Matplotlib

March 3, 2023

```
[1]: import matplotlib.pylab as plt
```

```
[2]: import numpy as np
```

```
[5]: x = np.linspace(1,10, 200)
```

```
[6]: x
```

```
[6]: array([ 1.        ,  1.04522613,  1.09045226,  1.13567839,  1.18090452,
             1.22613065,  1.27135678,  1.31658291,  1.36180905,  1.40703518,
             1.45226131,  1.49748744,  1.54271357,  1.5879397 ,  1.63316583,
             1.67839196,  1.72361809,  1.76884422,  1.81407035,  1.85929648,
             1.90452261,  1.94974874,  1.99497487,  2.04020101,  2.08542714,
             2.13065327,  2.1758794 ,  2.22110553,  2.26633166,  2.31155779,
             2.35678392,  2.40201005,  2.44723618,  2.49246231,  2.53768844,
             2.58291457,  2.6281407 ,  2.67336683,  2.71859296,  2.7638191 ,
             2.80904523,  2.85427136,  2.89949749,  2.94472362,  2.98994975,
             3.03517588,  3.08040201,  3.12562814,  3.17085427,  3.2160804 ,
             3.26130653,  3.30653266,  3.35175879,  3.39698492,  3.44221106,
             3.48743719,  3.53266332,  3.57788945,  3.62311558,  3.66834171,
             3.71356784,  3.75879397,  3.8040201 ,  3.84924623,  3.89447236,
             3.93969849,  3.98492462,  4.03015075,  4.07537688,  4.12060302,
             4.16582915,  4.21105528,  4.25628141,  4.30150754,  4.34673367,
             4.3919598 ,  4.43718593,  4.48241206,  4.52763819,  4.57286432,
             4.61809045,  4.66331658,  4.70854271,  4.75376884,  4.79899497,
             4.84422111,  4.88944724,  4.93467337,  4.9798995 ,  5.02512563,
             5.07035176,  5.11557789,  5.16080402,  5.20603015,  5.25125628,
             5.29648241,  5.34170854,  5.38693467,  5.4321608 ,  5.47738693,
             5.52261307,  5.5678392 ,  5.61306533,  5.65829146,  5.70351759,
             5.74874372,  5.79396985,  5.83919598,  5.88442211,  5.92964824,
             5.97487437,  6.0201005 ,  6.06532663,  6.11055276,  6.15577889,
             6.20100503,  6.24623116,  6.29145729,  6.33668342,  6.38190955,
             6.42713568,  6.47236181,  6.51758794,  6.56281407,  6.6080402 ,
             6.65326633,  6.69849246,  6.74371859,  6.78894472,  6.83417085,
             6.87939698,  6.92462312,  6.96984925,  7.01507538,  7.06030151,
             7.10552764,  7.15075377,  7.1959799 ,  7.24120603,  7.28643216,
             7.33165829,  7.37688442,  7.42211055,  7.46733668,  7.51256281,
```

```
        7.55778894,  7.60301508,  7.64824121,  7.69346734,  7.73869347,
        7.7839196 ,  7.82914573,  7.87437186,  7.91959799,  7.96482412,
        8.01005025,  8.05527638,  8.10050251,  8.14572864,  8.19095477,
        8.2361809 ,  8.28140704,  8.32663317,  8.3718593 ,  8.41708543,
        8.46231156,  8.50753769,  8.55276382,  8.59798995,  8.64321608,
        8.68844221,  8.73366834,  8.77889447,  8.8241206 ,  8.86934673,
        8.91457286,  8.95979899,  9.00502513,  9.05025126,  9.09547739,
        9.14070352,  9.18592965,  9.23115578,  9.27638191,  9.32160804,
        9.36683417,  9.4120603 ,  9.45728643,  9.50251256,  9.54773869,
        9.59296482,  9.63819095,  9.68341709,  9.72864322,  9.77386935,
        9.81909548,  9.86432161,  9.90954774,  9.95477387, 10.        ])
```

