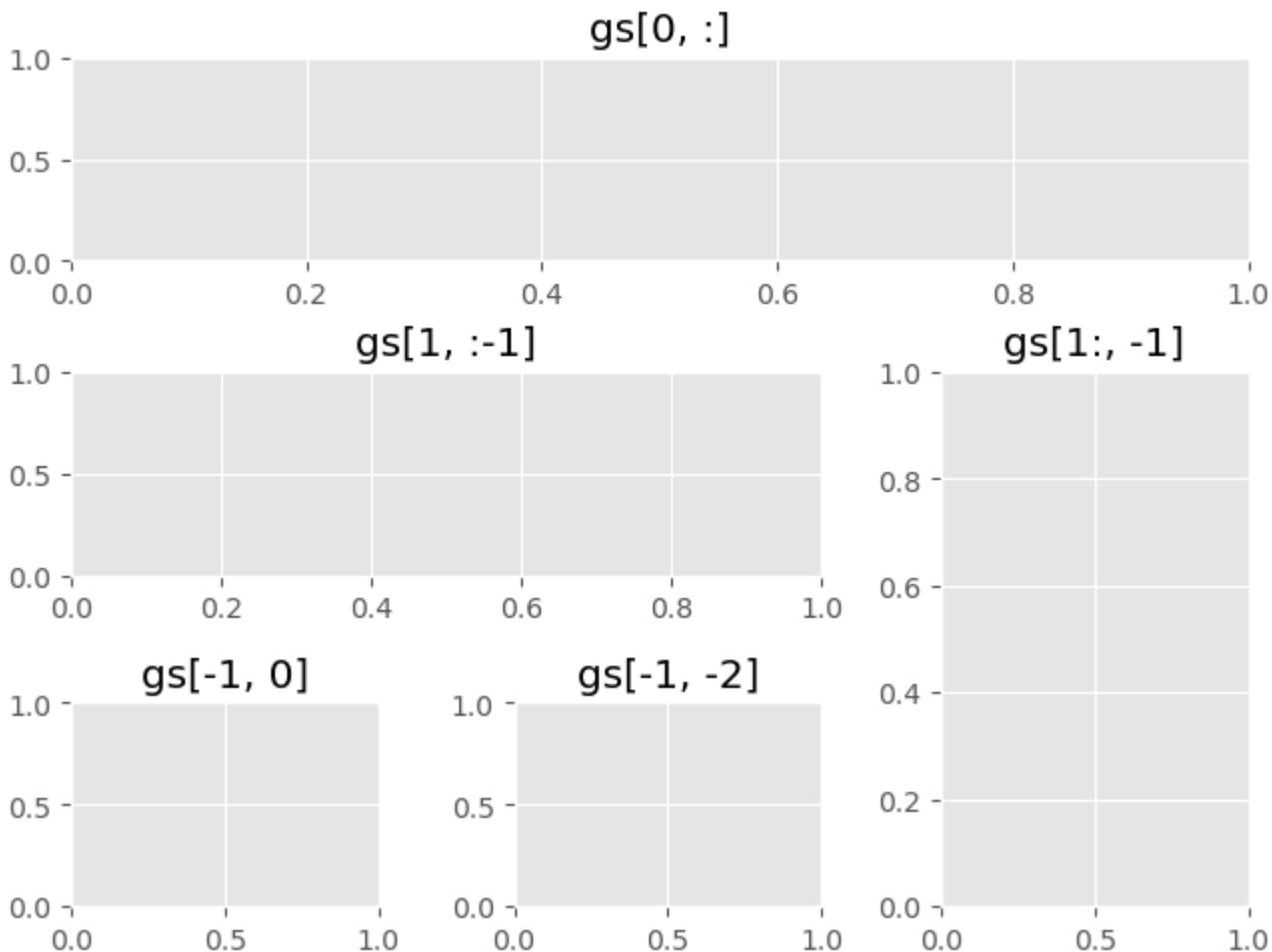
```
fig = plt.figure(constrained_layout=True)
gs = fig.add_gridspec(3, 3)
ax1 = fig.add_subplot(gs[0, :])
ax1.set_title('gs[0, :]')
ax2 = fig.add_subplot(gs[1, :])
ax2.set_title('gs[1, :]')
ax3 = fig.add_subplot(gs[2, :])
ax3.set_title('gs[2, :]')
plt.show()
```



```
fig = plt.figure(constrained_layout=True)
gs = fig.add_gridspec(3, 3)
ax1 = fig.add_subplot(gs[:, 0])
ax1.set_title('gs[:, 0]')
ax2 = fig.add_subplot(gs[:, 1])
ax2.set_title('gs[:, 1]')
ax3 = fig.add_subplot(gs[:, 2])
ax3.set_title('gs[:, 2]')
plt.show()
```



```
fig = plt.figure(constrained_layout=True)
gs = fig.add_gridspec(3, 3)
ax1 = fig.add_subplot(gs[0, :])
ax1.set_title('gs[0, :]')
ax2 = fig.add_subplot(gs[1, :-1])
ax2.set_title('gs[1, :-1]')
ax3 = fig.add_subplot(gs[1:, -1])
ax3.set_title('gs[1:, -1]')
ax4 = fig.add_subplot(gs[-1, 0])
ax4.set_title('gs[-1, 0]')
ax5 = fig.add_subplot(gs[-1, -2])
ax5.set_title('gs[-1, -2]')
plt.show()
```

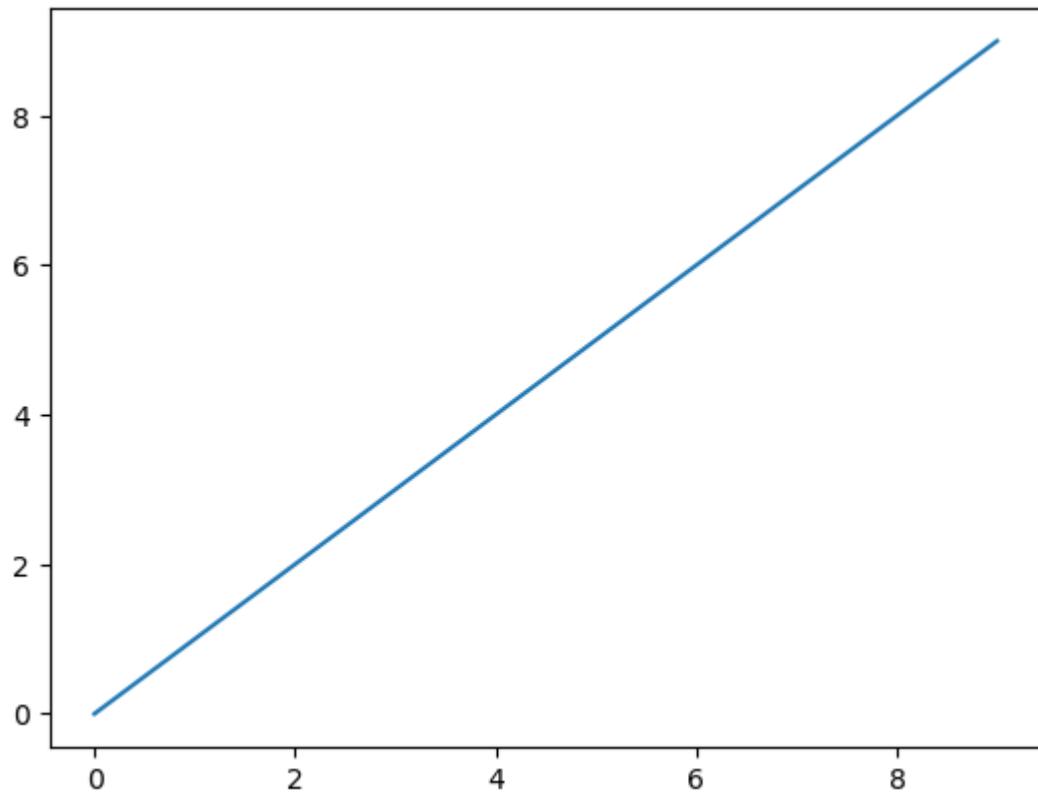


## handob ch6

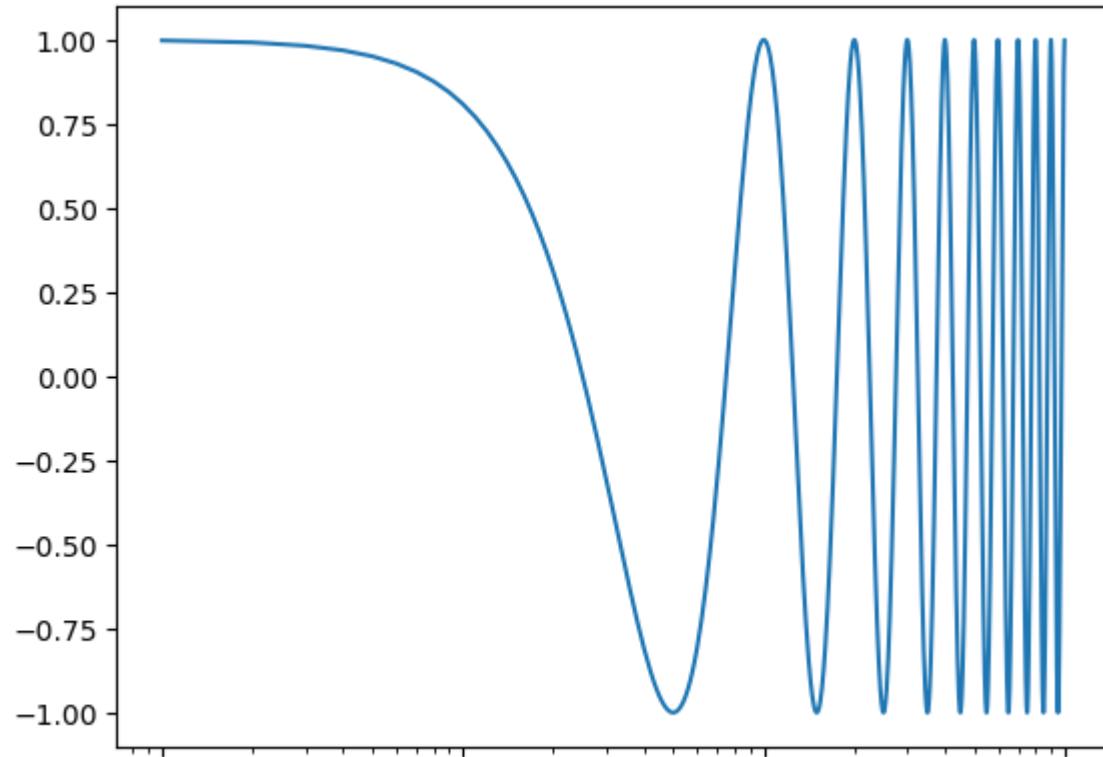
```
%matplotlib inline
import numpy as np
import matplotlib.pyplot as plt
data = np.linspace(0, 9, 10)

plt.plot(data)
plt.show()
```

[Skip to main content](#)

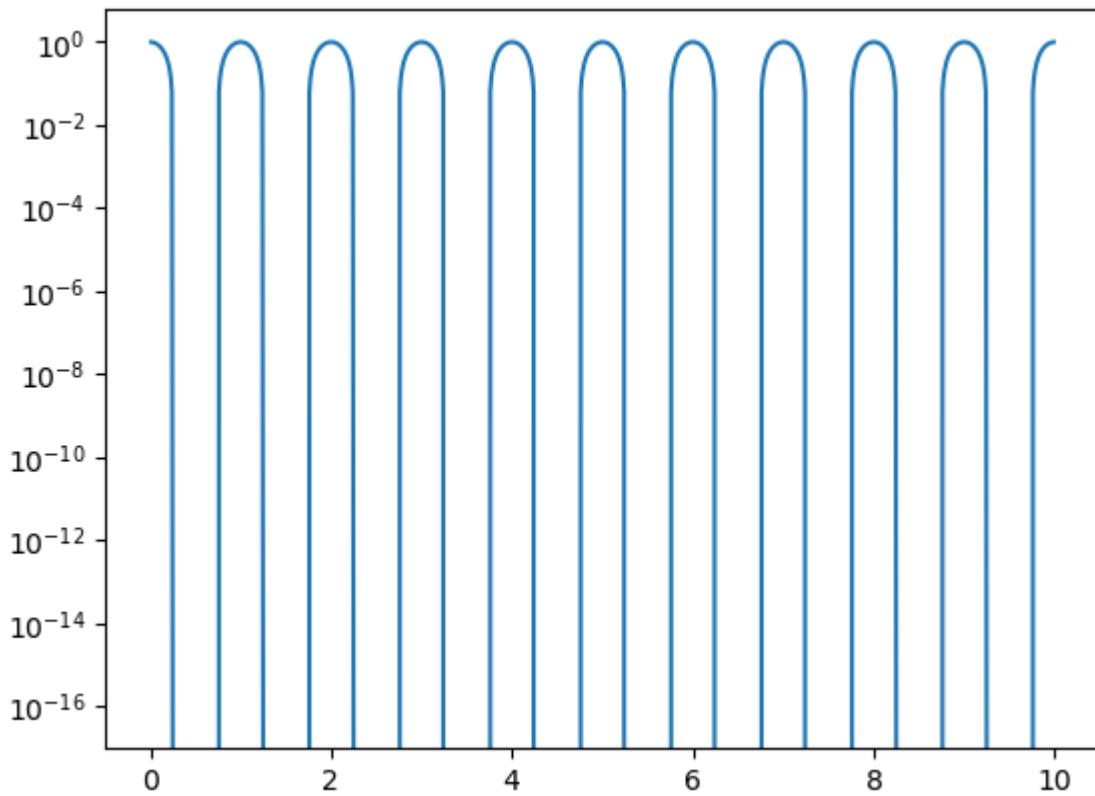


```
t = np.arange(0.01, 10, 0.01)
plt.semilogx(t, np.cos(2 * np.pi * t))
plt.show()
```

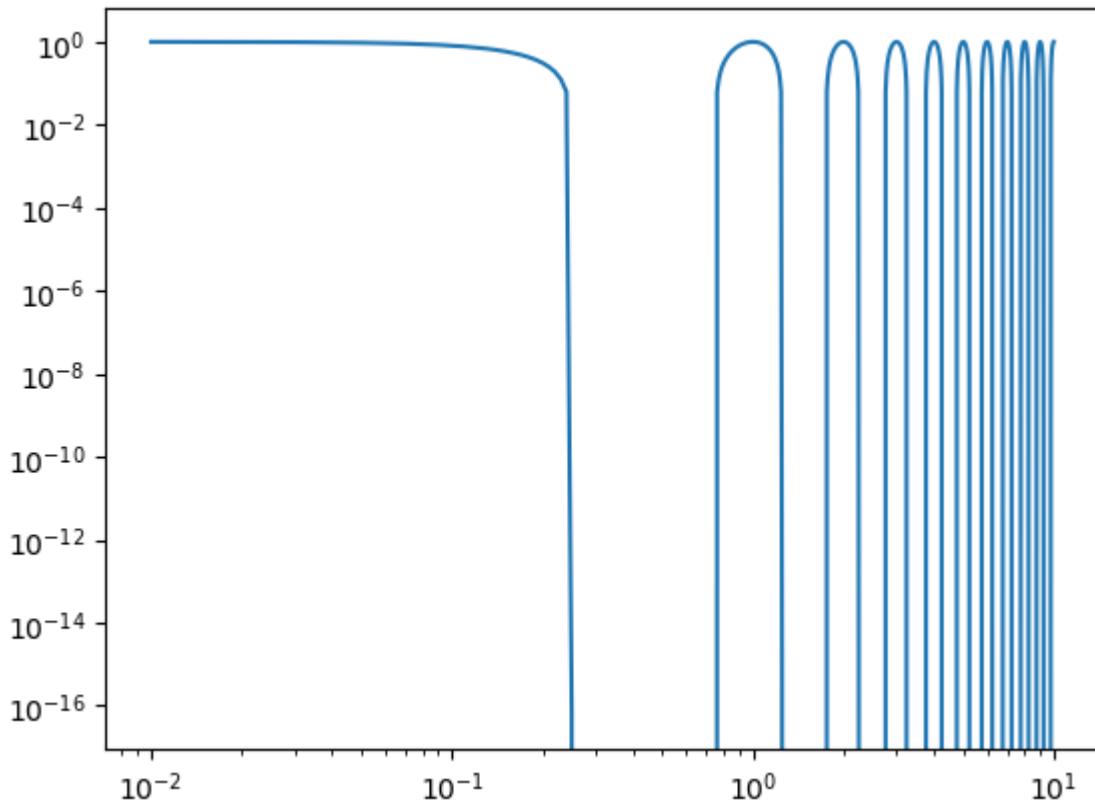


[Skip to main content](#)

```
plt.semilogy(t, np.cos(2 * np.pi * t))  
plt.show()
```

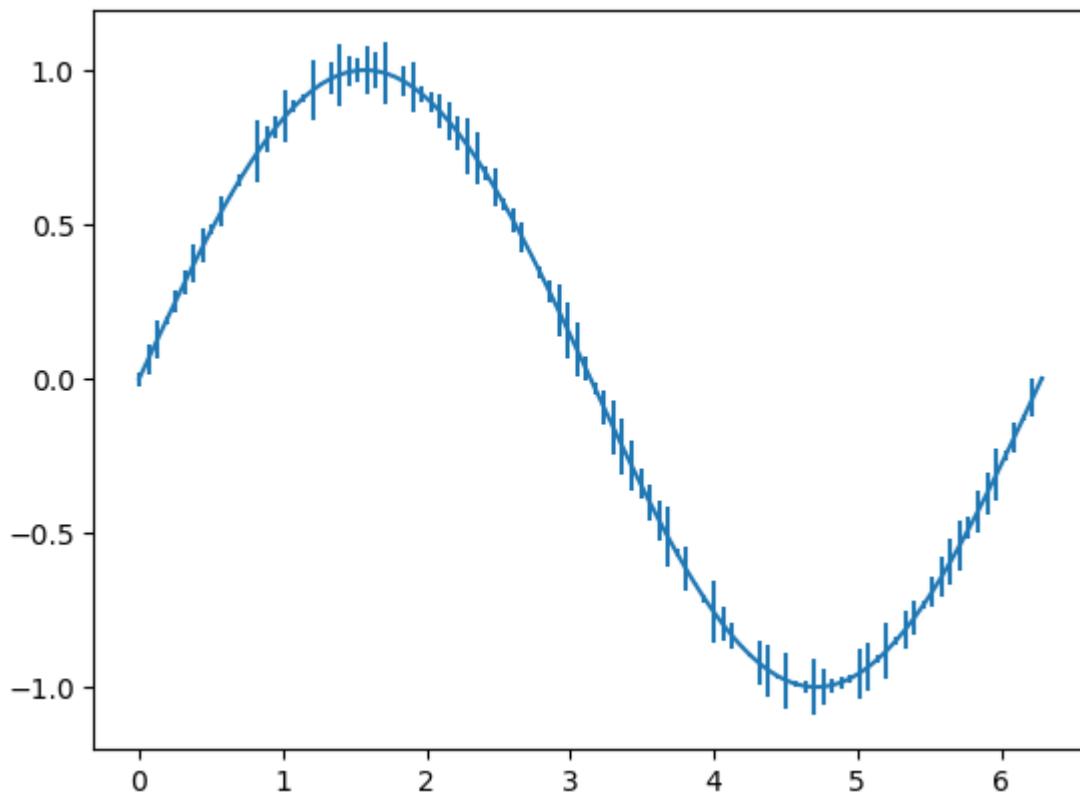


```
plt.loglog(t, np.cos(2 * np.pi * t))  
plt.show()
```

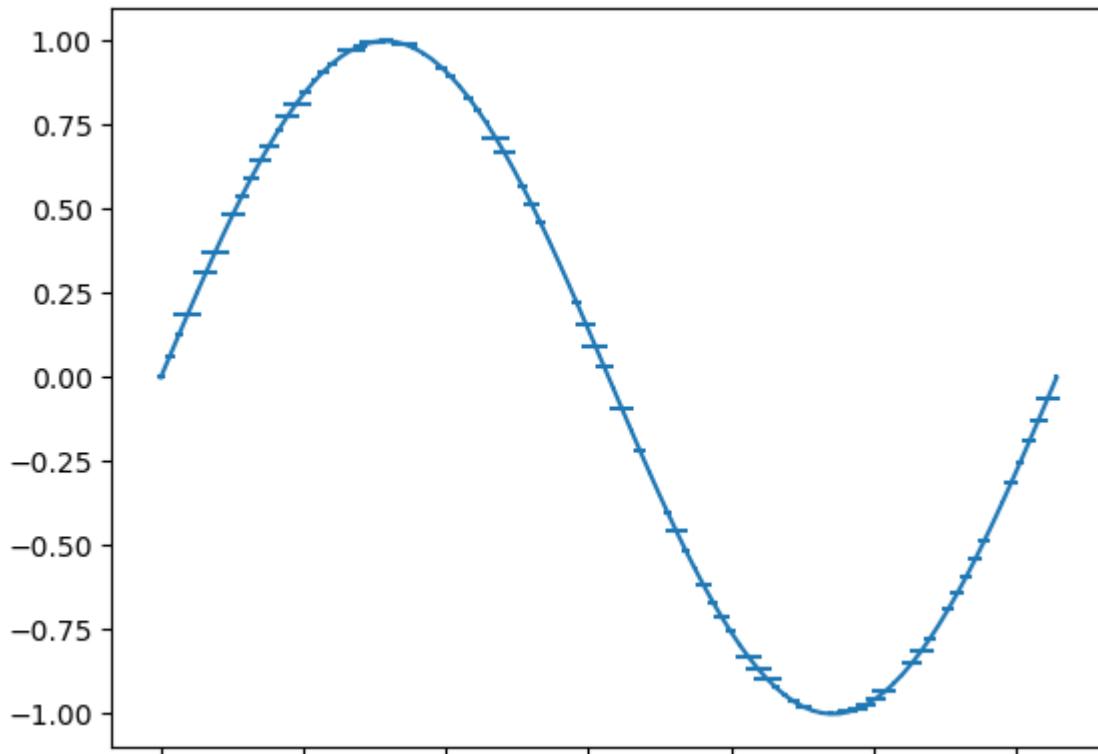


## err graph

```
x = np.linspace (0, 2 * np.pi, 100)
y = np.sin(x)
ye = np.random.rand(len(x))/10
plt.errorbar(x, y, yerr = ye)
plt.show()
```

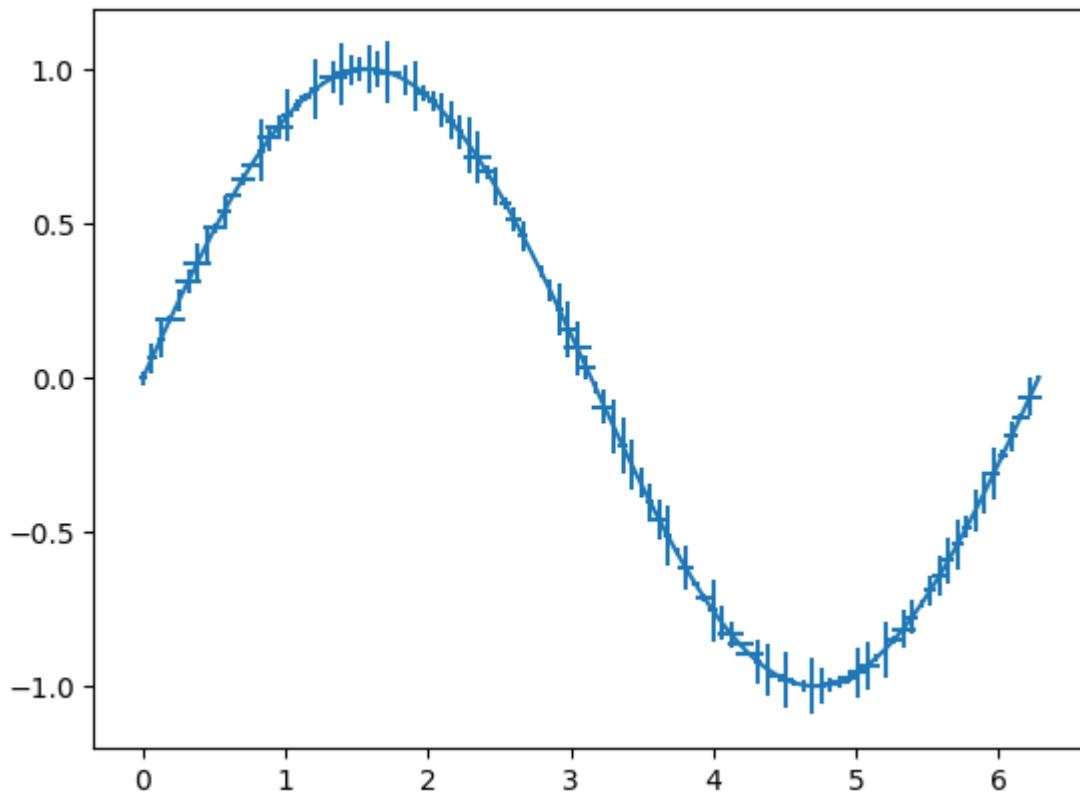


```
xe = np.random.rand(len(x))/10  
plt.errorbar(x, y, xerr = xe)  
plt.show()
```



[Skip to main content](#)

```
plt.errorbar(x, y, xerr = xe, yerr = ye)  
plt.show()
```

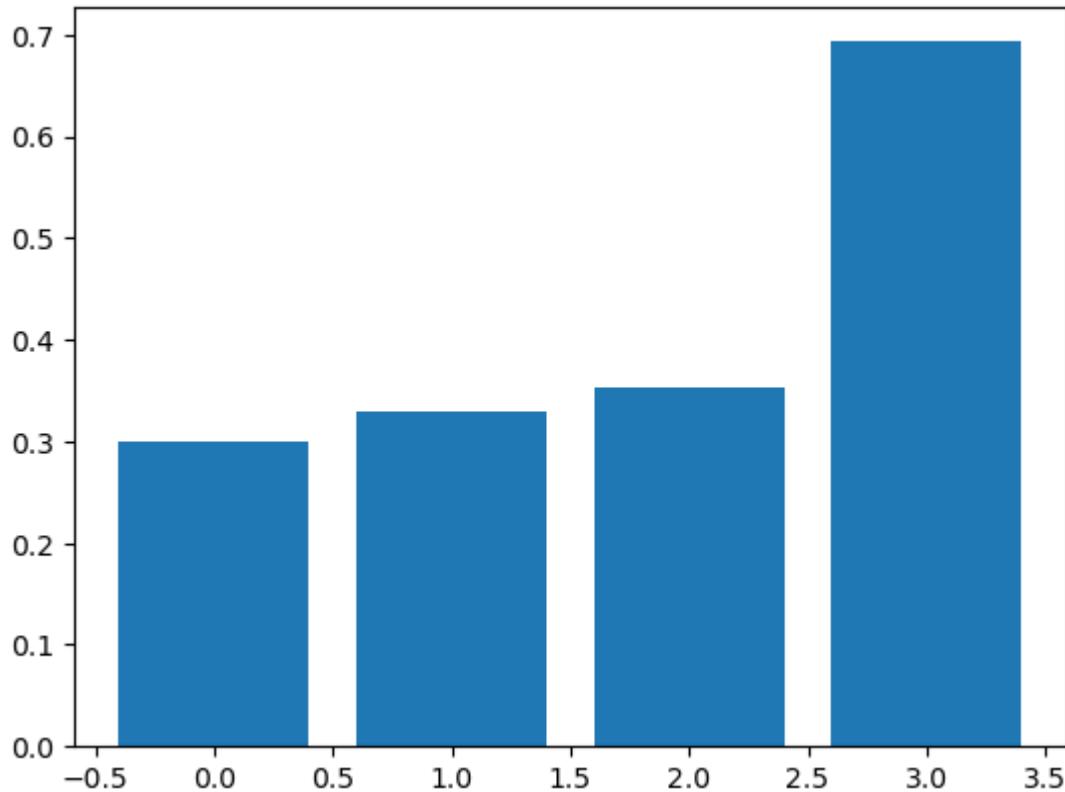


## bar graph

```
x = np.arange(4)  
y = np.random.rand(4)  
print(x)  
print(y)  
plt.bar(x, y)  
plt.show()
```

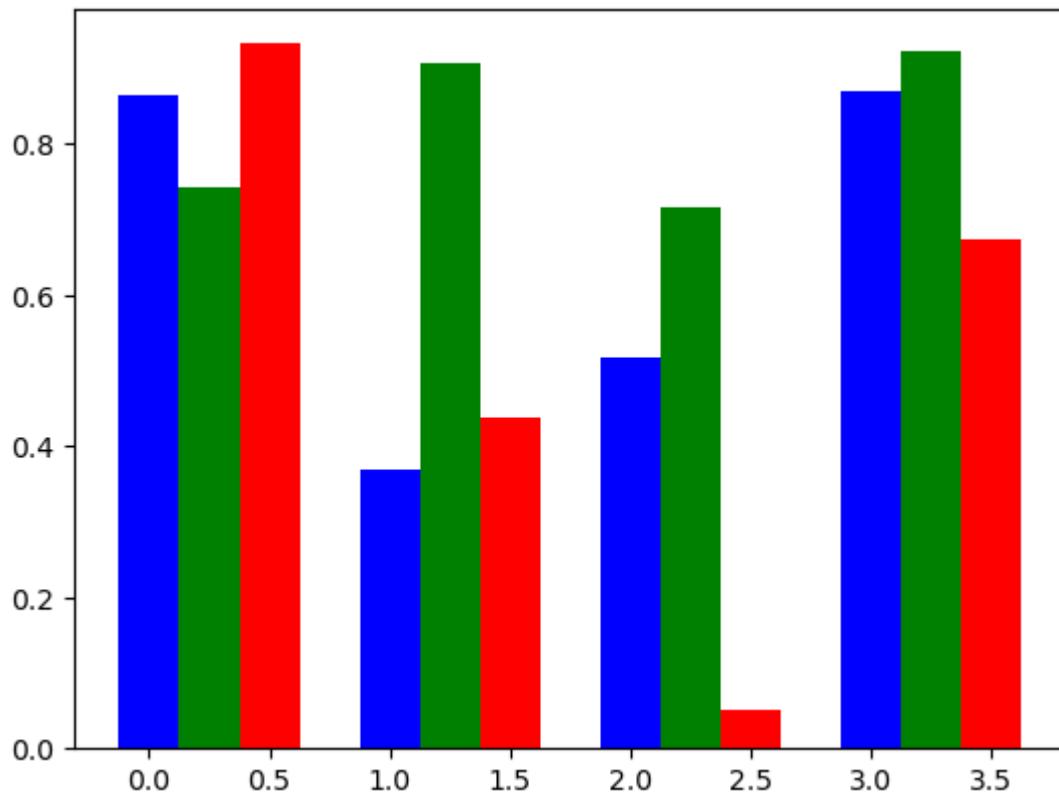
[Skip to main content](#)

```
[0 1 2 3]
[0.29950049 0.32909071 0.35274287 0.69319103]
```



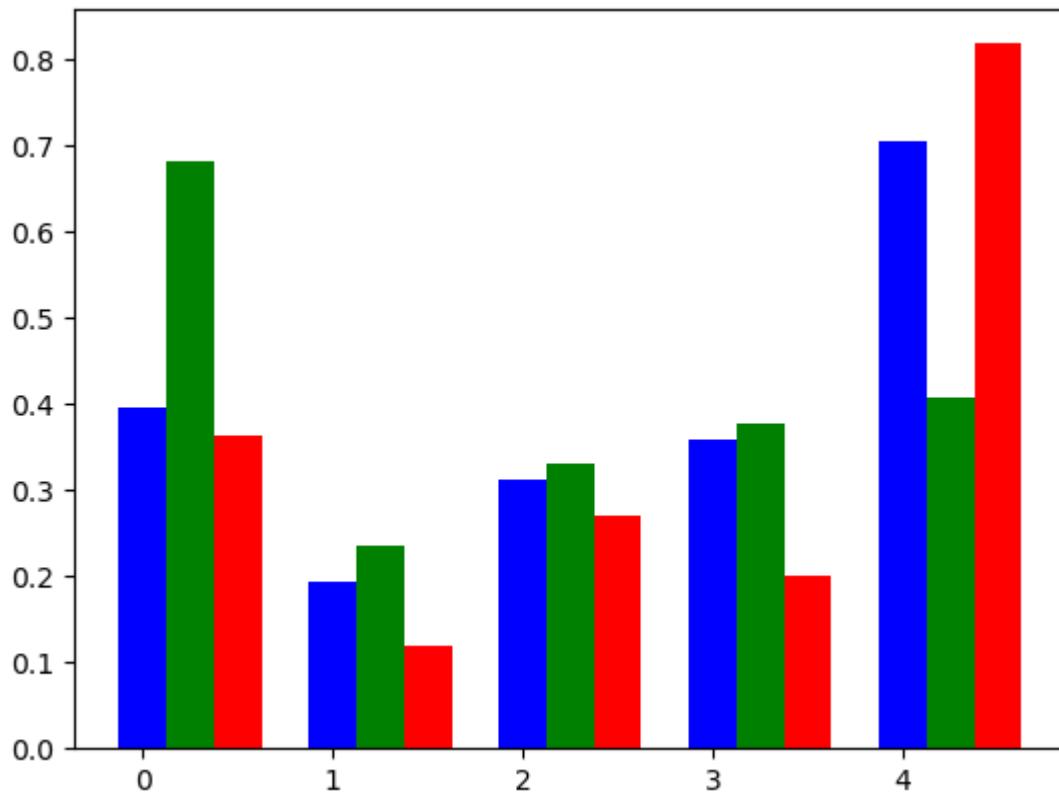
```
x = np.arange(4)
y = np.random.rand(3, 4)
print(x)
# assume 4 bar first as above
# within each bar we have 3 bars
print(y)
plt.bar(x + 0.00, y[0], color = 'b', width = 0.25)
plt.bar(x + 0.25, y[1], color = 'g', width = 0.25)
plt.bar(x + 0.50, y[2], color = 'r', width = 0.25)
plt.show()
```

```
[0 1 2 3]
[[0.86466205 0.36924349 0.5180949 0.86968971]
 [0.74122173 0.90734782 0.71470591 0.9230722 ]
[0.93233009 0.4365871 0.04988528 0.67356219]]
```



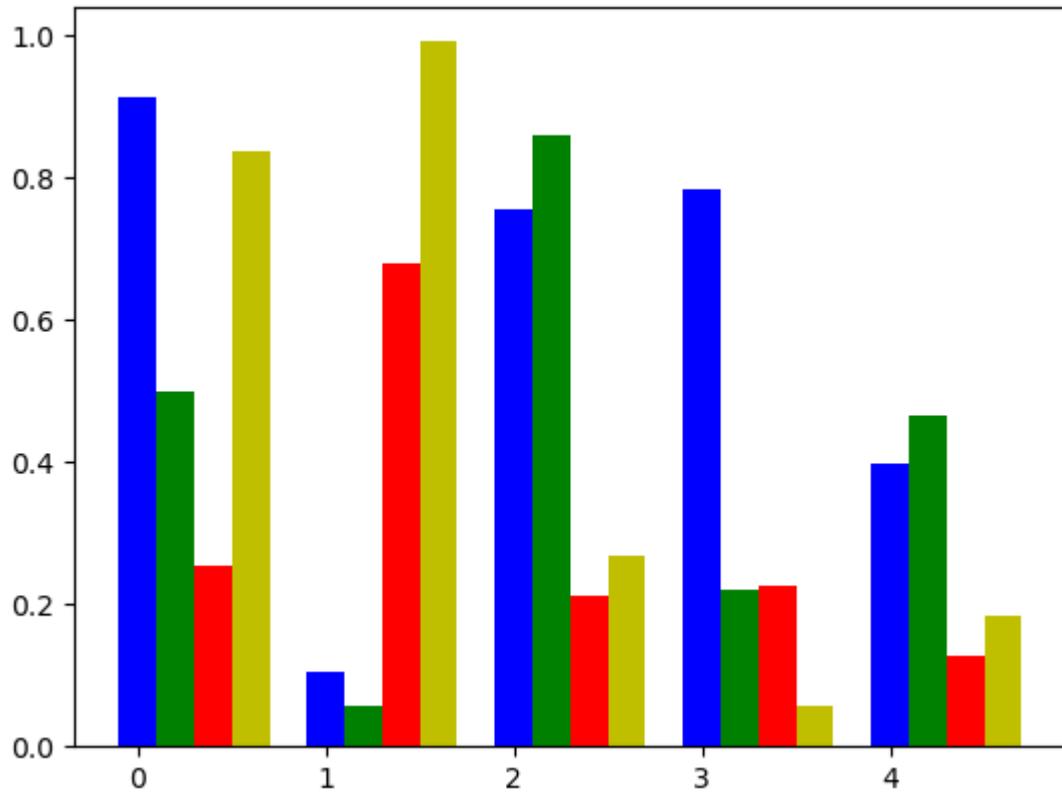
```
# cannot assume x = np.arange(4)
x = np.arange(5)
y = np.random.rand(3, 5)
print(x)
# assume 4 bar first as above
# within each bar we have 3 bars
print(y)
plt.bar(x + 0.00, y[0], color = 'b', width = 0.25)
plt.bar(x + 0.25, y[1], color = 'g', width = 0.25)
plt.bar(x + 0.50, y[2], color = 'r', width = 0.25)
plt.show()
```

```
[0 1 2 3 4]
[[0.39619169 0.19332382 0.31258569 0.35739841 0.70577912]
 [0.68208543 0.23542852 0.33045269 0.37656448 0.40825181]
 [0.36273984 0.11994143 0.27033318 0.20124338 0.81801961]]
```



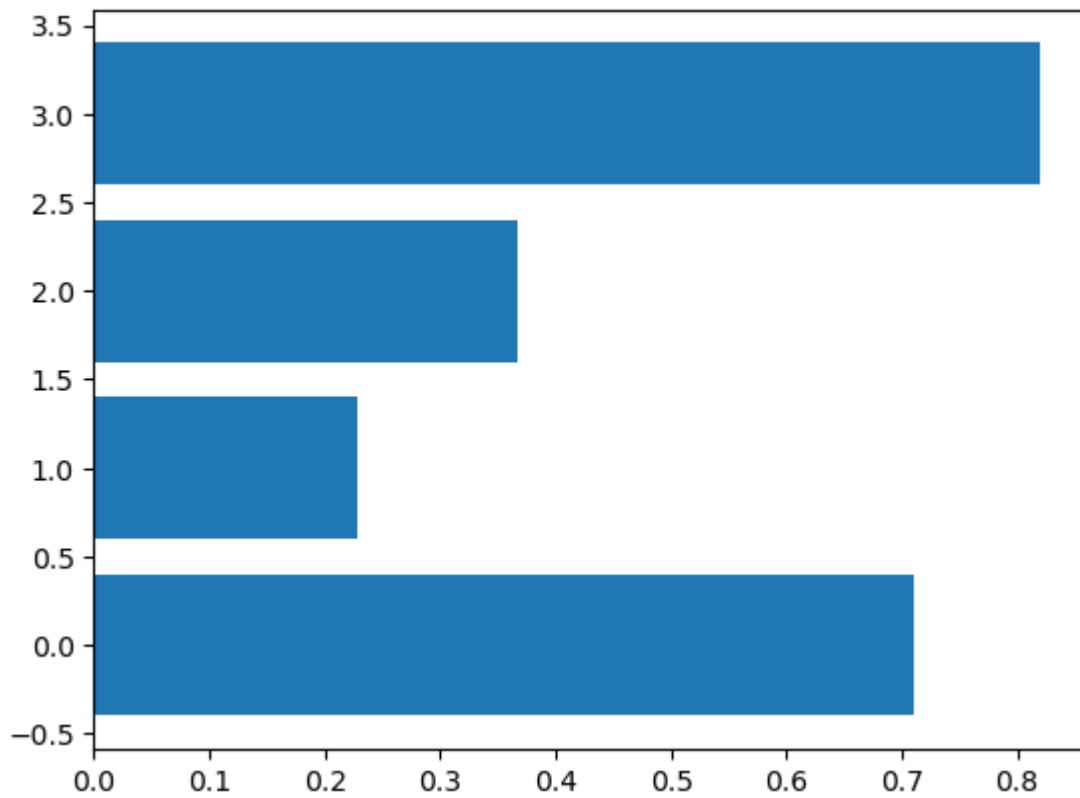
```
# cannot assume x = np.arange(4)
x = np.arange(5)
y = np.random.rand(4, 5)
print(x)
# assume 4 bar first as above
# within each bar we have 3 bars
print(y)
plt.bar(x + 0.00, y[0], color = 'b', width = 0.2)
plt.bar(x + 0.2, y[1], color = 'g', width = 0.2)
plt.bar(x + 0.4, y[2], color = 'r', width = 0.2)
plt.bar(x + 0.6, y[3], color = 'y', width = 0.2)
plt.show()
```

```
[0 1 2 3 4]
[[0.91152774 0.10535867 0.75611762 0.78299998 0.39844081]
 [0.49969485 0.0556701 0.85857802 0.22033525 0.4638407 ]
 [0.25360518 0.67889565 0.21317951 0.22539712 0.12797681]
 [0.83800133 0.99071833 0.26900332 0.05776595 0.1833309 ]]
```

