
Hand-on Book3

Dennis Ng

Oct 10, 2023

CONTENTS

...

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

```{tableofcontents}

```

```{contents}

:local:

```

**CHAPTER
ONE**

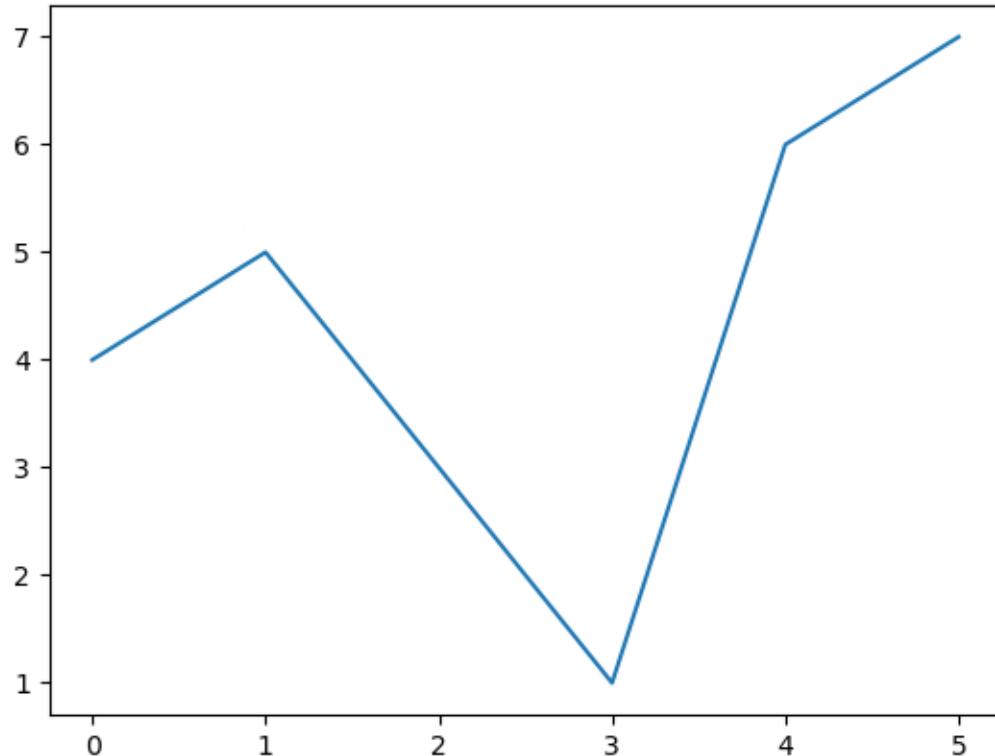
MACB3-HANDON

CHAPTER
TWO

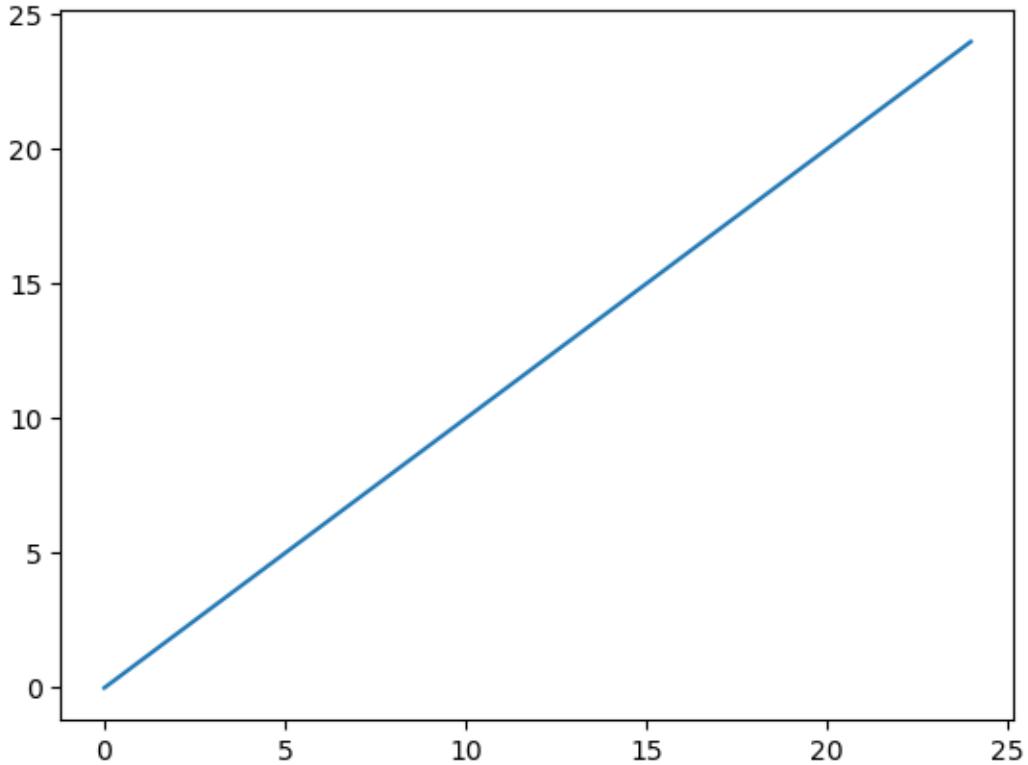
HANDON MATPLOTLIB CHP 4

HAND-ON CH 4

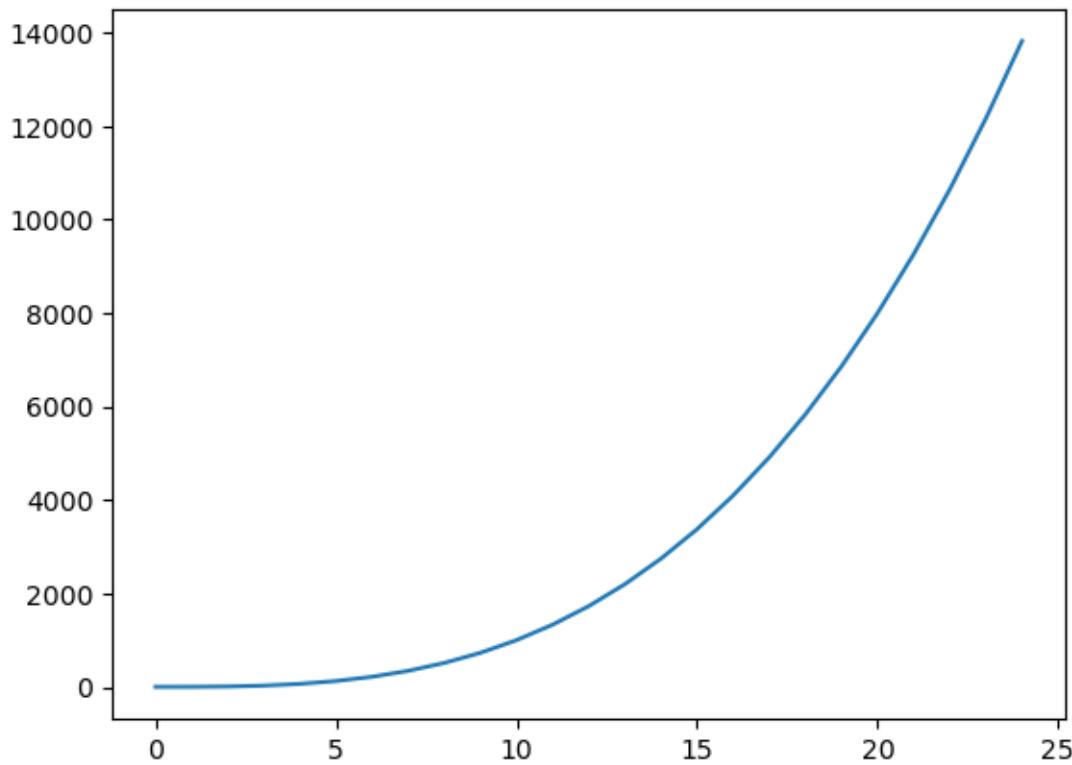
```
%matplotlib inline
import matplotlib.pyplot as plt
x = [4, 5, 3, 1, 6, 7]
plt.plot(x)
plt.show()
```



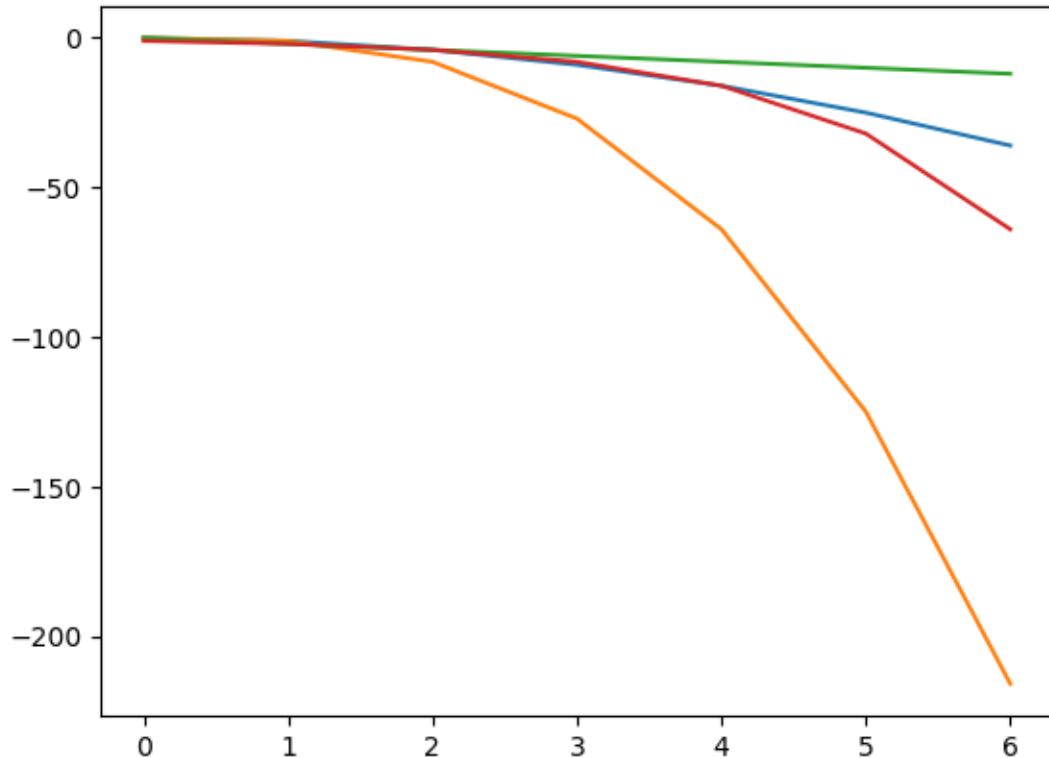
```
import numpy as np
x = np.arange(25)
plt.plot(x)
plt.show()
```



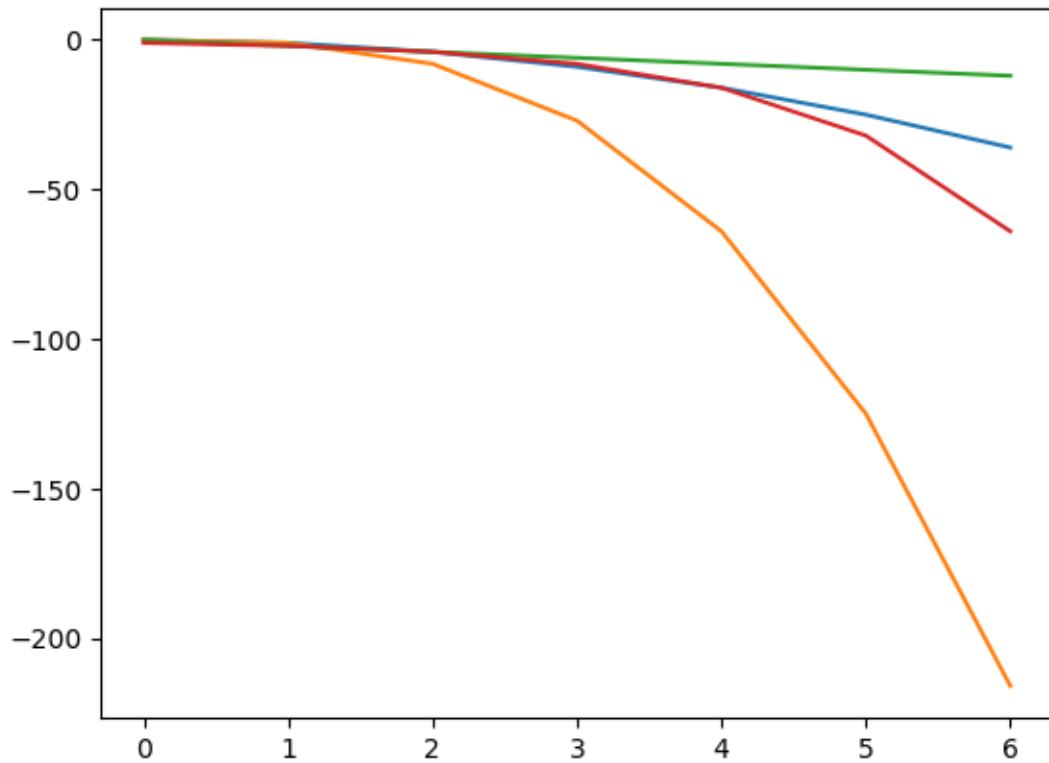
```
plt.plot(x, [(y**3 + 1) for y in x])
plt.show()
```



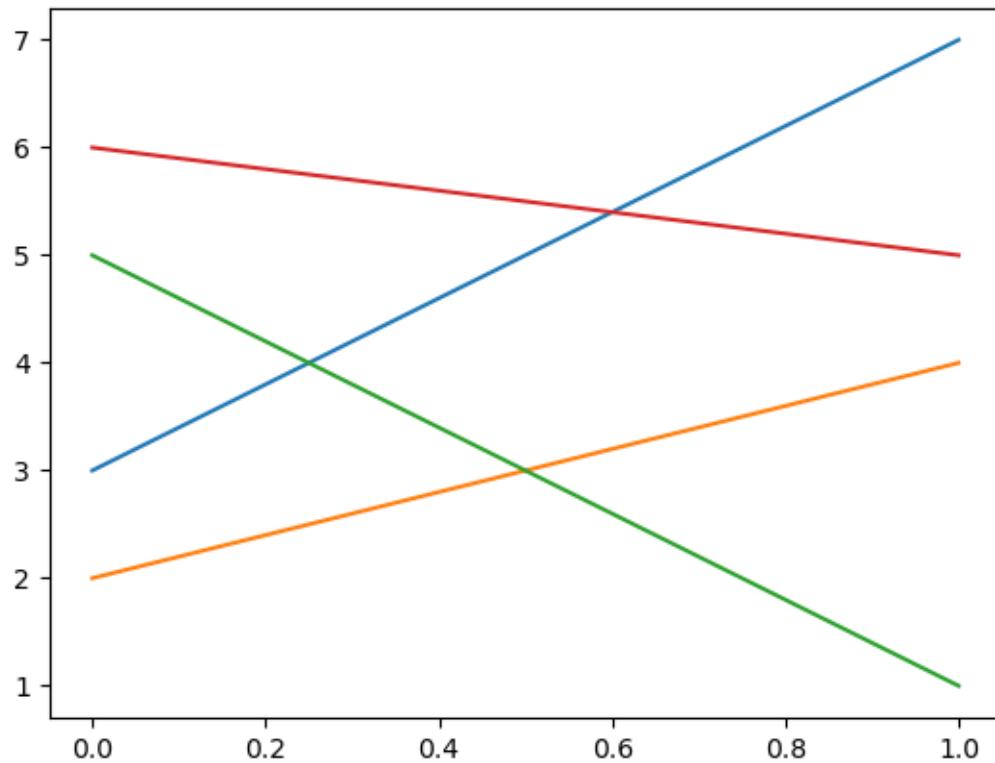
```
%matplotlib inline
import numpy as np
import matplotlib.pyplot as plt
x = np.arange(7)
plt.plot(x, -x**2)
plt.plot(x, -x**3)
plt.plot(x, -2*x)
plt.plot(x, -2**x)
plt.show()
# Figure 4-4 show
```



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

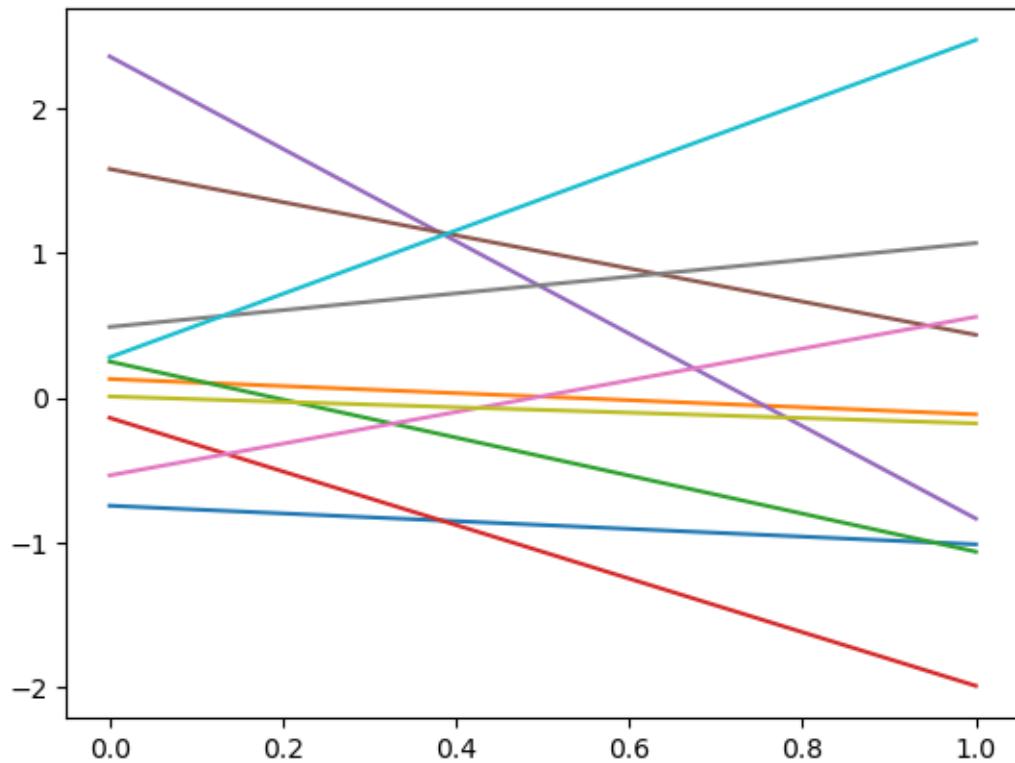


```
x = np.array([[3, 2, 5, 6], [7, 4, 1, 5]])
plt.plot(x)
plt.show()
```

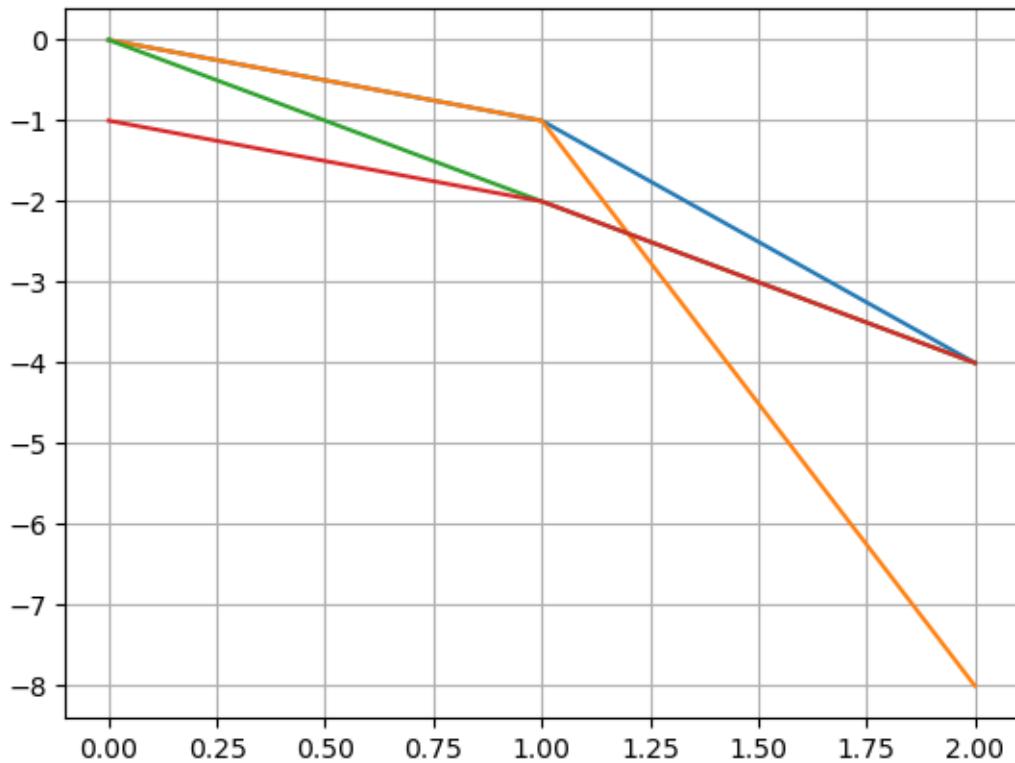


```
data = np.random.randn(2, 10)
print(data)
plt.plot([data[0], data[1]])
plt.show()
```

```
[[-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]]
```

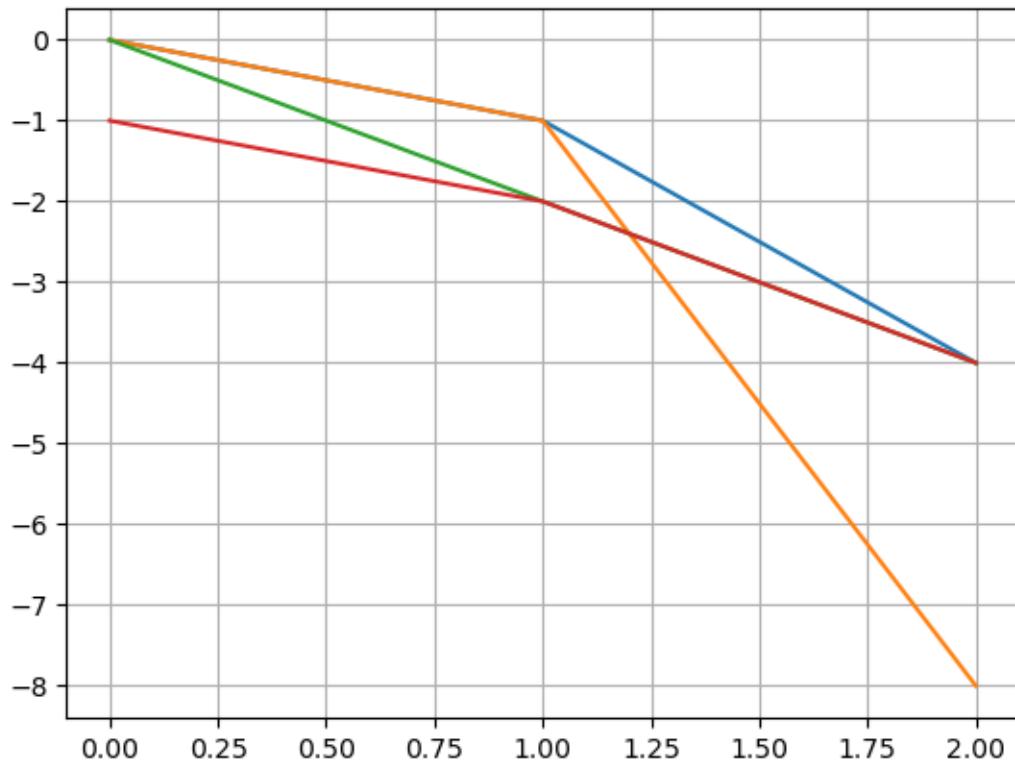


```
x = np.arange(3)
plt.plot(x, -x**2, x, -x**3, x, -2*x, x, -2*x)
plt.grid(True)
plt.savefig('img/handon-c4-test.png')
plt.show()
```



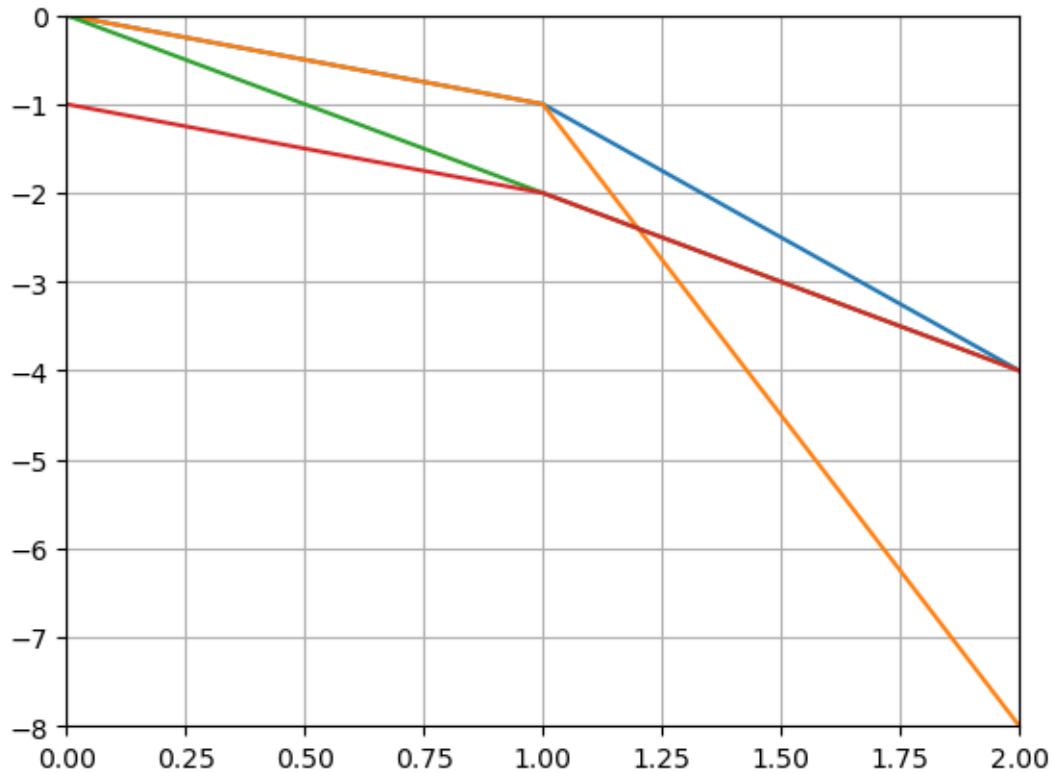
```
x = np.arange(3)
plt.plot(x, -x**2, x, -x**3, x, -2*x, x, -2**x)
plt.grid(True)
print(plt.axis())
plt.show()
```

```
(-0.1, 2.1, -8.4, 0.4)
```



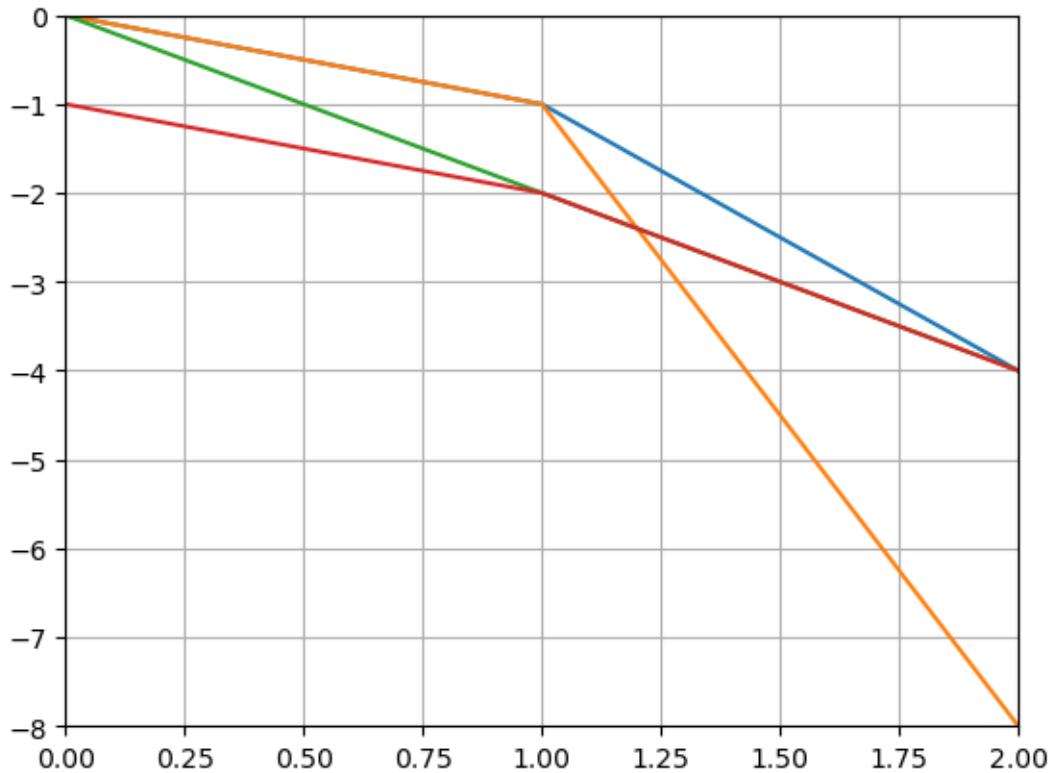
```
x = np.arange(3)
plt.plot(x, -x**2, x, -x**3, x, -2*x, x, -2**x)
plt.grid(True)
plt.axis([0, 2, -8, 0])
print(plt.axis())
plt.show()
```

```
(0.0, 2.0, -8.0, 0.0)
```

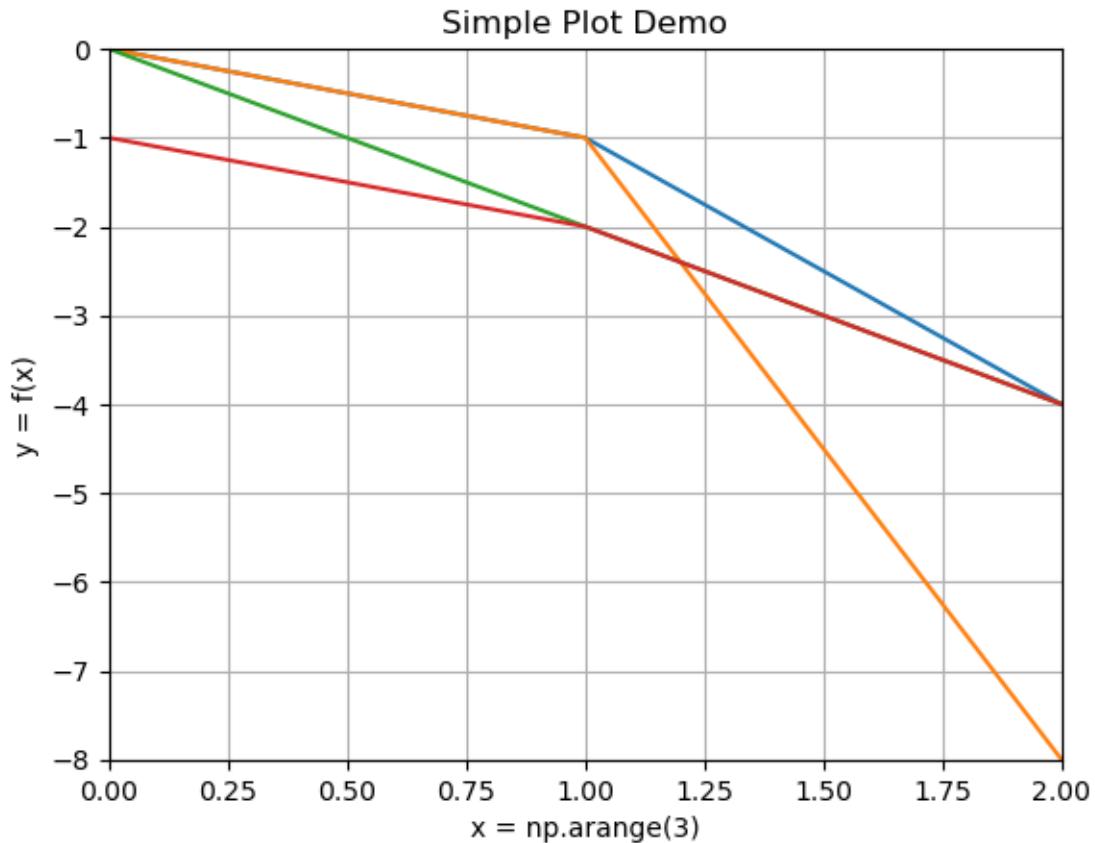


```
x = np.arange(3)
plt.plot(x, -x**2, x, -x**3, x, -2*x, x, -2*x)
plt.grid(True)
plt.xlim([0, 2])
plt.ylim([-8, 0])
print(plt.axis())
plt.show()
```

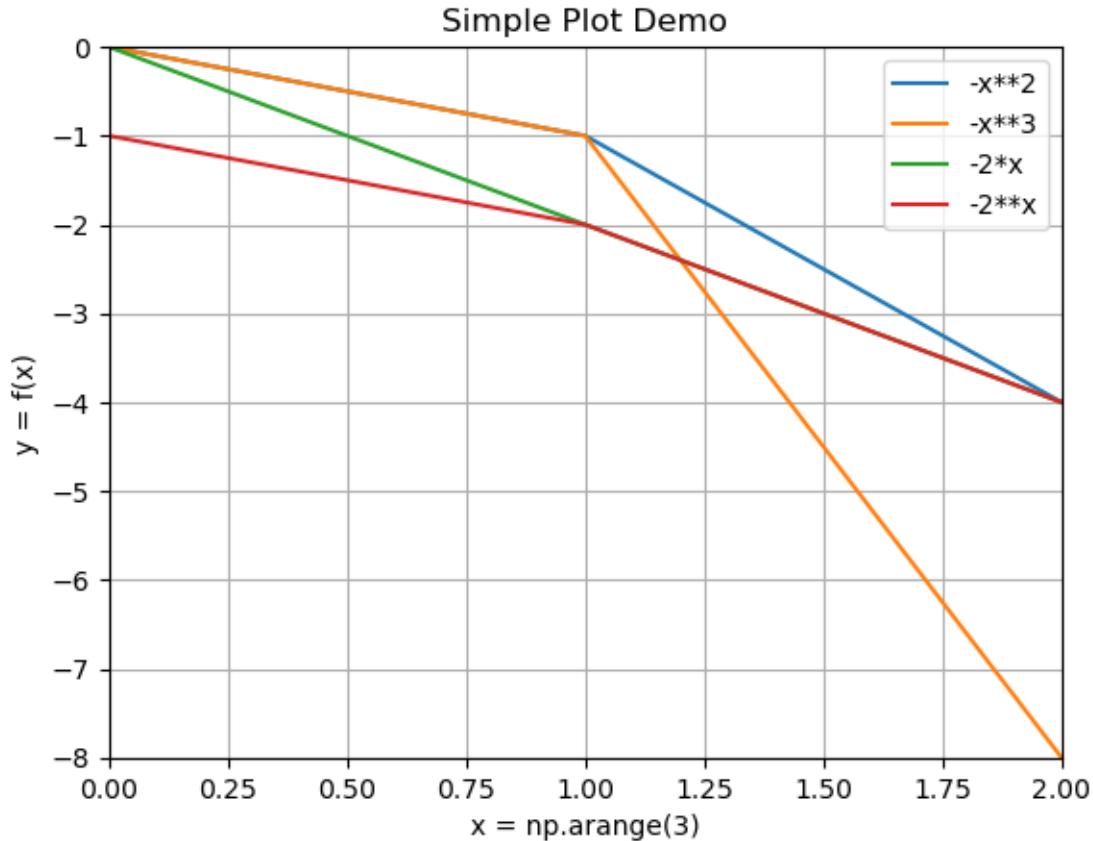
```
(0.0, 2.0, -8.0, 0.0)
```



```
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()
```

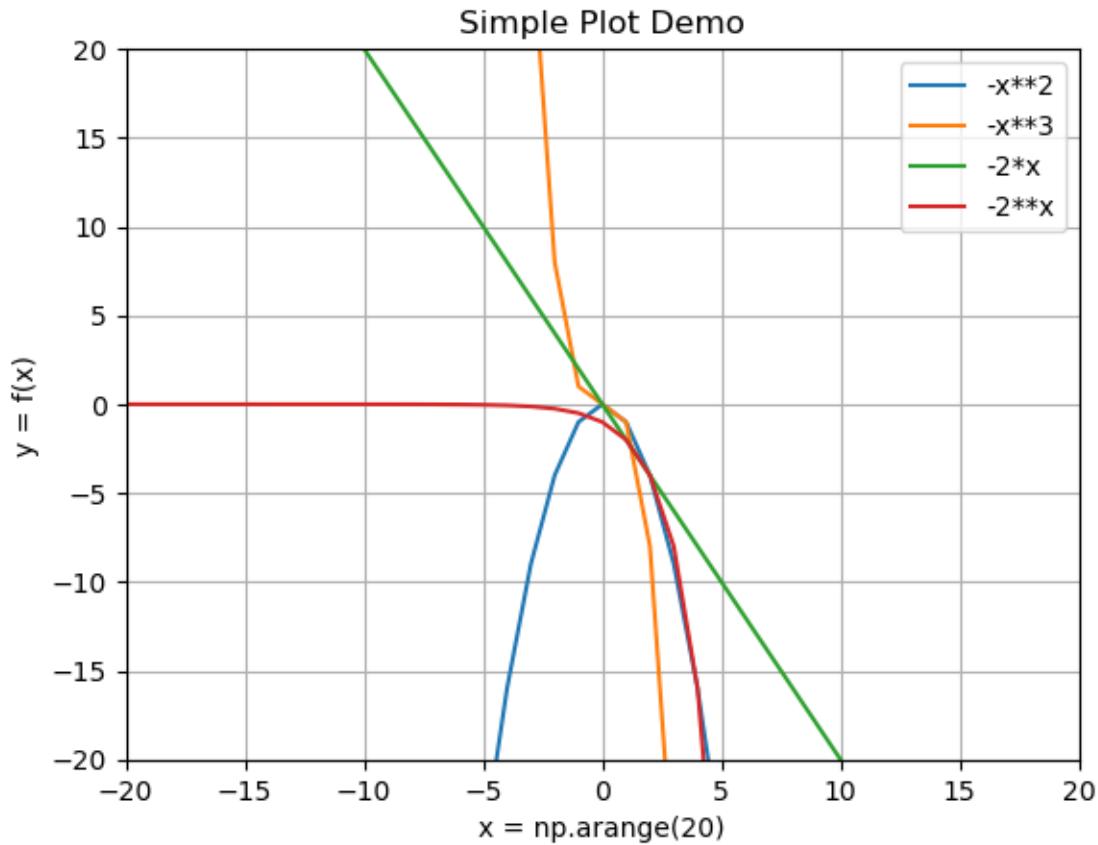


```
x = np.arange(3)
plt.plot(x, -x**2, label='-x**2')
plt.plot(x, -x**3, label='-x**3')
plt.plot(x, -2*x, label='-2*x')
plt.plot(x, -2*x*x, label='-2*x*x')
plt.legend()
plt.grid(True)
plt.xlabel('x = np.arange(3)')
plt.xlim([0, 2])
plt.ylabel('y = f(x)')
plt.ylim([-8, 0])
plt.title('Simple Plot Demo')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

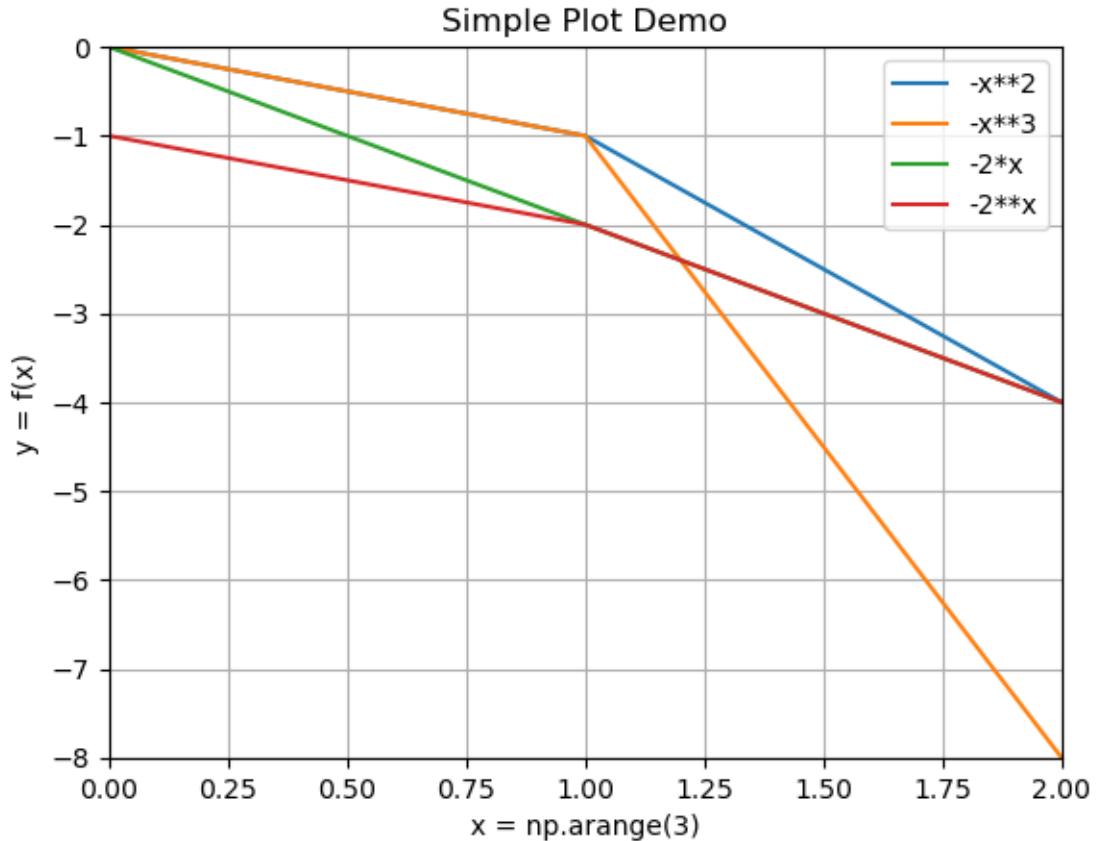


```
# dennis trying a bit

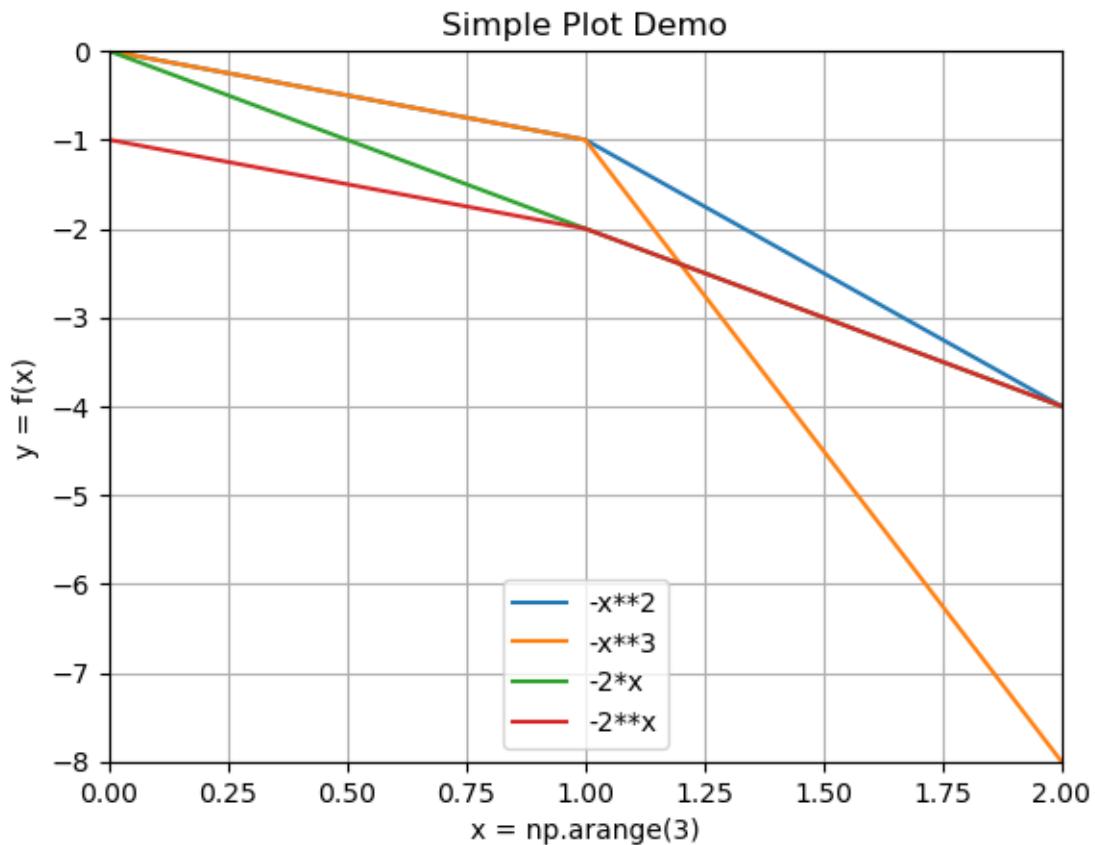
x = np.arange(-20, 20, dtype=float)
plt.plot(x, -x**2, label='-x**2')
plt.plot(x, -x**3, label='-x**3')
plt.plot(x, -2*x, label='-2*x')
plt.plot(x, -2**x, label='-2**x')
plt.legend()
plt.grid(True)
plt.xlabel('x = np.arange(20)')
plt.xlim([-20, 20])
plt.ylabel('y = f(x)')
plt.ylim([-20,20])
plt.title('Simple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



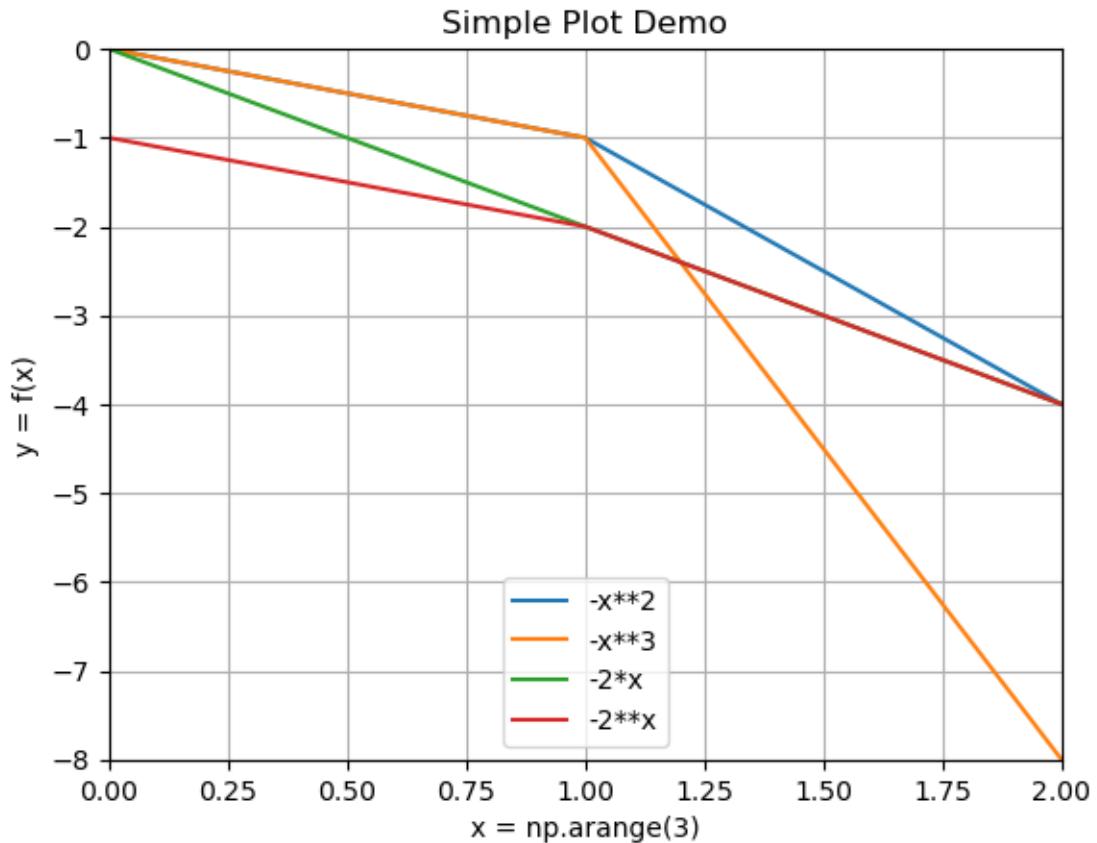
```
x = np.arange(3)
plt.plot(x, -x**2, x, -x**3, x, -2*x, x, -2*x**2)
plt.legend(['-x**2', '-x**3', '-2*x', '-2*x**2'])
plt.grid(True)
plt.xlabel('x = np.arange(3)')
plt.xlim([0, 2])
plt.ylabel('y = f(x)')
plt.ylim([-8, 0])
plt.title('Simple Plot Demo')
plt.show()
```



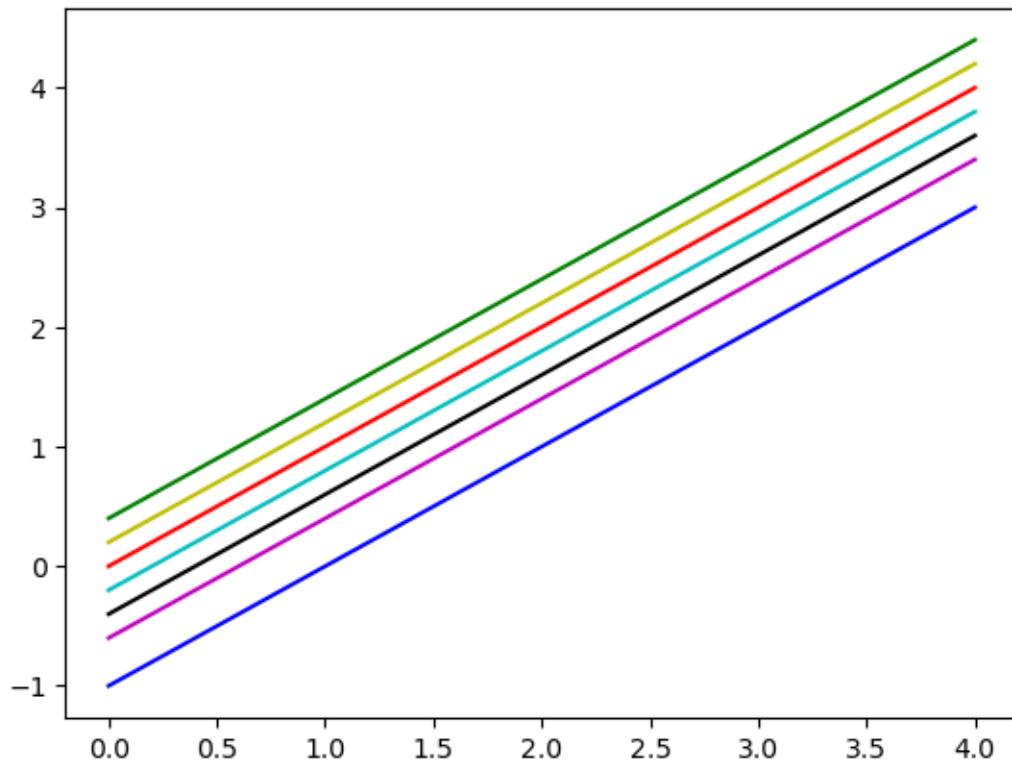
```
x = np.arange(3)
plt.plot(x, -x**2, x, -x**3, x, -2*x, x, -2**x)
plt.legend(['-x**2', '-x**3', '-2*x', '-2**x'],
           loc='lower center')
plt.grid(True)
plt.xlabel('x = np.arange(3)')
plt.xlim([0, 2])
plt.ylabel('y = f(x)')
plt.ylim([-8, 0])
plt.title('Simple Plot Demo')
plt.show()
```



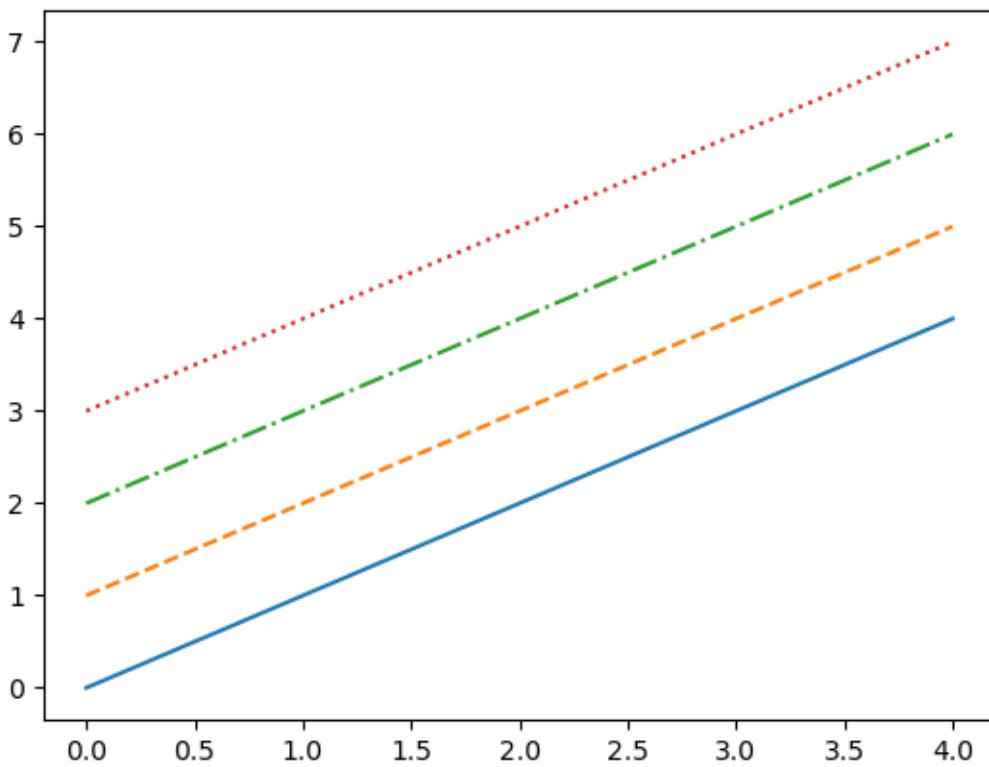
```
x = np.arange(3)
plt.plot(x, -x**2, x, -x**3, x, -2*x, x, -2**x)
plt.legend(['-x**2', '-x**3', '-2*x', '-2**x'],
           loc='lower center')
plt.grid(True)
plt.xlabel('x = np.arange(3)')
plt.xlim([0, 2])
plt.ylabel('y = f(x)')
plt.ylim([-8, 0])
plt.title('Simple Plot Demo')
plt.savefig('img/handon-c4-test-4-66.png')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



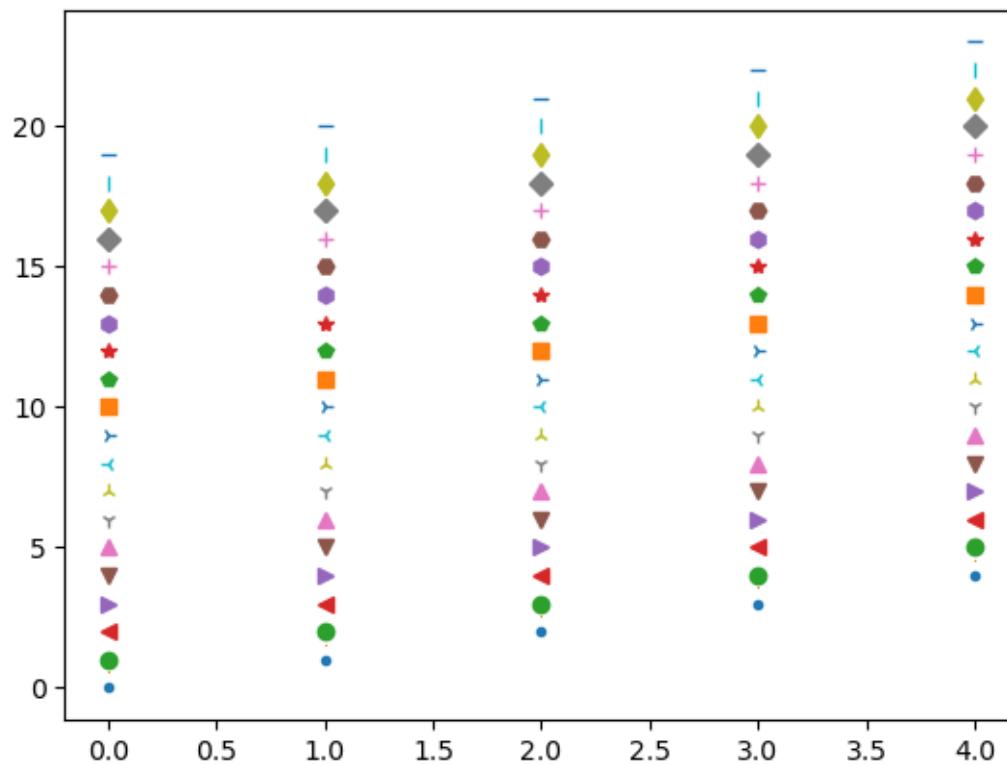
```
%matplotlib inline
import matplotlib.pyplot as plt
import numpy as np
x = np.arange(5)
y= x
plt.plot(x, y+0.4, 'g')
plt.plot(x, y+0.2, 'y')
plt.plot(x, y+0.0, 'r')
plt.plot(x, y-0.2, 'c')
plt.plot(x, y-0.4, 'k')
plt.plot(x, y-0.6, 'm')
plt.plot(x, y-0.8, 'w') # w on w issues
plt.plot(x, y-1.0, 'b')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



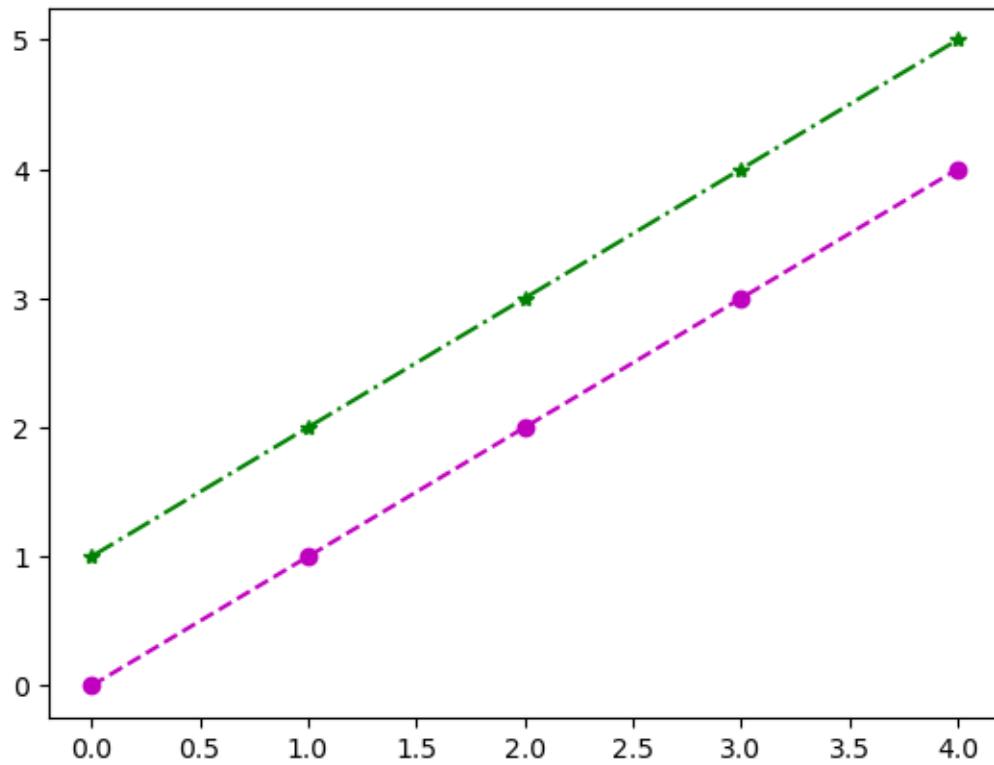
```
plt.plot(x, y, '-.', x, y+1, '--', x, y+2, '-.', x, y+3, ':')
```