[7]: `y = np.sin(x)`

[8]: `y`

```
[8]: array([ 0.84147098,  0.86503801,  0.88683599,  0.90682034,  0.92495019,
        0.94118847,  0.95550197,  0.96786141,  0.97824152,  0.98662108,
        0.99298295,  0.99731411,  0.99960571,  0.99985306,  0.99805565,
        0.99421717,  0.98834546,  0.98045253,  0.97055453,  0.95867168,
        0.9448283 ,  0.9290527 ,  0.91137713,  0.89183774,  0.8704745 ,
        0.84733109,  0.82245485,  0.79589664,  0.76771077,  0.7379549 ,
        0.70668987,  0.67397962,  0.63989104,  0.60449386,  0.56786045,
        0.53006573,  0.491187  ,  0.45130377,  0.4104976 ,  0.36885193,
        0.32645195,  0.28338435,  0.23973722,  0.19559981,  0.15106239,
        0.10621603,  0.06115246,  0.01596383, -0.02925744, -0.07441889,
       -0.11942814, -0.16419316, -0.20862239, -0.25262498, -0.29611093,
       -0.33899133, -0.38117846, -0.42258607, -0.46312947, -0.50272574,
       -0.54129391, -0.5787551 , -0.61503271, -0.65005254, -0.68374298,
       -0.71603513, -0.74686295, -0.77616339, -0.80387654, -0.82994571,
       -0.8543176 , -0.87694237, -0.89777374, -0.91676912, -0.93388965,
       -0.94910032, -0.96237004, -0.97367166, -0.98298206, -0.99028221,
       -0.99555719, -0.99879619, -0.9999926 , -0.99914398, -0.99625204,
       -0.99132272, -0.98436609, -0.97539638, -0.96443193, -0.95149517,
       -0.93661254, -0.91981449, -0.90113537, -0.88061338, -0.85829049,
       -0.83421235, -0.8084282 , -0.78099077, -0.75195617, -0.72138377,
       -0.68933611, -0.65587872, -0.62108003, -0.58501119, -0.54774597,
       -0.50936058, -0.46993352, -0.42954542, -0.38827887, -0.34621828,
       -0.30344965, -0.26006045, -0.21613941, -0.17177635, -0.12706201,
       -0.08208781, -0.03694574,  0.00827188,  0.05347259,  0.09856395,
        0.14345374,  0.18805015,  0.232262  ,  0.27599885,  0.31917127,
        0.36169097,  0.40347099,  0.4444259 ,  0.48447192,  0.52352718,
        0.56151179,  0.59834808,  0.63396072,  0.66827687,  0.70122637,
        0.73274181,  0.76275876,  0.79121582,  0.81805481,  0.84322083,
        0.86666242,  0.88833163,  0.90818416,  0.9261794 ,  0.94228056,
        0.9564547 ,  0.96867284,  0.97890999,  0.98714522,  0.99336168,
        0.99754666,  0.9996916 ,  0.99979213,  0.99784802,  0.99386326,
```

```
        0.98784599,  0.97980853,  0.9697673 ,  0.95774285,  0.94375976,
        0.92784664,  0.91003601,  0.89036431,  0.86887177,  0.84560234,
        0.82060361,  0.79392669,  0.76562616,  0.73575987,  0.70438892,
        0.67157746,  0.63739258,  0.6019042 ,  0.56518489,  0.52730975,
        0.48835623,  0.448404  ,  0.40753476,  0.36583208,  0.32338126,
        0.28026911,  0.23658379,  0.19241465,  0.147852  ,  0.10298699,
        0.05791137,  0.01271732, -0.03250275, -0.07765634, -0.12265112,
       -0.16739507, -0.21179669, -0.25576518, -0.29921061, -0.34204414,
       -0.38417817, -0.42552653, -0.46600468, -0.50552981, -0.54402111])
```
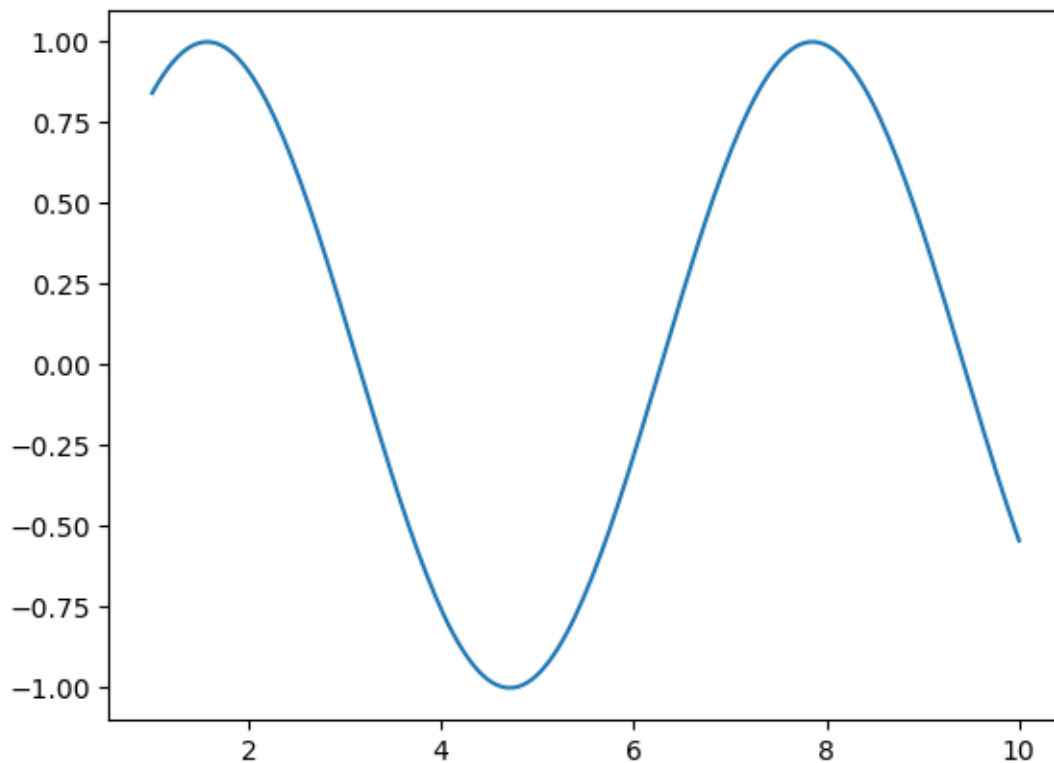
[9]: `plt.plot(x,y)`