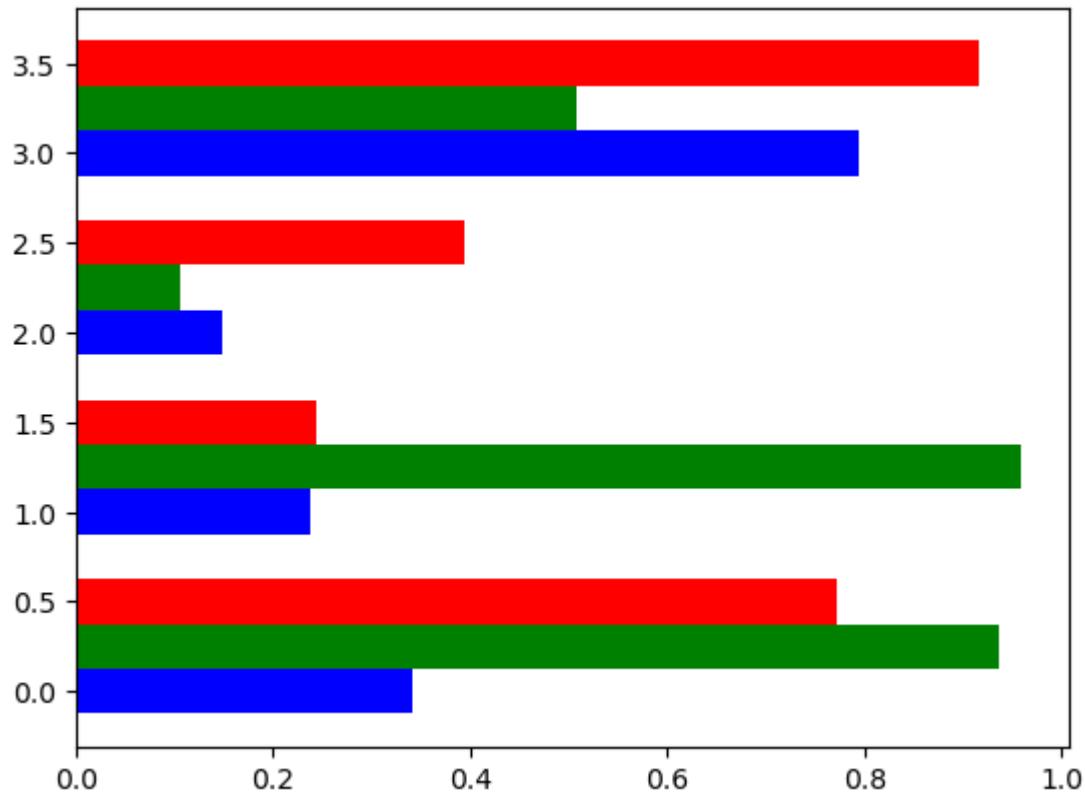


```
x = np.arange(4)
y = np.random.rand(4)
plt.barh(x, y)
plt.show()
```

[Skip to main content](#)

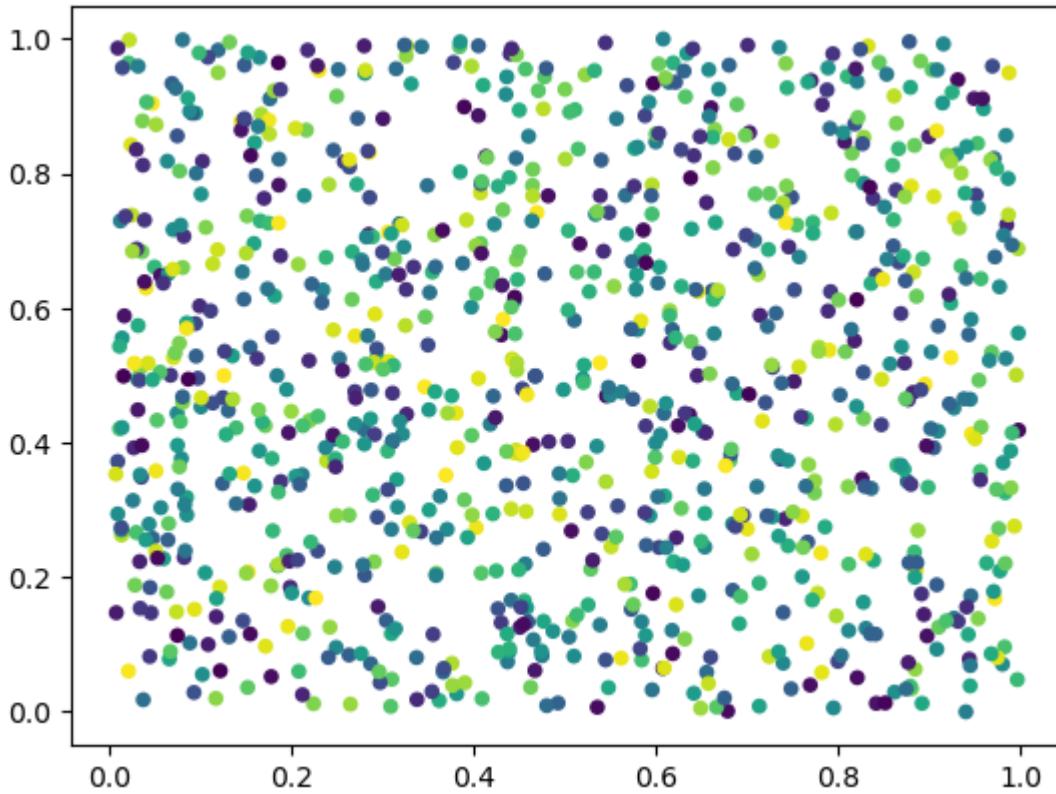


```
y = np.random.rand(3, 4)
plt.barh(x + 0.00, y[0], color = 'b', height=0.25)
plt.barh(x + 0.25, y[1], color = 'g', height=0.25)
plt.barh(x + 0.50, y[2], color = 'r', height=0.25)
plt.show()
```

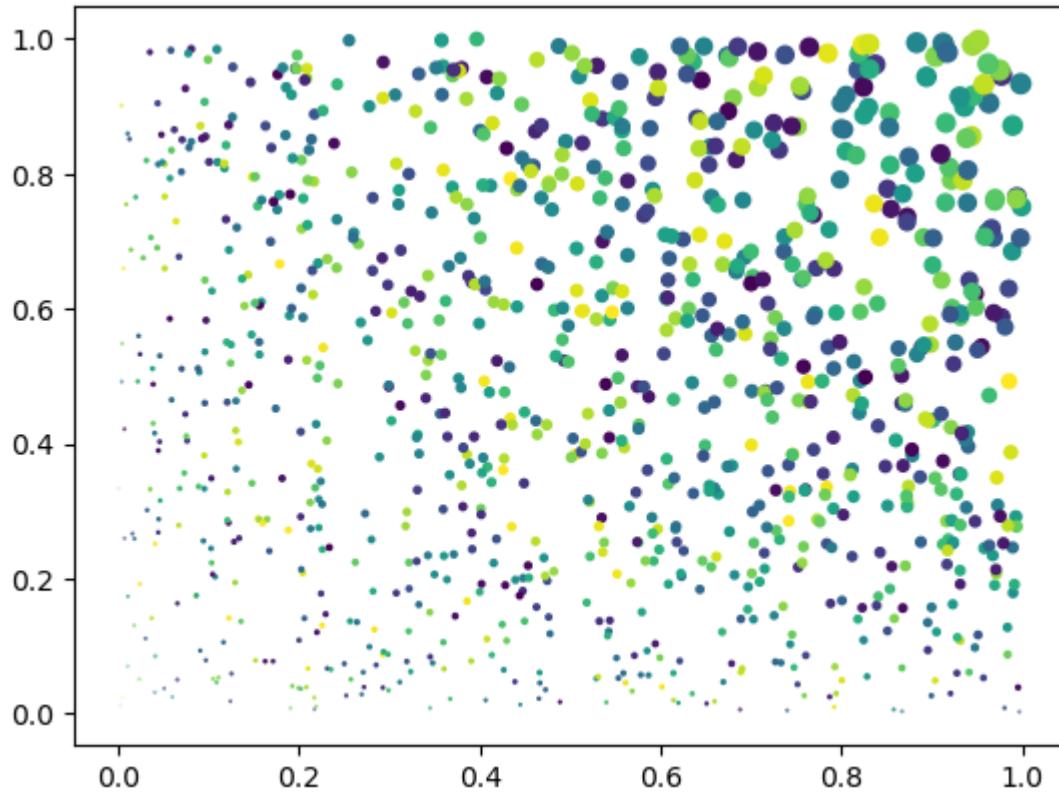


## scatter plot

```
N = 1000
x = np.random.rand(N)
y = np.random.rand(N)
colors = np.random.rand(N)
size = (20)
plt.scatter(x, y, s=size, c=colors, alpha=1)
plt.show()
```



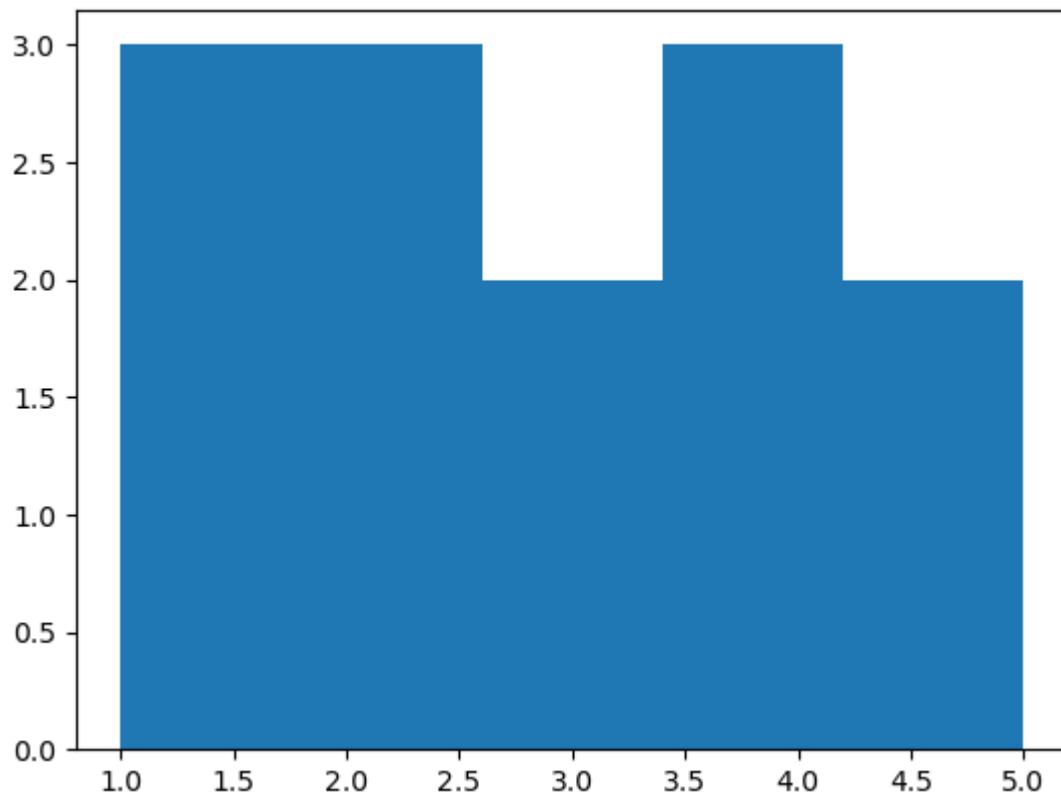
```
N = 1000
x = np.random.rand(N)
y = np.random.rand(N)
colors = np.random.rand(N)
size = (50 * x * y)
plt.scatter(x, y, s=size, c=colors, alpha=1)
plt.show()
```



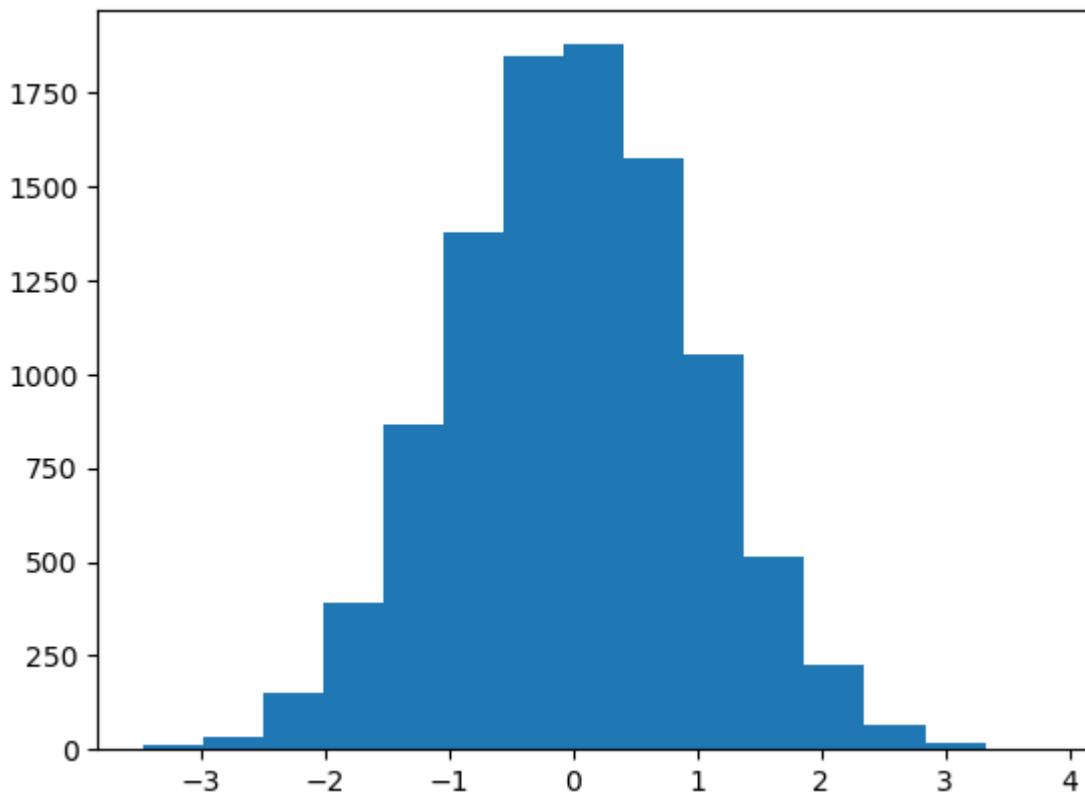
## handon-ch7

### histogram

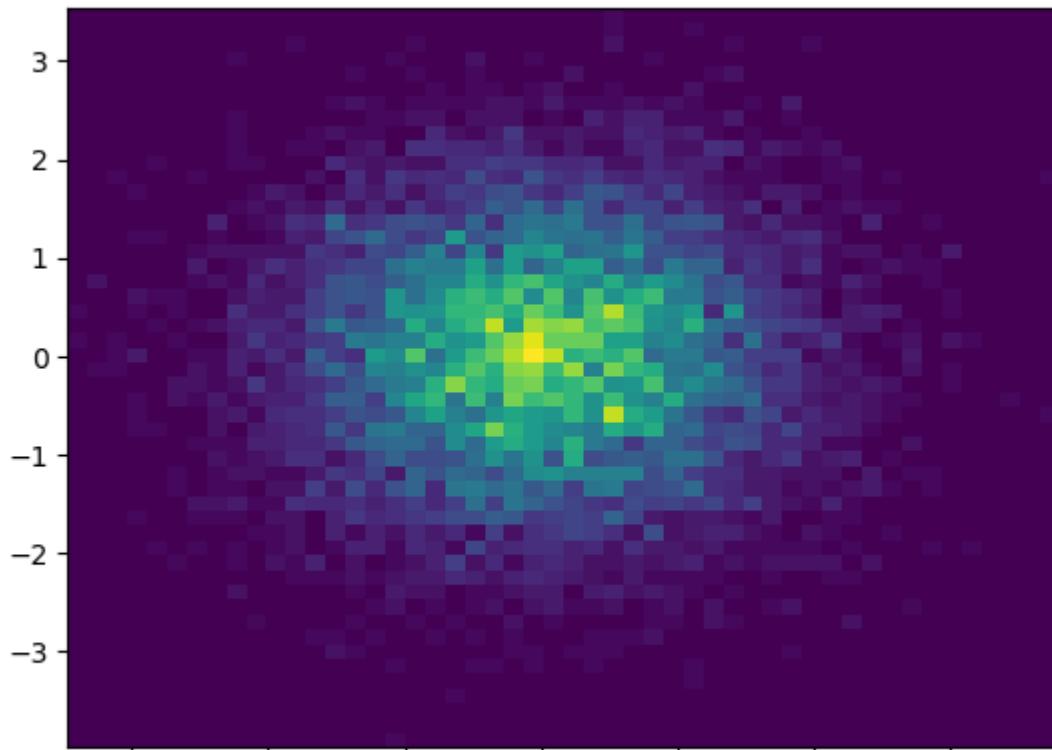
```
%matplotlib inline
import numpy as np
import matplotlib.pyplot as plt
x = [1, 3, 5, 1, 2, 4, 4, 2, 5, 4, 3, 1, 2]
n_bins = 5
plt.hist(x, bins=n_bins)
plt.show()
```



```
np.random.seed(31415)
n_points = 10000
n_bins = 15
x = np.random.randn(n_points)
plt.hist(x, bins=n_bins)
plt.show()
```

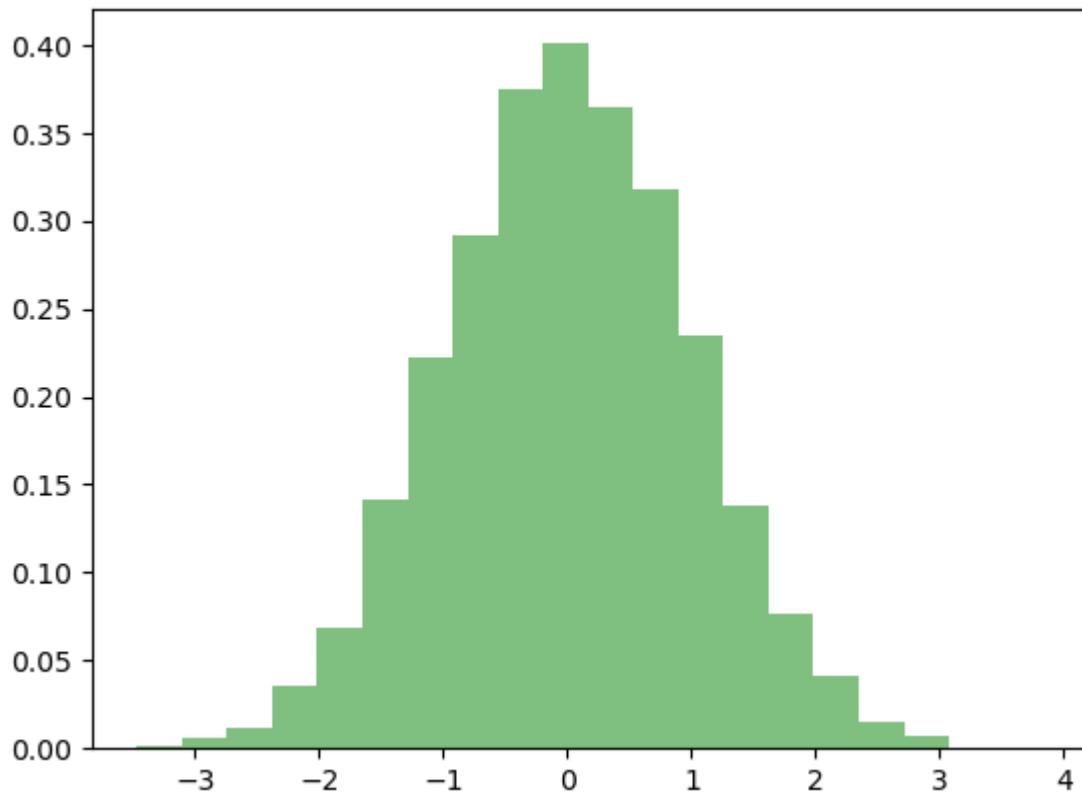


```
y = np.random.randn(n_points)  
plt.hist2d(x, y, bins=50)  
plt.show()
```



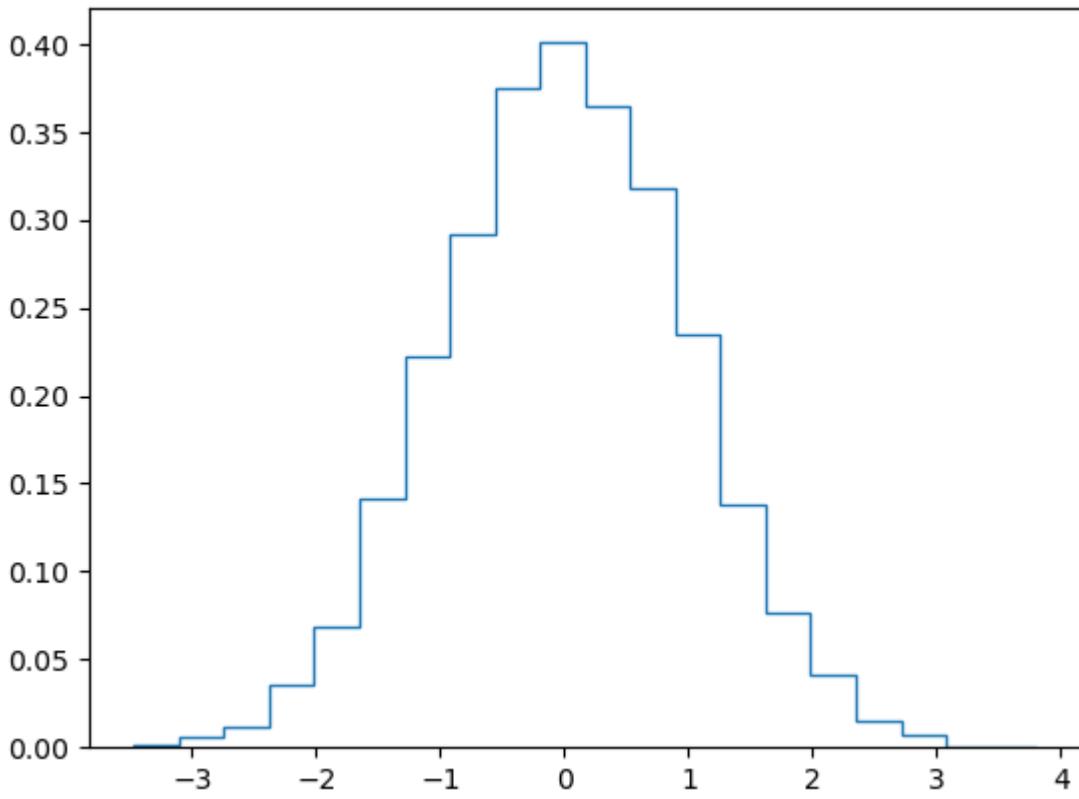
[Skip to main content](#)

```
plt.hist(x, 20, density=True,  
         histtype='stepfilled',  
         facecolor='g', alpha=0.5)  
plt.show()
```



```
plt.hist(x, 20, density=True,  
         histtype='step')  
plt.show()
```

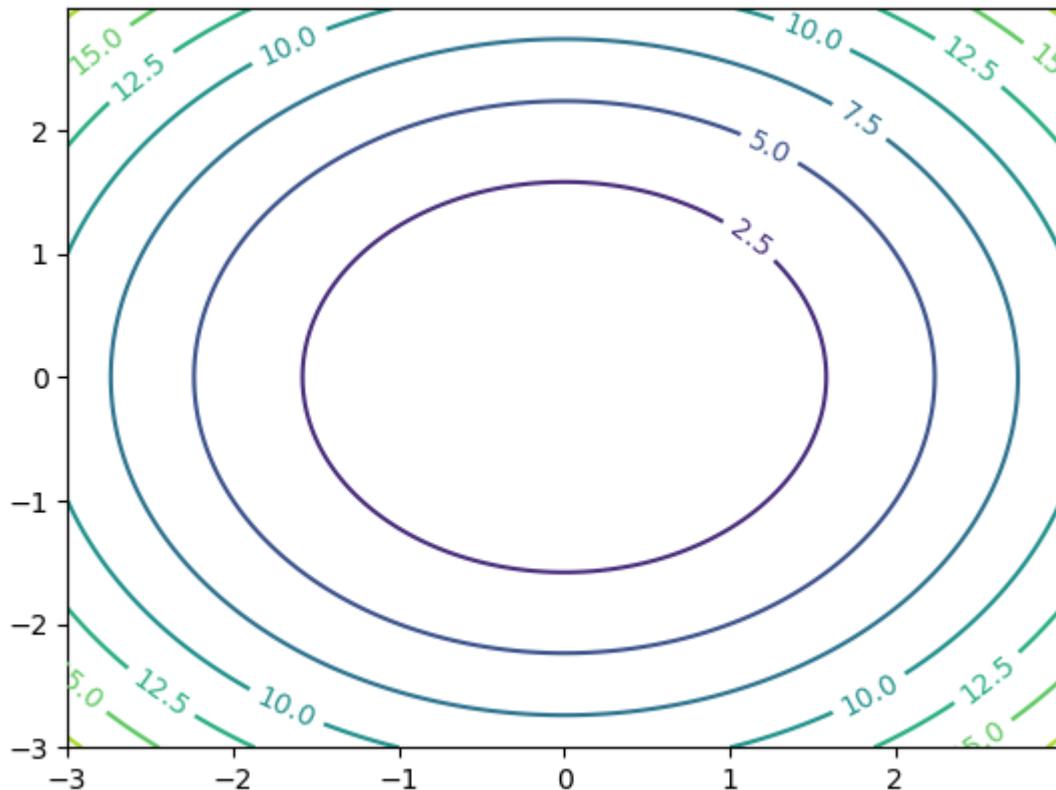
[Skip to main content](#)



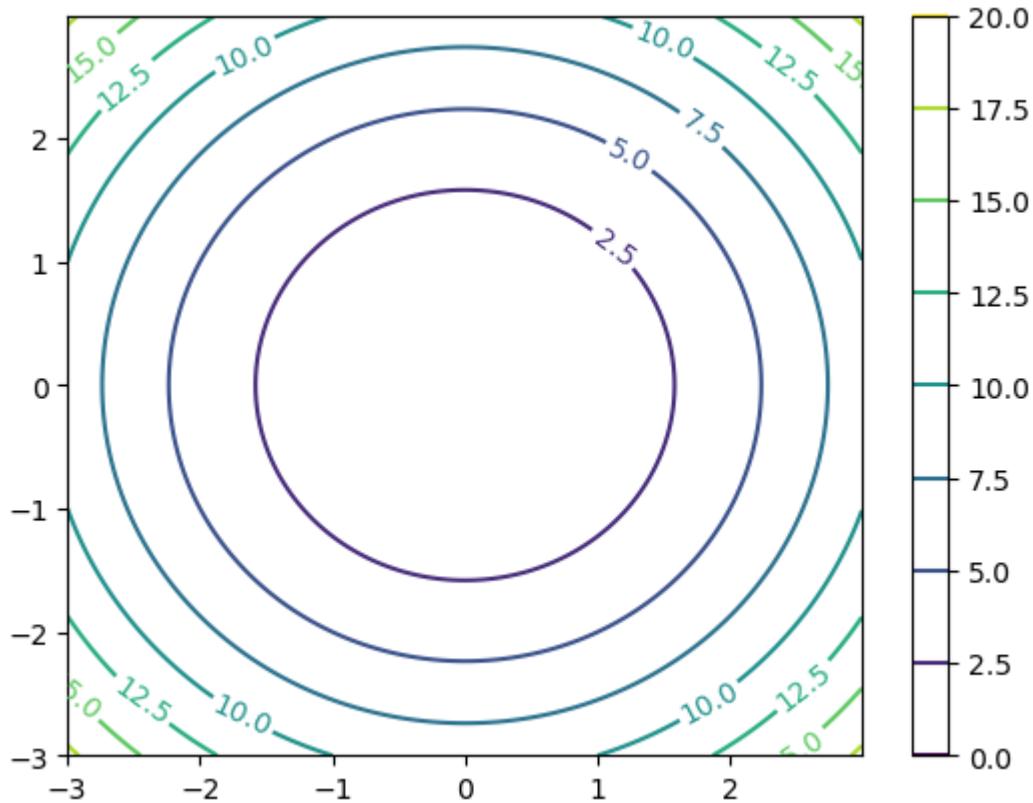
## contours

```
x = np.arange(-3, 3, 0.005)
y = np.arange(-3, 3, 0.005)
X, Y = np.meshgrid(x, y)
Z = (X**2 + Y**2)
out = plt.contour(X, Y, Z)
plt.clabel(out, inline=True,
           fontsize=10)
plt.show()
```

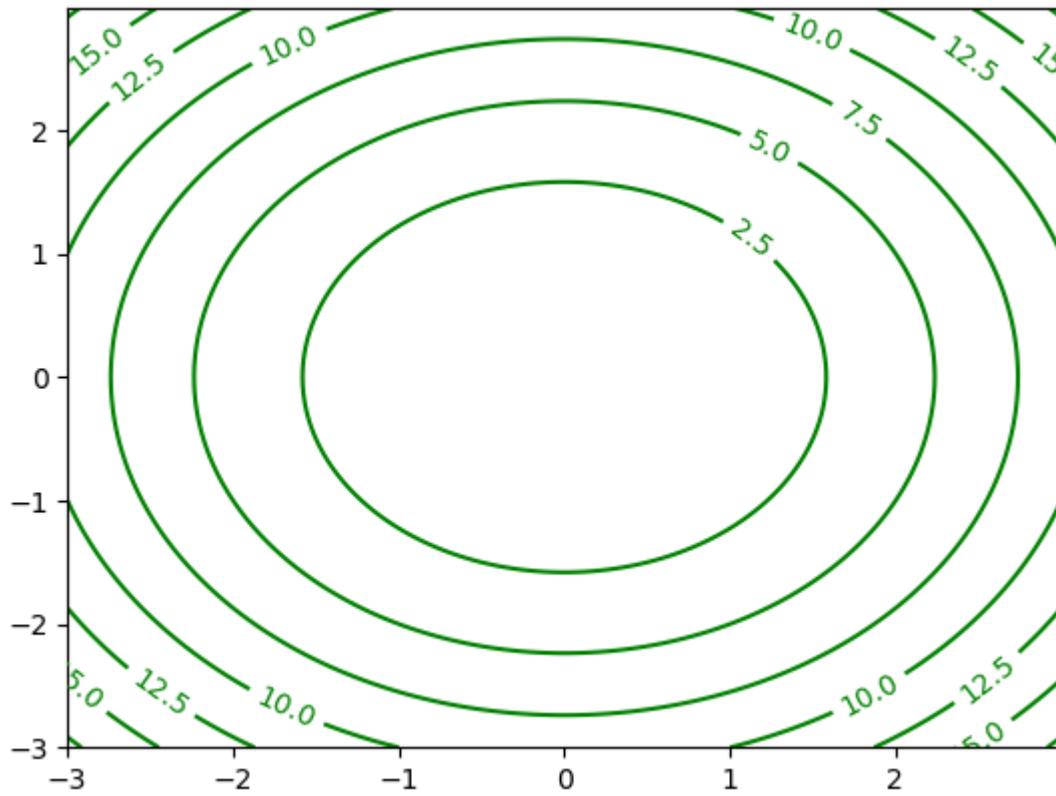
[Skip to main content](#)



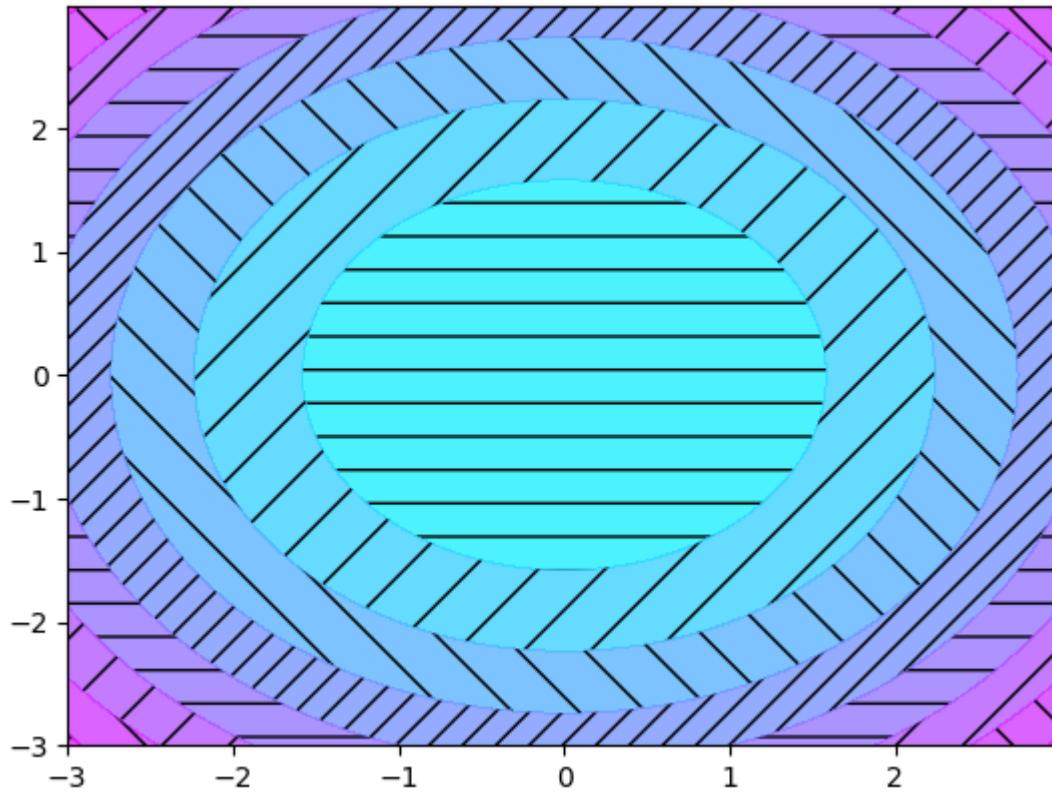
```
out = plt.contour(X, Y, Z)
plt.clabel(out, inline=True,
          fontsize=10)
plt.colorbar(out)
plt.show()
```



```
out = plt.contour(X, Y, Z,
                  colors='g')
plt.clabel(out, inline=True,
           fontsize=10)
plt.show()
```

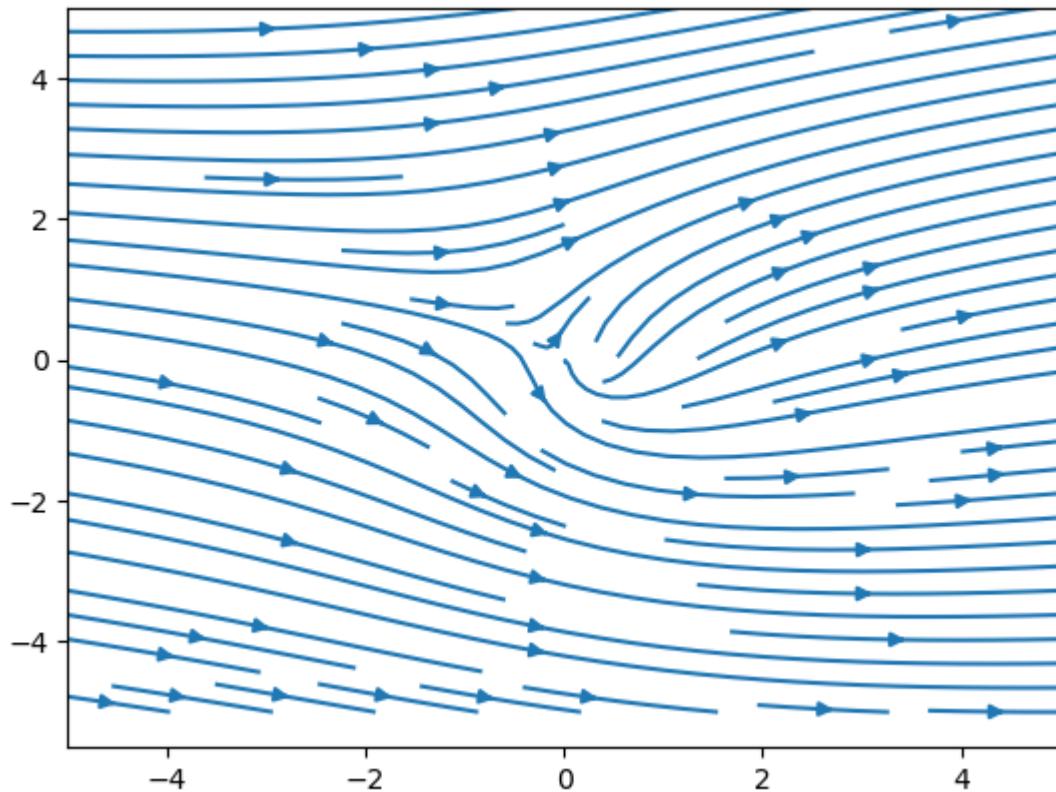


```
plt.contourf(X, Y, Z,
             hatches=['-', '/','\\','//'],
             cmap='cool',
             alpha=0.75)
#err plt.colorbar(X)
plt.show()
```

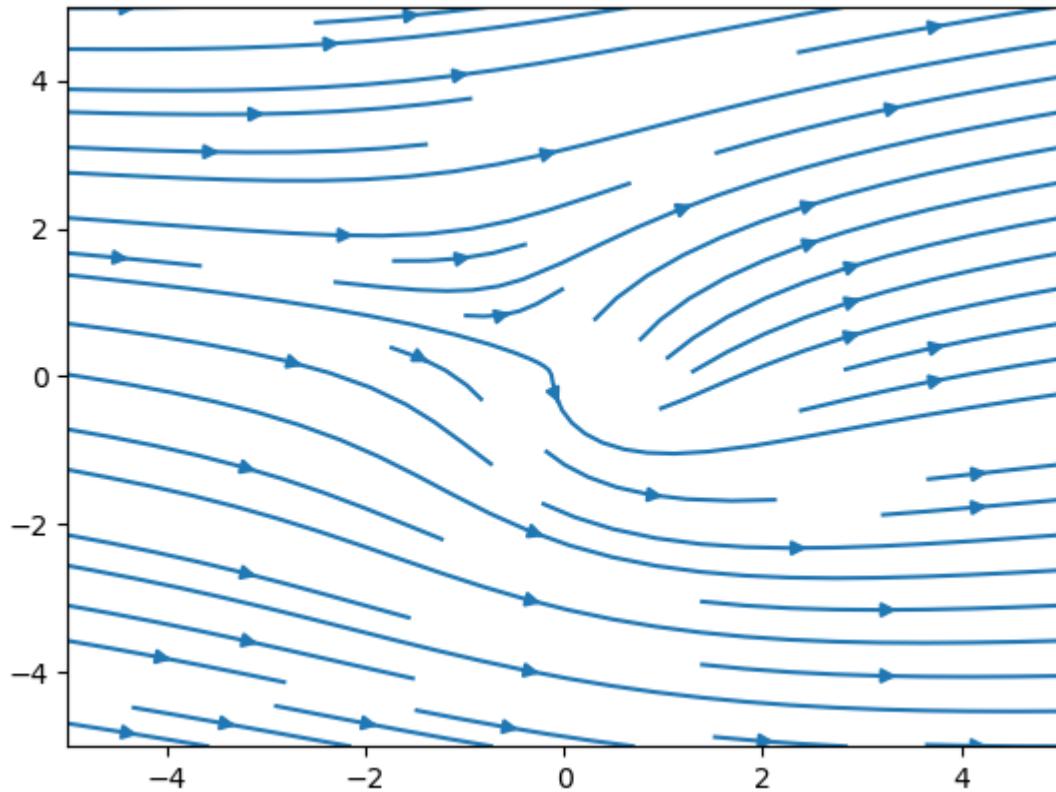


vector

```
Y, X = np.mgrid[-5:5:200j, -5:5:300j]
U = X**2 + Y**2
V=X+ Y
plt.streamplot(X, Y, U, V)
plt.show()
```