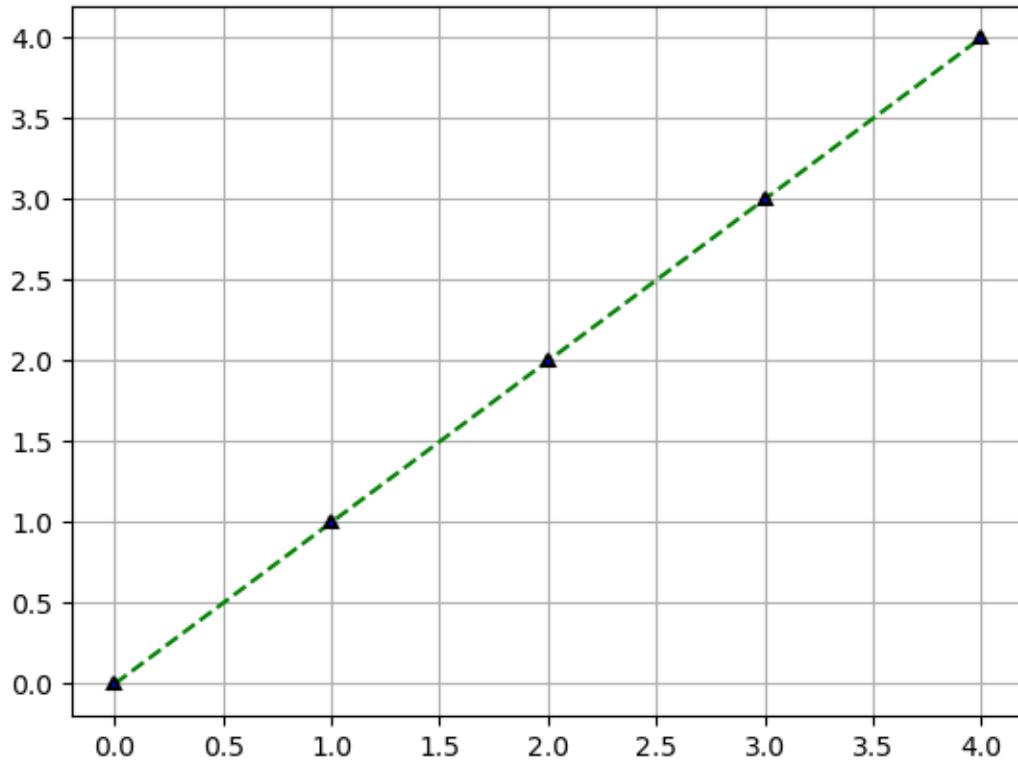
```
plt.plot(x, y, '.')
plt.plot(x, y+0.5, ',', ',')
plt.plot(x, y+1, 'o')
plt.plot(x, y+2, '<')
plt.plot(x, y+3, '>')
plt.plot(x, y+4, 'v')
plt.plot(x, y+5, '^')
plt.plot(x, y+6, '1')
plt.plot(x, y+7, '2')
plt.plot(x, y+8, '3')
plt.plot(x, y+9, '4')
plt.plot(x, y+10, 's')
plt.plot(x, y+11, 'p')
plt.plot(x, 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()
```



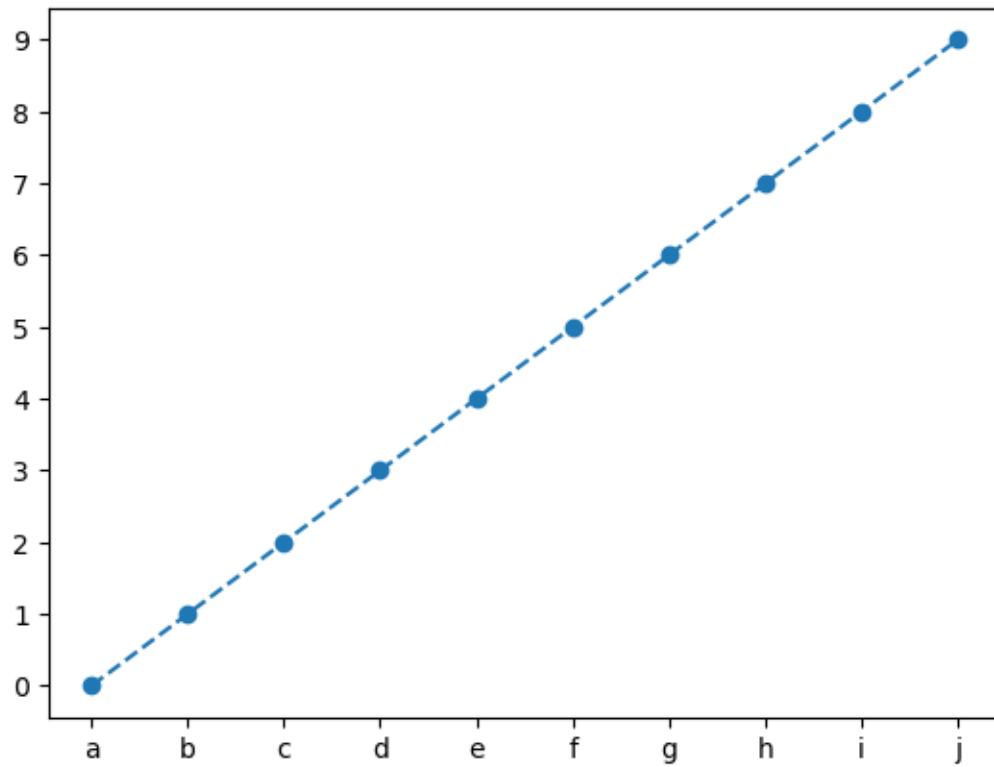
```
# (for colors, markers, and line styles)
plt.plot(x, y, 'mo--')
plt.plot(x, y+1 , 'g*-.')
plt.show()
```



```
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()
```

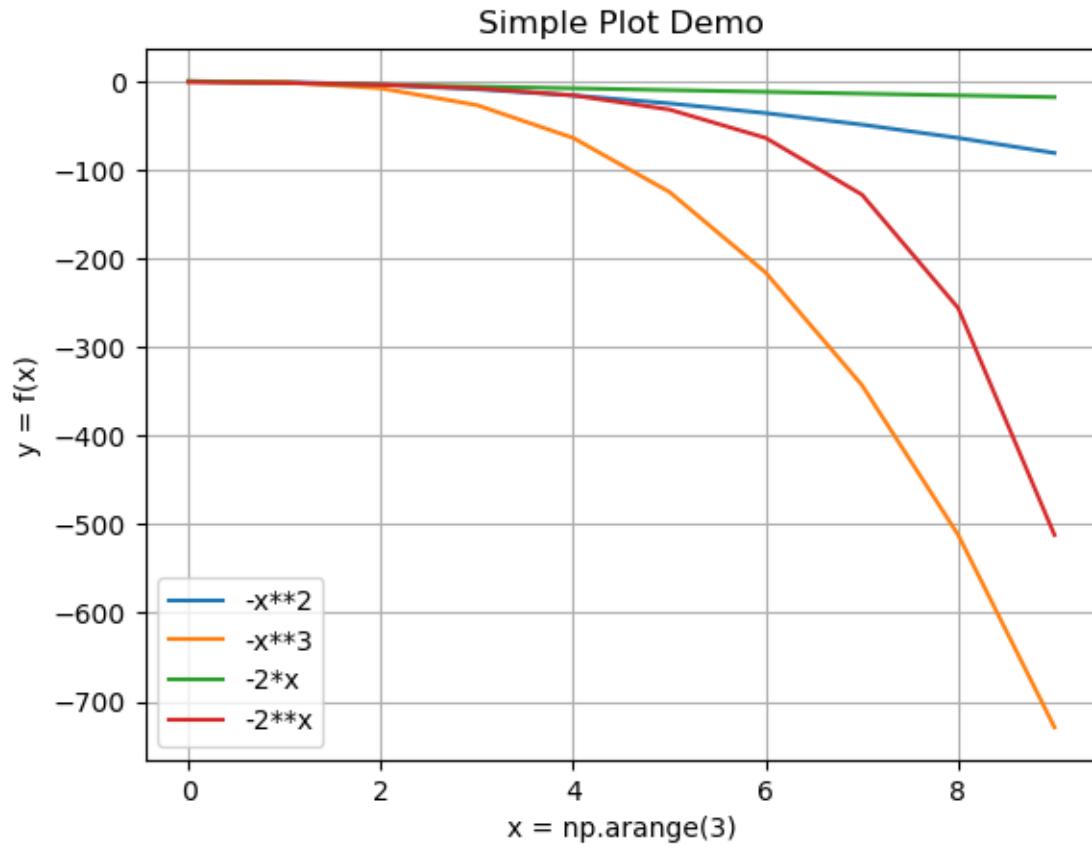


```
x = y = np.arange(10)
plt.plot(x, y, 'o--')
plt.xticks(range(len(x)), ['a', 'b', 'c', 'd', 'e', 'f', 'g', 'h', 'i', 'j'])
plt.yticks(range(0, 10, 1))
plt.show()
```

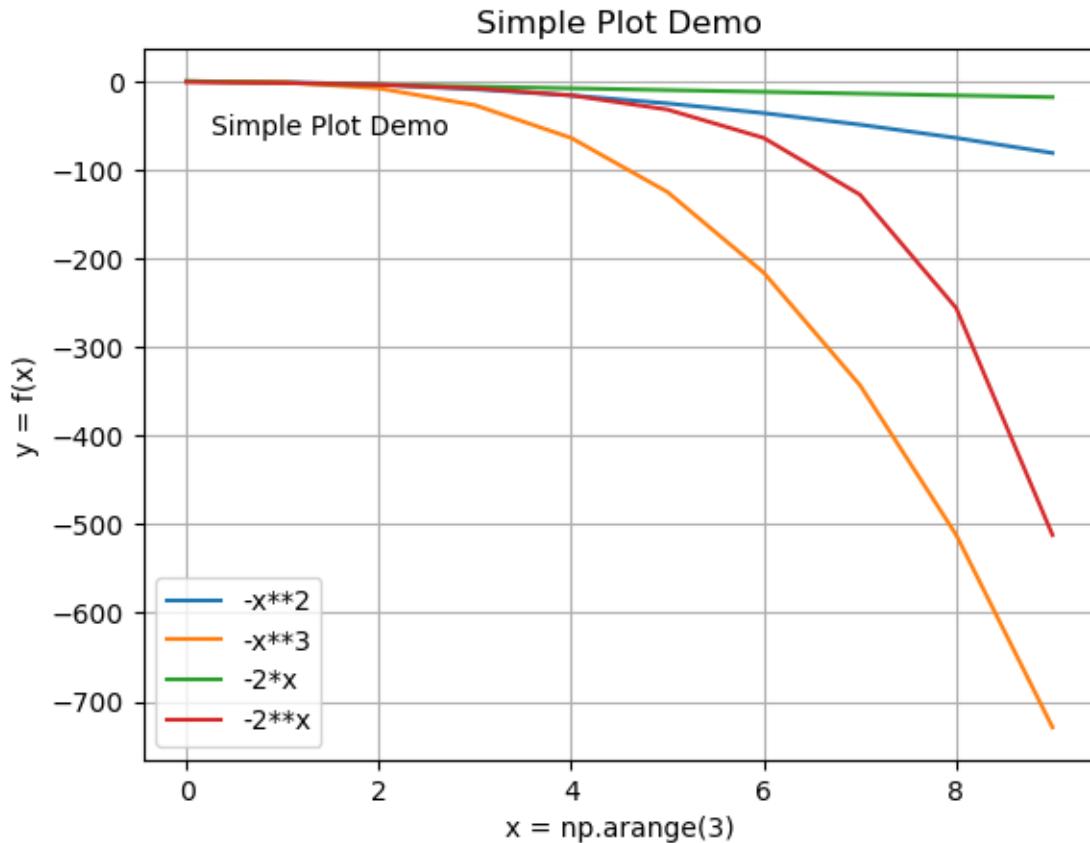


3.1 4-p71 oo style

```
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()
```



```
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()
```

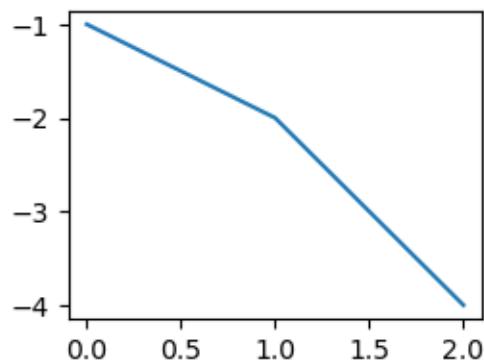
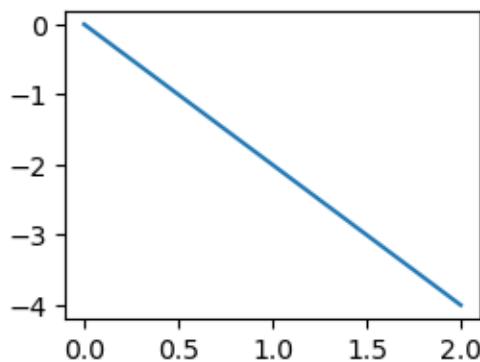
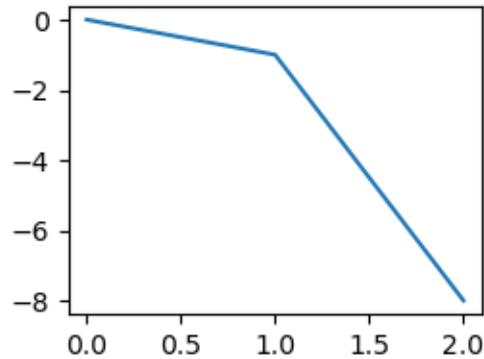
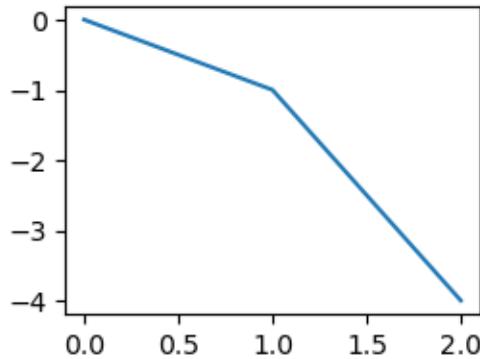


3.2 4-73 subplot

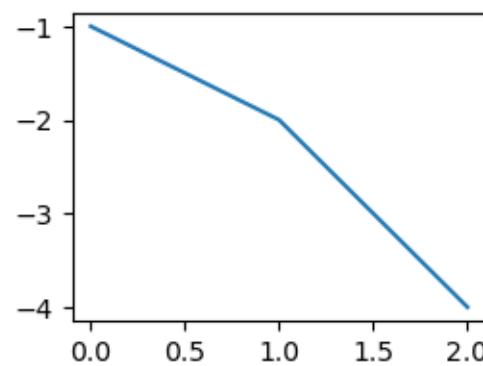
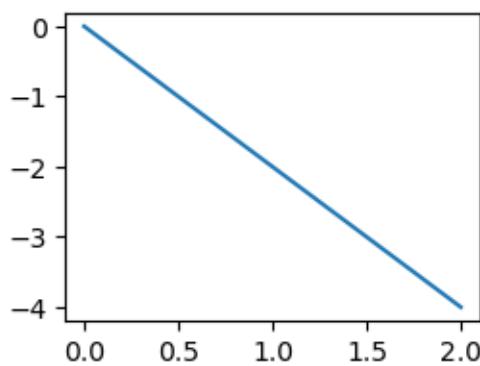
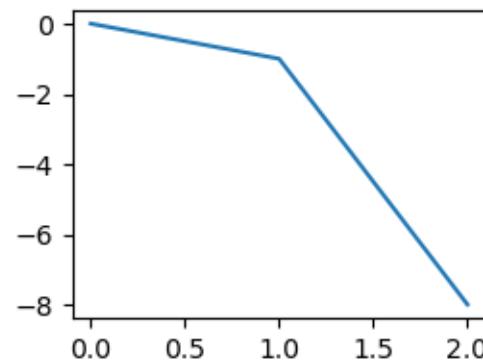
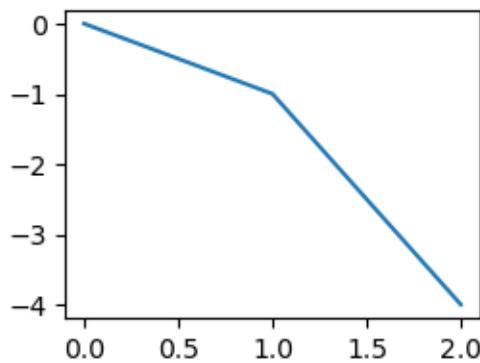
```

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**2)
plt.show()
```

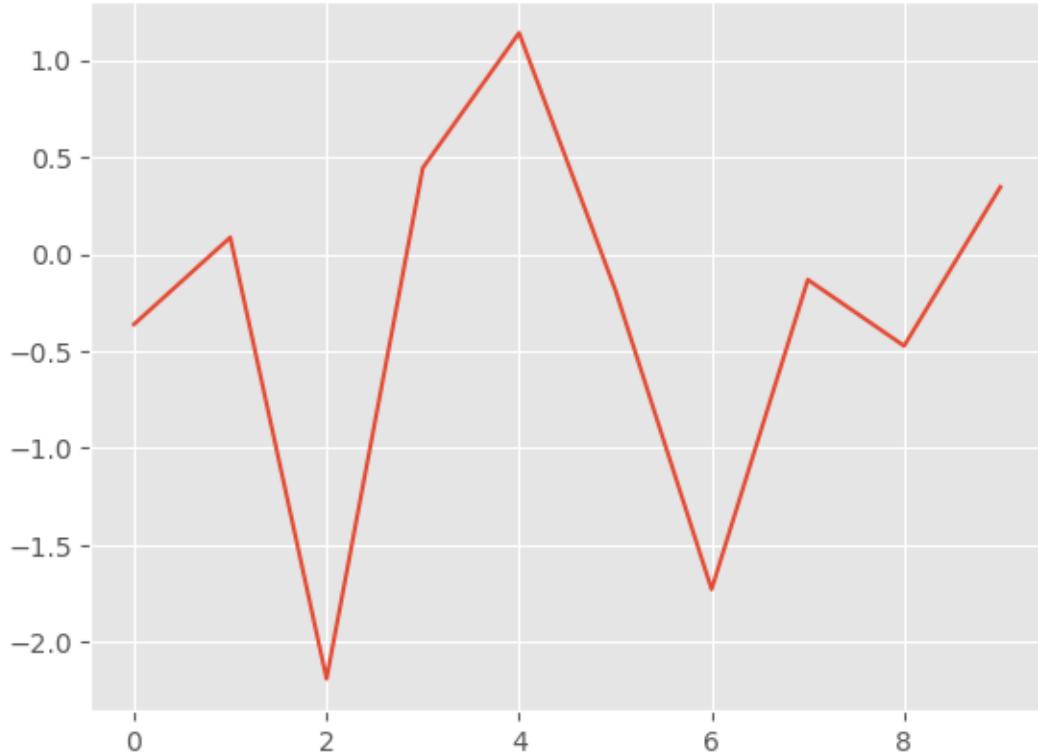


**CHAPTER
FOUR**

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()
```

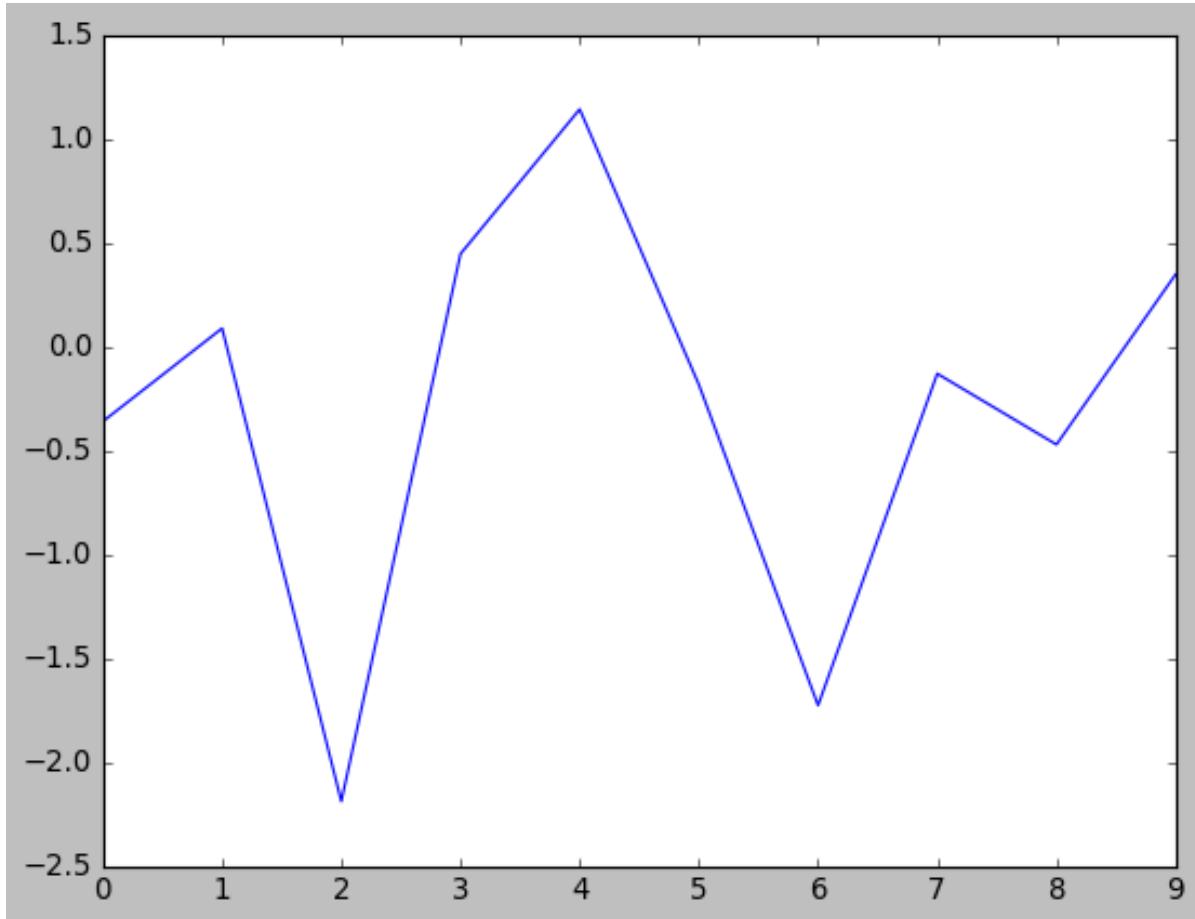
```
[-0.36180994  0.08624858 -2.18999836  0.44432251  1.14042698 -0.18488702
 -1.72815245 -0.13200888 -0.47319565  0.34591366]
```



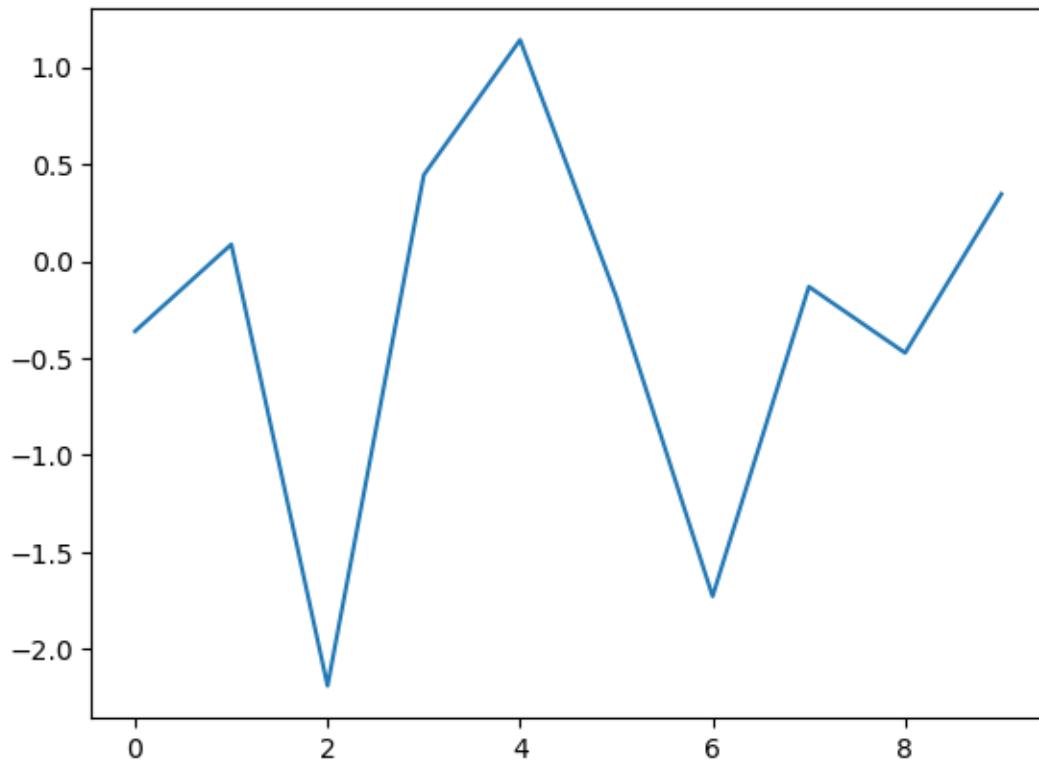
```
print(plt.style.available)
```

```
['Solarize_Light2', '_classic_test_patch', '_mpl-gallery', '_mpl-gallery-nogrid',
 'bmh', 'classic', 'dark_background', 'fast', 'fivethirtyeight', 'ggplot',
 'grayscale', 'seaborn-v0_8', 'seaborn-v0_8-bright', 'seaborn-v0_8-colorblind',
 'seaborn-v0_8-dark', 'seaborn-v0_8-dark-palette', 'seaborn-v0_8-darkgrid',
 'seaborn-v0_8-deep', 'seaborn-v0_8-muted', 'seaborn-v0_8-notebook', 'seaborn-v0_8-paper',
 'seaborn-v0_8-pastel', 'seaborn-v0_8-poster', 'seaborn-v0_8-talk',
 'seaborn-v0_8-ticks', 'seaborn-v0_8-white', 'seaborn-v0_8-whitegrid', 'tableau-colorblind10']
```

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

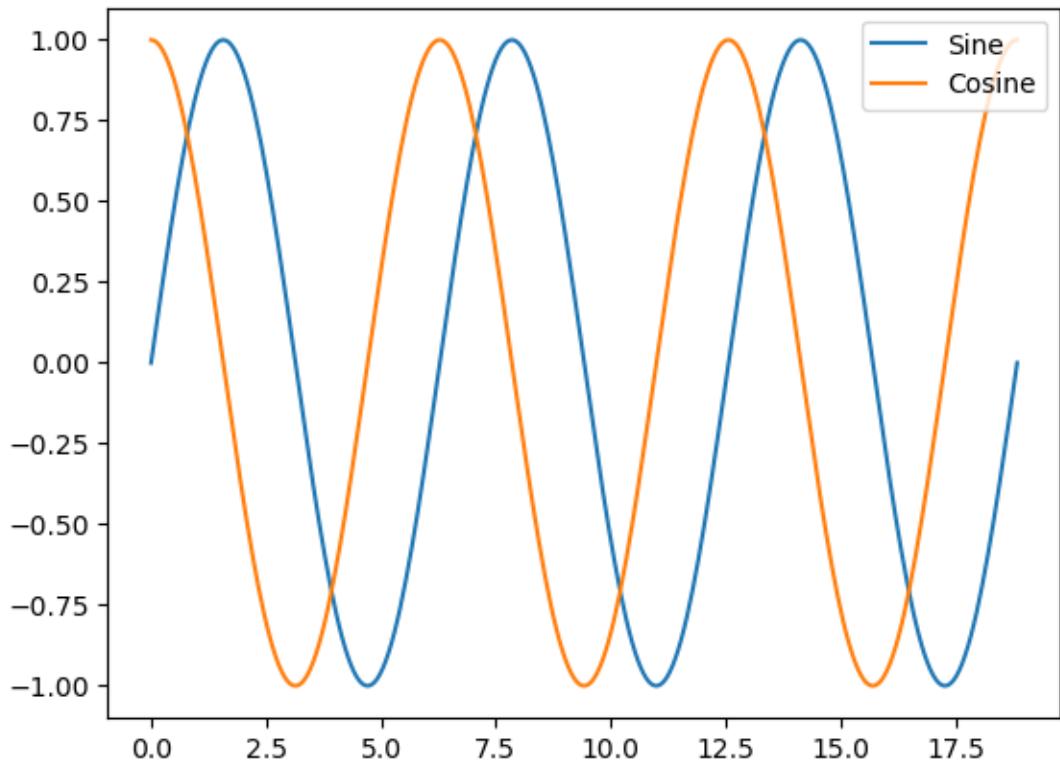


```
plt.style.use('default')
#Let's show the data with the following:
plt.plot(data)
plt.show()
```

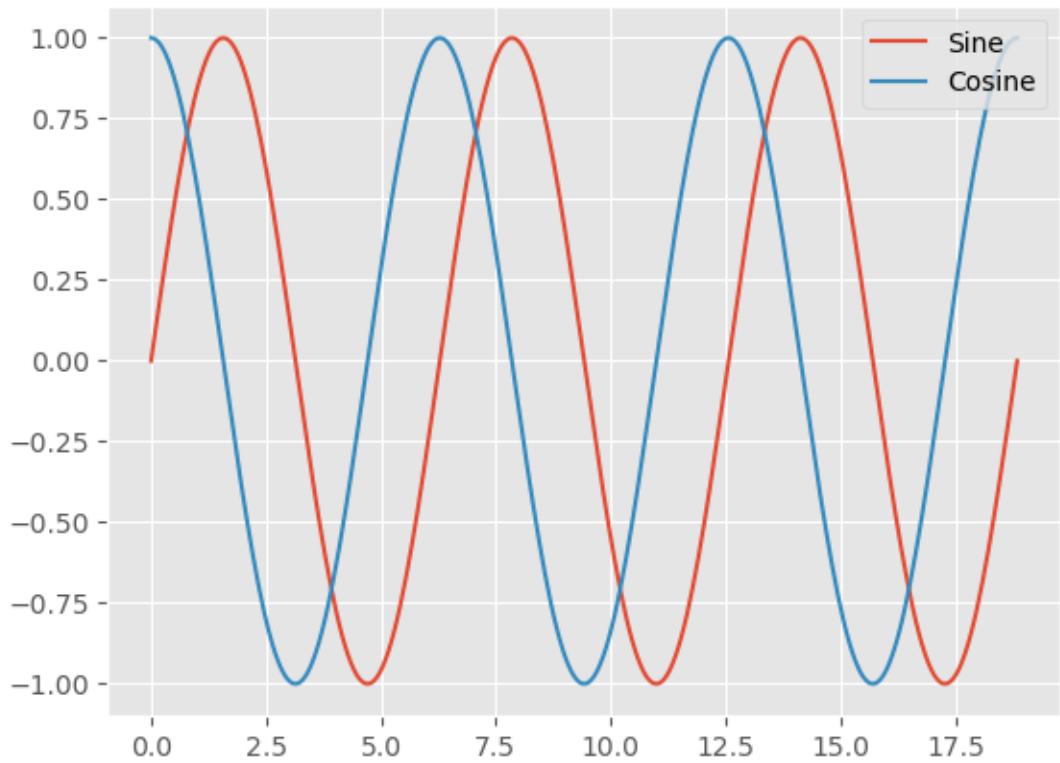


```
n= 3
data = np.linspace(0, 2*n*np.pi, 300)
# n * 2pi
def sinusoidal(sty):
    plt.style.use(sty)
    fig, ax = plt.subplots()
    ax.plot(data, np.sin(data), label='Sine')
    ax.plot(data, np.cos(data), label='Cosine')
    ax.legend()
```

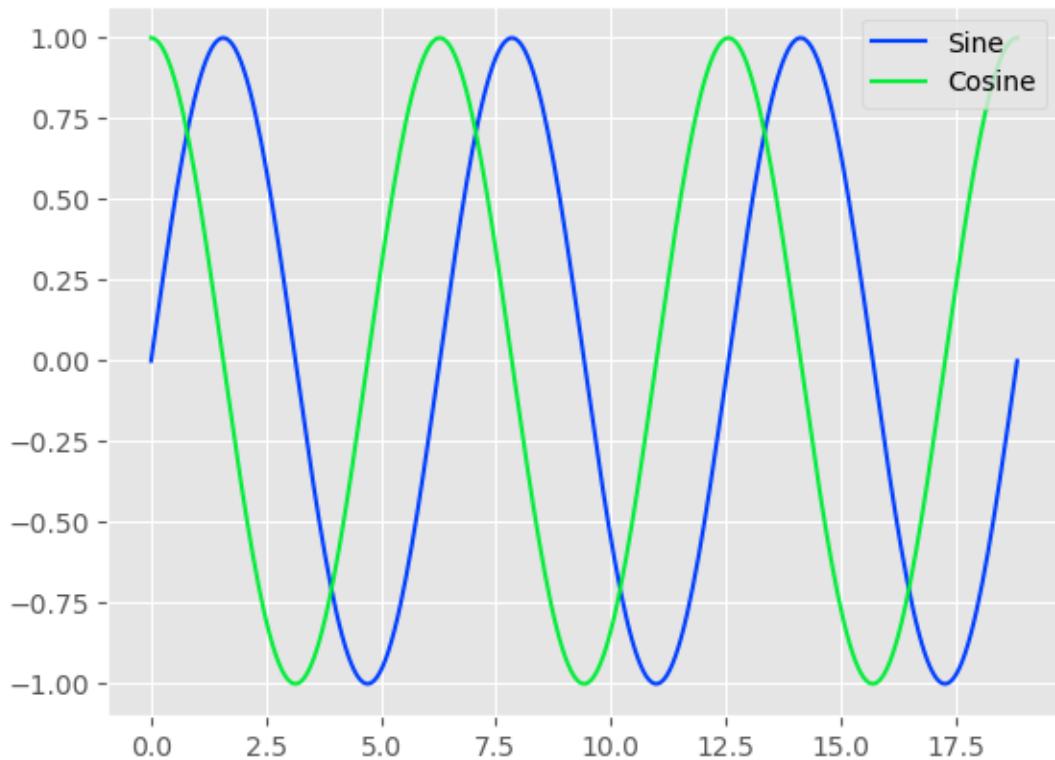
```
sinusoidal('default')
plt.show()
```



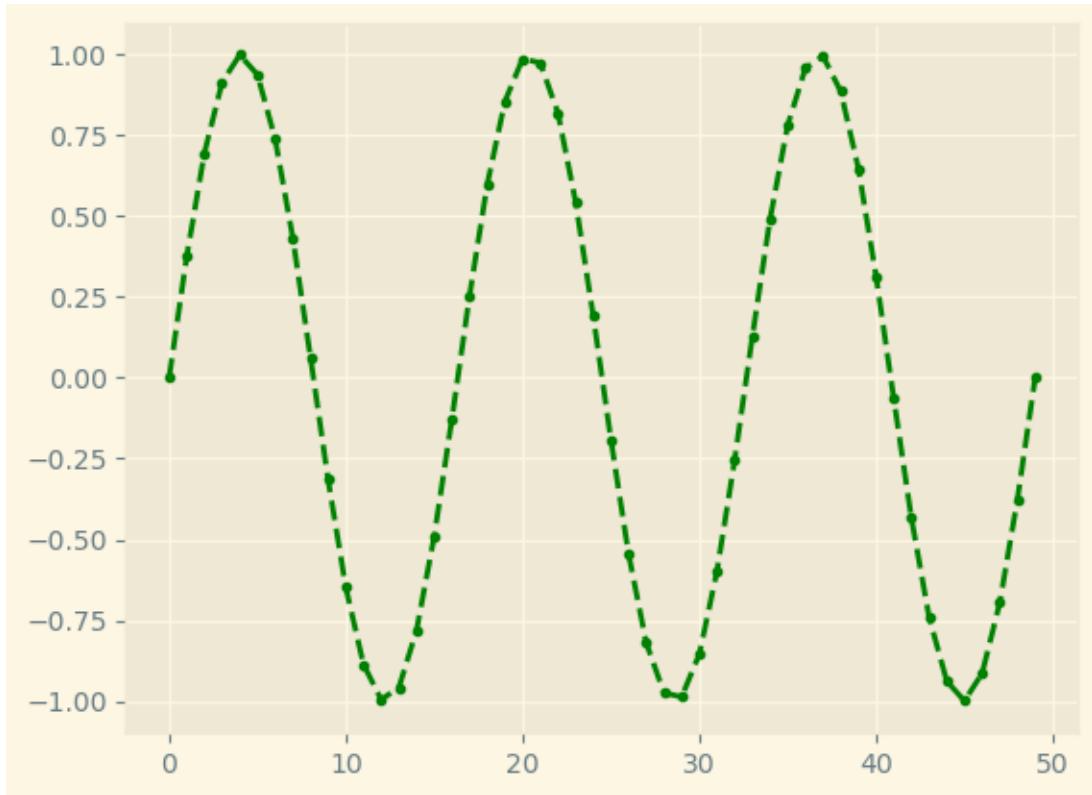
```
sinusoidal('ggplot')  
plt.show()
```



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

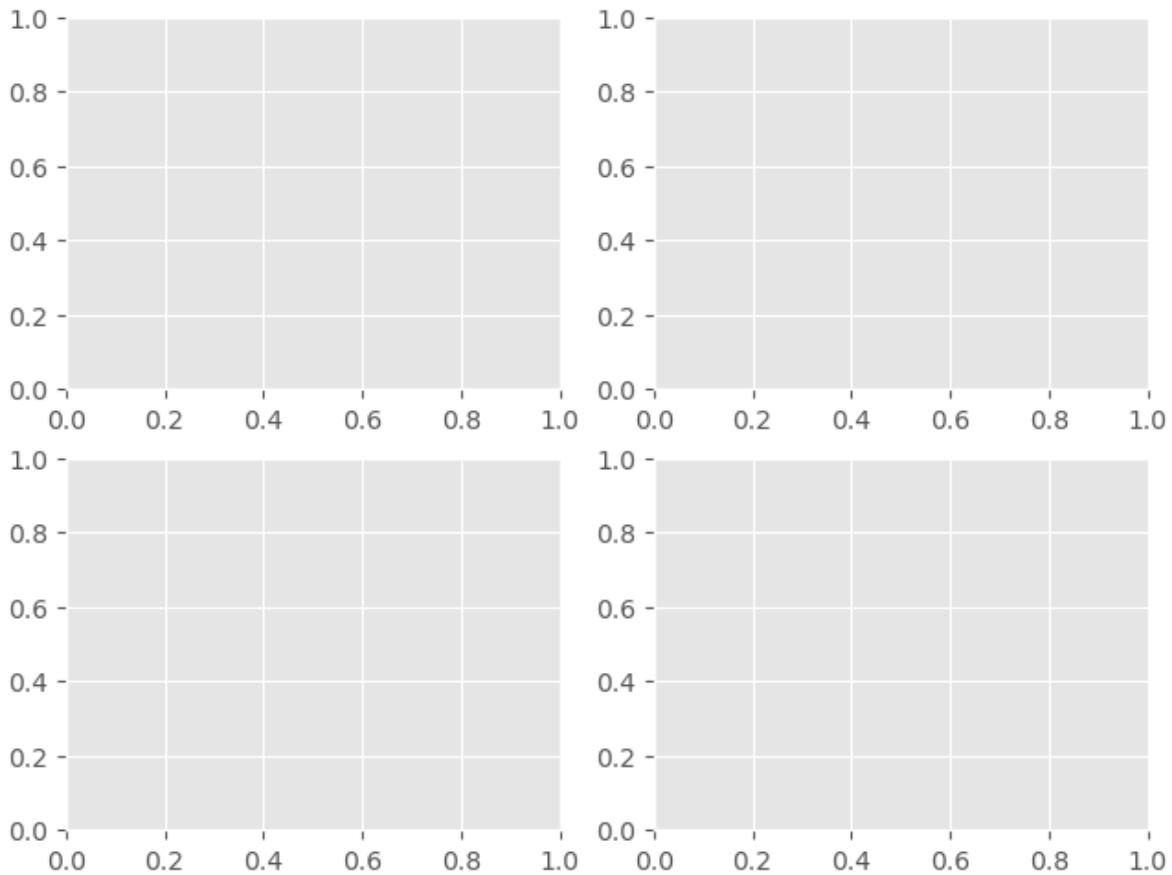


```
with plt.style.context('Solarize_Light2'):
    data = np.linspace(0, 6 * np.pi)
    plt.plot(np.sin(data), 'g.--')
    plt.show()
```

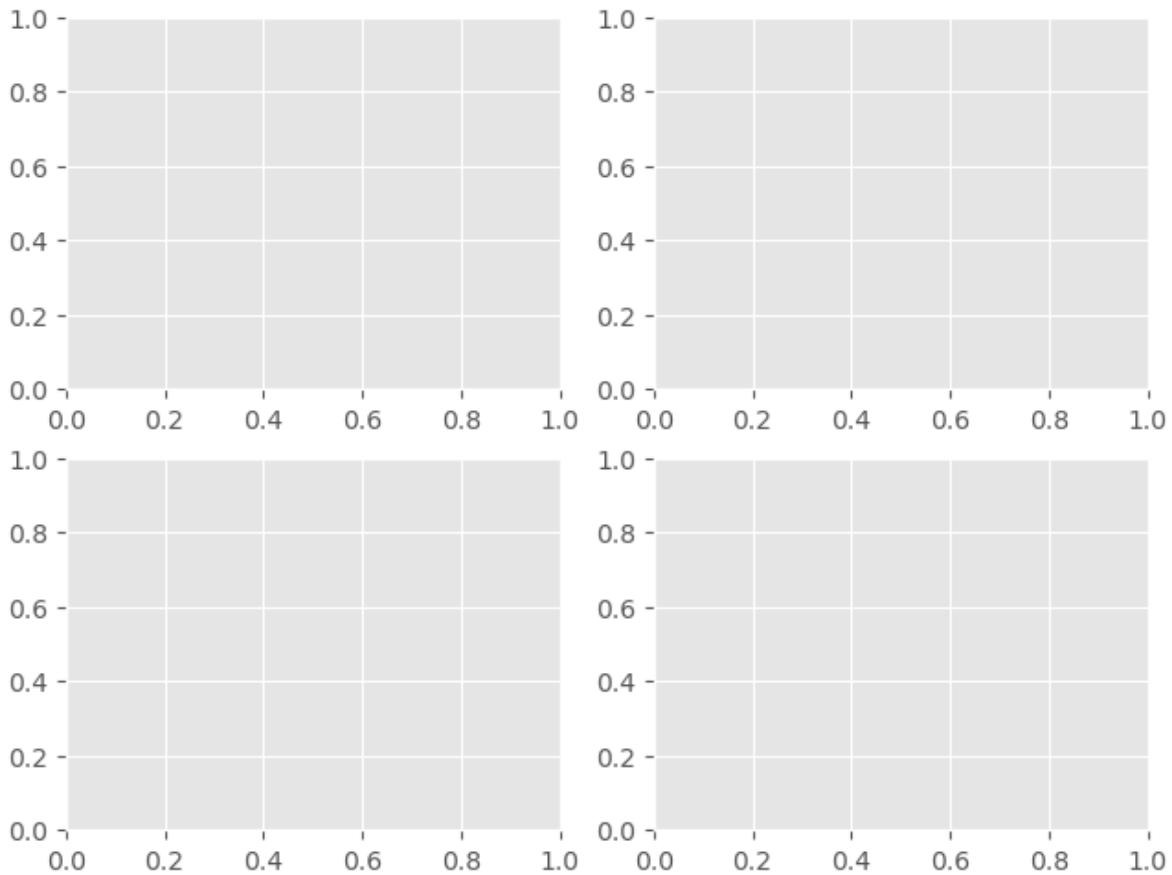


```
#plt.style.use('default')
```

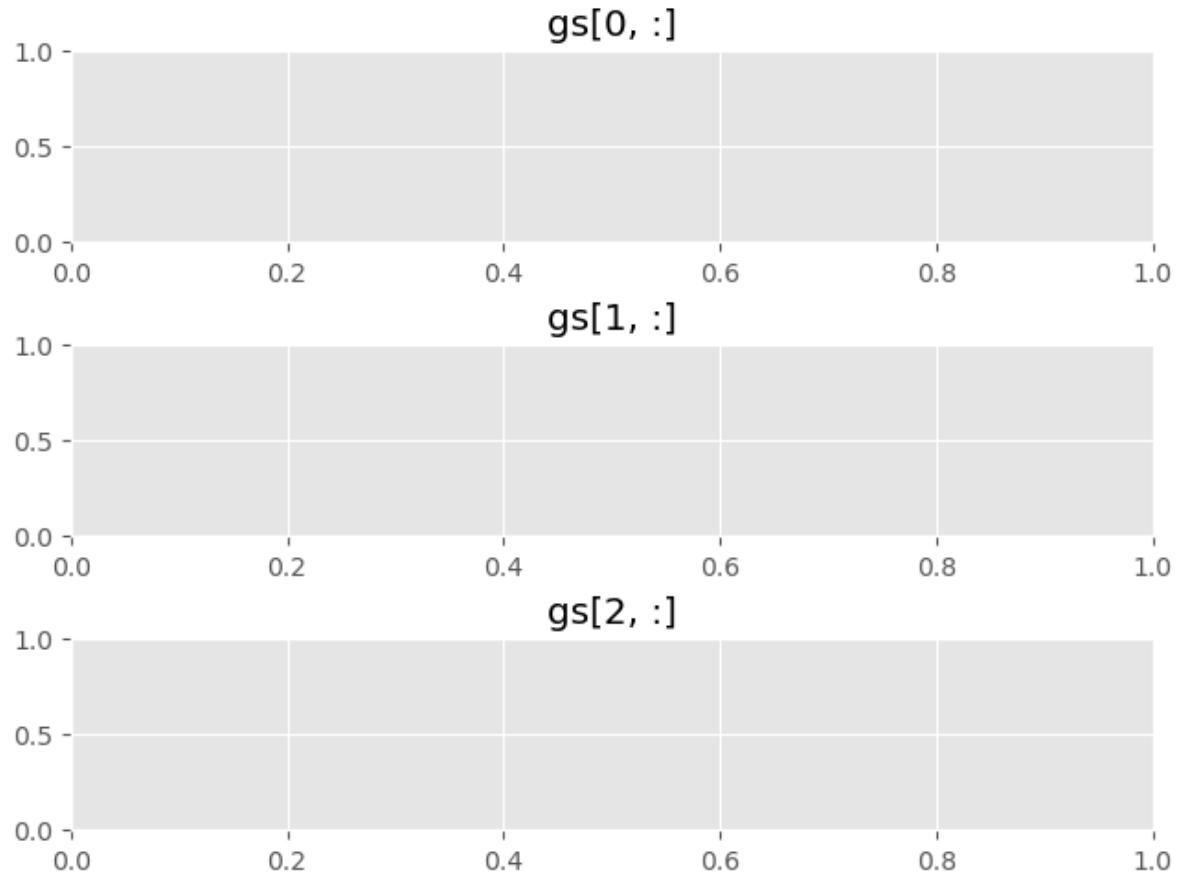
```
fig, axs = plt.subplots(ncols=2, nrows=2, constrained_layout=True)
plt.show()
```



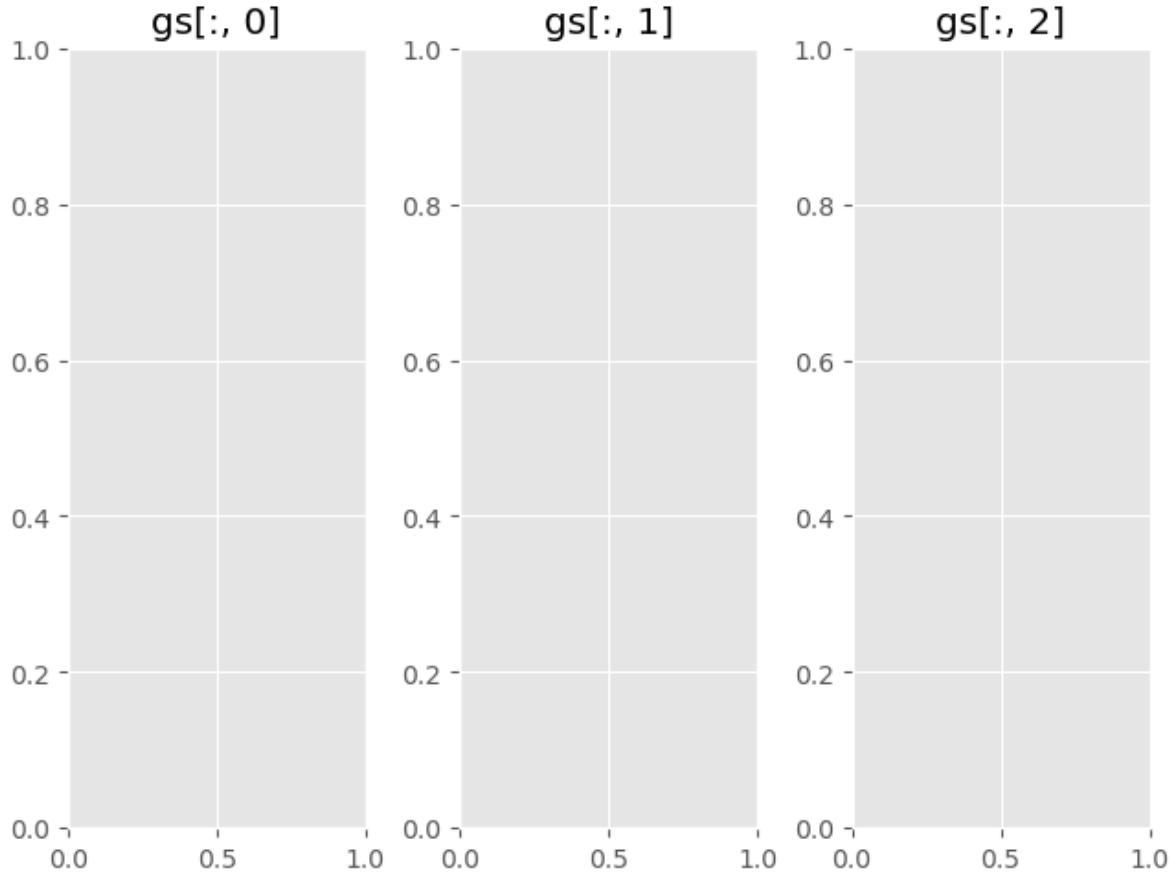
```
import matplotlib.gridspec as gridspec
fig = plt.figure(constrained_layout=True)
specs = gridspec.GridSpec(ncols=2, nrows=2, figure=fig)
ax1 = fig.add_subplot(specs[0, 0])
ax2 = fig.add_subplot(specs[0, 1])
ax3 = fig.add_subplot(specs[1, 0])
ax4 = fig.add_subplot(specs[1, 1])
plt.show()
```



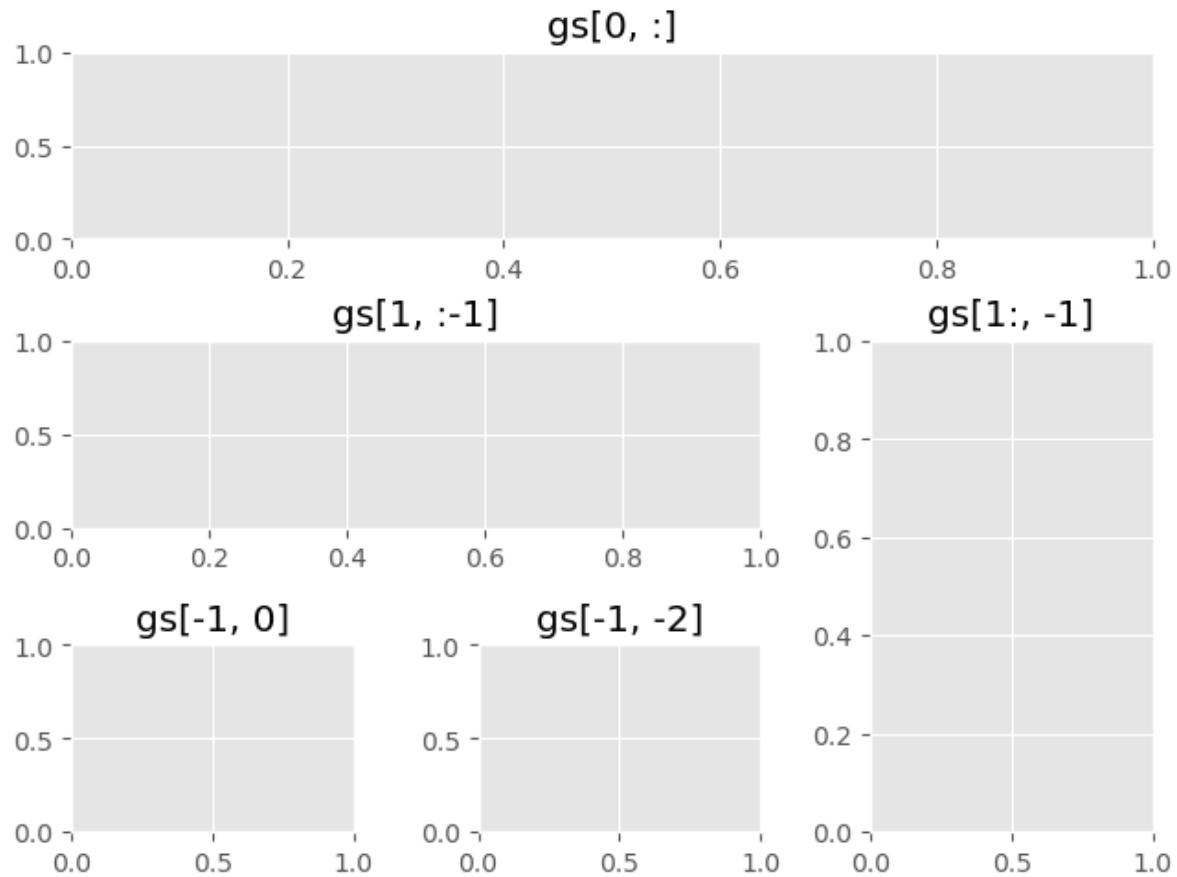
```
fig = plt.figure(constrained_layout=True)
gs = fig.add_gridspec(3, 3)
ax1 = fig.add_subplot(gs[0, :])
ax1.set_title('gs[0, :]')
ax2 = fig.add_subplot(gs[1, :])
ax2.set_title('gs[1, :]')
ax3 = fig.add_subplot(gs[2, :])
ax3.set_title('gs[2, :]')
plt.show()
```



```
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()
```

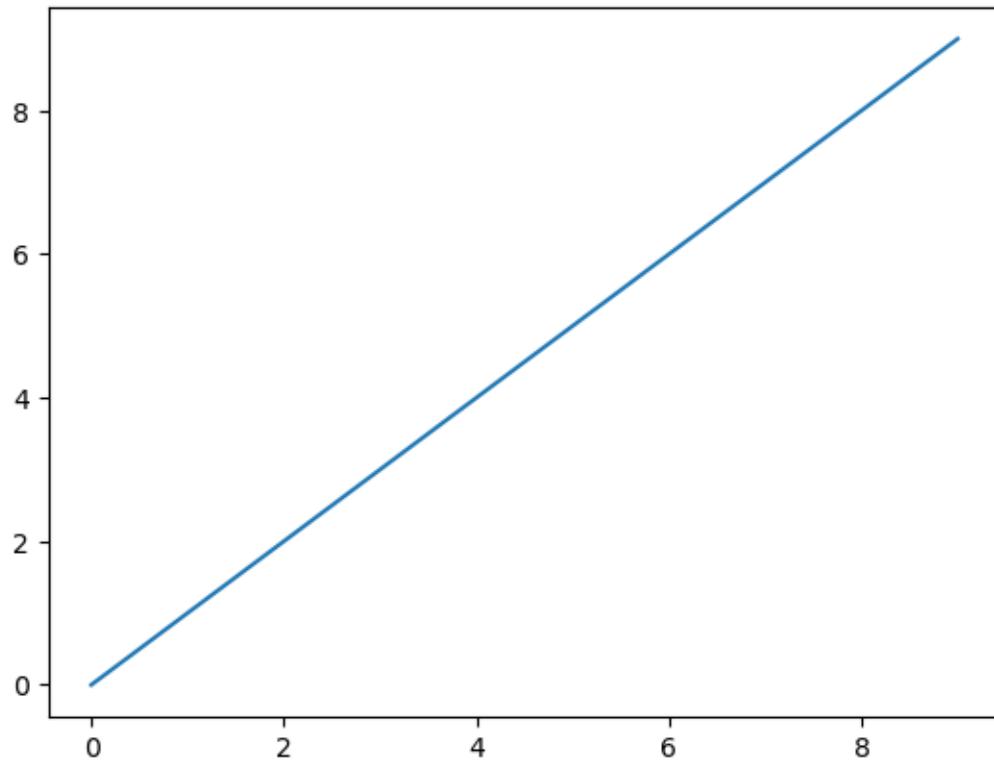


CHAPTER
FIVE

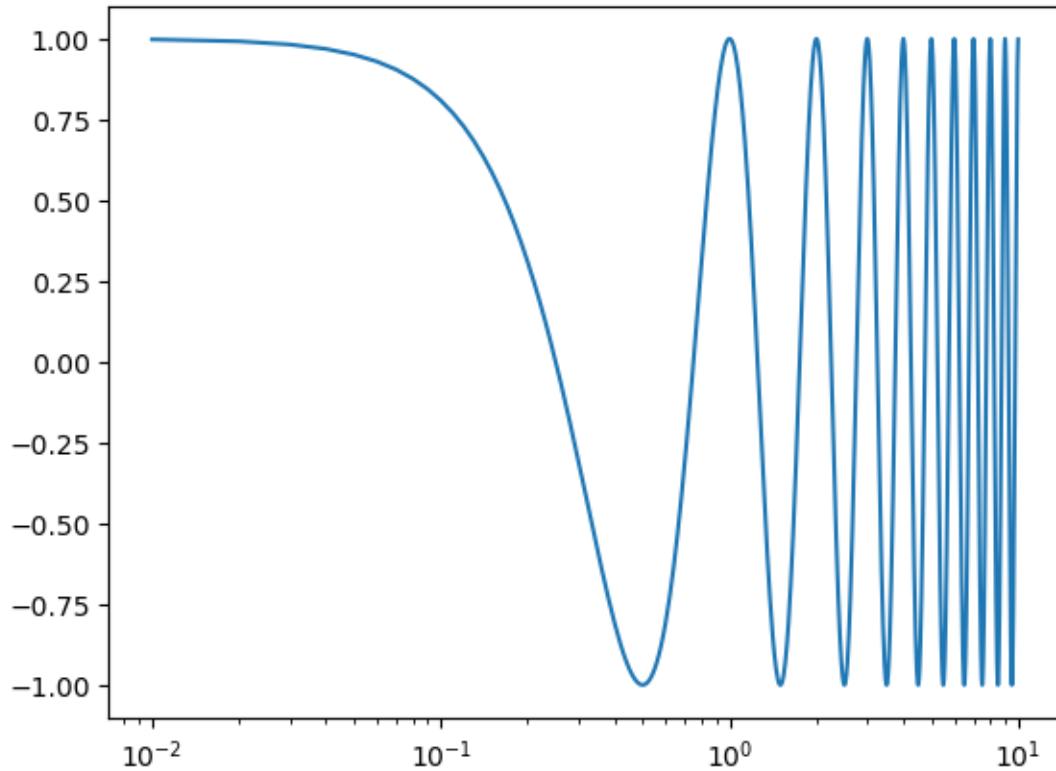
HANDOB CH6

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

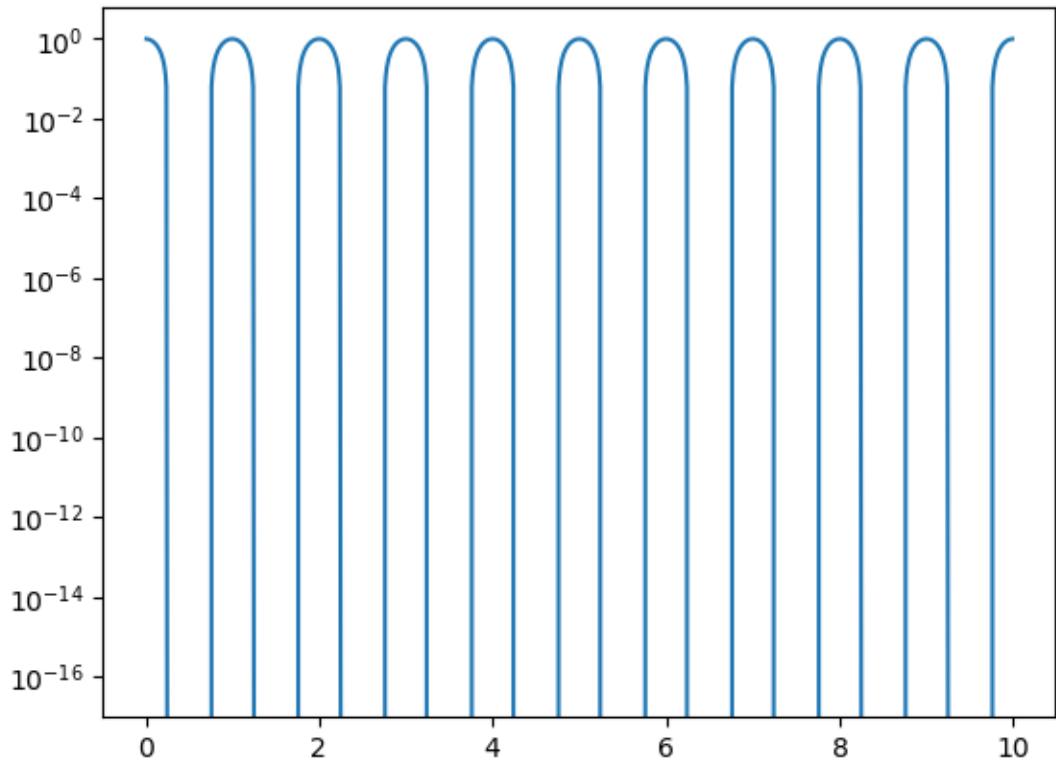
plt.plot(data)
plt.show()
```