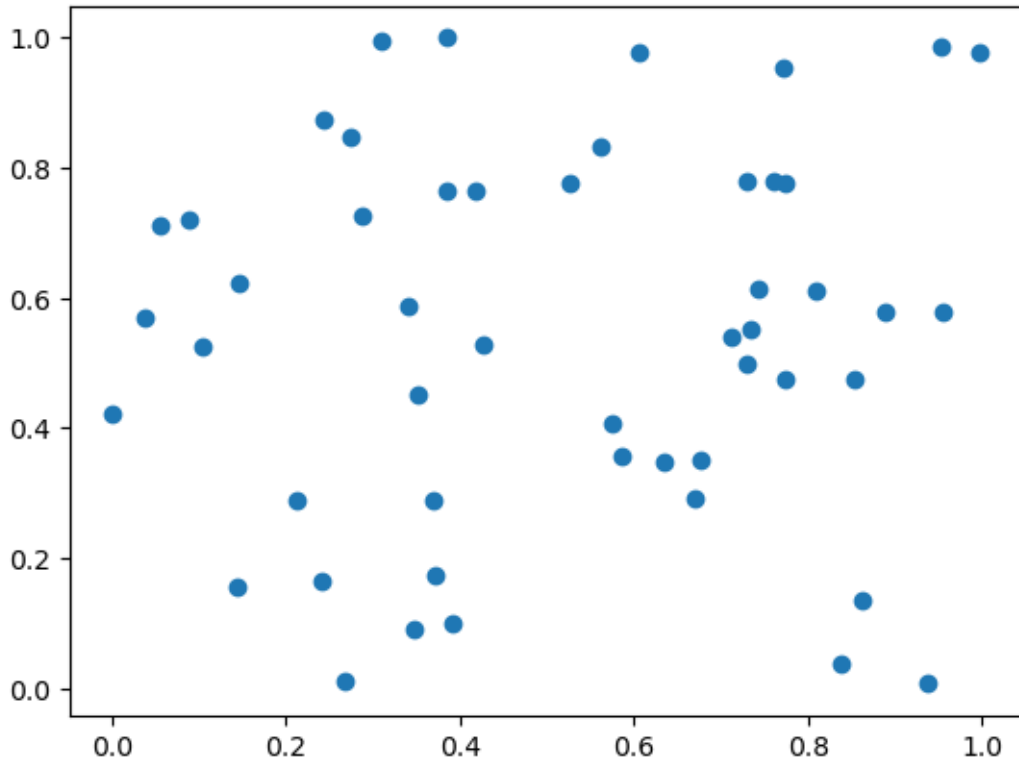[9]: `[<matplotlib.lines.Line2D at 0x7f91af8f0b50>]`

[14]:
```
plt.xlabel("this is my x data")
plt.ylabel("this is my y data")
plt.title("this is my title")
plt.show()
```

this is my title

this is my y data

this is my x data
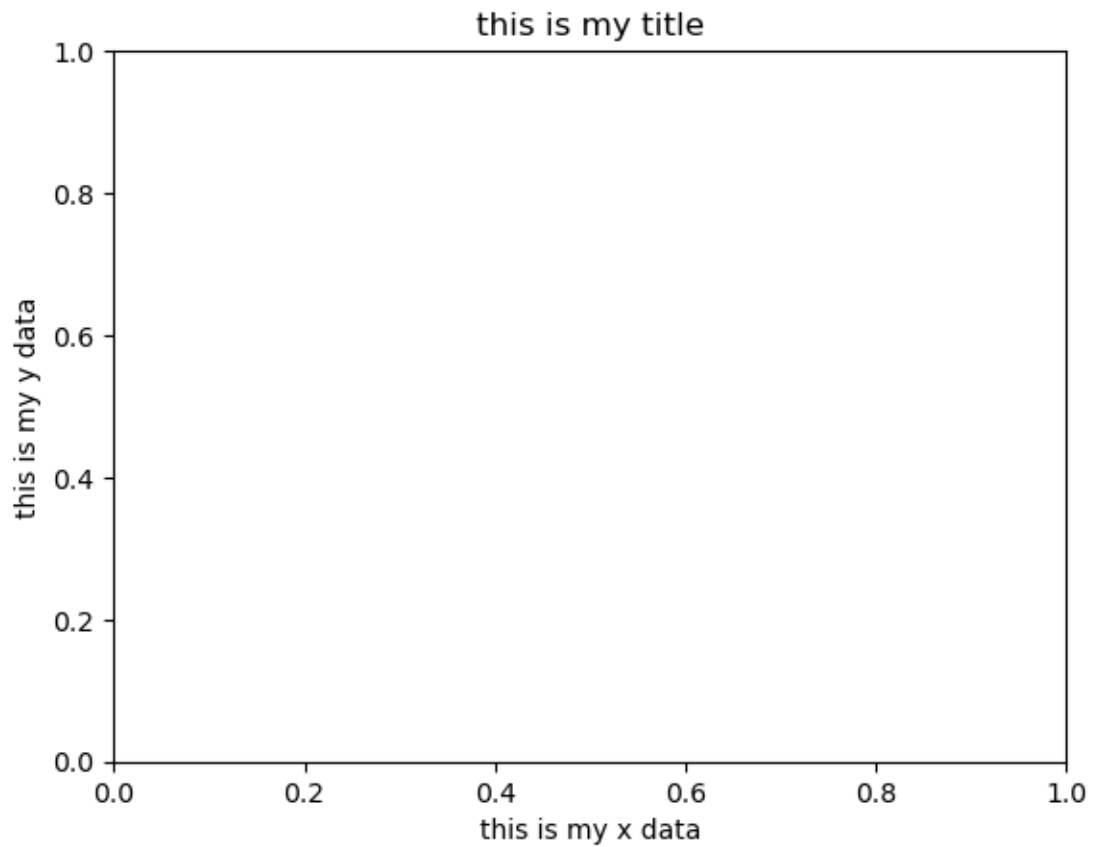
```
[19]:  x = np.random.rand(50)
       y = np.random.rand(50)
       plt.scatter(x,y)
```