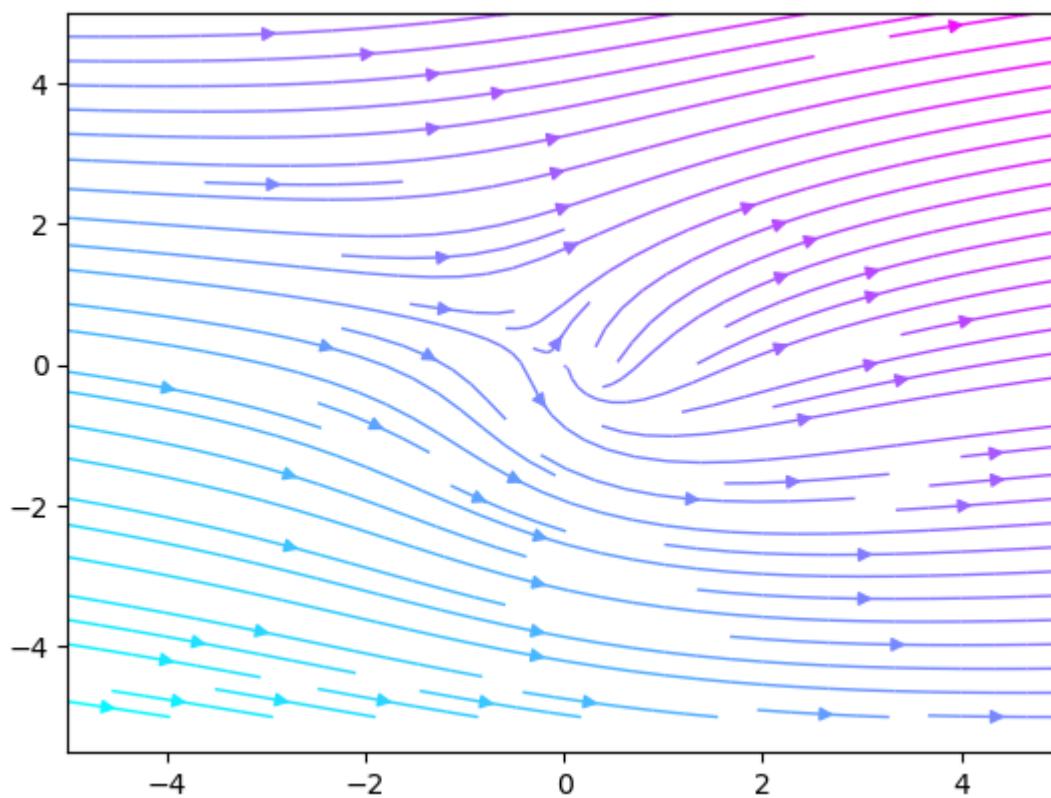


```
plt.streamplot(X, Y, U, V, density=[0.5, 0.75])  
plt.show()
```

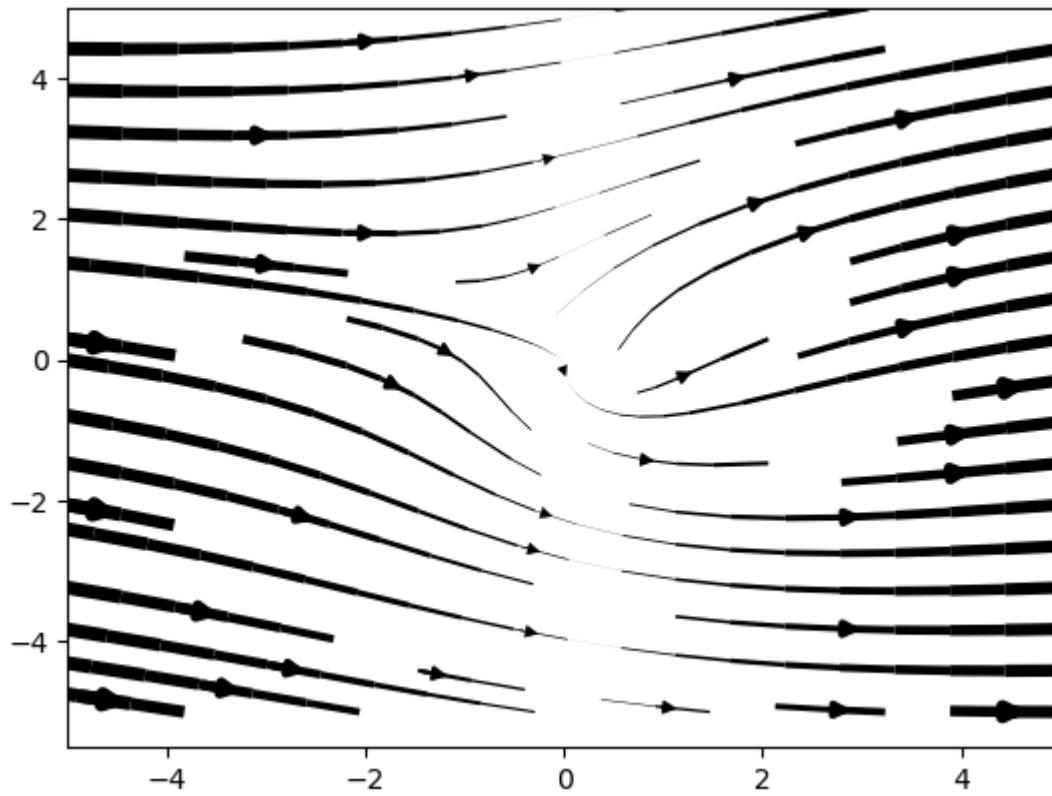


[Skip to main content](#)

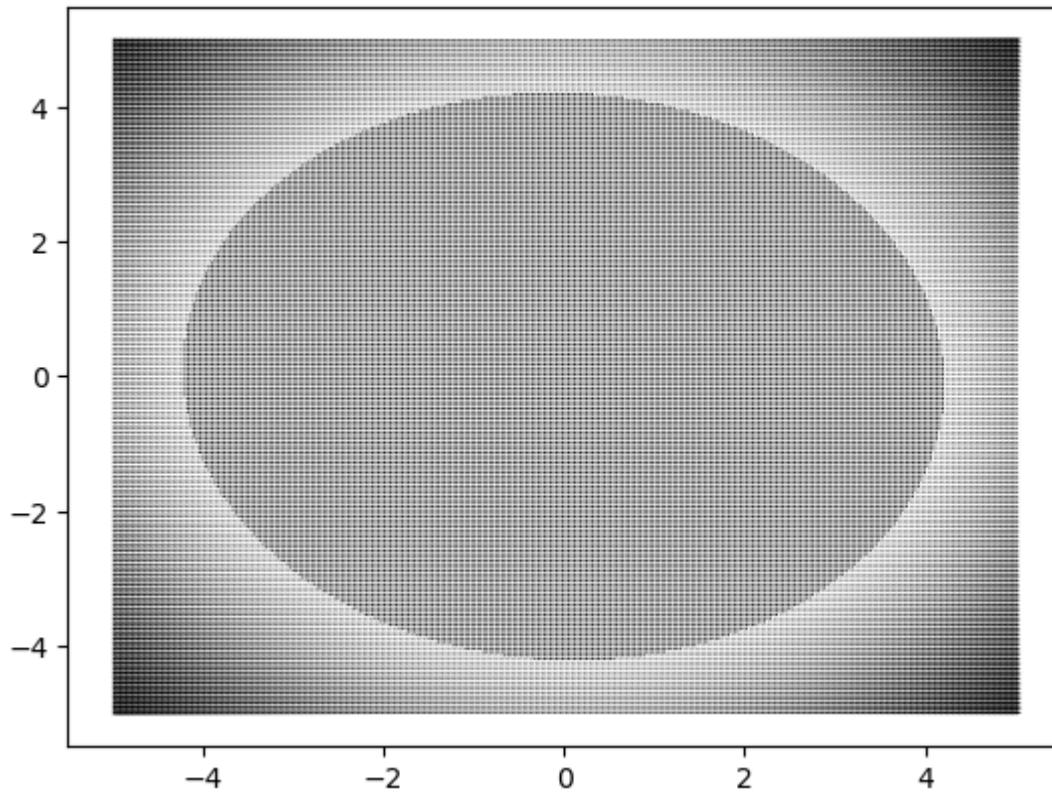
```
plt.streamplot(X, Y, U, V, color=V,  
              linewidth=1, cmap='cool')  
plt.show()
```



```
plt.streamplot(X, Y, U, V,density=0.6,color='k', linewidth=X)  
plt.show()
```

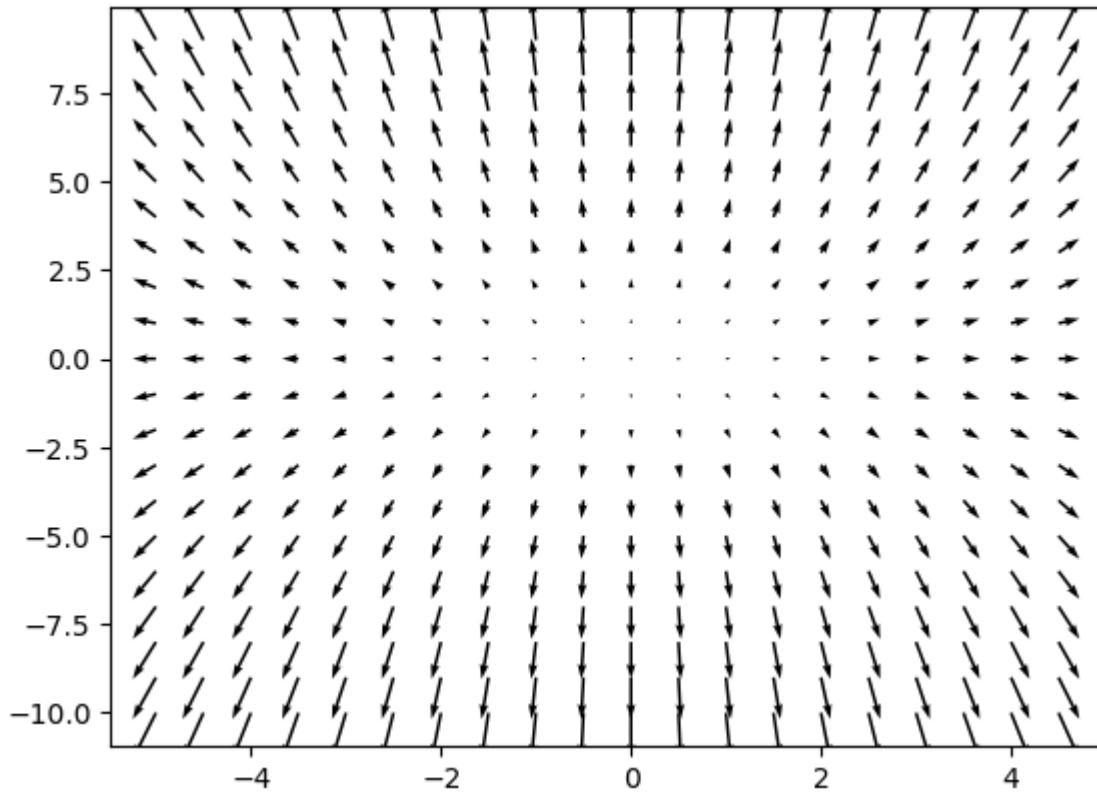


```
plt.quiver(X, Y, U, V)  
plt.show()
```



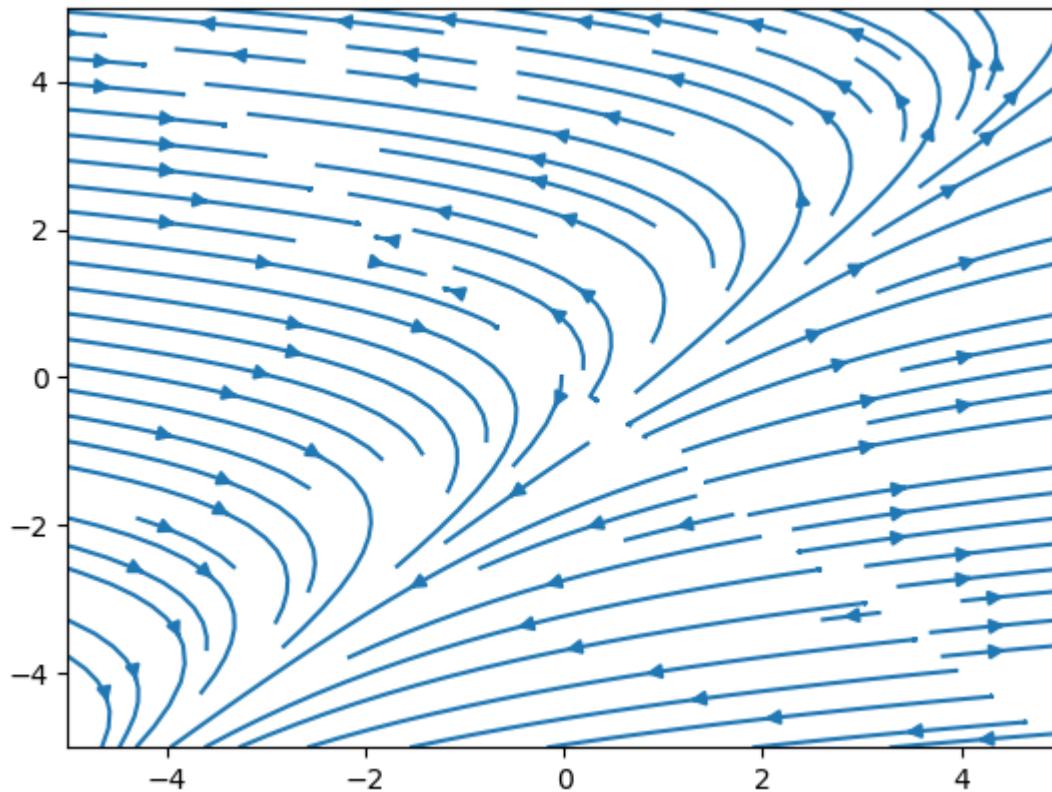
[Skip to main content](#)

```
X = np.arange(-5, 5, 0.5)
Y = np.arange(-10, 10, 1)
U, V = np.meshgrid(X, Y)
plt.quiver(X, Y, U, V)
plt.show()
```

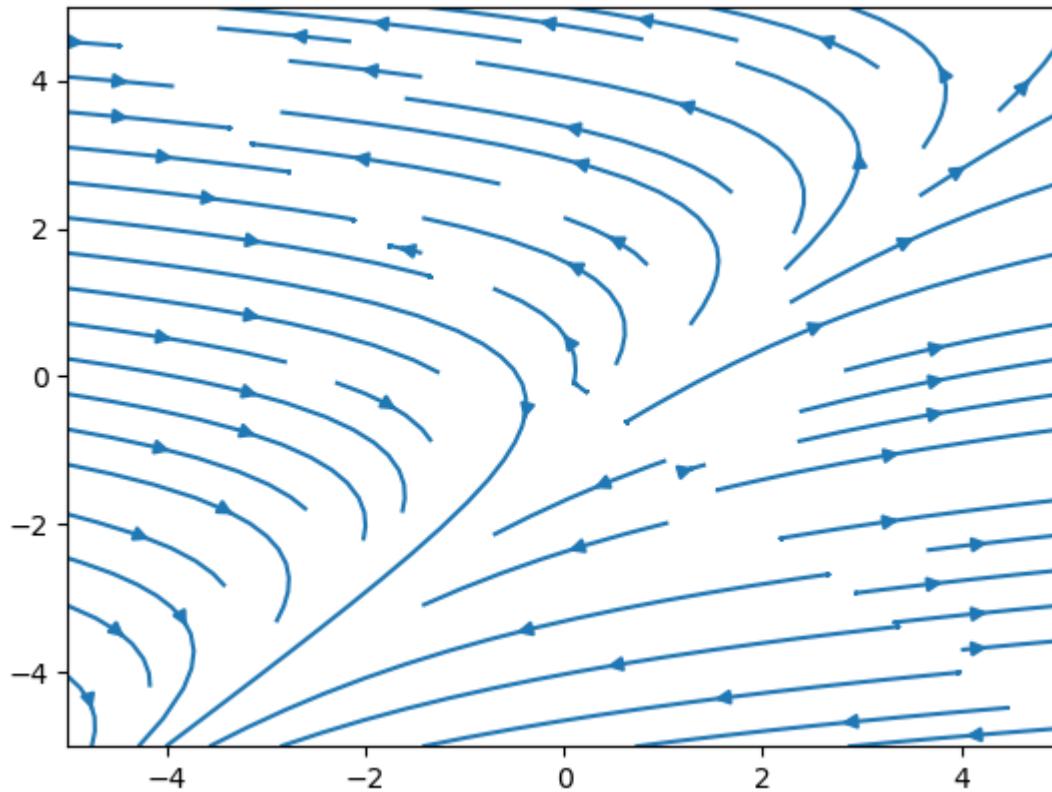


## hyperbola

```
# hyperbola
Y, X = np.mgrid[-5:5:200j, -5:5:300j]
U = X**2 - Y**2
V=X+ Y
plt.streamplot(X, Y, U, V)
plt.show()
```

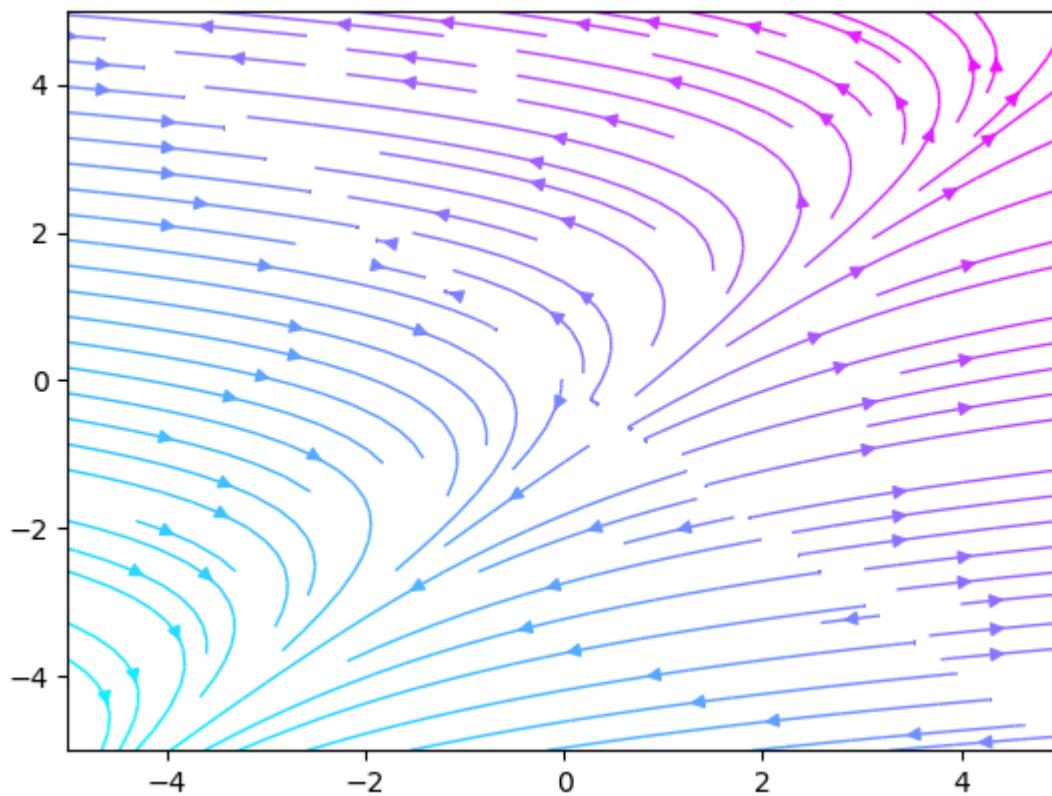


```
plt.streamplot(X, Y, U, V, density=[0.5, 0.75])  
plt.show()
```

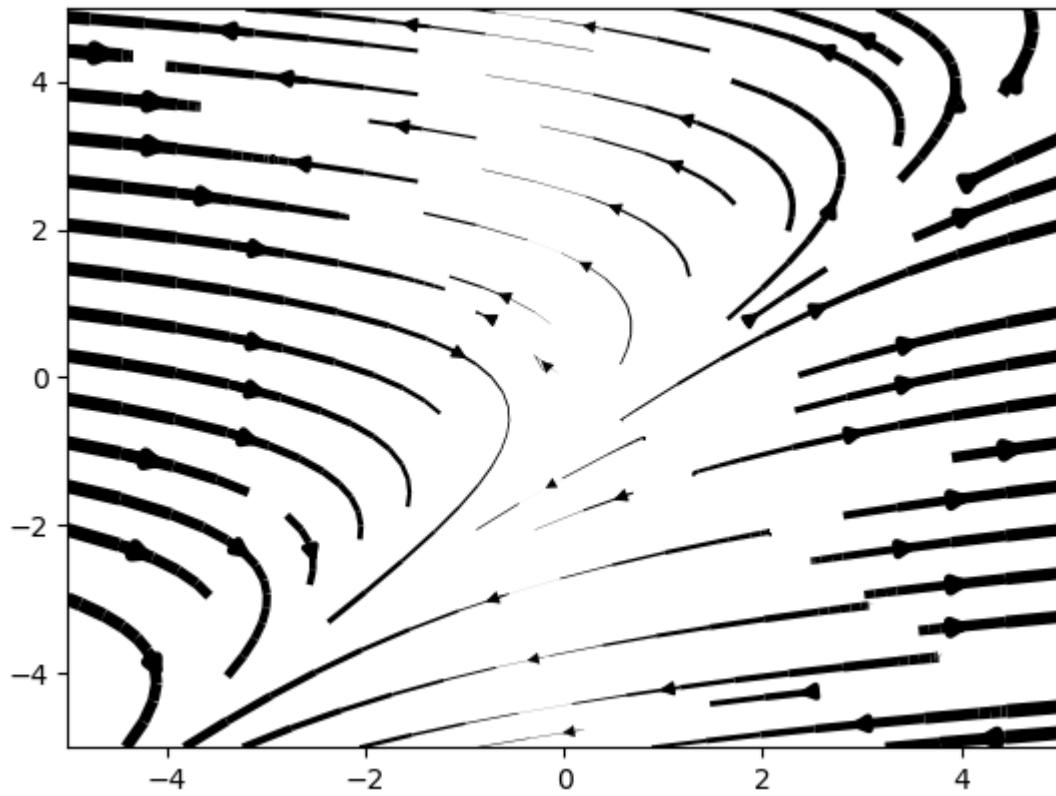


[Skip to main content](#)

```
plt.streamplot(X, Y, U, V, color=V,  
              linewidth=1, cmap='cool')  
plt.show()
```

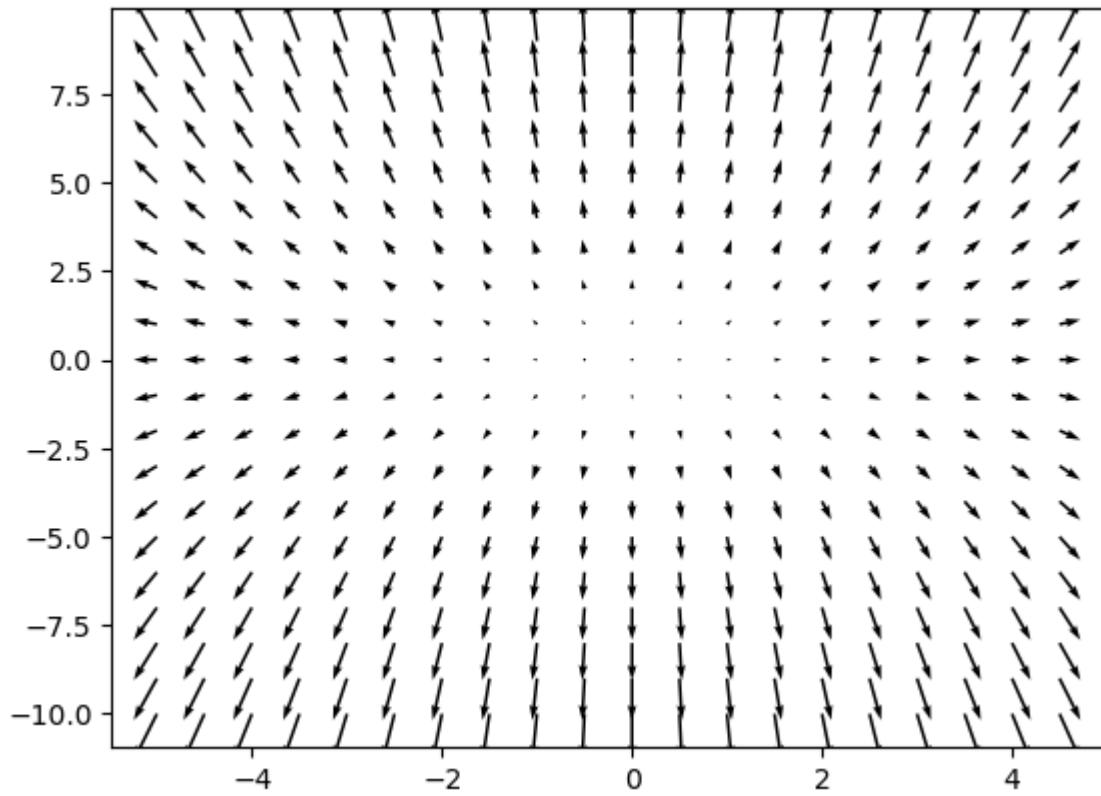


```
plt.streamplot(X, Y, U, V,  
              density=0.6,  
              color='k',  
              linewidth=X)  
plt.show()
```

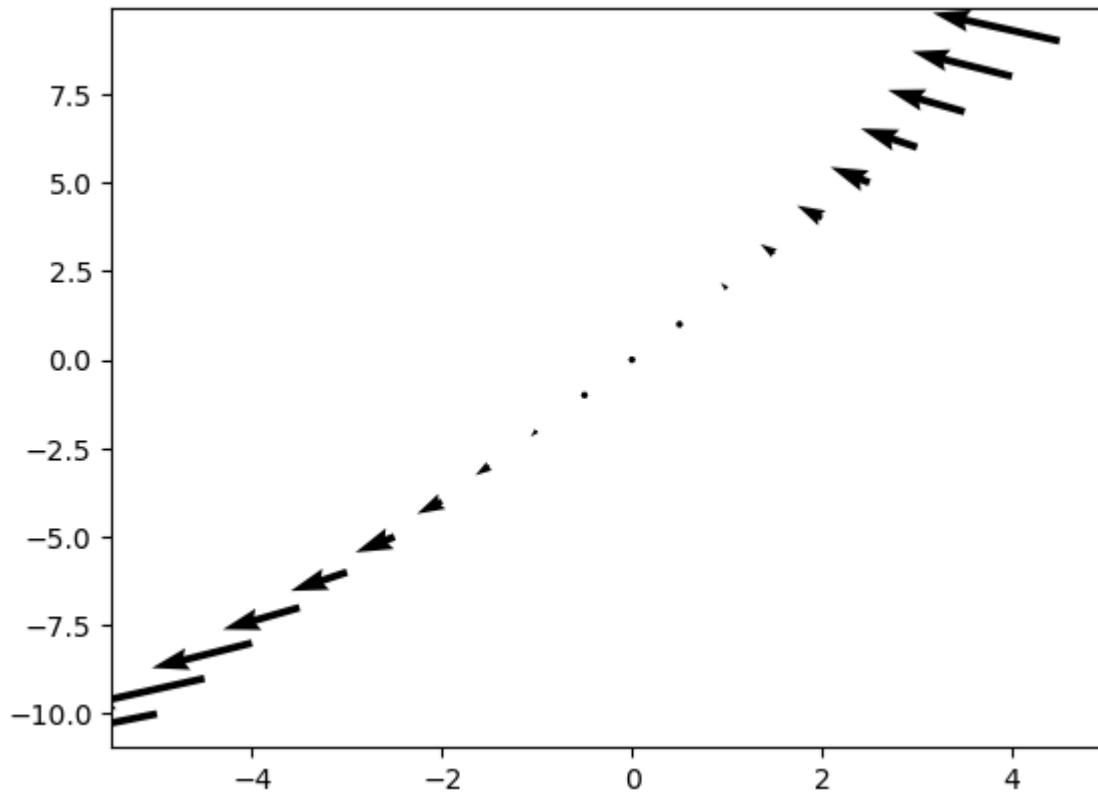


## mesh grid vector

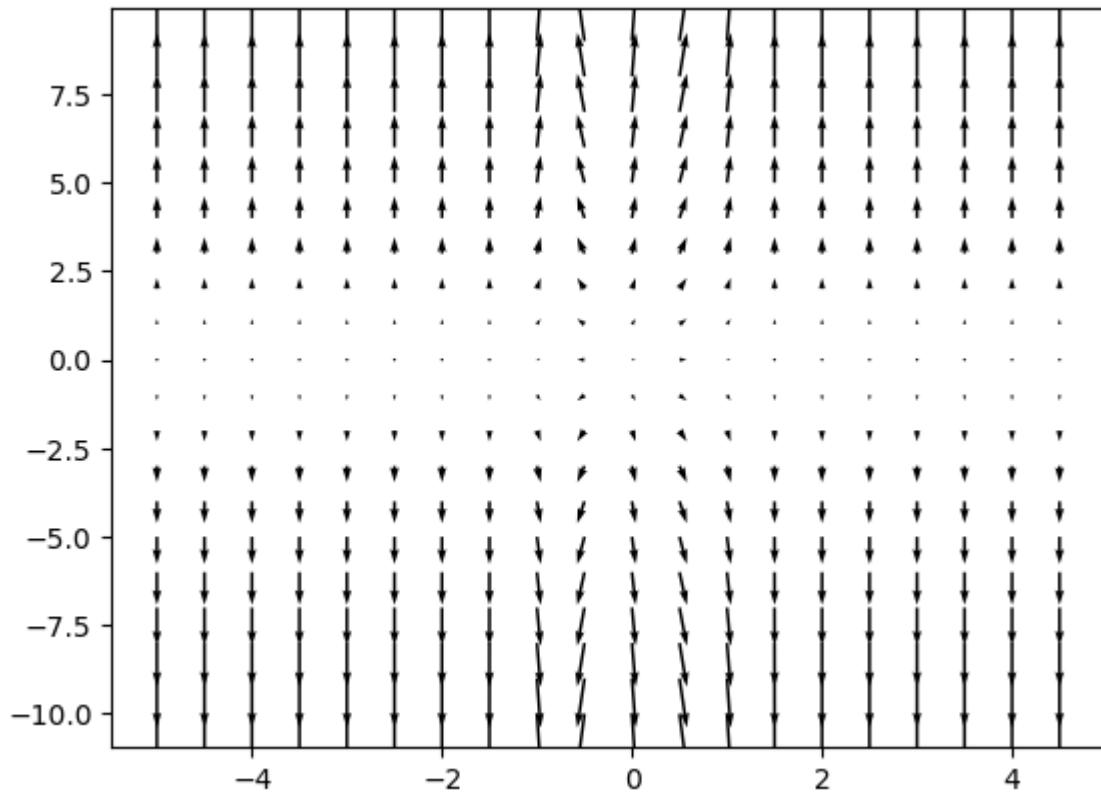
```
X = np.arange(-5, 5, 0.5)
Y = np.arange(-10, 10, 1)
U, V = np.meshgrid(X, Y)
plt.quiver(X, Y, U, V)
plt.show()
```



```
X = np.arange(-5, 5, 0.5)
Y = np.arange(-10, 10, 1)
#U, V = np.meshgrid(X, Y)
U = X**2 - Y**2
V=X+ Y
plt.quiver(X, Y, U, V)
plt.show()
```



```
X = np.arange(-5, 5, 0.5)
Y = np.arange(-10, 10, 1)
U, V = np.meshgrid(X**-Y**2,X+Y)
plt.quiver(X, Y, U, V)
plt.show()
```



**hanon-c8**

```
%matplotlib inline
import numpy as np
import matplotlib.pyplot as plt
# img1 = plt.imread("D:/Dataset/4.2.03.tiff")
# img1 = plt.imread("~/Dataset/4.2.03.tiff")
img1 = plt.imread("img/handon-c4-test-4-66.tiff") #test.png"
img2h = plt.imread("media/hk2.tiff")
img2t = plt.imread("media/Tk2.tiff")

def showimg(img1):
    """
    Please open the URL for reading and pass the "
    1522         "result to Pillow, e.g. with "
    1523         ``np.array(PIL.Image.open(urllib.request.urlopen(url)))``."
    """

    print(img1) # no dtype= as in tiff
    print(type(img1))

    plt.imshow(img1)
    plt.show()
    return

showimg(img2h)
showimg(img2t)
```

```
[[[ 0  0  0  0]
 [228 228 228 48]
 [226 226 226 134]
 ...
 [226 226 226 136]
 [228 228 228 49]
 [ 0  0  0  0]]]

[[228 228 228 49]
 [222 222 222 191]
 [215 215 215 255]
 ...
 [215 215 215 255]
 [223 223 223 192]
 [228 228 228 49]]]

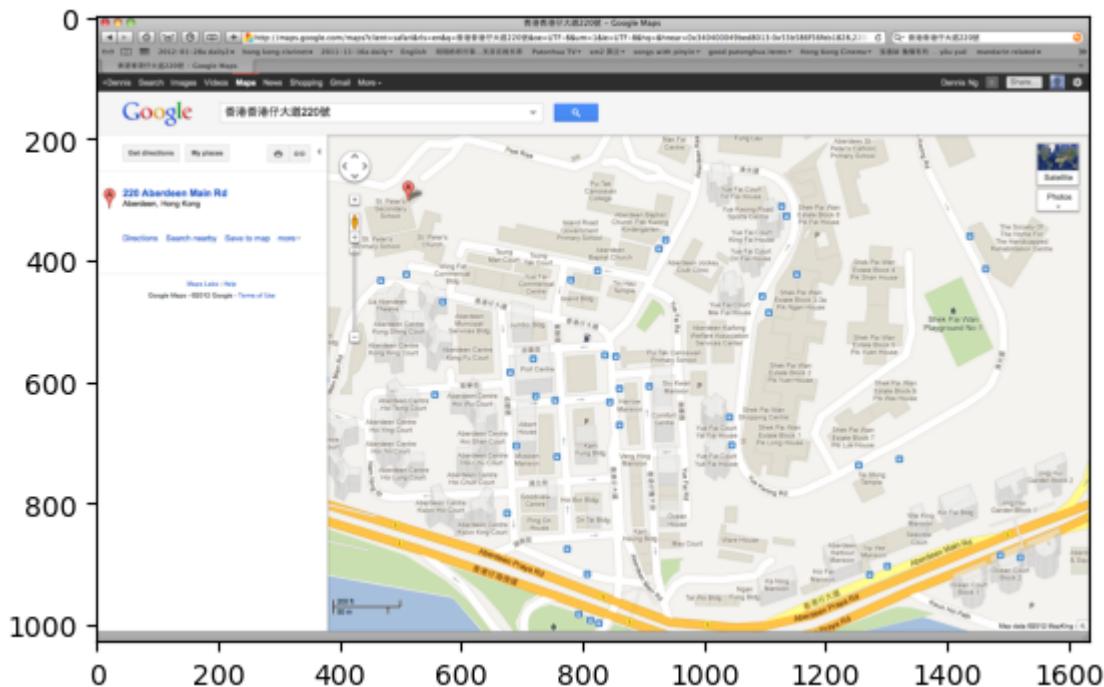
[[222 222 222 134]
 [210 210 210 255]
 [207 207 207 255]
 ...
 [207 207 207 255]
 [210 210 210 255]
 [221 221 221 135]]]

...
[[168 168 168 255]
 [168 168 168 255]
 [168 168 168 255]
 ...
 [143 143 143 255]
 [ 99  99  99 255]
 [168 168 168 255]]]

[[168 168 168 255]
 [168 168 168 255]
 [168 168 168 255]
 ...
 [ 99  99  99 255]
 [196 196 196 255]
 [168 168 168 255]]]

[[167 167 167 255]
 [167 167 167 255]
 [167 167 167 255]
 ...
 [167 167 167 255]
 [167 167 167 255]
 [167 167 167 255]]]

<class 'numpy.ndarray'>
```



```
[[[0 0 0 0]
 [0 0 0 0]
 [0 0 0 0]

 ...
 [0 0 0 0]
 [0 0 0 0]
 [0 0 0 0]

 [[0 0 0 0]
 [0 0 0 0]
 [0 0 0 0]

 ...
 [0 0 0 0]
 [0 0 0 0]
 [0 0 0 0]

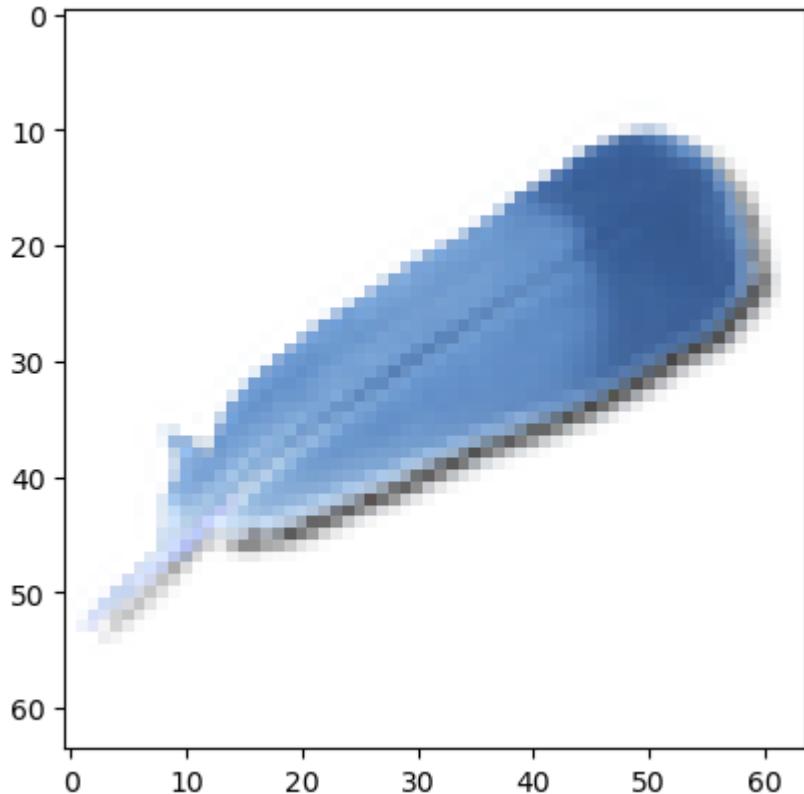
 ...
 [0 0 0 0]
 [0 0 0 0]
 [0 0 0 0]

 ...
 [0 0 0 0]
 [0 0 0 0]
 [0 0 0 0]

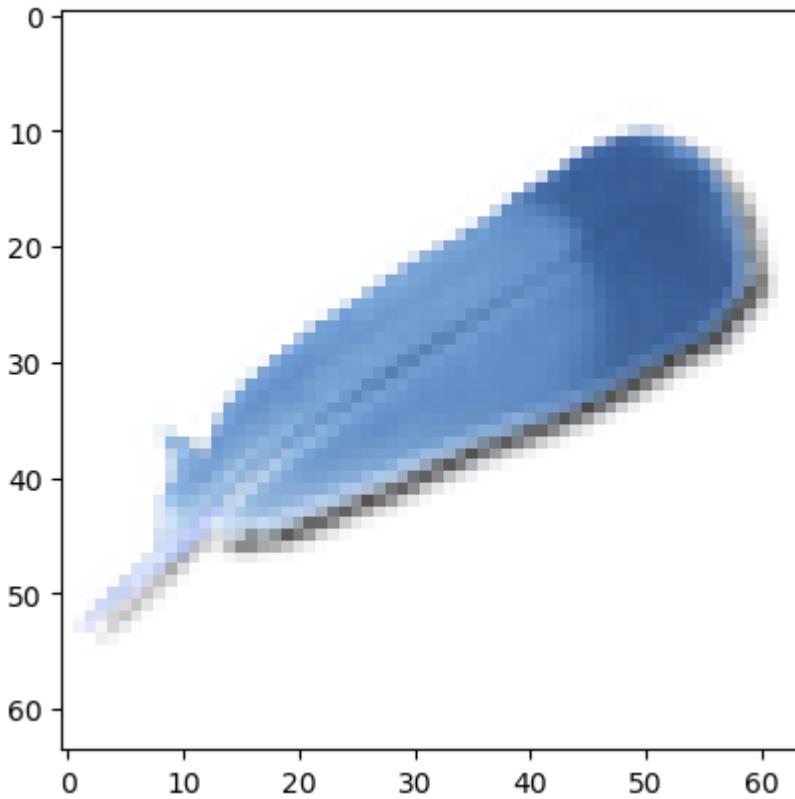
 ...
 [0 0 0 0]
 [0 0 0 0]
 [0 0 0 0]]]
```