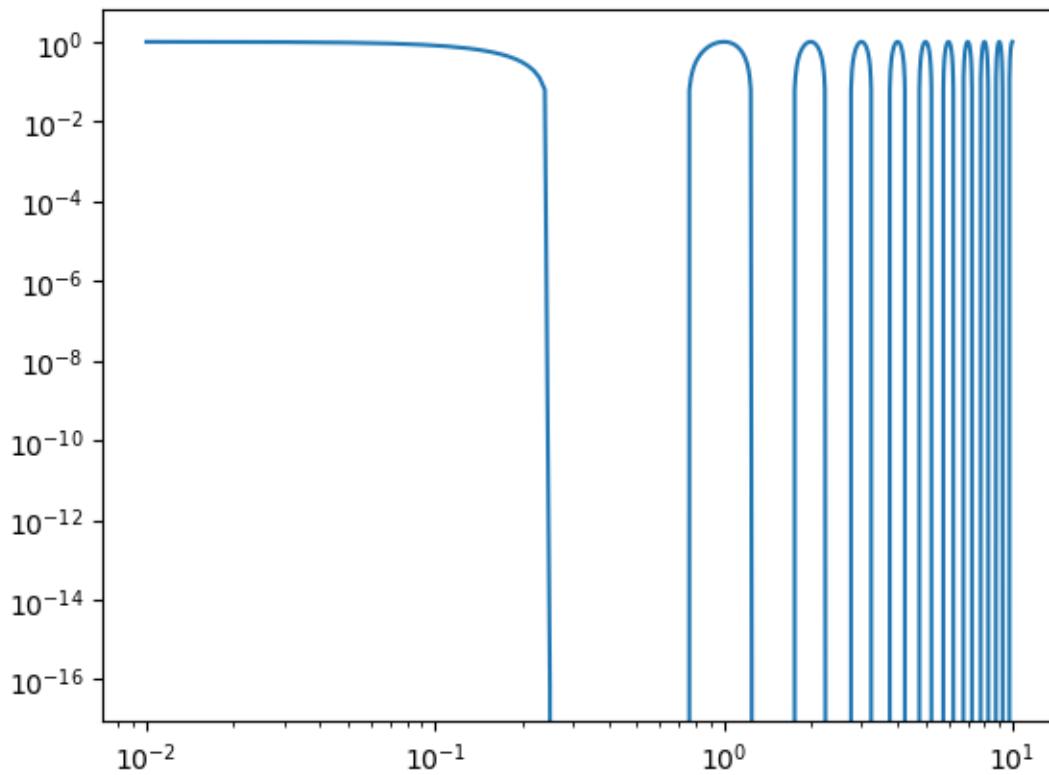
```
t = np.arange(0.01, 10, 0.01)
plt.semilogx(t, np.cos(2 * np.pi * t))
plt.show()
```



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

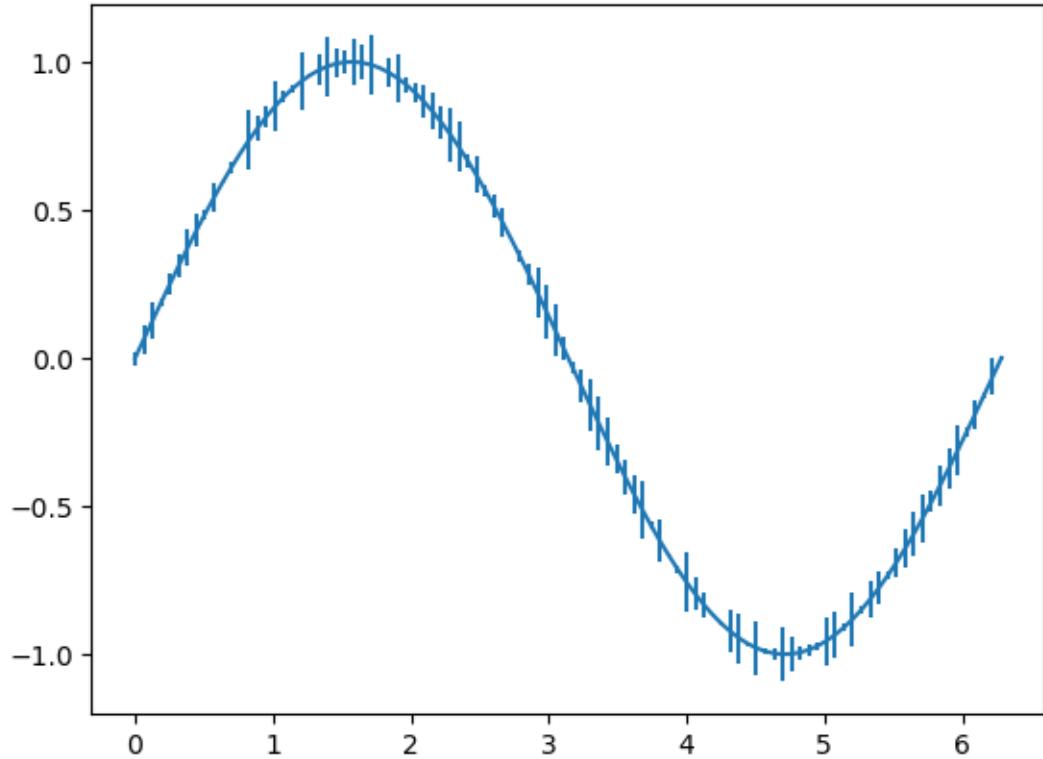


```
plt.loglog(t, np.cos(2 * np.pi * t))
plt.show()
```

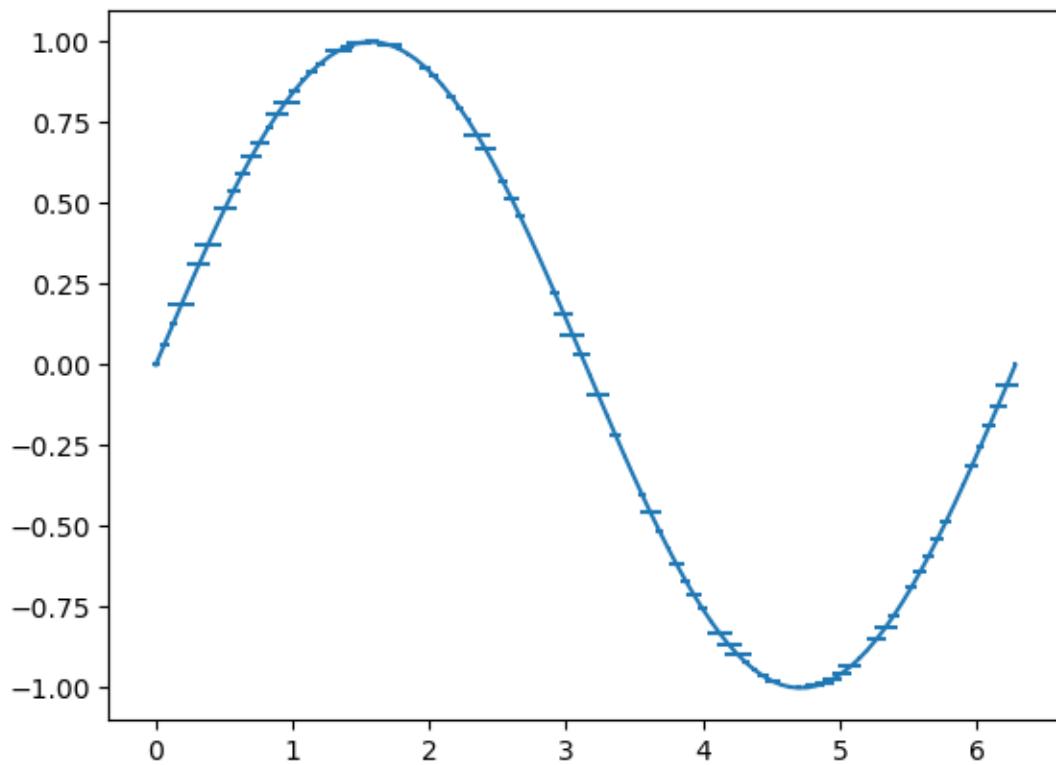


5.1 err graph

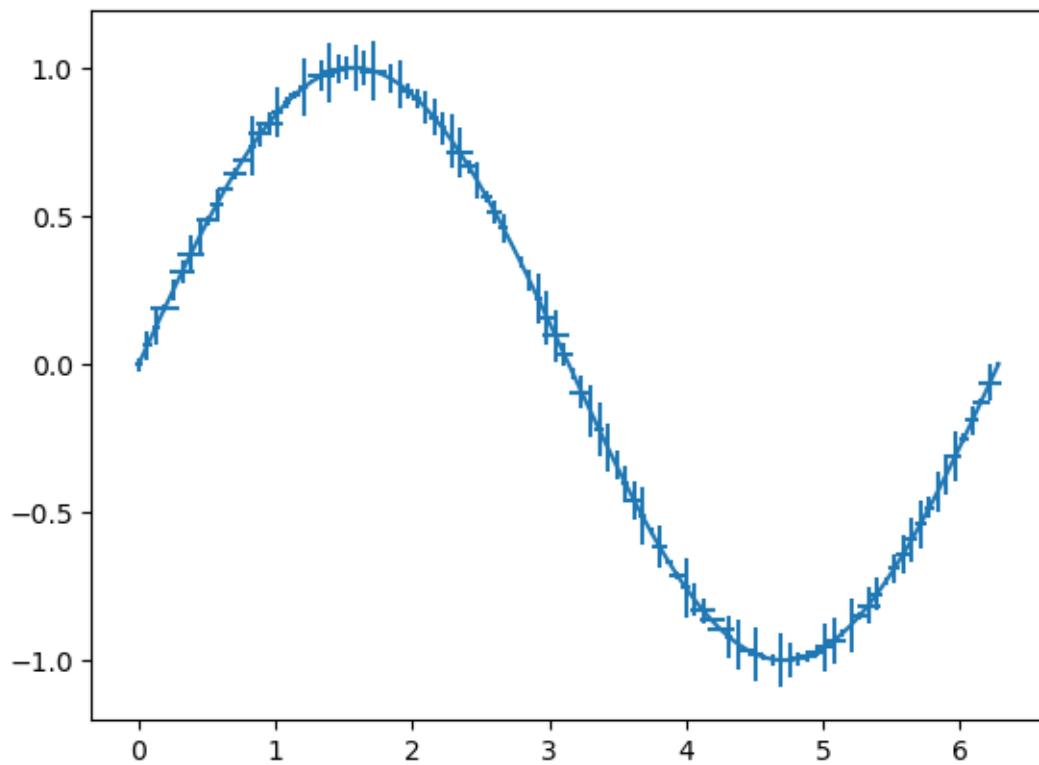
```
x = np.linspace (0, 2 * np.pi, 100)
y = np.sin(x)
ye = np.random.rand(len(x))/10
plt.errorbar(x, y, yerr = ye)
plt.show()
```



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



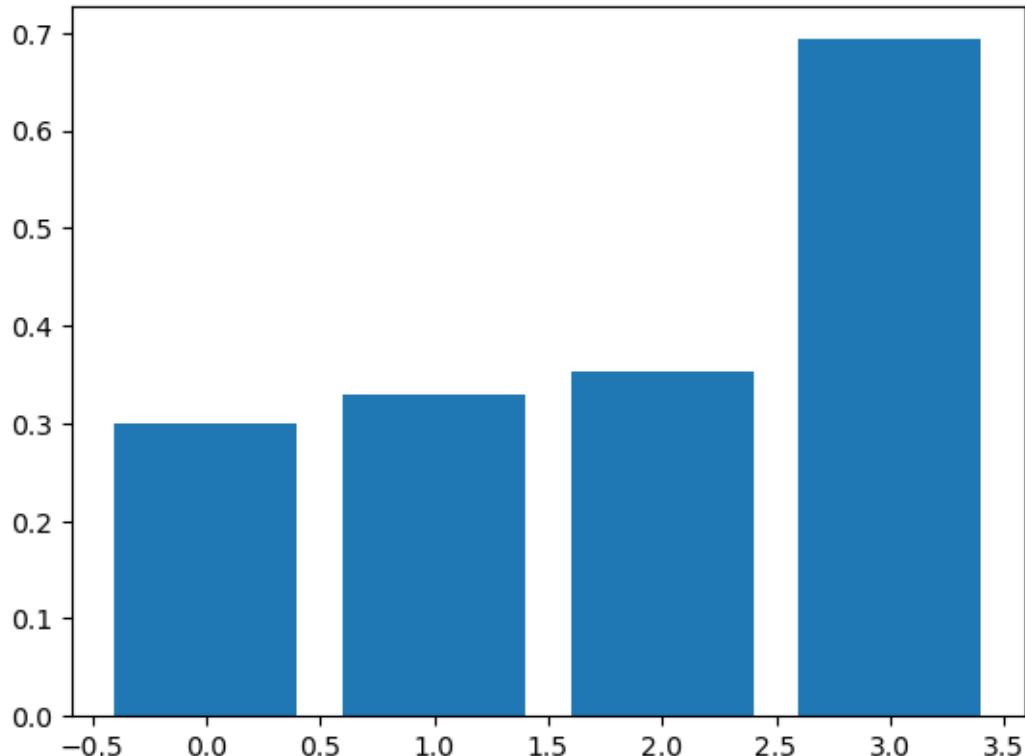
```
plt.errorbar(x, y, xerr = xe, yerr = ye)  
plt.show()
```



5.2 bar graph

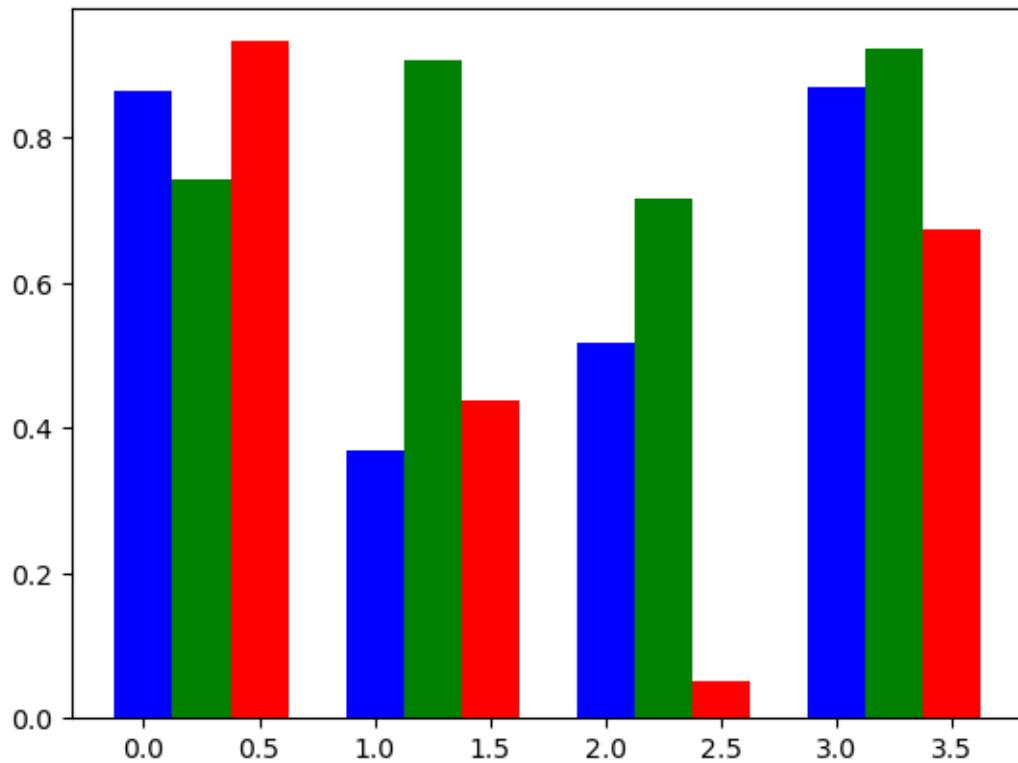
```
x = np.arange(4)
y = np.random.rand(4)
print(x)
print(y)
plt.bar(x, y)
plt.show()
```

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



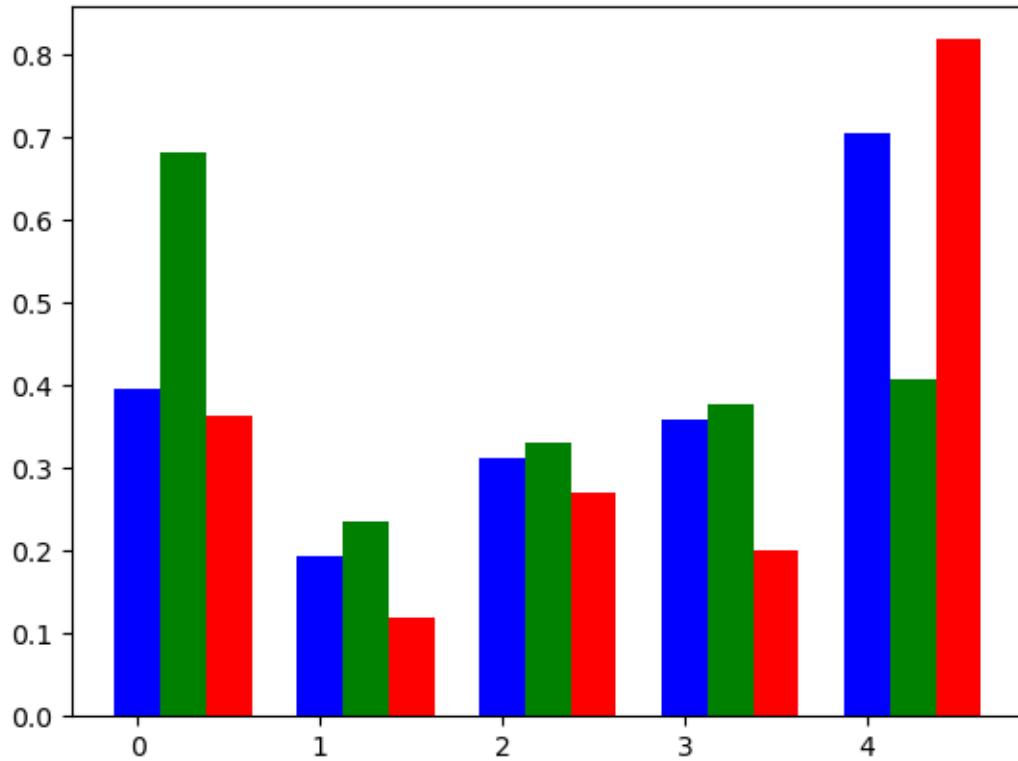
```
x = np.arange(4)
y = np.random.rand(3, 4)
print(x)
# assume 4 bar first as above
# within each bar we have 3 bars
print(y)
plt.bar(x + 0.00, y[0], color = 'b', width = 0.25)
plt.bar(x + 0.25, y[1], color = 'g', width = 0.25)
plt.bar(x + 0.50, y[2], color = 'r', width = 0.25)
plt.show()
```

```
[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]]
```



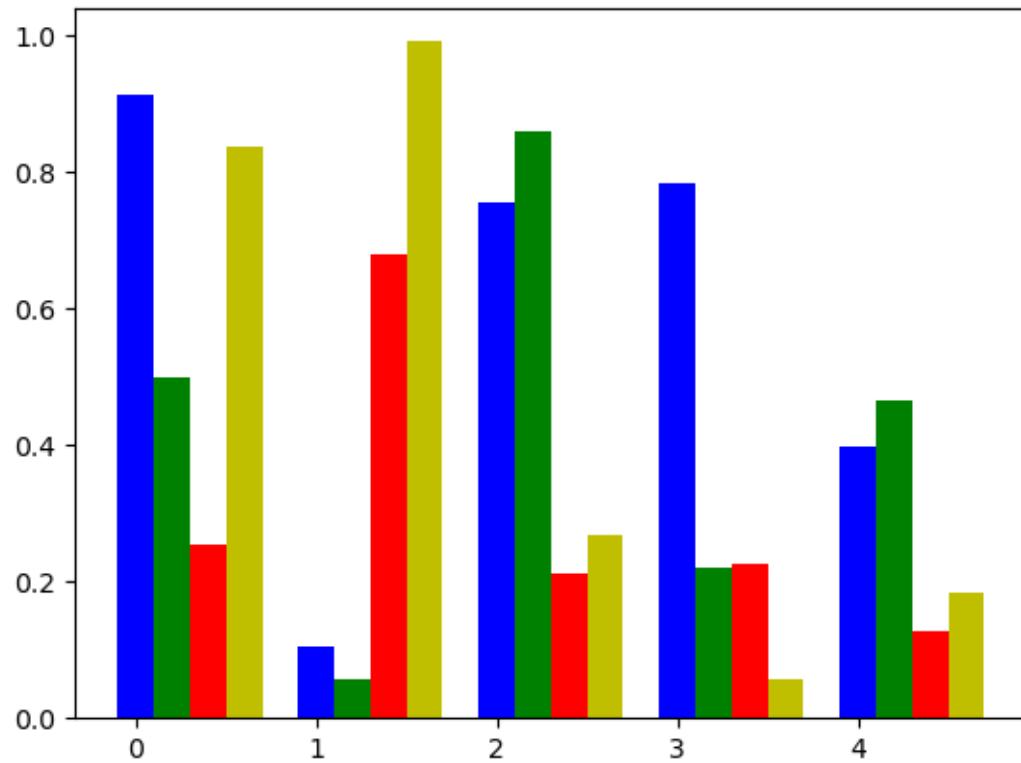
```
# cannot assume x = np.arange(4)
x = np.arange(5)
y = np.random.rand(3, 5)
print(x)
# assume 4 bar first as above
# within each bar we have 3 bars
print(y)
plt.bar(x + 0.00, y[0], color = 'b', width = 0.25)
plt.bar(x + 0.25, y[1], color = 'g', width = 0.25)
plt.bar(x + 0.50, y[2], color = 'r', width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

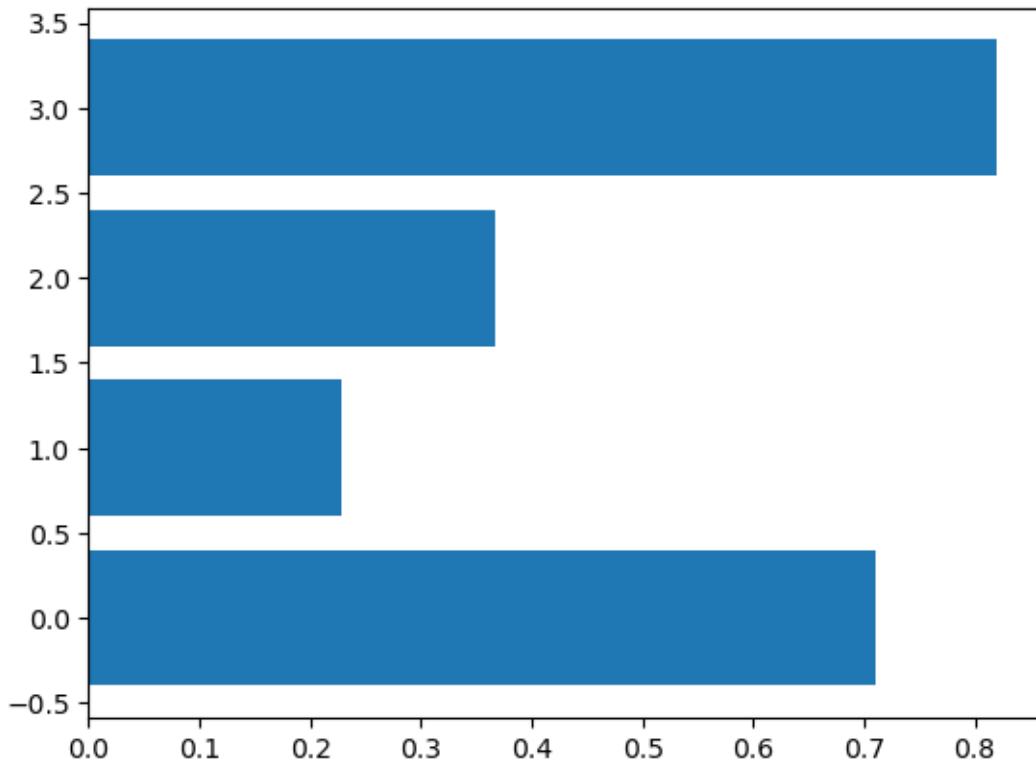


```
# cannot assume x = np.arange(4)
x = np.arange(5)
y = np.random.rand(4, 5)
print(x)
# assume 4 bar first as above
# within each bar we have 3 bars
print(y)
plt.bar(x + 0.00, y[0], color = 'b', width = 0.2)
plt.bar(x + 0.2, y[1], color = 'g', width = 0.2)
plt.bar(x + 0.4, y[2], color = 'r', width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

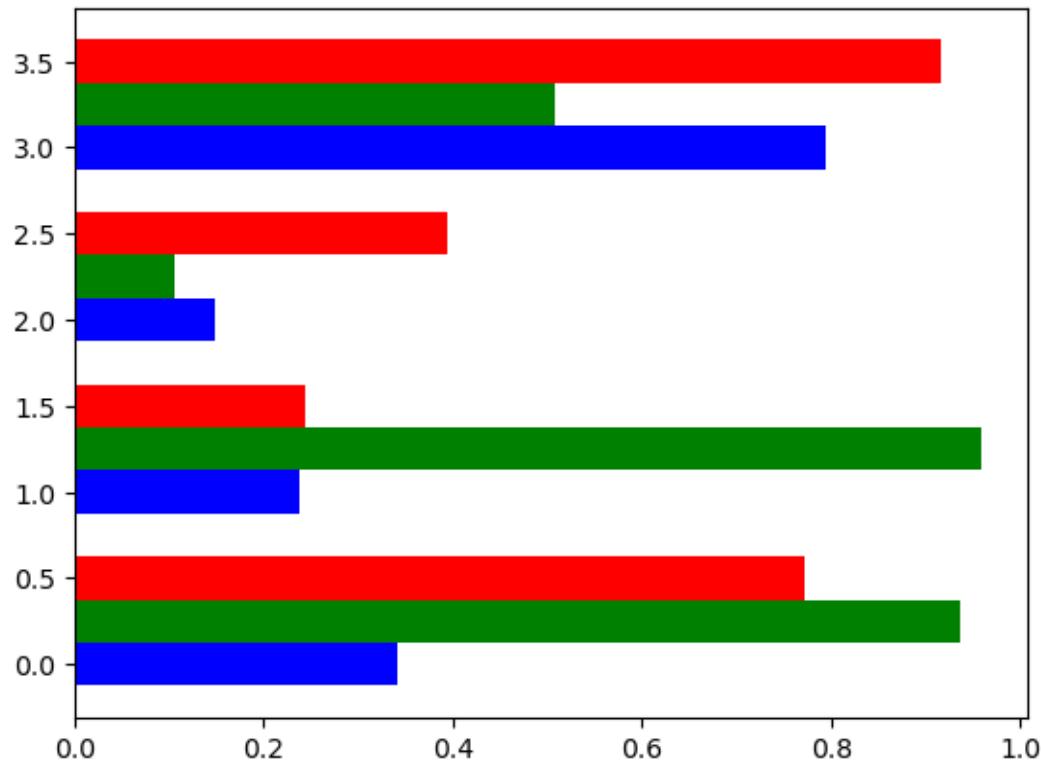
```
[0 1 2 3 4]
[[0.91152774 0.10535867 0.75611762 0.78299998 0.39844081]
 [0.49969485 0.0556701 0.85857802 0.22033525 0.4638407 ]
 [0.25360518 0.67889565 0.21317951 0.22539712 0.12797681]
 [0.83800133 0.99071833 0.26900332 0.05776595 0.1833309 ]]
```



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

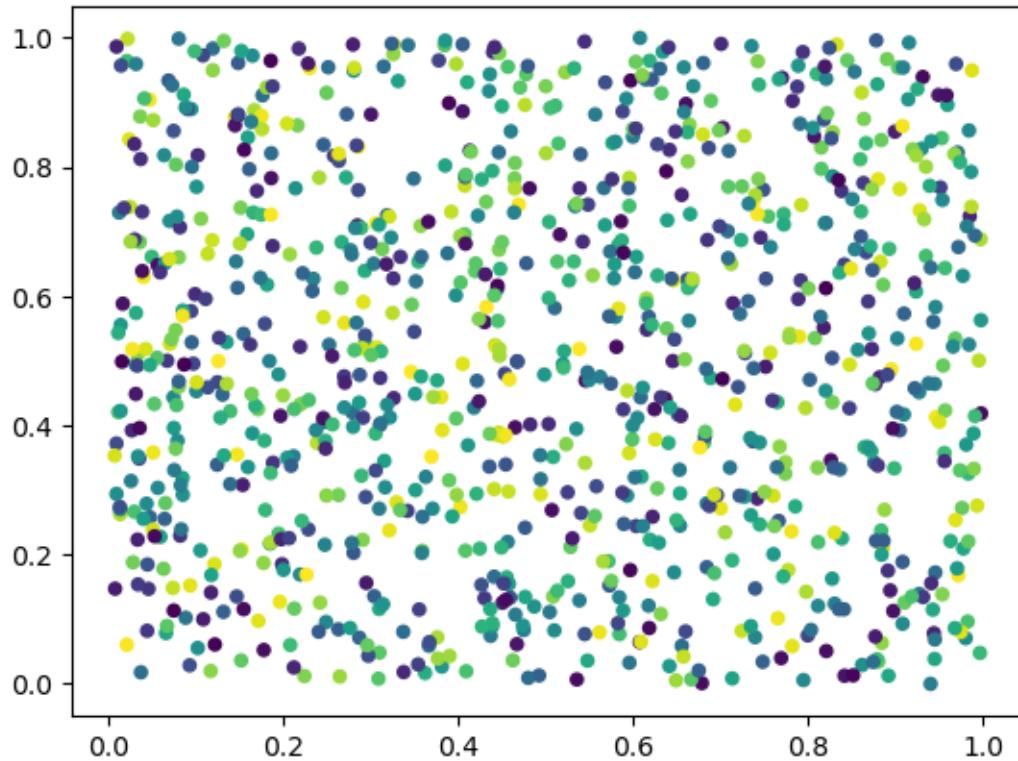


```
y = np.random.rand(3, 4)
plt.barh(x + 0.00, y[0], color = 'b', height=0.25)
plt.barh(x + 0.25, y[1], color = 'g', height=0.25)
plt.barh(x + 0.50, y[2], color = 'r', height=0.25)
plt.show()
```

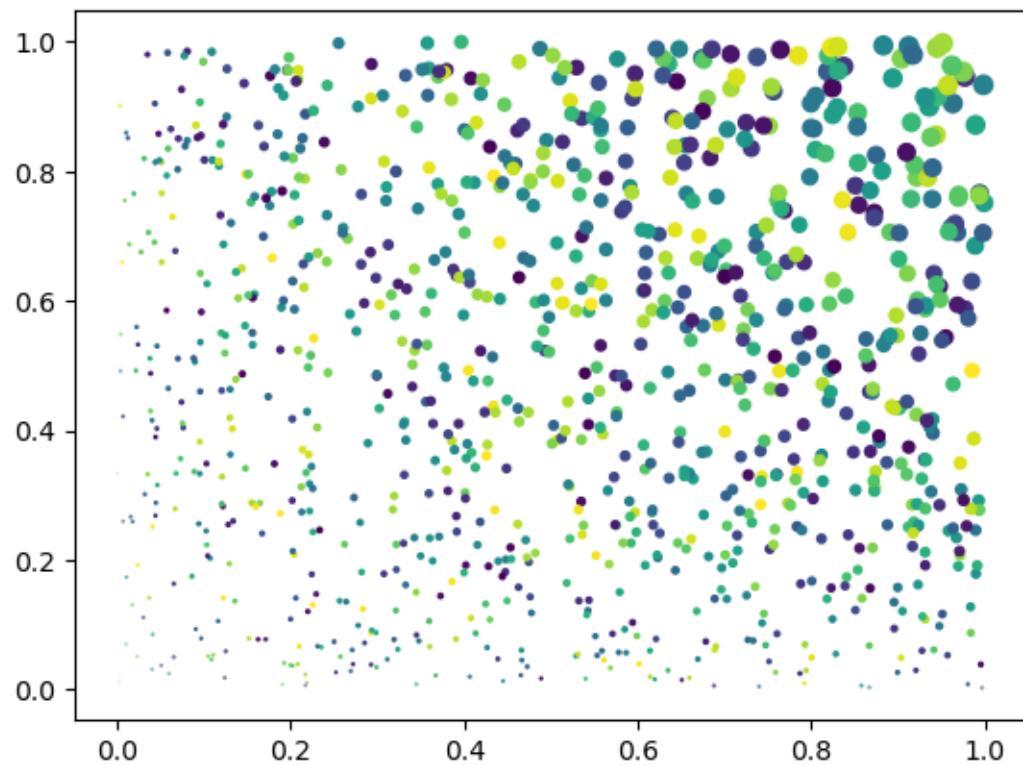


5.3 scatter plot

```
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()
```



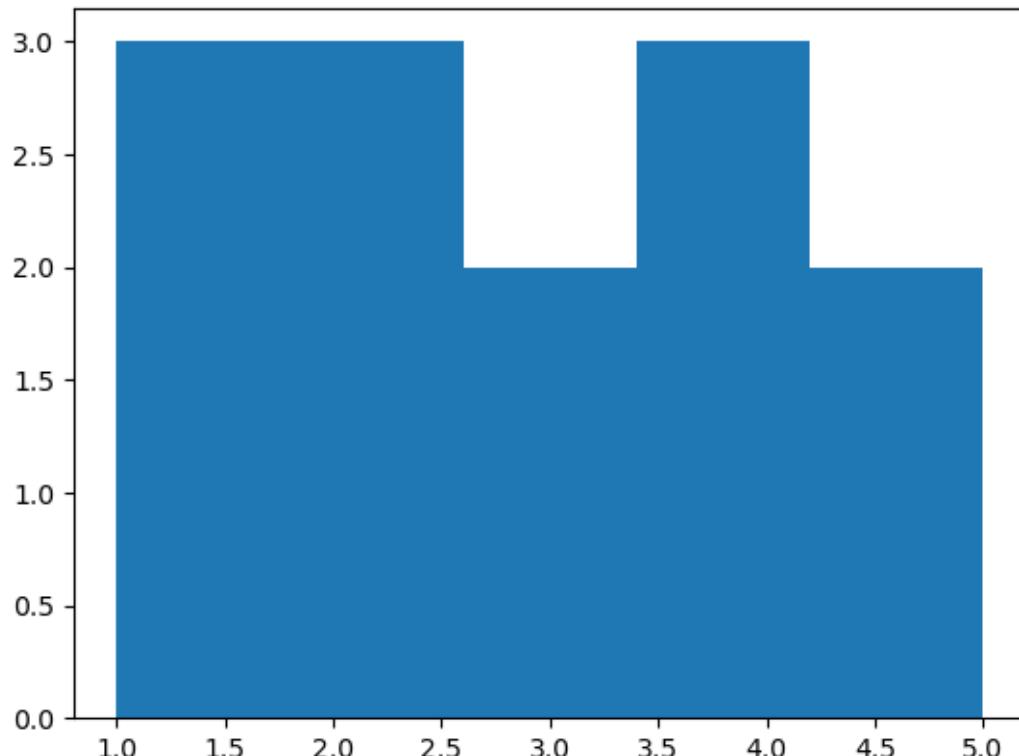
```
N = 1000
x = np.random.rand(N)
y = np.random.rand(N)
colors = np.random.rand(N)
size = (50 * x * y)
plt.scatter(x, y, s=size, c=colors, alpha=1)
plt.show()
```



HANDON-CH7

6.1 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()
```

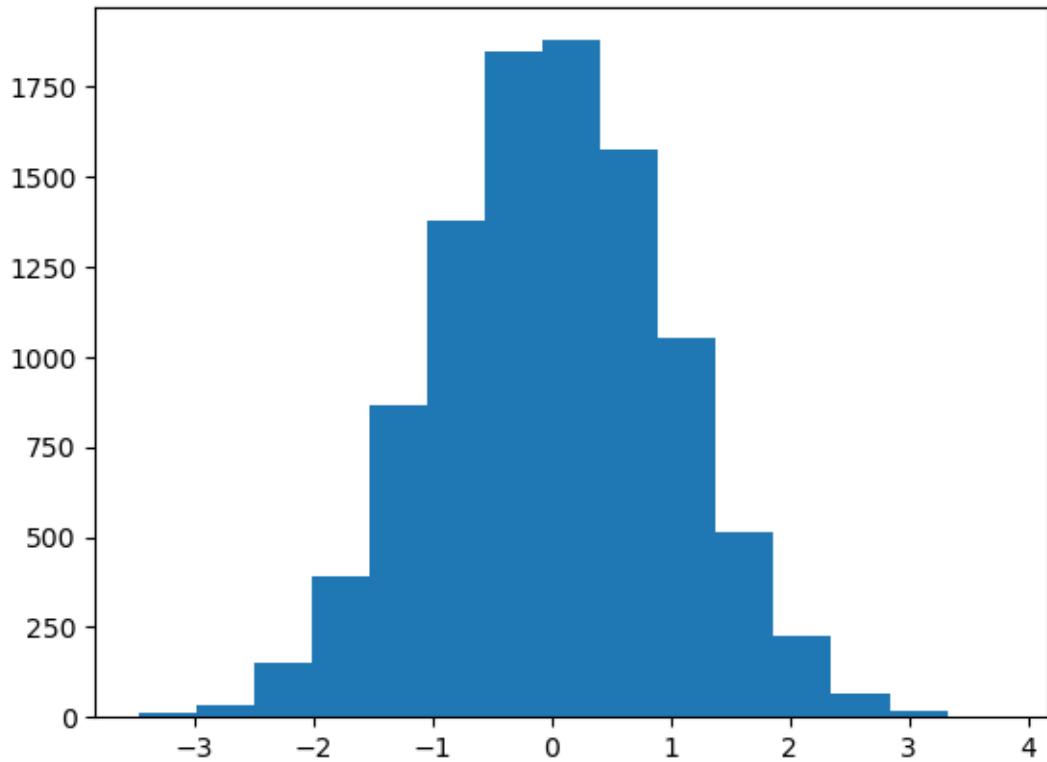


```
np.random.seed(31415)
n_points = 10000
n_bins = 15
x = np.random.randn(n_points)
```

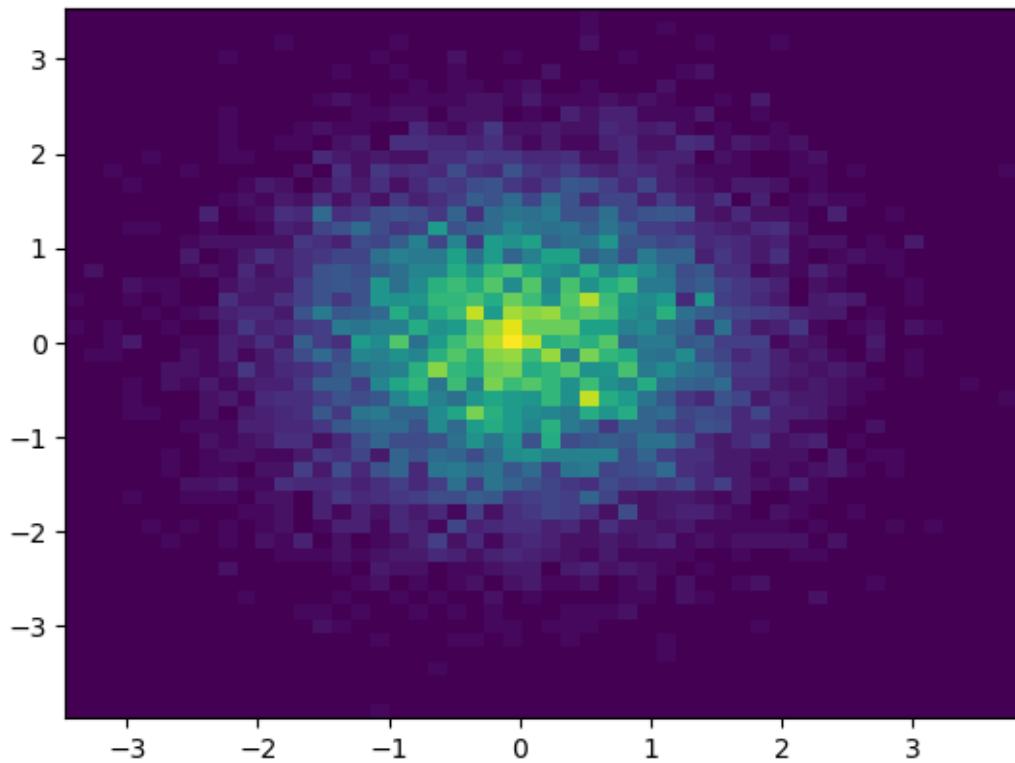
(continues on next page)

(continued from previous page)

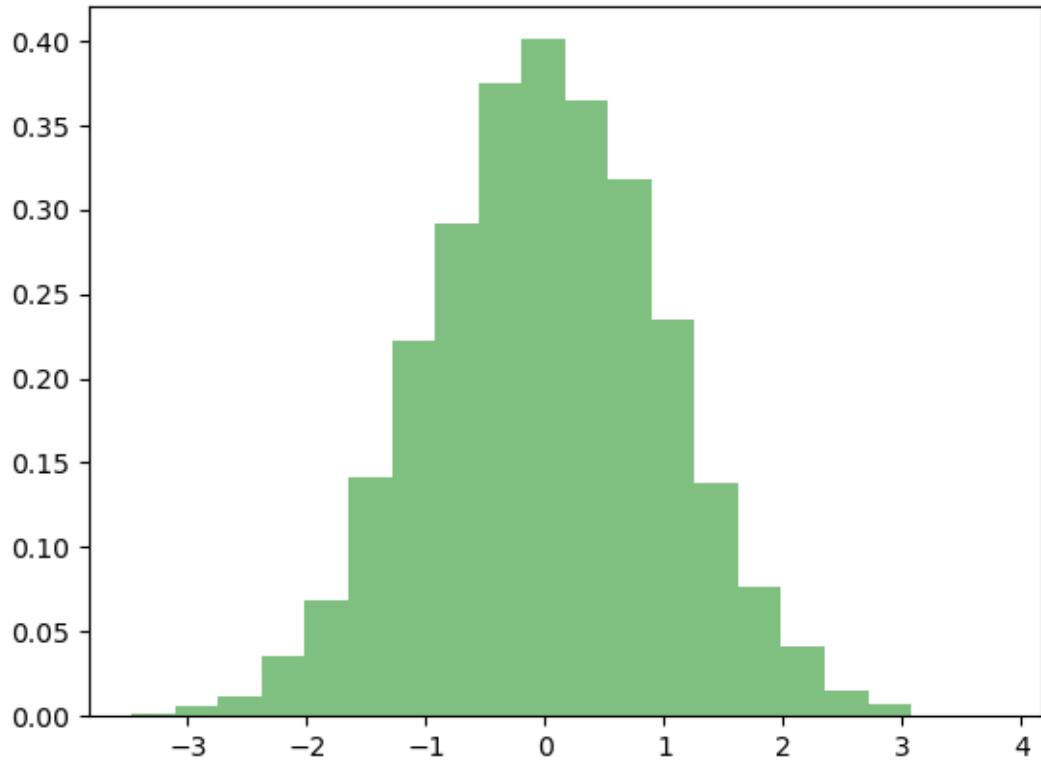
```
plt.hist(x, bins=n_bins)  
plt.show()
```



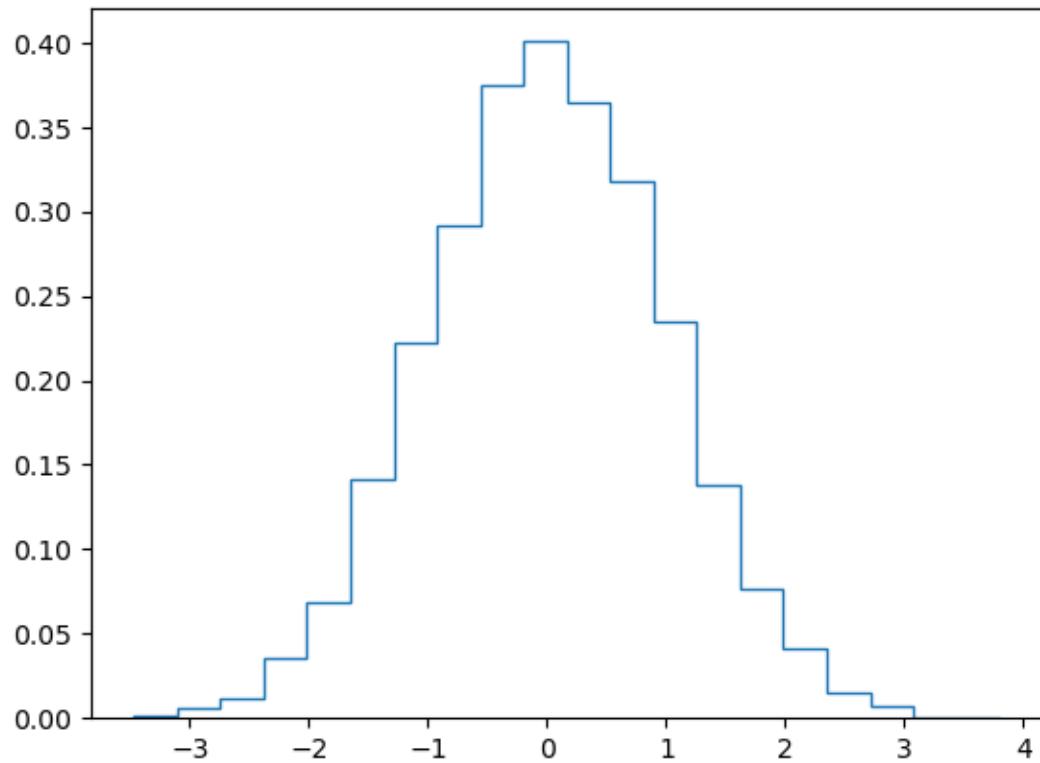
```
y = np.random.randn(n_points)  
plt.hist2d(x, y, bins=50)  
plt.show()
```



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

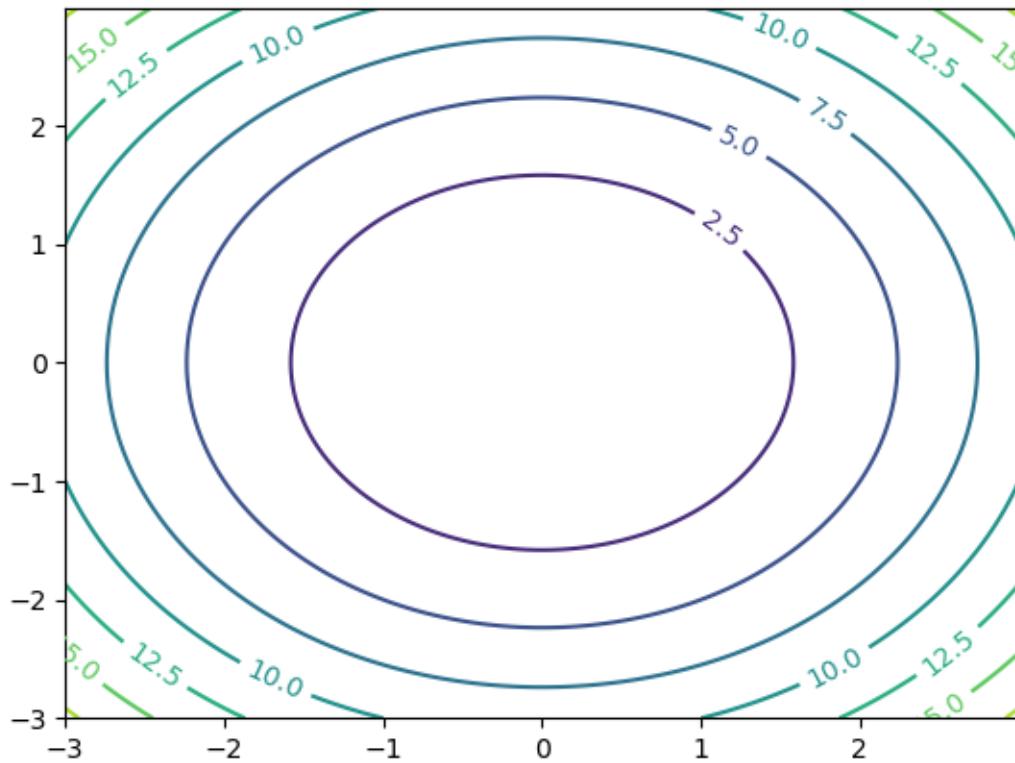


```
plt.hist(x, 20, density=True,  
         histtype='step')  
plt.show()
```

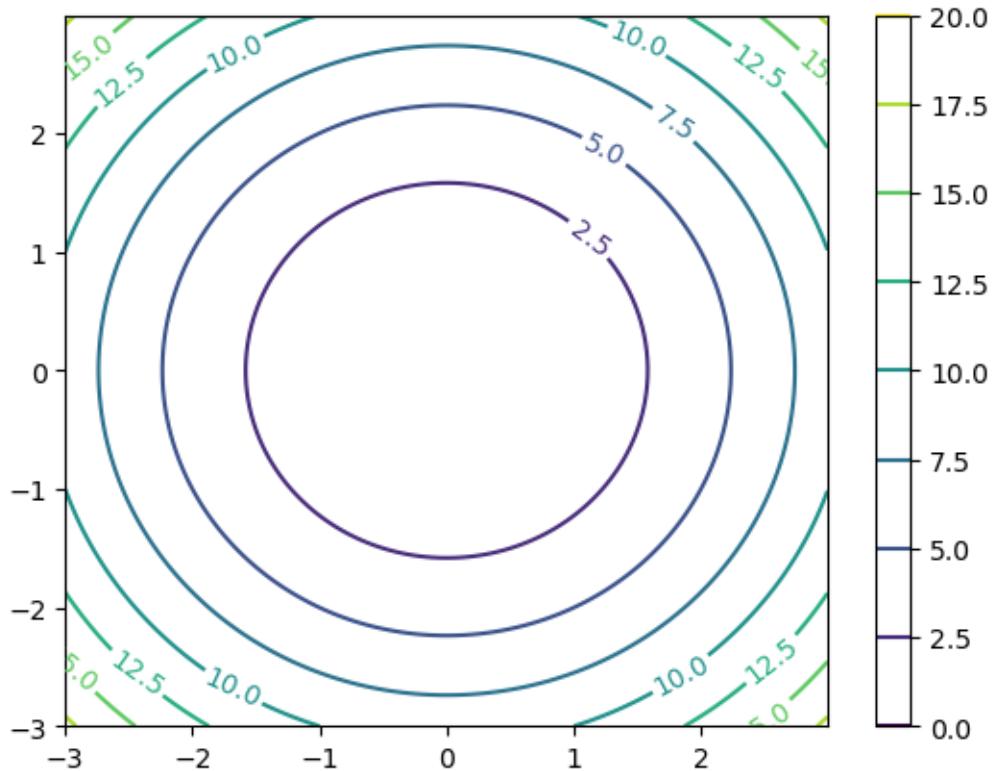


6.2 contours

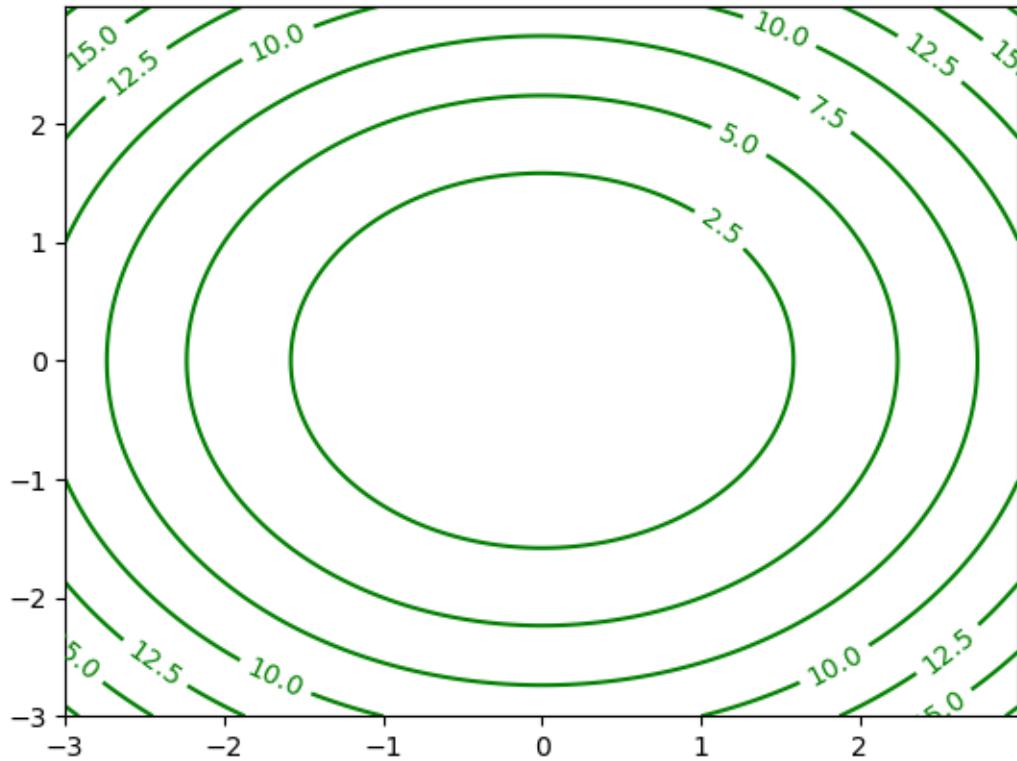
```
x = np.arange(-3, 3, 0.005)
y = np.arange(-3, 3, 0.005)
X, Y = np.meshgrid(x, y)
Z = (X**2 + Y**2)
out = plt.contour(X, Y, Z)
plt.clabel(out, inline=True,
           fontsize=10)
plt.show()
```



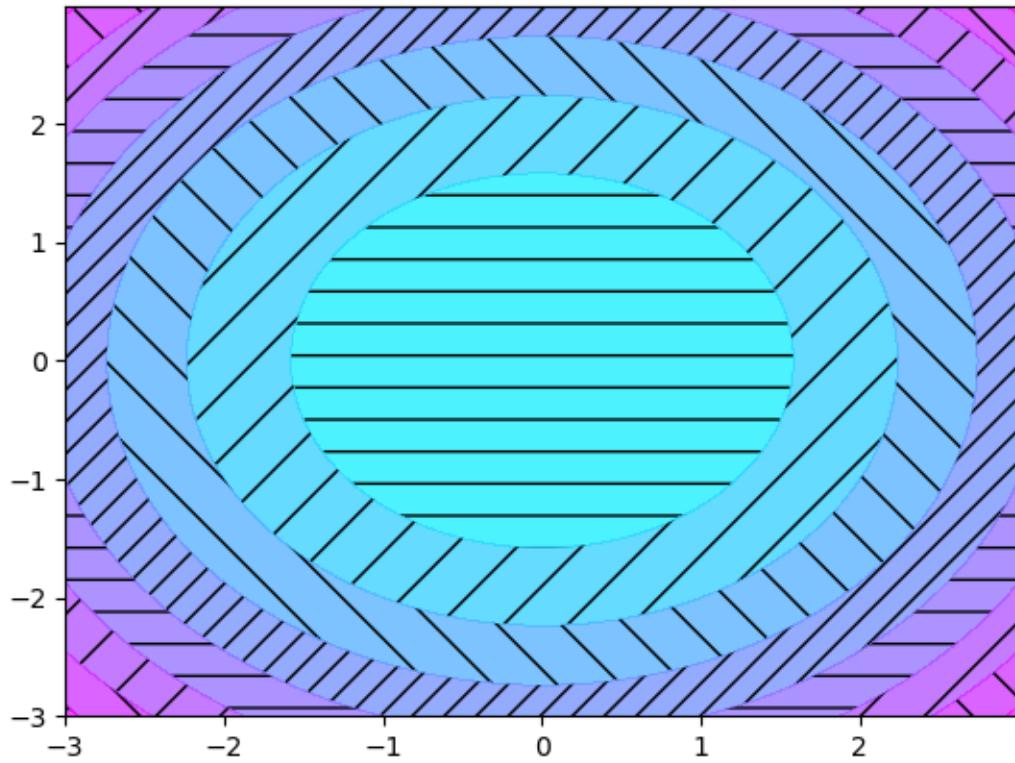
```
out = plt.contour(X, Y, Z)
plt.clabel(out, inline=True,
          fontsize=10)
plt.colorbar(out)
plt.show()
```



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

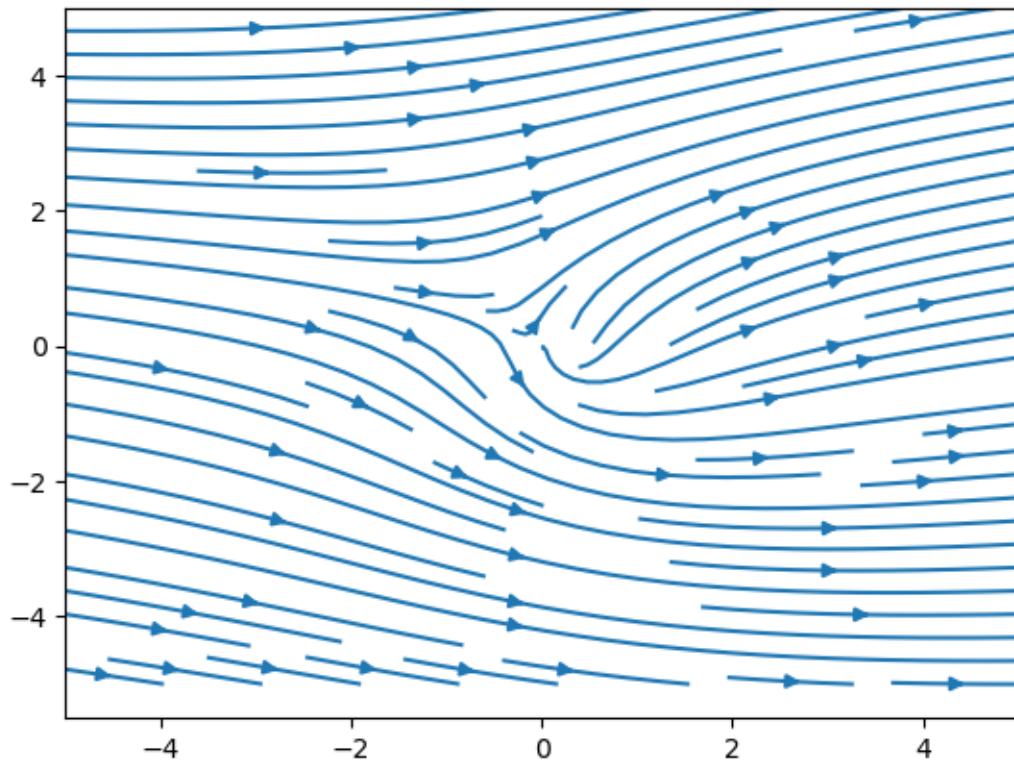