[19]: <matplotlib.collections.PathCollection at 0x7f91a7376680>

```
[16]: x
```

```
[16]: array([0.28334429, 0.48393432, 0.45353404, 0.39261207, 0.36352605,
             0.67003143, 0.61933206, 0.64283689, 0.94909281, 0.54488495,
             0.94189726, 0.58013028, 0.26455905, 0.94427989, 0.24851796,
             0.01671631, 0.81719324, 0.27897853, 0.52384928, 0.51435785,
             0.22441985, 0.91162364, 0.18604918, 0.47399359, 0.80102501,
             0.4824232 , 0.48168898, 0.58227373, 0.7820988 , 0.35382552,
             0.54980714, 0.85399821, 0.67875163, 0.66957148, 0.41031753,
             0.32593779, 0.37511951, 0.68043795, 0.53526923, 0.83264341,
             0.37447275, 0.00208393, 0.43603769, 0.99313108, 0.86199141,
             0.20900076, 0.13020754, 0.87326173, 0.37360904, 0.94008361])
```

```
[17]: y
```

```
[17]: array([ 0.84147098,  0.86503801,  0.88683599,  0.90682034,  0.92495019,
             0.94118847,  0.95550197,  0.96786141,  0.97824152,  0.98662108,
             0.99298295,  0.99731411,  0.99960571,  0.99985306,  0.99805565,
             0.99421717,  0.98834546,  0.98045253,  0.97055453,  0.95867168,
             0.9448283 ,  0.9290527 ,  0.91137713,  0.89183774,  0.8704745 ,
             0.84733109,  0.82245485,  0.79589664,  0.76771077,  0.7379549 ,
             0.70668987,  0.67397962,  0.63989104,  0.60449386,  0.56786045,
```

```
         0.53006573,  0.491187  ,  0.45130377,  0.4104976 ,  0.36885193,
         0.32645195,  0.28338435,  0.23973722,  0.19559981,  0.15106239,
         0.10621603,  0.06115246,  0.01596383, -0.02925744, -0.07441889,
        -0.11942814, -0.16419316, -0.20862239, -0.25262498, -0.29611093,
        -0.33899133, -0.38117846, -0.42258607, -0.46312947, -0.50272574,
        -0.54129391, -0.5787551 , -0.61503271, -0.65005254, -0.68374298,
        -0.71603513, -0.74686295, -0.77616339, -0.80387654, -0.82994571,
        -0.8543176 , -0.87694237, -0.89777374, -0.91676912, -0.93388965,
        -0.94910032, -0.96237004, -0.97367166, -0.98298206, -0.99028221,