[Skip to main content](#)

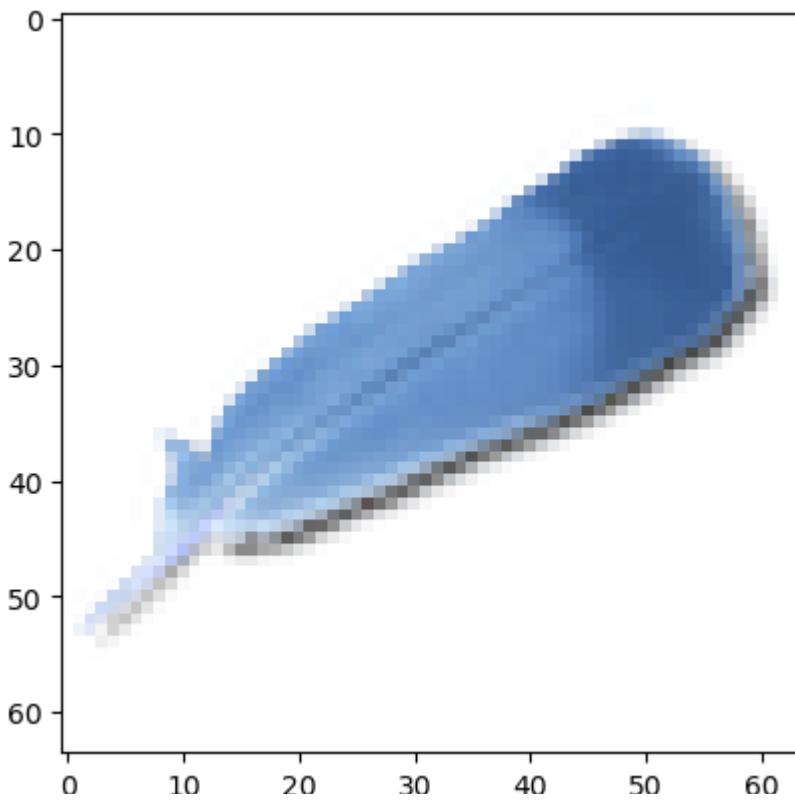
```
[[0 0 0 0]
 [0 0 0 0]
 [0 0 0 0]
 ...
 [[0 0 0 0]
 [0 0 0 0]
 [0 0 0 0]]
 ...
 [[0 0 0 0]
 [0 0 0 0]
 [0 0 0 0]
 [0 0 0 0]]]
<class 'numpy.ndarray'>
```



```
plt.imshow(img2t, cmap = 'gray') # not work for png, tiff as well
plt.show()
```



```
plt.imshow(img2t, cmap = 'cool')
plt.show()
```



[Skip to main content](#)

```
{ plt.colormaps()
```

```
['magma',
 'inferno',
 'plasma',
 'viridis',
 'cividis',
 'twilight',
 'twilight_shifted',
 'turbo',
 'Blues',
 'BrBG',
 'BuGn',
 'BuPu',
 'CMRmap',
 'GnBu',
 'Greens',
 'Greys',
 'OrRd',
 'Oranges',
 'PRGn',
 'PiYG',
 'PuBu',
 'PuBuGn',
 'PuOr',
 'PuRd',
 'Purples',
 'RdBu',
 'RdGy',
 'RdPu',
 'RdYlBu',
 'RdYlGn',
 'Reds',
 'Spectral',
 'Wistia',
 'YlGn',
 'YlGnBu',
 'YlOrBr',
 'YlOrRd',
 'afmhot',
 'autumn',
 'binary',
 'bone',
 'brg',
 'bwr',
 'cool',
 'coolwarm',
 'copper',
 'cubehelix',
 'flag',
 'gist_earth',
 'gist_gray',
 'gist_heat',
 'gist_ncar',
 'gist_rainbow',
```

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```
'gnuplot',
'gnuplot2',
'gray',
'hot',
'hsv',
'jet',
'nipy_spectral',
'ocean',
'pink',
'prism',
'rainbow',
'seismic',
'spring',
'summer',
'terrain',
'winter',
'Accent',
'Dark2',
'Paired',
'Pastel1',
'Pastel2',
'Set1',
'Set2',
'Set3',
'tab10',
'tab20',
'tab20b',
'tab20c',
'grey',
'gist_grey',
'gist_yerg',
'Grays',
'magma_r',
'inferno_r',
'plasma_r',
'veridis_r',
'cividis_r',
'twilight_r',
'twilight_shifted_r',
'turbo_r',
'Blues_r',
'BrBG_r',
'BuGn_r',
'BuPu_r',
'CMRmap_r',
'GnBu_r',
'Greens_r',
'Greys_r',
'OrRd_r',
'Oranges_r',
'PRGn_r',
'PiYG_r',
'PuBu_r',
'PuBuGn_r',
```

[Skip to main content](#)

'Purples\_r',  
'RdBu\_r',  
'RdGy\_r',  
'RdPu\_r',  
'RdYlBu\_r',  
'RdYlGn\_r',  
'Reds\_r',  
'Spectral\_r',  
'Wistia\_r',  
'YlGn\_r',  
'YlGnBu\_r',  
'YlOrBr\_r',  
'YlOrRd\_r',  
'afmhot\_r',  
'autumn\_r',  
'binary\_r',  
'bone\_r',  
'brg\_r',  
'bwr\_r',  
'cool\_r',  
'coolwarm\_r',  
'copper\_r',  
'cubehelix\_r',  
'flag\_r',  
'gist\_earth\_r',  
'gist\_gray\_r',  
'gist\_heat\_r',  
'gist\_ncar\_r',  
'gist\_rainbow\_r',  
'gist\_stern\_r',  
'gist\_yarg\_r',  
'gnuplot\_r',  
'gnuplot2\_r',  
'gray\_r',  
'hot\_r',  
'hsv\_r',  
'jet\_r',  
'nipy\_spectral\_r',  
'ocean\_r',  
'pink\_r',  
'prism\_r',  
'rainbow\_r',  
'seismic\_r',  
'spring\_r',  
'summer\_r',  
'terrain\_r',  
'winter\_r',  
'Accent\_r',  
'Dark2\_r',  
'Paired\_r',  
'Pastel1\_r',  
'Pastel2\_r',  
'Set1\_r',  
'Set2\_r',

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```
'tab20_r',
'tab20b_r',
'tab20c_r']
```

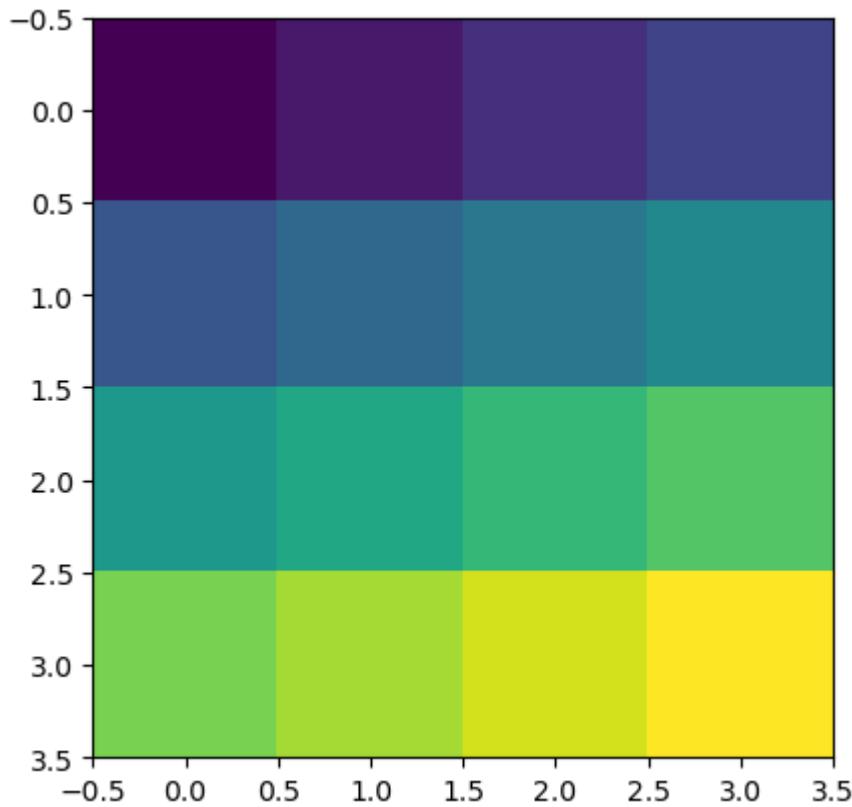
```
import matplotlib.patches as patches
fig, ax = plt.subplots()
im = ax.imshow(img2h)
patch = patches.Circle((245, 200),
radius=200,
transform=ax.transData)
im.set_clip_path(patch)
ax.axis('off')
plt.show()
```



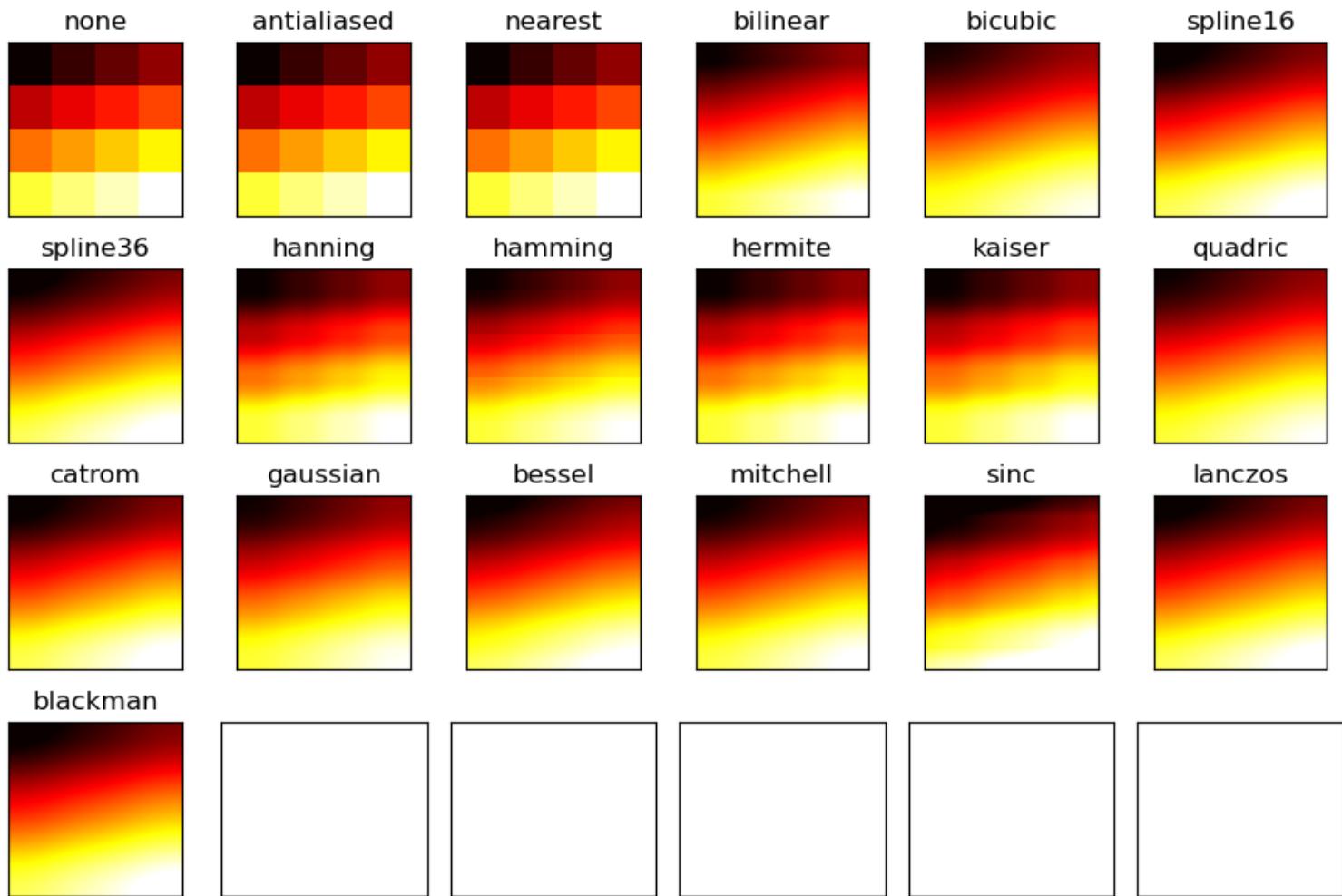
```
import matplotlib
import matplotlib.pyplot as plt
import numpy as np

img3 = [[1, 2, 3, 4],
[5, 6, 7, 8],
[9, 10, 11, 12],
[13, 14, 15, 16]]
plt.imshow(img3)
plt.show()
```

[Skip to main content](#)



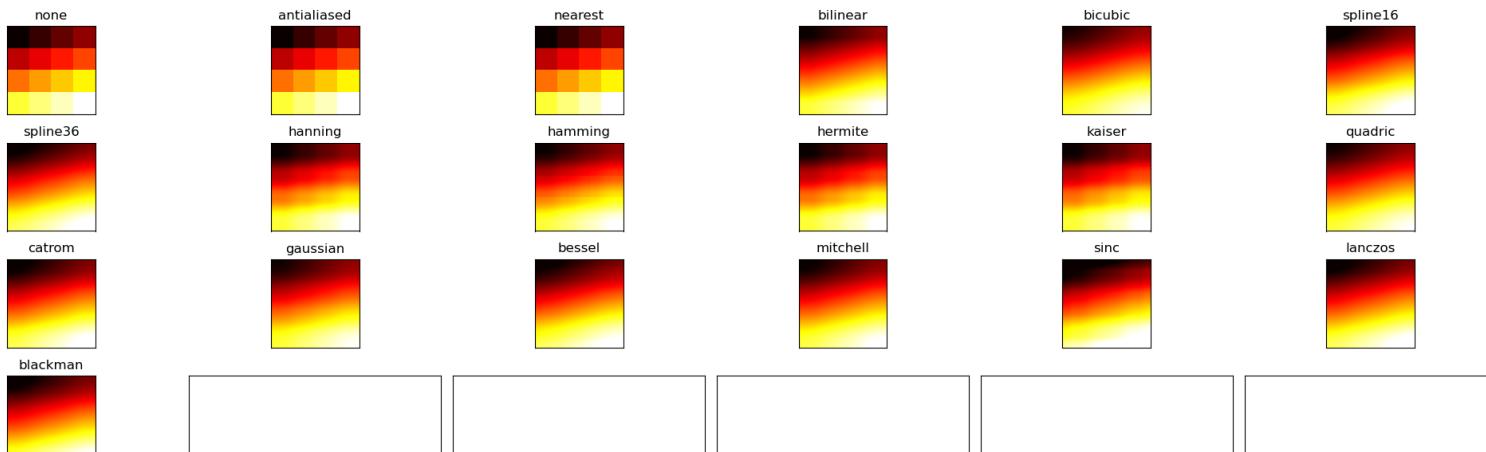
```
methods = ['none', 'antialiased', 'nearest', 'bilinear',
           'bicubic', 'spline16', 'spline36', 'hanning',
           'hamming', 'hermite', 'kaiser', 'quadric',
           'catrom', 'gaussian', 'bessel', 'mitchell',
           'sinc', 'lanczos', 'blackman']
fig, axs = plt.subplots(nrows=4, ncols=6, figsize=(9, 6),
                       subplot_kw={'xticks': [], 'yticks': []})
for ax, interp_method in zip(axs.flat, methods):
    ax.imshow(img3, interpolation=interp_method, cmap='hot')
    ax.set_title(str(interp_method))
plt.tight_layout()
plt.show()
```



```

fig, axs = plt.subplots(nrows=4, ncols=6, figsize=(20, 6),
                      subplot_kw={'xticks': [], 'yticks': []})
for ax, interp_method in zip(axs.flat, methods):
    ax.imshow(img3, interpolation=interp_method, cmap='hot')
    ax.set_title(str(interp_method))
plt.tight_layout()
plt.show()

```



[Skip to main content](#)

```
print(zip(axes.flat, methods))
```

```
<zip object at 0x1269f7e40>
```

```
print(np.tile(np.array([1,2,3]), (3, 1)))
#array([[1, 2, 3],
#       [1, 2, 3],
#       [1, 2, 3]])
```

```
print(np.array([[1,2,3],]*3))
```

```
#or for repeating columns:
```

```
print(np.tile(np.array([[1,2,3]]).transpose(), (1, 3)))
#array([[1, 1, 1],
#       [2, 2, 2],
#       [3, 3, 3]])
```

```
print(np.array([[1,2,3],]*3).transpose())
```

```
[[1 2 3]
 [1 2 3]
 [1 2 3]]
 [[1 2 3]
 [1 2 3]
 [1 2 3]]
 [[[1 1 1]
 [2 2 2]
 [3 3 3]]
 [[1 1 1]
 [2 2 2]
 [3 3 3]]]
```

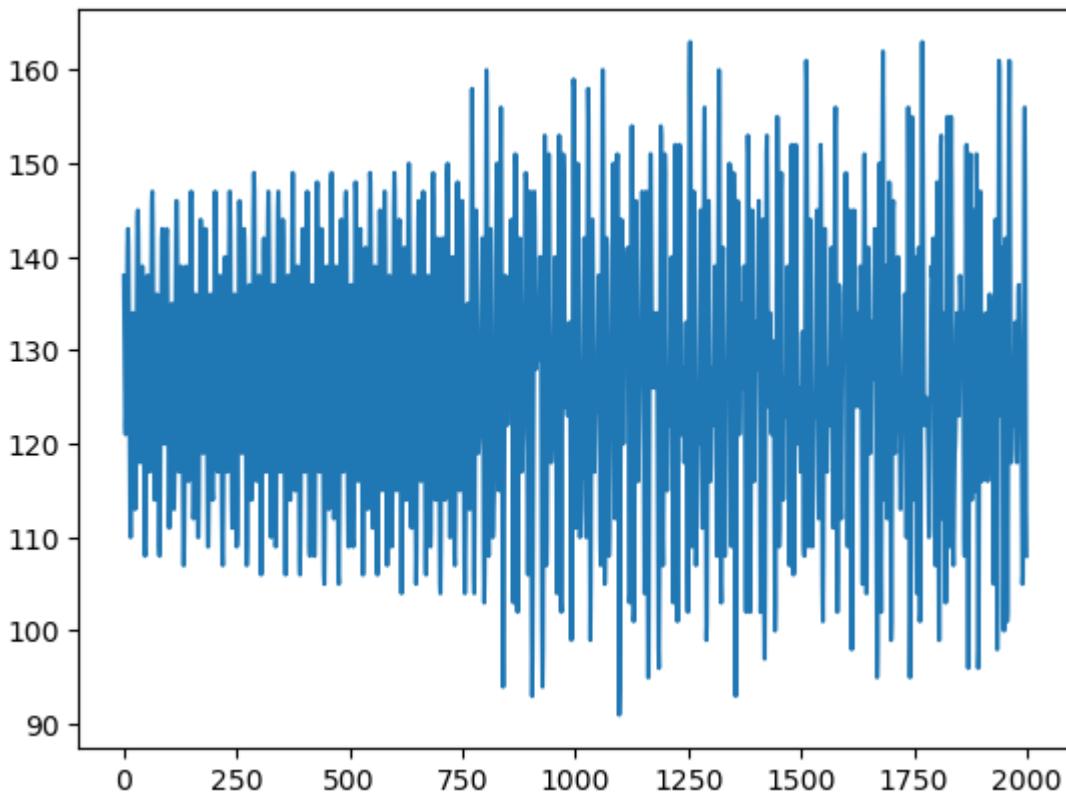
[Skip to main content](#)

```
%matplotlib inline
import matplotlib.pyplot as plt
from scipy.io import wavfile

def printaudio(sndf, plotting=True):
    """
    File format b' not understood. Only 'RIFF' and 'RIFX' supported
    """
    samplerate, data = wavfile.read(sndf)
    print(f" sndf={sndf}")
    print(f"====")
    print(f" samplerate={samplerate}")
    print(f" data={data}")
    print(f" {data[:20]} # up to 20 as 1 dim")
    print(f" type(data)={type(data)}")
    print(f" {data.shape} and no. of sample is {data.shape[0]}")
    print(f" {data.ndim}")
    print(f" {data.dtype}")
    print(f" {data.size}")
    print(f" {data.nbytes}")
    print("-----")
    print()
    if plotting:
        plt.plot(data[:2000])
        # assume stereo shape is (#####,2) but here is (####,)
        # just 1 colour it seems
        plt.show()
    return data, samplerate
```

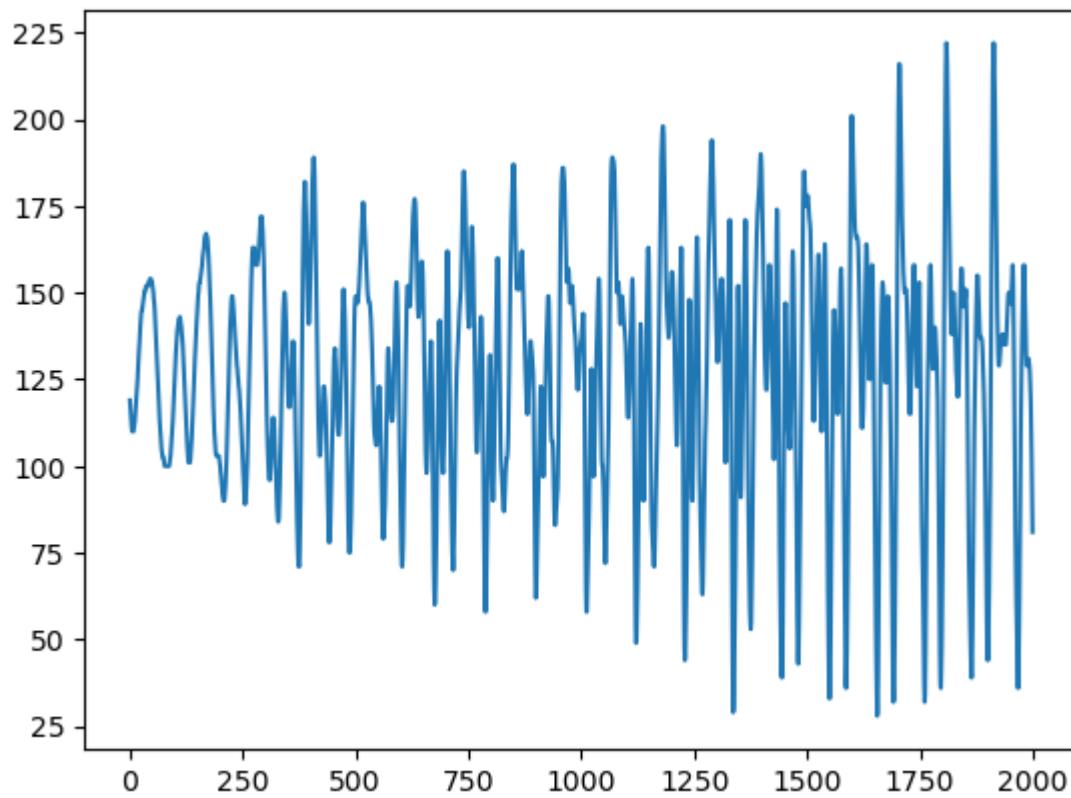
```
#printaudio("media/Rvb2.wav") #err
im2data, im2samplerate=printaudio("media/im2.wav")
we2data, we2samplerate=printaudio("media/welcome2.wav")
```

```
snmf='media/im2.wav'  
=====  
samplerate=11000  
data=array([138, 133, 127, ..., 129, 129, 127], dtype=uint8)  
data[:20]=array([138, 133, 127, 122, 121, 123, 129, 135, 141, 143, 141, 135, 126,  
    118, 112, 110, 113, 120, 127, 132], dtype=uint8)  
type(data)=<class 'numpy.ndarray'>  
data.shape=(10556,) and no. of sample is 10556  
data.ndim=1  
data.dtype=dtype('uint8')  
data.size=10556  
data nbytes=10556
```



```
snmf='media/welcome2.wav'  
=====  
samplerate=22000  
data=array([119, 117, 115, ..., 125, 125, 125], dtype=uint8)  
data[:20]=array([119, 117, 115, 113, 111, 110, 110, 110, 111, 112, 113, 115,  
    117, 119, 121, 123, 125, 128, 130], dtype=uint8)  
type(data)=<class 'numpy.ndarray'>  
data.shape=(13405,) and no. of sample is 13405  
data.ndim=1  
data.dtype=dtype('uint8')  
data.size=13405  
data nbytes=13405
```

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```

def printaudio(data, plotting=False, stereo=False):
    """
    ...

    print(f"data")
    #print(f"{inspect.signature(printaudio)=}")
    print("=====")
    print(f"data={data}")
    print(f"data[:10]={data[:10]} # up to 20 as 1 dim")
    print(f"type(data)={type(data)}")
    print(f"data.shape={data.shape} and no. of sample is {data.shape[0]}")
    print(f"data.ndim={data.ndim}")
    print(f"data.dtype={data.dtype}")
    print(f"data.size={data.size}")
    print(f"data.nbytes={data.nbytes}")
    print("-----")
    print()

    if plotting:
        plt.plot(data[:2000])
        # assume stereo shape is (#####,2) but here is (####,), just 1 colour it seems
        plt.show()
    if stereo:
        c1 = data[:, 0]
        c2 = data[:, 1]
        print(f"c1={c1}, {c2=}")
        print(f"c1.shape={c1.shape}, {c2.shape={c2.shape}}")
        plt.subplot(2, 1, 1)
        plt.plot(c1[:]) #10*samplerate]
        plt.subplot(2, 1, 2)
        plt.plot(c2[:], c='g') #10*samplerate], c='g')
        plt.show()
    return

im2data2 = np.tile(im2data, (2, 1))
printaudio(im2data2)
# https://stackoverflow.com/questions/36384760/transforming-a-row-vector-into-a-column-
#im2data2.reshape(-1,2)
im2data2reshape = im2data2.reshape(-1,2)
printaudio(im2data2reshape, plotting=True, stereo=True) #im2data2.reshape(-1,2), plotti

def dummy():
    # not the way # im2data2reshapehalf = im2data2reshape
    # not the way # printaudio(im2data2reshapehalf, plotting=True) #im2data2.reshape(-1

```

[Skip to main content](#)

```
#printaudio(im2data3) # , plotting=False)

# not copy as one more row but
# 2 data cell inside the row

#im2data3T = np.tile(im2data.transpose(), (3,2))
#printaudio(im2data3T) # , plotting=False)

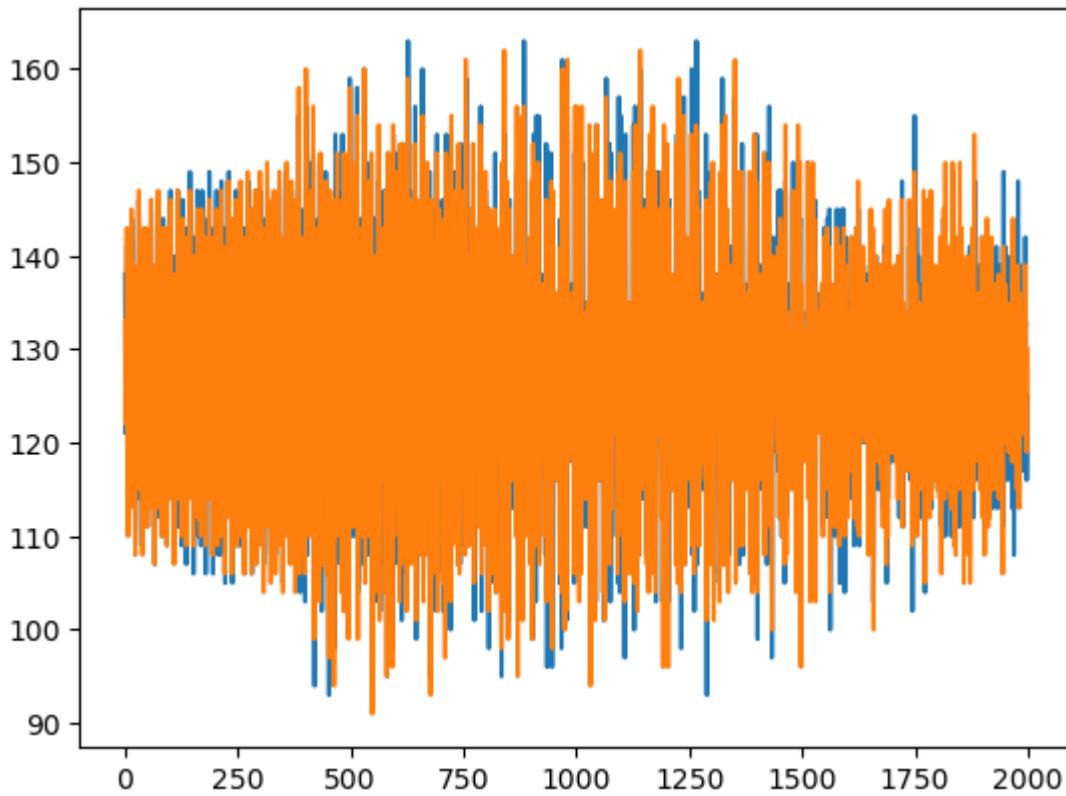
#im2data3aT = np.tile(im2data3.transpose(), (2,3)) #, (3, 1)) #(1, 3))
#printaudio(im2data3T) # , plotting=False)
return
```

```
data
=====
data=array([[138, 133, 127, ..., 129, 129, 127],
           [138, 133, 127, ..., 129, 129, 127]], dtype=uint8)
data[:10]=array([[138, 133, 127, ..., 129, 129, 127],
                [138, 133, 127, ..., 129, 129, 127]], dtype=uint8)
type(data)=<class 'numpy.ndarray'>
data.shape=(2, 10556) and no. of sample is 2
data.ndim=2
data.dtype=dtype('uint8')
data.size=21112
data nbytes=21112
```

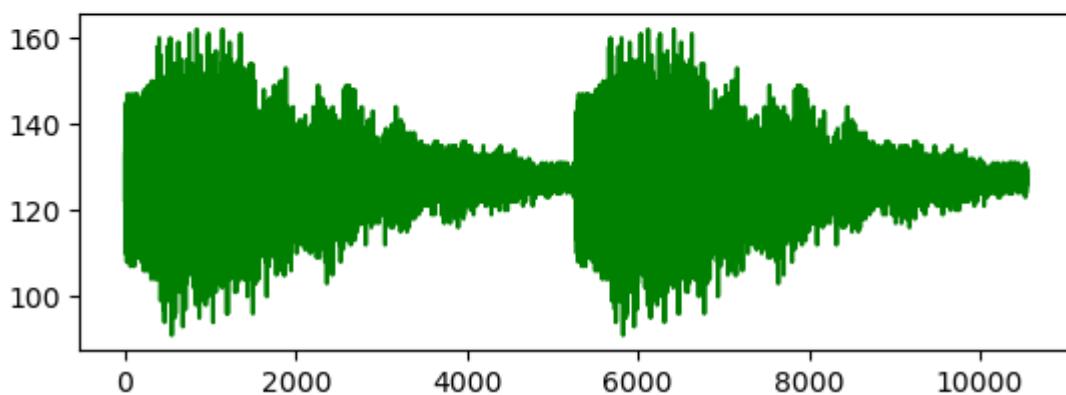
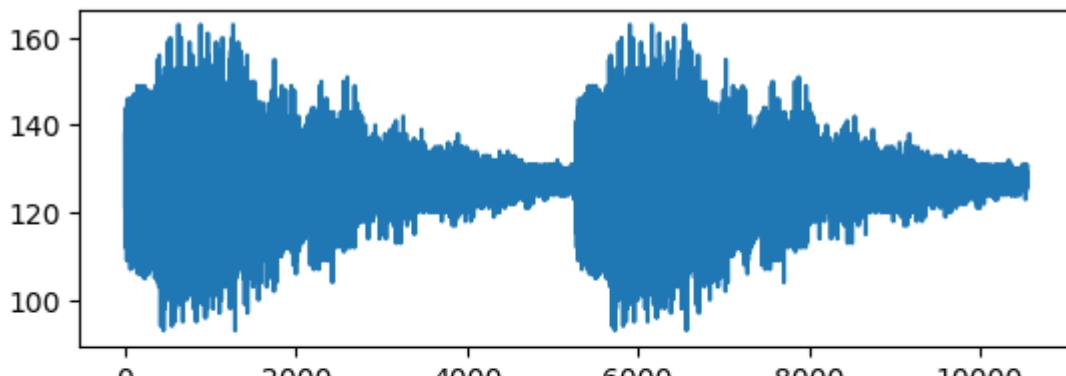
---

```
data
=====
data=array([[138, 133],
           [127, 122],
           [121, 123],
           ...,
           [128, 128],
           [128, 129],
           [129, 127]], dtype=uint8)
data[:10]=array([[138, 133],
                 [127, 122],
                 [121, 123],
                 [129, 135],
                 [141, 143],
                 [141, 135],
                 [126, 118],
                 [112, 110],
                 [113, 120],
                 [127, 132]], dtype=uint8)
type(data)=<class 'numpy.ndarray'>
data.shape=(10556, 2) and no. of sample is 10556
data.ndim=2
data.dtype=dtype('uint8')
data.size=21112
data nbytes=21112
```

---



```
c1=array([138, 127, 121, ..., 128, 128, 129], dtype=uint8), c2=array([133, 122, 123, ...  
c1.shape=(10556,), c2.shape=(10556,)
```



[Skip to main content](#)

```

import scipy.fftpack

def fft(data, samplerate):
    samples = data.shape[0]
    dataafft = scipy.fftpack.fft(data)
    fftabs = abs(dataafft)
    print(fftabs)
    freqs = scipy.fftpack.fftfreq( samples, 1/samplerate )
    plt.plot(freqs, fftabs)
    plt.show()

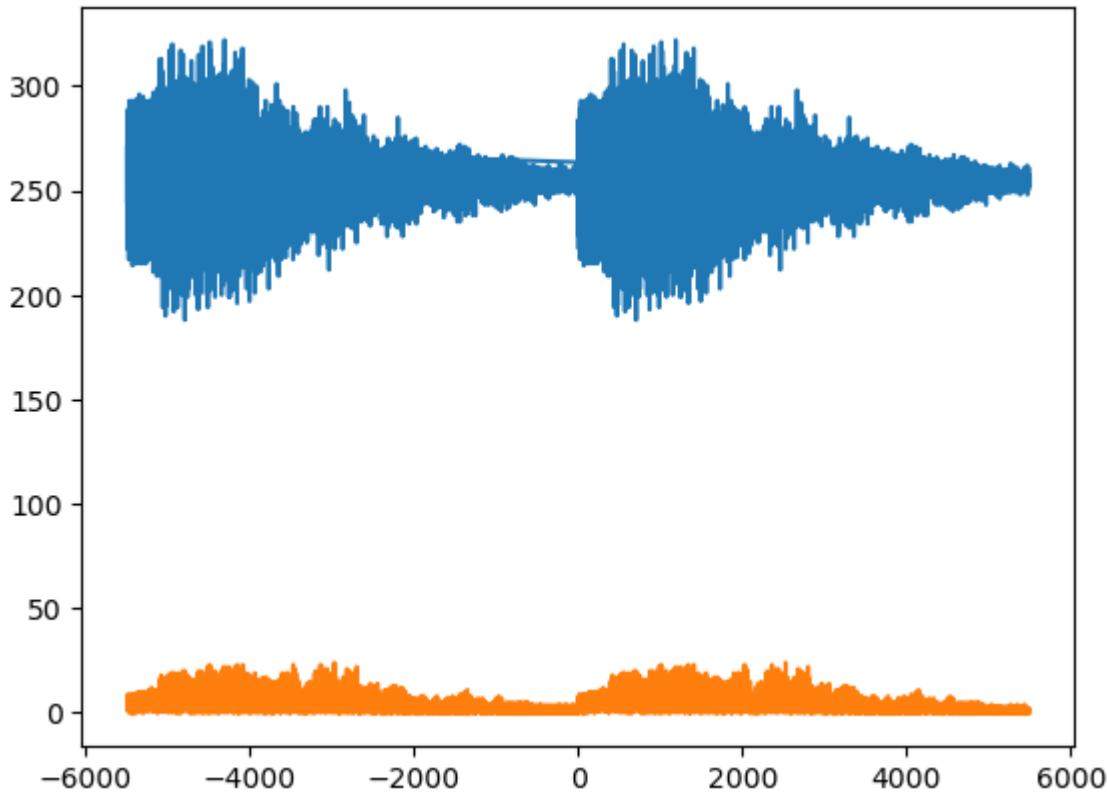
fft(im2data2reshape, im2samplerate)

```

```

[[271.  5.]
 [249.  5.]
 [244.  2.]
 ...
 [256.  0.]
 [257.  1.]
 [256.  2.]]

```



```

# https://stackoverflow.com/questions/218616/how-to-get-method-parameter-names

def _get_args_dict(fn, args, kwargs):
    arargs names = fn. code .co varnames[:fn. code .co aracount]

```

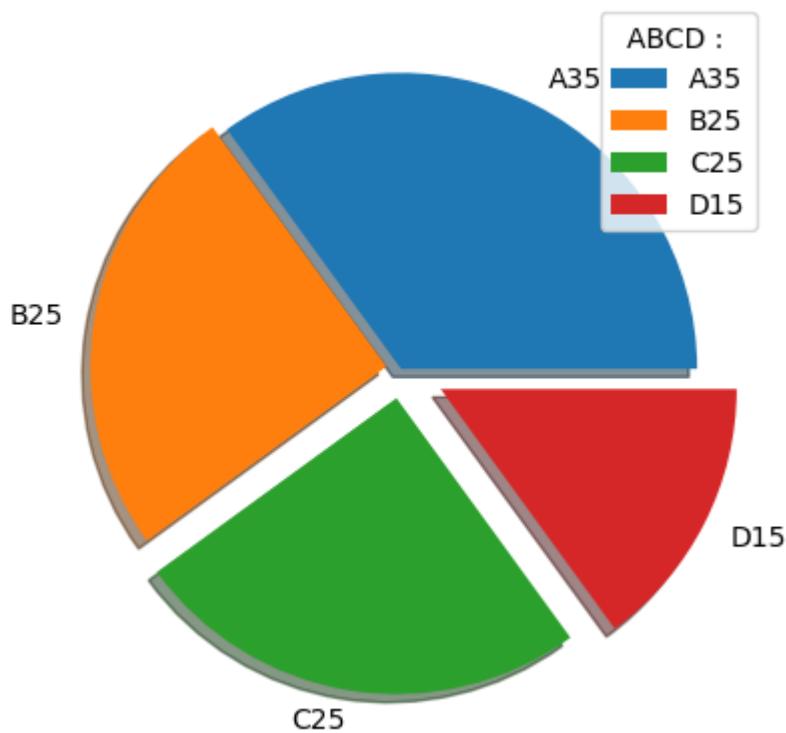
[Skip to main content](#)

# Handon C9