```
plt.contourf(X, Y, Z,
             hatches=['-', '/','\\','//'],
             cmap='cool',
             alpha=0.75)
#err plt.colorbar(X)
plt.show()
```

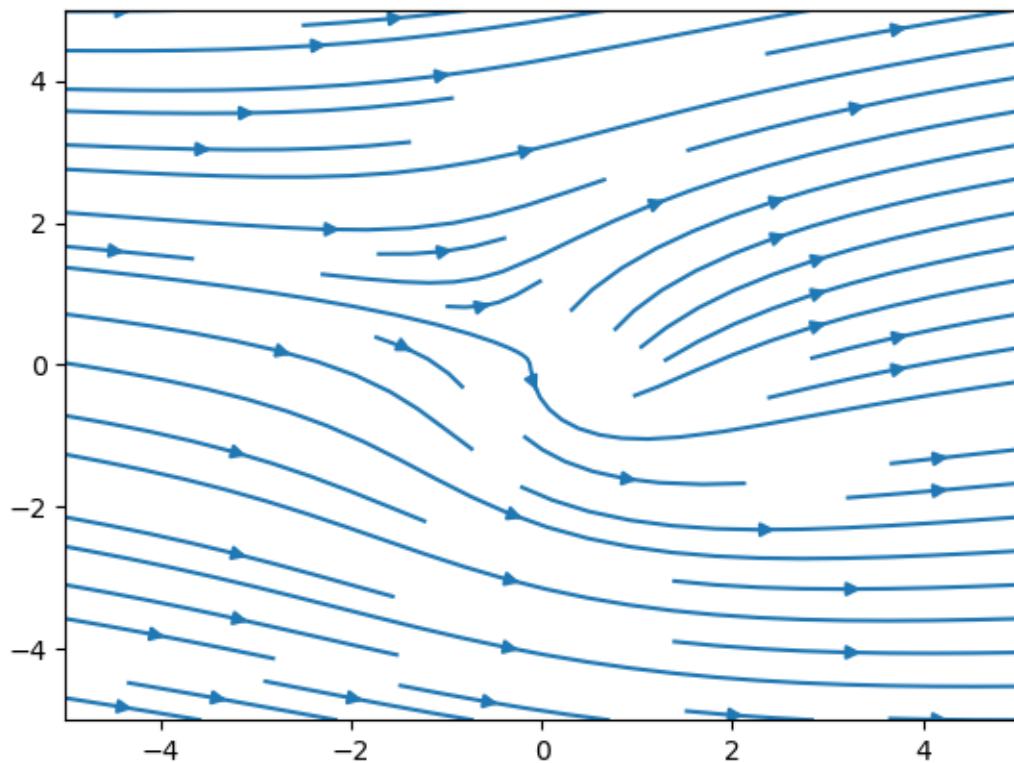


vector

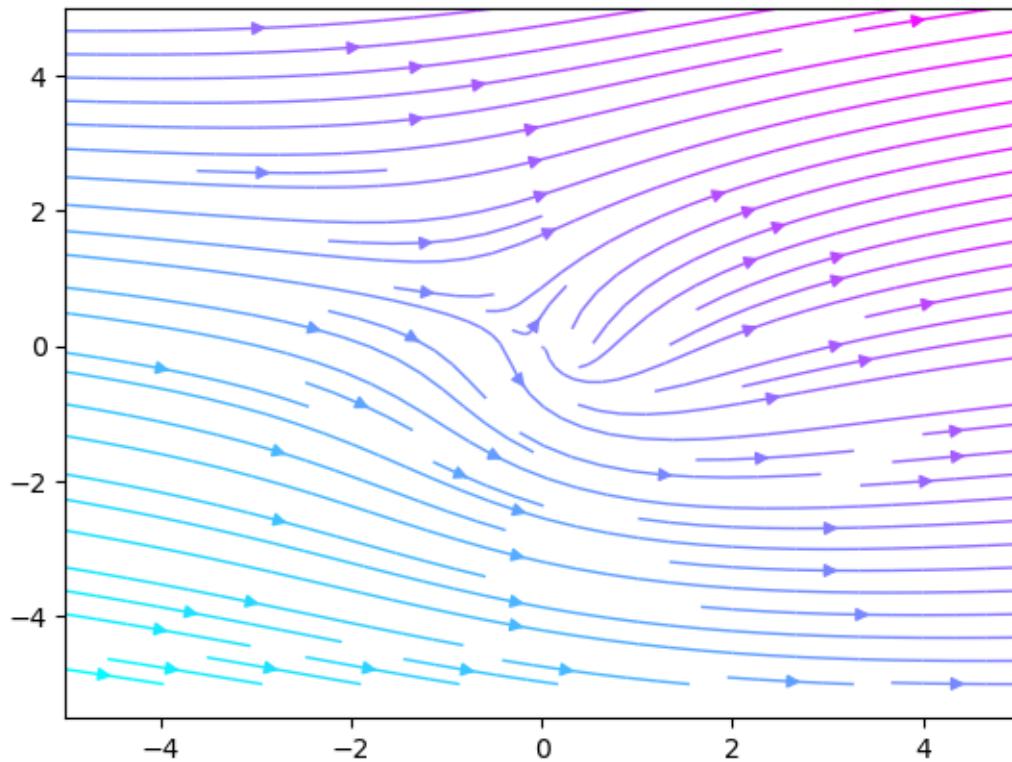
```
Y, X = np.mgrid[-5:5:200j, -5:5:300j]
U = X**2 + Y**2
V=X+ Y
plt.streamplot(X, Y, U, V)
plt.show()
```



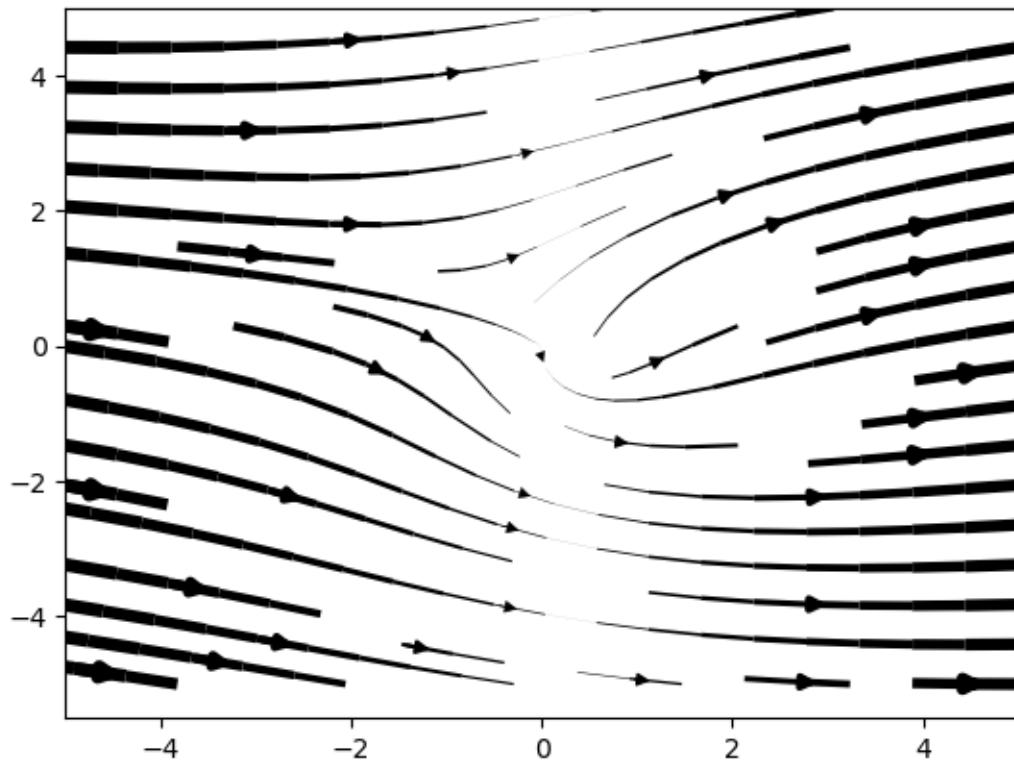
```
plt.streamplot(X, Y, U, V, density=[0.5, 0.75])  
plt.show()
```



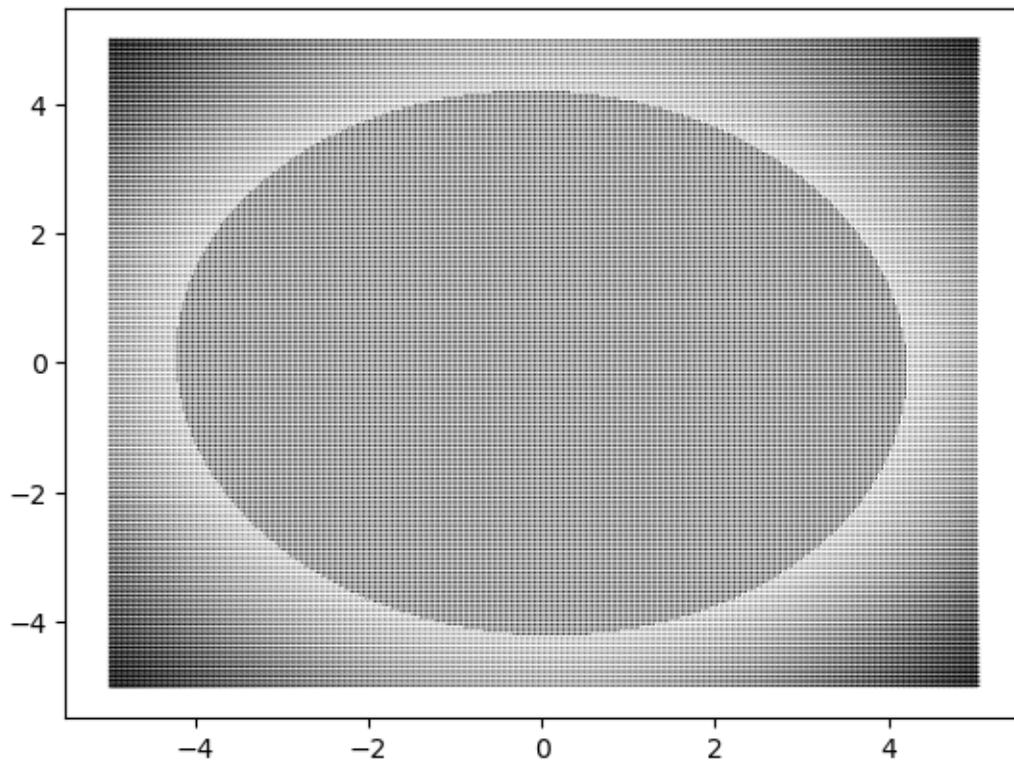
```
plt.streamplot(X, Y, U, V, color=V,  
               linewidth=1, cmap='cool')  
plt.show()
```



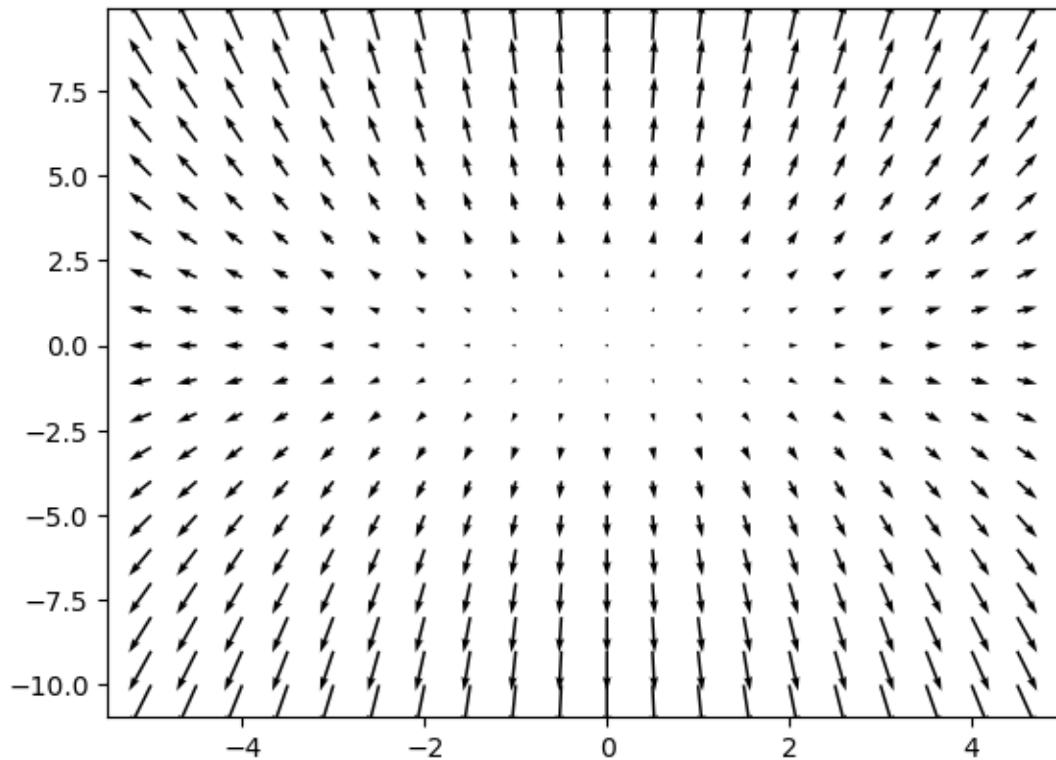
```
plt.streamplot(X, Y, U, V,density=0.6,color='k', linewidth=X)  
plt.show()
```



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

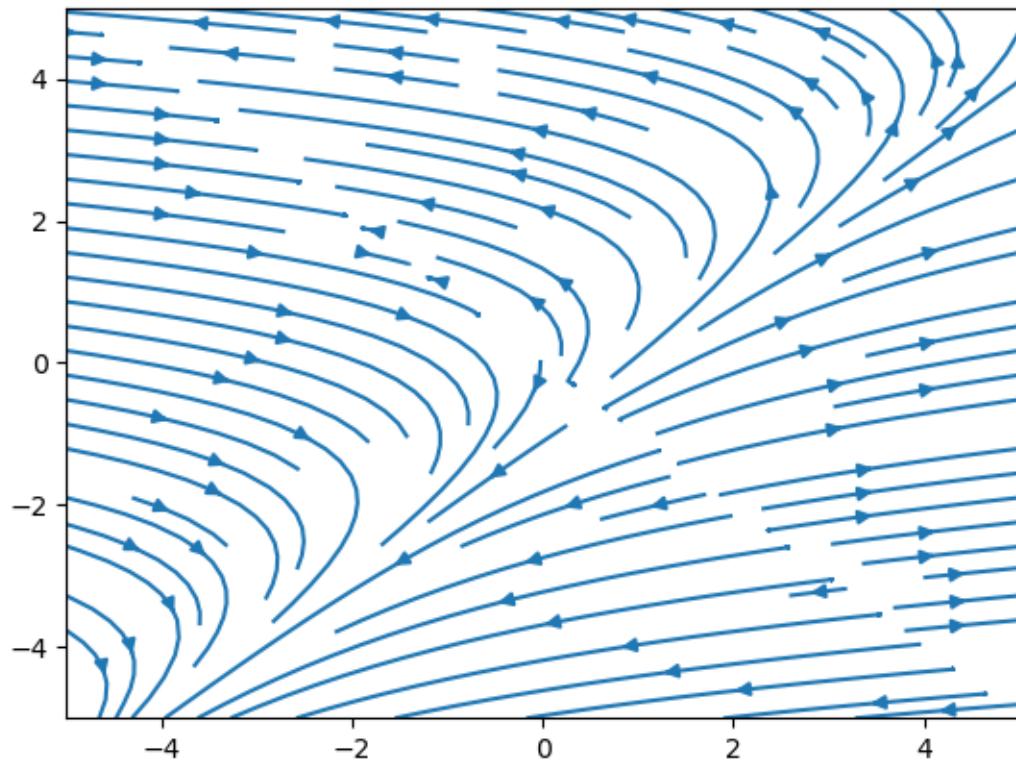


```
X = np.arange(-5, 5, 0.5)
Y = np.arange(-10, 10, 1)
U, V = np.meshgrid(X, Y)
plt.quiver(X, Y, U, V)
plt.show()
```

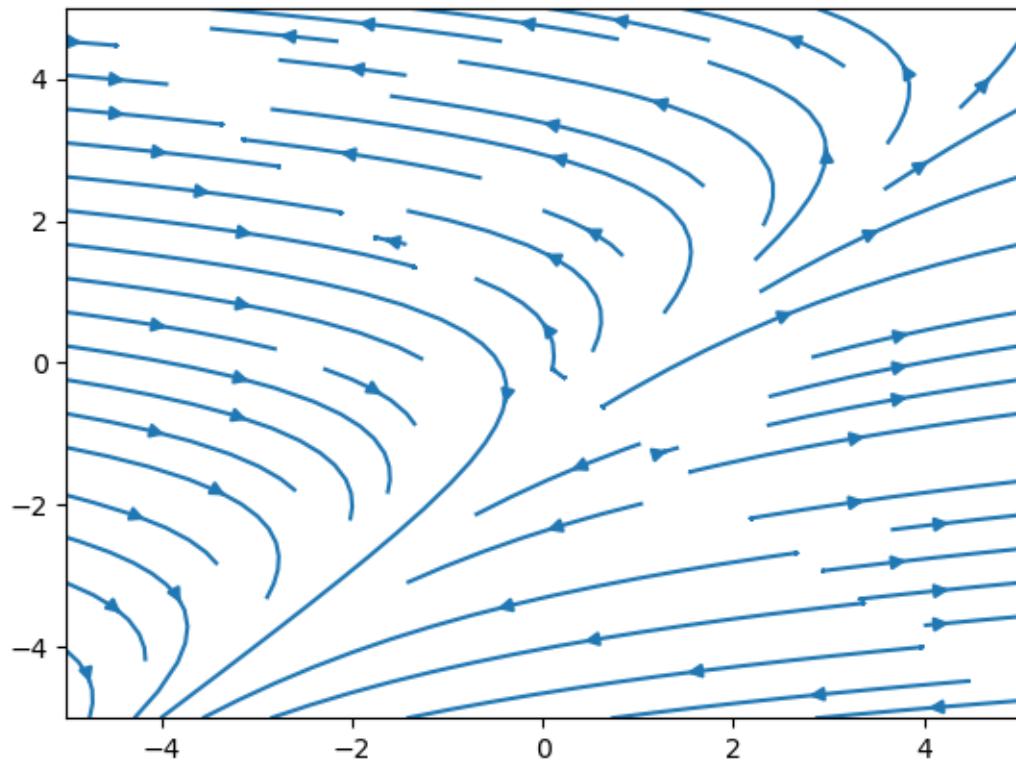


6.3 hyperbola

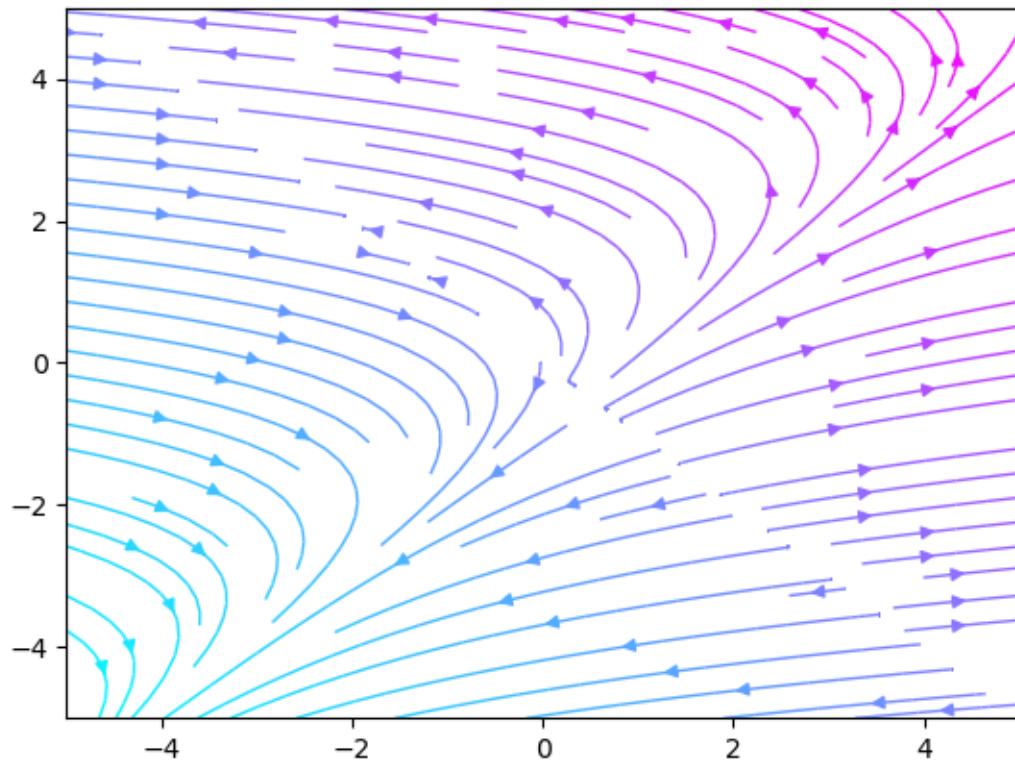
```
# hyperbola
Y, X = np.mgrid[-5:5:200j, -5:5:300j]
U = X**2 - Y**2
V=X+ Y
plt.streamplot(X, Y, U, V)
plt.show()
```



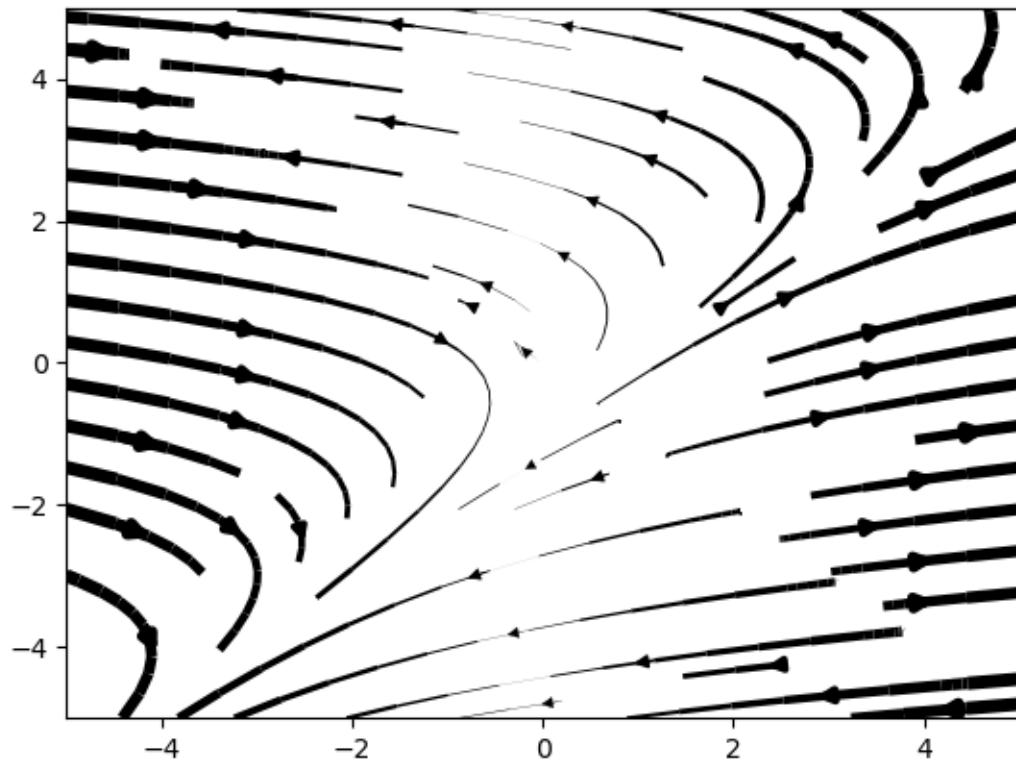
```
plt.streamplot(X, Y, U, V, density=[0.5, 0.75])  
plt.show()
```



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

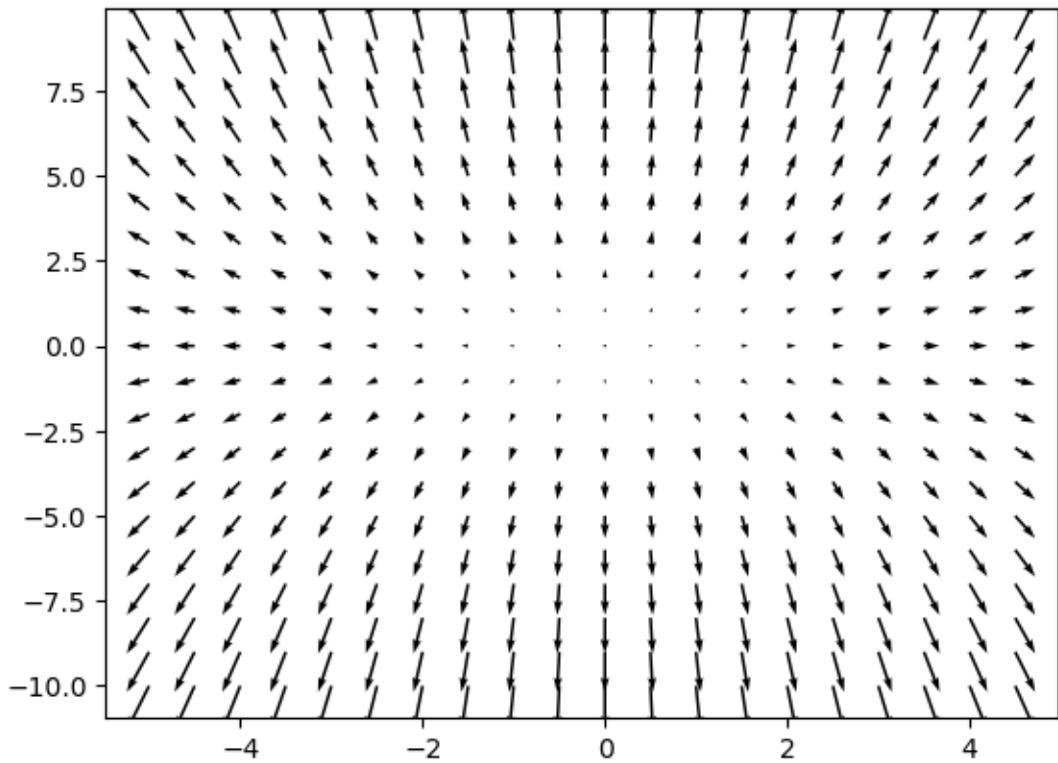


```
plt.streamplot(X, Y, U, V,
               density=0.6,
               color='k',
               linewidth=X)
plt.show()
```

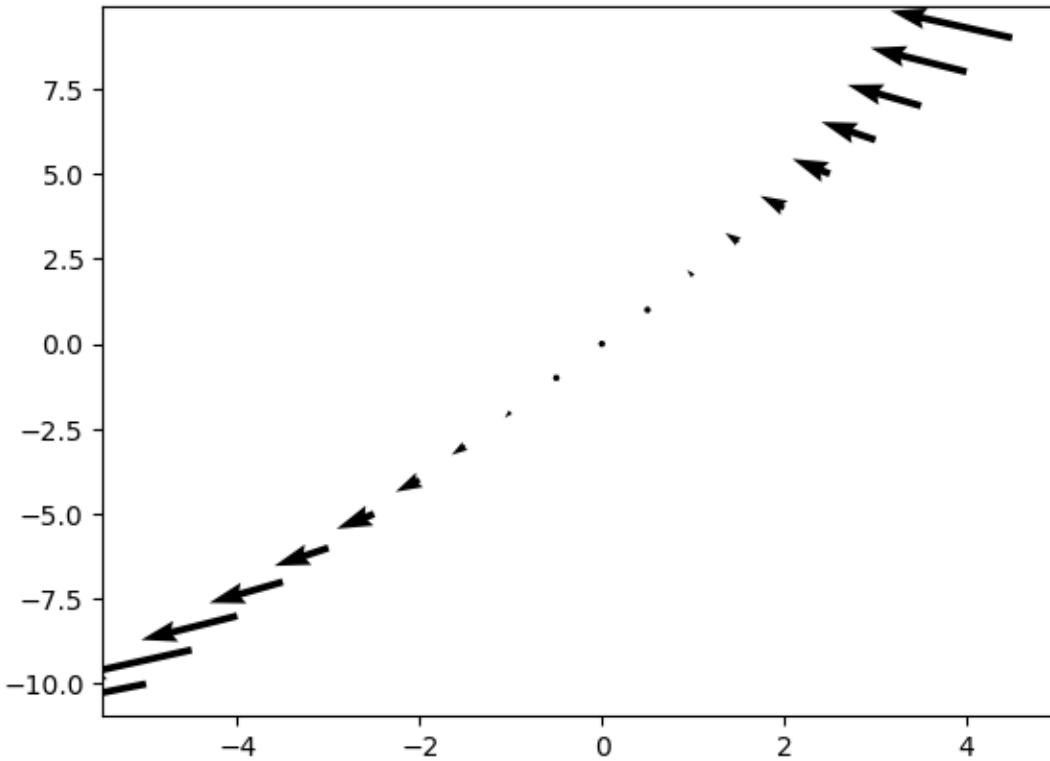


6.4 mesh grid vector

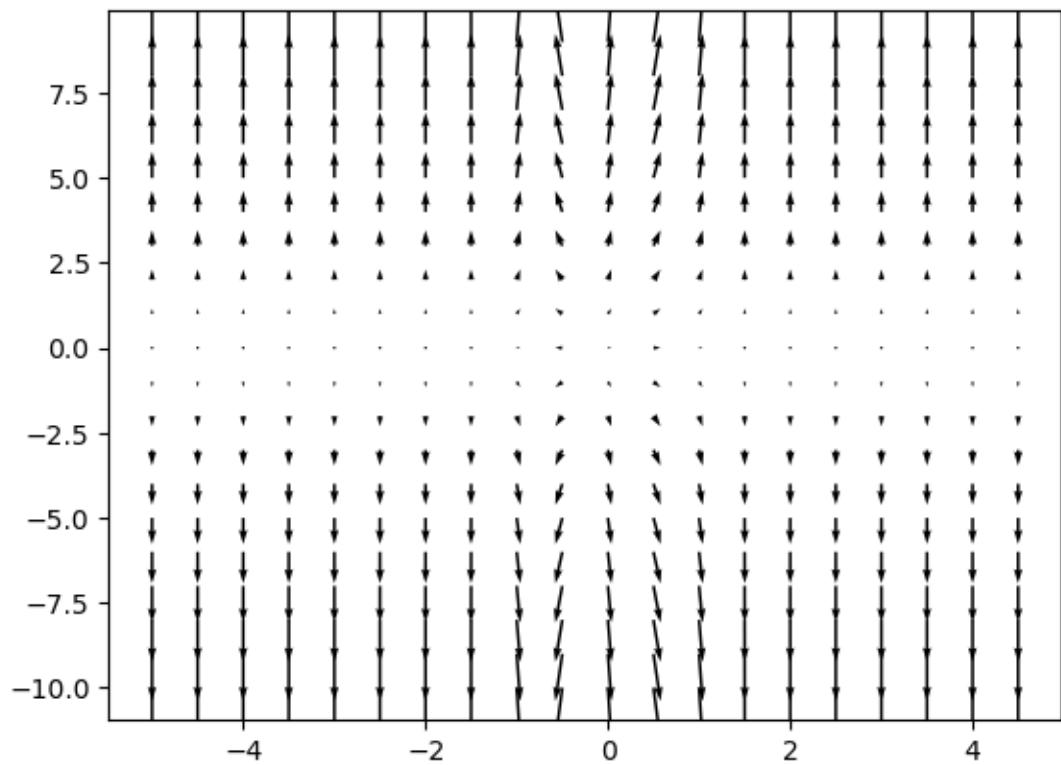
```
X = np.arange(-5, 5, 0.5)
Y = np.arange(-10, 10, 1)
U, V = np.meshgrid(X, Y)
plt.quiver(X, Y, U, V)
plt.show()
```



```
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]]
```

(continues on next page)

(continued from previous page)

```
[223 223 223 192]
[228 228 228 49]]
```

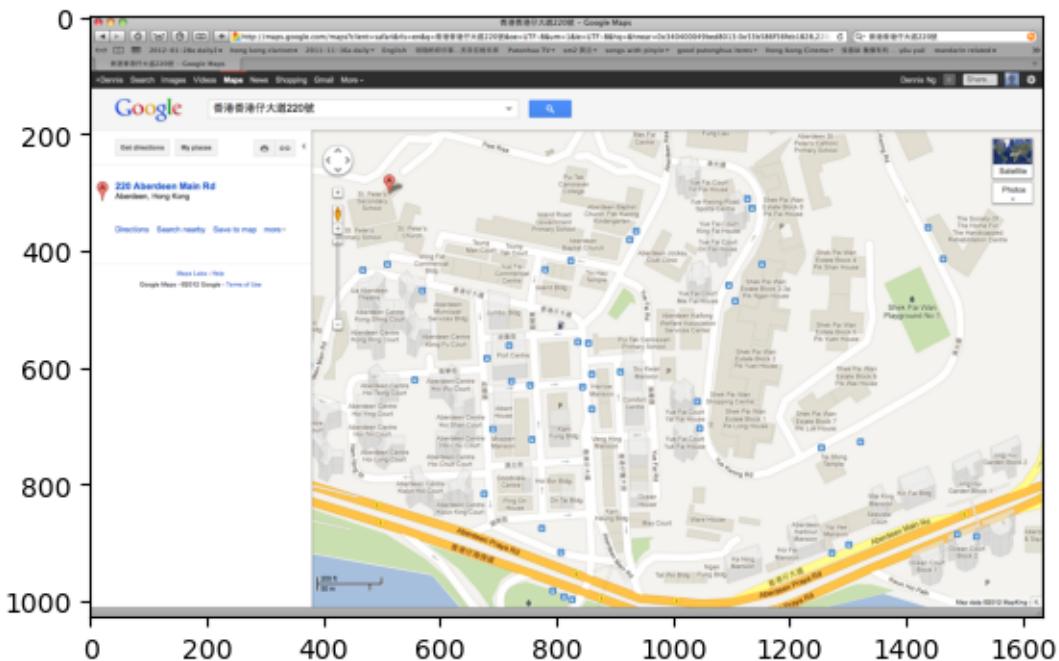
```
[[222 222 222 134]
[210 210 210 255]
[207 207 207 255]
...
[207 207 207 255]
[210 210 210 255]
[221 221 221 135]]
```

```
...
[[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'>
```

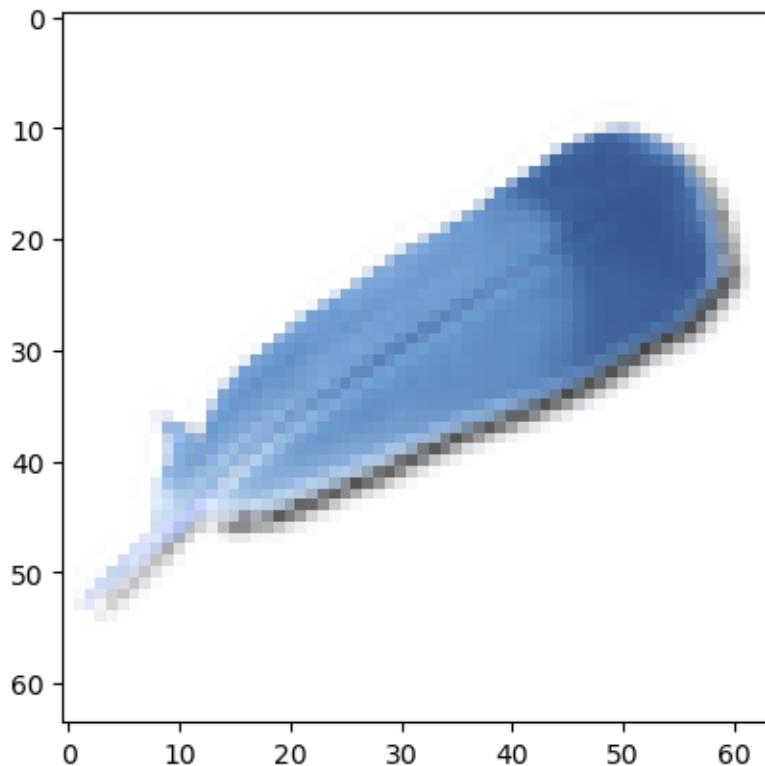


```
[[[0 0 0 0]
 [0 0 0 0]
 [0 0 0 0]
 ...
 [0 0 0 0]
 [0 0 0 0]
 [0 0 0 0]]
 
 [[[0 0 0 0]
 [0 0 0 0]
 [0 0 0 0]
 ...
 [0 0 0 0]
 [0 0 0 0]
 [0 0 0 0]]
 
 ...
 
 [[[0 0 0 0]
 [0 0 0 0]
 [0 0 0 0]
 ...
 [0 0 0 0]
 [0 0 0 0]
 [0 0 0 0]]]
```

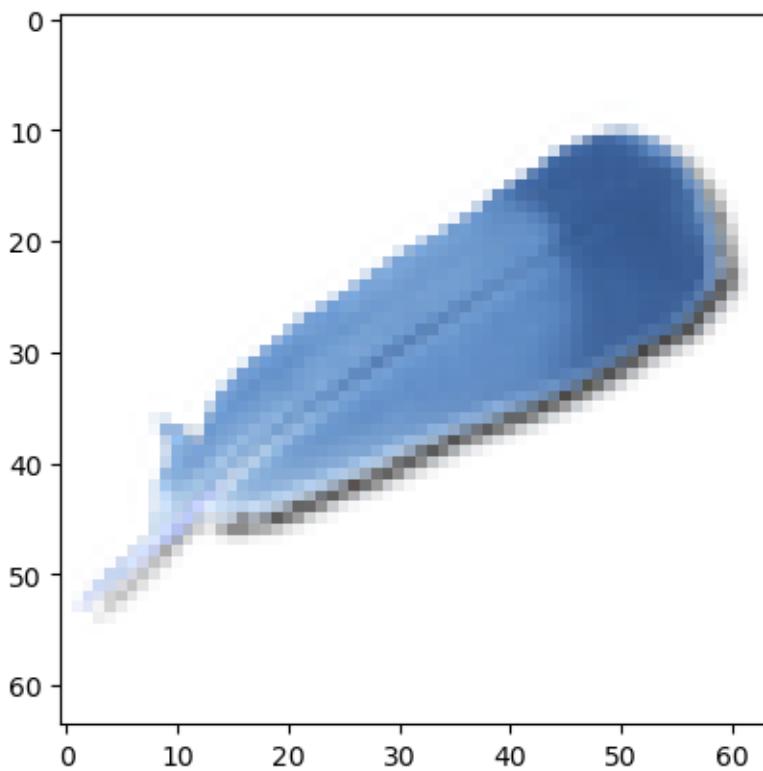
(continues on next page)

(continued from previous page)

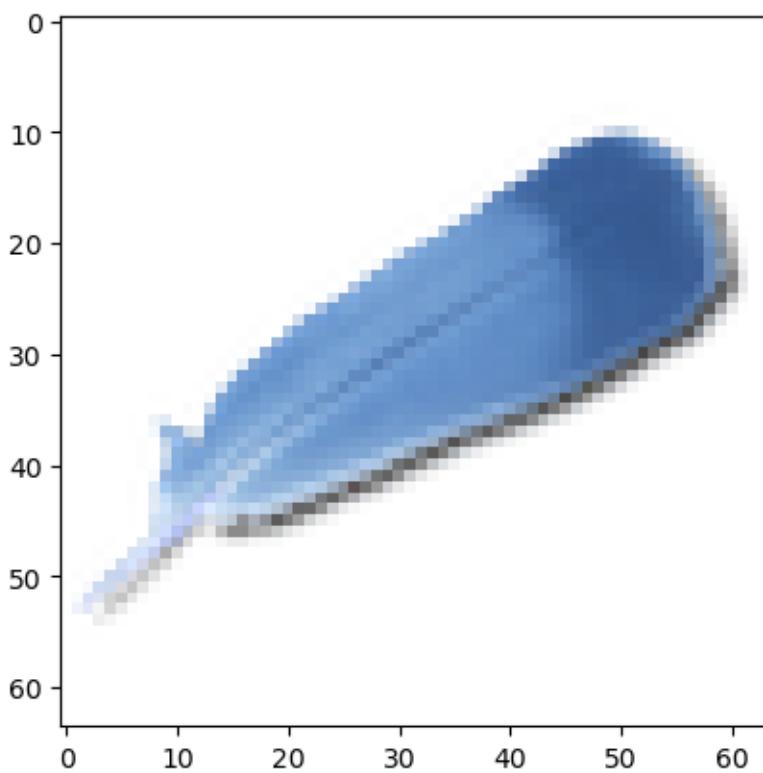
```
[[0 0 0 0]
 [0 0 0 0]
 [0 0 0 0]
 ...
 [0 0 0 0]
 [0 0 0 0]
 [0 0 0 0]]
[[0 0 0 0]
 [0 0 0 0]
 [0 0 0 0]
 ...
 [0 0 0 0]
 [0 0 0 0]
 [0 0 0 0]]
<class 'numpy.ndarray'>
```



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



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



```
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',
 'gist_stern',
```

(continues on next page)

(continued from previous page)

```
'gist_yarg',
'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',
'viridis_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',
'PuOr_r',
```

(continues on next page)

(continued from previous page)

```
'PuRd_r',
'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',
'Set3_r',
```

(continues on next page)

(continued from previous page)

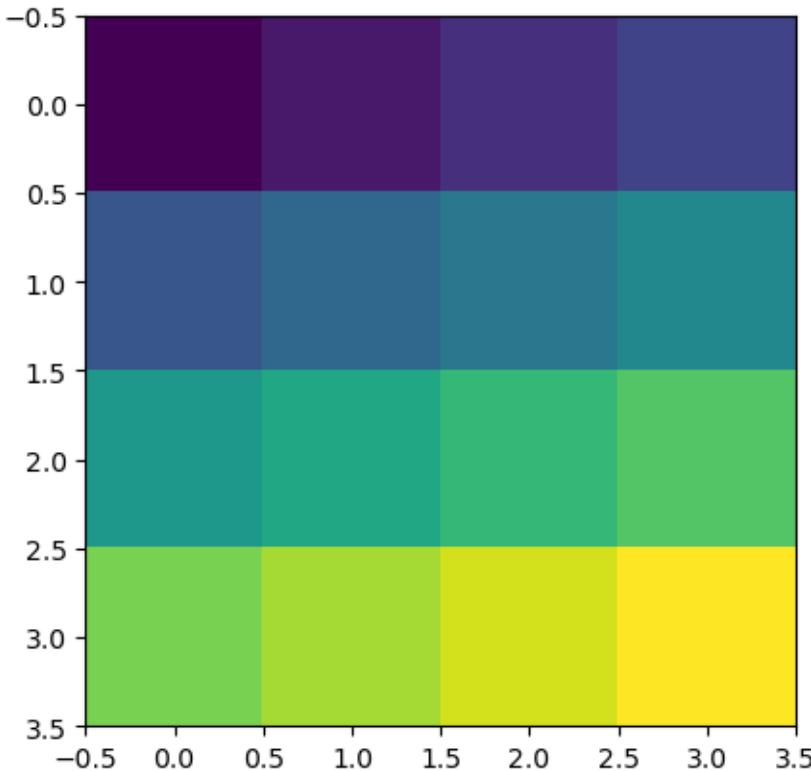
```
'tab10_r',
'tab20_r',
'tab20b_r',
'tab20c_r']
```

```
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()
```

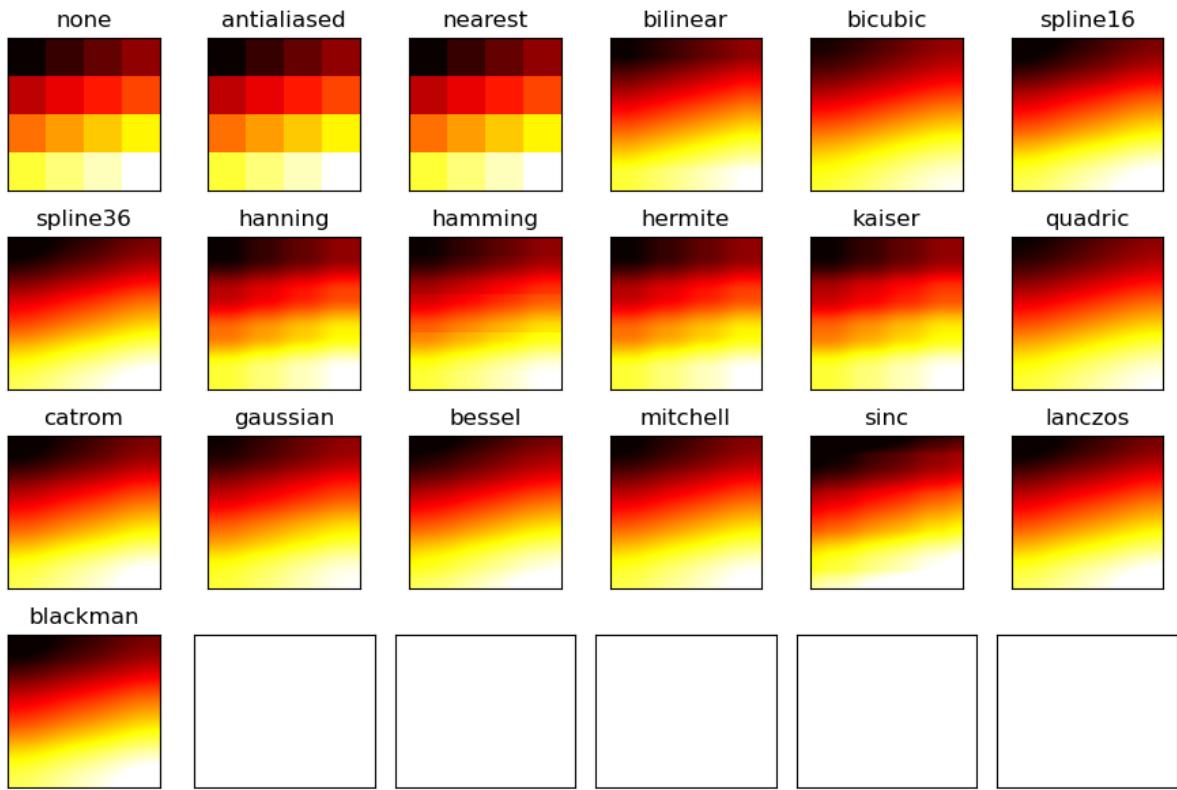


```
import matplotlib
import matplotlib.pyplot as plt
import numpy as np

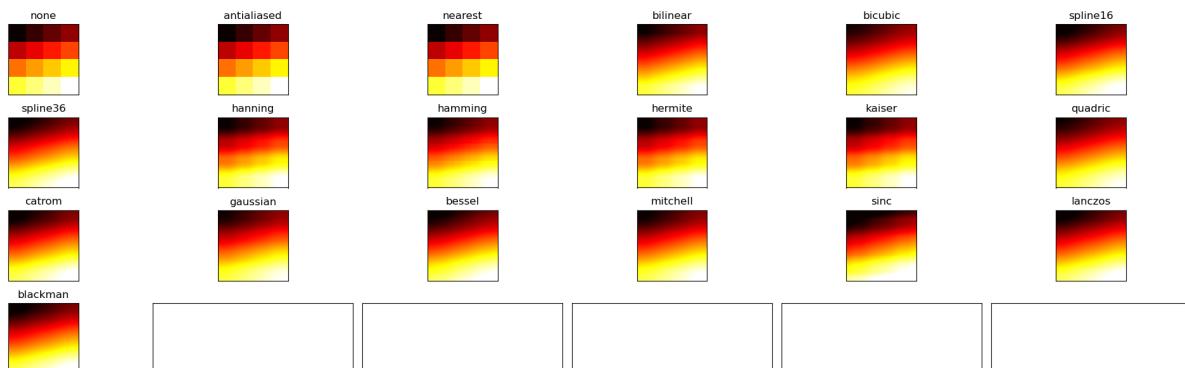
img3 = [[1, 2, 3, 4],
        [5, 6, 7, 8],
        [9, 10, 11, 12],
        [13, 14, 15, 16]]
plt.imshow(img3)
plt.show()
```



```
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()
```



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

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

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

(continues on next page)

(continued from previous page)

```
#      [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]]
```

```
%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} ")
    print("====")
    print(f" {samplerate} ")
    print(f" {data} ")
    print(f" {data[:20]} # up to 20 as 1 dim")
    print(f" {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 (####,)
```

(continues on next page)

(continued from previous page)

```

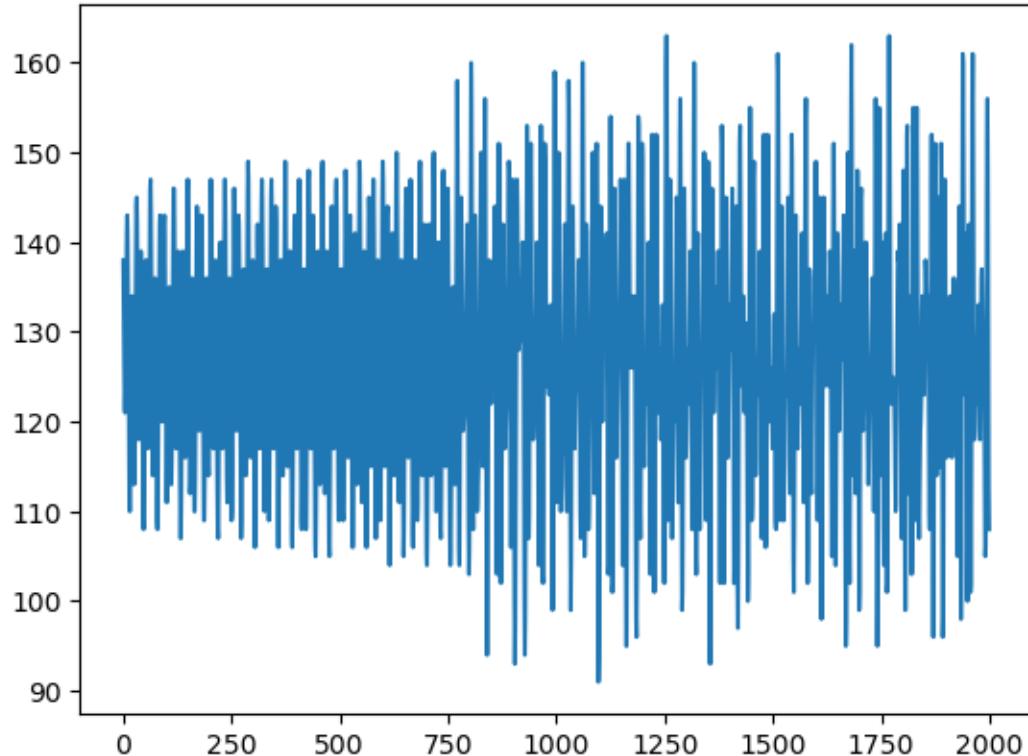
# just 1 colour it seems
plt.show()
return data, samplerate

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

```

```

sndf='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
-----
```



```

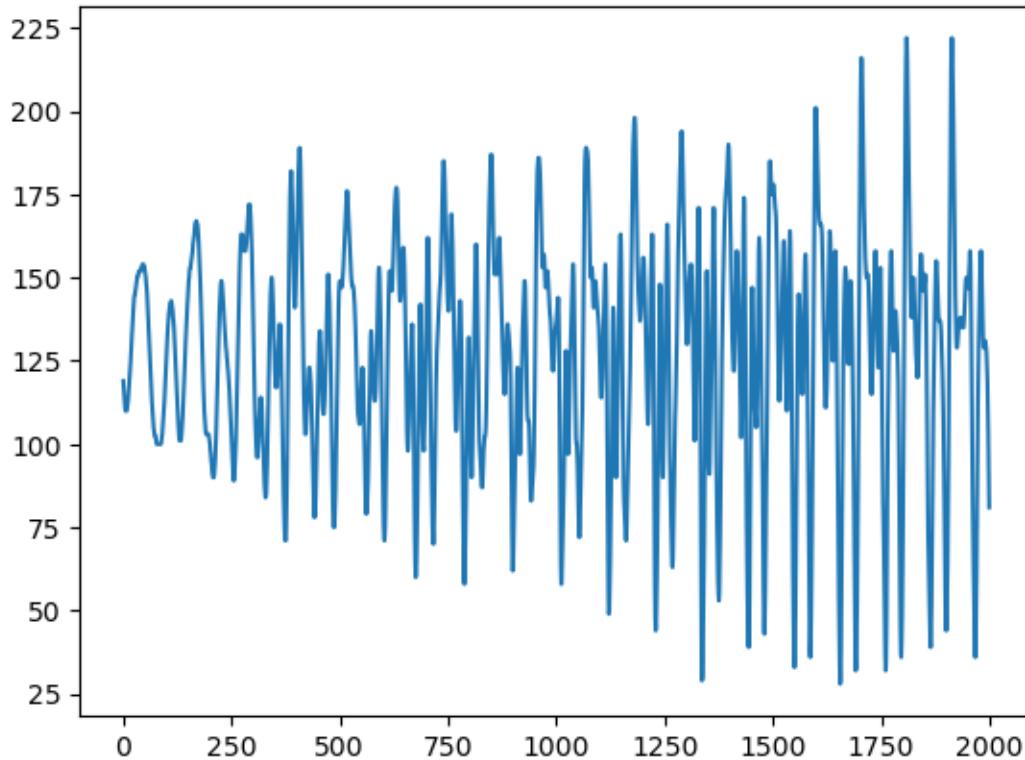
sndf='media/welcome2.wav'
=====
samplerate=22000

```

(continues on next page)

(continued from previous page)

```
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
-----
```



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

    print(f"data")
    #print(f"{inspect.signature(printaudio)=}")
    print(f"=====")
    print(f" {data=}")
    print(f" {data[:10]=} # up to 20 as 1 dim")
    print(f" {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(f"-----")
    print()
```

(continues on next page)

(continued from previous page)

```

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=}, {c2=}")
    print(f" {c1.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-vector-in-numpy
#im2data2.reshape(-1, 2)
im2data2reshape = im2data2.reshape(-1, 2)
printaudio(im2data2reshape, plotting=True, stereo=True) #im2data2.reshape(-1, 2), -
#plotting=True)

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

    #im2data3 = np.tile(im2data, (3, 1)) # data.shape=(2, 10556) and no. of sample is_
    #2
    #printaudio(im2data2, plotting=True)
    #printaudio(im2data3) # , plotting=False)

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

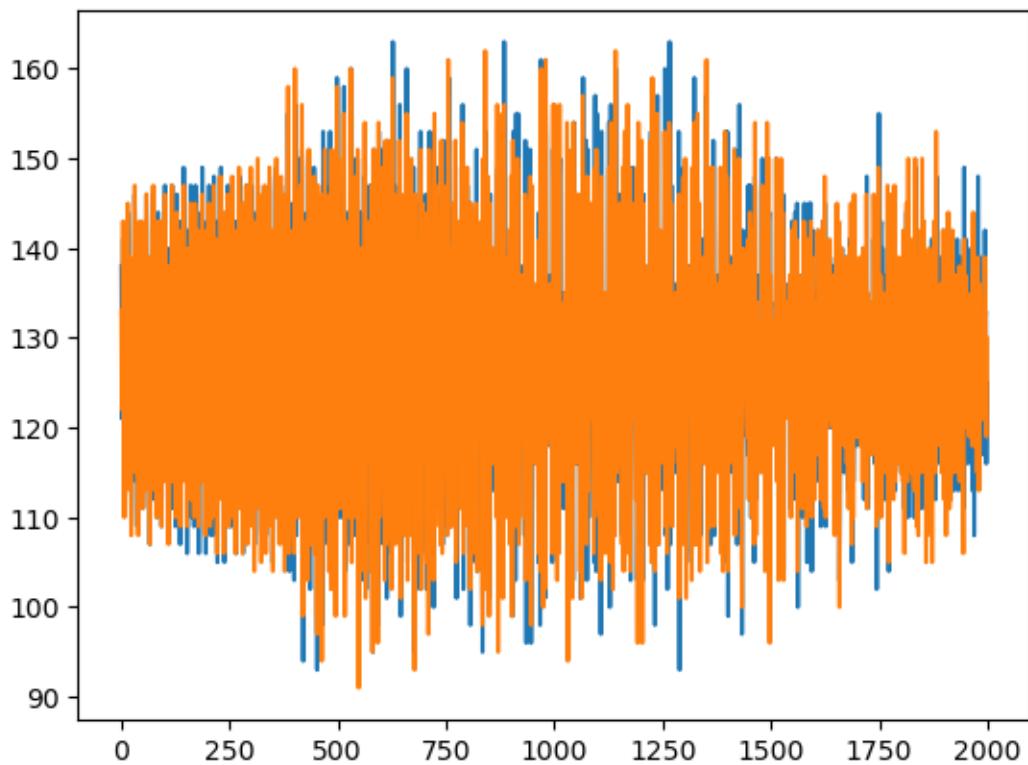
    #im2data3T = np.tile(im2data.transpose(), (3, 2))
    #printaudio(im2data3T) # , plotting=False)

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

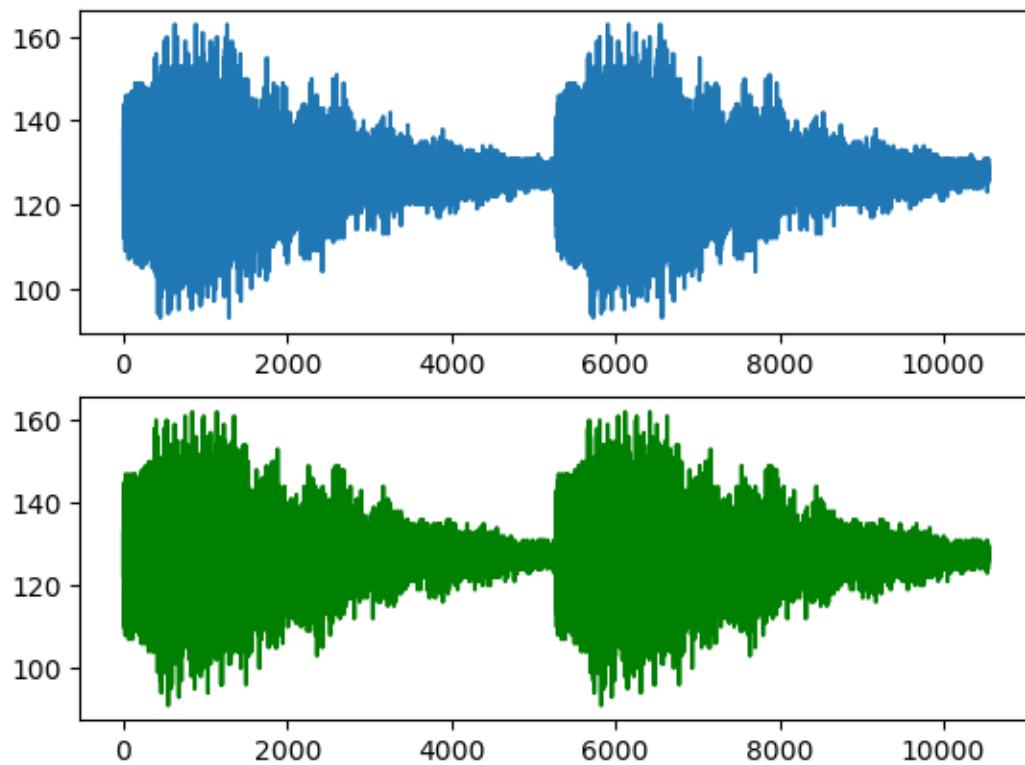
```

```
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, ..., 128, 129, 127], dtype=uint8)
c1.shape=(10556,), c2.shape=(10556,)
```