        -0.99555719, -0.99879619, -0.9999926 , -0.99914398, -0.99625204,
        -0.99132272, -0.98436609, -0.97539638, -0.96443193, -0.95149517,
        -0.93661254, -0.91981449, -0.90113537, -0.88061338, -0.85829049,
        -0.83421235, -0.8084282 , -0.78099077, -0.75195617, -0.72138377,
        -0.68933611, -0.65587872, -0.62108003, -0.58501119, -0.54774597,
        -0.50936058, -0.46993352, -0.42954542, -0.38827887, -0.34621828,
        -0.30344965, -0.26006045, -0.21613941, -0.17177635, -0.12706201,
        -0.08208781, -0.03694574,  0.00827188,  0.05347259,  0.09856395,
         0.14345374,  0.18805015,  0.232262  ,  0.27599885,  0.31917127,
         0.36169097,  0.40347099,  0.4444259 ,  0.48447192,  0.52352718,
         0.56151179,  0.59834808,  0.63396072,  0.66827687,  0.70122637,
         0.73274181,  0.76275876,  0.79121582,  0.81805481,  0.84322083,
         0.86666242,  0.88833163,  0.90818416,  0.9261794 ,  0.94228056,
         0.9564547 ,  0.96867284,  0.97890999,  0.98714522,  0.99336168,
         0.99754666,  0.9996916 ,  0.99979213,  0.99784802,  0.99386326,
         0.98784599,  0.97980853,  0.9697673 ,  0.95774285,  0.94375976,
         0.92784664,  0.91003601,  0.89036431,  0.86887177,  0.84560234,
         0.82060361,  0.79392669,  0.76562616,  0.73575987,  0.70438892,
         0.67157746,  0.63739258,  0.6019042 ,  0.56518489,  0.52730975,
         0.48835623,  0.448404  ,  0.40753476,  0.36583208,  0.32338126,
         0.28026911,  0.23658379,  0.19241465,  0.147852  ,  0.10298699,
         0.05791137,  0.01271732, -0.03250275, -0.07765634, -0.12265112,
        -0.16739507, -0.21179669, -0.25576518, -0.29921061, -0.34204414,
        -0.38417817, -0.42552653, -0.46600468, -0.50552981, -0.54402111])
```
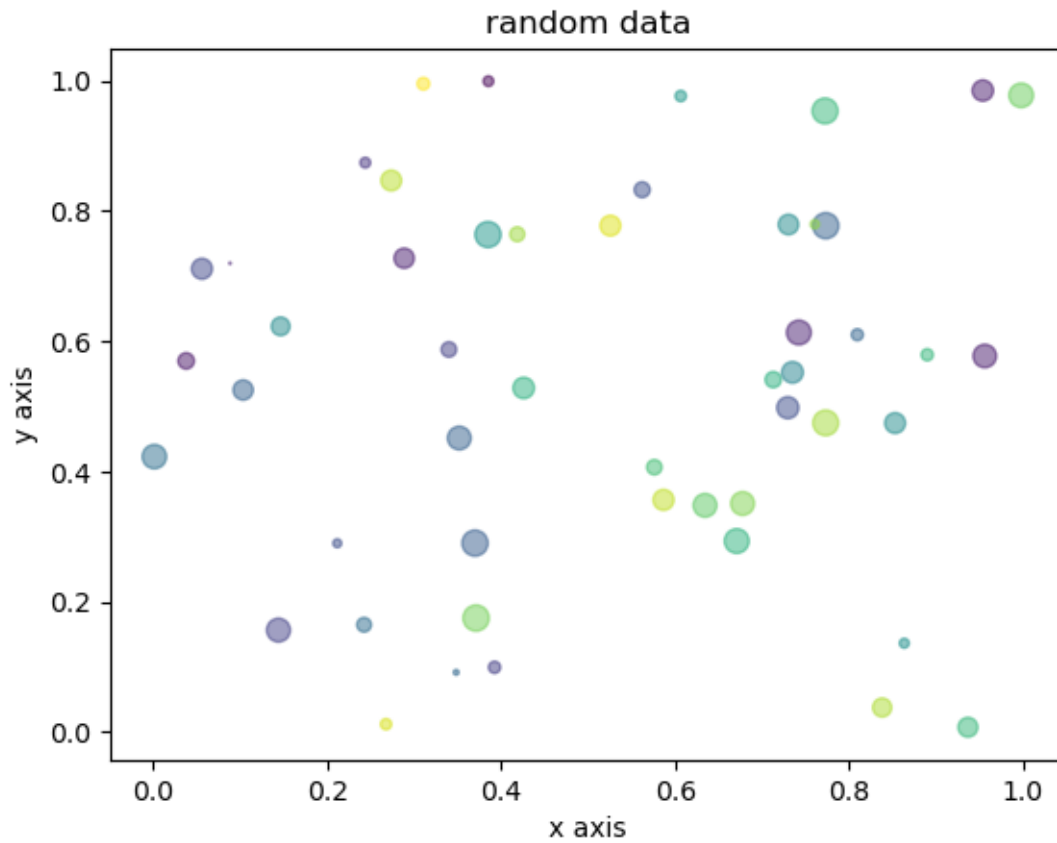
```
[27]: colours = np.random.rand(50)
      sizes = 100 * np.random.rand(50)
      plt.scatter(x,y, c = colours , s = sizes , alpha= .5)
      plt.xlabel("x axis")
      plt.ylabel("y axis")
      plt.title("random data")
```
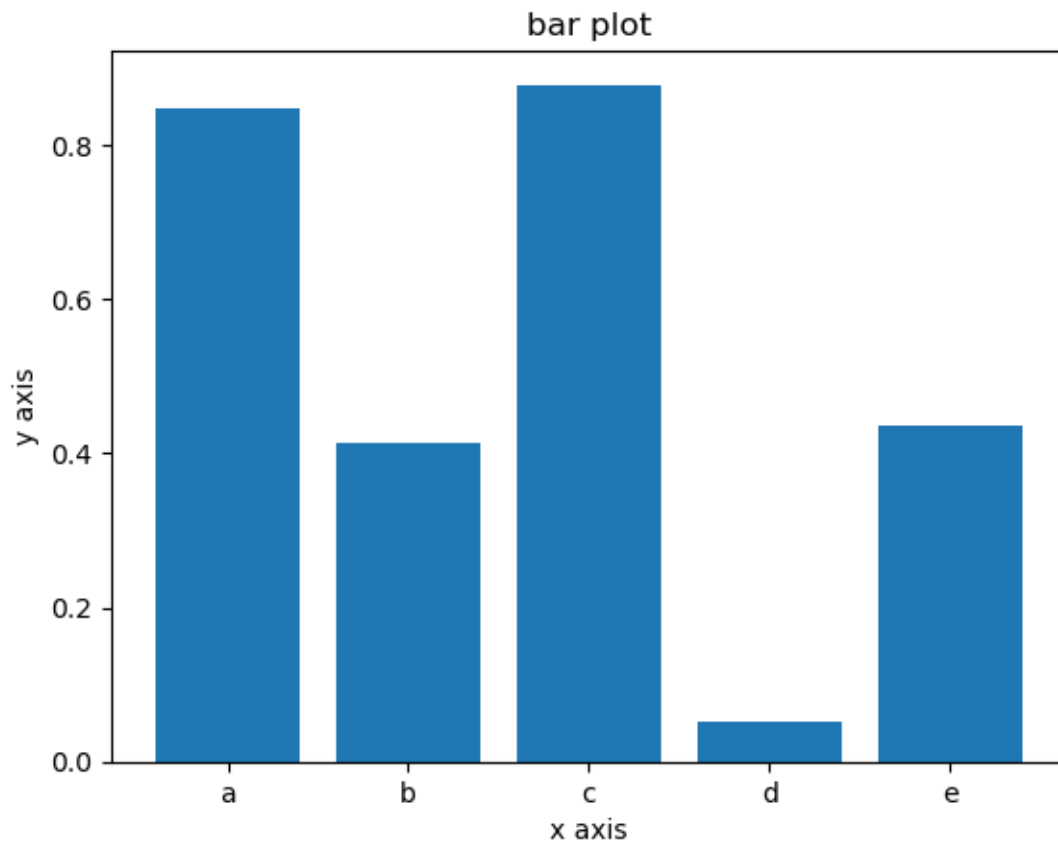
```
[27]: Text(0.5, 1.0, 'random data')
```