```
%matplotlib inline  
import numpy as np  
import matplotlib.pyplot as plt
```

## pie-chart

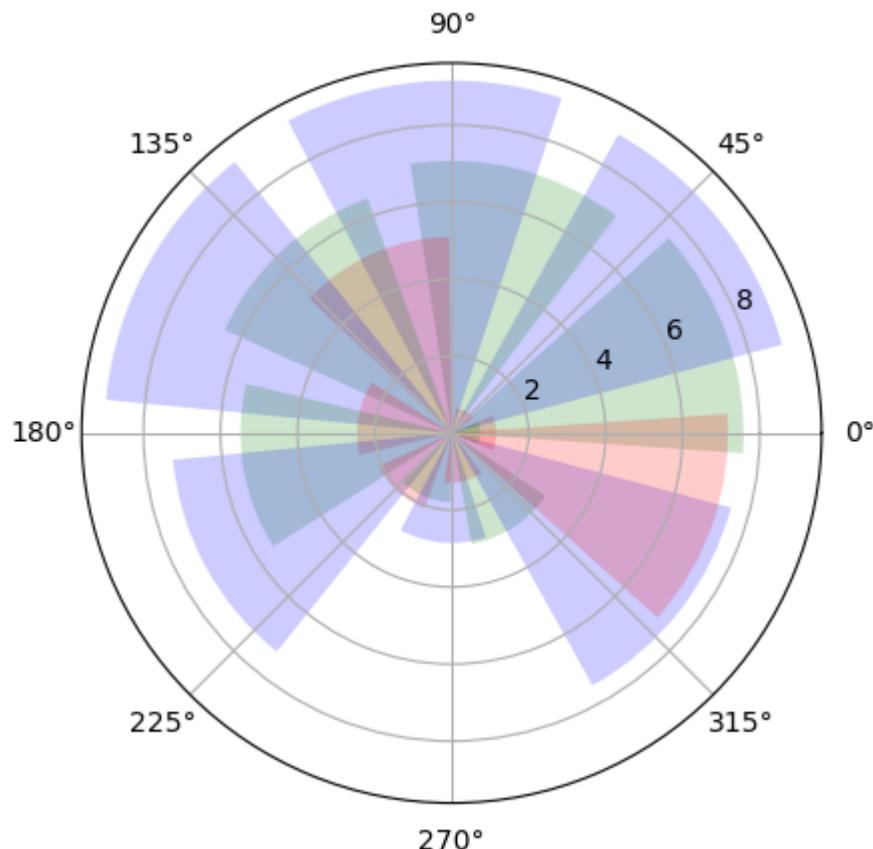
```
data = np.array([35, 25, 25, 15])  
mylabels = ['A35', 'B25', 'C25', 'D15']  
  
explode = [0.0, 0.05, 0.1, 0.15]  
plt.pie(data,  
         labels = mylabels,  
         explode = explode,  
         shadow = True)  
plt.legend(title='ABCD : ')  
plt.show()
```



## polar charts

[Skip to main content](#)

```
N = 20
theta = np.linspace(0.0, 2 * np.pi, N)
r = 10 * np.random.rand(N)
# The set of points can be visualized as follows:
plt.subplot(projection='polar')
plt.bar(theta, r, bottom=0.0,
        color=['r', 'g', 'b'], alpha=0.2)
plt.show()
```



See

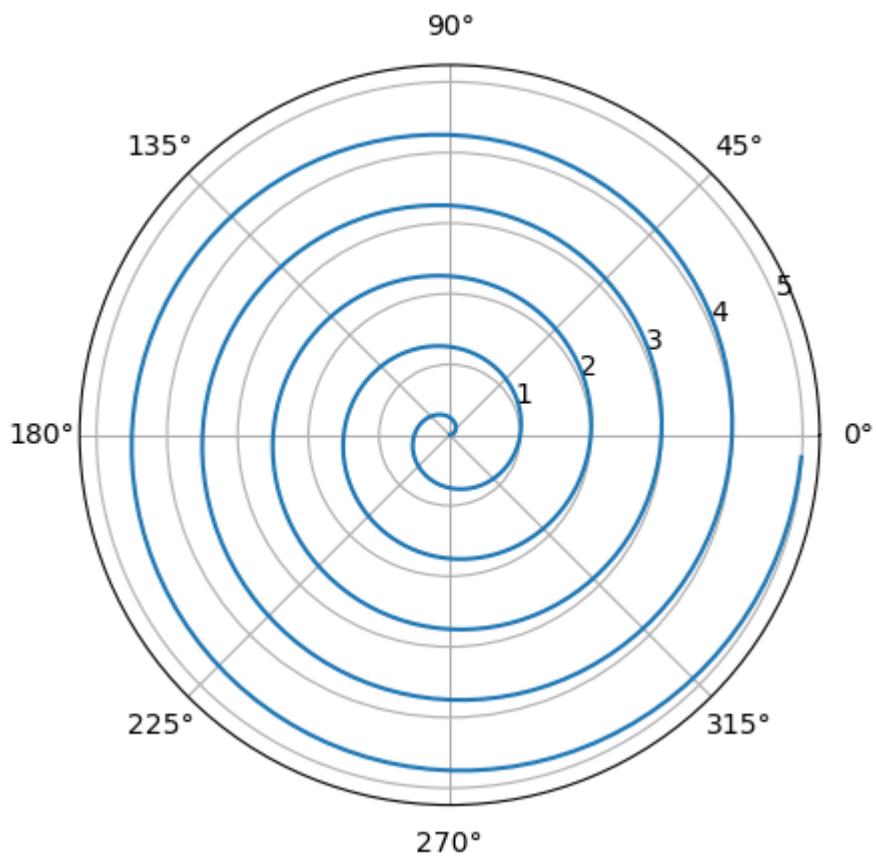
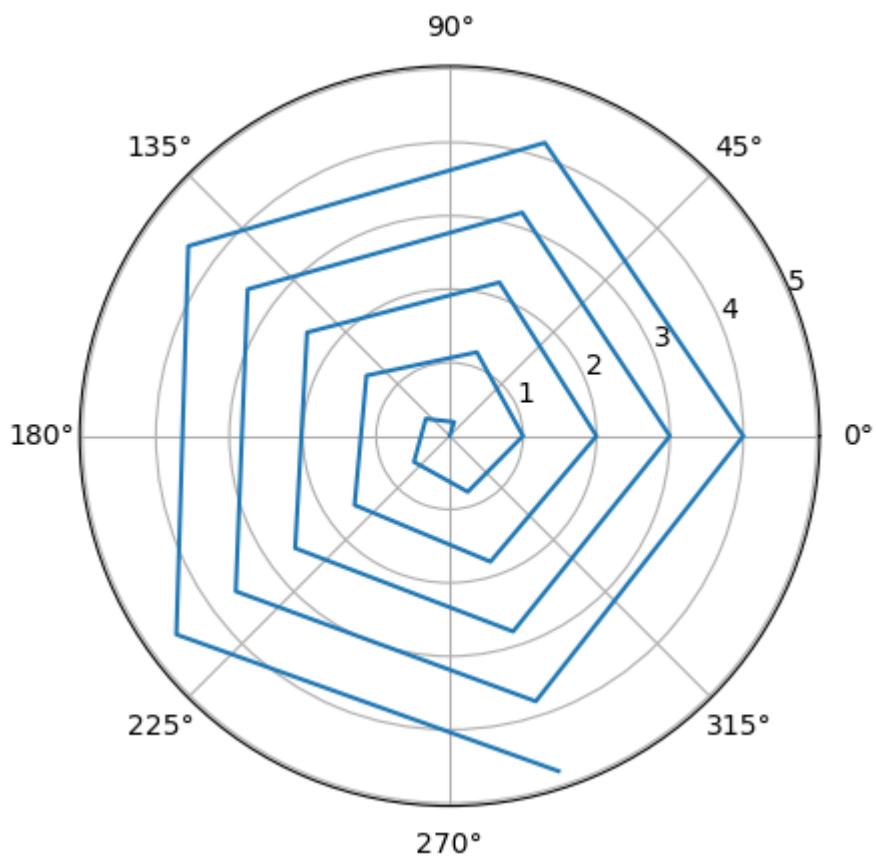
1. [https://www.youtube.com/watch?v=mDT\\_DG\\_A0JA](https://www.youtube.com/watch?v=mDT_DG_A0JA)
2. <https://www.youtube.com/watch?v=GMcRqtm4mNo>
3. <https://www.youtube.com/watch?v=VmQ1isayjJI>

```
r = np.arange(0, 5, 0.2)
theta = 2 * np.pi * r
plt.subplot(projection='polar')
plt.plot(theta, r)
plt.show()

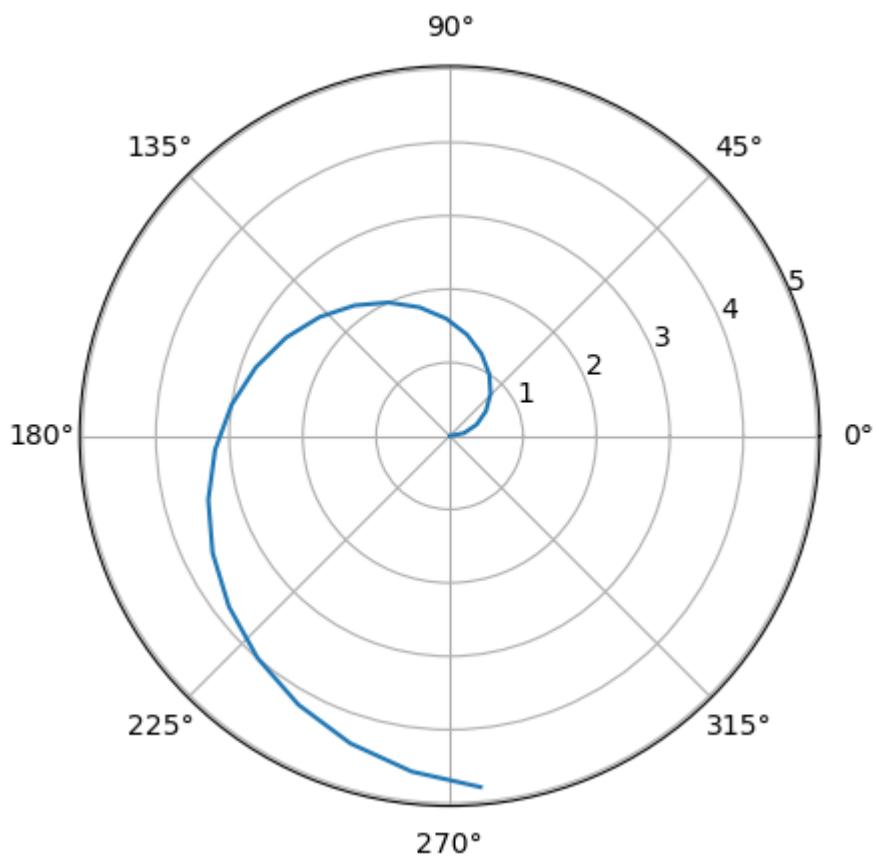
r = np.arange(0, 5, 0.01) # 0.2
theta = 2 * np.pi * r
plt.subplot(projection='polar')
plt.plot(theta, r)
plt.show()

r = np.arange(0, 5, 0.2)
theta = r # 2 * np.pi * r
plt.subplot(projection='polar')
plt.plot(theta, r)
plt.show()
```

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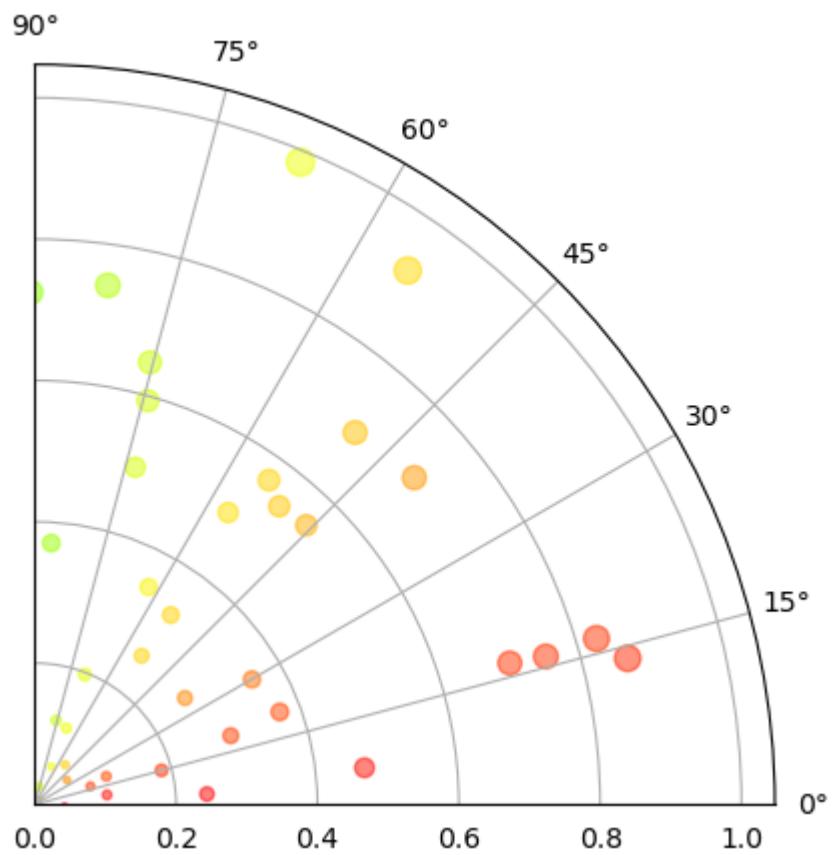
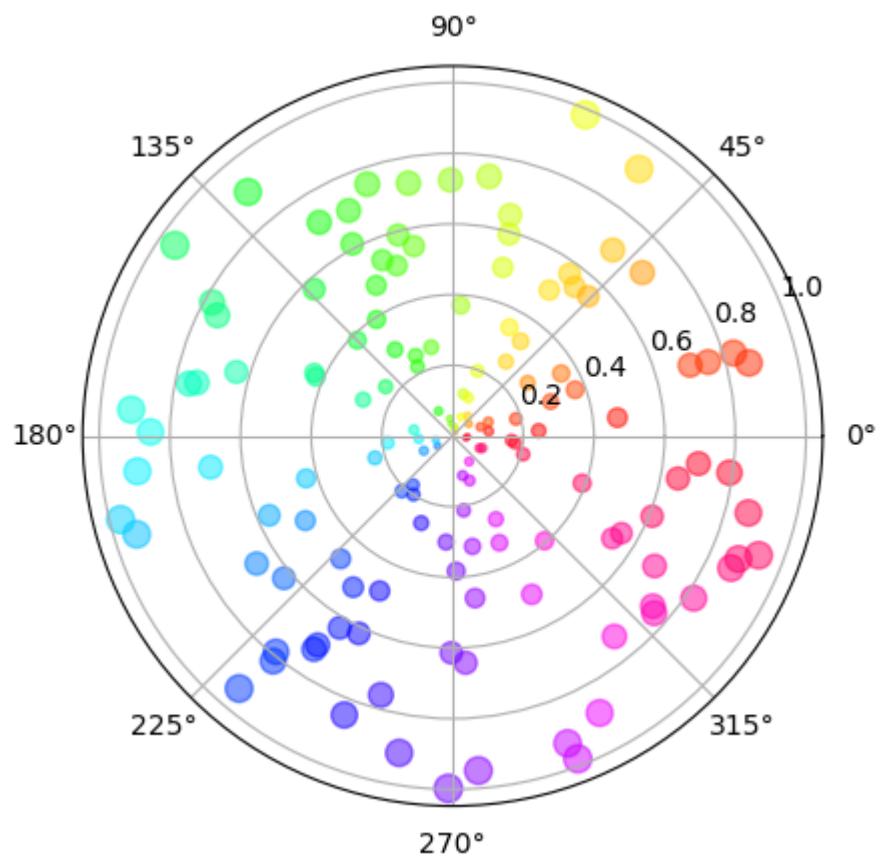
[Skip to main content](#)

```
N = 150
r = np.random.rand(N)
theta = 2 * np.pi * np.random.rand(N)
size = r * 100

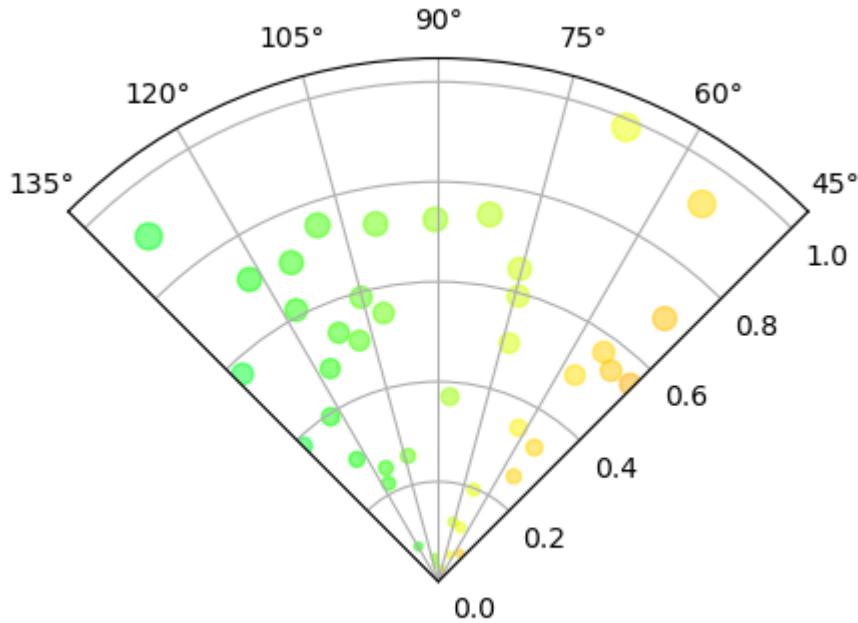
plt.subplot(projection='polar')
plt.scatter(theta, r, c=theta,
            s=size, cmap='hsv',
            alpha=0.5)
plt.show()

fig = plt.figure()
ax = fig.add_subplot(projection='polar')
c = ax.scatter(theta, r, c=theta,
                s=size, cmap='hsv',
                alpha=0.5)
ax.set_thetamin(0)
ax.set_thetamax(90)
plt.show()

fig = plt.figure()
ax = fig.add_subplot(projection='polar')
c = ax.scatter(theta, r, c=theta,
                s=size, cmap='hsv',
                alpha=0.5)
ax.set_thetamin(45)
ax.set_thetamax(135)
plt.show()
```



[Skip to main content](#)

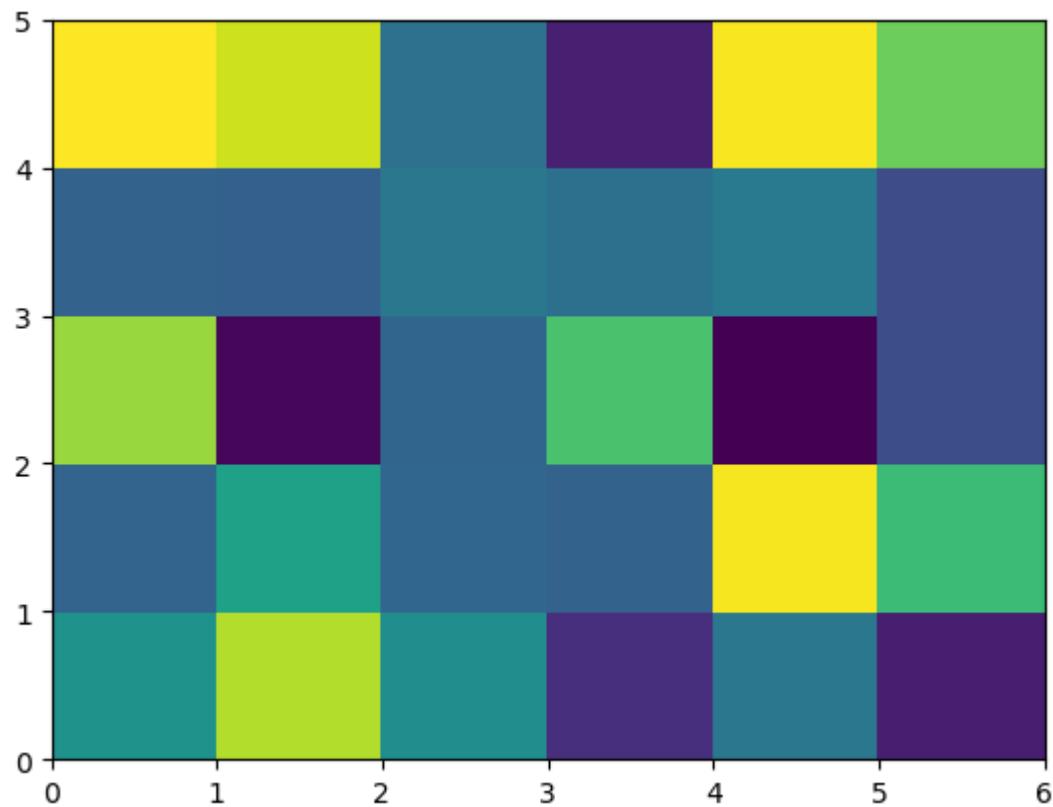


## handon-10 colors

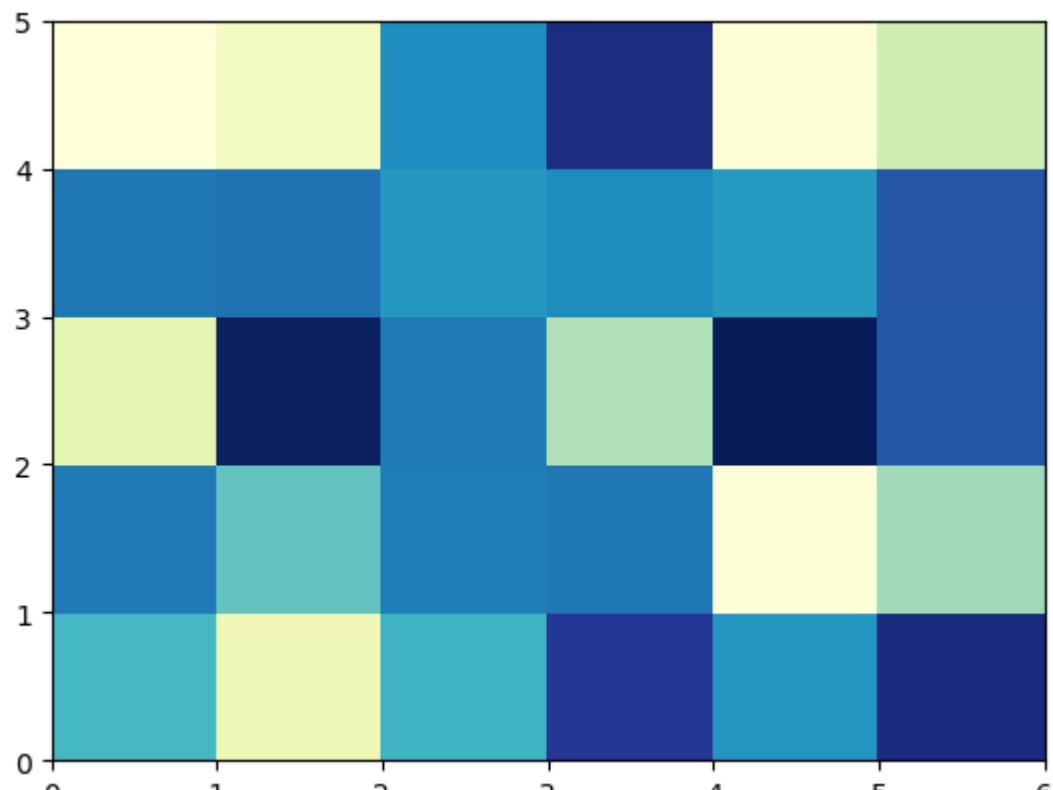
### colors

```
%matplotlib inline  
import matplotlib.pyplot as plt  
import numpy as np
```

```
data = np.random.rand(5, 6)  
plt.pcolor(data)  
plt.show()
```



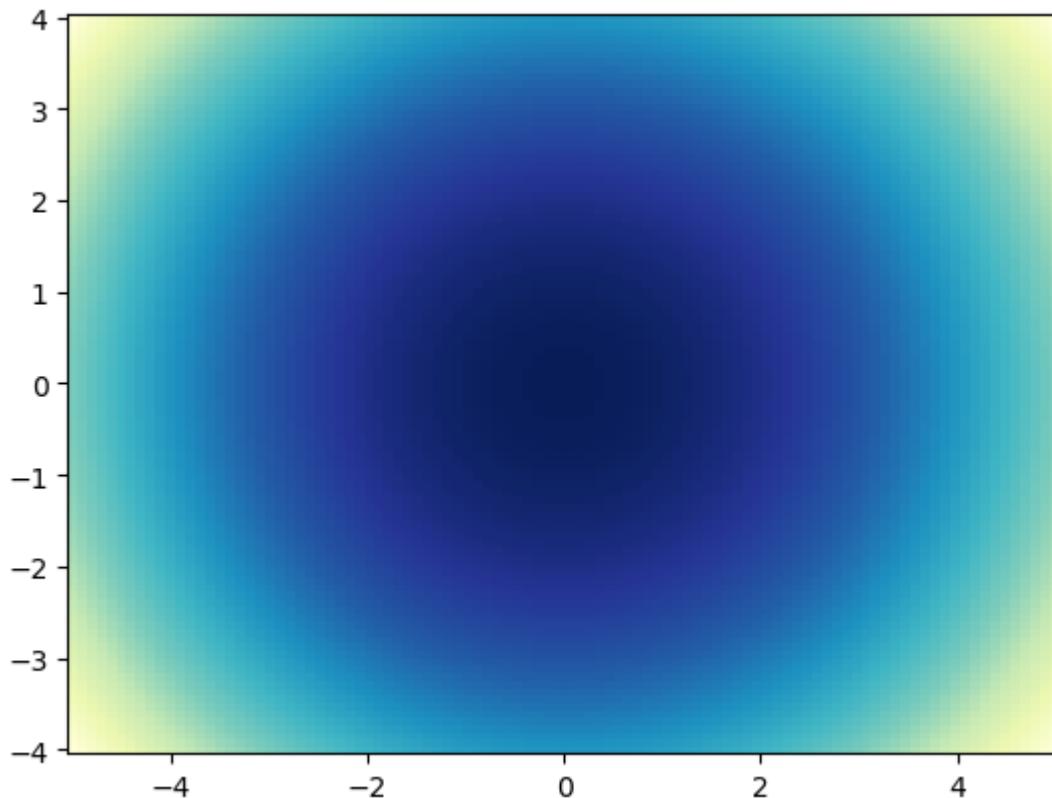
```
plt.pcolor(data, cmap='YlGnBu_r')
plt.show()
```



[Skip to main content](#)

```
N = 100
X, Y = np.meshgrid(np.linspace(-5, 5, N),
                    np.linspace(-4, 4, N))
Z = (X**2 + Y**2)

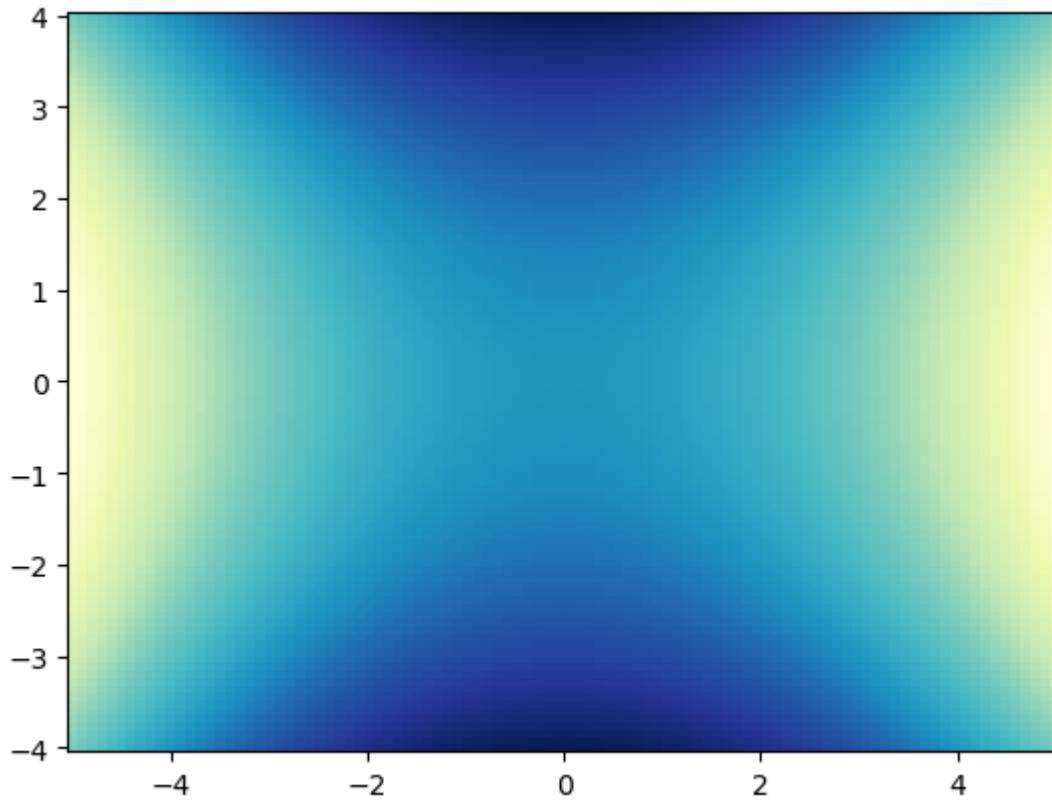
plt.pcolor(X, Y, Z,
            cmap='YlGnBu_r',
            shading='auto')
plt.show()
```



```
N = 100
X, Y = np.meshgrid(np.linspace(-5, 5, N),
                    np.linspace(-4, 4, N))
Z = (X**2 - Y**2)

plt.pcolor(X, Y, Z,
            cmap='YlGnBu_r',
            shading='auto')
plt.show()
```

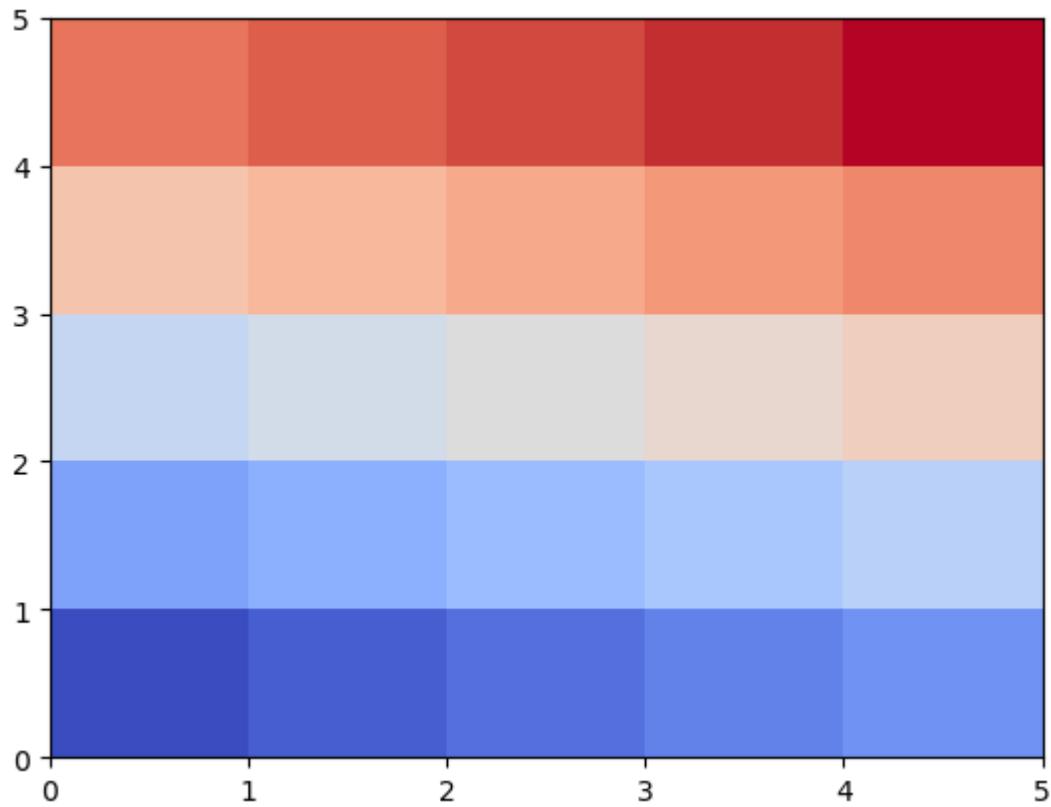
[Skip to main content](#)



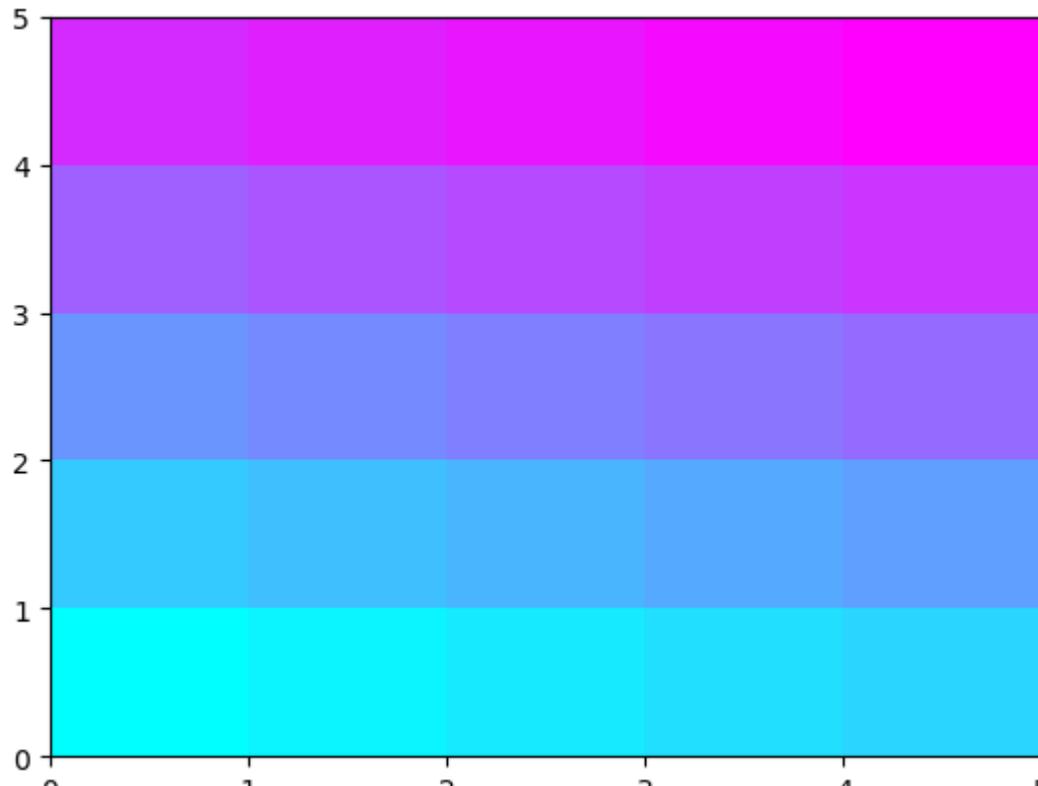
```
import os  
os.getcwd()
```

```
'/Users/ngcchk/Documents/GitHub/gpd2-win-unity1/ipadred-rain/imgno_book1/imgnobk3'
```

```
nrows = ncols = 5  
x = np.arange(ncols + 1)  
y = np.arange(nrows + 1)  
z = np.arange(nrows * ncols).reshape(nrows, ncols)  
plt.pcolormesh(x, y, z,  
shading='flat',  
cmap='coolwarm')  
plt.show()
```



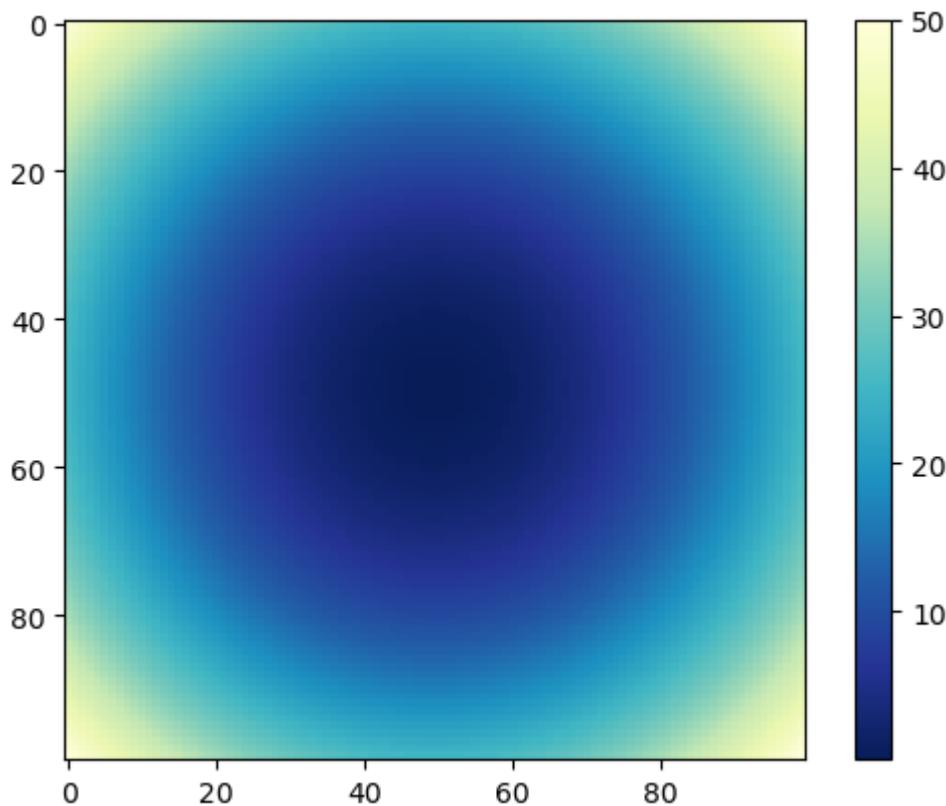
```
plt.pcolormesh(x, y, z,    shading='auto', cmap='cool')
plt.show()
```



[Skip to main content](#)

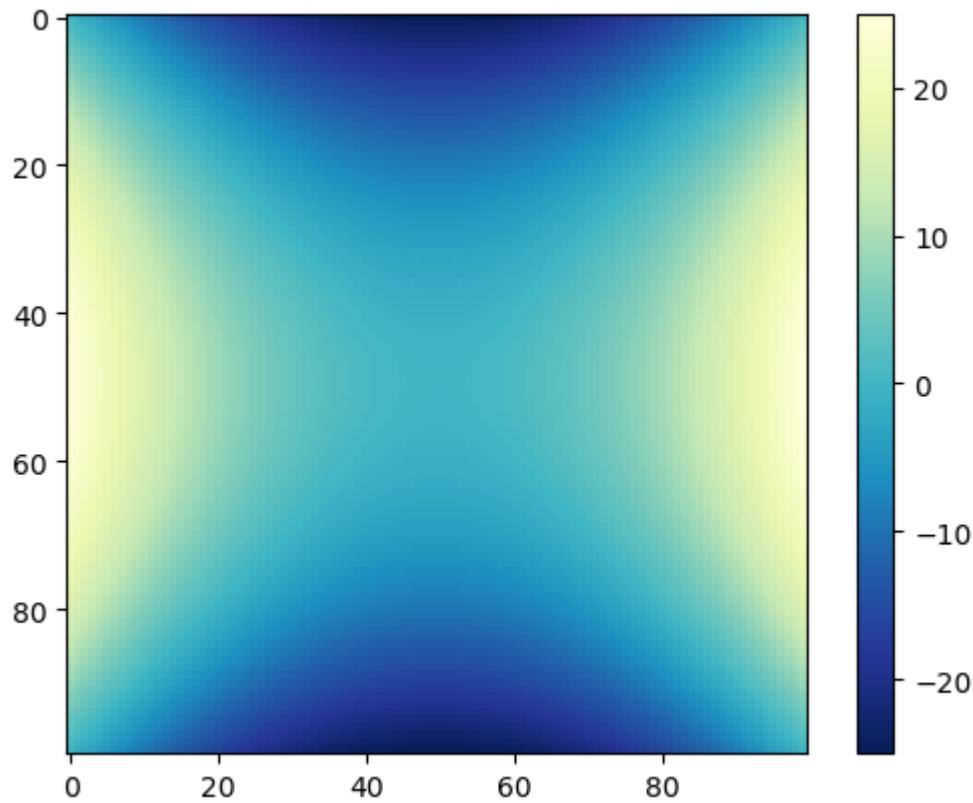
```
# error ... p.139
z = np.random.rand(6, 10)
x = np.arange(0, 10, 1)
y = np.arange(4, 10, 1)
T = 0.5
X, Y = np.meshgrid(x, y)
X=X+T* Y
Y=Y+T* X
# plt.pcolormesh(X, Y, Z, shading='auto')
#plt.show()
```