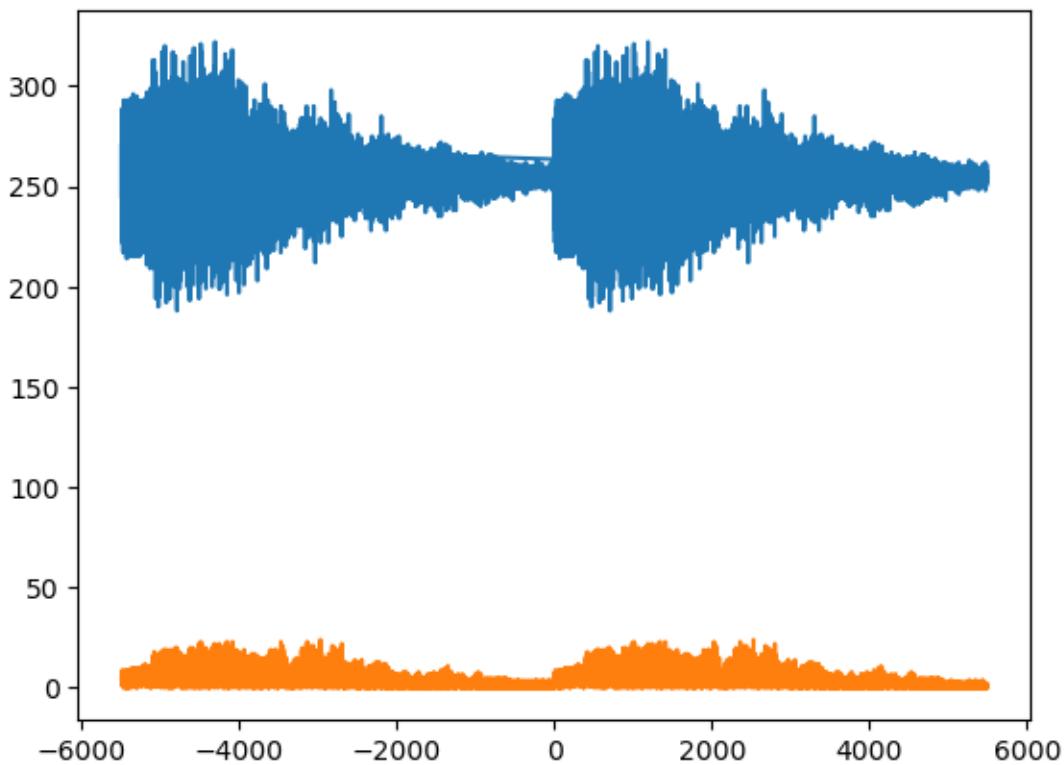


```
import scipy.fftpack

def fft(data, samplerate):
    samples = data.shape[0]
    datafft = scipy.fftpack.fft(data)
    fftabs = abs(datafft)
    print(fftabs)
    freqs = scipy.fftpack.freq( 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):
    args_names = fn.__code__.co_varnames[:fn.__code__.co_argcount]
    return {**dict(zip(args_names, args)), **kwargs}
```

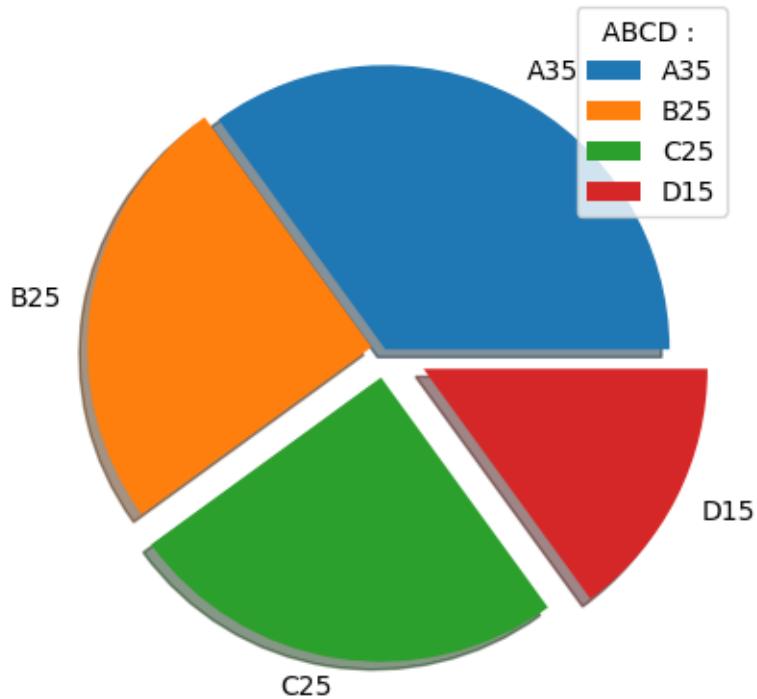


```
%matplotlib inline
import numpy as np
import matplotlib.pyplot as plt
```

8.1 pie-chart

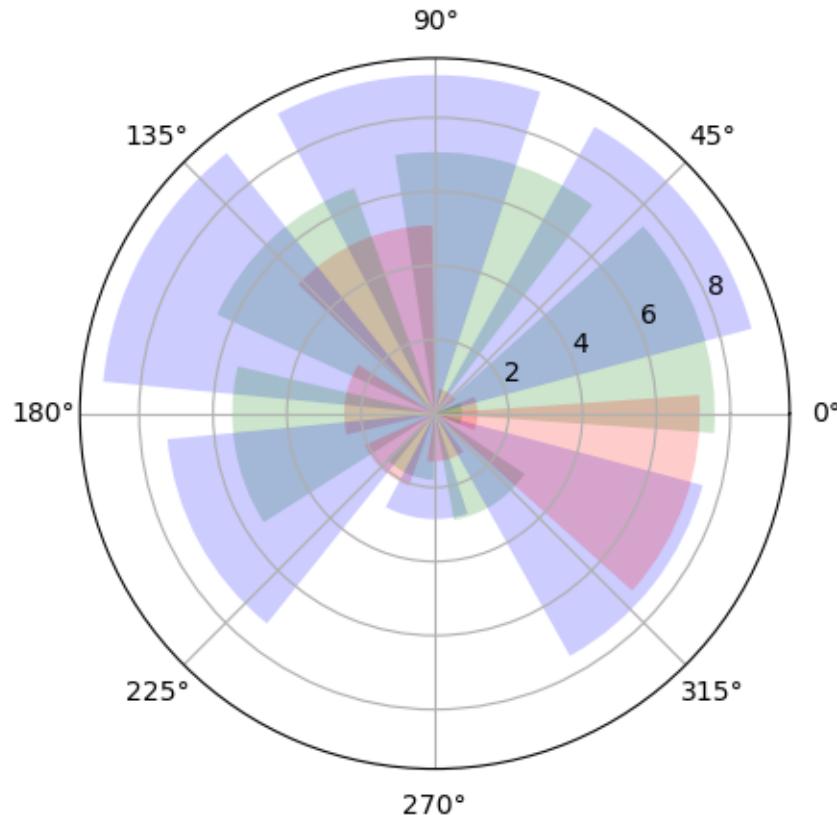
```
data = np.array([35, 25, 25, 15])
mylabels = ['A35', 'B25', 'C25', 'D15']

explode = [0.0, 0.05, 0.1, 0.15]
plt.pie(data,
         labels = mylabels,
         explode = explode,
         shadow = True)
plt.legend(title='ABCD : ')
plt.show()
```



8.2 polar charts

```
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()
```



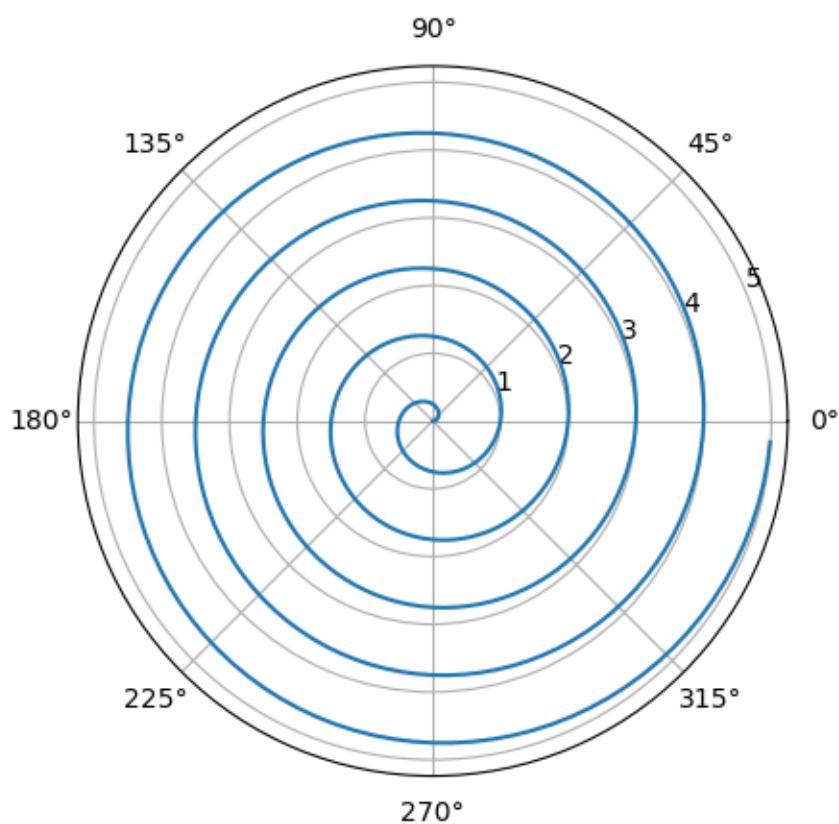
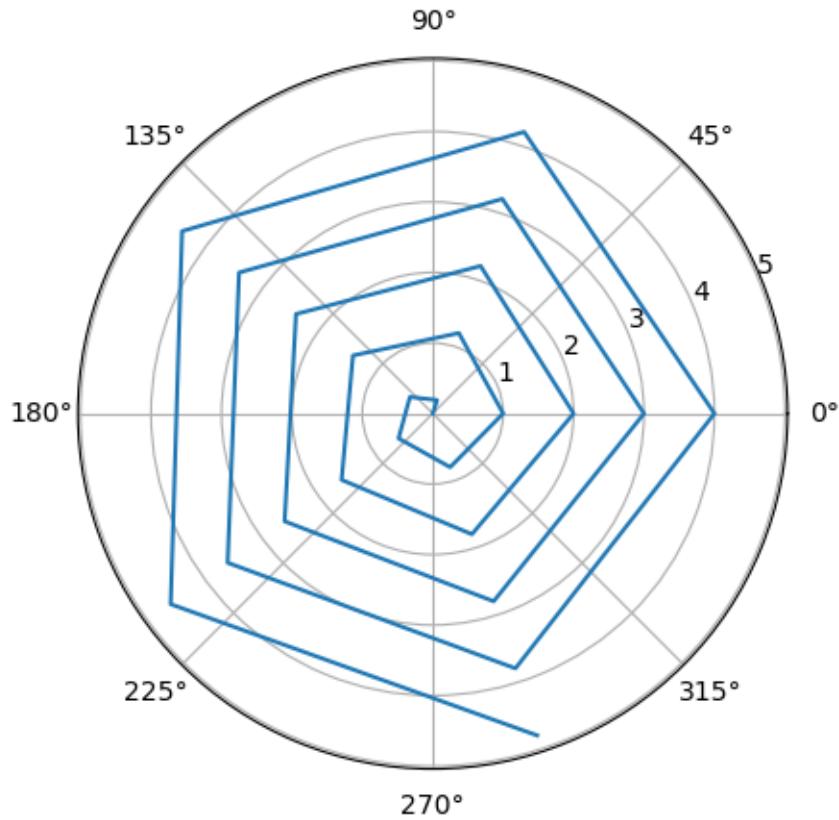
See

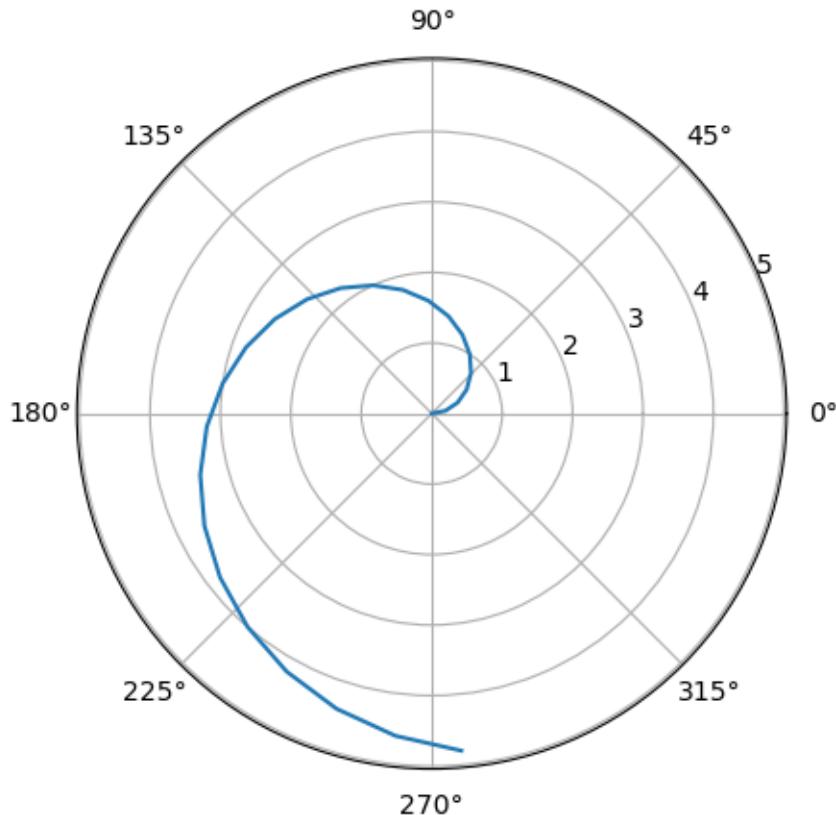
1. https://www.youtube.com/watch?v=mDT_DG_A0JA
2. <https://www.youtube.com/watch?v=GMcRqtm4mNo>
3. <https://www.youtube.com/watch?v=VmQ1isayjJI>

```
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()
```





```

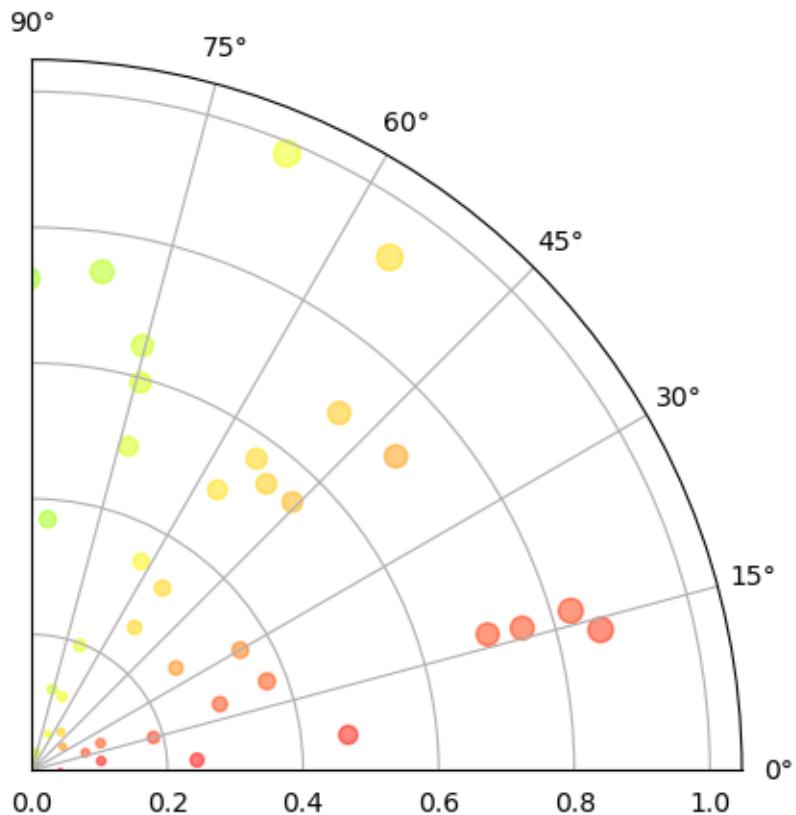
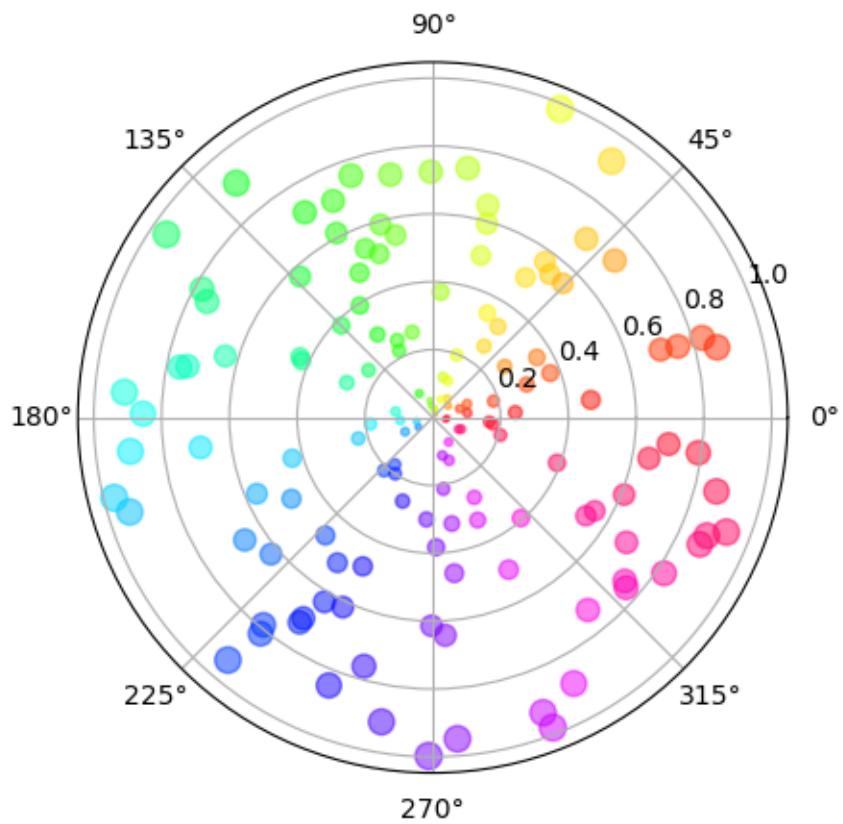
N = 150
r = np.random.rand(N)
theta = 2 * np.pi * np.random.rand(N)
size = r * 100

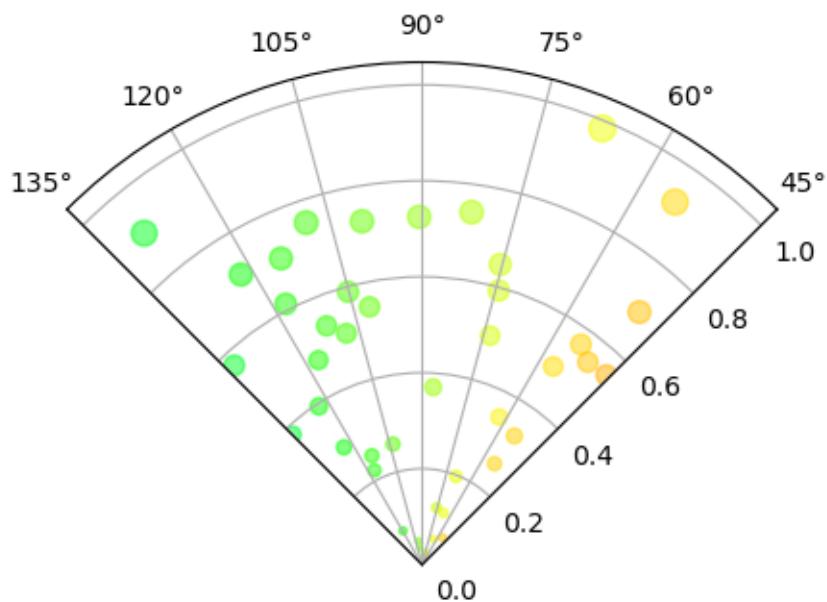
plt.subplot(projection='polar')
plt.scatter(theta, r, c=theta,
            s=size, cmap='hsv',
            alpha=0.5)
plt.show()

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()

```



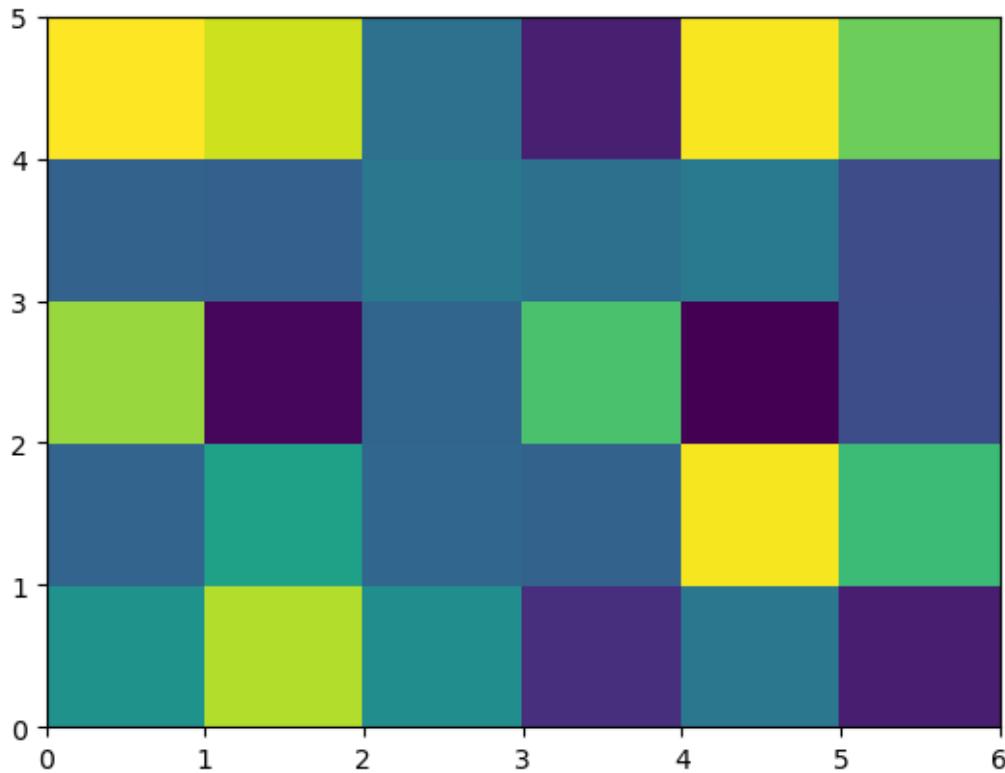


HANDON-10 COLORS

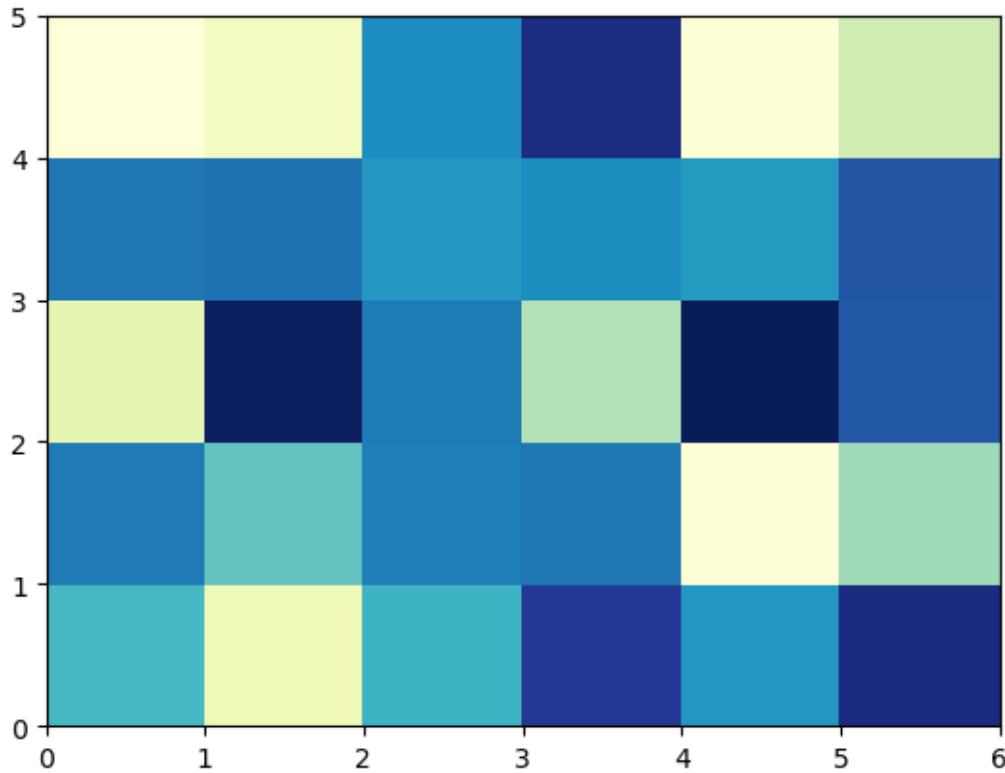
9.1 colors

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

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

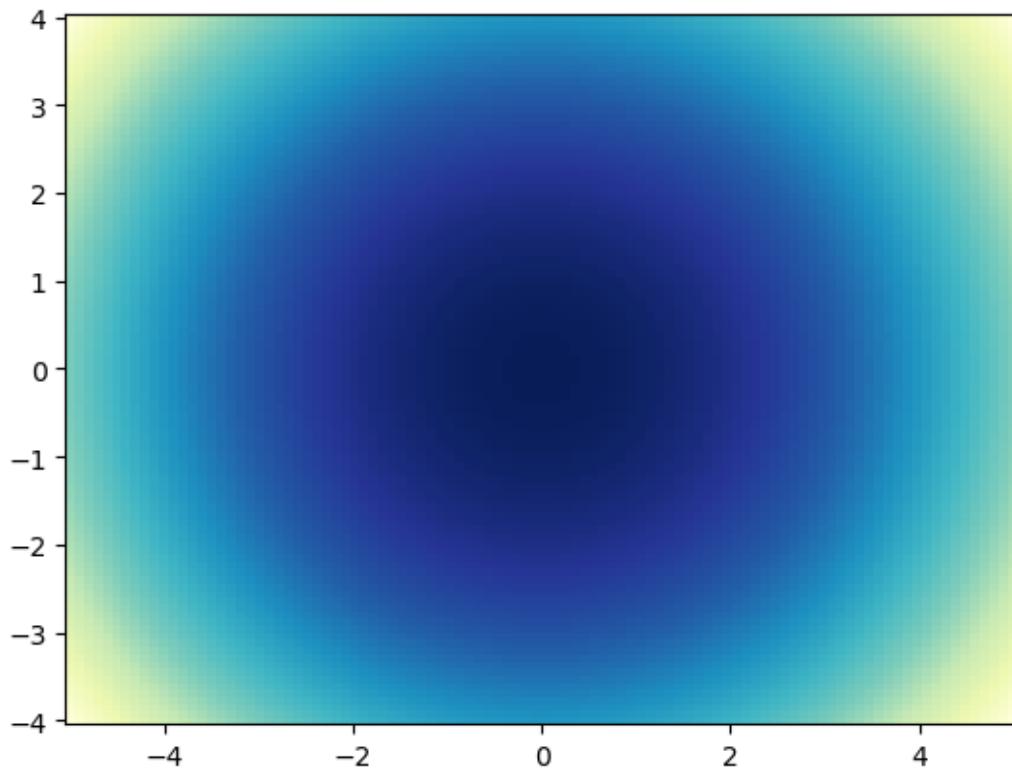


```
plt.pcolor(data, cmap='YlGnBu_r')
plt.show()
```



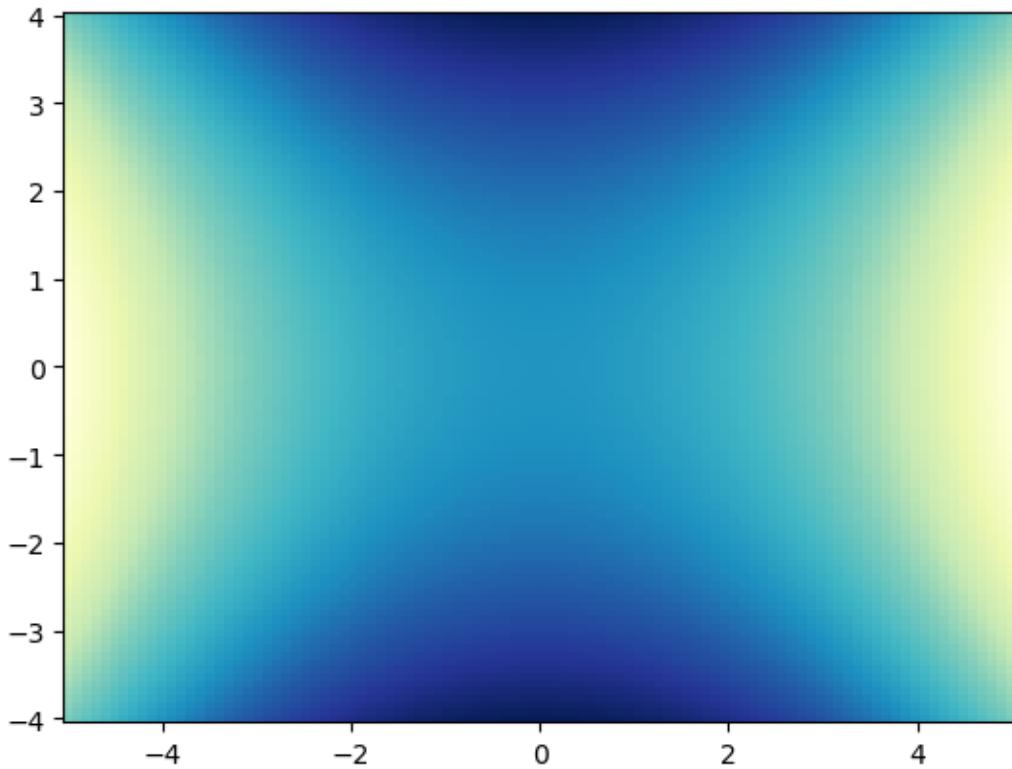
```
N = 100
X, Y = np.meshgrid(np.linspace(-5, 5, N),
                    np.linspace(-4, 4, N))
Z = (X**2 + Y**2)

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)

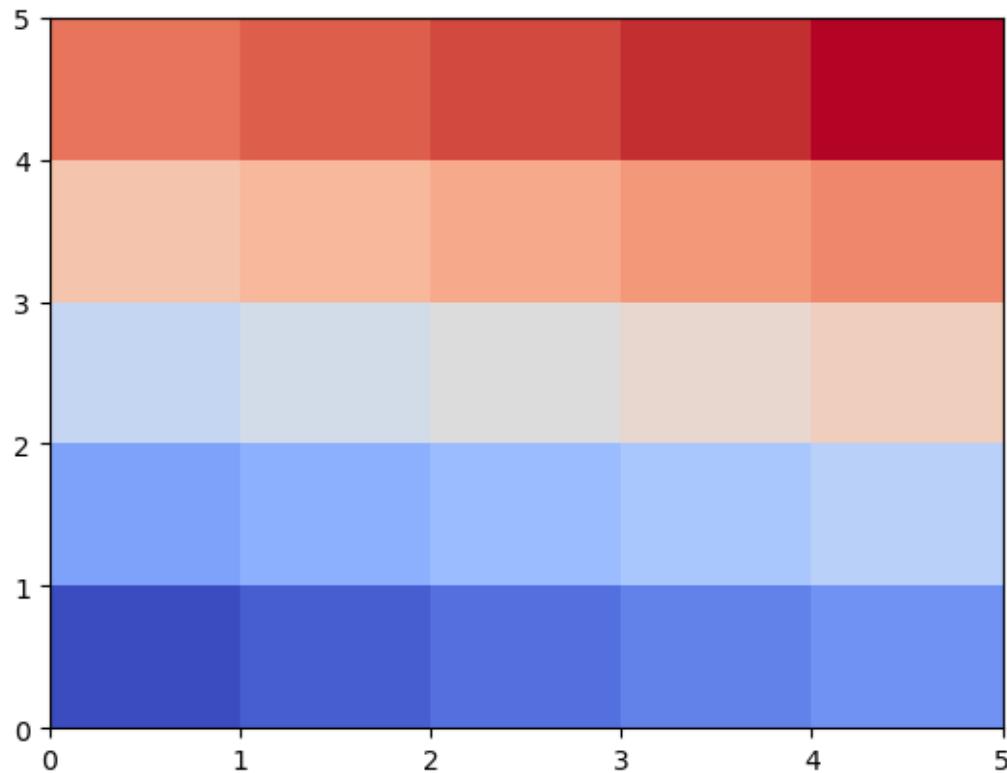
plt.pcolor(X, Y, Z,
            cmap='YlGnBu_r',
            shading='auto')
plt.show()
```



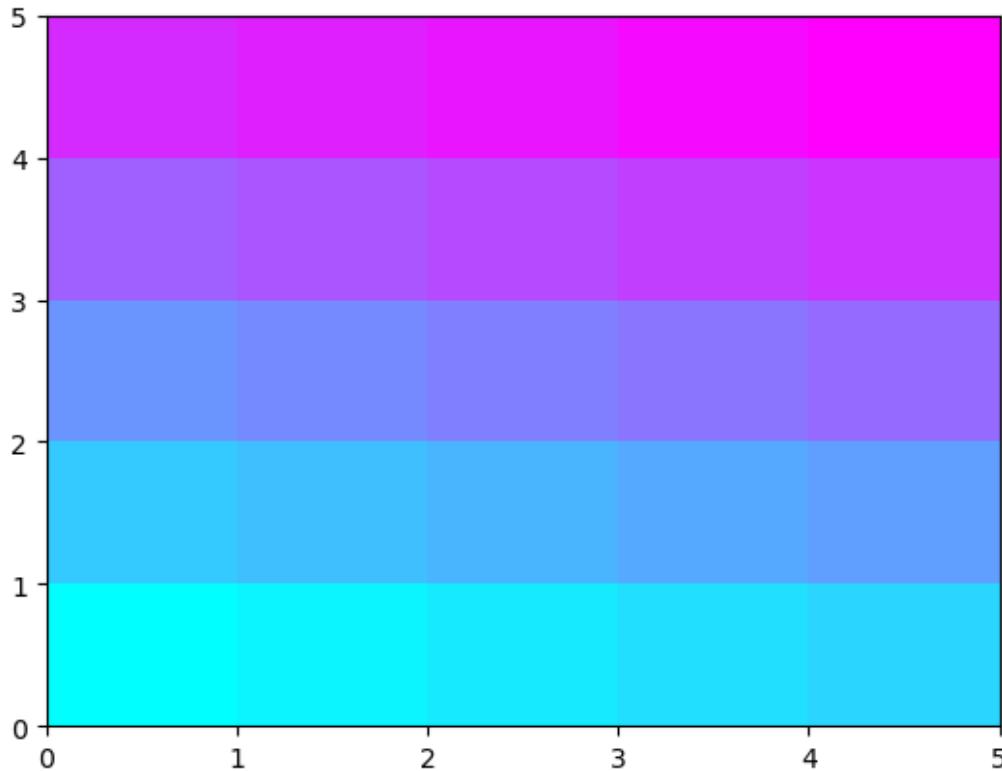
```
import os  
os.getcwd()
```

```
'/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.pcolor(x, y, z,  
           shading='flat',  
           cmap='coolwarm')  
plt.show()
```

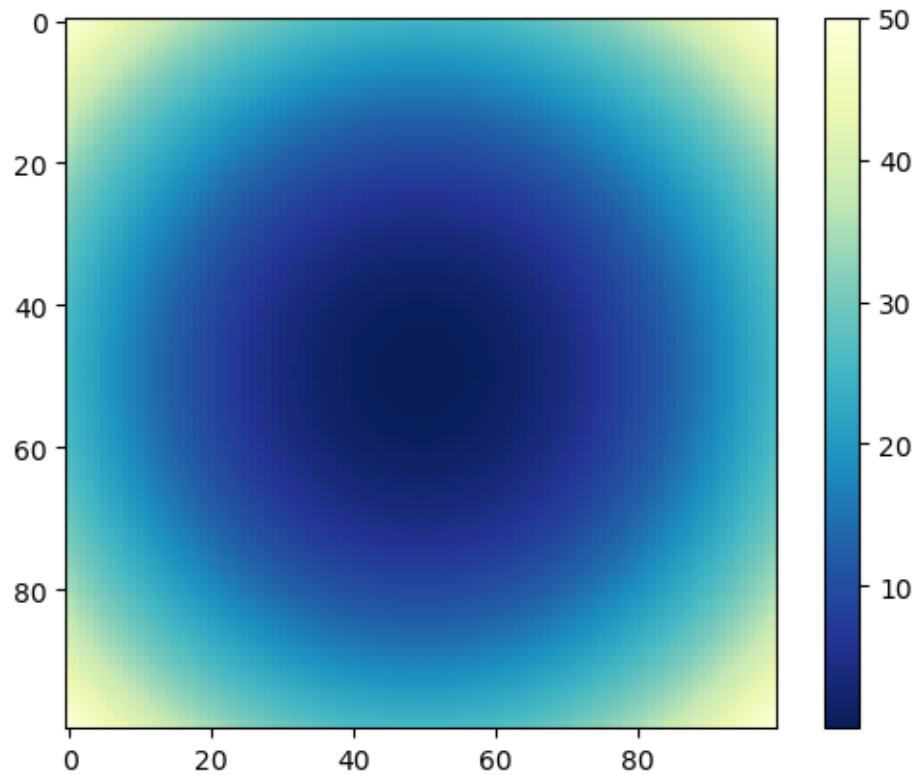


```
plt.pcolormesh(x, y, z,     shading='auto', cmap='cool')
plt.show()
```

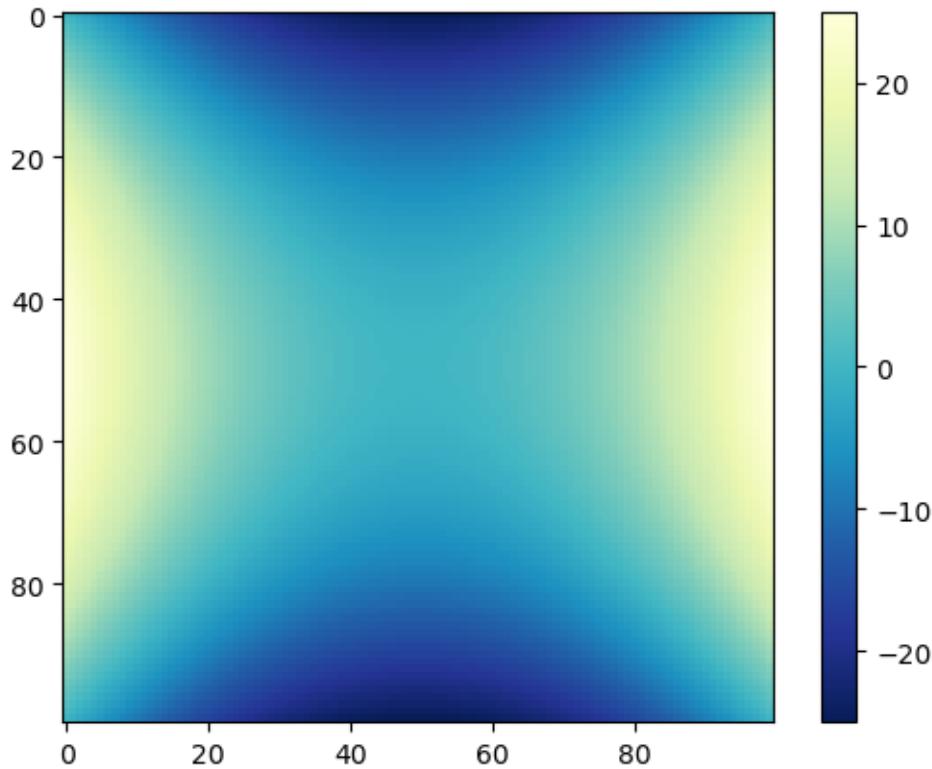


```
# error ... p.139
z = np.random.rand(6, 10)
x = np.arange(0, 10, 1)
y = np.arange(4, 10, 1)
T = 0.5
X, Y = np.meshgrid(x, y)
X=X+T* Y
Y=Y+T* X
# plt.pcolormesh(X, Y, z, shading='auto')
#plt.show()
```

```
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()
```

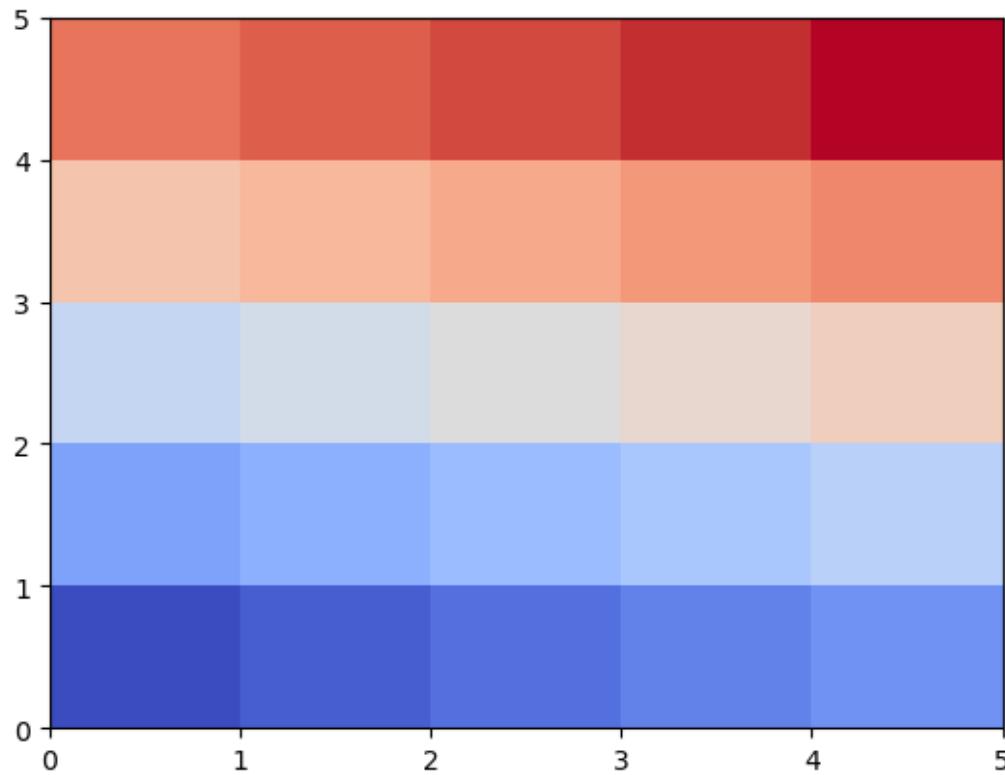


```
N = 100
X, Y = np.meshgrid(np.linspace(-5, 5, N), np.linspace(-5, 5, N))
Z = (X**2 - Y**2)
img = plt.imshow(Z, cmap='YlGnBu_r')
plt.colorbar(img)
plt.show()
```



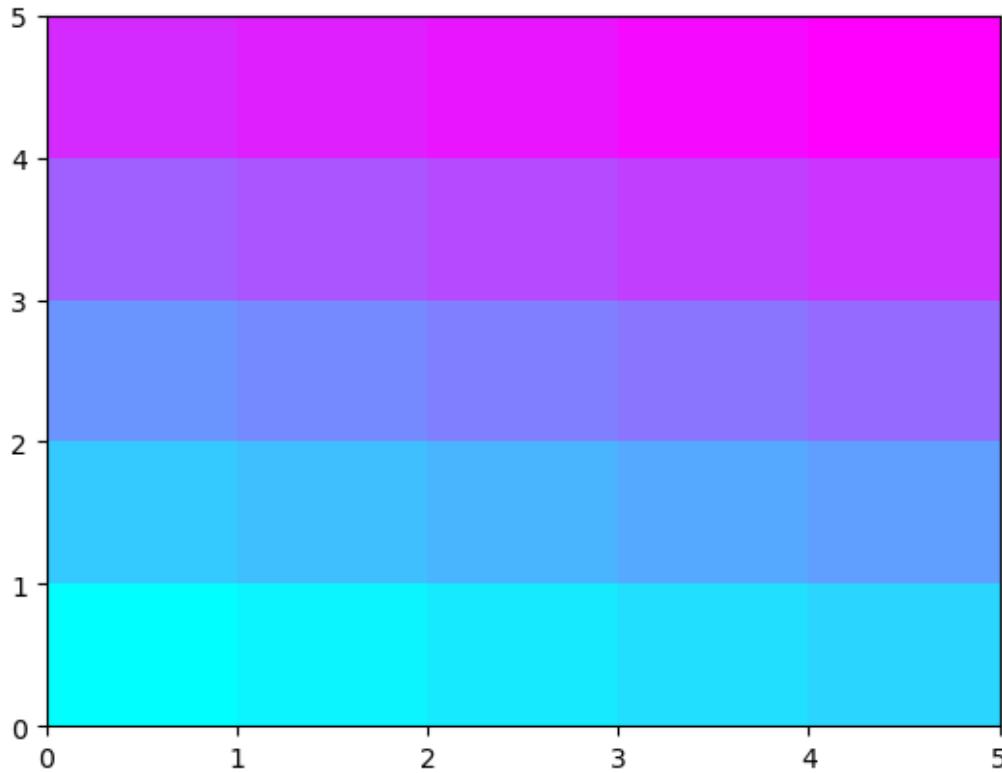
```
%matplotlib inline
import matplotlib.pyplot as plt
import numpy as np
```

```
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()
```

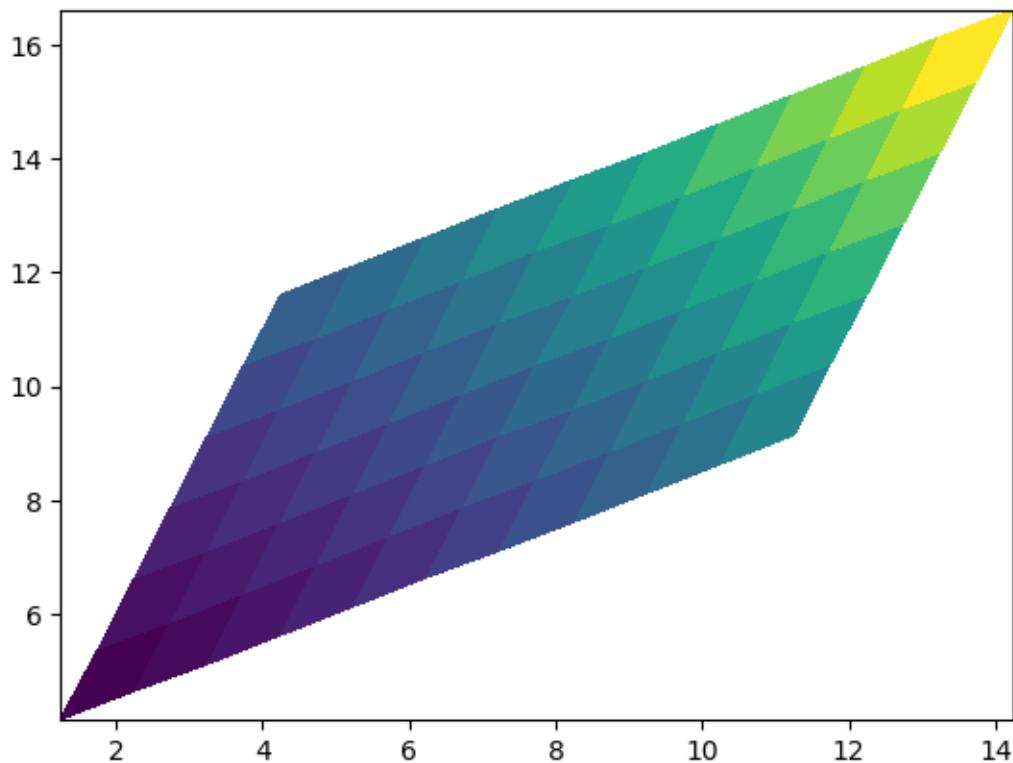


```
plt.pcolormesh(x, y, z,
shading='auto',
cmap='cool')
# ? has names ?
```

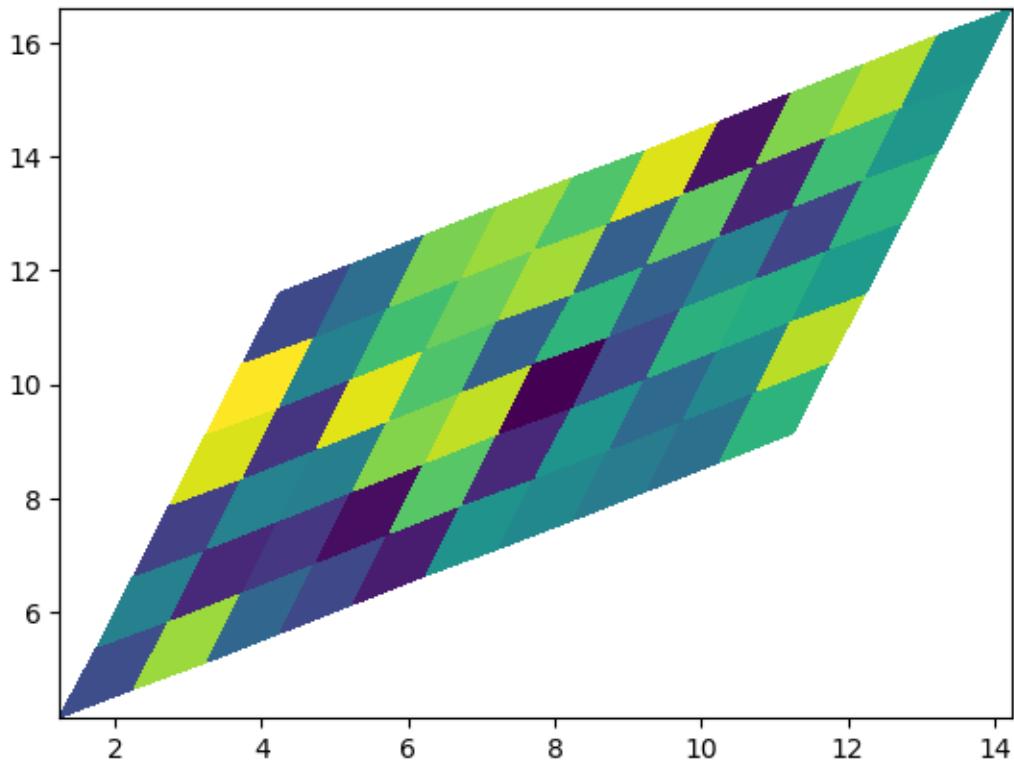
```
<matplotlib.collections.QuadMesh at 0x136c0f150>
```



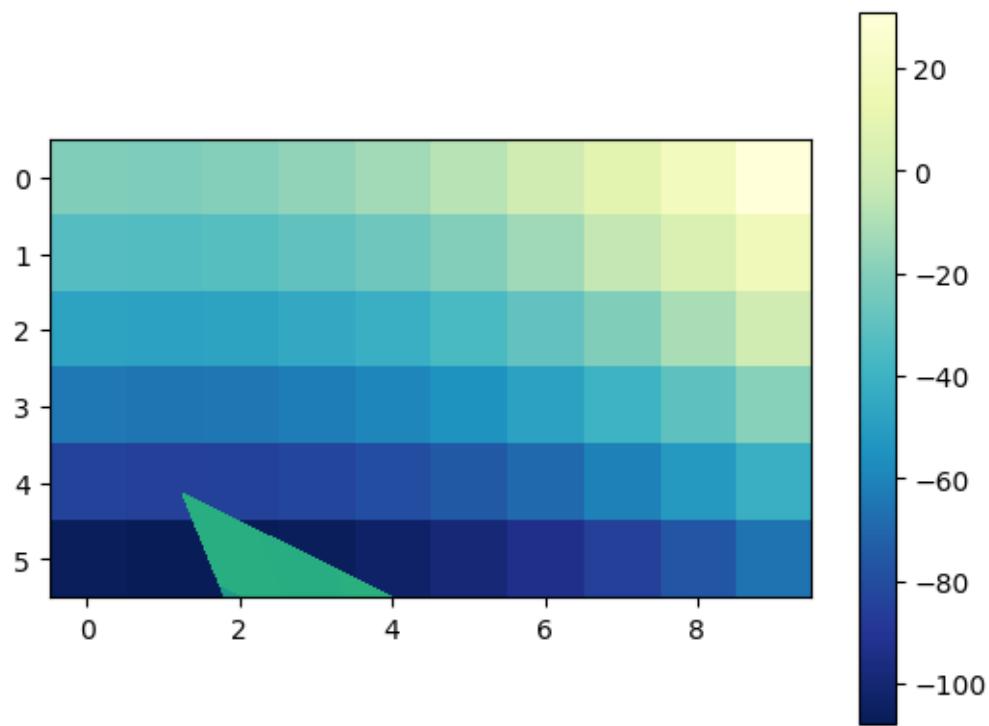
```
z = np.random.rand(6, 10)
x = np.arange(0, 10, 1)
y = np.arange(4, 10, 1)
T = 0.5
X, Y = np.meshgrid(x, y)
X=X+T* Y
Y=Y+T* X
Z = (X**2 + Y**2)
plt.pcolormesh(X, Y, Z,
                shading='auto')
plt.show()
```



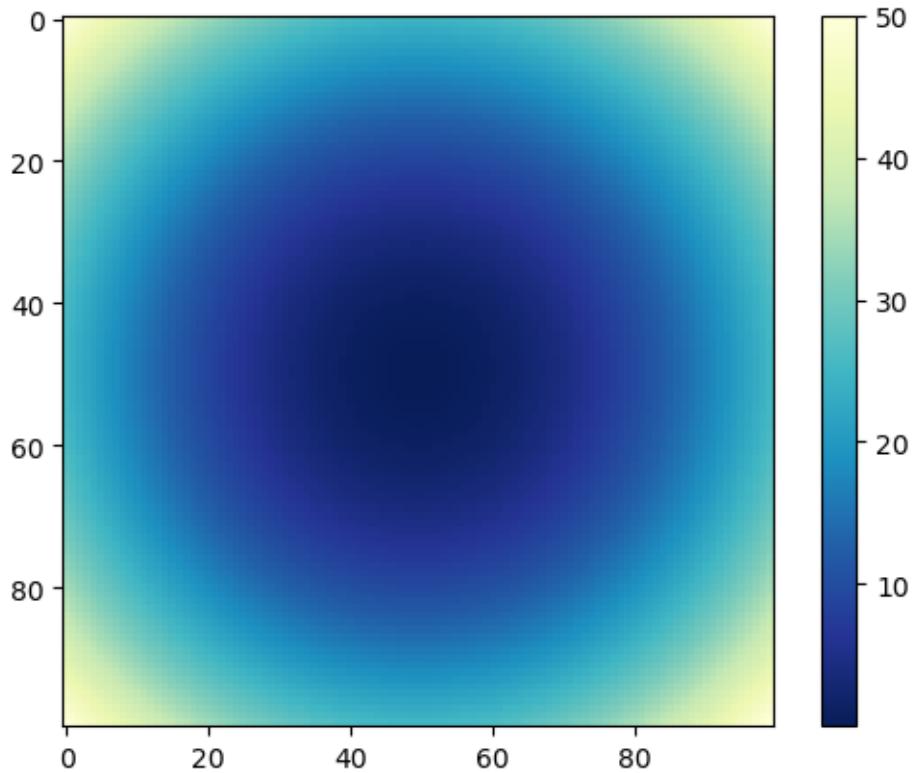
```
Z = z
plt.pcolormesh(X, Y, Z,
                shading='auto')
plt.show()
```



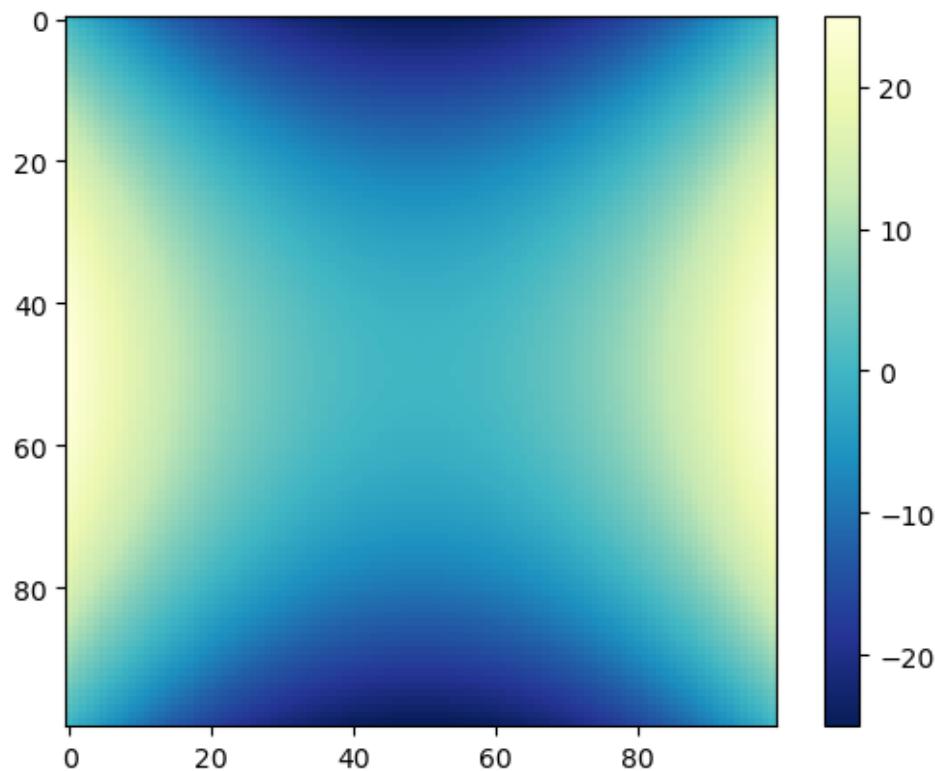
```
z = np.random.rand(6, 10)
x = np.arange(0, 10, 1)
y = np.arange(4, 10, 1)
T = 0.5
X, Y = np.meshgrid(x, y)
X=T* Y
Y=T* X
Z = (X**2 - Y**2)
plt.pcolormesh(X, Y, Z,
                shading='auto')
img = plt.imshow(Z, cmap='YlGnBu_r')
plt.colorbar(img)
plt.show()
```