random data

```
[30]: x = ['a','b','c','d','e']
      y = np.random.rand(5)
      plt.bar(x,y)
      plt.xlabel("x axis")
      plt.ylabel("y axis")
      plt.title("bar plot")
```

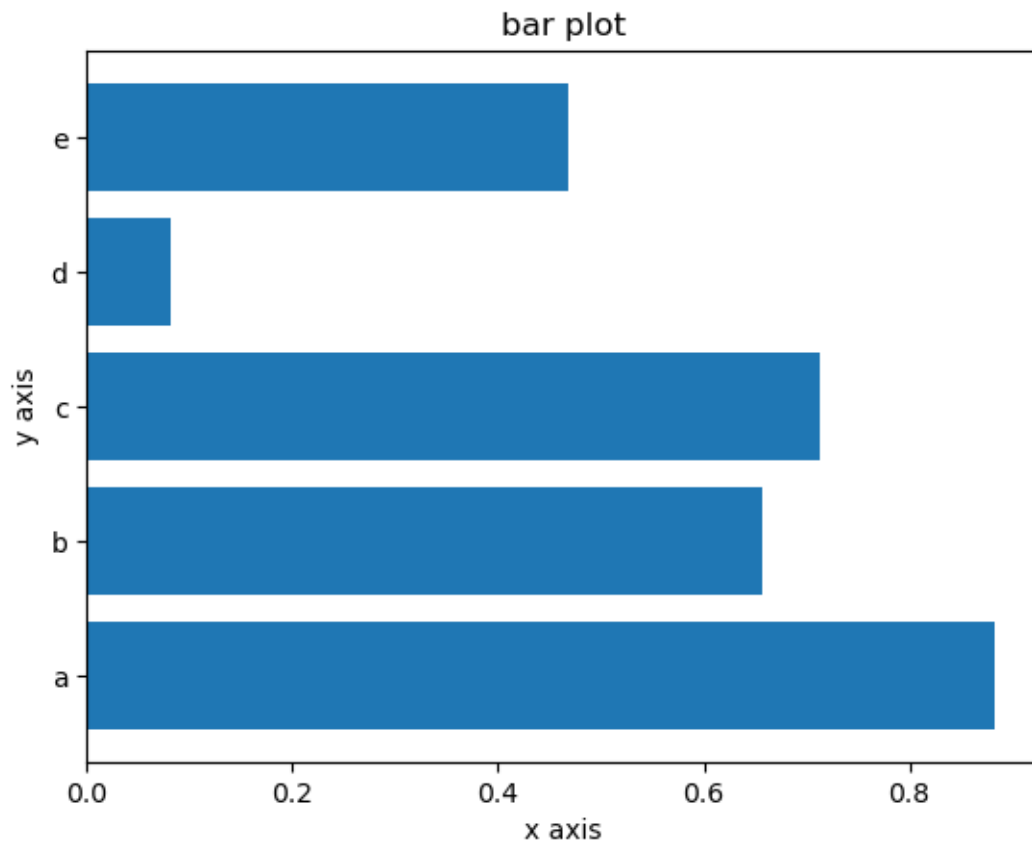[30]: Text(0.5, 1.0, 'bar plot')

bar plot

[29]: y

[29]: array([0.71561815, 0.16746457, 0.81766398, 0.01396799, 0.87380518])

[31]:
```python
x = ['a','b','c','d','e']
y = np.random.rand(5)
plt.barh(x,y)
plt.xlabel("x axis")
plt.ylabel("y axis")
plt.title("bar plot")
```

[31]: Text(0.5, 1.0, 'bar plot')

bar plot

```
[32]: x = np.linspace(1,10, 200)
      y = np.sin(x)
```

```
[34]: plt.plot(x,y, '--r')
      plt.xlabel("this is my x data")
      plt.ylabel("this is my y data")
      plt.title("this is my title")
      plt.show()
```

this is my title

this is my y data
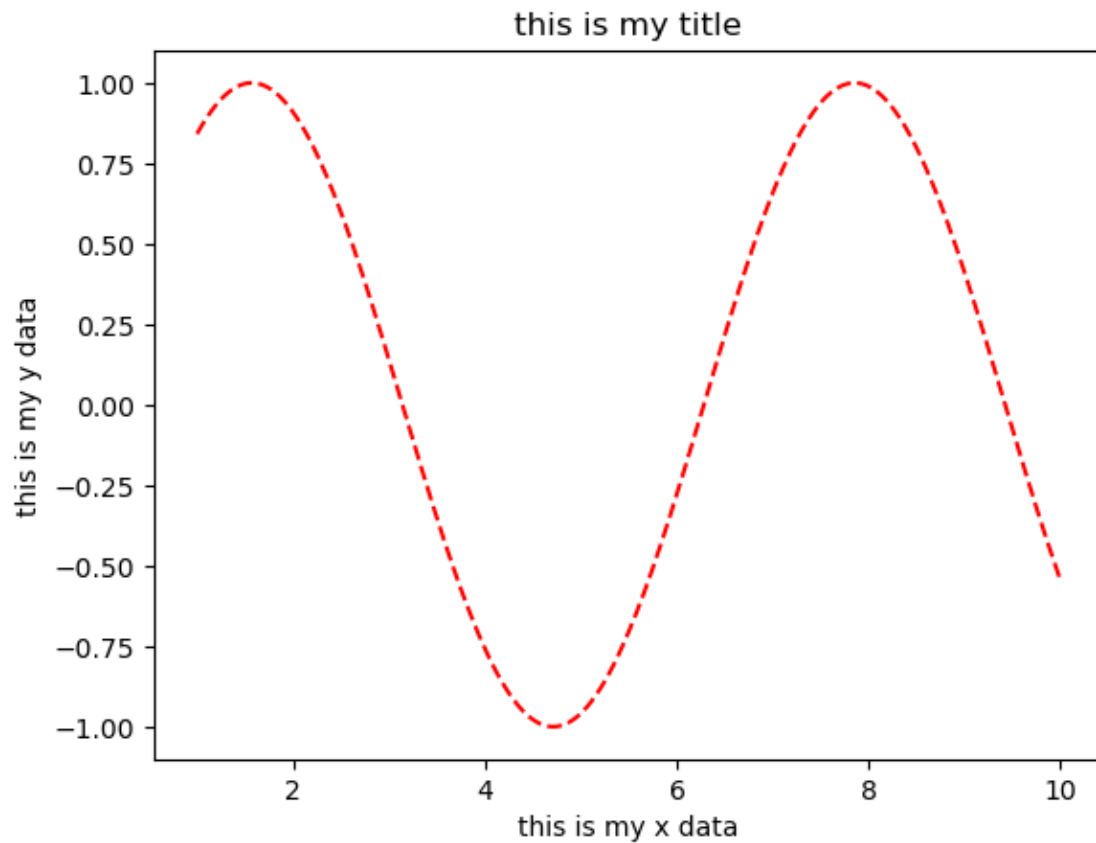
this is my x data

```
[39]: plt.figure(figsize= (6,2) )
      plt.plot(x,y, '--b')
      plt.xlabel("this is my x data")
      plt.ylabel("this is my y data")
      plt.title("this is my title")
      plt.grid()
      plt.show()
```