```
N = 100
X, Y = np.meshgrid(np.linspace(-5, 5, N), np.linspace(-5, 5, N))
Z = (X**2 + Y**2)
img = plt.imshow(Z, cmap='YlGnBu_r')
plt.colorbar(img)
plt.show()
```



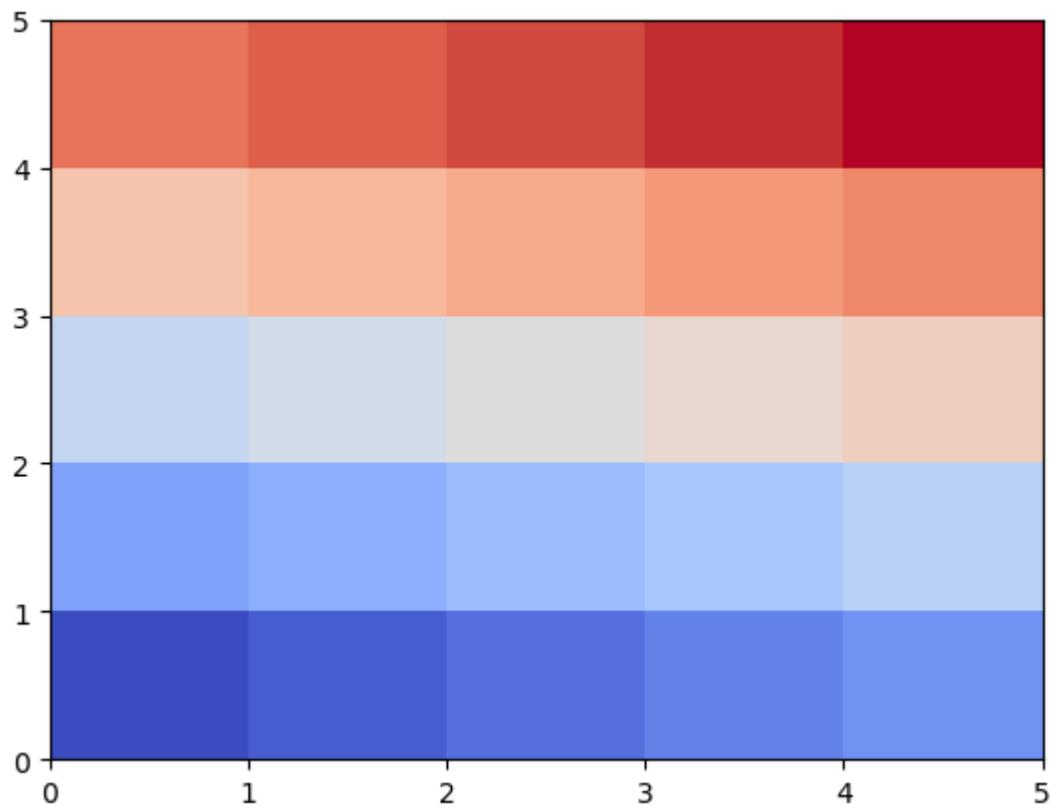
```
N = 100
X, Y = np.meshgrid(np.linspace(-5, 5, N), np.linspace(-5, 5, N))
Z = (X**2 - Y**2)
img = plt.imshow(Z, cmap='YlGnBu_r')
plt.colorbar(img)
plt.show()
```

[Skip to main content](#)



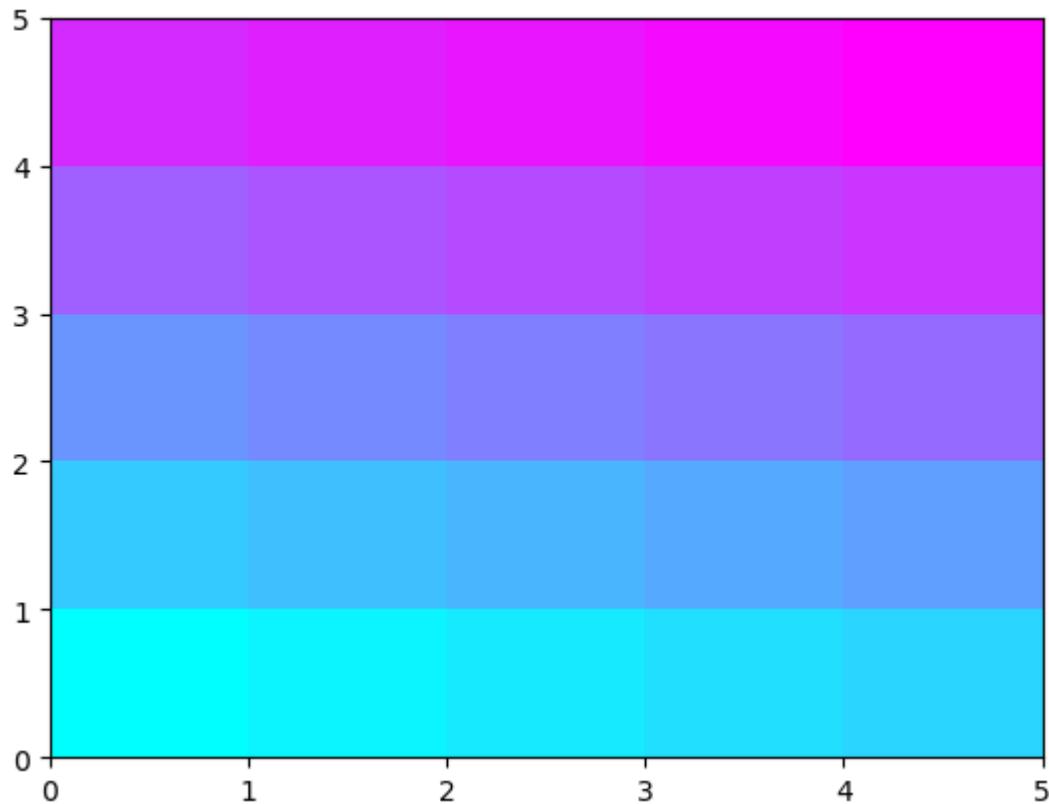
```
%matplotlib inline
import matplotlib.pyplot as plt
import numpy as np
```

```
nrows = ncols = 5
x = np.arange(ncols + 1)
y = np.arange(nrows + 1)
z = np.arange(nrows * ncols).reshape(nrows, ncols)
plt.pcolormesh(x, y, z,
shading='flat',
cmap='coolwarm')
plt.show()
```



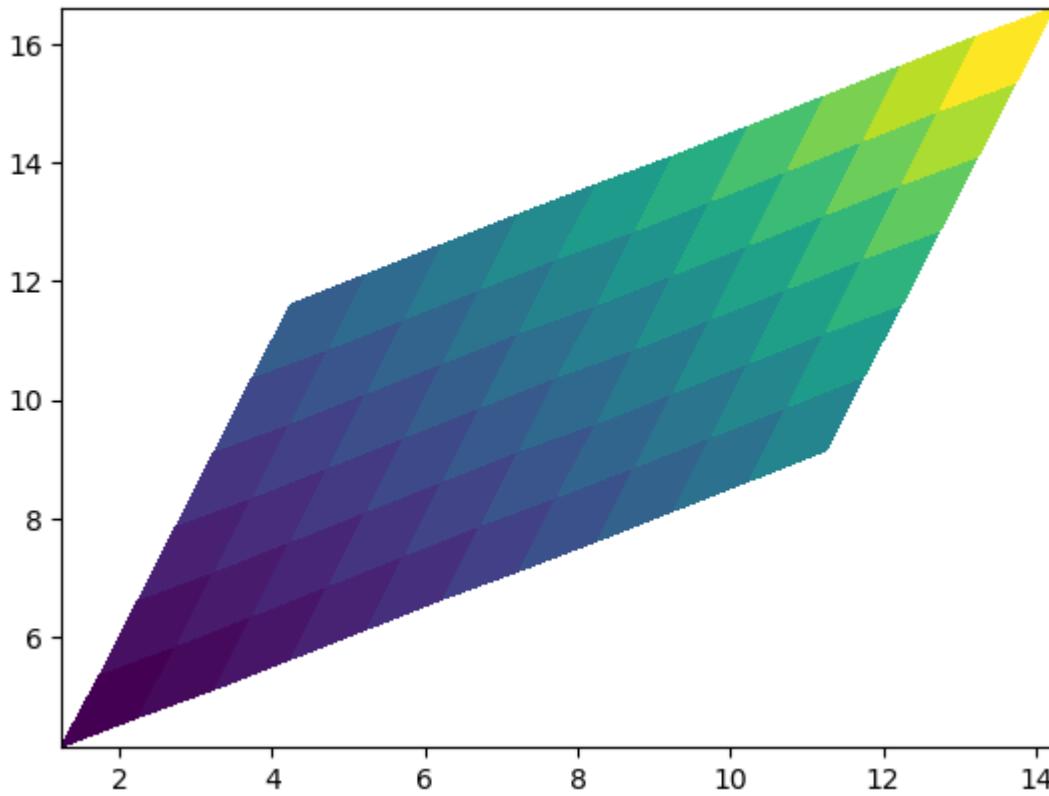
```
plt.pcolormesh(x, y, z,  
shading='auto',  
cmap='cool')  
# ? has names ?
```

```
<matplotlib.collections.QuadMesh at 0x136c0f150>
```

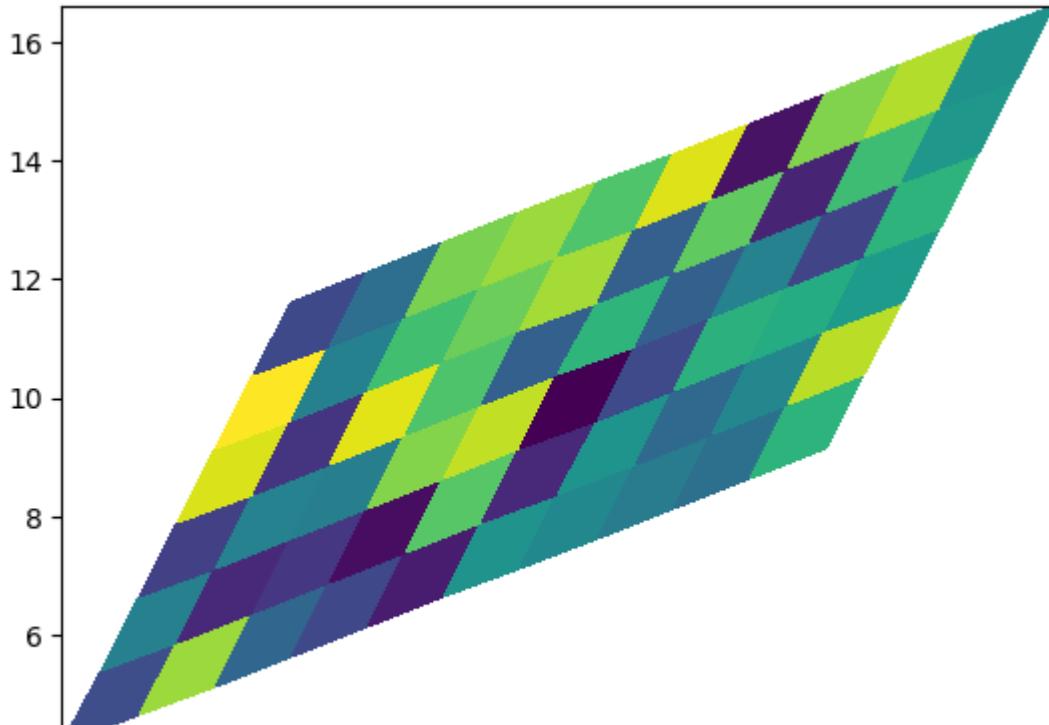


```
z = np.random.rand(6, 10)
x = np.arange(0, 10, 1)
y = np.arange(4, 10, 1)
T = 0.5
X, Y = np.meshgrid(x, y)
X=X+T* Y
Y=Y+T* X
Z = (X**2 + Y**2)
plt.pcolormesh(X, Y, Z,
               shading='auto')
plt.show()
```

[Skip to main content](#)



```
Z = z  
plt.pcolormesh(X, Y, Z,  
                shading='auto')  
plt.show()
```

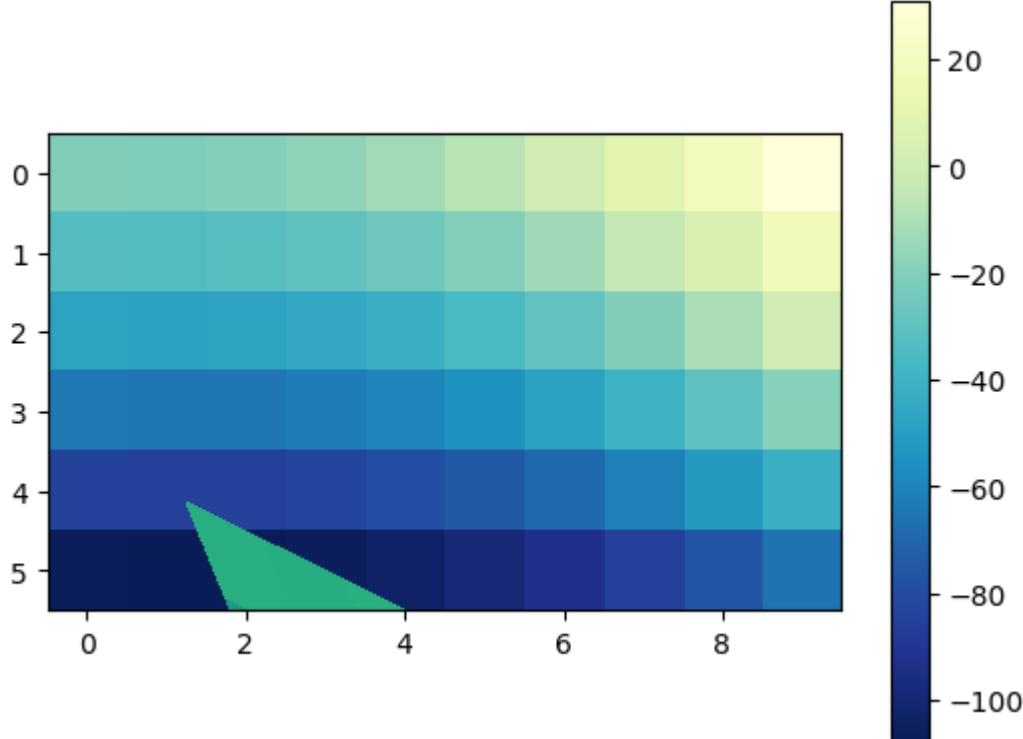


[Skip to main content](#)

```

z = np.random.rand(6, 10)
x = np.arange(0, 10, 1)
y = np.arange(4, 10, 1)
T = 0.5
X, Y = np.meshgrid(x, y)
X=X+T* Y
Y=Y+T* X
Z = (X**2 - Y**2)
plt.pcolormesh(X, Y, Z,
                shading='auto')
img = plt.imshow(Z, cmap='YlGnBu_r')
plt.colorbar(img)
plt.show()

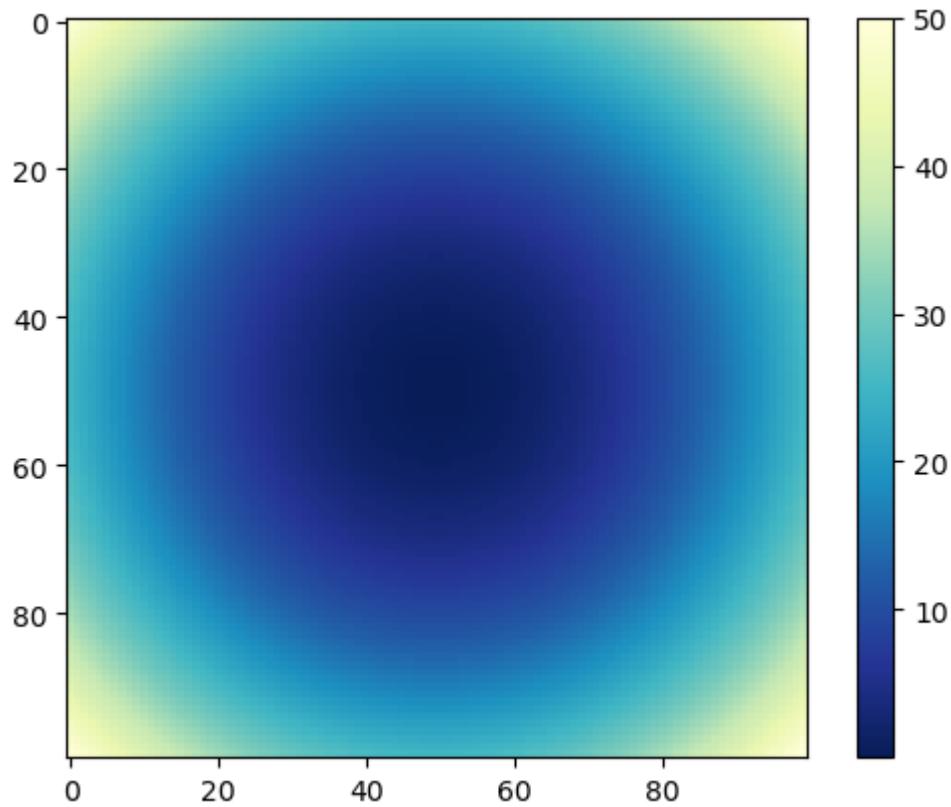
```



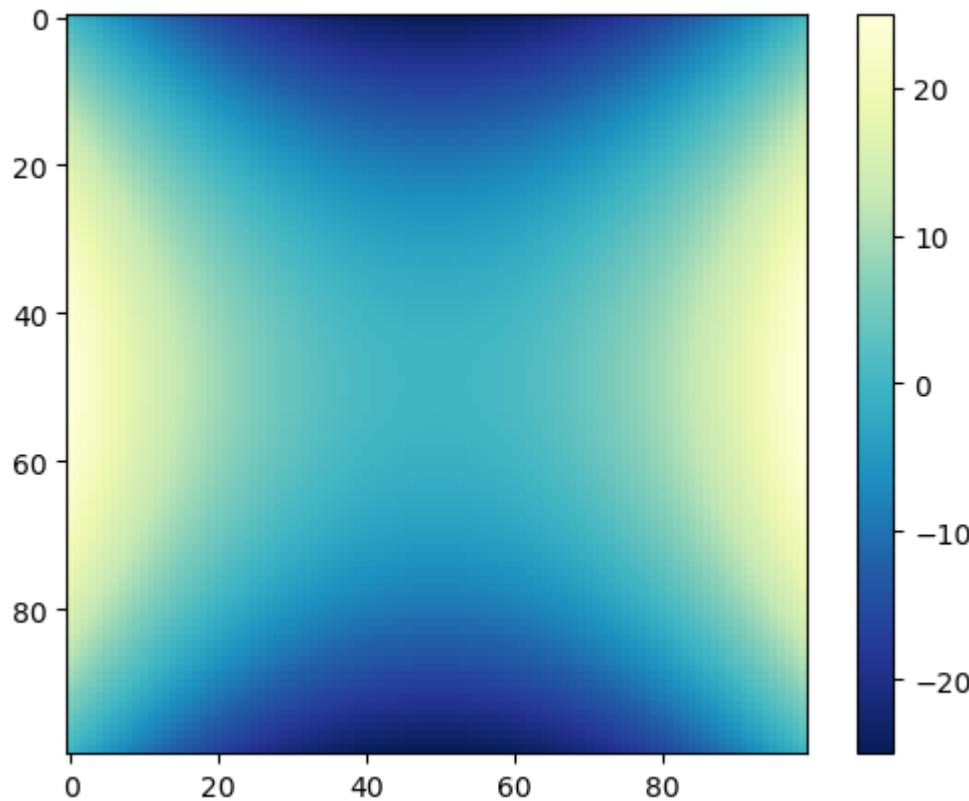
```

N = 100
X, Y = np.meshgrid(np.linspace(-5, 5, N),
                    np.linspace(-5, 5, N))
Z = (X**2 + Y**2)
img = plt.imshow(Z, cmap='YlGnBu_r')
plt.colorbar(img)
plt.show()

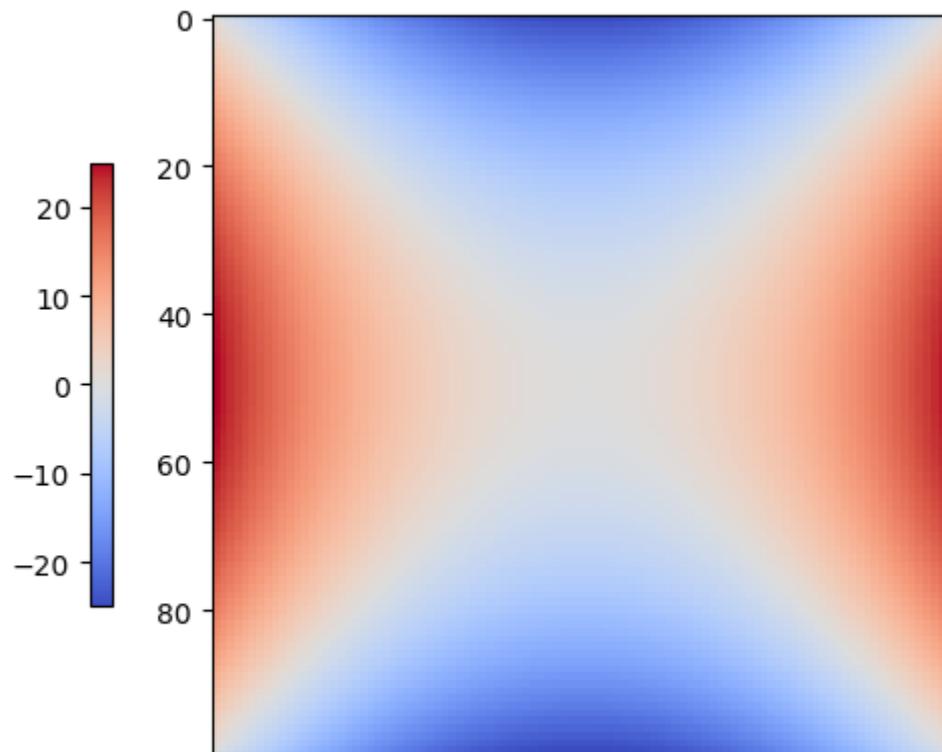
```



```
N = 100
X, Y = np.meshgrid(np.linspace(-5, 5, N), np.linspace(-5, 5, N))
Z = (X**2 - Y**2)
img = plt.imshow(Z, cmap='YlGnBu_r')
plt.colorbar(img)
plt.show()
```

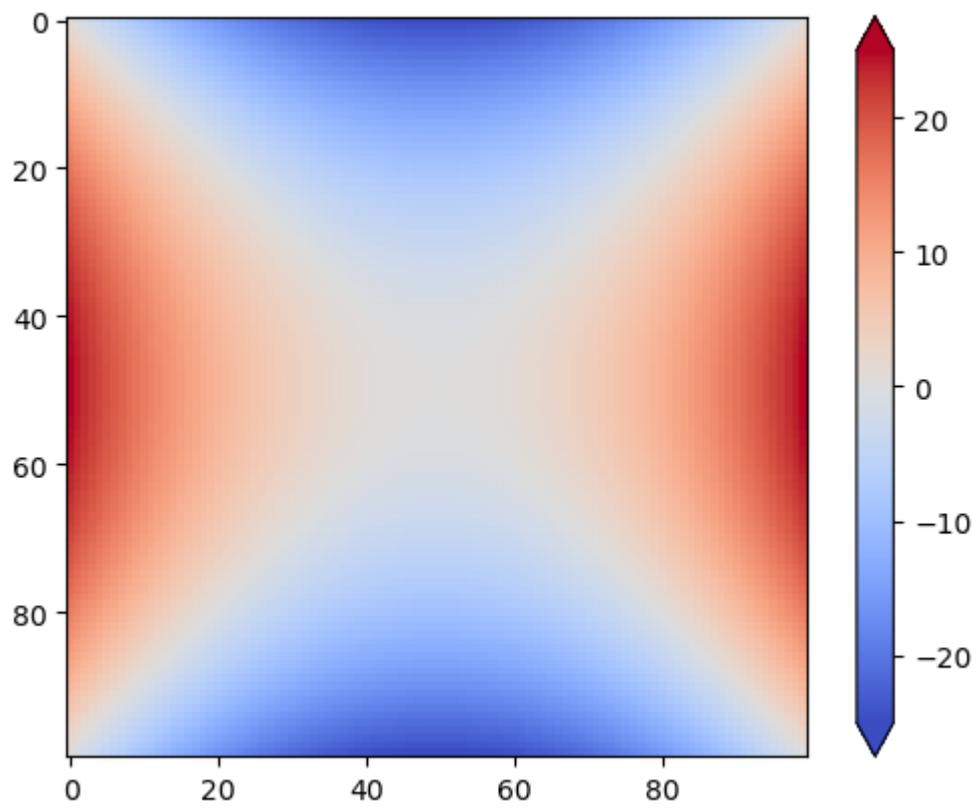


```
img = plt.imshow(Z, cmap='coolwarm')
plt.colorbar(img, location='left', shrink=0.6)
plt.show()
```



[Skip to main content](#)

```
[1]:  
img = plt.imshow(Z, cmap='coolwarm')  
plt.colorbar(img, extend='both')  
plt.show()
```



## handon-11-pyqt5

```
# conda install -c anaconda pyqt

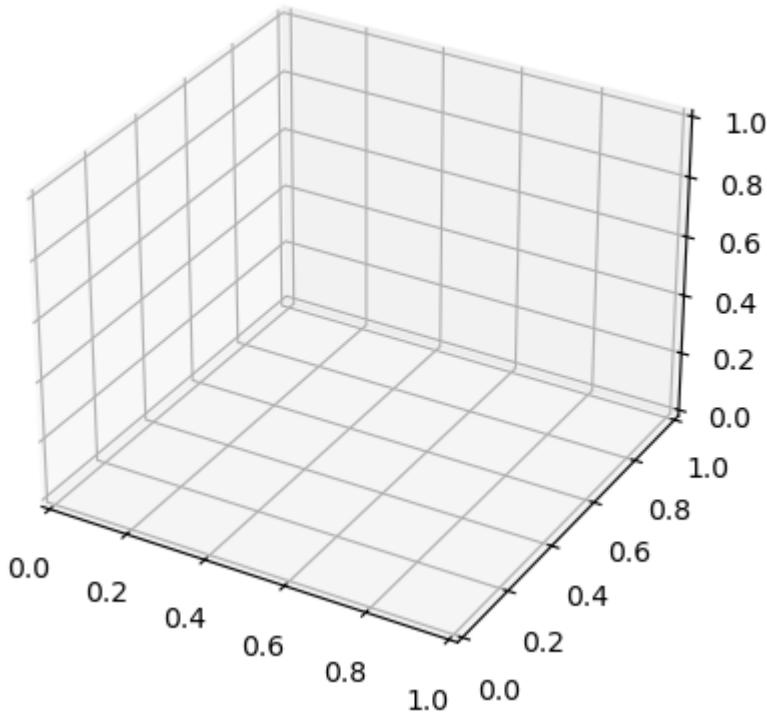
%matplotlib inline
#%matplotlib qt

import numpy as np
import matplotlib.pyplot as plt
from mpl_toolkits import mplot3d

fig = plt.figure()
ax = plt.axes(projection='3d')
plt.show()

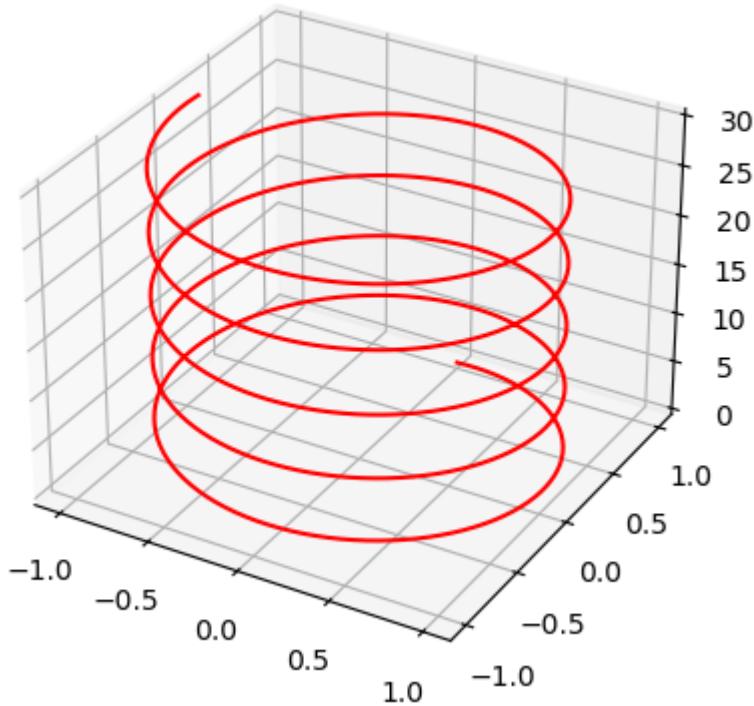
# in another windows; not sure how it would work in iOS
# actually now internal server error

# 23-10-09 14:01:58.252 python[35577:3996244] Warning: Window move completed without be
```



```
fig = plt.figure()
ax = plt.axes(projection='3d')
z = np.linspace(0, 30, 1000)
x = np.sin(z)
y = np.cos(z)
ax.plot3D(x, y, z, 'red')
plt.show()
```

[Skip to main content](#)

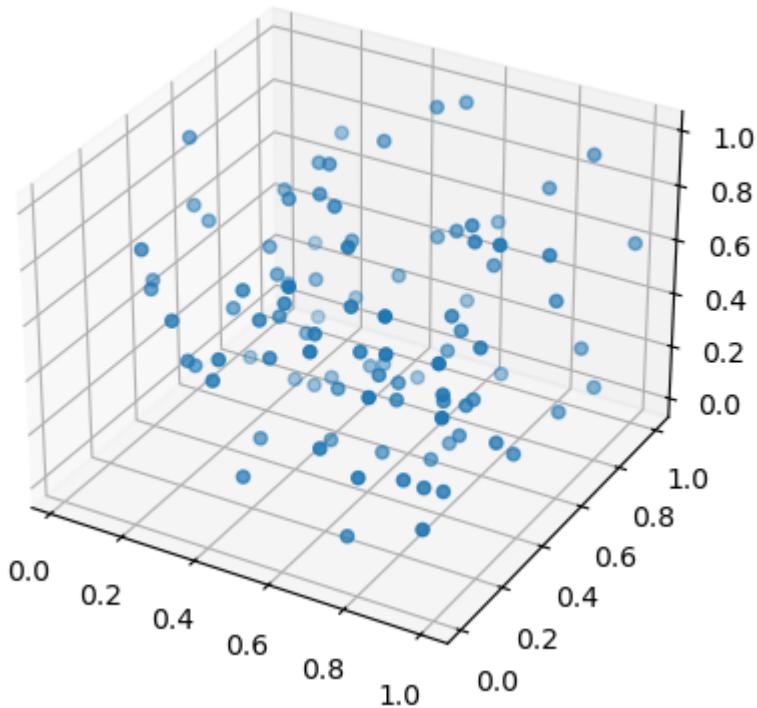


```
fig = plt.figure()
ax = plt.axes(projection='3d')
y = np.random.random(100)
x = np.random.random(100)
z = np.random.random(100)

ax.scatter3D(x, y, z, cmap='cool');
plt.show()

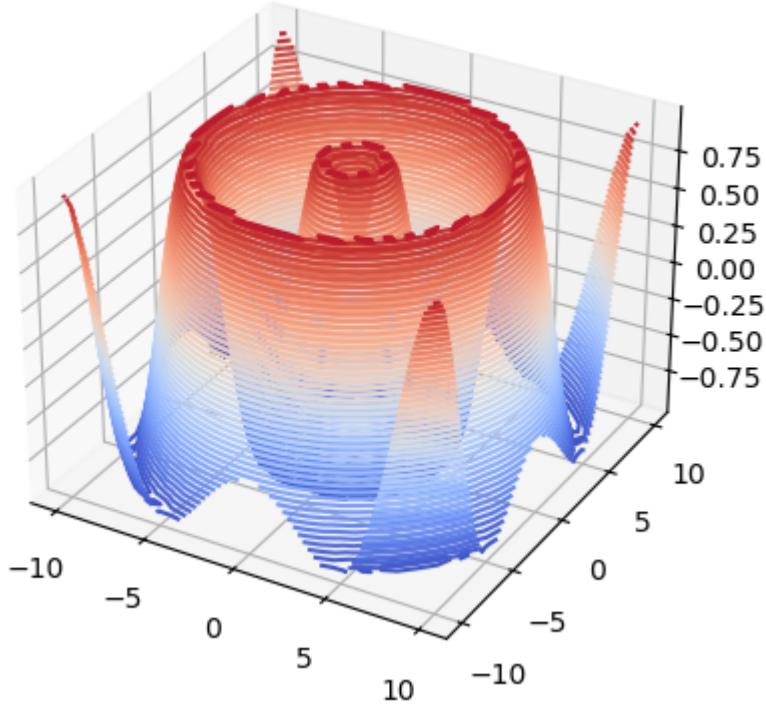
# /var/folders/33/krstvgnns2rncl74r18tkv6_80000gn/T/ipykernel_35577/3836579356.py:7: Use
# ax.scatter3D(x, y, z, cmap='cool');
```

```
/var/folders/33/krstvgns2rncl74r18tkv6_80000gn/T/ipykernel_32401/1669576427.py:7: UserWarning:  
ax.scatter3D(x, y, z, cmap='cool');
```



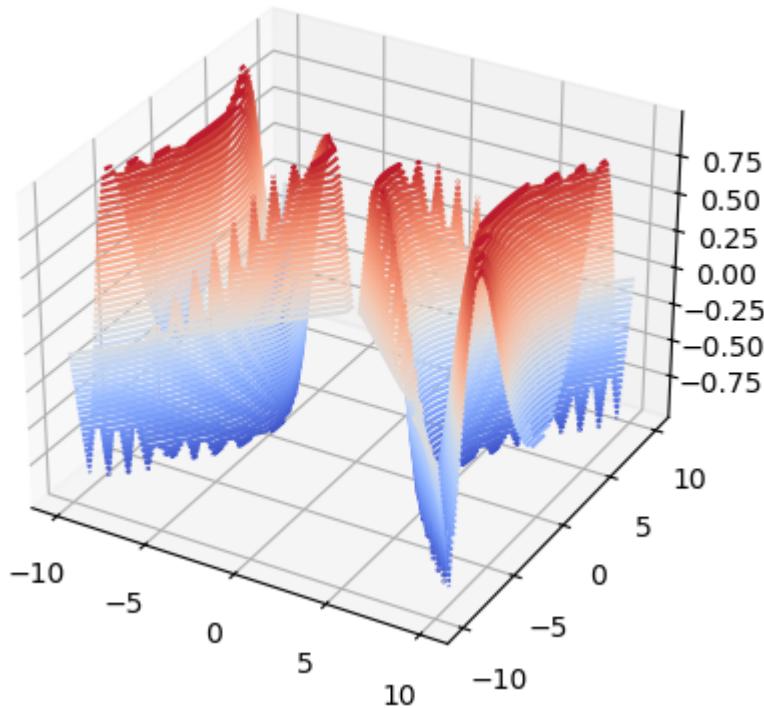
```
x = np.linspace(-10, 10, 30)  
y = np.linspace(-10, 10, 30)  
X, Y = np.meshgrid(x, y)  
Z = np.sin(np.sqrt(X ** 2 + Y ** 2))  
fig = plt.figure()  
ax = fig.add_subplot(projection='3d')  
ax.contour(X, Y, Z, 50, cmap='coolwarm')  
plt.show()
```

[Skip to main content](#)



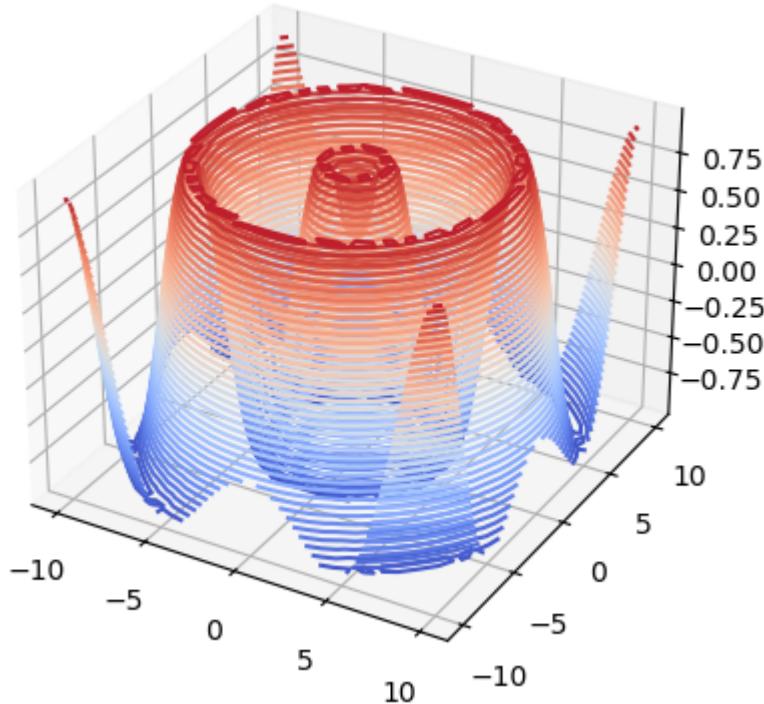
```
x = np.linspace(-10, 10, 30)
y = np.linspace(-10, 10, 30)
X, Y = np.meshgrid(x, y)
Z = np.sin(np.sqrt(X ** 2 - Y ** 2))
fig = plt.figure()
ax = fig.add_subplot(projection='3d')
ax.contour(X, Y, Z, 50, cmap='coolwarm')
plt.show()
# /var/folders/33/krstvgnns2rncl74r18tkv6_80000gn/T/ipykernel_35577/265096374.py:4: Run
#     Z = np.sin(np.sqrt(X ** 2 - Y ** 2))
```