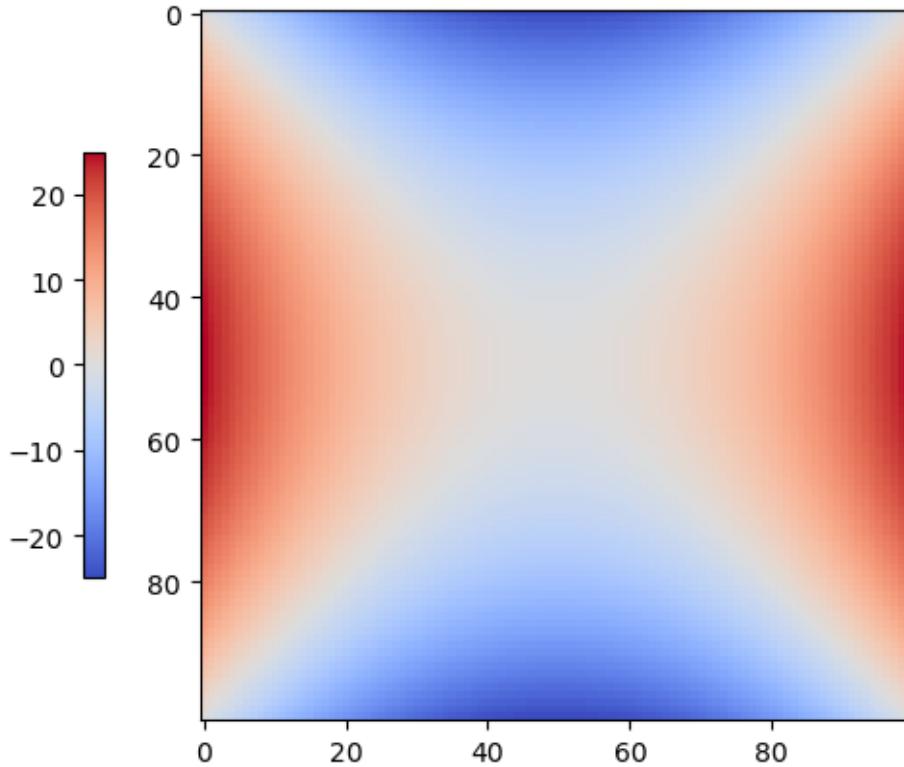
```
N = 100
X, Y = np.meshgrid(np.linspace(-5, 5, N),
                    np.linspace(-5, 5, N))
Z = (X**2 + Y**2)
img = plt.imshow(Z, cmap='YlGnBu_r')
plt.colorbar(img)
plt.show()
```



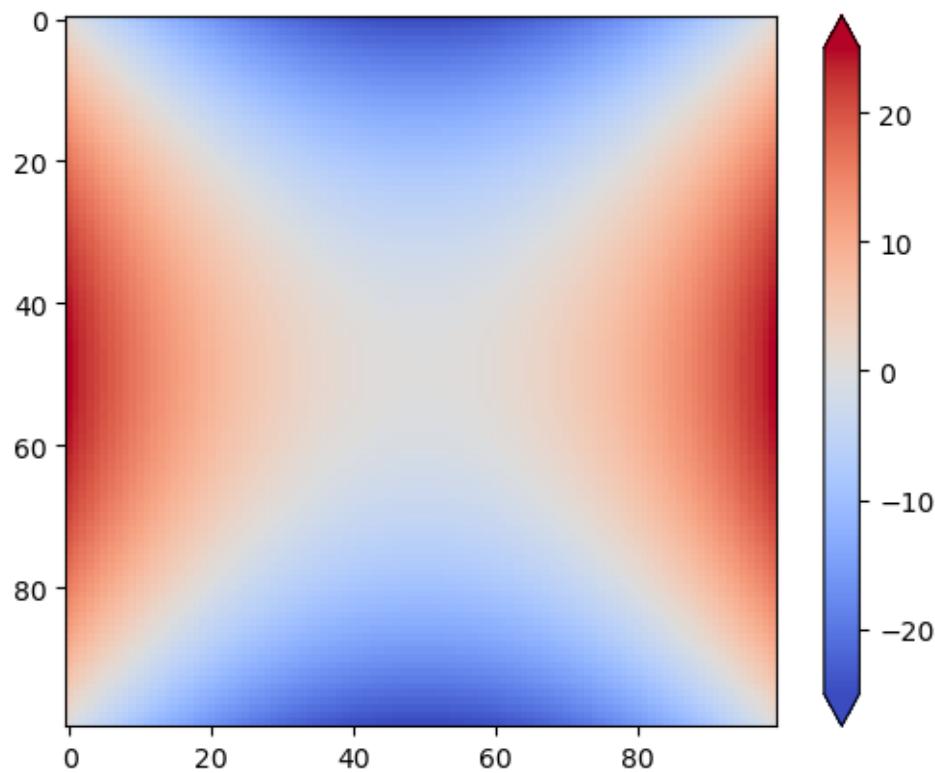
```
N = 100
X, Y = np.meshgrid(np.linspace(-5, 5, N), np.linspace(-5, 5, N))
Z = (X**2 - Y**2)
img = plt.imshow(Z, cmap='YlGnBu_r')
plt.colorbar(img)
plt.show()
```



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



```
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

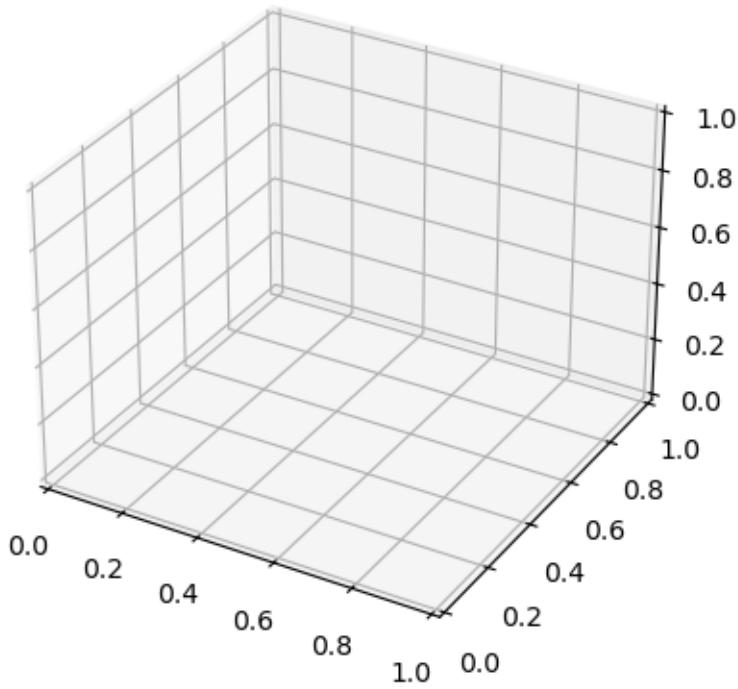
fig = plt.figure()

ax = plt.axes(projection='3d')

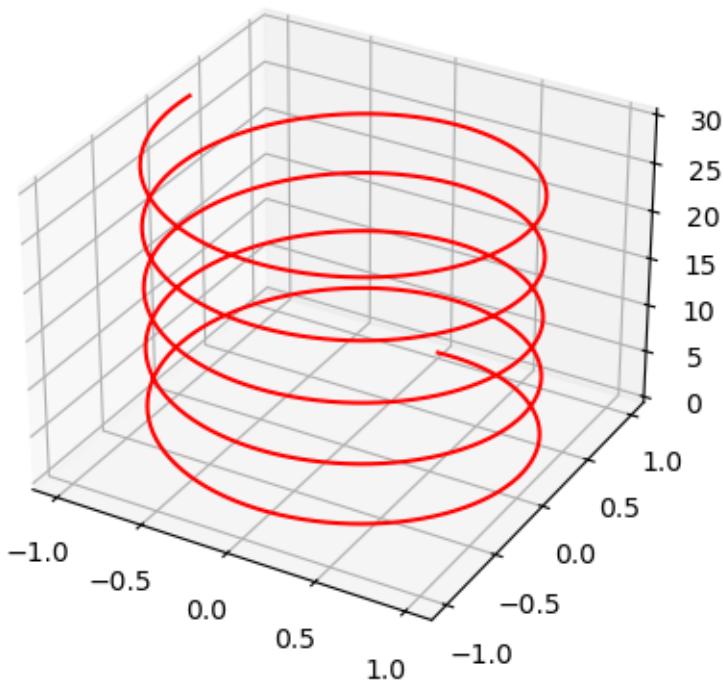
plt.show()

# 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
→beginning
```



```
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()
```



```

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()

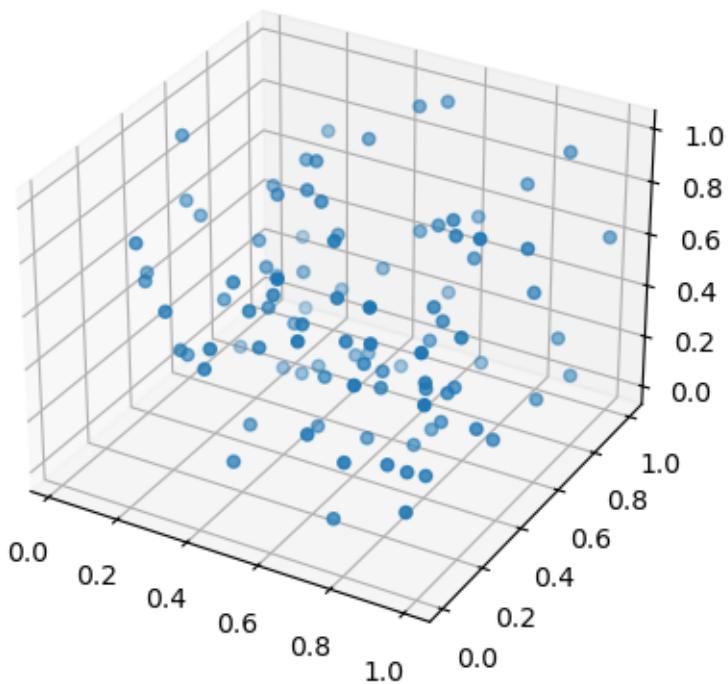
# /var/folders/33/krstvgn2rncl74r18tkv6_80000gn/T/ipykernel_35577/3836579356.py:7:_
# UserWarning: No data for colormapping provided via 'c'. Parameters 'cmap' will be_
# ignored
# ax.scatter3D(x, y, z, cmap='cool');

```

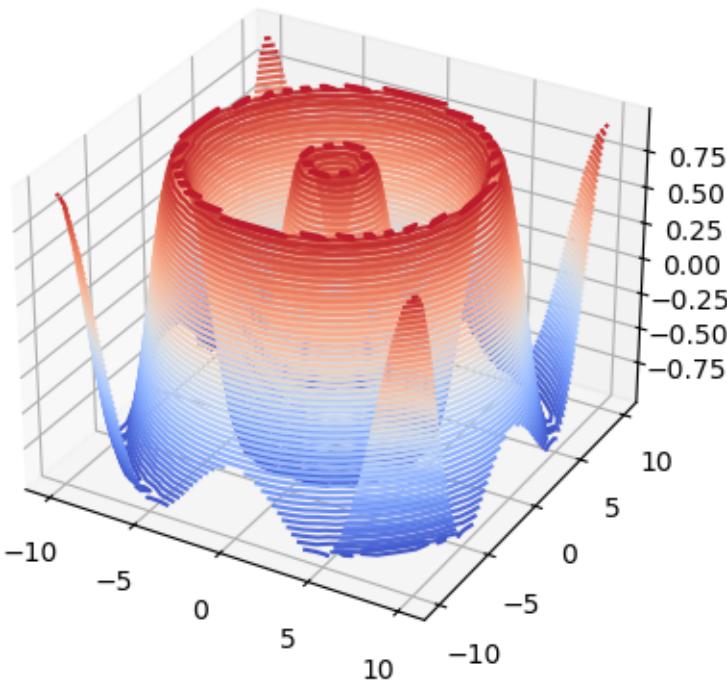
```

/var/folders/33/krstvgn2rncl74r18tkv6_80000gn/T/ipykernel_32401/1669576427.py:7:_
# UserWarning: No data for colormapping provided via 'c'. Parameters 'cmap' will be_
# ignored
ax.scatter3D(x, y, z, cmap='cool');

```

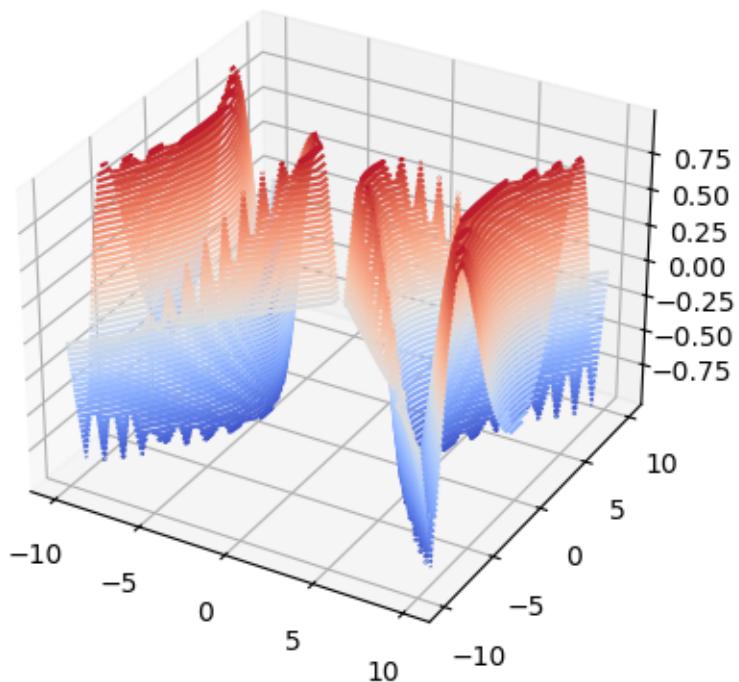


```
x = np.linspace(-10, 10, 30)
y = np.linspace(-10, 10, 30)
X, Y = np.meshgrid(x, y)
Z = np.sin(np.sqrt(X ** 2 + Y ** 2))
fig = plt.figure()
ax = fig.add_subplot(projection='3d')
ax.contour(X, Y, Z, 50, cmap='coolwarm')
plt.show()
```

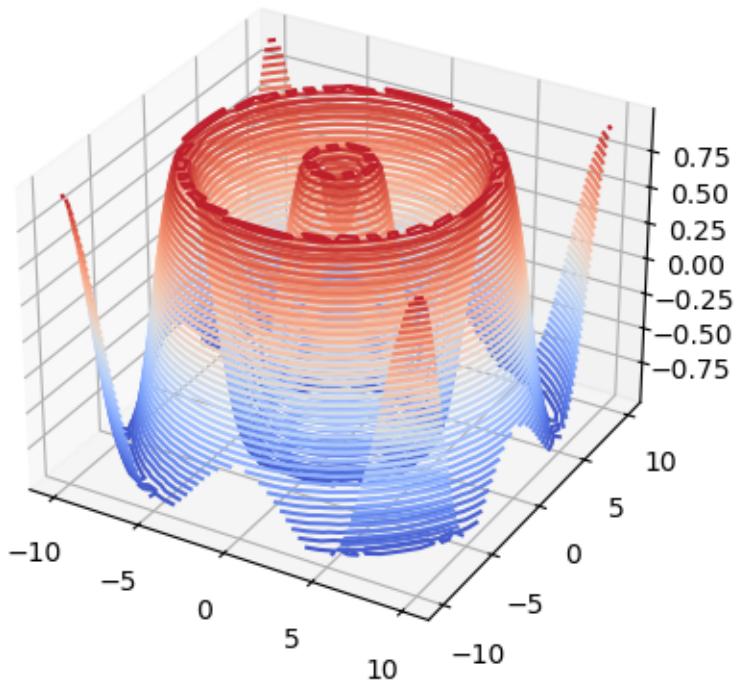


```
x = np.linspace(-10, 10, 30)
y = np.linspace(-10, 10, 30)
X, Y = np.meshgrid(x, y)
Z = np.sin(np.sqrt(X ** 2 - Y ** 2))
fig = plt.figure()
ax = fig.add_subplot(projection='3d')
ax.contour(X, Y, Z, 50, cmap='coolwarm')
plt.show()
# /var/folders/33/krstvgn2rncl74r18tkv6_80000gn/T/ipykernel_35577/265096374.py:4:_
#   RuntimeWarning: invalid value encountered in sqrt
#     Z = np.sin(np.sqrt(X ** 2 - Y ** 2))
```

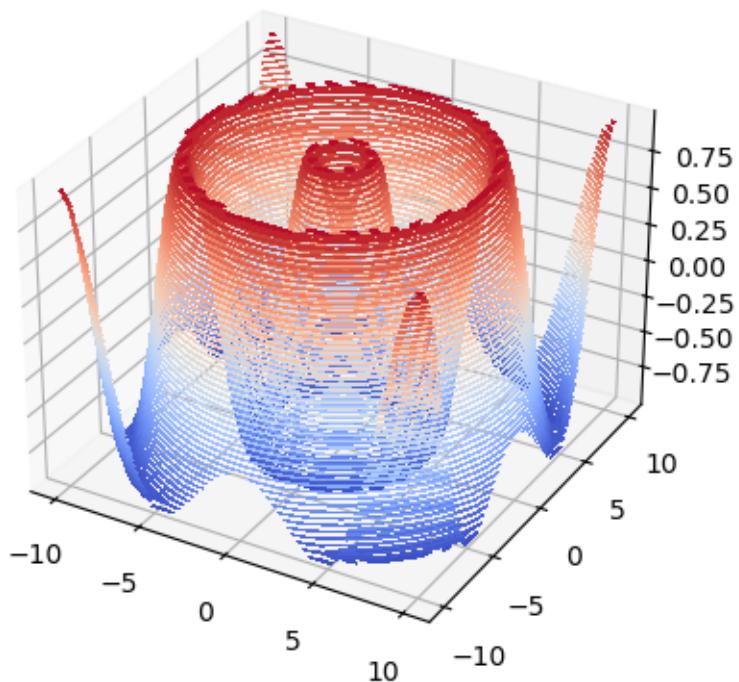
```
/var/folders/33/krstvgn2rncl74r18tkv6_80000gn/T/ipykernel_32401/3856492819.py:4:_
#   RuntimeWarning: invalid value encountered in sqrt
#     Z = np.sin(np.sqrt(X ** 2 - Y ** 2))
```



```
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()
```

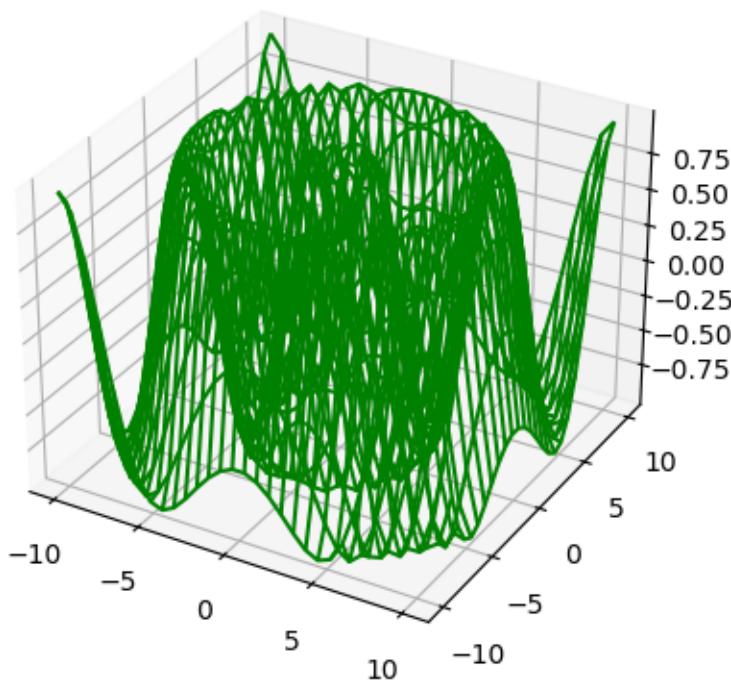


```
fig = plt.figure()
ax = fig.add_subplot(projection='3d')
Z = np.sin(np.sqrt(X ** 2 + Y ** 2))
#Z = np.sin(np.sqrt(X ** 2 - Y ** 2))
ax.contourf(X, Y, Z, 50, cmap='coolwarm')
plt.show()
```



```
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()
```

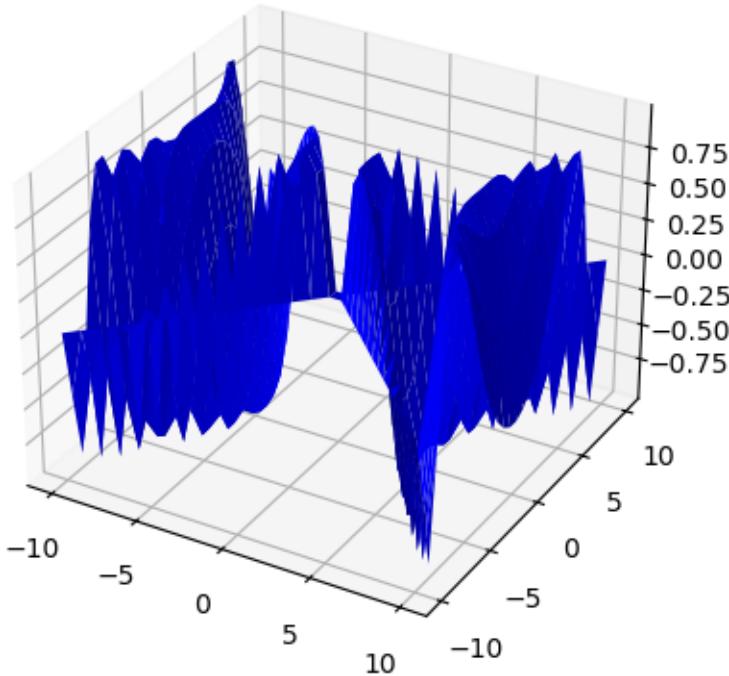
wireframe



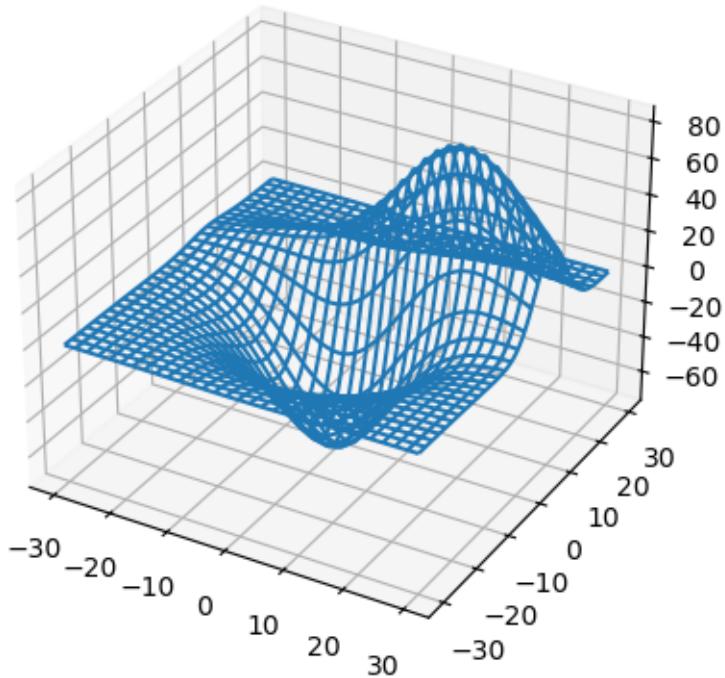
```
#Z = np.sin(np.sqrt(X ** 2 + Y ** 2))
Z = np.sin(np.sqrt(X ** 2 - Y ** 2))
fig = plt.figure()
ax = plt.axes(projection='3d')
ax.plot_surface(X, Y, Z, color='Blue')
ax.set_title('Surface Plot')
plt.show()
```

```
/var/folders/33/krstvgnns2rncl74r18tkv6_80000gn/T/ipykernel_32401/2054144969.py:2:_
  RuntimeWarning: invalid value encountered in sqrt
    Z = np.sin(np.sqrt(X ** 2 - Y ** 2))
```

Surface Plot



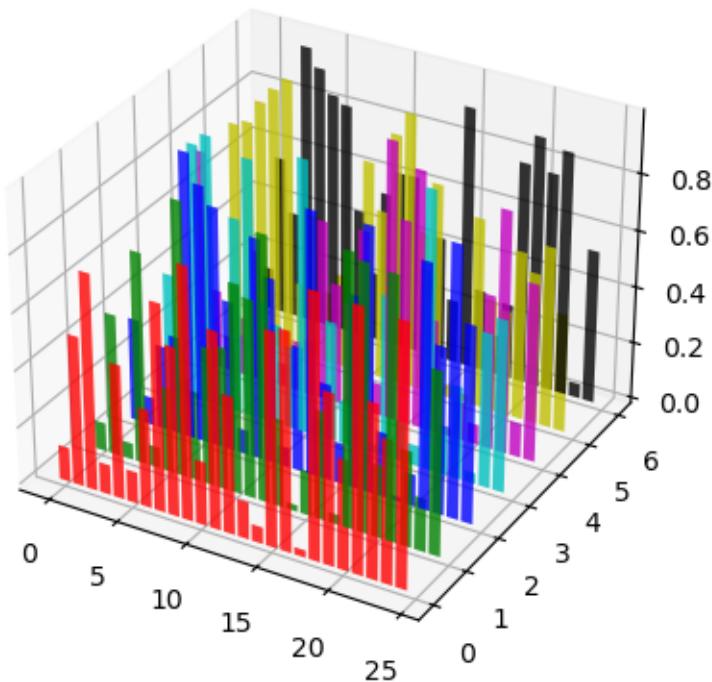
```
from mpl_toolkits.mplot3d import axes3d
fig = plt.figure()
ax = fig.add_subplot(projection='3d')
X, Y, Z = axes3d.get_test_data(0.02)
ax.plot_wireframe(X, Y, Z,
                  rstride=10,
                  cstride=10)
plt.show()
```



```
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]

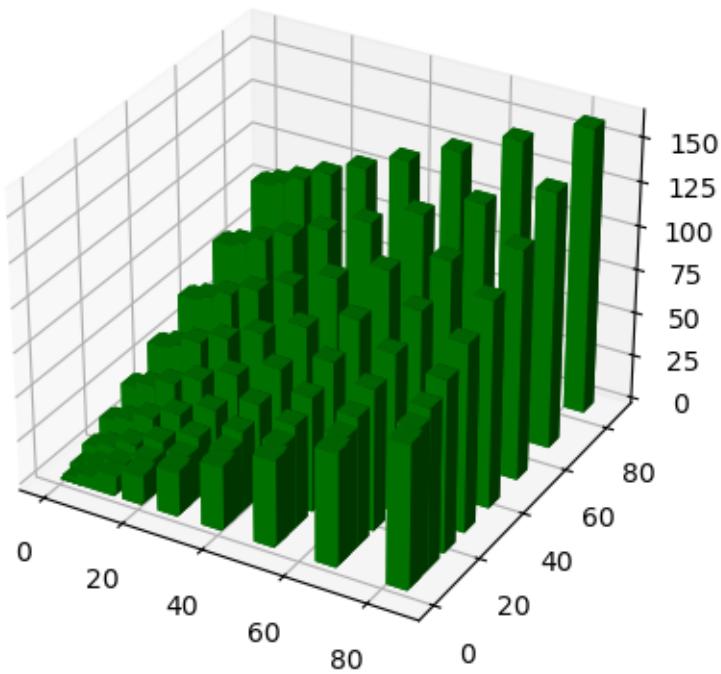
for c, k in zip(colors, yticks):
    x = np.arange(25)
    y = np.random.rand(25)
    ax.bar(x, y, zs=k, zdir='y',
           color=c, alpha=0.8)

plt.show()
```



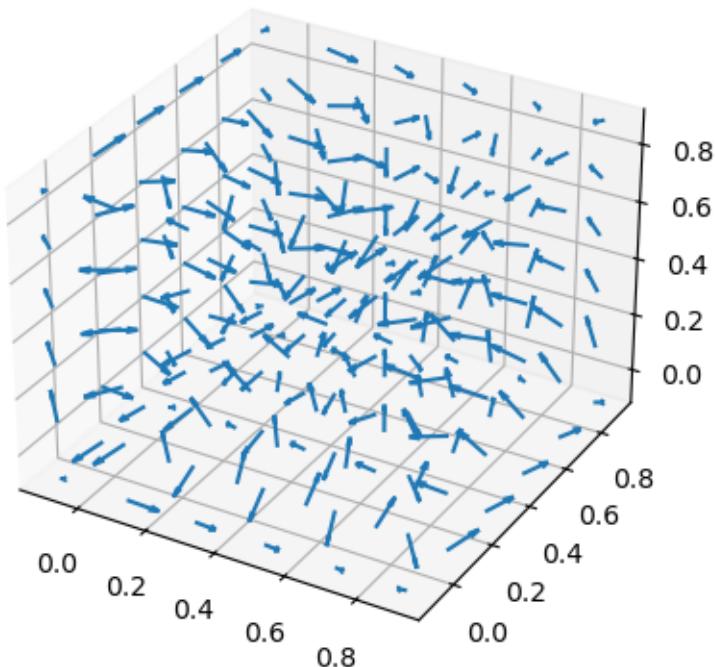
```
fig = plt.figure()
ax = fig.add_subplot(projection='3d')
x = np.arange(10) * np.arange(10)
y = np.arange(10) * np.arange(10)
x, y = np.meshgrid(x, y)
x, y = x.ravel(), y.ravel()
top = x + y
bottom = np.zeros_like(top)
width = depth = 5

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



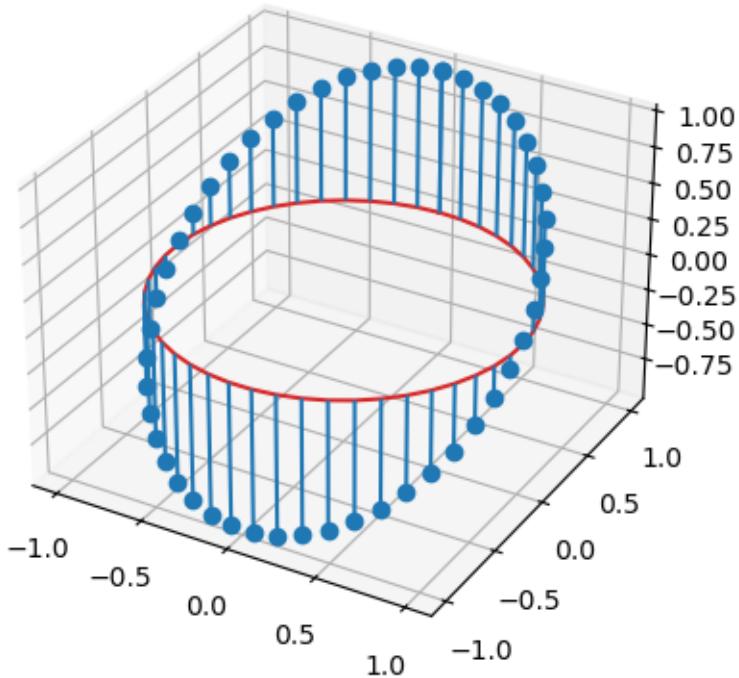
```
fig = plt.figure()
ax = fig.add_subplot(projection='3d')
x = y = z = np.arange(-0.1, 1, 0.2)
X, Y, Z = np.meshgrid(x, y, z)
u = np.cos(np.pi * X) * np.sin(np.pi * Y) * np.sin(np.pi * Z)
v = -np.sin(np.pi * X) * np.cos(np.pi * Y) * np.sin(np.pi * Z)
w = np.sin(np.pi * X) * np.sin(np.pi * Y) * np.cos(np.pi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

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



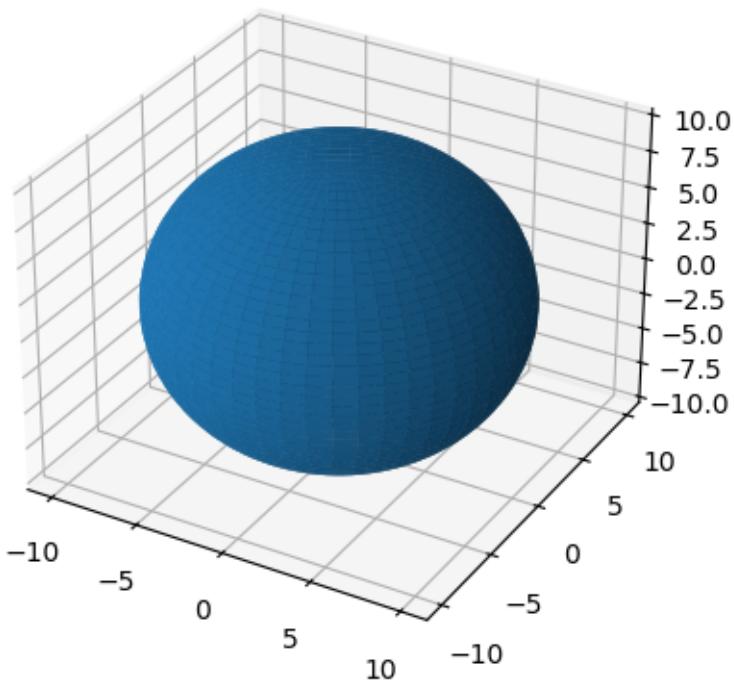
```
fig = plt.figure()
ax = fig.add_subplot(projection='3d')
theta = np.linspace(0, 2 * np.pi)
x = np.sin(theta)
y = np.cos(theta)
z = np.cos(theta)

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

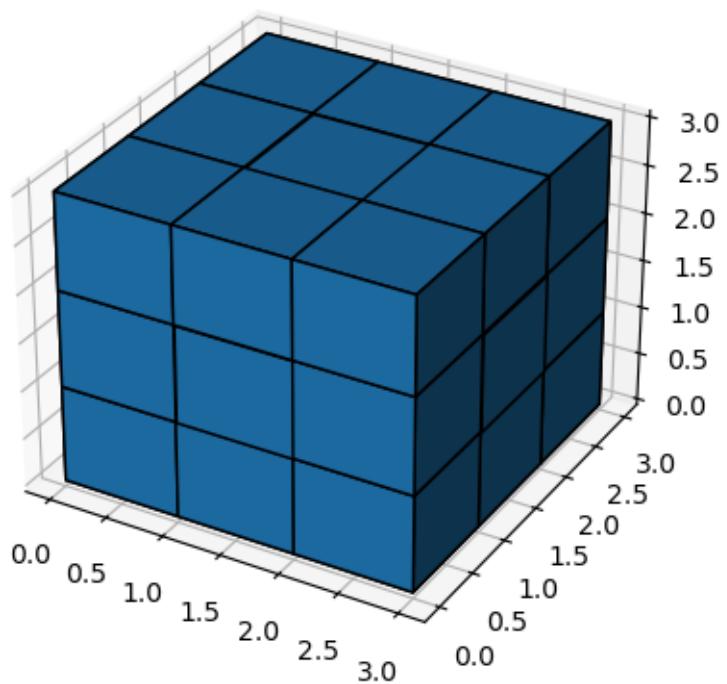


```
fig = plt.figure()
ax = fig.add_subplot(projection='3d')
u = np.linspace(0, 2 * np.pi, 100)
v = np.linspace(0, np.pi, 100)
x = 10 * np.outer(np.cos(u), np.sin(v))
y = 10 * np.outer(np.sin(u), np.sin(v))
z = 10 * np.outer(np.ones(np.size(u)), np.cos(v))

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()
```



HANDON-C12 QT VERSION

```
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)
```

(continues on next page)

(continued from previous page)

```
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)
```

```
anim.save('handon-c12-sine_wave.gif', writer='pillow')
```

```
# 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()
```

11.1 celluloid (above pyqt)

11.1.1 `conda install -c anaconda PyQt5 --solver=classic # <- additional for hands on>`

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

11.1.3 `# <- 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
    # colour each plot
    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()
```

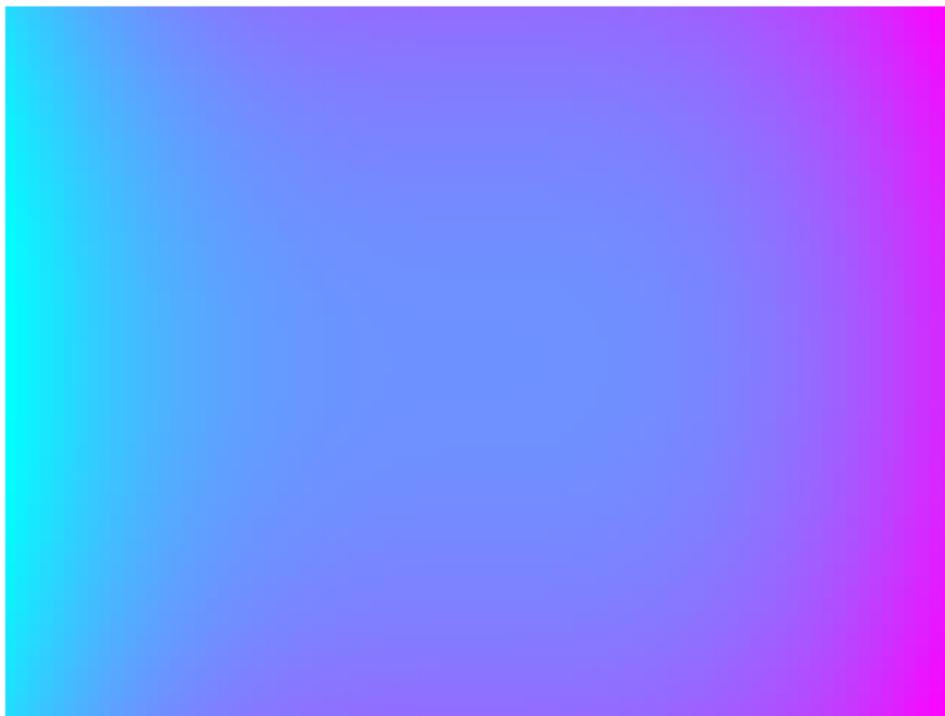
CHAPTER
TWELVE

HANDON-C13

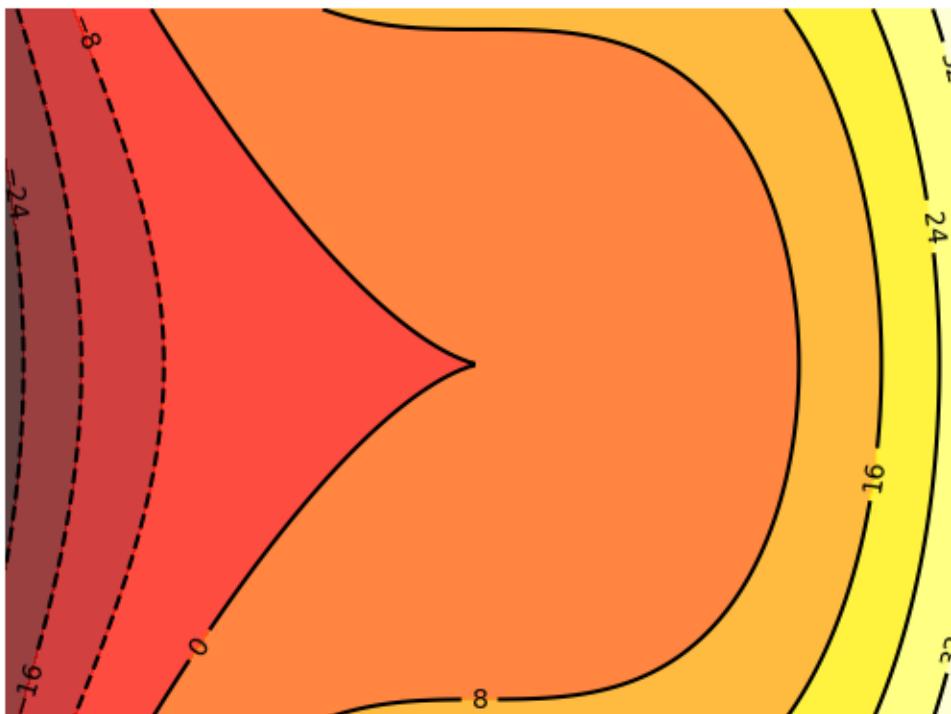
```
%matplotlib inline
import numpy as np
import matplotlib.pyplot as plt

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

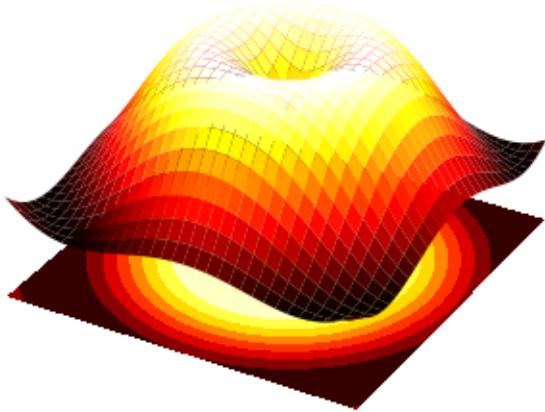
n = 10
x = np.linspace(-3, 3, 8 * n)
y = np.linspace(-3, 3, 6 * n)
X, Y = np.meshgrid(x, y)
Z = f(X, Y)
plt.imshow(Z, interpolation='nearest',
           cmap = 'cool', origin='lower')
plt.axis('off')
plt.show()
```



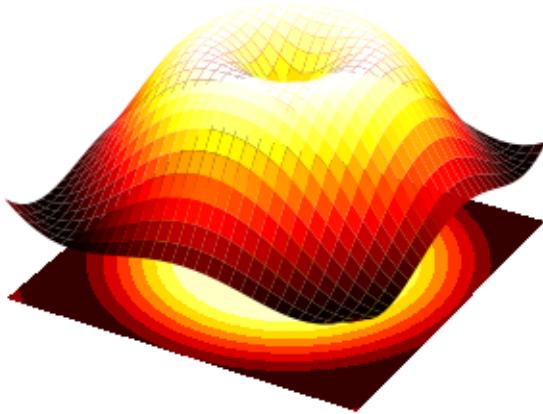
```
n = 256
x = np.linspace(-3, 3, n)
y = np.linspace(-3, 3, n)
X, Y = np.meshgrid(x, y)
plt.contourf(X, Y, f(X, Y), 8,
             alpha = 0.75, cmap='hot')
C = plt.contour(X, Y, f(X, Y), 8,
                 colors='black')
plt.clabel(C, inline=1, fontsize=10)
plt.axis('off')
plt.show()
```



```
%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()
```

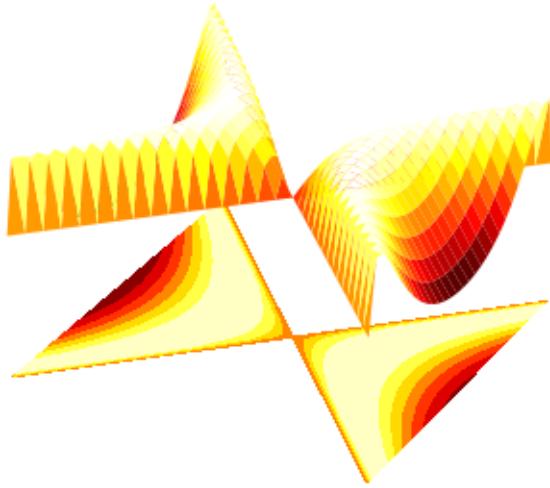


```
%matplotlib inline
#%matplotlib qt
fig = plt.figure()
ax = plt.axes(projection='3d')
X = np.arange(-4, 4, 0.25)
Y = np.arange(-4, 4, 0.25)
X, Y = np.meshgrid(X, Y)
R = np.sqrt(X ** 2 + Y ** 2)
Z = np.sin(R)
ax.plot_surface(X, Y, Z, rstride=1,
                cstride=1, cmap='hot')
ax.contourf(X,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



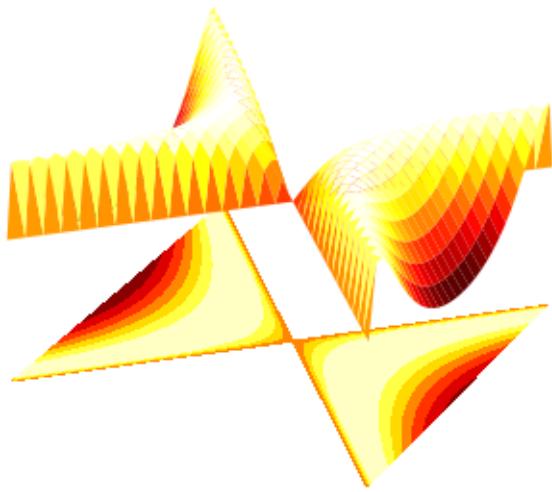
```
%matplotlib inline
fig = plt.figure()
ax = plt.axes(projection='3d')
X = np.arange(-4, 4, 0.25)
Y = np.arange(-4, 4, 0.25)
X, Y = np.meshgrid(X, Y)
R = np.sqrt(X ** 2 - Y ** 2)
Z = np.sin(R)
ax.plot_surface(X, Y, Z, rstride=1,
                cstride=1, cmap='hot')
ax.contourf(X, Y, Z, zdir='z',
             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:_
  RuntimeWarning: invalid value encountered in sqrt
    R = np.sqrt(X ** 2 - Y ** 2)
```

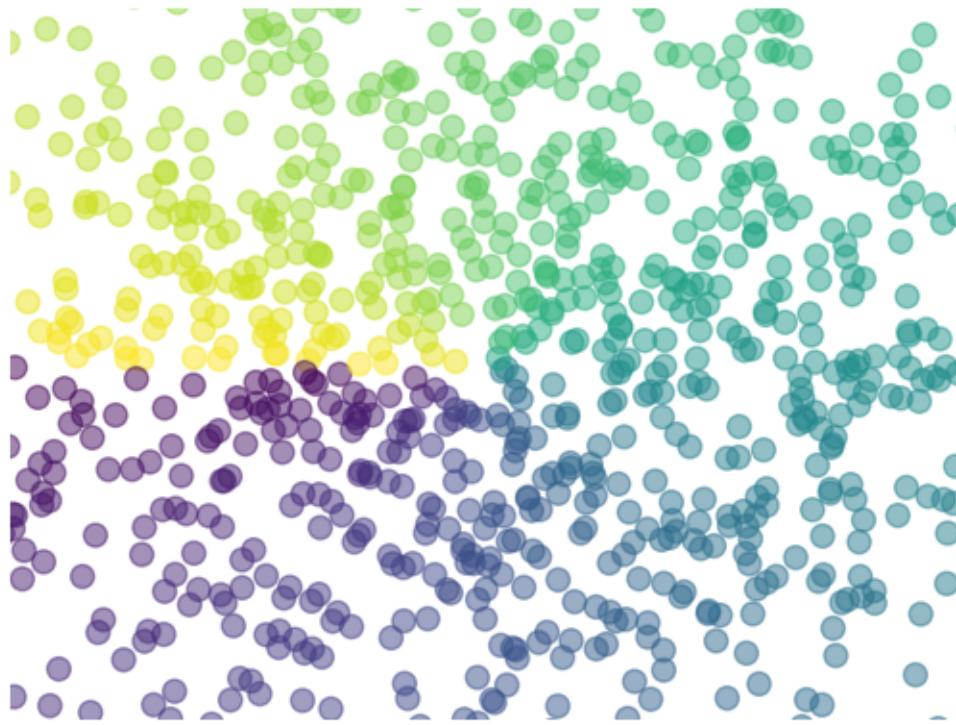


```
%matplotlib inline
#%matplotlib qt
fig = plt.figure()
ax = plt.axes(projection='3d')
X = np.arange(-4, 4, 0.25)
Y = np.arange(-4, 4, 0.25)
X, Y = np.meshgrid(X, Y)
R = np.sqrt(X ** 2 - Y ** 2)
Z = np.sin(R)
ax.plot_surface(X, Y, Z, rstride=1,
                cstride=1, cmap='hot')
ax.contourf(X,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

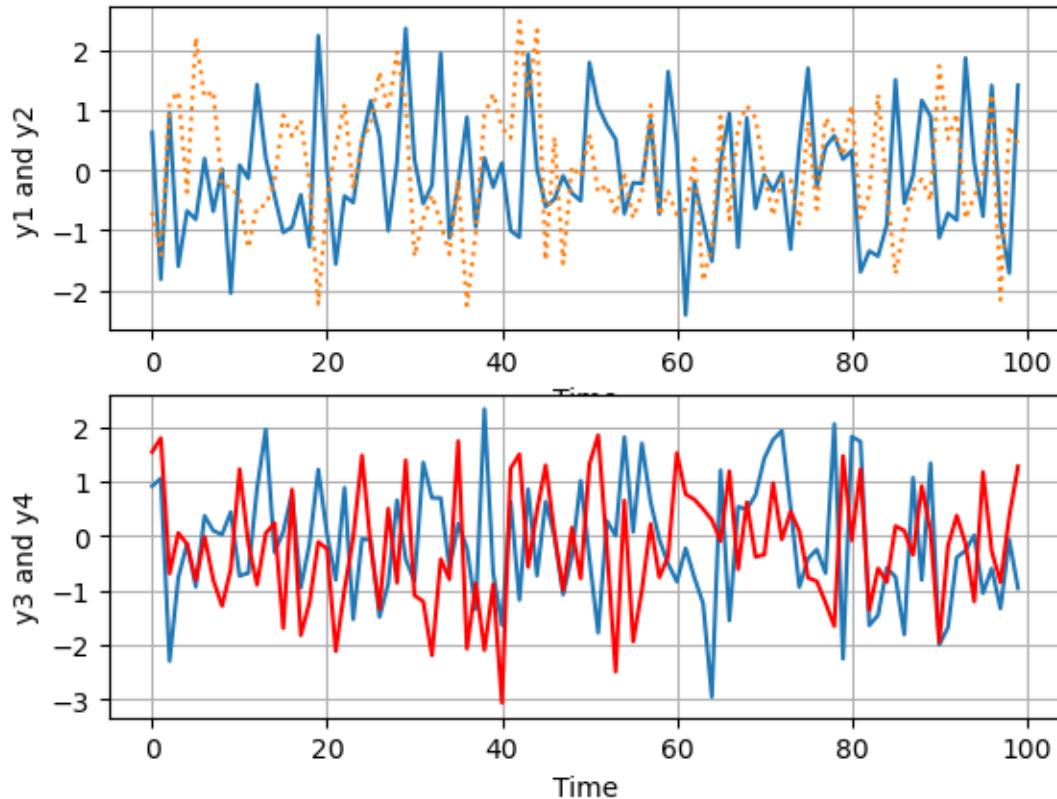
```
/var/folders/33/krstvgn2rncl74r18tkv6_80000gn/T/ipykernel_32430/3209884936.py:8:_
  RuntimeWarning: invalid value encountered in sqrt
    R = np.sqrt(X ** 2 - Y ** 2)
```



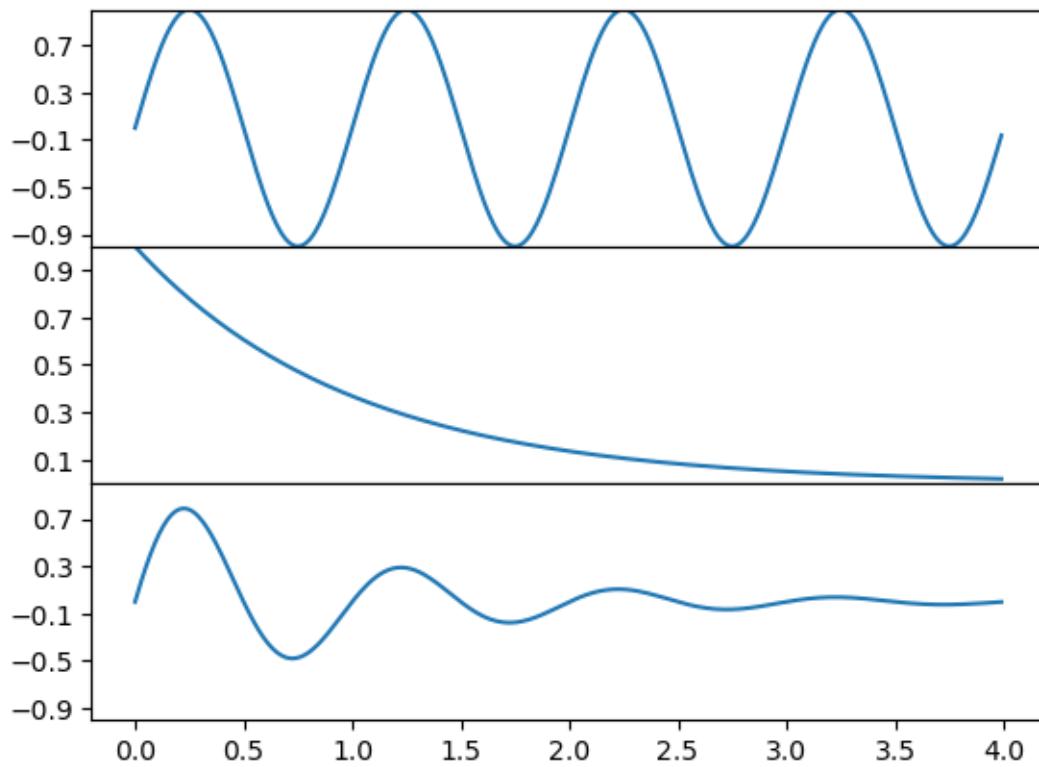
```
%matplotlib inline
n = 1024
X = np.random.normal(0, 1, n)
Y = np.random.normal(0, 1, n)
color = np.arctan2(Y, X)
plt.scatter(X, Y, s=75, c=color, alpha=0.5)
plt.xlim(-1.5, 1.5)
plt.ylim(-1.5, 1.5)
plt.axis('off')
plt.show()
```



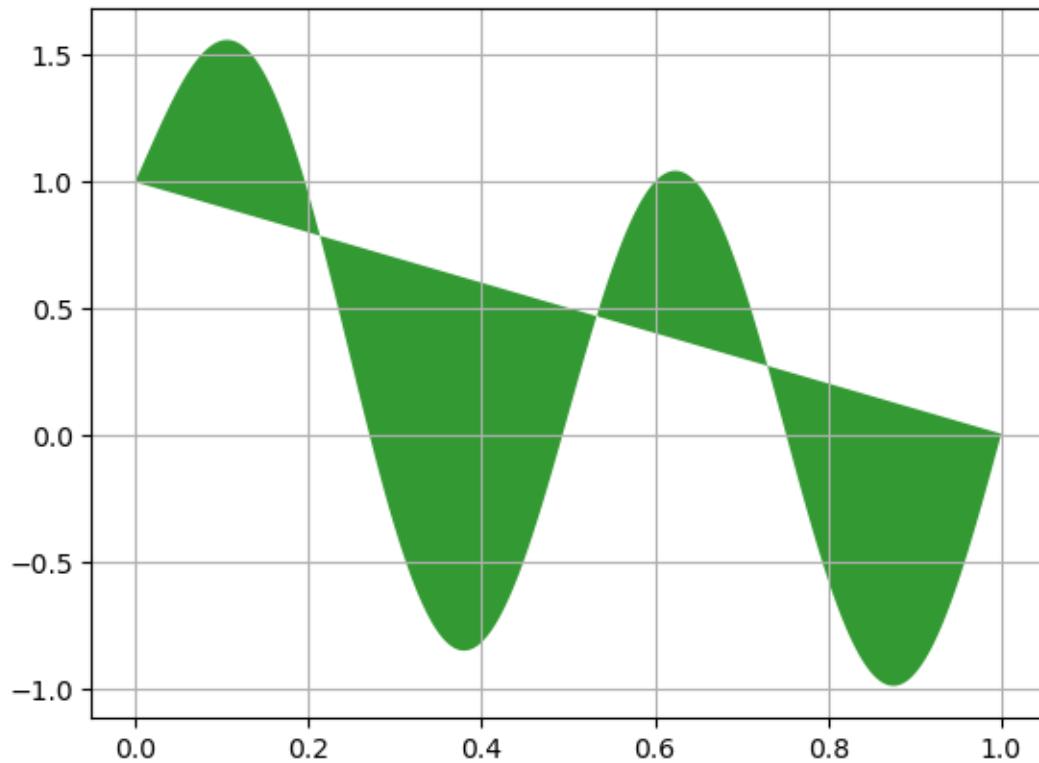
```
N = 100
x = np.arange(N) # timestamps
y1 = np.random.randn(N)
y2 = np.random.randn(N)
y3 = np.random.randn(N)
y4 = np.random.randn(N)
plt.subplot(2, 1, 1) # what is 2, 1, 1
plt.plot(x, y1)
plt.plot(x, y2, ':')
plt.grid()
plt.xlabel('Time')
plt.ylabel('y1 and y2')
plt.axis('tight')
plt.subplot(2,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



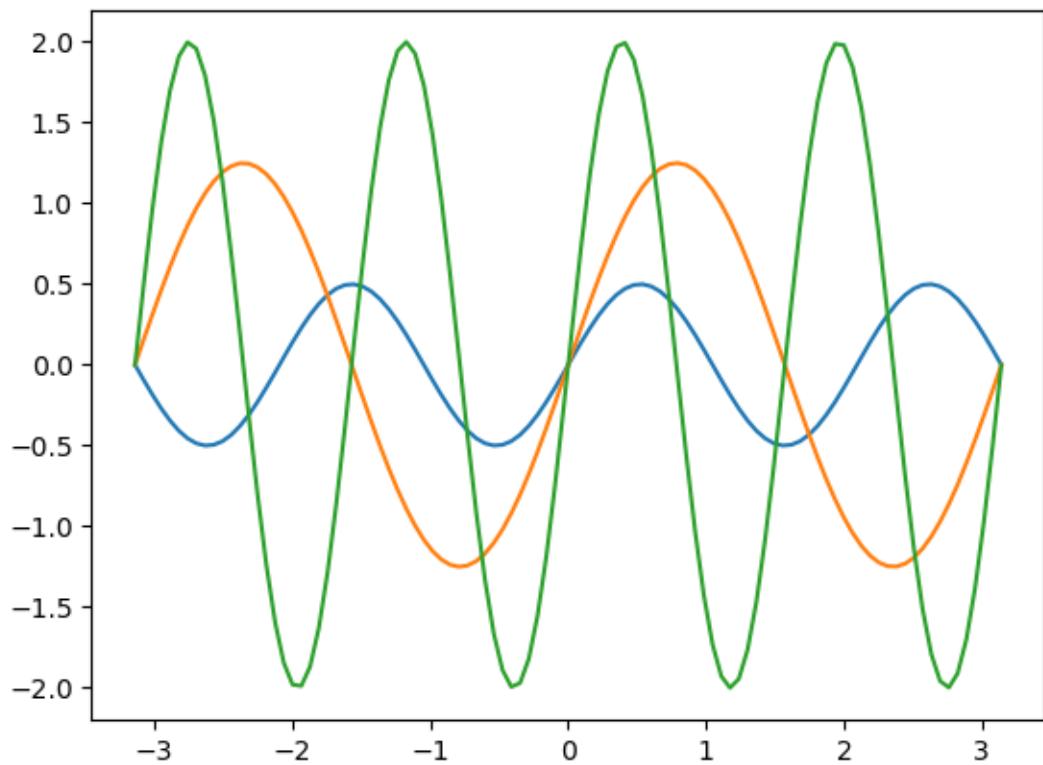
```
f= 1
t = np.arange( 0.0, 4.0, 0.01)
s1 = np.sin(2 *np.pi * f * t)
s2 = np.exp(-t)
s3 = s1 * s2
f = plt.figure()
plt.subplots_adjust(hspace=0.001)
ax1 = plt.subplot( 311 )
ax1.plot(t, s1)
plt.yticks(np.arange(-0.9, 1.0, 0.4))
plt.ylim(-1, 1)
ax2 = plt.subplot(312, sharex=ax1)
ax2.plot(t, s2)
plt.yticks(np.arange(0.1, 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()
```



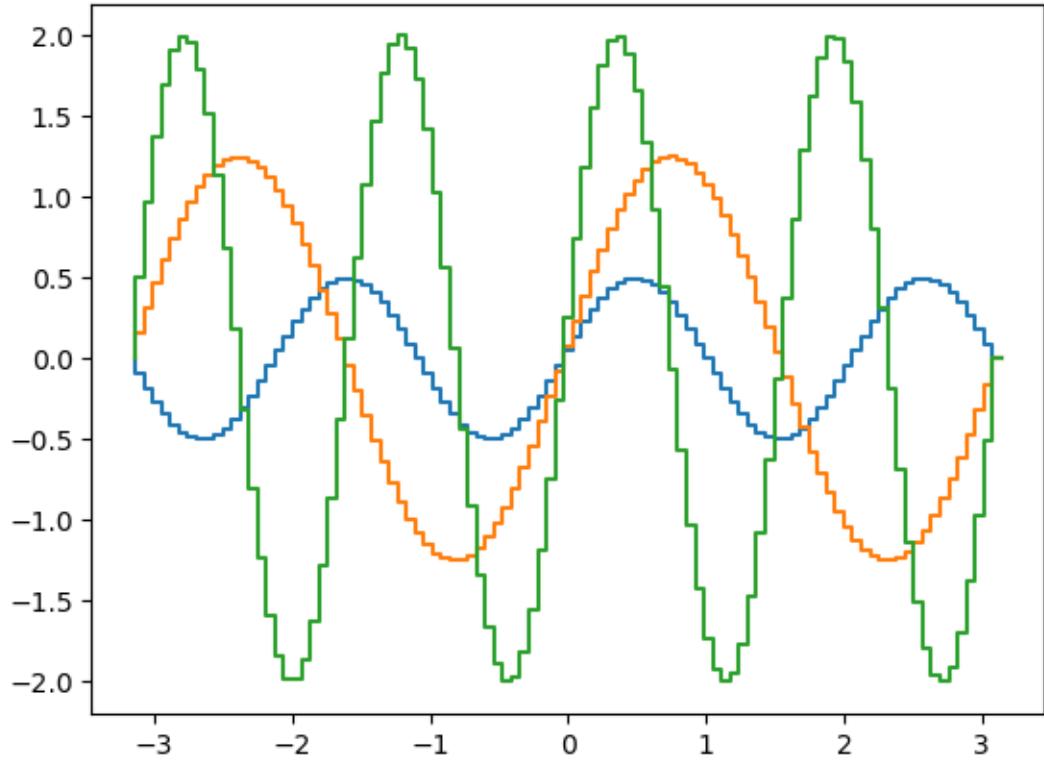
```
N = 1000
x = np.linspace(0, 1, N)
y = np.sin(4 * np.pi * x) + np.exp(-5 * x)
plt.fill(x, y, 'g', alpha = 0.8)
plt.grid(True)
plt.show()
```



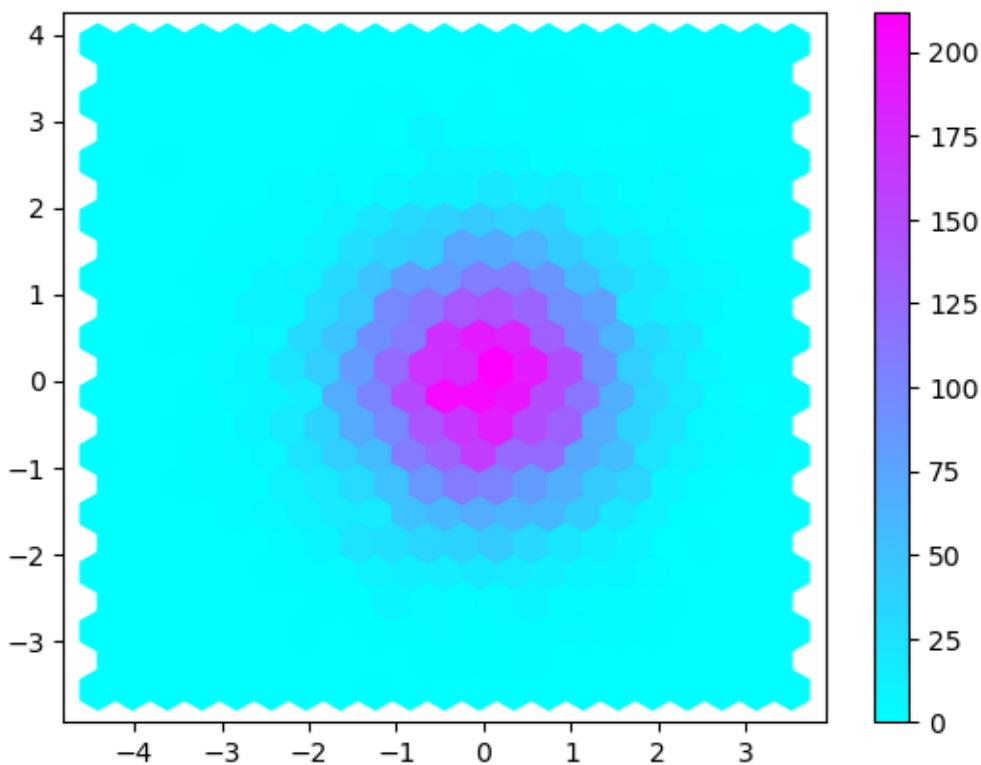
```
N = 100
x = np.linspace(-np.pi, np.pi, N)
y1 = 0.5 * np.sin(3*x)
y2 = 1.25 * np.sin(2*x)
y3 = 2 * np.sin(4*x)
plt.plot(x, y1, x, y2, x, y3)
plt.show()
```



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