this is my title

this is my y data

this is my x data
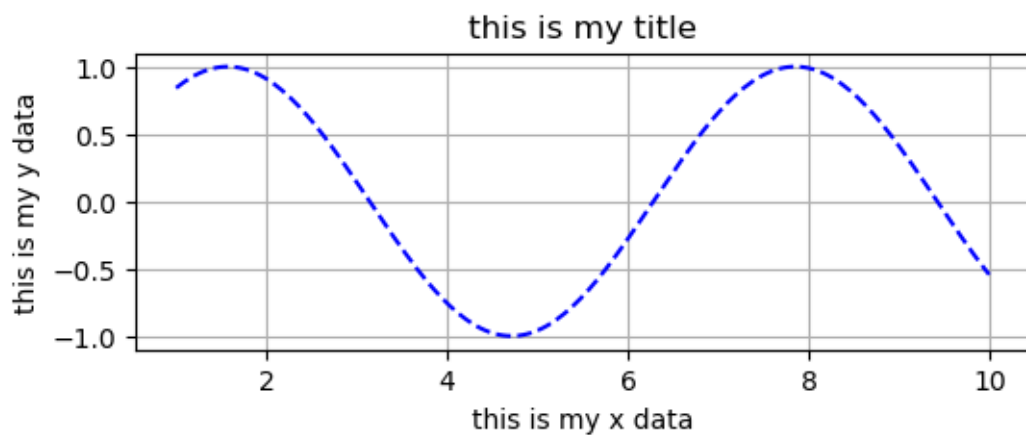
```
[53]: x = np.random.rand(50)
      y = np.random.rand(50)
      plt.scatter(x,y)
      colours = np.random.rand(50)
      sizes = 100 * np.random.rand(50)
      plt.scatter(x,y, c = '#E16E19' , s = sizes , alpha= .5, marker = 'v')
      plt.xlabel("x axis")
      plt.ylabel("y axis")
      plt.title("random data")
```