```
/var/folders/33/krstvgn2rncl74r18tkv6_80000gn/T/ipykernel_32401/3856492819.py:4: Runti  
Z = np.sin(np.sqrt(X ** 2 - Y ** 2))
```

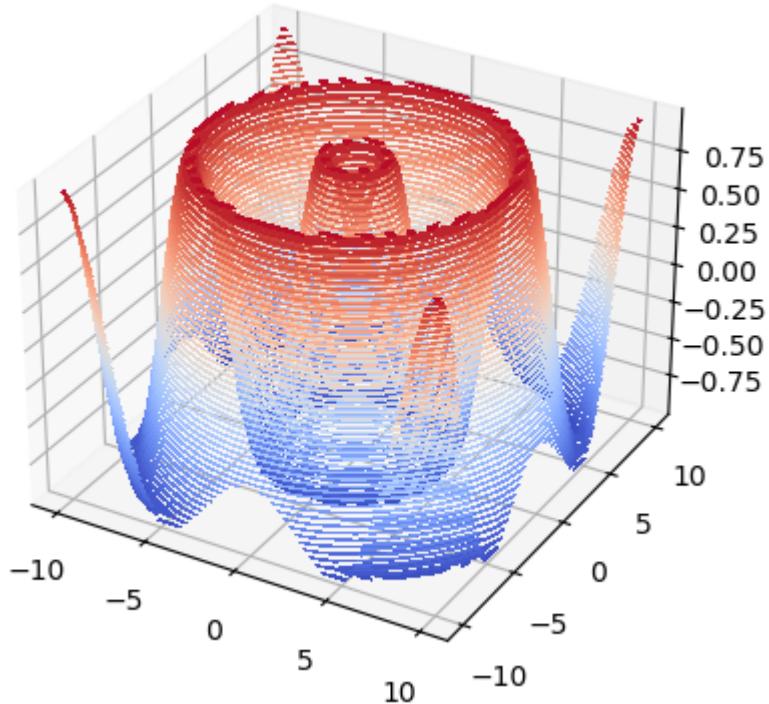


```
fig = plt.figure()  
ax = plt.axes(projection='3d')  
Z = np.sin(np.sqrt(X ** 2 + Y ** 2))  
#Z = np.sin(np.sqrt(X ** 2 - Y ** 2))  
ax.contour3D(X, Y, Z, 40,  
             cmap='coolwarm')  
plt.show()
```

[Skip to main content](#)

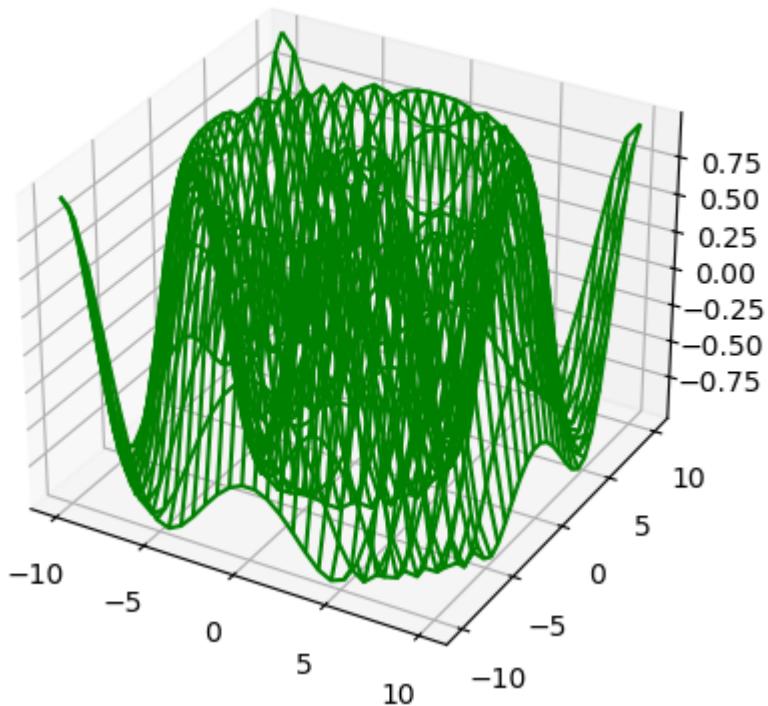


```
fig = plt.figure()
ax = fig.add_subplot(projection='3d')
Z = np.sin(np.sqrt(X ** 2 + Y ** 2))
#Z = np.sin(np.sqrt(X ** 2 - Y ** 2))
ax.contourf(X, Y, Z, 50, cmap='coolwarm')
plt.show()
```



```
fig = plt.figure()
ax = plt.axes(projection='3d')
Z = np.sin(np.sqrt(X ** 2 + Y ** 2))
#Z = np.sin(np.sqrt(X ** 2 - Y ** 2))
ax.plot_wireframe(X, Y, Z, color='Green')
ax.set_title('wireframe')
plt.show()
```

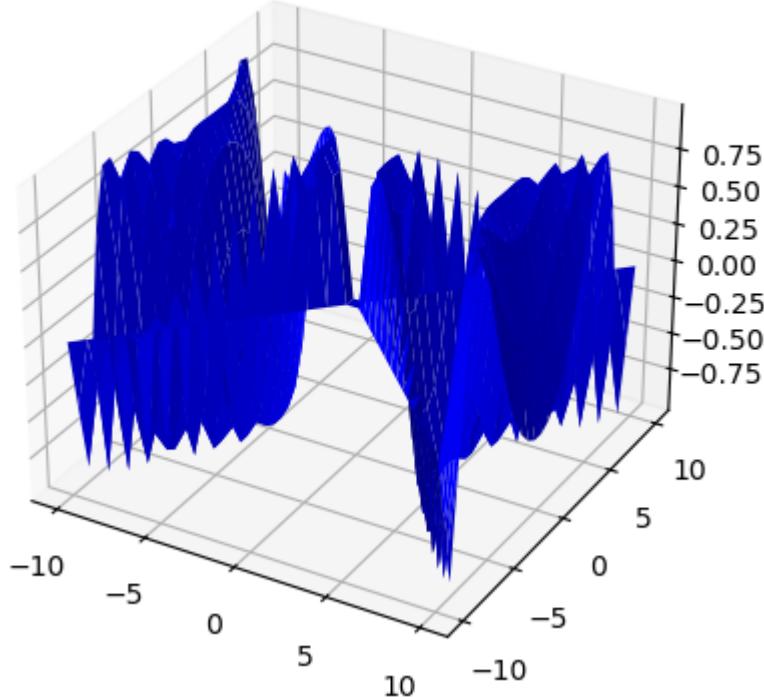
## wireframe



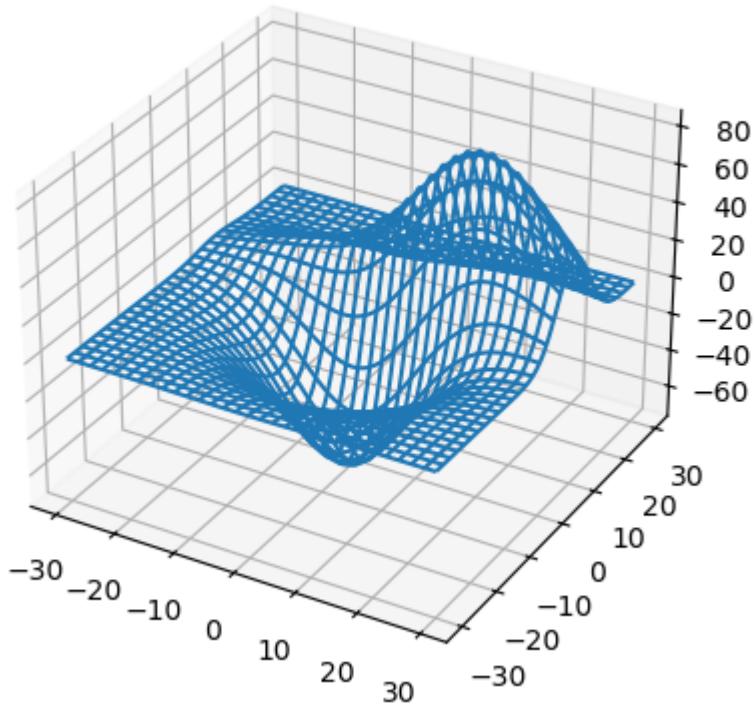
```
#Z = np.sin(np.sqrt(X ** 2 + Y ** 2))
Z = np.sin(np.sqrt(X ** 2 - Y ** 2))
fig = plt.figure()
ax = plt.axes(projection='3d')
ax.plot_surface(X, Y, Z, color='Blue')
ax.set_title('Surface Plot')
plt.show()
```

```
/var/folders/33/krstvgns2rncl74r18tkv6_80000gn/T/ipykernel_32401/2054144969.py:2: Runti  
Z = np.sin(np.sqrt(X ** 2 - Y ** 2))
```

Surface Plot

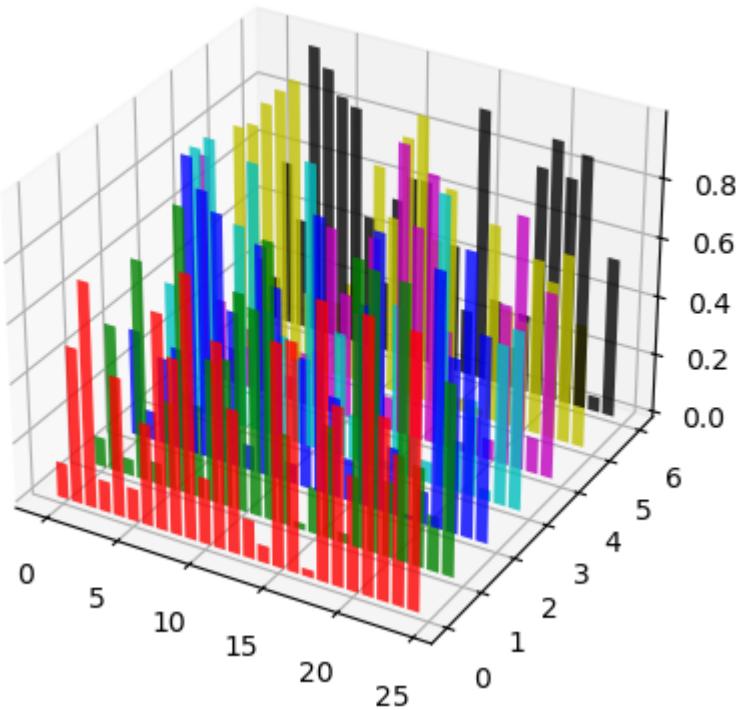


```
from mpl_toolkits.mplot3d import axes3d  
fig = plt.figure()  
ax = fig.add_subplot(projection='3d')  
X, Y, Z = axes3d.get_test_data(0.02)  
ax.plot_wireframe(X, Y, Z,  
                  rstride=10,  
                  cstride=10)  
plt.show()
```



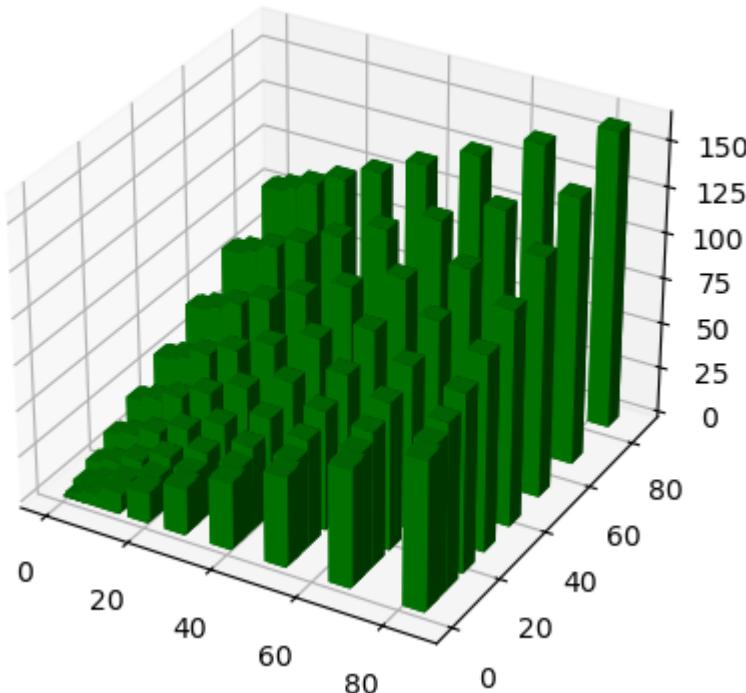
```
fig = plt.figure()
ax = fig.add_subplot(projection='3d')
colors = ['r', 'g', 'b', 'c', 'm', 'y', 'k']
yticks = [0, 1, 2, 3, 4, 5, 6]

for c, k in zip(colors, yticks):
    x = np.arange(25)
    y = np.random.rand(25)
    ax.bar(x, y, zs=k, zdir='y',
           color=c, alpha=0.8)
plt.show()
```



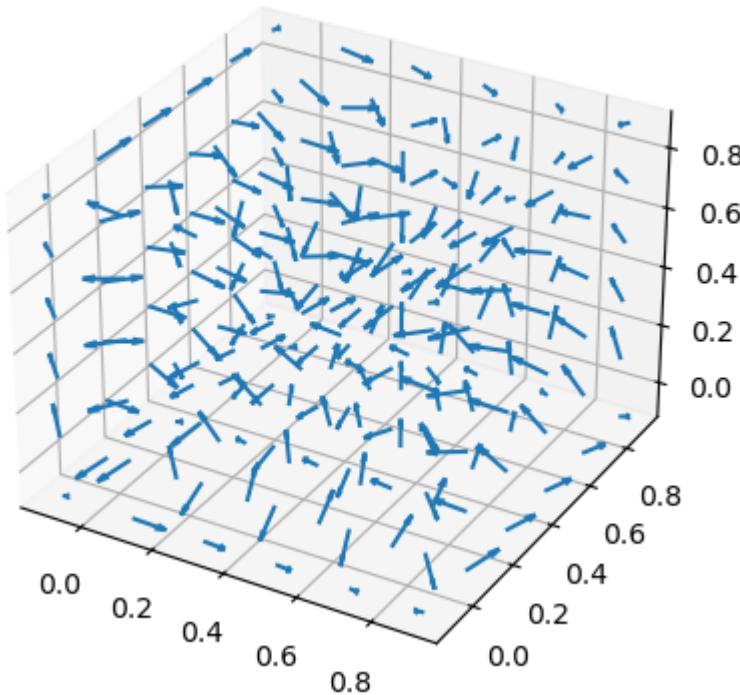
```
fig = plt.figure()
ax = fig.add_subplot(projection='3d')
x = np.arange(10) * np.arange(10)
y = np.arange(10) * np.arange(10)
x, y = np.meshgrid(x, y)
x, y = x.ravel(), y.ravel()
top = x + y
bottom = np.zeros_like(top)
width = depth = 5

ax.bar3d(x, y, bottom, width,
          depth, top,
          shade=True,
          color='g')
plt.show()
```



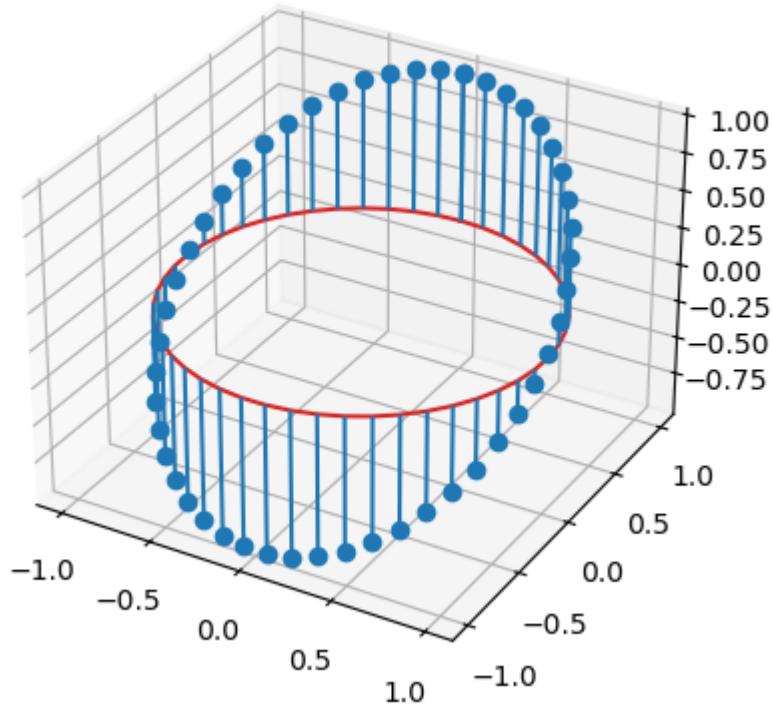
```
fig = plt.figure()
ax = fig.add_subplot(projection='3d')
x = y = z = np.arange(-0.1, 1, 0.2)
X, Y, Z = np.meshgrid(x, y, z)
u = np.cos(np.pi * X) * np.sin(np.pi * Y) * np.sin(np.pi * Z)
v = -np.sin(np.pi * X) * np.cos(np.pi * Y) * np.sin(np.pi * Z)
w = np.sin(np.pi * X) * np.sin(np.pi * Y) * np.cos(np.pi * Z)

ax.quiver(X, Y, Z, u, v, w,
           length=0.1,
           normalize=True)
plt.show()
```



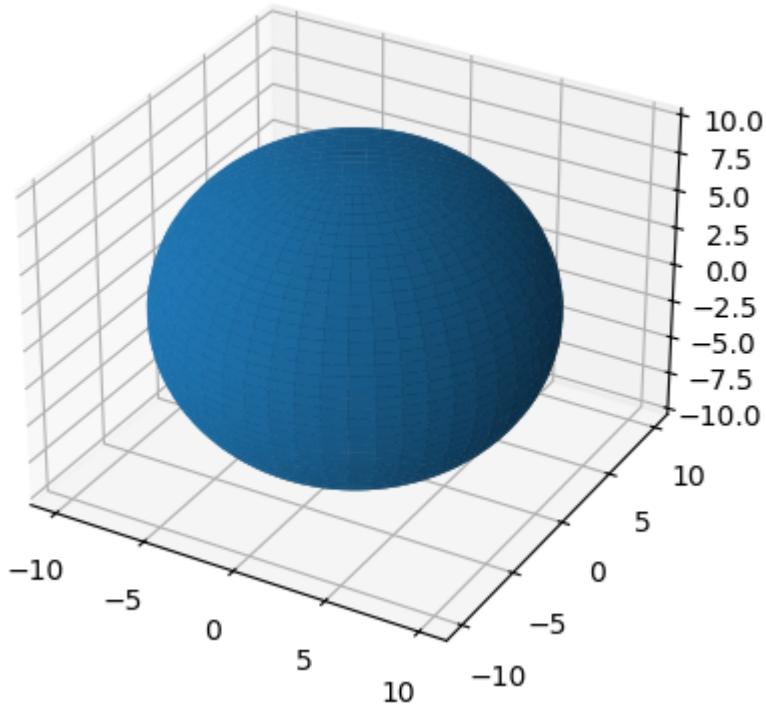
```
fig = plt.figure()
ax = fig.add_subplot(projection='3d')
theta = np.linspace(0, 2 * np.pi)
x = np.sin(theta)
y = np.cos(theta)
z = np.cos(theta)

ax.stem(x, y, z)
plt.show()
```

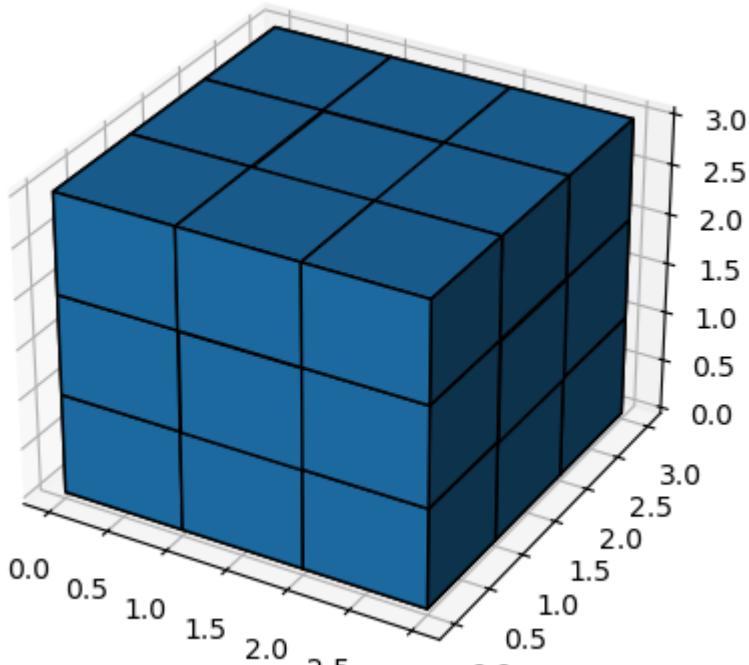


```
fig = plt.figure()
ax = fig.add_subplot(projection='3d')
u = np.linspace(0, 2 * np.pi, 100)
v = np.linspace(0, np.pi, 100)
x = 10 * np.outer(np.cos(u), np.sin(v))
y = 10 * np.outer(np.sin(u), np.sin(v))
z = 10 * np.outer(np.ones(np.size(u)), np.cos(v))

ax.plot_surface(x, y, z)
plt.show()
```



```
ma = np.random.randint(1, 3, size=(3, 3, 3))
fig = plt.figure()
ax = plt.axes(projection='3d')
ax.voxels(ma, edgecolor='k')
plt.show()
```



[Skip to main content](#)

# handon-c12 qt version

[Skip to main content](#)

```
import numpy as np
from matplotlib import pyplot as plt
from matplotlib.animation import FuncAnimation

# %matplotlib.use("MacOSX") --err
# %matplotlib --nothing
%matplotlib tk

# NOT EXACTLY WORKING USING INLINE

#%matplotlib inline

# work

# if nothing use TkAgg
#%matplotlib
#%matplotlib qt
#%matplotlib tk

# not exactly working
#%matplotlib gtk
# Warning: Cannot change to a different GUI toolkit: gtk. Using tk instead.

# not working

# %matplotlib TkAgg <-- not working see above default; even ""
# %matplotlib MacOS
# %matplotlib macos

fig = plt.figure()
ax = plt.axes(xlim=(0, 4), ylim=(-2, 2))
line, = ax.plot([], [], lw=3)

def init():
    line.set_data([], [])
    return line,

# why , ???

def animate(i):
    x = np.linspace(0, 4, 1000)
    y = np.sin(2 * np.pi * (x - 0.01 * i))
    line.set_data(x, y)
    return line,

anim = FuncAnimation(fig, animate,
                     init_func=init,
                     frames=1000,
                     interval=10,
                     blit=True)
```

[Skip to main content](#)

```
# export value
...
top=0.88,
bottom=0.11,
left=0.125,
right=0.9,
hspace=0.2,
wspace=0.2
...
```

```
'\ntop=0.88,\nbottom=0.11,\nleft=0.125,\nright=0.9,\nhspace=0.2,\nwspace=0.2\n'
```

```
fig = plt.figure()
ax = plt.axes(xlim=(-50, 50), ylim=(-50, 50))
line, = ax.plot([], [], lw=2)
def init():
    line.set_data([], [])
    return line,
xdata, ydata = [], []
def animate(i):
    t = 0.2*i
    x = t*np.cos(t)
    y = t*np.sin(t)
    xdata.append(x)
    ydata.append(y)
    line.set_data(xdata, ydata)
    return line,
anim = FuncAnimation(fig, animate,
                     init_func=init,
                     frames=500, #3000,
                     interval=5,
                     blit=True)

anim.save('handon-c12-a.gif', writer='pillow')
# look very different seems overlap spiral if anim.save

# implicit display ???
plt.title("2a")
plt.show()
```

## celluloid (above pyqt)

```
conda install -c anaconda numpy -solver=classic # <- additional for hands
```

[Skip to main content](#)

```
conda install -c anaconda celluloid –solver=classic # <- additional for hands on>
```

```
# <- additional for hands on>
```

```
from celluloid import Camera

fig = plt.figure()
camera = Camera(fig)

for i in range(10):
    plt.plot([i] * 10)
    camera.snap()

animation = camera.animate()
animation.save('handon-c12-b.gif', writer='pillow')
plt.title("3b")
plt.show()
```

```
fig, axes = plt.subplots()
camera = Camera(fig)
t = np.linspace(0, 2 * np.pi, 128, endpoint=False)
for i in t:
    plt.plot(t, np.sin(t + i)) #, color='green') # you can see actually it changed color
    camera.snap()
animation = camera.animate()
animation.save('handon-c12-c.gif', writer='pillow')
plt.title("4c")
plt.show()
```

```
fig, axes = plt.subplots()
camera = Camera(fig)
y = np.arange(5)
for i in y:
    plt.bar( np.random.rand(5)*10 , y)
    camera.snap()
animation = camera.animate()
animation.save('handon-c12-d.gif', writer='pillow')
plt.title("5d")
plt.show()
```

## handon-c13

[Skip to main content](#)

```
%matplotlib inline
import numpy as np
import matplotlib.pyplot as plt

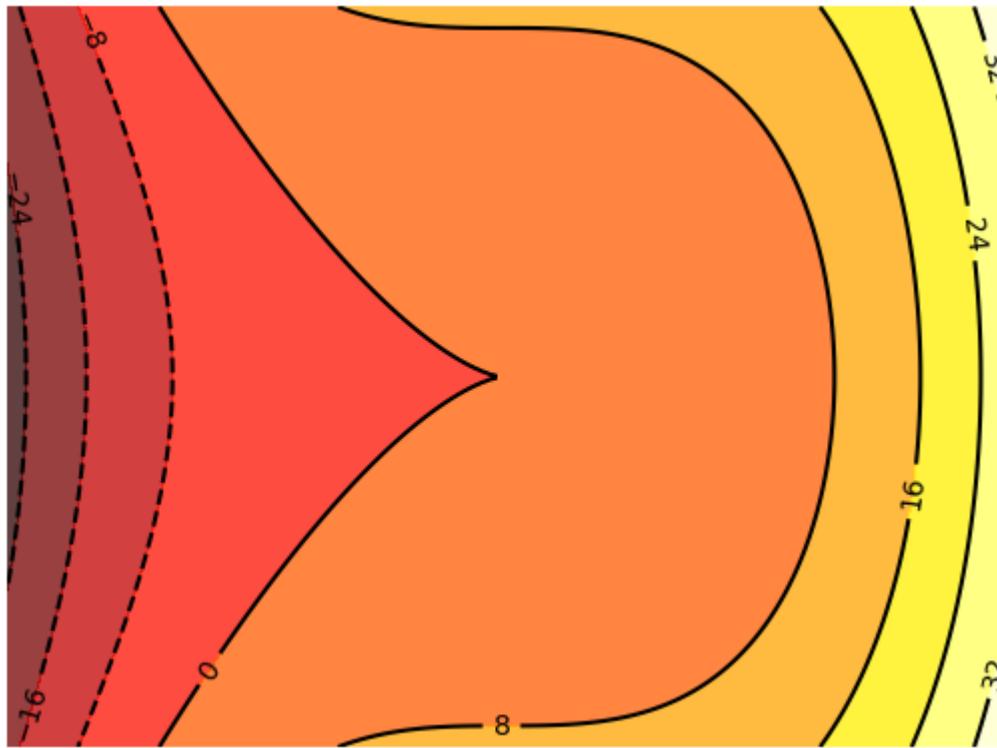
def f(x, y):
    return (x ** 3 + y ** 2)

n = 10
x = np.linspace(-3, 3, 8 * n)
y = np.linspace(-3, 3, 6 * n)
X, Y = np.meshgrid(x, y)
Z = f(X, Y)
plt.imshow(Z, interpolation='nearest',
           cmap = 'cool', origin='lower')
plt.axis('off')
plt.show()
```

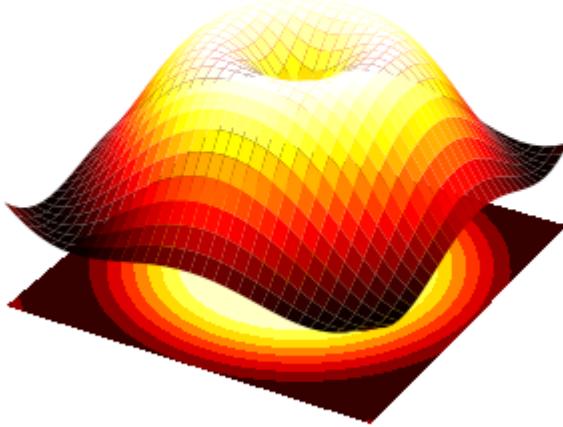


```
n = 256
x = np.linspace(-3, 3, n)
y = np.linspace(-3, 3, n)
X, Y = np.meshgrid(x, y)
plt.contourf(X, Y, f(X, Y), 8,
             alpha = 0.75, cmap='hot')
C = plt.contour(X, Y, f(X, Y), 8,
                colors='black')
plt.clabel(C, inline=1, fontsize=10)
plt.axis('off')
```

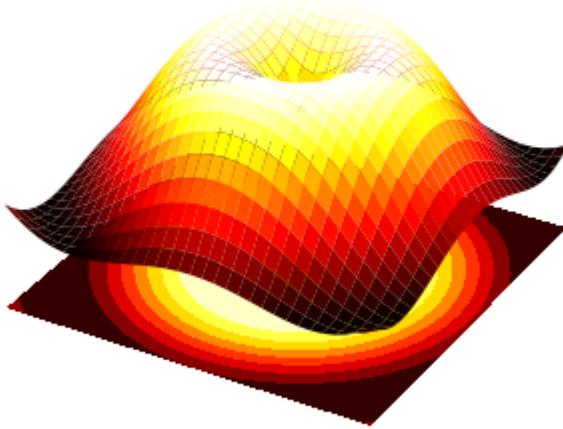
[Skip to main content](#)



```
%matplotlib inline
# qt
fig = plt.figure()
ax = plt.axes(projection='3d')
X = np.arange(-4, 4, 0.25)
Y = np.arange(-4, 4, 0.25)
X, Y = np.meshgrid(X, Y)
R = np.sqrt(X ** 2 + Y ** 2)
Z = np.sin(R)
ax.plot_surface(X, Y, Z, rstride=1,
                cstride=1, cmap='hot')
ax.contourf(X, Y, Z, zdir='z',
            offset=-2, cmap='hot')
ax.set_zlim(-2, 2)
plt.axis('off')
ax.set_zticks(())
plt.show()
```

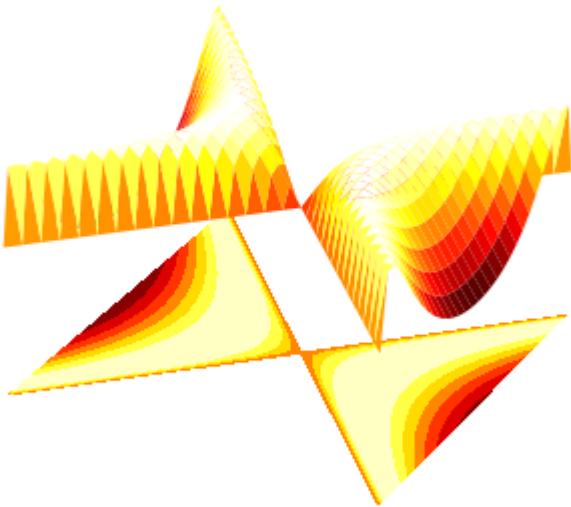


```
%matplotlib inline
#%matplotlib qt
fig = plt.figure()
ax = plt.axes(projection='3d')
X = np.arange(-4, 4, 0.25)
Y = np.arange(-4, 4, 0.25)
X, Y = np.meshgrid(X, Y)
R = np.sqrt(X ** 2 + Y ** 2)
Z = np.sin(R)
ax.plot_surface(X, Y, Z, rstride=1,
                cstride=1, cmap='hot')
ax.contourf(X, Y, Z, zdir='z',
             offset=-2, cmap='hot')
ax.set_zlim(-2, 2)
plt.axis('off')
ax.set_zticks(())
plt.show()
```



```
%matplotlib inline
fig = plt.figure()
ax = plt.axes(projection='3d')
X = np.arange(-4, 4, 0.25)
Y = np.arange(-4, 4, 0.25)
X, Y = np.meshgrid(X, Y)
R = np.sqrt(X ** 2 + Y ** 2)
Z = np.sin(R)
ax.plot_surface(X, Y, Z, rstride=1,
                cstride=1, cmap='hot')
ax.contourf(X, Y, Z, zdir='z',
             offset=-2, cmap='hot')
ax.set_zlim(-2, 2)
plt.axis('off')
ax.set_zticks(())
plt.show()
```

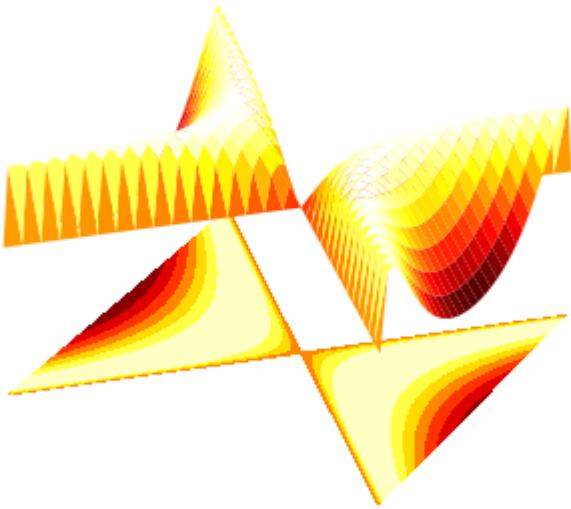
```
/var/folders/33/krstvgn2rncl74r18tkv6_80000gn/T/ipykernel_32430/4105777294.py:7: Runti  
R = np.sqrt(X ** 2 - Y ** 2)
```



```
%matplotlib inline  
#%matplotlib qt  
fig = plt.figure()  
ax = plt.axes(projection='3d')  
X = np.arange(-4, 4, 0.25)  
Y = np.arange(-4, 4, 0.25)  
X, Y = np.meshgrid(X, Y)  
R = np.sqrt(X ** 2 - Y ** 2)  
Z = np.sin(R)  
ax.plot_surface(X, Y, Z, rstride=1,  
                cstride=1, cmap='hot')  
ax.contourf(X, Y, Z, zdir='z',  
            offset=-2, cmap='hot')  
ax.set_zlim(-2, 2)  
plt.axis('off')  
ax.set_zticks(())  
plt.show()
```

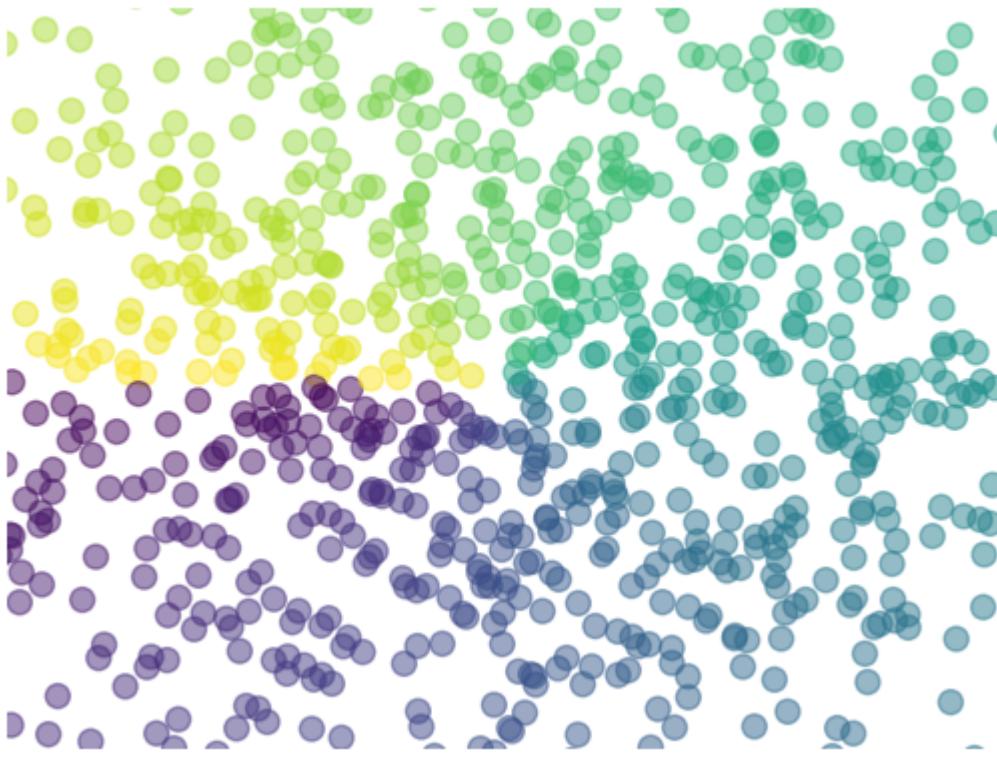
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```
/var/folders/33/krstvgns2rncl74r18tkv6_80000gn/T/ipykernel_32430/3209884936.py:8: Runti  
R = np.sqrt(X ** 2 - Y ** 2)
```

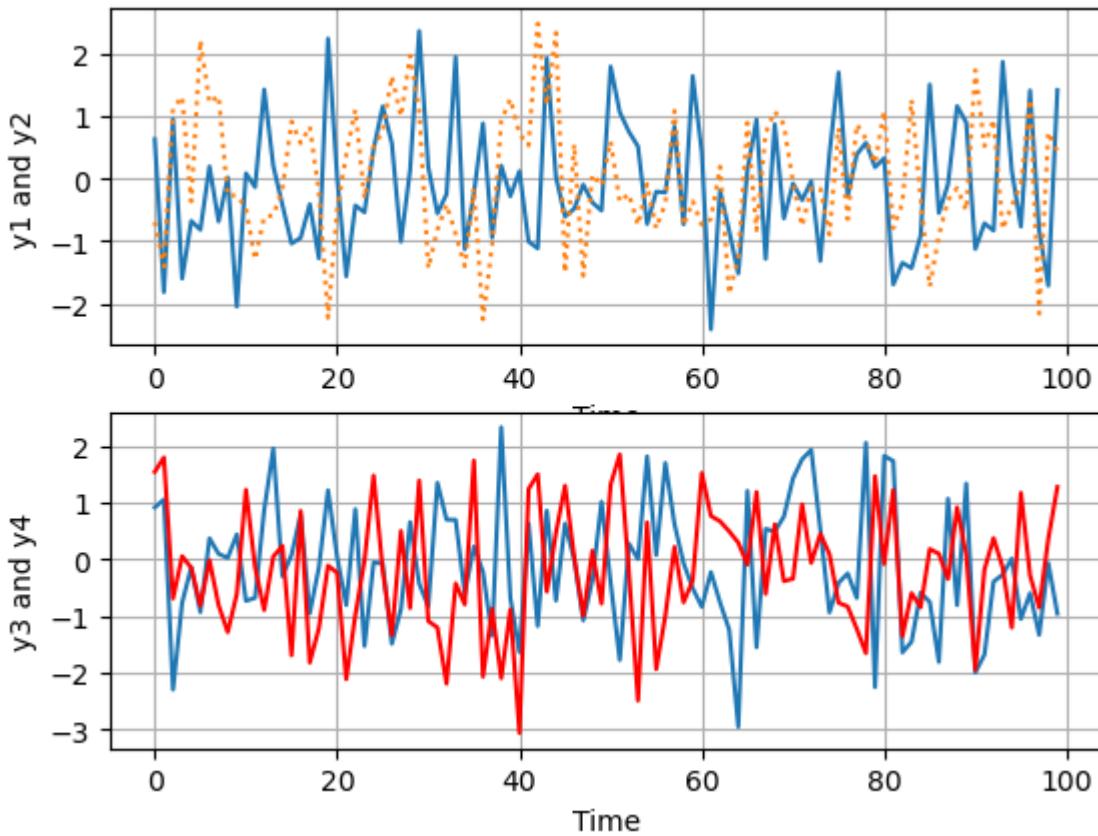


```
%matplotlib inline  
n = 1024  
X = np.random.normal(0, 1, n)  
Y = np.random.normal(0, 1, n)  
color = np.arctan2(Y, X)  
plt.scatter(X, Y, s=75, c=color, alpha=0.5)  
plt.xlim(-1.5, 1.5)  
plt.ylim(-1.5, 1.5)  
plt.axis('off')  
plt.show()
```