```
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 ???
```

```
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.
```

```
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.  
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.  
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.  
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.
```

```
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.
```

```
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.
```

```
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.
```

```
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.
```

```
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.
```

```
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.
```

```
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.
```

```
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.
```

```
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.
```

```
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.
```

```
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.  
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.  
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.  
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.
```

```
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.
```

```
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.
```

```
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.
```

```
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.
```

```
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.
```

```
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.
```

```
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.
```

```
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.
```

```
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.
```

```
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.
```

```
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.
```

```
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.
```

```
findfont: Font family 'xkcd Script' not found.
```

```
findfont: Font family 'Humor Sans' not found.
```

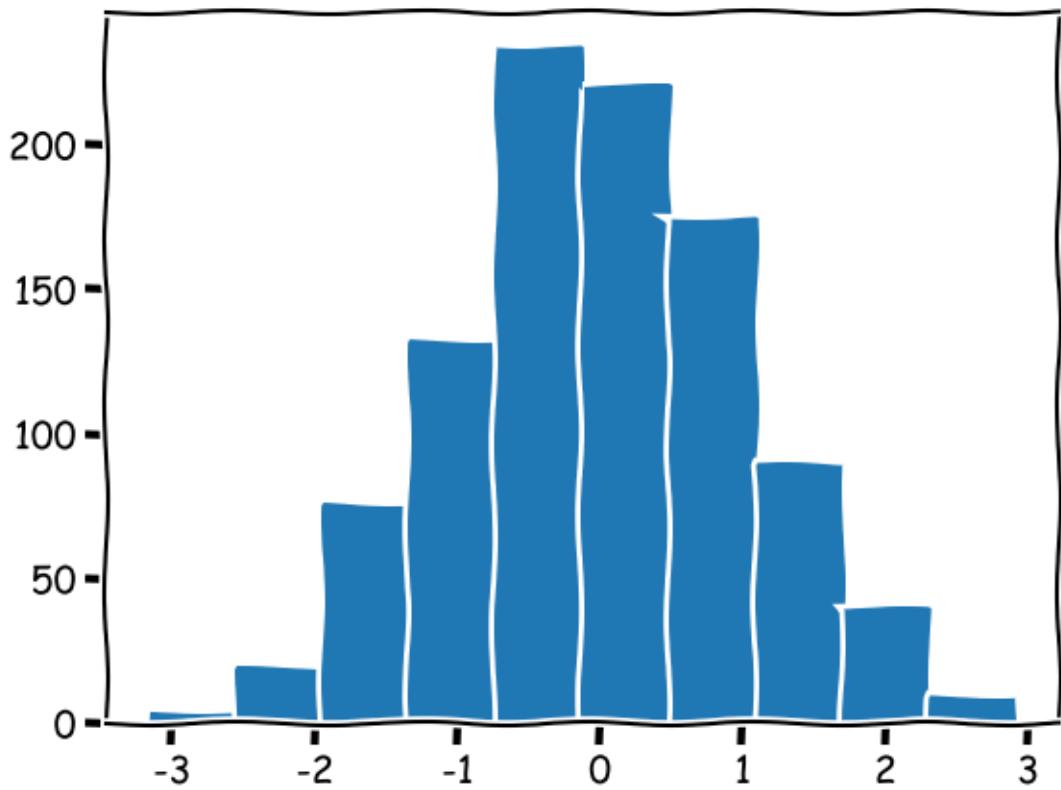
```
findfont: Font family 'Comic Neue' not found.
```

```
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.
```



```
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()
```

```
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.
```

```
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.
```

```
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.
```

```
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.
```

```
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.  
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.  
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.  
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.  
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.
```

```
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.
```

```
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.
```

```
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.
```

```
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.
```

```
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.
```

```
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.
```

```
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.
```

```
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.
```

```
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.
```

```
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.  
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.  
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.  
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.  
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.
```

```
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.
```

```
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.
```

```
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.
```

```
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.
```

```
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.
```

```
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.
```

```
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.
```

```
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.
```

```
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.
```

```
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.
```

```
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.
```

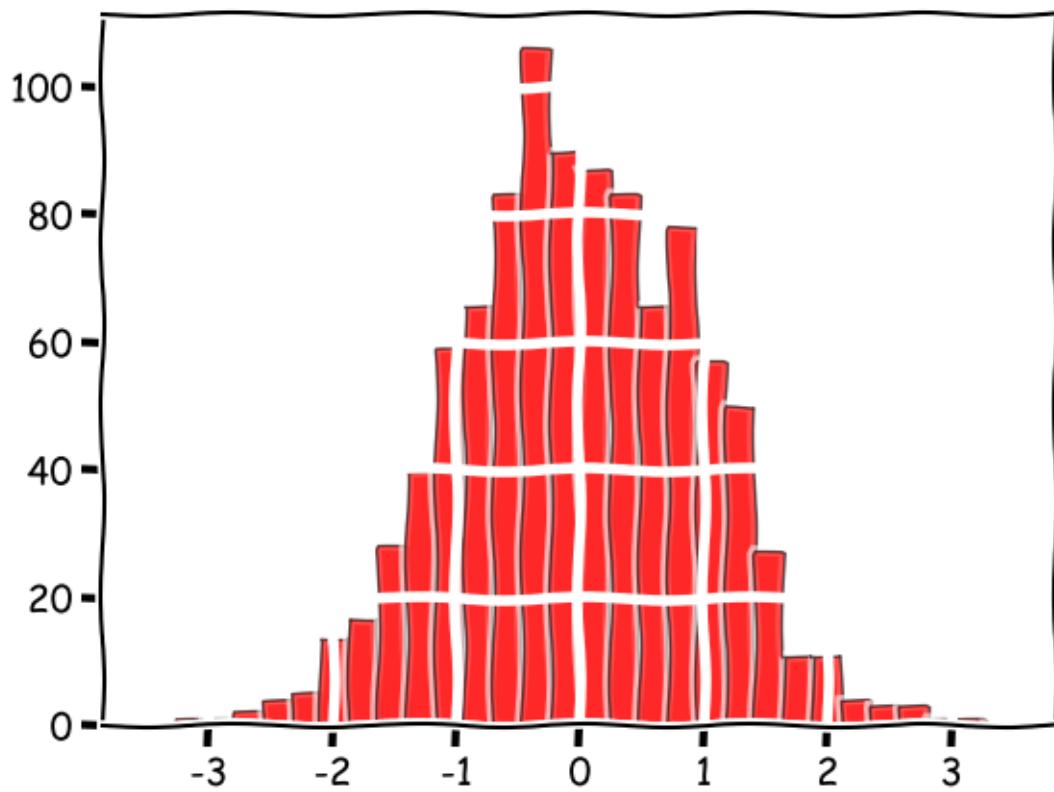
```
findfont: Font family 'Comic Neue' not found.
```

```
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.
```



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

```
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.
```

```
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.
```

```
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.
```

```
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.
```

```
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.
```

```
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.
```

```
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.
```

```
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.
```

```
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.
```

```
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.
```

```
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.
```

```
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.
```

```
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.  
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.  
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.  
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.
```

```
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.
```

```
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.
```

```
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.
```

```
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.
```

```
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.
```

```
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.
```

```
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.
```

```
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.
```

```
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.
```

```
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.
```

```
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.
```

```
findfont: Font family 'xkcd Script' not found.
```

```
findfont: Font family 'Humor Sans' not found.
```

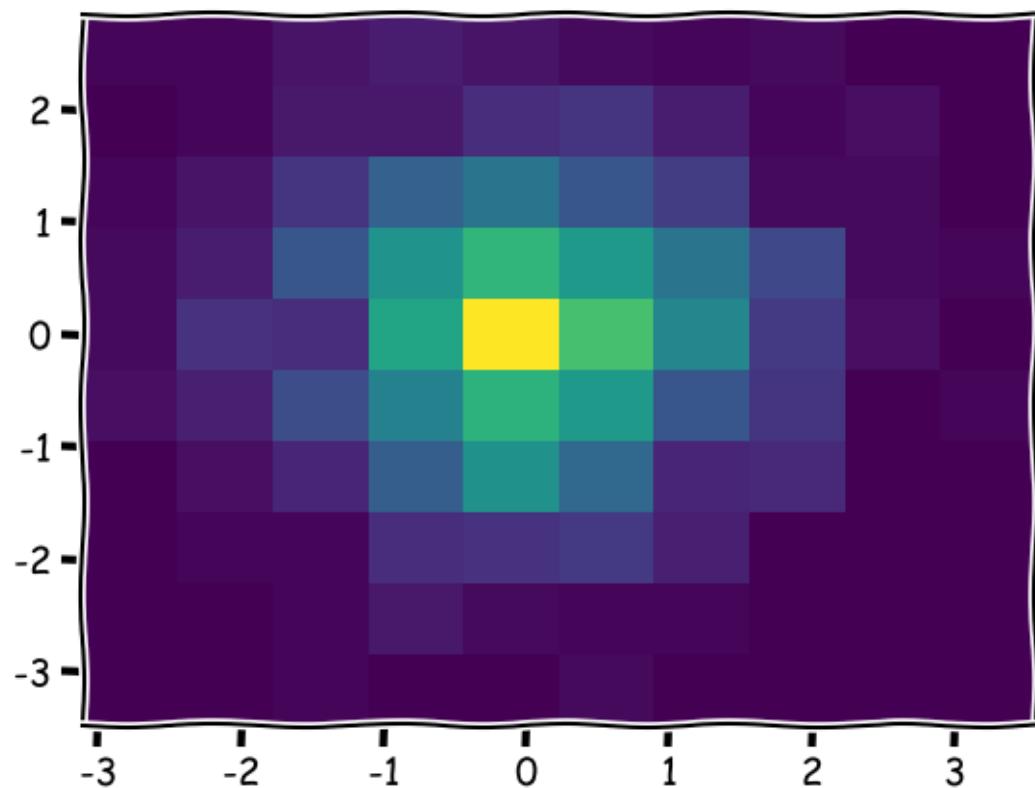
```
findfont: Font family 'Comic Neue' not found.
```

```
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.
```



CHAPTER
THIRTEEN

HANDOM 18 COVID

<https://github.com/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_cases': 0, 'deaths': 1649114, 'new_deaths': 0, 'recovered': 124286789,
↳ 'active': 2702752, 'active_cases': 2702752, 'critical': 6771, 'total_tests': 0,
↳ 'total_tests_per_million': Decimal('0'), 'total_cases_per_million': Decimal('0'),
↳ 'total_deaths_per_million': Decimal('0'), 'population': Decimal('0')}, {'country':
↳ ': 'Asia', 'total_cases': 220801172, 'confirmed': 220801172, 'new_cases': 0,
↳ 'deaths': 1549896, 'new_deaths': 0, 'recovered': 204576313, 'active': 14674963,
↳ 'active_cases': 14674963, 'critical': 15145, 'total_tests': 0, 'total_tests_per_
million': Decimal('0'), 'total_cases_per_million': Decimal('0'), 'total_deaths_
per_million': Decimal('0'), 'population': Decimal('0')}, {'country': 'Europe',
↳ 'total_cases': 250396529, 'confirmed': 250396529, 'new_cases': 0, 'deaths':_
2075010, 'new_deaths': 0, 'recovered': 246303289, 'active': 2018230, 'active_
cases': 2018230, 'critical': 5525, 'total_tests': 0, 'total_tests_per_million':_
Decimal('0'), 'total_cases_per_million': Decimal('0'), 'total_deaths_per_million
↳ ': Decimal('0'), 'population': Decimal('0')}, {'country': 'South America',
↳ 'total_cases': 69041246, 'confirmed': 69041246, 'new_cases': 0, 'deaths':_
1361392, 'new_deaths': 0, 'recovered': 66543667, 'active': 1136187, 'active_cases
↳ ': 1136187, 'critical': 10089, 'total_tests': 0, 'total_tests_per_million':_
Decimal('0'), 'total_cases_per_million': Decimal('0'), 'total_deaths_per_million
↳ ': Decimal('0'), 'population': Decimal('0')}, {'country': 'Oceania',
↳ 'total_cases': 14669573, 'confirmed': 14669573, 'new_cases': 0, 'deaths': 30547,
↳ 'new_deaths': 0, 'recovered': 14532599, 'active': 106427, 'active_cases': 106427,
↳ 'critical': 49, 'total_tests': 0, 'total_tests_per_million': Decimal('0'),
↳ 'total_cases_per_million': Decimal('0'), 'total_deaths_per_million': Decimal('0'),
↳ 'population': Decimal('0')}, {'country': 'Africa',
↳ 'total_cases': 12840092, 'confirmed': 12840092, 'new_cases': 0, 'deaths': 258838,
↳ 'new_deaths': 0, 'recovered': 12088366, 'active': 492888, 'active_cases': 492888,
↳ 'critical': 547, 'total_tests': 0, 'total_tests_per_million': Decimal('0'),
↳ 'total_cases_per_million': Decimal('0'), 'total_deaths_per_million': Decimal('0'),
↳ 'population': Decimal('0')}, {'country': '0', 'total_cases': 721, 'confirmed': 721,
↳ 'new_cases': 0, 'deaths': 15, 'new_deaths': 0, 'recovered': 706, 'active': 0,
↳ 'active_cases': 191, 'critical': 0, 'total_tests': 0, 'total_tests_per_million': Decimal('0'),
↳ 'total_cases_per_million': Decimal('0'), 'total_deaths_per_million': Decimal('0'),
↳ 'population': Decimal('0')}, {'country': 'World', 'total_cases': 696387988,
↳ 'confirmed': 696387988, 'new_cases': 0, 'deaths': 6924812, 'new_deaths': 0,
```

(continues on next page)

(continued from previous page)

```

deaths: 6924812, confirmed: 696387988, recovered: 668331729
countries: ['north america', 'asia', 'europe', 'south america', 'oceania', 'africa',
    ' ', 'world', 'usa', 'india', 'france', 'germany', 'brazil', 's. korea', 'japan',
    'italy', 'uk', 'russia', 'turkey', 'spain', 'australia', 'vietnam', 'taiwan',
    'argentina', 'netherlands', 'mexico', 'iran', 'indonesia', 'poland', 'colombia',
    'greece', 'austria', 'portugal', 'ukraine', 'chile', 'malaysia', 'israel',
    'belgium', 'dprk', 'thailand', 'canada', 'czechia', 'peru', 'switzerland',
    'philippines', 'south africa', 'romania', 'denmark', 'hong kong', 'sweden',
    'singapore', 'serbia', 'new zealand', 'iraq', 'hungary', 'bangladesh', 'slovakia',
    'georgia', 'jordan', 'ireland', 'pakistan', 'norway', 'finland', 'kazakhstan',
    'slovenia', 'lithuania', 'bulgaria', 'guatemala', 'morocco', 'croatia', 'lebanon',
    'costa rica', 'bolivia', 'tunisia', 'cuba', 'ecuador', 'uae', 'panama',
    'uruguay', 'mongolia', 'nepal', 'belarus', 'latvia', 'saudi arabia', 'azerbaijan',
    'paraguay', 'bahrain', 'sri lanka', 'dominican republic', 'kuwait', 'cyprus',
    'myanmar', 'moldova', 'palestine', 'estonia', 'venezuela', 'egypt', 'qatar',
    'libya', 'ethiopia', 'réunion', 'honduras', 'armenia', 'bosnia and herzegovina',
    'oman', 'zambia', 'north macedonia', 'kenya', 'albania', 'botswana', 'luxembourg',
    'brunei', 'montenegro', 'algeria', 'nigeria', 'zimbabwe', 'uzbekistan',
    'mozambique', 'martinique', 'afghanistan', 'laos', 'iceland', 'kyrgyzstan',
    'guadeloupe', 'el salvador', 'trinidad and tobago', 'maldives', 'namibia',
    'uganda', 'ghana', 'jamaica', 'cambodia', 'rwanda', 'cameroon', 'malta',
    'barbados', 'angola', 'channel islands', 'french guiana', 'drc', 'senegal',
    'malawi', 'ivory coast', 'suriname', 'new caledonia', 'french polynesia',
    'eswatini', 'guyana', 'belize', 'fiji', 'madagascar', 'cabo verde', 'sudan',
    'mauritania', 'bhutan', 'syria', 'burundi', 'seychelles', 'gabon', 'andorra',
    'papua new guinea', 'curaçao', 'aruba', 'tanzania', 'mauritius', 'mayotte', 'togo',
    'guinea', 'bahamas', 'isle of man', 'lesotho', 'faeroe islands', 'haiti',
    'mali', 'cayman islands', 'saint lucia', 'benin', 'somalia', 'micronesia', 'congo',
    'san marino', 'solomon islands', 'timor-leste', 'burkina faso', 'liechtenstein',
    'gibraltar', 'grenada', 'macao', 'bermuda', 'nicaragua', 'south sudan',
    'tajikistan', 'equatorial guinea', 'monaco', 'tonga', 'samoa', 'marshall islands',
    'dominica', 'djibouti', 'car', 'gambia', 'saint martin', 'vanuatu', 'greenland',
    'yemen', 'caribbean netherlands', 'sint maarten', 'eritrea', 'niger', 'st._vincent grenadines',
    'guinea-bissau', 'comoros', 'antigua and barbuda', 'iberia',
    'sierra leone', 'chad', 'british virgin islands', 'cook islands', 'turks and caicos',
    'saint kitts and nevis', 'sao tome and principe', 'palau', 'st. barth',
    'nauru', 'kiribati', 'anguilla', 'wallis and futuna', 'saint pierre miquelon',
    'tuvalu', 'saint helena', 'falkland islands', 'montserrat', 'niue', 'diamond_princess',
    'tokelau', 'vatican city', 'western sahara', 'ms zaandam', 'china']
cases: {'country': 'Sweden', 'total_cases': 2718172, 'confirmed': 2718172, 'new_cases': 0, 'deaths': 24922, 'new_deaths': 0, 'recovered': 2691266, 'active': 1984, 'active_cases': 1984, 'critical': 1, 'total_tests': 19500873, 'total_tests_per_million': Decimal('0'), 'total_cases_per_million': Decimal('265993'), 'total_deaths_per_million': Decimal('2439'), 'population': Decimal('10218971')}

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

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

```
[{'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, 'last_update': 1678454462000}, {'id': '95', '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', 'country': 'Vietnam', 'confirmed': 11526994, '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, 'active': None, 'deaths': 333188, '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, 'recovered': None, 'latitude': 39.3999, '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': (continues on next page) 5570473, 'active': None, 'deaths': 26266, 'recovered': None, 'latitude': 39.3999, 'longitude': -8.2245, 'last_update': 1678454462000} ]
```

(continued from previous page)

deaths: 6881955, confirmed: 676609955

```
cases: {'id': '40', 'country': 'Comoros', 'confirmed': 9008, 'active': None,  
↳ 'deaths': 161, 'recovered': None, 'latitude': -11.6455, 'longitude': 43.3333,  
↳ 'last_update': 1678454462000}
```

```
countries: [{"id": "187", "name": "US"}, {"id": "81", "name": "India"}, {"id": "64  
↳ ", "name": "France"}, {"id": "68", "name": "Germany"}, {"id": "25", "name":  
↳ "Brazil"}, {"id": "89", "name": "Japan"}, {"id": "95", "name": "Korea, South"}, {"id":  
↳ "87", "name": "Italy"}, {"id": "191", "name": "United Kingdom"}, {"id": "148",  
↳ "name": "Russia"}, {"id": "185", "name": "Turkey"}, {"id": "168", "name": "Spain"},  
{"id": "196", "name": "Vietnam"}, {"id": "10", "name": "Australia"}, {"id": "8",  
↳ "name": "Argentina"}, {"id": "176", "name": "Taiwan"}, {"id": "129", "name": "Netherlands"},  
{"id": "83", "name": "Iran"}, {"id": "118", "name": "Mexico"}, {"id": "82", "name": "Indonesia"},  
{"id": "144", "name": "Poland"}, {"id": "39", "name": "Colombia"}, {"id": "11", "name": "Austria"}, {"id": "189",  
↳ "name": "Ukraine"}, {"id": "145", "name": "Portugal"}, {"id": "70", "name": "Greece"},  
{"id": "37", "name": "Chile"}, {"id": "111", "name": "Malaysia"}, {"id": "38", "name": "China"},  
{"id": "86", "name": "Israel"}, {"id": "18", "name": "Belgium"}, {"id": "179", "name": "Thailand"},  
{"id": "48", "name": "Czechia"}, {"id": "34", "name": "Canada"}, {"id": "142", "name": "Peru"}, {"id": "174", "name": "Switzerland"},  
{"id": "143", "name": "Philippines"}, {"id": "166", "name": "South Africa"}, {"id": "49", "name": "Denmark"},  
{"id": "147", "name": "Romania"}, {"id": "173", "name": "Sweden"}, {"id": "162", "name": "Slovakia"}, {"id": "158",  
↳ "name": "Serbia"}, {"id": "84", "name": "Iraq"}, {"id": "130", "name": "New Zealand"},  
{"id": "161", "name": "Singapore"}, {"id": "79", "name": "Hungary"}, {"id": "15", "name": "Bangladesh"},  
{"id": "67", "name": "Georgia"}, {"id": "90", "name": "Jordan"}, {"id": "85", "name": "Ireland"}, {"id": "137", "name": "Pakistan"},  
{"id": "91", "name": "Kazakhstan"}, {"id": "135", "name": "Norway"}, {"id": "63", "name": "Finland"},  
{"id": "163", "name": "Slovenia"}, {"id": "106", "name": "Lithuania"}, {"id": "27", "name": "Bulgaria"}, {"id": "124", "name": "Morocco"},  
{"id": "45", "name": "Croatia"}, {"id": "72", "name": "Guatemala"}, {"id": "101", "name": "Lebanon"}, {"id": "43", "name": "Costa Rica"}, {"id": "22",  
↳ "name": "Bolivia"}, {"id": "184", "name": "Tunisia"}, {"id": "46", "name": "Cuba"}, {"id": "54", "name": "Ecuador"},  
{"id": "190", "name": "United Arab Emirates"}, {"id": "192", "name": "Uruguay"}, {"id": "139", "name": "Panama"}, {"id": "122", "name": "Mongolia"},  
{"id": "128", "name": "Nepal"}, {"id": "17", "name": "Belarus"}, {"id": "100", "name": "Latvia"}, {"id": "156", "name": "Saudi Arabia"},  
{"id": "12", "name": "Azerbaijan"}, {"id": "141", "name": "Paraguay"}, {"id": "14", "name": "Bahrain"},  
{"id": "197", "name": "West Bank and Gaza"}, {"id": "169", "name": "Sri Lanka"}, {"id": "97", "name": "Kuwait"}, {"id": "53", "name": "Dominican Republic"},  
{"id": "47", "name": "Cyprus"}, {"id": "29", "name": "Burma"}, {"id": "59", "name": "Estonia"}, {"id": "120", "name": "Moldova"}, {"id": "195", "name": "Venezuela"},  
{"id": "55", "name": "Egypt"}, {"id": "104", "name": "Libya"}, {"id": "61", "name": "Ethiopia"}, {"id": "146", "name": "Qatar"}, {"id": "78", "name": "Honduras"},  
{"id": "9", "name": "Armenia"}, {"id": "23", "name": "Bosnia and Herzegovina"}, {"id": "136", "name": "Oman"}, {"id": "134", "name": "North Macedonia"}, {"id": "200", "name": "Zambia"}, {"id": "92", "name": "Kenya"},  
{"id": "2", "name": "Albania"}, {"id": "24", "name": "Botswana"}, {"id": "107", "name": "Luxembourg"}, {"id": "117", "name": "Mauritius"}, {"id": "123", "name": "Montenegro"},  
{"id": "26", "name": "Brunei"}, {"id": "96", "name": "Kosovo"}, {"id": "3", "name": "Algeria"}, {"id": "133", "name": "Nigeria"}, {"id": "201", "name": "Zimbabwe"},  
{"id": "193", "name": "Uzbekistan"}, {"id": "125", "name": "Mozambique"}, {"id": "99", "name": "Laos"}, {"id": "80", "name": "Afghanistan"},  
{"id": "183", "name": "Kyrgyzstan"}, {"id": "56", "name": "El Salvador"}, {"id": "183", "name": "Trinidad and Tobago"}, {"id": "112", "name": "Maldives"},  
{"id": "126", "name": "Namibia"}, {"id": "188", "name": "Uganda"}, {"id": "88", "name": "Jamaica"}, {"id": "32", "name": "Cambodia"}, {"id": "149", "name": "Rwanda"},  
{"id": "33", "name": "Cameroon"}, {"id": "114", "name": "Malta"}, {"id": "161", "name": "Barbados"}, {"id": "5", "name": "Angola"}, {"id": "42", "name": "Continued on next page"}]
```

(continued from previous page)

```

cases: {'id': '173', 'country': 'Sweden', 'confirmed': 2699339, 'active': None,
↳ 'deaths': 23777, 'recovered': None, 'latitude': 60.1282, 'longitude': 18.6435,
↳ 'last_update': 1678454462000}

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

see https://github.com/CSSEGISandData/COVID-19/commits/master/csse_covid_19_data/csse_covid_19_daily_reports

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:

Global: World Health Organization (WHO) U.S.: U.S. Centers for Disease Control and Prevention (CDC) For more information, visit the Johns Hopkins Coronavirus Resource Center.

```

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 Mar 10, 2023. It is now read-only. -")
# see https://github.com/CSSEGISandData/COVID-19/commits/master/csse_covid_19_data/csse_covid_19_daily_reports

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, 2023. It is now read-only. -
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.txt', 'handon-c4.ipynb', 'handon-c12-a.gif', 'imgnobk3References.bib',
↳ 'handon-c12-b.gif', 'handon-c12-c.gif', 'handon-c5.ipynb', 'handon-c12-d.gif',
↳ 'handon-c12-sine_wave.gif', 'handon-c7.ipynb', 'handon-c12.ipynb', '_toc.yml',
↳ 'handon-c9.ipynb', 'handon-c10.ipynb', 'Less.png', '_build', '_config.yml',
↳ 'lib', '.ipynb_checkpoints', 'handon-c8.ipynb', 'introHandon.md',
↳ 'handon-c13.ipynb', 'main', 'handon-c11-pyqt5.ipynb', 'data', 'handon-c18-covid195.ipynb',
↳ 'MacB3-Handon.ipynb', 'media']
```

(continued from previous page)

```

covid.source='john_hopkins'
countries=[{'id': '187', 'name': 'US'}, {'id': '81', 'name': 'India'}, {'id': '64',
↳ 'name': 'France'}, {'id': '68', 'name': 'Germany'}, {'id': '25', 'name': 'Brazil
↳ '}, {'id': '89', 'name': 'Japan'}, {'id': '95', 'name': 'Korea, South'}, {'id':
↳ '87', 'name': 'Italy'}, {'id': '191', 'name': 'United Kingdom'}, {'id': '148',
↳ 'name': 'Russia'}, {"id": "185", "name": "Turkey"}, {"id": "168", "name": "Spain
↳ '}, {"id": "196", "name": "Vietnam"}, {"id": "10", "name": "Australia"}, {"id":
↳ '8", "name": "Argentina"}, {"id": "176", "name": "Taiwan*"}, {"id": "129", "name
↳ ': 'Netherlands'}, {"id": "83", "name": "Iran"}, {"id": "118", "name": "Mexico"}, {
↳ 'id": "82", "name": "Indonesia"}, {"id": "144", "name": "Poland"}, {"id": "39",
↳ 'name": "Colombia"}, {"id": "11", "name": "Austria"}, {"id": "189", "name":
↳ 'Ukraine"}, {"id": "145", "name": "Portugal"}, {"id": "70", "name": "Greece"}, {
↳ 'id": "37", "name": "Chile"}, {"id": "111", "name": "Malaysia"}, {"id": "38",
↳ 'name": "China"}, {"id": "86", "name": "Israel"}, {"id": "18", "name": "Belgium"} {
↳ , {"id": "179", "name": "Thailand"}, {"id": "48", "name": "Czechia"}, {"id": "34
↳ '}, {"name": "Canada"}, {"id": "142", "name": "Peru"}, {"id": "174", "name":
↳ 'Switzerland"}, {"id": "143", "name": "Philippines"}, {"id": "166", "name":
↳ 'South Africa"}, {"id": "49", "name": "Denmark"}, {"id": "147", "name": "Romania
↳ '}, {"id": "173", "name": "Sweden"}, {"id": "162", "name": "Slovakia"}, {"id": "158",
↳ 'name": "Serbia"}, {"id": "84", "name": "Iraq"}, {"id": "130", "name":
↳ 'New Zealand"}, {"id": "161", "name": "Singapore"}, {"id": "79", "name": "Hungary
↳ '}, {"id": "15", "name": "Bangladesh"}, {"id": "67", "name": "Georgia"}, {"id": "id
↳ '90", "name": "Jordan"}, {"id": "85", "name": "Ireland"}, {"id": "137", "name":
↳ 'Pakistan"}, {"id": "91", "name": "Kazakhstan"}, {"id": "135", "name": "Norway"}, {
↳ 'id": "63", "name": "Finland"}, {"id": "163", "name": "Slovenia"}, {"id": "106
↳ '}, {"name": "Lithuania"}, {"id": "27", "name": "Bulgaria"}, {"id": "124", "name":
↳ 'Morocco"}, {"id": "45", "name": "Croatia"}, {"id": "72", "name": "Guatemala"}, {
↳ 'id": "101", "name": "Lebanon"}, {"id": "43", "name": "Costa Rica"}, {"id": "22",
↳ 'name": "Bolivia"}, {"id": "184", "name": "Tunisia"}, {"id": "46", "name": "Cuba
↳ '}, {"id": "54", "name": "Ecuador"}, {"id": "190", "name": "United Arab Emirates
↳ '}, {"id": "192", "name": "Uruguay"}, {"id": "139", "name": "Panama"}, {"id": "id
↳ '122", "name": "Mongolia"}, {"id": "128", "name": "Nepal"}, {"id": "17", "name":
↳ 'Belarus"}, {"id": "100", "name": "Latvia"}, {"id": "156", "name": "Saudi Arabia
↳ '}, {"id": "12", "name": "Azerbaijan"}, {"id": "141", "name": "Paraguay"}, {"id
↳ '": "14", "name": "Bahrain"}, {"id": "197", "name": "West Bank and Gaza"}, {"id":
↳ '169", "name": "Sri Lanka"}, {"id": "97", "name": "Kuwait"}, {"id": "53", "name":
↳ 'Dominican Republic"}, {"id": "47", "name": "Cyprus"}, {"id": "29", "name":
↳ 'Burma"}, {"id": "59", "name": "Estonia"}, {"id": "120", "name": "Moldova"}, {"id
↳ '": "195", "name": "Venezuela"}, {"id": "55", "name": "Egypt"}, {"id": "104",
↳ 'name": "Libya"}, {"id": "61", "name": "Ethiopia"}, {"id": "146", "name": "Qatar
↳ '}, {"id": "78", "name": "Honduras"}, {"id": "9", "name": "Armenia"}, {"id": "23
↳ '}, {"name": "Bosnia and Herzegovina"}, {"id": "136", "name": "Oman"}, {"id": "134
↳ '}, {"name": "North Macedonia"}, {"id": "200", "name": "Zambia"}, {"id": "92",
↳ 'name": "Kenya"}, {"id": "2", "name": "Albania"}, {"id": "24", "name": "Botswana
↳ '}, {"id": "107", "name": "Luxembourg"}, {"id": "117", "name": "Mauritius"}, {"id
↳ '": "123", "name": "Montenegro"}, {"id": "26", "name": "Brunei"}, {"id": "96",
↳ 'name": "Kosovo"}, {"id": "3", "name": "Algeria"}, {"id": "133", "name": "Nigeria
↳ '}, {"id": "201", "name": "Zimbabwe"}, {"id": "193", "name": "Uzbekistan"}, {"id
↳ '": "125", "name": "Mozambique"}, {"id": "99", "name": "Laos"}, {"id": "1", "name
↳ '": "Afghanistan"}, {"id": "80", "name": "Iceland"}, {"id": "98", "name":
↳ 'Kyrgyzstan"}, {"id": "56", "name": "El Salvador"}, {"id": "183", "name":
↳ 'Trinidad and Tobago"}, {"id": "112", "name": "Maldives"}, {"id": "69", "name":
↳ 'Ghana"}, {"id": "126", "name": "Namibia"}, {"id": "188", "name": "Uganda"}, {"id
↳ '": "88", "name": "Jamaica"}, {"id": "32", "name": "Cambodia"}, {"id": "149
↳ '}, {"name": "Rwanda"}, {"id": "33", "name": "Cameroon"}, {"id": "114", "name": "Malta
↳ '}, {"id": "16", "name": "Barbados"}, {"id": "5", "name": "Angola"}, {"id": "42",
↳ 'name": "Congo (Kinshasa)"}, {"id": "157", "name": "Senegal"}, {"id": "110
↳ 'name": "Malawi"}, {"id": "44", "name": "Cote d'Ivoire"}, {"id": "172", "name":
↳ 'Suriname"}, {"id": "60", "name": "Eswatini"}, {"id": "75", "name": "Guyana"}, {
↳ 'id": "19", "name": "Belize"}, {"id": "62", "name": "Fiji"}, {"id": "109", "name
↳ '": "Madagascar"}, {"id": "170", "name": "Sudan"}, {"id": "116", "name": "
continues on next page")

```

(continued from previous page)

```

italy_cases1={'id': '115', 'country': 'Marshall Islands', 'confirmed': 15649,
↳ 'active': None, 'deaths': 17, 'recovered': None, 'latitude': 7.1315, 'longitude':
↳ ': 171.1845, 'last_update': 1678454462000}
italy_cases2={'id': '87', 'country': 'Italy', 'confirmed': 25603510, 'active':_
↳ None, 'deaths': 188322, 'recovered': None, 'latitude': 41.8719, 'longitude': 12.
↳ 5674, 'last_update': 1678454462000}
confirmed=676609955
deaths=6881955
italy_cases2['last_update']=1678454462000
-----
```

```

-----
covid.source='john_hopkins'
countries=[{'id': '187', 'name': 'US'}, {'id': '81', 'name': 'India'}, {'id': '64',
↳ 'name': 'France'}, {'id': '68', 'name': 'Germany'}, {'id': '25', 'name': 'Brazil
↳ '}, {'id': '89', 'name': 'Japan'}, {'id': '95', 'name': 'Korea, South'}, {'id':
↳ '87', 'name': 'Italy'}, {'id': '191', 'name': 'United Kingdom'}, {'id': '148',
↳ 'name': 'Russia'}, {'id': '185', 'name': 'Turkey'}, {'id': '168', 'name': 'Spain
↳ '}, {'id': '196', 'name': 'Vietnam'}, {'id': '10', 'name': 'Australia'}, {'id':
↳ '8', 'name': 'Argentina'}, {'id': '176', 'name': 'Taiwan*'}, {'id': '129', 'name
↳ ': 'Netherlands'}, {'id': '83', 'name': 'Iran'}, {'id': '118', 'name': 'Mexico'},
↳ {'id': '82', 'name': 'Indonesia'}, {'id': '144', 'name': 'Poland'}, {'id': '39',
↳ 'name': 'Colombia'}, {'id': '11', 'name': 'Austria'}, {'id': '189', 'name':
↳ 'Ukraine'}, {'id': '145', 'name': 'Portugal'}, {'id': '70', 'name': 'Greece'}, {
↳ 'id': '37', 'name': 'Chile'}, {'id': '111', 'name': 'Malaysia'}, {'id': '38',
↳ 'name': 'China'}, {'id': '86', 'name': 'Israel'}, {'id': '18', 'name': 'Belgium'}
↳ , {'id': '179', 'name': 'Thailand'}, {'id': '48', 'name': 'Czechia'}, {'id': '34
↳ ', 'name': 'Canada'}, {'id': '142', 'name': 'Peru'}, {'id': '174', 'name':
↳ 'Switzerland'}, {'id': '143', 'name': 'Philippines'}, {'id': '166', 'name':
↳ 'South Africa'}, {'id': '49', 'name': 'Denmark'}, {'id': '147', 'name': 'Romania
↳ '}, {'id': '173', 'name': 'Sweden'}, {'id': '162', 'name': 'Slovakia'}, {'id':
↳ '158', 'name': 'Serbia'}, {'id': '84', 'name': 'Iraq'}, {'id': '130', 'name':
↳ 'New Zealand'}, {'id': '161', 'name': 'Singapore'}, {'id': '79', 'name': 'Hungary
↳ '}, {'id': '15', 'name': 'Bangladesh'}, {'id': '67', 'name': 'Georgia'}, {'id':
↳ '90', 'name': 'Jordan'}, {'id': '85', 'name': 'Ireland'}, {'id': '137', 'name':
↳ 'Pakistan'}, {'id': '91', 'name': 'Kazakhstan'}, {'id': '135', 'name': 'Norway'},
↳ {'id': '63', 'name': 'Finland'}, {'id': '163', 'name': 'Slovenia'}, {'id': '106
↳ ', 'name': 'Lithuania'}, {'id': '27', 'name': 'Bulgaria'}, {'id': '124', 'name':
↳ 'Morocco'}, {'id': '45', 'name': 'Croatia'}, {'id': '72', 'name': 'Guatemala'}, {
↳ 'id': '101', 'name': 'Lebanon'}, {'id': '43', 'name': 'Costa Rica'}, {'id': '22',
↳ 'name': 'Bolivia'}, {'id': '184', 'name': 'Tunisia'}, {'id': '46', 'name': 'Cuba
↳ '}, {'id': '54', 'name': 'Ecuador'}, {'id': '190', 'name': 'United Arab Emirates
↳ '}, {'id': '192', 'name': 'Uruguay'}, {'id': '139', 'name': 'Panama'}, {'id':
↳ '122', 'name': 'Mongolia'}, {'id': '128', 'name': 'Nepal'}, {'id': '17', 'name':
↳ 'Belarus'}, {'id': '100', 'name': 'Latvia'}, {'id': '156', 'name': 'Saudi Arabia
↳ '}, {'id': '12', 'name': 'Azerbaijan'}, {'id': '141', 'name': 'Paraguay'}, {'id':
↳ '14', 'name': 'Bahrain'}, {"id": "197", "name": "West Bank and Gaza"}, {"id":
↳ "169", "name": "Sri Lanka"}, {"id": "97", "name": "Kuwait"}, {"id": "53", "name
↳ ': 'Dominican Republic'}, {"id": "47", "name": "Cyprus"}, {"id": "29", "name":
↳ "Burma"}, {"id": "59", "name": "Estonia"}, {"id": "120", "name": "Moldova"}, {"id
↳ ': '195', 'name': 'Venezuela'}, {"id": "55", "name": "Egypt"}, {"id": "104",
↳ 'name': 'Libya'}, {"id": "61", "name": "Ethiopia"}, {"id": "146", "name": 'Qatar
↳ '}, {"id": "78", "name": "Honduras"}, {"id": "9", "name": "Armenia"}, {"id": "23
↳ ", "name": "Bosnia and Herzegovina"}, {"id": "136", "name": "Oman"}, {"id": "134
↳ ", "name": "North Macedonia"}, {"id": "200", "name": "Zambia"}, {"id": "92",
↳ 'name': 'Kenya'}, {"id": "2", "name": 'Albania'}, {"id": "24", "name": 'Mauritius'},

-----
```

(continued on next page)

(continued from previous page)

```
italy_cases1={'id': '115', 'country': 'Marshall Islands', 'confirmed': 15649,
↳ 'active': None, 'deaths': 17, 'recovered': None, 'latitude': 7.1315, 'longitude
↳ ': 171.1845, 'last_update': 1678454462000}
italy_cases2={'id': '87', 'country': 'Italy', 'confirmed': 25603510, 'active':_
↳ None, 'deaths': 188322, 'recovered': None, 'latitude': 41.8719, 'longitude': 12.
↳ 5674, 'last_update': 1678454462000}
confirmed=676609955
deaths=6881955
-----
-----
```

```
import os
os.getcwd()
# cd '/Users/ngcchk/Documents/GitHub/gpd2-win-unity1/ipadred-rain/imgno_book1/
↳ imagebk3Ani'
```

```
'/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()
```

```
[{'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},
```

(continues on next page)

(continued from previous page)

```
'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,
'last_update': 1678454462000},
{'id': '95',
'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',
```

(continues on next page)

(continued from previous page)

```
'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',
'country': 'Vietnam',
'confirmed': 11526994,
'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,
```

(continues on next page)

(continued from previous page)

```

'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,
'active': None,
'deaths': 333188,
'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,

```

(continues on next page)

(continued from previous page)

```
'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,
'recovered': None,
'latitude': 39.3999,
'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,
```

(continues on next page)

(continued from previous page)

```

'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,
'longitude': 4.469936,
'last_update': 1678454462000},
{'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},

```

(continues on next page)

(continued from previous page)

```
{'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},
{'id': '166',
 'country': 'South Africa',
 'confirmed': 4067067,
 'active': None,
 'deaths': 102595,
 'recovered': None,
 'latitude': -30.5595,
 'longitude': 22.9375,
 'last_update': 1678454462000},
{'id': '49',
 'country': 'Denmark',
 'confirmed': 3451036,
 'active': None,
 'deaths': 8345,
 'recovered': None,
 'latitude': 56.2639,
 'longitude': 9.5018,
 'last_update': 1678454462000},
{'id': '147',
 'country': 'Romania',
 'confirmed': 3346046,
 'active': None,
 'deaths': 67736,
 'recovered': None,
 'latitude': 45.9432,
 'longitude': 24.9668,
 'last_update': 1678454462000},
{'id': '173',
 'country': 'Sweden',
```

(continues on next page)

(continued from previous page)

```

'confirmed': 2699339,
'active': None,
'deaths': 23777,
'recovered': None,
'latitude': 60.1282,
'longitude': 18.6435,
'last_update': 1678454462000},
{'id': '162',
'country': 'Slovakia',
'confirmed': 2667782,
'active': None,
'deaths': 21036,
'recovered': None,
'latitude': 48.669,
'longitude': 19.699,
'last_update': 1678454462000},
{'id': '158',
'country': 'Serbia',
'confirmed': 2500142,
'active': None,
'deaths': 17881,
'recovered': None,
'latitude': 44.0165,
'longitude': 21.0059,
'last_update': 1678454462000},
{'id': '84',
'country': 'Iraq',
'confirmed': 2465545,
'active': None,
'deaths': 25375,
'recovered': None,
'latitude': 33.223191,
'longitude': 43.679291,
'last_update': 1678454462000},
{'id': '130',
'country': 'New Zealand',
'confirmed': 2236114,
'active': None,
'deaths': 2550,
'recovered': None,
'latitude': -40.9006,
'longitude': 174.886,
'last_update': 1678454462000},
{'id': '161',
'country': 'Singapore',
'confirmed': 2235294,
'active': None,
'deaths': 1722,
'recovered': None,
'latitude': 1.2833,
'longitude': 103.8333,
'last_update': 1678454462000},
{'id': '79',
'country': 'Hungary',
'confirmed': 2196804,
'active': None,

```

(continues on next page)

(continued from previous page)

```
'deaths': 48762,
'recovered': None,
'latitude': 47.1625,
'longitude': 19.5033,
'last_update': 1678454462000},
{'id': '15',
'country': 'Bangladesh',
'confirmed': 2037871,
'active': None,
'deaths': 29445,
'recovered': None,
'latitude': 23.685,
'longitude': 90.3563,
'last_update': 1678454462000},
{'id': '67',
'country': 'Georgia',
'confirmed': 1827537,
'active': None,
'deaths': 16971,
'recovered': None,
'latitude': 42.3154,
'longitude': 43.3569,
'last_update': 1678454462000},
{'id': '90',
'country': 'Jordan',
'confirmed': 1746997,
'active': None,
'deaths': 14122,
'recovered': None,
'latitude': 31.24,
'longitude': 36.51,
'last_update': 1678454462000},
{'id': '85',
'country': 'Ireland',
'confirmed': 1704502,
'active': None,
'deaths': 8708,
'recovered': None,
'latitude': 53.1424,
'longitude': -7.6921,
'last_update': 1678454462000},
{'id': '137',
'country': 'Pakistan',
'confirmed': 1577411,
'active': None,
'deaths': 30644,
'recovered': None,
'latitude': 30.3753,
'longitude': 69.3451,
'last_update': 1678454462000},
{'id': '91',
'country': 'Kazakhstan',
'confirmed': 1498668,
'active': None,
'deaths': 19071,
'recovered': None,
```

(continues on next page)

(continued from previous page)

```

'latitude': 48.0196,
'longitude': 66.9237,
'last_update': 1678454462000},
{'id': '135',
'country': 'Norway',
'confirmed': 1479506,
'active': None,
'deaths': 5213,
'recovered': None,
'latitude': 60.472,
'longitude': 8.4689,
'last_update': 1678454462000},
{'id': '63',
'country': 'Finland',
'confirmed': 1463644,
'active': None,
'deaths': 8967,
'recovered': None,
'latitude': 61.9241,
'longitude': 25.7482,
'last_update': 1678454462000},
{'id': '163',
'country': 'Slovenia',
'confirmed': 1332121,
'active': None,
'deaths': 7078,
'recovered': None,
'latitude': 46.1512,
'longitude': 14.9955,
'last_update': 1678454462000},
{'id': '106',
'country': 'Lithuania',
'confirmed': 1308131,
'active': None,
'deaths': 9598,
'recovered': None,
'latitude': 55.1694,
'longitude': 23.8813,
'last_update': 1678454462000},
{'id': '27',
'country': 'Bulgaria',
'confirmed': 1297523,
'active': None,
'deaths': 38228,
'recovered': None,
'latitude': 42.7339,
'longitude': 25.4858,
'last_update': 1678454462000},
{'id': '124',
'country': 'Morocco',
'confirmed': 1272490,
'active': None,
'deaths': 16296,
'recovered': None,
'latitude': 31.7917,
'longitude': -7.0926,

```

(continues on next page)

(continued from previous page)

```
'last_update': 1678454462000},
{'id': '45',
'country': 'Croatia',
'confirmed': 1269326,
'active': None,
'deaths': 17987,
'recovered': None,
'latitude': 45.1,
'longitude': 15.2,
'last_update': 1678454462000},
{'id': '72',
'country': 'Guatemala',
'confirmed': 1238247,
'active': None,
'deaths': 20182,
'recovered': None,
'latitude': 15.7835,
'longitude': -90.2308,
'last_update': 1678454462000},
{'id': '101',
'country': 'Lebanon',
'confirmed': 1232828,
'active': None,
'deaths': 10841,
'recovered': None,
'latitude': 33.8547,
'longitude': 35.8623,
'last_update': 1678454462000},
{'id': '43',
'country': 'Costa Rica',
'confirmed': 1209725,
'active': None,
'deaths': 9245,
'recovered': None,
'latitude': 9.7489,
'longitude': -83.7534,
'last_update': 1678454462000},
{'id': '22',
'country': 'Bolivia',
'confirmed': 1194277,
'active': None,
'deaths': 22365,
'recovered': None,
'latitude': -16.2902,
'longitude': -63.5887,
'last_update': 1678454462000},
{'id': '184',
'country': 'Tunisia',
'confirmed': 1151126,
'active': None,
'deaths': 29341,
'recovered': None,
'latitude': 33.886917,
'longitude': 9.537499,
'last_update': 1678454462000},
{'id': '46',
```

(continues on next page)

(continued from previous page)

```
'country': 'Cuba',
'confirmed': 1112643,
'active': None,
'deaths': 8530,
'recovered': None,
'latitude': 21.521757,
'longitude': -77.781167,
'last_update': 1678454462000},
{'id': '54',
'country': 'Ecuador',
'confirmed': 1057121,
'active': None,
'deaths': 36014,
'recovered': None,
'latitude': -1.8312,
'longitude': -78.1834,
'last_update': 1678454462000},
{'id': '190',
'country': 'United Arab Emirates',
'confirmed': 1053213,
'active': None,
'deaths': 2349,
'recovered': None,
'latitude': 23.424076,
'longitude': 53.847818,
'last_update': 1678454462000},
{'id': '192',
'country': 'Uruguay',
'confirmed': 1034303,
'active': None,
'deaths': 7617,
'recovered': None,
'latitude': -32.5228,
'longitude': -55.7658,
'last_update': 1678454462000},
{'id': '139',
'country': 'Panama',
'confirmed': 1031731,
'active': None,
'deaths': 8609,
'recovered': None,
'latitude': 8.538,
'longitude': -80.7821,
'last_update': 1678454462000},
{'id': '122',
'country': 'Mongolia',
'confirmed': 1007900,
'active': None,
'deaths': 2136,
'recovered': None,
'latitude': 46.8625,
'longitude': 103.8467,
'last_update': 1678454462000},
{'id': '128',
'country': 'Nepal',
'confirmed': 1001154,
```

(continues on next page)

(continued from previous page)

```
'active': None,
'deaths': 12020,
'recovered': None,
'latitude': 28.1667,
'longitude': 84.25,
'last_update': 1678454462000},
{'id': '17',
'country': 'Belarus',
'confirmed': 994037,
'active': None,
'deaths': 7118,
'recovered': None,
'latitude': 53.7098,
'longitude': 27.9534,
'last_update': 1678454462000},
{'id': '100',
'country': 'Latvia',
'confirmed': 976267,
'active': None,
'deaths': 6269,
'recovered': None,
'latitude': 56.8796,
'longitude': 24.6032,
'last_update': 1678454462000},
{'id': '156',
'country': 'Saudi Arabia',
'confirmed': 830127,
'active': None,
'deaths': 9618,
'recovered': None,
'latitude': 23.885942,
'longitude': 45.079162,
'last_update': 1678454462000},
{'id': '12',
'country': 'Azerbaijan',
'confirmed': 828825,
'active': None,
'deaths': 10138,
'recovered': None,
'latitude': 40.1431,
'longitude': 47.5769,
'last_update': 1678454462000},
{'id': '141',
'country': 'Paraguay',
'confirmed': 808401,
'active': None,
'deaths': 19878,
'recovered': None,
'latitude': -23.4425,
'longitude': -58.4438,
'last_update': 1678454462000},
{'id': '14',
'country': 'Bahrain',
'confirmed': 710693,
'active': None,
'deaths': 1553,
```

(continues on next page)

(continued from previous page)

```

'recovered': None,
'latitude': 26.0275,
'longitude': 50.55,
'last_update': 1678454462000},
{'id': '197',
'country': 'West Bank and Gaza',
'confirmed': 703228,
'active': None,
'deaths': 5708,
'recovered': None,
'latitude': 31.9522,
'longitude': 35.2332,
'last_update': 1678454462000},
{'id': '169',
'country': 'Sri Lanka',
'confirmed': 672039,
'active': None,
'deaths': 16830,
'recovered': None,
'latitude': 7.873054,
'longitude': 80.771797,
'last_update': 1678454462000},
{'id': '97',
'country': 'Kuwait',
'confirmed': 663860,
'active': None,
'deaths': 2570,
'recovered': None,
'latitude': 29.31166,
'longitude': 47.481766,
'last_update': 1678454462000},
{'id': '53',
'country': 'Dominican Republic',
'confirmed': 660790,
'active': None,
'deaths': 4384,
'recovered': None,
'latitude': 18.7357,
'longitude': -70.1627,
'last_update': 1678454462000},
{'id': '47',
'country': 'Cyprus',
'confirmed': 650685,
'active': None,
'deaths': 1330,
'recovered': None,
'latitude': 35.1264,
'longitude': 33.4299,
'last_update': 1678454462000},
{'id': '29',
'country': 'Burma',
'confirmed': 633950,
'active': None,
'deaths': 19490,
'recovered': None,
'latitude': 21.9162,

```

(continues on next page)

(continued from previous page)

```
'longitude': 95.956,
'last_update': 1678454462000},
{'id': '59',
'country': 'Estonia',
'confirmed': 615433,
'active': None,
'deaths': 2946,
'recovered': None,
'latitude': 58.5953,
'longitude': 25.0136,
'last_update': 1678454462000},
{'id': '120',
'country': 'Moldova',
'confirmed': 611140,
'active': None,
'deaths': 12003,
'recovered': None,
'latitude': 47.4116,
'longitude': 28.3699,
'last_update': 1678454462000},
{'id': '195',
'country': 'Venezuela',
'confirmed': 552168,
'active': None,
'deaths': 5854,
'recovered': None,
'latitude': 6.4238,
'longitude': -66.5897,
'last_update': 1678454462000},
{'id': '55',
'country': 'Egypt',
'confirmed': 515759,
'active': None,
'deaths': 24812,
'recovered': None,
'latitude': 26.820553,
'longitude': 30.802498,
'last_update': 1678454462000},
{'id': '104',
'country': 'Libya',
'confirmed': 507187,
'active': None,
'deaths': 6437,
'recovered': None,
'latitude': 26.3351,
'longitude': 17.228331,
'last_update': 1678454462000},
{'id': '61',
'country': 'Ethiopia',
'confirmed': 500116,
'active': None,
'deaths': 7572,
'recovered': None,
'latitude': 9.145,
'longitude': 40.4897,
'last_update': 1678454462000},
```

(continues on next page)

(continued from previous page)

```
{
  'id': '146',
  'country': 'Qatar',
  'confirmed': 495090,
  'active': None,
  'deaths': 688,
  'recovered': None,
  'latitude': 25.3548,
  'longitude': 51.1839,
  'last_update': 1678454462000},
{
  'id': '78',
  'country': 'Honduras',
  'confirmed': 472250,
  'active': None,
  'deaths': 11111,
  'recovered': None,
  'latitude': 15.2,
  'longitude': -86.2419,
  'last_update': 1678454462000},
{
  'id': '9',
  'country': 'Armenia',
  'confirmed': 447308,
  'active': None,
  'deaths': 8727,
  'recovered': None,
  'latitude': 40.0691,
  'longitude': 45.0382,
  'last_update': 1678454462000},
{
  'id': '23',
  'country': 'Bosnia and Herzegovina',
  'confirmed': 401729,
  'active': None,
  'deaths': 16280,
  'recovered': None,
  'latitude': 43.9159,
  'longitude': 17.6791,
  'last_update': 1678454462000},
{
  'id': '136',
  'country': 'Oman',
  'confirmed': 399449,
  'active': None,
  'deaths': 4628,
  'recovered': None,
  'latitude': 21.512583,
  'longitude': 55.923255,
  'last_update': 1678454462000},
{
  'id': '134',
  'country': 'North Macedonia',
  'confirmed': 346852,
  'active': None,
  'deaths': 9662,
  'recovered': None,
  'latitude': 41.6086,
  'longitude': 21.7453,
  'last_update': 1678454462000},
{
  'id': '200',
  'country': 'Zambia',
}
```

(continues on next page)

(continued from previous page)

```
'confirmed': 343135,
'active': None,
'deaths': 4057,
'recovered': None,
'latitude': -13.133897,
'longitude': 27.849332,
'last_update': 1678454462000},
{'id': '92',
'country': 'Kenya',
'confirmed': 342937,
'active': None,
'deaths': 5688,
'recovered': None,
'latitude': -0.0236,
'longitude': 37.9062,
'last_update': 1678454462000},
{'id': '2',
'country': 'Albania',
'confirmed': 334457,
'active': None,
'deaths': 3598,
'recovered': None,
'latitude': 41.1533,
'longitude': 20.1683,
'last_update': 1678454462000},
{'id': '24',
'country': 'Botswana',
'confirmed': 329758,
'active': None,
'deaths': 2801,
'recovered': None,
'latitude': -22.3285,
'longitude': 24.6849,
'last_update': 1678454462000},
{'id': '107',
'country': 'Luxembourg',
'confirmed': 317367,
'active': None,
'deaths': 1220,
'recovered': None,
'latitude': 49.8153,
'longitude': 6.1296,
'last_update': 1678454462000},
{'id': '117',
'country': 'Mauritius',
'confirmed': 296042,
'active': None,
'deaths': 1044,
'recovered': None,
'latitude': -20.348404,
'longitude': 57.552152,
'last_update': 1678454462000},
{'id': '123',
'country': 'Montenegro',
'confirmed': 288808,
'active': None,
```

(continues on next page)

(continued from previous page)

```

'deaths': 2808,
'recovered': None,
'latitude': 42.708678,
'longitude': 19.37439,
'last_update': 1678454462000},
{'id': '26',
'country': 'Brunei',
'confirmed': 279661,
'active': None,
'deaths': 225,
'recovered': None,
'latitude': 4.5353,
'longitude': 114.7277,
'last_update': 1678454462000},
{'id': '96',
'country': 'Kosovo',
'confirmed': 273348,
'active': None,
'deaths': 3211,
'recovered': None,
'latitude': 42.602636,
'longitude': 20.902977,
'last_update': 1678454462000},
{'id': '3',
'country': 'Algeria',
'confirmed': 271496,
'active': None,
'deaths': 6881,
'recovered': None,
'latitude': 28.0339,
'longitude': 1.6596,
'last_update': 1678454462000},
{'id': '133',
'country': 'Nigeria',
'confirmed': 266598,
'active': None,
'deaths': 3155,
'recovered': None,
'latitude': 9.082,
'longitude': 8.6753,
'last_update': 1678454462000},
{'id': '201',
'country': 'Zimbabwe',
'confirmed': 264276,
'active': None,
'deaths': 5671,
'recovered': None,
'latitude': -19.015438,
'longitude': 29.154857,
'last_update': 1678454462000},
{'id': '193',
'country': 'Uzbekistan',
'confirmed': 251247,
'active': None,
'deaths': 1637,
'recovered': None,

```

(continues on next page)

(continued from previous page)

```
'latitude': 41.377491,
'longitude': 64.585262,
'last_update': 1678454462000},
{'id': '125',
'country': 'Mozambique',
'confirmed': 233214,
'active': None,
'deaths': 2242,
'recovered': None,
'latitude': -18.665695,
'longitude': 35.529562,
'last_update': 1678454462000},
{'id': '99',
'country': 'Laos',
'confirmed': 218023,
'active': None,
'deaths': 758,
'recovered': None,
'latitude': 19.85627,
'longitude': 102.495496,
'last_update': 1678454462000},
{'id': '1',
'country': 'Afghanistan',
'confirmed': 209484,
'active': None,
'deaths': 7896,
'recovered': None,
'latitude': 33.93911,
'longitude': 67.709953,
'last_update': 1678454462000},
{'id': '80',
'country': 'Iceland',
'confirmed': 209137,
'active': None,
'deaths': 263,
'recovered': None,
'latitude': 64.9631,
'longitude': -19.0208,
'last_update': 1678454462000},
{'id': '98',
'country': 'Kyrgyzstan',
'confirmed': 206708,
'active': None,
'deaths': 2991,
'recovered': None,
'latitude': 41.20438,
'longitude': 74.766098,
'last_update': 1678454462000},
{'id': '56',
'country': 'El Salvador',
'confirmed': 201785,
'active': None,
'deaths': 4230,
'recovered': None,
'latitude': 13.7942,
'longitude': -88.8965,
```

(continues on next page)

(continued from previous page)

```
'last_update': 1678454462000},
{'id': '183',
'country': 'Trinidad and Tobago',
'confirmed': 189918,
'active': None,
'deaths': 4355,
'recovered': None,
'latitude': 10.6918,
'longitude': -61.2225,
'last_update': 1678454462000},
{'id': '112',
'country': 'Maldives',
'confirmed': 185738,
'active': None,
'deaths': 311,
'recovered': None,
'latitude': 3.2028,
'longitude': 73.2207,
'last_update': 1678454462000},
{'id': '69',
'country': 'Ghana',
'confirmed': 171229,
'active': None,
'deaths': 1462,
'recovered': None,
'latitude': 7.9465,
'longitude': -1.0232,
'last_update': 1678454462000},
{'id': '126',
'country': 'Namibia',
'confirmed': 171156,
'active': None,
'deaths': 4090,
'recovered': None,
'latitude': -22.9576,
'longitude': 18.4904,
'last_update': 1678454462000},
{'id': '188',
'country': 'Uganda',
'confirmed': 170544,
'active': None,
'deaths': 3630,
'recovered': None,
'latitude': 1.373333,
'longitude': 32.290275,
'last_update': 1678454462000},
{'id': '88',
'country': 'Jamaica',
'confirmed': 154416,
'active': None,
'deaths': 3514,
'recovered': None,
'latitude': 18.1096,
'longitude': -77.2975,
'last_update': 1678454462000},
{'id': '32',
```

(continues on next page)

(continued from previous page)

```
'country': 'Cambodia',
'confirmed': 138719,
'active': None,
'deaths': 3056,
'recovered': None,
'latitude': 11.55,
'longitude': 104.9167,
'last_update': 1678454462000},
{'id': '149',
'country': 'Rwanda',
'confirmed': 133194,
'active': None,
'deaths': 1468,
'recovered': None,
'latitude': -1.9403,
'longitude': 29.8739,
'last_update': 1678454462000},
{'id': '33',
'country': 'Cameroon',
'confirmed': 124392,
'active': None,
'deaths': 1965,
'recovered': None,
'latitude': 3.848,
'longitude': 11.5021,
'last_update': 1678454462000},
{'id': '114',
'country': 'Malta',
'confirmed': 117610,
'active': None,
'deaths': 828,
'recovered': None,
'latitude': 35.9375,
'longitude': 14.3754,
'last_update': 1678454462000},
{'id': '16',
'country': 'Barbados',
'confirmed': 106798,
'active': None,
'deaths': 579,
'recovered': None,
'latitude': 13.1939,
'longitude': -59.5432,
'last_update': 1678454462000},
{'id': '5',
'country': 'Angola',
'confirmed': 105288,
'active': None,
'deaths': 1933,
'recovered': None,
'latitude': -11.2027,
'longitude': 17.8739,
'last_update': 1678454462000},
{'id': '42',
'country': 'Congo (Kinshasa)',
'confirmed': 95749,
```

(continues on next page)

(continued from previous page)

```

'active': None,
'deaths': 1464,
'recovered': None,
'latitude': -4.0383,
'longitude': 21.7587,
'last_update': 1678454462000},
{'id': '157',
'country': 'Senegal',
'confirmed': 88926,
'active': None,
'deaths': 1971,
'recovered': None,
'latitude': 14.4974,
'longitude': -14.4524,
'last_update': 1678454462000},
{'id': '110',
'country': 'Malawi',
'confirmed': 88707,
'active': None,
'deaths': 2686,
'recovered': None,
'latitude': -13.2543,
'longitude': 34.3015,
'last_update': 1678454462000},
{'id': '44',
'country': "Cote d'Ivoire",
'confirmed': 88263,
'active': None,
'deaths': 834,
'recovered': None,
'latitude': 7.54,
'longitude': -5.5471,
'last_update': 1678454462000},
{'id': '172',
'country': 'Suriname',
'confirmed': 82467,
'active': None,
'deaths': 1404,
'recovered': None,
'latitude': 3.9193,
'longitude': -56.0278,
'last_update': 1678454462000},
{'id': '60',
'country': 'Eswatini',
'confirmed': 74267,
'active': None,
'deaths': 1425,
'recovered': None,
'latitude': -26.5225,
'longitude': 31.4659,
'last_update': 1678454462000},
{'id': '75',
'country': 'Guyana',
'confirmed': 73075,
'active': None,
'deaths': 1298,

```

(continues on next page)

(continued from previous page)

```
'recovered': None,
'latitude': 4.860416,
'longitude': -58.93018,
'last_update': 1678454462000},
{'id': '19',
'country': 'Belize',
'confirmed': 70757,
'active': None,
'deaths': 688,
'recovered': None,
'latitude': 17.1899,
'longitude': -88.4976,
'last_update': 1678454462000},
{'id': '62',
'country': 'Fiji',
'confirmed': 68898,
'active': None,
'deaths': 883,
'recovered': None,
'latitude': -17.7134,
'longitude': 178.065,
'last_update': 1678454462000},
{'id': '109',
'country': 'Madagascar',
'confirmed': 67889,
'active': None,
'deaths': 1423,
'recovered': None,
'latitude': -18.766947,
'longitude': 46.869107,
'last_update': 1678454462000},
{'id': '170',
'country': 'Sudan',
'confirmed': 63829,
'active': None,
'deaths': 5017,
'recovered': None,
'latitude': 12.8628,
'longitude': 30.2176,
'last_update': 1678454462000},
{'id': '116',
'country': 'Mauritania',
'confirmed': 63668,
'active': None,
'deaths': 997,
'recovered': None,
'latitude': 21.0079,
'longitude': -10.9408,
'last_update': 1678454462000},
{'id': '31',
'country': 'Cabo Verde',
'confirmed': 63244,
'active': None,
'deaths': 413,
'recovered': None,
'latitude': 16.5388,
```

(continues on next page)

(continued from previous page)

```

'longitude': -23.0418,
'last_update': 1678454462000},
{'id': '21',
'country': 'Bhutan',
'confirmed': 62627,
'active': None,
'deaths': 21,
'recovered': None,
'latitude': 27.5142,
'longitude': 90.4336,
'last_update': 1678454462000},
{'id': '175',
'country': 'Syria',
'confirmed': 57467,
'active': None,
'deaths': 3164,
'recovered': None,
'latitude': 34.802075,
'longitude': 38.996815,
'last_update': 1678454462000},
{'id': '30',
'country': 'Burundi',
'confirmed': 53631,
'active': None,
'deaths': 38,
'recovered': None,
'latitude': -3.3731,
'longitude': 29.9189,
'last_update': 1678454462000},
{'id': '159',
'country': 'Seychelles',
'confirmed': 50665,
'active': None,
'deaths': 172,
'recovered': None,
'latitude': -4.6796,
'longitude': 55.492,
'last_update': 1678454462000},
{'id': '65',
'country': 'Gabon',
'confirmed': 48981,
'active': None,
'deaths': 306,
'recovered': None,
'latitude': -0.8037,
'longitude': 11.6094,
'last_update': 1678454462000},
{'id': '4',
'country': 'Andorra',
'confirmed': 47890,
'active': None,
'deaths': 165,
'recovered': None,
'latitude': 42.5063,
'longitude': 1.5218,
'last_update': 1678454462000},

```

(continues on next page)

(continued from previous page)

```
{'id': '140',
 'country': 'Papua New Guinea',
 'confirmed': 46825,
 'active': None,
 'deaths': 670,
 'recovered': None,
 'latitude': -6.314993,
 'longitude': 143.95555,
 'last_update': 1678454462000},
{'id': '178',
 'country': 'Tanzania',
 'confirmed': 42906,
 'active': None,
 'deaths': 846,
 'recovered': None,
 'latitude': -6.369028,
 'longitude': 34.888822,
 'last_update': 1678454462000},
{'id': '181',
 'country': 'Togo',
 'confirmed': 39396,
 'active': None,
 'deaths': 290,
 'recovered': None,
 'latitude': 8.6195,
 'longitude': 0.8248,
 'last_update': 1678454462000},
{'id': '73',
 'country': 'Guinea',
 'confirmed': 38267,
 'active': None,
 'deaths': 467,
 'recovered': None,
 'latitude': 9.9456,
 'longitude': -9.6966,
 'last_update': 1678454462000},
{'id': '13',
 'country': 'Bahamas',
 'confirmed': 37491,
 'active': None,
 'deaths': 833,
 'recovered': None,
 'latitude': 25.025885,
 'longitude': -78.035889,
 'last_update': 1678454462000},
{'id': '102',
 'country': 'Lesotho',
 'confirmed': 34790,
 'active': None,
 'deaths': 723,
 'recovered': None,
 'latitude': -29.61,
 'longitude': 28.2336,
 'last_update': 1678454462000},
{'id': '76',
 'country': 'Haiti',
```

(continues on next page)

(continued from previous page)

```

'confirmed': 34202,
'active': None,
'deaths': 860,
'recovered': None,
'latitude': 18.9712,
'longitude': -72.2852,
'last_update': 1678454462000},
{'id': '113',
'country': 'Mali',
'confirmed': 33062,
'active': None,
'deaths': 743,
'recovered': None,
'latitude': 17.570692,
'longitude': -3.996166,
'last_update': 1678454462000},
{'id': '151',
'country': 'Saint Lucia',
'confirmed': 30004,
'active': None,
'deaths': 409,
'recovered': None,
'latitude': 13.9094,
'longitude': -60.9789,
'last_update': 1678454462000},
{'id': '20',
'country': 'Benin',
'confirmed': 27999,
'active': None,
'deaths': 163,
'recovered': None,
'latitude': 9.3077,
'longitude': 2.3158,
'last_update': 1678454462000},
{'id': '165',
'country': 'Somalia',
'confirmed': 27324,
'active': None,
'deaths': 1361,
'recovered': None,
'latitude': 5.152149,
'longitude': 46.199616,
'last_update': 1678454462000},
{'id': '41',
'country': 'Congo (Brazzaville)',
'confirmed': 25087,
'active': None,
'deaths': 388,
'recovered': None,
'latitude': -0.228,
'longitude': 15.8277,
'last_update': 1678454462000},
{'id': '164',
'country': 'Solomon Islands',
'confirmed': 24575,
'active': None,

```

(continues on next page)

(continued from previous page)

```
'deaths': 153,
'recovered': None,
'latitude': -9.6457,
'longitude': 160.1562,
'last_update': 1678454462000},
{'id': '119',
'country': 'Micronesia',
'confirmed': 23948,
'active': None,
'deaths': 61,
'recovered': None,
'latitude': 7.4256,
'longitude': 150.5508,
'last_update': 1678454462000},
{'id': '154',
'country': 'San Marino',
'confirmed': 23616,
'active': None,
'deaths': 122,
'recovered': None,
'latitude': 43.9424,
'longitude': 12.4578,
'last_update': 1678454462000},
{'id': '180',
'country': 'Timor-Leste',
'confirmed': 23419,
'active': None,
'deaths': 138,
'recovered': None,
'latitude': -8.874217,
'longitude': 125.727539,
'last_update': 1678454462000},
{'id': '28',
'country': 'Burkina Faso',
'confirmed': 22056,
'active': None,
'deaths': 396,
'recovered': None,
'latitude': 12.2383,
'longitude': -1.5616,
'last_update': 1678454462000},
{'id': '105',
'country': 'Liechtenstein',
'confirmed': 21432,
'active': None,
'deaths': 89,
'recovered': None,
'latitude': 47.14,
'longitude': 9.55,
'last_update': 1678454462000},
{'id': '71',
'country': 'Grenada',
'confirmed': 19680,
'active': None,
'deaths': 238,
'recovered': None,
```

(continues on next page)

(continued from previous page)

```

'latitude': 12.1165,
'longitude': -61.679,
'last_update': 1678454462000},
{'id': '167',
'country': 'South Sudan',
'confirmed': 18368,
'active': None,
'deaths': 138,
'recovered': None,
'latitude': 6.877,
'longitude': 31.307,
'last_update': 1678454462000},
{'id': '177',
'country': 'Tajikistan',
'confirmed': 17786,
'active': None,
'deaths': 125,
'recovered': None,
'latitude': 38.861,
'longitude': 71.2761,
'last_update': 1678454462000},
{'id': '57',
'country': 'Equatorial Guinea',
'confirmed': 17229,
'active': None,
'deaths': 183,
'recovered': None,
'latitude': 1.6508,
'longitude': 10.2679,
'last_update': 1678454462000},
{'id': '182',
'country': 'Tonga',
'confirmed': 16810,
'active': None,
'deaths': 13,
'recovered': None,
'latitude': -21.179,
'longitude': -175.1982,
'last_update': 1678454462000},
{'id': '153',
'country': 'Samoa',
'confirmed': 16607,
'active': None,
'deaths': 29,
'recovered': None,
'latitude': -13.759,
'longitude': -172.1046,
'last_update': 1678454462000},
{'id': '121',
'country': 'Monaco',
'confirmed': 16121,
'active': None,
'deaths': 67,
'recovered': None,
'latitude': 43.7333,
'longitude': 7.4167,

```

(continues on next page)

(continued from previous page)

```
'last_update': 1678454462000},
{'id': '52',
'country': 'Dominica',
'confirmed': 15760,
'active': None,
'deaths': 74,
'recovered': None,
'latitude': 15.415,
'longitude': -61.371,
'last_update': 1678454462000},
{'id': '51',
'country': 'Djibouti',
'confirmed': 15690,
'active': None,
'deaths': 189,
'recovered': None,
'latitude': 11.8251,
'longitude': 42.5903,
'last_update': 1678454462000},
{'id': '131',
'country': 'Nicaragua',
'confirmed': 15655,
'active': None,
'deaths': 245,
'recovered': None,
'latitude': 12.865416,
'longitude': -85.207229,
'last_update': 1678454462000},
{'id': '115',
'country': 'Marshall Islands',
'confirmed': 15649,
'active': None,
'deaths': 17,
'recovered': None,
'latitude': 7.1315,
'longitude': 171.1845,
'last_update': 1678454462000},
{'id': '35',
'country': 'Central African Republic',
'confirmed': 15368,
'active': None,
'deaths': 113,
'recovered': None,
'latitude': 6.6111,
'longitude': 20.9394,
'last_update': 1678454462000},
{'id': '66',
'country': 'Gambia',
'confirmed': 12598,
'active': None,
'deaths': 372,
'recovered': None,
'latitude': 13.4432,
'longitude': -15.3101,
'last_update': 1678454462000},
{'id': '194',
```

(continues on next page)

(continued from previous page)

```

'country': 'Vanuatu',
'confirmed': 12014,
'active': None,
'deaths': 14,
'recovered': None,
'latitude': -15.3767,
'longitude': 166.9592,
'last_update': 1678454462000},
{'id': '199',
'country': 'Yemen',
'confirmed': 11945,
'active': None,
'deaths': 2159,
'recovered': None,
'latitude': 15.552727,
'longitude': 48.516388,
'last_update': 1678454462000},
{'id': '58',
'country': 'Eritrea',
'confirmed': 10189,
'active': None,
'deaths': 103,
'recovered': None,
'latitude': 15.1794,
'longitude': 39.7823,
'last_update': 1678454462000},
{'id': '152',
'country': 'Saint Vincent and the Grenadines',
'confirmed': 9589,
'active': None,
'deaths': 123,
'recovered': None,
'latitude': 12.9843,
'longitude': -61.2872,
'last_update': 1678454462000},
{'id': '132',
'country': 'Niger',
'confirmed': 9508,
'active': None,
'deaths': 315,
'recovered': None,
'latitude': 17.607789,
'longitude': 8.081666,
'last_update': 1678454462000},
{'id': '7',
'country': 'Antigua and Barbuda',
'confirmed': 9106,
'active': None,
'deaths': 146,
'recovered': None,
'latitude': 17.0608,
'longitude': -61.7964,
'last_update': 1678454462000},
{'id': '40',
'country': 'Comoros',
'confirmed': 9008,

```

(continues on next page)

(continued from previous page)

```
'active': None,
'deaths': 161,
'recovered': None,
'latitude': -11.6455,
'longitude': 43.3333,
'last_update': 1678454462000},
{'id': '74',
'country': 'Guinea-Bissau',
'confirmed': 8960,
'active': None,
'deaths': 176,
'recovered': None,
'latitude': 11.8037,
'longitude': -15.1804,
'last_update': 1678454462000},
{'id': '103',
'country': 'Liberia',
'confirmed': 8090,
'active': None,
'deaths': 295,
'recovered': None,
'latitude': 6.428055,
'longitude': -9.429499,
'last_update': 1678454462000},
{'id': '160',
'country': 'Sierra Leone',
'confirmed': 7760,
'active': None,
'deaths': 126,
'recovered': None,
'latitude': 8.460555,
'longitude': -11.779889,
'last_update': 1678454462000},
{'id': '36',
'country': 'Chad',
'confirmed': 7679,
'active': None,
'deaths': 194,
'recovered': None,
'latitude': 15.4542,
'longitude': 18.7322,
'last_update': 1678454462000},
{'id': '150',
'country': 'Saint Kitts and Nevis',
'confirmed': 6597,
'active': None,
'deaths': 47,
'recovered': None,
'latitude': 17.357822,
'longitude': -62.782998,
'last_update': 1678454462000},
{'id': '155',
'country': 'Sao Tome and Principe',
'confirmed': 6281,
'active': None,
'deaths': 77,
```

(continues on next page)

(continued from previous page)

```

'recovered': None,
'latitude': 0.1864,
'longitude': 6.6131,
'last_update': 1678454462000},
{'id': '138',
'country': 'Palau',
'confirmed': 5991,
'active': None,
'deaths': 9,
'recovered': None,
'latitude': 7.515,
'longitude': 134.5825,
'last_update': 1678454462000},
{'id': '127',
'country': 'Nauru',
'confirmed': 5393,
'active': None,
'deaths': 1,
'recovered': None,
'latitude': -0.5228,
'longitude': 166.9315,
'last_update': 1678454462000},
{'id': '93',
'country': 'Kiribati',
'confirmed': 5014,
'active': None,
'deaths': 18,
'recovered': None,
'latitude': -3.3704,
'longitude': -168.734,
'last_update': 1678454462000},
{'id': '186',
'country': 'Tuvalu',
'confirmed': 2805,
'active': None,
'deaths': 0,
'recovered': None,
'latitude': -7.1095,
'longitude': 177.6493,
'last_update': 1678454462000},
{'id': '171',
'country': 'Summer Olympics 2020',
'confirmed': 865,
'active': None,
'deaths': 0,
'recovered': None,
'latitude': 35.6491,
'longitude': 139.7737,
'last_update': 1678454462000},
{'id': '50',
'country': 'Diamond Princess',
'confirmed': 712,
'active': None,
'deaths': 13,
'recovered': None,
'latitude': None,

```

(continues on next page)

(continued from previous page)

```
'longitude': None,
'last_update': 1678454462000},
{'id': '198',
'country': 'Winter Olympics 2022',
'confirmed': 535,
'active': None,
'deaths': 0,
'recovered': None,
'latitude': 39.9042,
'longitude': 116.4074,
'last_update': 1678454462000},
{'id': '77',
'country': 'Holy See',
'confirmed': 29,
'active': None,
'deaths': 0,
'recovered': None,
'latitude': 41.9029,
'longitude': 12.4534,
'last_update': 1678454462000},
{'id': '6',
'country': 'Antarctica',
'confirmed': 11,
'active': None,
'deaths': 0,
'recovered': None,
'latitude': -71.9499,
'longitude': 23.347,
'last_update': 1678454462000},
{'id': '108',
'country': 'MS Zaandam',
'confirmed': 9,
'active': None,
'deaths': 2,
'recovered': None,
'latitude': None,
'longitude': None,
'last_update': 1678454462000}]
```

```
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',
```

(continues on next page)

(continued from previous page)

```
'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()
```

```
[{'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',
```

(continues on next page)

(continued from previous page)

```
'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,
'last_update': 1678454462000},
{'id': '95',
'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,
```

(continues on next page)

(continued from previous page)

```

'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',
'country': 'Vietnam',
'confirmed': 11526994,
'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,

```

(continues on next page)

(continued from previous page)

```
'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,
'active': None,
'deaths': 333188,
'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,
```

(continues on next page)

(continued from previous page)

```

'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,
'recovered': None,
'latitude': 39.3999,
'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},

```

(continues on next page)

(continued from previous page)

```
{'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,
 'longitude': 4.469936,
 'last_update': 1678454462000},
{'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',
```

(continues on next page)

(continued from previous page)

```

'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},
{'id': '166',
'country': 'South Africa',
'confirmed': 4067067,
'active': None,
'deaths': 102595,
'recovered': None,
'latitude': -30.5595,
'longitude': 22.9375,
'last_update': 1678454462000},
{'id': '49',
'country': 'Denmark',
'confirmed': 3451036,
'active': None,
'deaths': 8345,
'recovered': None,
'latitude': 56.2639,
'longitude': 9.5018,
'last_update': 1678454462000},
{'id': '147',
'country': 'Romania',
'confirmed': 3346046,
'active': None,
'deaths': 67736,
'recovered': None,
'latitude': 45.9432,
'longitude': 24.9668,
'last_update': 1678454462000},
{'id': '173',
'country': 'Sweden',
'confirmed': 2699339,
'active': None,
'deaths': 23777,
'recovered': None,
'latitude': 60.1282,
'longitude': 18.6435,
'last_update': 1678454462000},
{'id': '162',
'country': 'Slovakia',
'confirmed': 2667782,
'active': None,

```

(continues on next page)

(continued from previous page)

```
'deaths': 21036,
'recovered': None,
'latitude': 48.669,
'longitude': 19.699,
'last_update': 1678454462000},
{'id': '158',
'country': 'Serbia',
'confirmed': 2500142,
'active': None,
'deaths': 17881,
'recovered': None,
'latitude': 44.0165,
'longitude': 21.0059,
'last_update': 1678454462000},
{'id': '84',
'country': 'Iraq',
'confirmed': 2465545,
'active': None,
'deaths': 25375,
'recovered': None,
'latitude': 33.223191,
'longitude': 43.679291,
'last_update': 1678454462000},
{'id': '130',
'country': 'New Zealand',
'confirmed': 2236114,
'active': None,
'deaths': 2550,
'recovered': None,
'latitude': -40.9006,
'longitude': 174.886,
'last_update': 1678454462000},
{'id': '161',
'country': 'Singapore',
'confirmed': 2235294,
'active': None,
'deaths': 1722,
'recovered': None,
'latitude': 1.2833,
'longitude': 103.8333,
'last_update': 1678454462000},
{'id': '79',
'country': 'Hungary',
'confirmed': 2196804,
'active': None,
'deaths': 48762,
'recovered': None,
'latitude': 47.1625,
'longitude': 19.5033,
'last_update': 1678454462000},
{'id': '15',
'country': 'Bangladesh',
'confirmed': 2037871,
'active': None,
'deaths': 29445,
'recovered': None,
```

(continues on next page)

(continued from previous page)

```
'latitude': 23.685,
'longitude': 90.3563,
'last_update': 1678454462000},
{'id': '67',
'country': 'Georgia',
'confirmed': 1827537,
'active': None,
'deaths': 16971,
'recovered': None,
'latitude': 42.3154,
'longitude': 43.3569,
'last_update': 1678454462000},
{'id': '90',
'country': 'Jordan',
'confirmed': 1746997,
'active': None,
'deaths': 14122,
'recovered': None,
'latitude': 31.24,
'longitude': 36.51,
'last_update': 1678454462000},
{'id': '85',
'country': 'Ireland',
'confirmed': 1704502,
'active': None,
'deaths': 8708,
'recovered': None,
'latitude': 53.1424,
'longitude': -7.6921,
'last_update': 1678454462000},
{'id': '137',
'country': 'Pakistan',
'confirmed': 1577411,
'active': None,
'deaths': 30644,
'recovered': None,
'latitude': 30.3753,
'longitude': 69.3451,
'last_update': 1678454462000},
{'id': '91',
'country': 'Kazakhstan',
'confirmed': 1498668,
'active': None,
'deaths': 19071,
'recovered': None,
'latitude': 48.0196,
'longitude': 66.9237,
'last_update': 1678454462000},
{'id': '135',
'country': 'Norway',
'confirmed': 1479506,
'active': None,
'deaths': 5213,
'recovered': None,
'latitude': 60.472,
'longitude': 8.4689,
```

(continues on next page)

(continued from previous page)

```
'last_update': 1678454462000},
{'id': '63',
'country': 'Finland',
'confirmed': 1463644,
'active': None,
'deaths': 8967,
'recovered': None,
'latitude': 61.9241,
'longitude': 25.7482,
'last_update': 1678454462000},
{'id': '163',
'country': 'Slovenia',
'confirmed': 1332121,
'active': None,
'deaths': 7078,
'recovered': None,
'latitude': 46.1512,
'longitude': 14.9955,
'last_update': 1678454462000},
{'id': '106',
'country': 'Lithuania',
'confirmed': 1308131,
'active': None,
'deaths': 9598,
'recovered': None,
'latitude': 55.1694,
'longitude': 23.8813,
'last_update': 1678454462000},
{'id': '27',
'country': 'Bulgaria',
'confirmed': 1297523,
'active': None,
'deaths': 38228,
'recovered': None,
'latitude': 42.7339,
'longitude': 25.4858,
'last_update': 1678454462000},
{'id': '124',
'country': 'Morocco',
'confirmed': 1272490,
'active': None,
'deaths': 16296,
'recovered': None,
'latitude': 31.7917,
'longitude': -7.0926,
'last_update': 1678454462000},
{'id': '45',
'country': 'Croatia',
'confirmed': 1269326,
'active': None,
'deaths': 17987,
'recovered': None,
'latitude': 45.1,
'longitude': 15.2,
'last_update': 1678454462000},
{'id': '72',
```

(continues on next page)

(continued from previous page)

```

'country': 'Guatemala',
'confirmed': 1238247,
'active': None,
'deaths': 20182,
'recovered': None,
'latitude': 15.7835,
'longitude': -90.2308,
'last_update': 1678454462000},
{'id': '101',
'country': 'Lebanon',
'confirmed': 1232828,
'active': None,
'deaths': 10841,
'recovered': None,
'latitude': 33.8547,
'longitude': 35.8623,
'last_update': 1678454462000},
{'id': '43',
'country': 'Costa Rica',
'confirmed': 1209725,
'active': None,
'deaths': 9245,
'recovered': None,
'latitude': 9.7489,
'longitude': -83.7534,
'last_update': 1678454462000},
{'id': '22',
'country': 'Bolivia',
'confirmed': 1194277,
'active': None,
'deaths': 22365,
'recovered': None,
'latitude': -16.2902,
'longitude': -63.5887,
'last_update': 1678454462000},
{'id': '184',
'country': 'Tunisia',
'confirmed': 1151126,
'active': None,
'deaths': 29341,
'recovered': None,
'latitude': 33.886917,
'longitude': 9.537499,
'last_update': 1678454462000},
{'id': '46',
'country': 'Cuba',
'confirmed': 1112643,
'active': None,
'deaths': 8530,
'recovered': None,
'latitude': 21.521757,
'longitude': -77.781167,
'last_update': 1678454462000},
{'id': '54',
'country': 'Ecuador',
'confirmed': 1057121,

```

(continues on next page)

(continued from previous page)

```
'active': None,
'deaths': 36014,
'recovered': None,
'latitude': -1.8312,
'longitude': -78.1834,
'last_update': 1678454462000},
{'id': '190',
'country': 'United Arab Emirates',
'confirmed': 1053213,
'active': None,
'deaths': 2349,
'recovered': None,
'latitude': 23.424076,
'longitude': 53.847818,
'last_update': 1678454462000},
{'id': '192',
'country': 'Uruguay',
'confirmed': 1034303,
'active': None,
'deaths': 7617,
'recovered': None,
'latitude': -32.5228,
'longitude': -55.7658,
'last_update': 1678454462000},
{'id': '139',
'country': 'Panama',
'confirmed': 1031731,
'active': None,
'deaths': 8609,
'recovered': None,
'latitude': 8.538,
'longitude': -80.7821,
'last_update': 1678454462000},
{'id': '122',
'country': 'Mongolia',
'confirmed': 1007900,
'active': None,
'deaths': 2136,
'recovered': None,
'latitude': 46.8625,
'longitude': 103.8467,
'last_update': 1678454462000},
{'id': '128',
'country': 'Nepal',
'confirmed': 1001154,
'active': None,
'deaths': 12020,
'recovered': None,
'latitude': 28.1667,
'longitude': 84.25,
'last_update': 1678454462000},
{'id': '17',
'country': 'Belarus',
'confirmed': 994037,
'active': None,
'deaths': 7118,
```

(continues on next page)

(continued from previous page)

```

'recovered': None,
'latitude': 53.7098,
'longitude': 27.9534,
'last_update': 1678454462000},
{'id': '100',
'country': 'Latvia',
'confirmed': 976267,
'active': None,
'deaths': 6269,
'recovered': None,
'latitude': 56.8796,
'longitude': 24.6032,
'last_update': 1678454462000},
{'id': '156',
'country': 'Saudi Arabia',
'confirmed': 830127,
'active': None,
'deaths': 9618,
'recovered': None,
'latitude': 23.885942,
'longitude': 45.079162,
'last_update': 1678454462000},
{'id': '12',
'country': 'Azerbaijan',
'confirmed': 828825,
'active': None,
'deaths': 10138,
'recovered': None,
'latitude': 40.1431,
'longitude': 47.5769,
'last_update': 1678454462000},
{'id': '141',
'country': 'Paraguay',
'confirmed': 808401,
'active': None,
'deaths': 19878,
'recovered': None,
'latitude': -23.4425,
'longitude': -58.4438,
'last_update': 1678454462000},
{'id': '14',
'country': 'Bahrain',
'confirmed': 710693,
'active': None,
'deaths': 1553,
'recovered': None,
'latitude': 26.0275,
'longitude': 50.55,
'last_update': 1678454462000},
{'id': '197',
'country': 'West Bank and Gaza',
'confirmed': 703228,
'active': None,
'deaths': 5708,
'recovered': None,
'latitude': 31.9522,

```

(continues on next page)

(continued from previous page)

```
'longitude': 35.2332,
'last_update': 1678454462000},
{'id': '169',
'country': 'Sri Lanka',
'confirmed': 672039,
'active': None,
'deaths': 16830,
'recovered': None,
'latitude': 7.873054,
'longitude': 80.771797,
'last_update': 1678454462000},
{'id': '97',
'country': 'Kuwait',
'confirmed': 663860,
'active': None,
'deaths': 2570,
'recovered': None,
'latitude': 29.31166,
'longitude': 47.481766,
'last_update': 1678454462000},
{'id': '53',
'country': 'Dominican Republic',
'confirmed': 660790,
'active': None,
'deaths': 4384,
'recovered': None,
'latitude': 18.7357,
'longitude': -70.1627,
'last_update': 1678454462000},
{'id': '47',
'country': 'Cyprus',
'confirmed': 650685,
'active': None,
'deaths': 1330,
'recovered': None,
'latitude': 35.1264,
'longitude': 33.4299,
'last_update': 1678454462000},
{'id': '29',
'country': 'Burma',
'confirmed': 633950,
'active': None,
'deaths': 19490,
'recovered': None,
'latitude': 21.9162,
'longitude': 95.956,
'last_update': 1678454462000},
{'id': '59',
'country': 'Estonia',
'confirmed': 615433,
'active': None,
'deaths': 2946,
'recovered': None,
'latitude': 58.5953,
'longitude': 25.0136,
'last_update': 1678454462000},
```

(continues on next page)

(continued from previous page)

```
{
  'id': '120',
  'country': 'Moldova',
  'confirmed': 611140,
  'active': None,
  'deaths': 12003,
  'recovered': None,
  'latitude': 47.4116,
  'longitude': 28.3699,
  'last_update': 1678454462000},
{
  'id': '195',
  'country': 'Venezuela',
  'confirmed': 552168,
  'active': None,
  'deaths': 5854,
  'recovered': None,
  'latitude': 6.4238,
  'longitude': -66.5897,
  'last_update': 1678454462000},
{
  'id': '55',
  'country': 'Egypt',
  'confirmed': 515759,
  'active': None,
  'deaths': 24812,
  'recovered': None,
  'latitude': 26.820553,
  'longitude': 30.802498,
  'last_update': 1678454462000},
{
  'id': '104',
  'country': 'Libya',
  'confirmed': 507187,
  'active': None,
  'deaths': 6437,
  'recovered': None,
  'latitude': 26.3351,
  'longitude': 17.228331,
  'last_update': 1678454462000},
{
  'id': '61',
  'country': 'Ethiopia',
  'confirmed': 500116,
  'active': None,
  'deaths': 7572,
  'recovered': None,
  'latitude': 9.145,
  'longitude': 40.4897,
  'last_update': 1678454462000},
{
  'id': '146',
  'country': 'Qatar',
  'confirmed': 495090,
  'active': None,
  'deaths': 688,
  'recovered': None,
  'latitude': 25.3548,
  'longitude': 51.1839,
  'last_update': 1678454462000},
{
  'id': '78',
  'country': 'Honduras',
}
```

(continues on next page)

(continued from previous page)

```
'confirmed': 472250,
'active': None,
'deaths': 11111,
'recovered': None,
'latitude': 15.2,
'longitude': -86.2419,
'last_update': 1678454462000},
{'id': '9',
'country': 'Armenia',
'confirmed': 447308,
'active': None,
'deaths': 8727,
'recovered': None,
'latitude': 40.0691,
'longitude': 45.0382,
'last_update': 1678454462000},
{'id': '23',
'country': 'Bosnia and Herzegovina',
'confirmed': 401729,
'active': None,
'deaths': 16280,
'recovered': None,
'latitude': 43.9159,
'longitude': 17.6791,
'last_update': 1678454462000},
{'id': '136',
'country': 'Oman',
'confirmed': 399449,
'active': None,
'deaths': 4628,
'recovered': None,
'latitude': 21.512583,
'longitude': 55.923255,
'last_update': 1678454462000},
{'id': '134',
'country': 'North Macedonia',
'confirmed': 346852,
'active': None,
'deaths': 9662,
'recovered': None,
'latitude': 41.6086,
'longitude': 21.7453,
'last_update': 1678454462000},
{'id': '200',
'country': 'Zambia',
'confirmed': 343135,
'active': None,
'deaths': 4057,
'recovered': None,
'latitude': -13.133897,
'longitude': 27.849332,
'last_update': 1678454462000},
{'id': '92',
'country': 'Kenya',
'confirmed': 342937,
'active': None,
```

(continues on next page)

(continued from previous page)

```

'deaths': 5688,
'recovered': None,
'latitude': -0.0236,
'longitude': 37.9062,
'last_update': 1678454462000},
{'id': '2',
'country': 'Albania',
'confirmed': 334457,
'active': None,
'deaths': 3598,
'recovered': None,
'latitude': 41.1533,
'longitude': 20.1683,
'last_update': 1678454462000},
{'id': '24',
'country': 'Botswana',
'confirmed': 329758,
'active': None,
'deaths': 2801,
'recovered': None,
'latitude': -22.3285,
'longitude': 24.6849,
'last_update': 1678454462000},
{'id': '107',
'country': 'Luxembourg',
'confirmed': 317367,
'active': None,
'deaths': 1220,
'recovered': None,
'latitude': 49.8153,
'longitude': 6.1296,
'last_update': 1678454462000},
{'id': '117',
'country': 'Mauritius',
'confirmed': 296042,
'active': None,
'deaths': 1044,
'recovered': None,
'latitude': -20.348404,
'longitude': 57.552152,
'last_update': 1678454462000},
{'id': '123',
'country': 'Montenegro',
'confirmed': 288808,
'active': None,
'deaths': 2808,
'recovered': None,
'latitude': 42.708678,
'longitude': 19.37439,
'last_update': 1678454462000},
{'id': '26',
'country': 'Brunei',
'confirmed': 279661,
'active': None,
'deaths': 225,
'recovered': None,

```

(continues on next page)

(continued from previous page)

```
'latitude': 4.5353,
'longitude': 114.7277,
'last_update': 1678454462000},
{'id': '96',
'country': 'Kosovo',
'confirmed': 273348,
'active': None,
'deaths': 3211,
'recovered': None,
'latitude': 42.602636,
'longitude': 20.902977,
'last_update': 1678454462000},
{'id': '3',
'country': 'Algeria',
'confirmed': 271496,
'active': None,
'deaths': 6881,
'recovered': None,
'latitude': 28.0339,
'longitude': 1.6596,
'last_update': 1678454462000},
{'id': '133',
'country': 'Nigeria',
'confirmed': 266598,
'active': None,
'deaths': 3155,
'recovered': None,
'latitude': 9.082,
'longitude': 8.6753,
'last_update': 1678454462000},
{'id': '201',
'country': 'Zimbabwe',
'confirmed': 264276,
'active': None,
'deaths': 5671,
'recovered': None,
'latitude': -19.015438,
'longitude': 29.154857,
'last_update': 1678454462000},
{'id': '193',
'country': 'Uzbekistan',
'confirmed': 251247,
'active': None,
'deaths': 1637,
'recovered': None,
'latitude': 41.377491,
'longitude': 64.585262,
'last_update': 1678454462000},
{'id': '125',
'country': 'Mozambique',
'confirmed': 233214,
'active': None,
'deaths': 2242,
'recovered': None,
'latitude': -18.665695,
'longitude': 35.529562,
```

(continues on next page)

(continued from previous page)

```
'last_update': 1678454462000},
{'id': '99',
'country': 'Laos',
'confirmed': 218023,
'active': None,
'deaths': 758,
'recovered': None,
'latitude': 19.85627,
'longitude': 102.495496,
'last_update': 1678454462000},
{'id': '1',
'country': 'Afghanistan',
'confirmed': 209484,
'active': None,
'deaths': 7896,
'recovered': None,
'latitude': 33.93911,
'longitude': 67.709953,
'last_update': 1678454462000},
{'id': '80',
'country': 'Iceland',
'confirmed': 209137,
'active': None,
'deaths': 263,
'recovered': None,
'latitude': 64.9631,
'longitude': -19.0208,
'last_update': 1678454462000},
{'id': '98',
'country': 'Kyrgyzstan',
'confirmed': 206708,
'active': None,
'deaths': 2991,
'recovered': None,
'latitude': 41.20438,
'longitude': 74.766098,
'last_update': 1678454462000},
{'id': '56',
'country': 'El Salvador',
'confirmed': 201785,
'active': None,
'deaths': 4230,
'recovered': None,
'latitude': 13.7942,
'longitude': -88.8965,
'last_update': 1678454462000},
{'id': '183',
'country': 'Trinidad and Tobago',
'confirmed': 189918,
'active': None,
'deaths': 4355,
'recovered': None,
'latitude': 10.6918,
'longitude': -61.2225,
'last_update': 1678454462000},
{'id': '112',
```

(continues on next page)

(continued from previous page)

```
'country': 'Maldives',
'confirmed': 185738,
'active': None,
'deaths': 311,
'recovered': None,
'latitude': 3.2028,
'longitude': 73.2207,
'last_update': 1678454462000},
{'id': '69',
'country': 'Ghana',
'confirmed': 171229,
'active': None,
'deaths': 1462,
'recovered': None,
'latitude': 7.9465,
'longitude': -1.0232,
'last_update': 1678454462000},
{'id': '126',
'country': 'Namibia',
'confirmed': 171156,
'active': None,
'deaths': 4090,
'recovered': None,
'latitude': -22.9576,
'longitude': 18.4904,
'last_update': 1678454462000},
{'id': '188',
'country': 'Uganda',
'confirmed': 170544,
'active': None,
'deaths': 3630,
'recovered': None,
'latitude': 1.373333,
'longitude': 32.290275,
'last_update': 1678454462000},
{'id': '88',
'country': 'Jamaica',
'confirmed': 154416,
'active': None,
'deaths': 3514,
'recovered': None,
'latitude': 18.1096,
'longitude': -77.2975,
'last_update': 1678454462000},
{'id': '32',
'country': 'Cambodia',
'confirmed': 138719,
'active': None,
'deaths': 3056,
'recovered': None,
'latitude': 11.55,
'longitude': 104.9167,
'last_update': 1678454462000},
{'id': '149',
'country': 'Rwanda',
'confirmed': 133194,
```

(continues on next page)

(continued from previous page)

```

'active': None,
'deaths': 1468,
'recovered': None,
'latitude': -1.9403,
'longitude': 29.8739,
'last_update': 1678454462000},
{'id': '33',
'country': 'Cameroon',
'confirmed': 124392,
'active': None,
'deaths': 1965,
'recovered': None,
'latitude': 3.848,
'longitude': 11.5021,
'last_update': 1678454462000},
{'id': '114',
'country': 'Malta',
'confirmed': 117610,
'active': None,
'deaths': 828,
'recovered': None,
'latitude': 35.9375,
'longitude': 14.3754,
'last_update': 1678454462000},
{'id': '16',
'country': 'Barbados',
'confirmed': 106798,
'active': None,
'deaths': 579,
'recovered': None,
'latitude': 13.1939,
'longitude': -59.5432,
'last_update': 1678454462000},
{'id': '5',
'country': 'Angola',
'confirmed': 105288,
'active': None,
'deaths': 1933,
'recovered': None,
'latitude': -11.2027,
'longitude': 17.8739,
'last_update': 1678454462000},
{'id': '42',
'country': 'Congo (Kinshasa)',
'confirmed': 95749,
'active': None,
'deaths': 1464,
'recovered': None,
'latitude': -4.0383,
'longitude': 21.7587,
'last_update': 1678454462000},
{'id': '157',
'country': 'Senegal',
'confirmed': 88926,
'active': None,
'deaths': 1971,

```

(continues on next page)

(continued from previous page)

```
'recovered': None,
'latitude': 14.4974,
'longitude': -14.4524,
'last_update': 1678454462000},
{'id': '110',
'country': 'Malawi',
'confirmed': 88707,
'active': None,
'deaths': 2686,
'recovered': None,
'latitude': -13.2543,
'longitude': 34.3015,
'last_update': 1678454462000},
{'id': '44',
'country': "Cote d'Ivoire",
'confirmed': 88263,
'active': None,
'deaths': 834,
'recovered': None,
'latitude': 7.54,
'longitude': -5.5471,
'last_update': 1678454462000},
{'id': '172',
'country': 'Suriname',
'confirmed': 82467,
'active': None,
'deaths': 1404,
'recovered': None,
'latitude': 3.9193,
'longitude': -56.0278,
'last_update': 1678454462000},
{'id': '60',
'country': 'Eswatini',
'confirmed': 74267,
'active': None,
'deaths': 1425,
'recovered': None,
'latitude': -26.5225,
'longitude': 31.4659,
'last_update': 1678454462000},
{'id': '75',
'country': 'Guyana',
'confirmed': 73075,
'active': None,
'deaths': 1298,
'recovered': None,
'latitude': 4.860416,
'longitude': -58.93018,
'last_update': 1678454462000},
{'id': '19',
'country': 'Belize',
'confirmed': 70757,
'active': None,
'deaths': 688,
'recovered': None,
'latitude': 17.1899,
```

(continues on next page)

(continued from previous page)

```
'longitude': -88.4976,
'last_update': 1678454462000},
{'id': '62',
'country': 'Fiji',
'confirmed': 68898,
'active': None,
'deaths': 883,
'recovered': None,
'latitude': -17.7134,
'longitude': 178.065,
'last_update': 1678454462000},
{'id': '109',
'country': 'Madagascar',
'confirmed': 67889,
'active': None,
'deaths': 1423,
'recovered': None,
'latitude': -18.766947,
'longitude': 46.869107,
'last_update': 1678454462000},
{'id': '170',
'country': 'Sudan',
'confirmed': 63829,
'active': None,
'deaths': 5017,
'recovered': None,
'latitude': 12.8628,
'longitude': 30.2176,
'last_update': 1678454462000},
{'id': '116',
'country': 'Mauritania',
'confirmed': 63668,
'active': None,
'deaths': 997,
'recovered': None,
'latitude': 21.0079,
'longitude': -10.9408,
'last_update': 1678454462000},
{'id': '31',
'country': 'Cabo Verde',
'confirmed': 63244,
'active': None,
'deaths': 413,
'recovered': None,
'latitude': 16.5388,
'longitude': -23.0418,
'last_update': 1678454462000},
{'id': '21',
'country': 'Bhutan',
'confirmed': 62627,
'active': None,
'deaths': 21,
'recovered': None,
'latitude': 27.5142,
'longitude': 90.4336,
'last_update': 1678454462000},
```

(continues on next page)

(continued from previous page)

```
{'id': '175',
 'country': 'Syria',
 'confirmed': 57467,
 'active': None,
 'deaths': 3164,
 'recovered': None,
 'latitude': 34.802075,
 'longitude': 38.996815,
 'last_update': 1678454462000},
{'id': '30',
 'country': 'Burundi',
 'confirmed': 53631,
 'active': None,
 'deaths': 38,
 'recovered': None,
 'latitude': -3.3731,
 'longitude': 29.9189,
 'last_update': 1678454462000},
{'id': '159',
 'country': 'Seychelles',
 'confirmed': 50665,
 'active': None,
 'deaths': 172,
 'recovered': None,
 'latitude': -4.6796,
 'longitude': 55.492,
 'last_update': 1678454462000},
{'id': '65',
 'country': 'Gabon',
 'confirmed': 48981,
 'active': None,
 'deaths': 306,
 'recovered': None,
 'latitude': -0.8037,
 'longitude': 11.6094,
 'last_update': 1678454462000},
{'id': '4',
 'country': 'Andorra',
 'confirmed': 47890,
 'active': None,
 'deaths': 165,
 'recovered': None,
 'latitude': 42.5063,
 'longitude': 1.5218,
 'last_update': 1678454462000},
{'id': '140',
 'country': 'Papua New Guinea',
 'confirmed': 46825,
 'active': None,
 'deaths': 670,
 'recovered': None,
 'latitude': -6.314993,
 'longitude': 143.95555,
 'last_update': 1678454462000},
{'id': '178',
 'country': 'Tanzania',
```

(continues on next page)

(continued from previous page)

```

'confirmed': 42906,
'active': None,
'deaths': 846,
'recovered': None,
'latitude': -6.369028,
'longitude': 34.888822,
'last_update': 1678454462000},
{'id': '181',
'country': 'Togo',
'confirmed': 39396,
'active': None,
'deaths': 290,
'recovered': None,
'latitude': 8.6195,
'longitude': 0.8248,
'last_update': 1678454462000},
{'id': '73',
'country': 'Guinea',
'confirmed': 38267,
'active': None,
'deaths': 467,
'recovered': None,
'latitude': 9.9456,
'longitude': -9.6966,
'last_update': 1678454462000},
{'id': '13',
'country': 'Bahamas',
'confirmed': 37491,
'active': None,
'deaths': 833,
'recovered': None,
'latitude': 25.025885,
'longitude': -78.035889,
'last_update': 1678454462000},
{'id': '102',
'country': 'Lesotho',
'confirmed': 34790,
'active': None,
'deaths': 723,
'recovered': None,
'latitude': -29.61,
'longitude': 28.2336,
'last_update': 1678454462000},
{'id': '76',
'country': 'Haiti',
'confirmed': 34202,
'active': None,
'deaths': 860,
'recovered': None,
'latitude': 18.9712,
'longitude': -72.2852,
'last_update': 1678454462000},
{'id': '113',
'country': 'Mali',
'confirmed': 33062,
'active': None,

```

(continues on next page)

(continued from previous page)

```
'deaths': 743,
'recovered': None,
'latitude': 17.570692,
'longitude': -3.996166,
'last_update': 1678454462000},
{'id': '151',
'country': 'Saint Lucia',
'confirmed': 30004,
'active': None,
'deaths': 409,
'recovered': None,
'latitude': 13.9094,
'longitude': -60.9789,
'last_update': 1678454462000},
{'id': '20',
'country': 'Benin',
'confirmed': 27999,
'active': None,
'deaths': 163,
'recovered': None,
'latitude': 9.3077,
'longitude': 2.3158,
'last_update': 1678454462000},
{'id': '165',
'country': 'Somalia',
'confirmed': 27324,
'active': None,
'deaths': 1361,
'recovered': None,
'latitude': 5.152149,
'longitude': 46.199616,
'last_update': 1678454462000},
{'id': '41',
'country': 'Congo (Brazzaville)',
'confirmed': 25087,
'active': None,
'deaths': 388,
'recovered': None,
'latitude': -0.228,
'longitude': 15.8277,
'last_update': 1678454462000},
{'id': '164',
'country': 'Solomon Islands',
'confirmed': 24575,
'active': None,
'deaths': 153,
'recovered': None,
'latitude': -9.6457,
'longitude': 160.1562,
'last_update': 1678454462000},
{'id': '119',
'country': 'Micronesia',
'confirmed': 23948,
'active': None,
'deaths': 61,
'recovered': None,
```

(continues on next page)

(continued from previous page)

```
'latitude': 7.4256,
'longitude': 150.5508,
'last_update': 1678454462000},
{'id': '154',
'country': 'San Marino',
'confirmed': 23616,
'active': None,
'deaths': 122,
'recovered': None,
'latitude': 43.9424,
'longitude': 12.4578,
'last_update': 1678454462000},
{'id': '180',
'country': 'Timor-Leste',
'confirmed': 23419,
'active': None,
'deaths': 138,
'recovered': None,
'latitude': -8.874217,
'longitude': 125.727539,
'last_update': 1678454462000},
{'id': '28',
'country': 'Burkina Faso',
'confirmed': 22056,
'active': None,
'deaths': 396,
'recovered': None,
'latitude': 12.2383,
'longitude': -1.5616,
'last_update': 1678454462000},
{'id': '105',
'country': 'Liechtenstein',
'confirmed': 21432,
'active': None,
'deaths': 89,
'recovered': None,
'latitude': 47.14,
'longitude': 9.55,
'last_update': 1678454462000},
{'id': '71',
'country': 'Grenada',
'confirmed': 19680,
'active': None,
'deaths': 238,
'recovered': None,
'latitude': 12.1165,
'longitude': -61.679,
'last_update': 1678454462000},
{'id': '167',
'country': 'South Sudan',
'confirmed': 18368,
'active': None,
'deaths': 138,
'recovered': None,
'latitude': 6.877,
'longitude': 31.307,
```

(continues on next page)

(continued from previous page)

```
'last_update': 1678454462000},
{'id': '177',
'country': 'Tajikistan',
'confirmed': 17786,
'active': None,
'deaths': 125,
'recovered': None,
'latitude': 38.861,
'longitude': 71.2761,
'last_update': 1678454462000},
{'id': '57',
'country': 'Equatorial Guinea',
'confirmed': 17229,
'active': None,
'deaths': 183,
'recovered': None,
'latitude': 1.6508,
'longitude': 10.2679,
'last_update': 1678454462000},
{'id': '182',
'country': 'Tonga',
'confirmed': 16810,
'active': None,
'deaths': 13,
'recovered': None,
'latitude': -21.179,
'longitude': -175.1982,
'last_update': 1678454462000},
{'id': '153',
'country': 'Samoa',
'confirmed': 16607,
'active': None,
'deaths': 29,
'recovered': None,
'latitude': -13.759,
'longitude': -172.1046,
'last_update': 1678454462000},
{'id': '121',
'country': 'Monaco',
'confirmed': 16121,
'active': None,
'deaths': 67,
'recovered': None,
'latitude': 43.7333,
'longitude': 7.4167,
'last_update': 1678454462000},
{'id': '52',
'country': 'Dominica',
'confirmed': 15760,
'active': None,
'deaths': 74,
'recovered': None,
'latitude': 15.415,
'longitude': -61.371,
'last_update': 1678454462000},
{'id': '51',
```

(continues on next page)

(continued from previous page)

```

'country': 'Djibouti',
'confirmed': 15690,
'active': None,
'deaths': 189,
'recovered': None,
'latitude': 11.8251,
'longitude': 42.5903,
'last_update': 1678454462000},
{'id': '131',
'country': 'Nicaragua',
'confirmed': 15655,
'active': None,
'deaths': 245,
'recovered': None,
'latitude': 12.865416,
'longitude': -85.207229,
'last_update': 1678454462000},
{'id': '115',
'country': 'Marshall Islands',
'confirmed': 15649,
'active': None,
'deaths': 17,
'recovered': None,
'latitude': 7.1315,
'longitude': 171.1845,
'last_update': 1678454462000},
{'id': '35',
'country': 'Central African Republic',
'confirmed': 15368,
'active': None,
'deaths': 113,
'recovered': None,
'latitude': 6.6111,
'longitude': 20.9394,
'last_update': 1678454462000},
{'id': '66',
'country': 'Gambia',
'confirmed': 12598,
'active': None,
'deaths': 372,
'recovered': None,
'latitude': 13.4432,
'longitude': -15.3101,
'last_update': 1678454462000},
{'id': '194',
'country': 'Vanuatu',
'confirmed': 12014,
'active': None,
'deaths': 14,
'recovered': None,
'latitude': -15.3767,
'longitude': 166.9592,
'last_update': 1678454462000},
{'id': '199',
'country': 'Yemen',
'confirmed': 11945,

```

(continues on next page)

(continued from previous page)

```
'active': None,
'deaths': 2159,
'recovered': None,
'latitude': 15.552727,
'longitude': 48.516388,
'last_update': 1678454462000},
{'id': '58',
'country': 'Eritrea',
'confirmed': 10189,
'active': None,
'deaths': 103,
'recovered': None,
'latitude': 15.1794,
'longitude': 39.7823,
'last_update': 1678454462000},
{'id': '152',
'country': 'Saint Vincent and the Grenadines',
'confirmed': 9589,
'active': None,
'deaths': 123,
'recovered': None,
'latitude': 12.9843,
'longitude': -61.2872,
'last_update': 1678454462000},
{'id': '132',
'country': 'Niger',
'confirmed': 9508,
'active': None,
'deaths': 315,
'recovered': None,
'latitude': 17.607789,
'longitude': 8.081666,
'last_update': 1678454462000},
{'id': '7',
'country': 'Antigua and Barbuda',
'confirmed': 9106,
'active': None,
'deaths': 146,
'recovered': None,
'latitude': 17.0608,
'longitude': -61.7964,
'last_update': 1678454462000},
{'id': '40',
'country': 'Comoros',
'confirmed': 9008,
'active': None,
'deaths': 161,
'recovered': None,
'latitude': -11.6455,
'longitude': 43.3333,
'last_update': 1678454462000},
{'id': '74',
'country': 'Guinea-Bissau',
'confirmed': 8960,
'active': None,
'deaths': 176,
```

(continues on next page)

(continued from previous page)

```

'recovered': None,
'latitude': 11.8037,
'longitude': -15.1804,
'last_update': 1678454462000},
{'id': '103',
'country': 'Liberia',
'confirmed': 8090,
'active': None,
'deaths': 295,
'recovered': None,
'latitude': 6.428055,
'longitude': -9.429499,
'last_update': 1678454462000},
{'id': '160',
'country': 'Sierra Leone',
'confirmed': 7760,
'active': None,
'deaths': 126,
'recovered': None,
'latitude': 8.460555,
'longitude': -11.779889,
'last_update': 1678454462000},
{'id': '36',
'country': 'Chad',
'confirmed': 7679,
'active': None,
'deaths': 194,
'recovered': None,
'latitude': 15.4542,
'longitude': 18.7322,
'last_update': 1678454462000},
{'id': '150',
'country': 'Saint Kitts and Nevis',
'confirmed': 6597,
'active': None,
'deaths': 47,
'recovered': None,
'latitude': 17.357822,
'longitude': -62.782998,
'last_update': 1678454462000},
{'id': '155',
'country': 'Sao Tome and Principe',
'confirmed': 6281,
'active': None,
'deaths': 77,
'recovered': None,
'latitude': 0.1864,
'longitude': 6.6131,
'last_update': 1678454462000},
{'id': '138',
'country': 'Palau',
'confirmed': 5991,
'active': None,
'deaths': 9,
'recovered': None,
'latitude': 7.515,

```

(continues on next page)

(continued from previous page)

```
'longitude': 134.5825,
'last_update': 1678454462000},
{'id': '127',
'country': 'Nauru',
'confirmed': 5393,
'active': None,
'deaths': 1,
'recovered': None,
'latitude': -0.5228,
'longitude': 166.9315,
'last_update': 1678454462000},
{'id': '93',
'country': 'Kiribati',
'confirmed': 5014,
'active': None,
'deaths': 18,
'recovered': None,
'latitude': -3.3704,
'longitude': -168.734,
'last_update': 1678454462000},
{'id': '186',
'country': 'Tuvalu',
'confirmed': 2805,
'active': None,
'deaths': 0,
'recovered': None,
'latitude': -7.1095,
'longitude': 177.6493,
'last_update': 1678454462000},
{'id': '171',
'country': 'Summer Olympics 2020',
'confirmed': 865,
'active': None,
'deaths': 0,
'recovered': None,
'latitude': 35.6491,
'longitude': 139.7737,
'last_update': 1678454462000},
{'id': '50',
'country': 'Diamond Princess',
'confirmed': 712,
'active': None,
'deaths': 13,
'recovered': None,
'latitude': None,
'longitude': None,
'last_update': 1678454462000},
{'id': '198',
'country': 'Winter Olympics 2022',
'confirmed': 535,
'active': None,
'deaths': 0,
'recovered': None,
'latitude': 39.9042,
'longitude': 116.4074,
'last_update': 1678454462000},
```

(continues on next page)

(continued from previous page)

```
{'id': '77',
 'country': 'Holy See',
 'confirmed': 29,
 'active': None,
 'deaths': 0,
 'recovered': None,
 'latitude': 41.9029,
 'longitude': 12.4534,
 'last_update': 1678454462000},
{'id': '6',
 'country': 'Antarctica',
 'confirmed': 11,
 'active': None,
 'deaths': 0,
 'recovered': None,
 'latitude': -71.9499,
 'longitude': 23.347,
 'last_update': 1678454462000},
{'id': '108',
 'country': 'MS Zaandam',
 'confirmed': 9,
 'active': None,
 'deaths': 2,
 'recovered': None,
 'latitude': None,
 'longitude': None,
 'last_update': 1678454462000}]
```