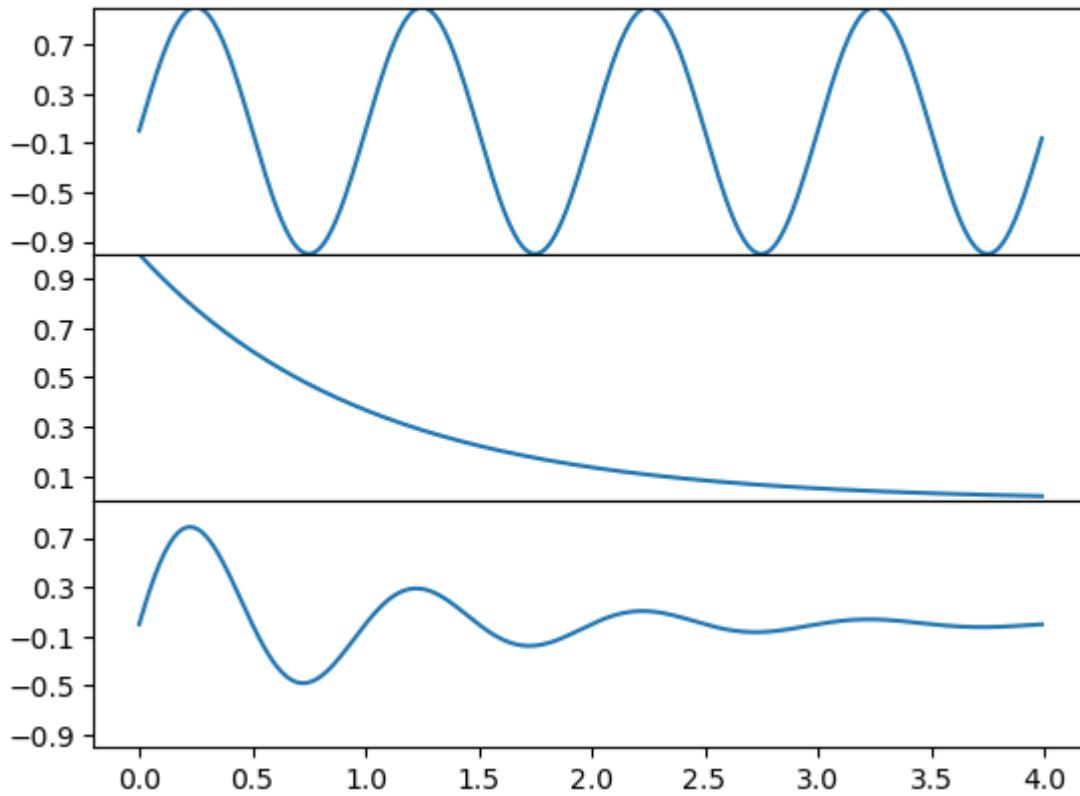
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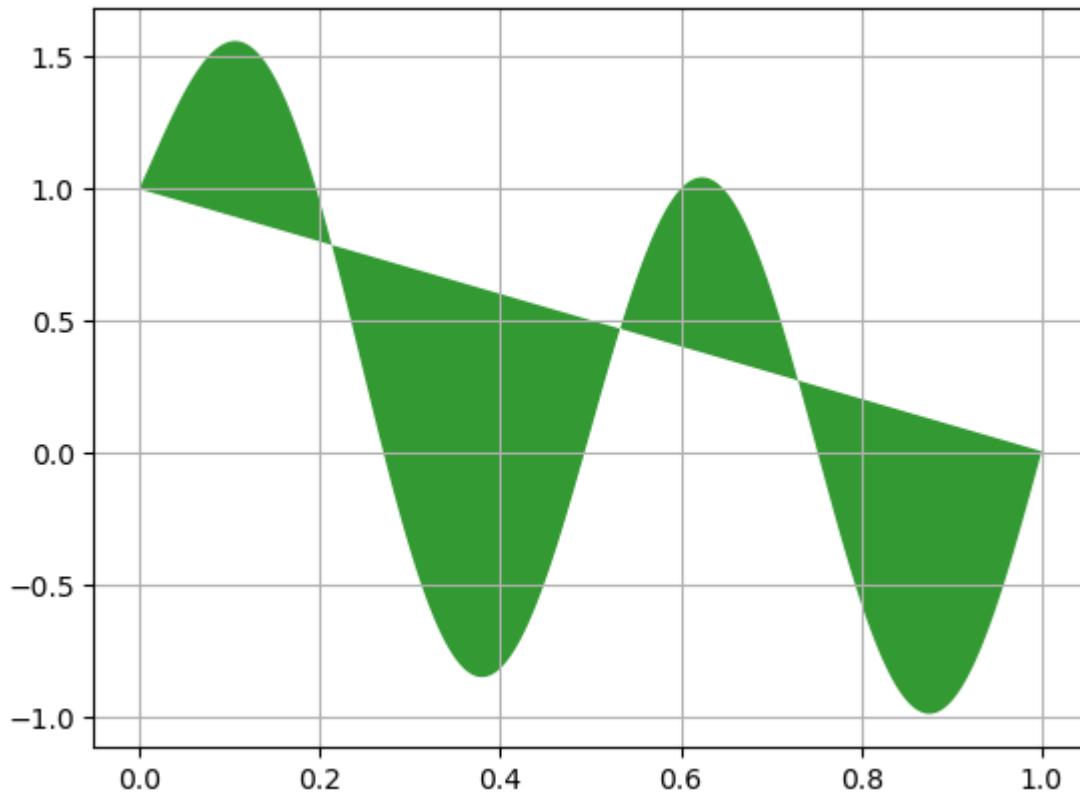
```
N = 100
x = np.arange(N) # timestamps
y1 = np.random.randn(N)
y2 = np.random.randn(N)
y3 = np.random.randn(N)
y4 = np.random.randn(N)
plt.subplot(2, 1, 1) # what is 2, 1, 1
plt.plot(x, y1)
plt.plot(x, y2, ':')
plt.grid()
plt.xlabel('Time')
plt.ylabel('y1 and y2')
plt.axis('tight')
plt.subplot(2, 1, 2) # what is 2, 1, 2
plt.plot(x, y3)
plt.plot(x, y4, 'r')
plt.grid()
plt.xlabel('Time')
plt.ylabel('y3 and y4')
plt.axis('tight')
plt.show()
```



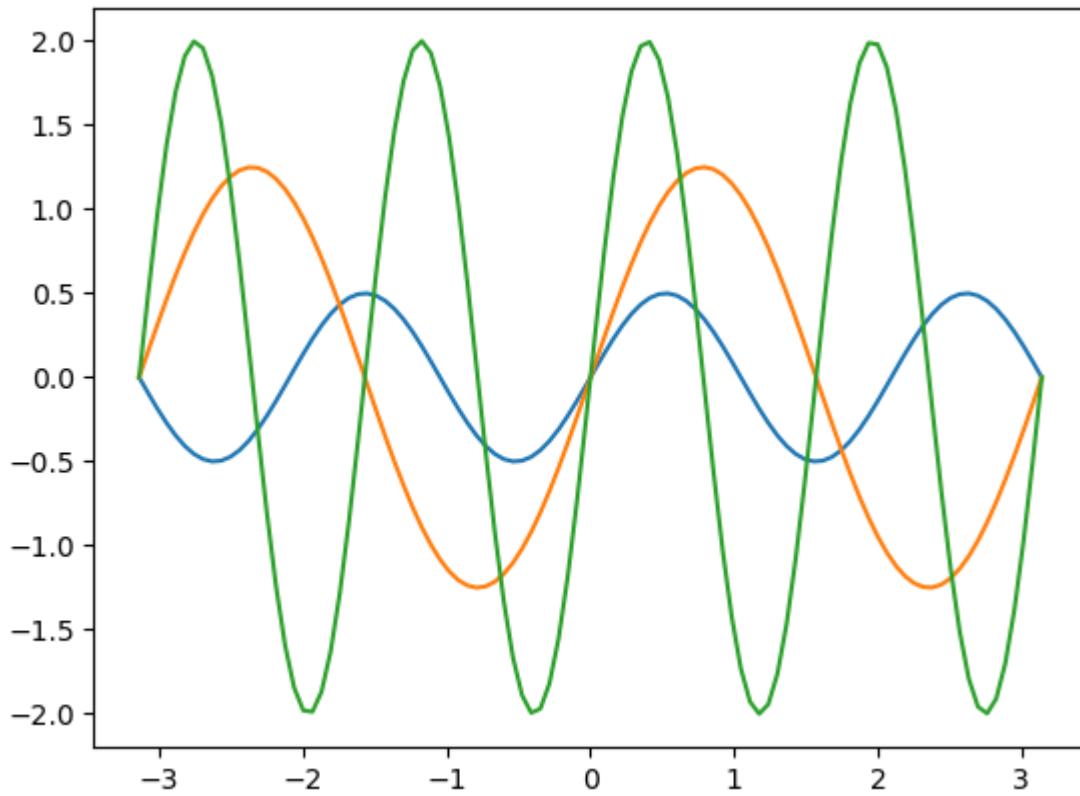
```
f= 1
t = np.arange( 0.0, 4.0, 0.01)
s1 = np.sin(2 *np.pi * f * t)
s2 = np.exp(-t)
s3 = s1 * s2
f = plt.figure()
plt.subplots_adjust(hspace=0.001)
ax1 = plt.subplot( 311 )
ax1.plot(t, s1)
plt.yticks(np.arange(-0.9, 1.0, 0.4))
plt.ylim(-1, 1)
ax2 = plt.subplot(312, sharex=ax1)
ax2.plot(t, s2)
plt.yticks(np.arange(0.1, 1.0, 0.2))
plt.ylim(0, 1)
ax3 = plt.subplot(313, sharex = ax1)
ax3.plot(t, s3)
plt.yticks(np.arange(-0.9, 1.0, 0.4))
plt.ylim(-1, 1)
xticklabels = ax1.get_xticklabels() + ax2.get_xticklabels()
plt.setp(xticklabels, visible=False)
plt.show()
```



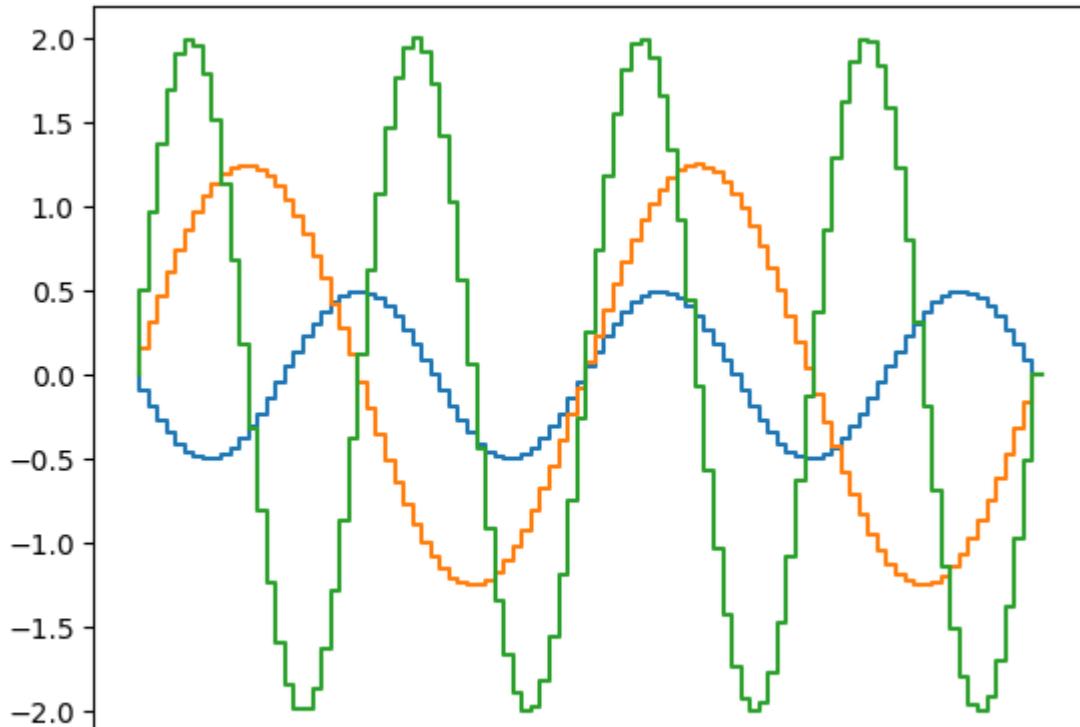
```
N = 1000
x = np.linspace(0, 1, N)
y = np.sin(4 * np.pi * x) + np.exp(-5 * x)
plt.fill(x, y, 'g', alpha = 0.8)
plt.grid(True)
plt.show()
```



```
N = 100
x = np.linspace(-np.pi, np.pi, N)
y1 = 0.5 * np.sin(3*x)
y2 = 1.25 * np.sin(2*x)
y3 = 2 * np.sin(4*x)
plt.plot(x, y1, x, y2, x, y3)
plt.show()
```

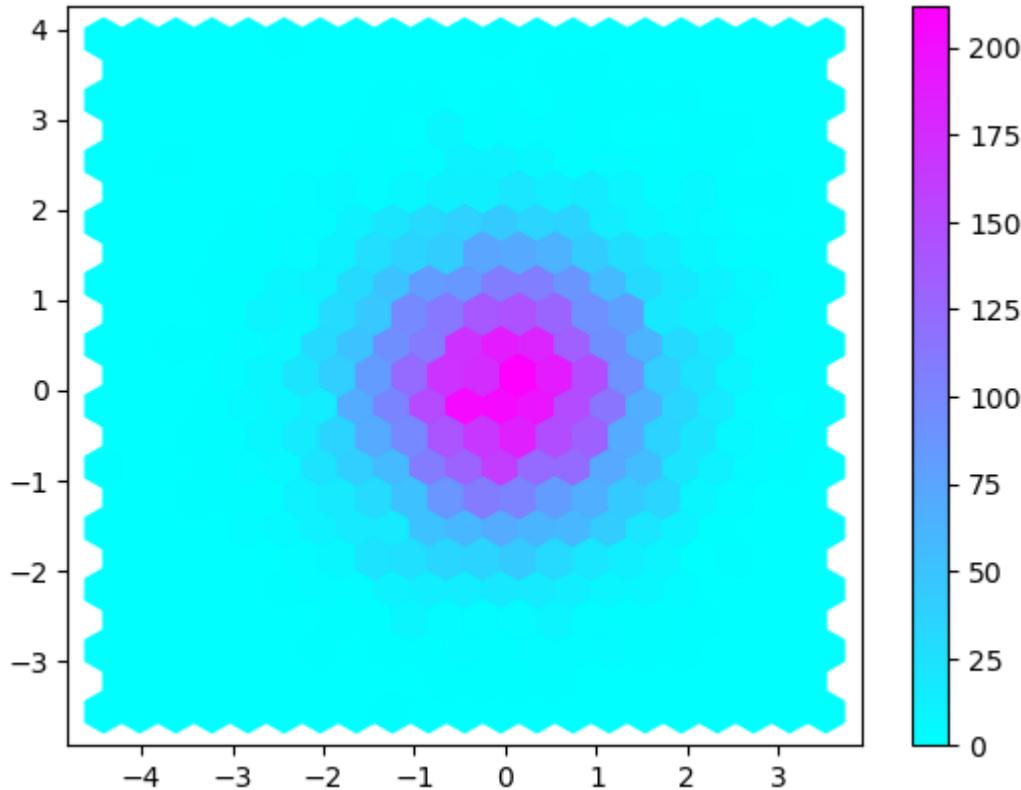


```
plt.step(x, y1)
plt.step(x, y2)
plt.step(x, y3)
plt.show()
```



[Skip to main content](#)

```
x, y = np.random.normal(size=(2, 10000))
plt.hexbin(x, y,
           gridsize=20,
           cmap='cool')
plt.colorbar()
plt.show()
```



```
y = np.random.randn(1000)
plt.xkcd()
plt.hist(y)
plt.show()
# many font family not found ???
```

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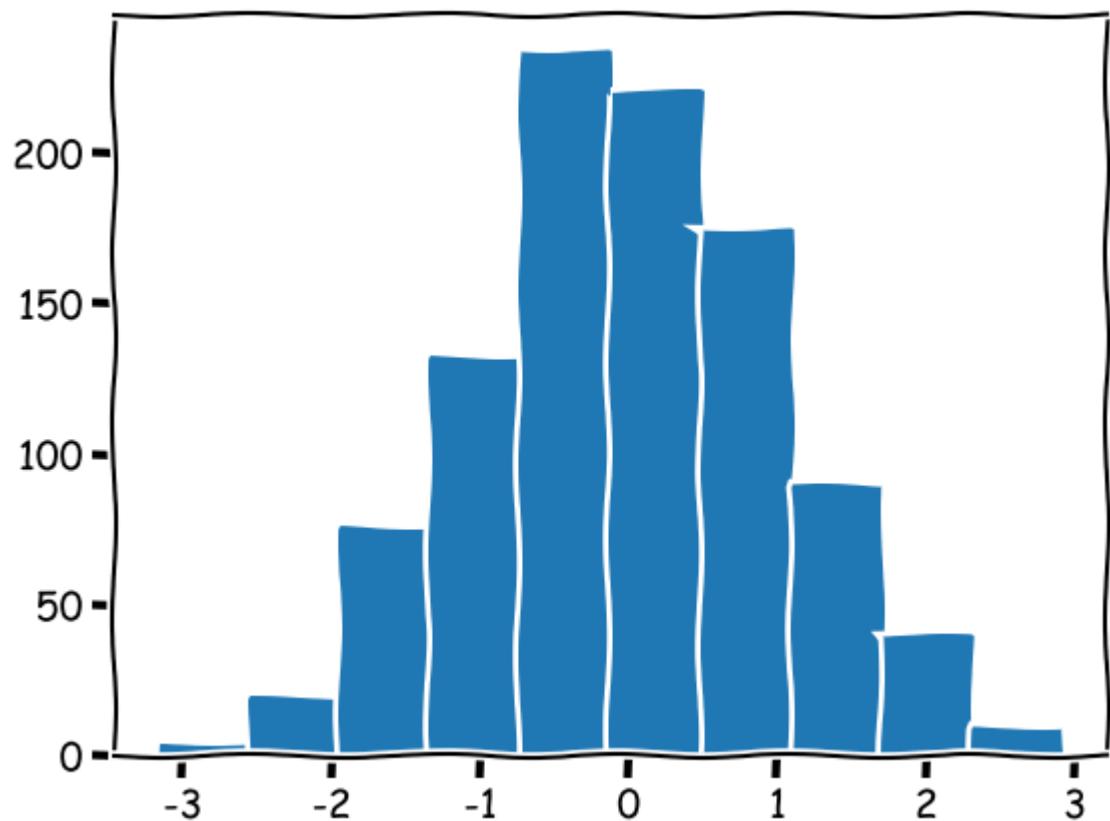
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```
y = np.random.randn(1000)
plt.xkcd()
plt.hist(y, bins = 30,
          range=[-3.5, 3.5],
          facecolor='r',
          alpha=0.6,
          edgecolor='k')
plt.grid()
plt.show()
```

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findfont: Font family 'Humor Sans' not found.

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findfont: Font family 'xkcd' not found.

findfont: Font family 'xkcd Script' not found.

findfont: Font family 'Humor Sans' not found.

findfont: Font family 'Comic Neue' not found.

findfont: Font family 'xkcd' not found.

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findfont: Font family 'xkcd' not found.

findfont: Font family 'xkcd Script' not found.

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findfont: Font family 'Humor Sans' not found.

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findfont: Font family 'Humor Sans' not found.

findfont: Font family 'Comic Neue' not found.

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findfont: Font family 'xkcd Script' not found.

findfont: Font family 'Humor Sans' not found.

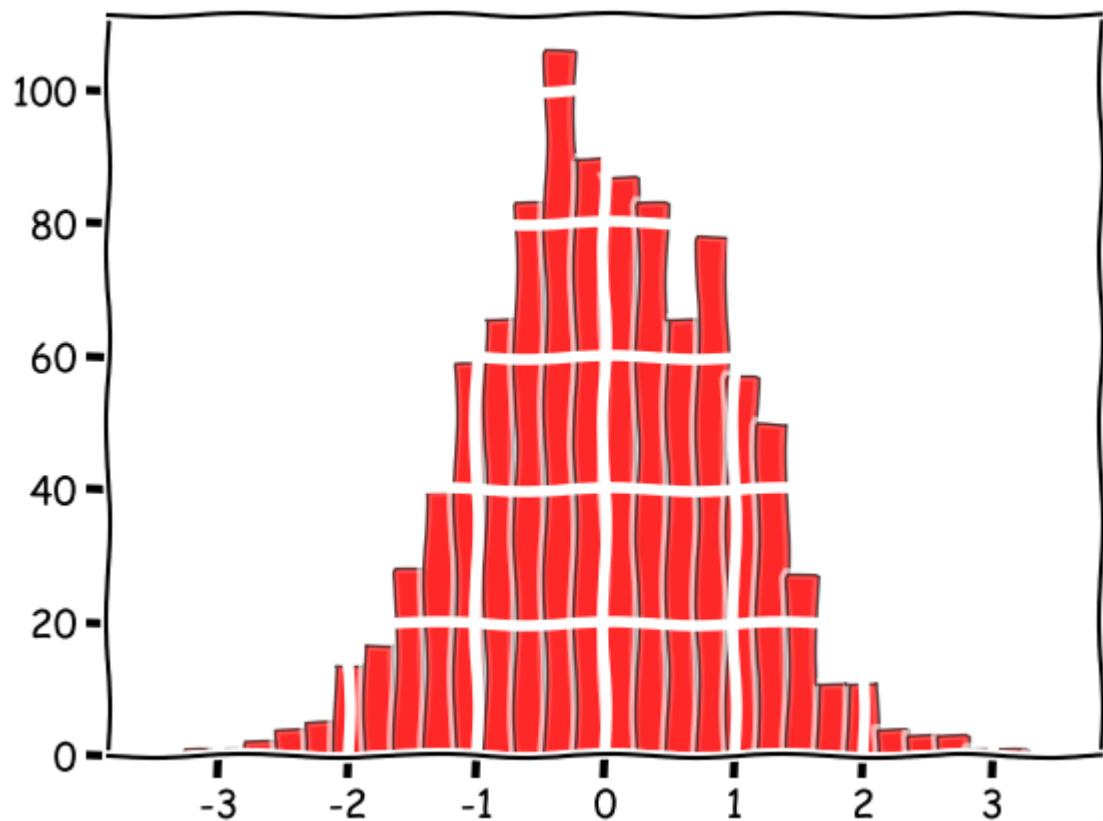
findfont: Font family 'Comic Neue' not found.

findfont: Font family 'xkcd' not found.

findfont: Font family 'xkcd Script' not found.

findfont: Font family 'Humor Sans' not found.

findfont: Font family 'Comic Neue' not found.



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```
data = np.random.randn(1000, 1000)
plt.xkcd()
plt.hist2d(data[0], data[1])
plt.show()
```

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findfont: Font family 'xkcd' not found.

findfont: Font family 'xkcd Script' not found.

findfont: Font family 'Humor Sans' not found.

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findfont: Font family 'xkcd Script' not found.

findfont: Font family 'Humor Sans' not found.

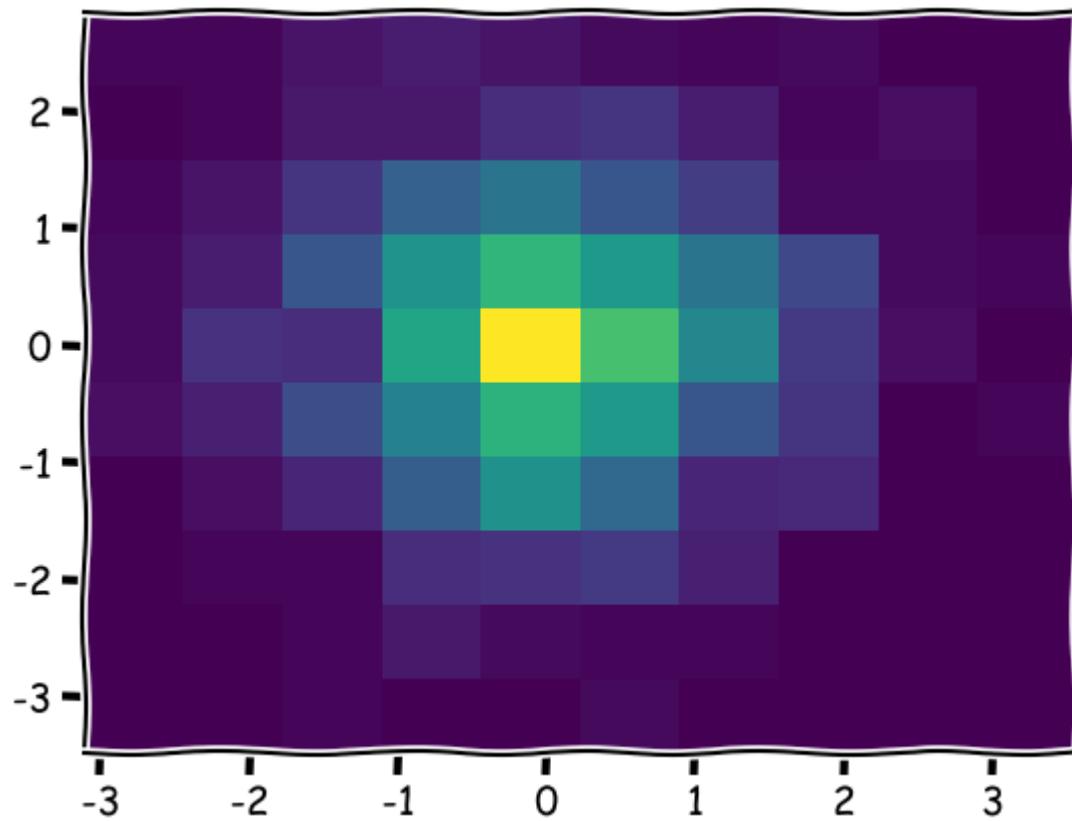
findfont: Font family 'Comic Neue' not found.

findfont: Font family 'xkcd' not found.

findfont: Font family 'xkcd Script' not found.

findfont: Font family 'Humor Sans' not found.

findfont: Font family 'Comic Neue' not found.



## handon 18 covid

nf1s/covid use pip3 to install

```
pip3 install covid
conda install pydantic
conda install requests
pip install covid
```

requests are installed issues at stake you have to restart the whole nucleus after installation!!!

```
from main import example_covid
```

```
=====
message='not main' covid_source='worldometers'
=====
```

```
[{'country': 'North America', 'total_cases': 128638655, 'confirmed': 128638655, 'new_ca  
deaths: 6924812, confirmed: 696387988, recovered: 668331729  
countries: ['north america', 'asia', 'europe', 'south america', 'oceania', 'africa', ''  
cases: {'country': 'Sweden', 'total_cases': 2718172, 'confirmed': 2718172, 'new_cases':  
=====
```

```
message='not main' covid_source='worldometers'  
=====
```

```
=====
message='not main' covid_source='john_hopkins'
=====
```

```
[{'id': '187', 'country': 'US', 'confirmed': 103804263, 'active': None, 'deaths': 11238  
=====
```

```
deaths: 6881955, confirmed: 676609955  
=====
```

```
cases: {'id': '40', 'country': 'Comoros', 'confirmed': 9008, 'active': None, 'deaths':  
=====
```

```
countries: [{"id": "187", "name": "US"}, {"id": "81", "name": "India"}, {"id": "64", "n  
=====
```

```
cases: {'id': '173', 'country': 'Sweden', 'confirmed': 2699339, 'active': None, 'deaths':  
=====
```

```
message='not main' covid_source='john_hopkins'  
=====
```

see  [CSSEGISandData/COVID-19](#)

On March 10, 2023, the Johns Hopkins Coronavirus Resource Center ceased its collecting and reporting of global COVID-19 data. For updated cases, deaths, and vaccine data please visit the following sources:

[Skip to main content](#)

```
from datetime import date, datetime

# Getting Datetime from timestamp
date_time = datetime.fromtimestamp(1887639468)
print("Datetime from timestamp:", date_time)

print()
timestamp = date.fromtimestamp(1678454462) #000
print(timestamp)
date_time = datetime.fromtimestamp(1678454462) #000
print("Datetime from timestamp:", date_time)
print("This align with the message - This repository has been archived by the owner on
# see https://github.com/CSSEGISandData/COVID-19/commits/master/csse_covid_19_data/csse

print(f"{datetime.now()=}")
print(datetime.now())
print(datetime.now().timestamp())
```

Datetime from timestamp: 2029-10-26 00:17:48

2023-03-10

Datetime from timestamp: 2023-03-10 21:21:02

This align with the message - This repository has been archived by the owner on Mar 10,  
datetime.now()=datetime.datetime(2023, 10, 10, 15, 8, 12, 372007)

2023-10-10 15:08:12.372079

1696921692.372144

```
from main import test_covid
```

```
/Users/ngcchk/Documents/GitHub/gpd2-win-unity1/ipadred-rain/imgno_book1/imgnobk3  
['handon-c12-spiral.gif', 'JB_logo.png', '.DS_Store', 'handon-c6.ipynb', 'requirements.
```

```
covid.source='john_hopkins'  
countries=[{'id': '187', 'name': 'US'}, {'id': '81', 'name': 'India'}, {'id': '64', 'na  
italy_cases1={'id': '115', 'country': 'Marshall Islands', 'confirmed': 15649, 'active':  
italy_cases2={'id': '87', 'country': 'Italy', 'confirmed': 25603510, 'active': None, 'd  
confirmed=676609955  
deaths=6881955  
italy_cases2['last_update']=1678454462000
```

```
covid.source='john_hopkins'  
countries=[{'id': '187', 'name': 'US'}, {'id': '81', 'name': 'India'}, {'id': '64', 'na  
italy_cases1={'id': '115', 'country': 'Marshall Islands', 'confirmed': 15649, 'active':  
italy_cases2={'id': '87', 'country': 'Italy', 'confirmed': 25603510, 'active': None, 'd  
confirmed=676609955  
deaths=6881955
```

```
import os  
os.getcwd()  
# cd '/Users/ngcchk/Documents/GitHub/gpd2-win-unity1/ipadred-rain/imgno_book1/imagebk3A
```

```
'/Users/ngcchk/Documents/GitHub/gpd2-win-unity1/ipadred-rain/imgno_book1/imgnobk3'
```

```
import pydantic  
import requests  
from covid import Covid  
  
covid = Covid()  
# strange work in command line!!!  
  
covid.get_data()
```

[Skip to main content](#)

```
[{'id': '187',
 'country': 'US',
 'confirmed': 103804263,
 'active': None,
 'deaths': 1123836,
 'recovered': None,
 'latitude': 40.0,
 'longitude': -100.0,
 'last_update': 1678454462000},
 {'id': '81',
 'country': 'India',
 'confirmed': 44690738,
 'active': None,
 'deaths': 530779,
 'recovered': None,
 'latitude': 20.593684,
 'longitude': 78.96288,
 'last_update': 1678454462000},
 {'id': '64',
 'country': 'France',
 'confirmed': 39866718,
 'active': None,
 'deaths': 166176,
 'recovered': None,
 'latitude': 46.2276,
 'longitude': 2.2137,
 'last_update': 1678454462000},
 {'id': '68',
 'country': 'Germany',
 'confirmed': 38249060,
 'active': None,
 'deaths': 168935,
 'recovered': None,
 'latitude': 51.165691,
 'longitude': 10.451526,
 'last_update': 1678454462000},
 {'id': '25',
 'country': 'Brazil',
 'confirmed': 37085675,
 'active': None,
 'deaths': 699310,
 'recovered': None,
 'latitude': -14.235,
 'longitude': -51.9253,
 'last_update': 1678454462000},
 {'id': '89',
 'country': 'Japan',
 'confirmed': 33329551,
 'active': None,
 'deaths': 73046,
 'recovered': None,
 'latitude': 36.204824,
 'longitude': 138.252924},
```

[Skip to main content](#)

```
'country': 'Korea, South',
'confirmed': 30615522,
'active': None,
'deaths': 34093,
'recovered': None,
'latitude': 35.907757,
'longitude': 127.766922,
'last_update': 1678454462000},
{'id': '87',
'country': 'Italy',
'confirmed': 25603510,
'active': None,
'deaths': 188322,
'recovered': None,
'latitude': 41.8719,
'longitude': 12.5674,
'last_update': 1678454462000},
{'id': '191',
'country': 'United Kingdom',
'confirmed': 24658705,
'active': None,
'deaths': 220721,
'recovered': None,
'latitude': 55.0,
'longitude': -3.0,
'last_update': 1678454462000},
{'id': '148',
'country': 'Russia',
'confirmed': 22086064,
'active': None,
'deaths': 388521,
'recovered': None,
'latitude': 61.524,
'longitude': 105.3188,
'last_update': 1678454462000},
{'id': '185',
'country': 'Turkey',
'confirmed': 17042722,
'active': None,
'deaths': 101492,
'recovered': None,
'latitude': 38.9637,
'longitude': 35.2433,
'last_update': 1675120855000},
{'id': '168',
'country': 'Spain',
'confirmed': 13770429,
'active': None,
'deaths': 119479,
'recovered': None,
'latitude': 40.463667,
'longitude': -3.74922,
'last_update': 1678454462000},
{'id': '196',
```

[Skip to main content](#)

```
'active': None,
'deaths': 43186,
'recovered': None,
'latitude': 14.058324,
'longitude': 108.277199,
'last_update': 1678454462000},
{'id': '10',
'country': 'Australia',
'confirmed': 11401996,
'active': None,
'deaths': 19578,
'recovered': None,
'latitude': -25.0,
'longitude': 133.0,
'last_update': 1678454462000},
{'id': '8',
'country': 'Argentina',
'confirmed': 10044957,
'active': None,
'deaths': 130472,
'recovered': None,
'latitude': -38.4161,
'longitude': -63.6167,
'last_update': 1678454462000},
{'id': '176',
'country': 'Taiwan*',
'confirmed': 9970937,
'active': None,
'deaths': 17672,
'recovered': None,
'latitude': 23.7,
'longitude': 121.0,
'last_update': 1678454462000},
{'id': '129',
'country': 'Netherlands',
'confirmed': 8712835,
'active': None,
'deaths': 23707,
'recovered': None,
'latitude': 52.3167,
'longitude': 5.55,
'last_update': 1678454462000},
{'id': '83',
'country': 'Iran',
'confirmed': 7572311,
'active': None,
'deaths': 144933,
'recovered': None,
'latitude': 32.427908,
'longitude': 53.688046,
'last_update': 1678454462000},
{'id': '118',
'country': 'Mexico',
'confirmed': 7483444,
```

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```
'recovered': None,
'latitude': 23.6345,
'longitude': -102.5528,
'last_update': 1678454462000},
{'id': '82',
'country': 'Indonesia',
'confirmed': 6738225,
'active': None,
'deaths': 160941,
'recovered': None,
'latitude': -0.7893,
'longitude': 113.9213,
'last_update': 1678454462000},
{'id': '144',
'country': 'Poland',
'confirmed': 6448577,
'active': None,
'deaths': 119016,
'recovered': None,
'latitude': 51.9194,
'longitude': 19.1451,
'last_update': 1678454462000},
{'id': '39',
'country': 'Colombia',
'confirmed': 6359093,
'active': None,
'deaths': 142339,
'recovered': None,
'latitude': 4.5709,
'longitude': -74.2973,
'last_update': 1678454462000},
{'id': '11',
'country': 'Austria',
'confirmed': 5961143,
'active': None,
'deaths': 21970,
'recovered': None,
'latitude': 47.5162,
'longitude': 14.5501,
'last_update': 1678454462000},
{'id': '189',
'country': 'Ukraine',
'confirmed': 5712034,
'active': None,
'deaths': 119284,
'recovered': None,
'latitude': 48.3794,
'longitude': 31.1656,
'last_update': 1678454462000},
{'id': '145',
'country': 'Portugal',
'confirmed': 5570473,
'active': None,
'deaths': 26266,
```

[Skip to main content](#)

```
'longitude': -8.2245,
'last_update': 1678454462000},
{'id': '70',
'country': 'Greece',
'confirmed': 5548487,
'active': None,
'deaths': 34779,
'recovered': None,
'latitude': 39.0742,
'longitude': 21.8243,
'last_update': 1678454462000},
{'id': '37',
'country': 'Chile',
'confirmed': 5192286,
'active': None,
'deaths': 64273,
'recovered': None,
'latitude': -35.6751,
'longitude': -71.543,
'last_update': 1678454462000},
{'id': '111',
'country': 'Malaysia',
'confirmed': 5044718,
'active': None,
'deaths': 36967,
'recovered': None,
'latitude': 4.210484,
'longitude': 101.975766,
'last_update': 1678454462000},
{'id': '38',
'country': 'China',
'confirmed': 4903524,
'active': None,
'deaths': 101056,
'recovered': None,
'latitude': 30.5928,
'longitude': 114.3055,
'last_update': 1678454462000},
{'id': '86',
'country': 'Israel',
'confirmed': 4804188,
'active': None,
'deaths': 12329,
'recovered': None,
'latitude': 31.046051,
'longitude': 34.851612,
'last_update': 1678454462000},
{'id': '18',
'country': 'Belgium',
'confirmed': 4739365,
'active': None,
'deaths': 33814,
'recovered': None,
'latitude': 50.8333,
```

[Skip to main content](#)

```
{'id': '179',
'country': 'Thailand',
'confirmed': 4728182,
'active': None,
'deaths': 33918,
'recovered': None,
'latitude': 15.870032,
'longitude': 100.992541,
'last_update': 1678454462000},
{'id': '48',
'country': 'Czechia',
'confirmed': 4619204,
'active': None,
'deaths': 42497,
'recovered': None,
'latitude': 49.8175,
'longitude': 15.473,
'last_update': 1678454462000},
{'id': '34',
'country': 'Canada',
'confirmed': 4617095,
'active': None,
'deaths': 51720,
'recovered': None,
'latitude': 60.001,
'longitude': -95.001,
'last_update': 1678454462000},
{'id': '142',
'country': 'Peru',
'confirmed': 4487553,
'active': None,
'deaths': 219539,
'recovered': None,
'latitude': -9.19,
'longitude': -75.0152,
'last_update': 1678454462000},
{'id': '174',
'country': 'Switzerland',
'confirmed': 4413911,
'active': None,
'deaths': 14210,
'recovered': None,
'latitude': 46.8182,
'longitude': 8.2275,
'last_update': 1678454462000},
{'id': '143',
'country': 'Philippines',
'confirmed': 4077625,
'active': None,
'deaths': 66193,
'recovered': None,
'latitude': 12.879721,
'longitude': 121.774017,
'last_update': 1678454462000},
```

[Skip to main content](#)

```
'confirmed': 4067067,
'active': None,
'deaths': 102595,
'recovered': None,
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 'latitude': None,
 'longitude': None,
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```
covid = Covid()
# covid = Covid(source="john_hopkins")
# covid = Covid(source="worldometers")
covid.source
```

```
'john_hopkins'
```

```
# covid.get_status_by_country_name("italy")

# Only valid for Johns Hopkins
covid.get_status_by_country_id(115)
```

```
{'id': '115',
 'country': 'Marshall Islands',
 'confirmed': 15649,
 'active': None,
 'deaths': 17,
 'recovered': None,
 'latitude': 7.1315,
 'longitude': 171.1845,
 'last_update': 1678454462000}
```

```
#covid.get_status_by_country_name( "Mexico")
x = covid.list_countries()
```

```
from covid import Covid

covid = Covid()
covid.get_data()
```

[Skip to main content](#)

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[{'id': '187',
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