[53]: Text(0.5, 1.0, 'random data')
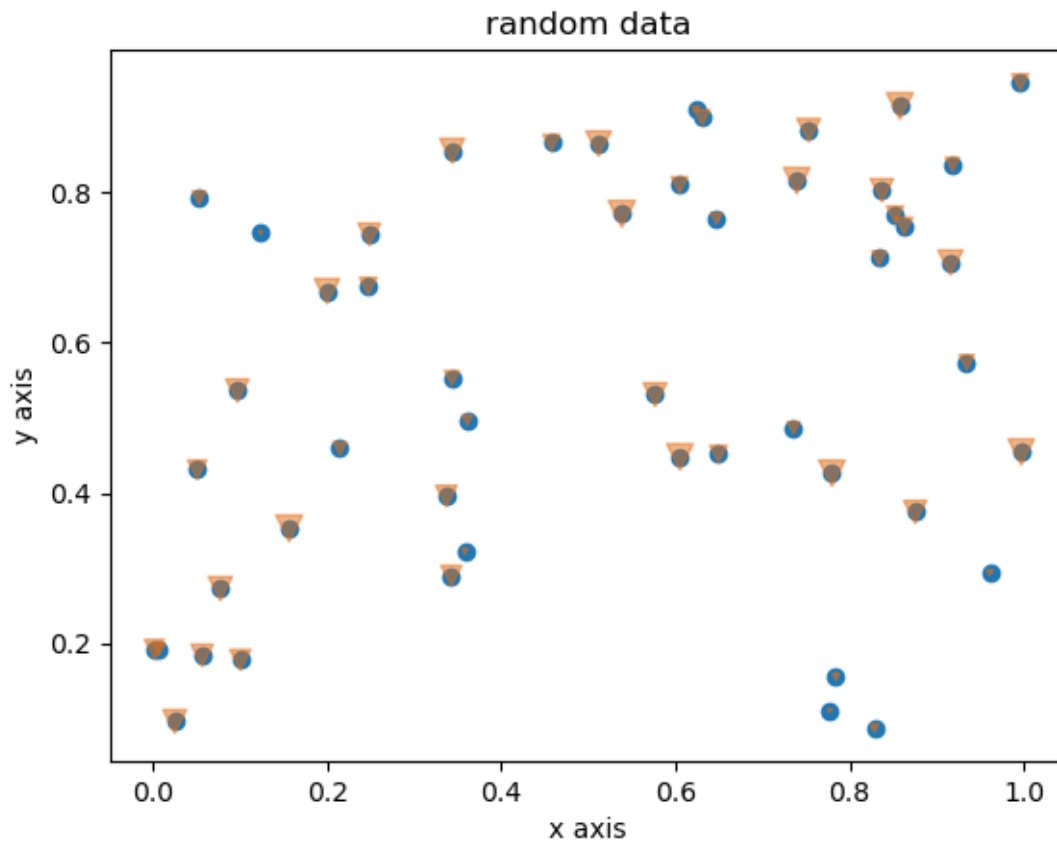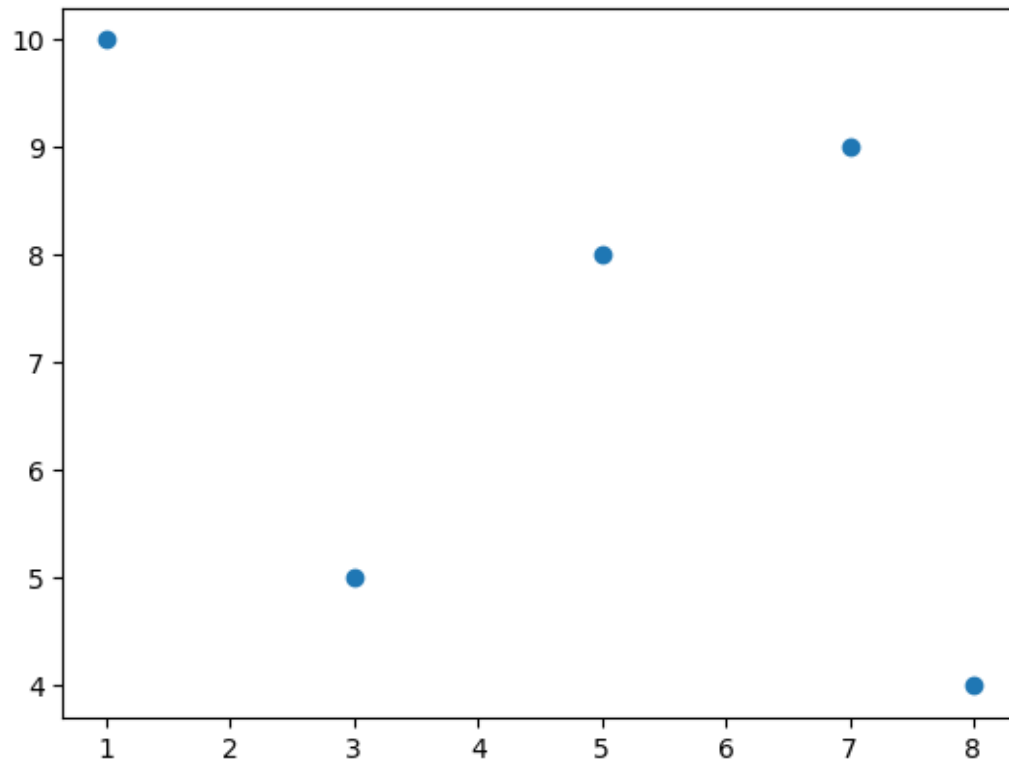


```
[57]: x = [5,3,7,8,1]
      y = [8,5,9,4,10]
      plt.plot(x,y)
      plt.show
```
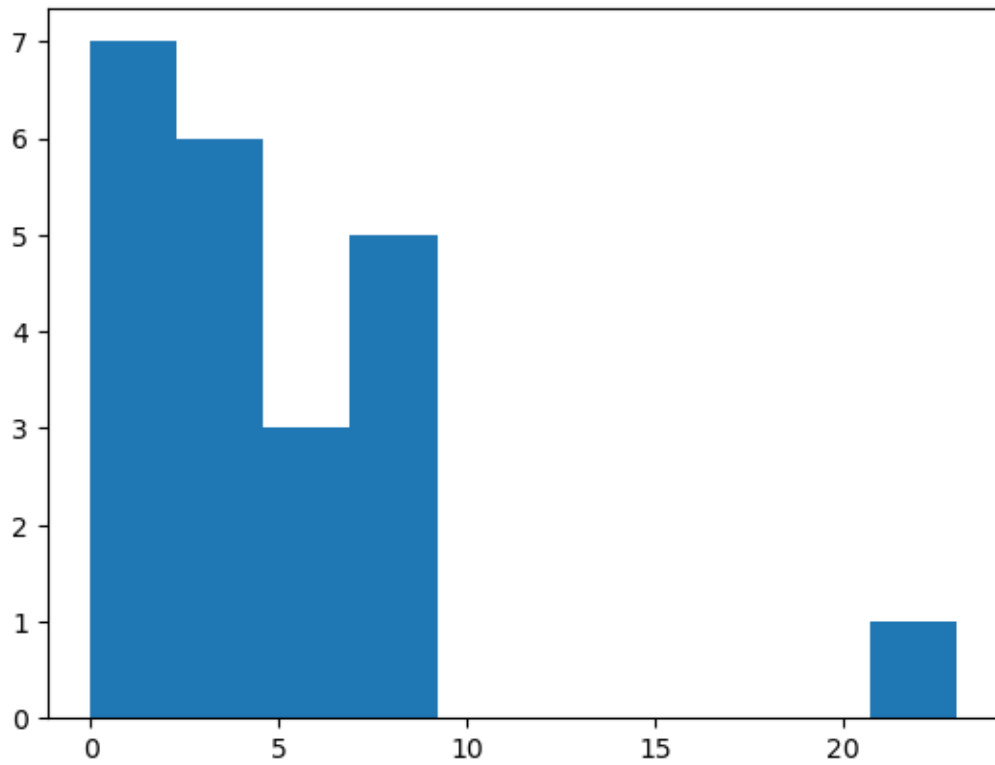
[57]: <function matplotlib.pyplot.show(close=None, block=None)>
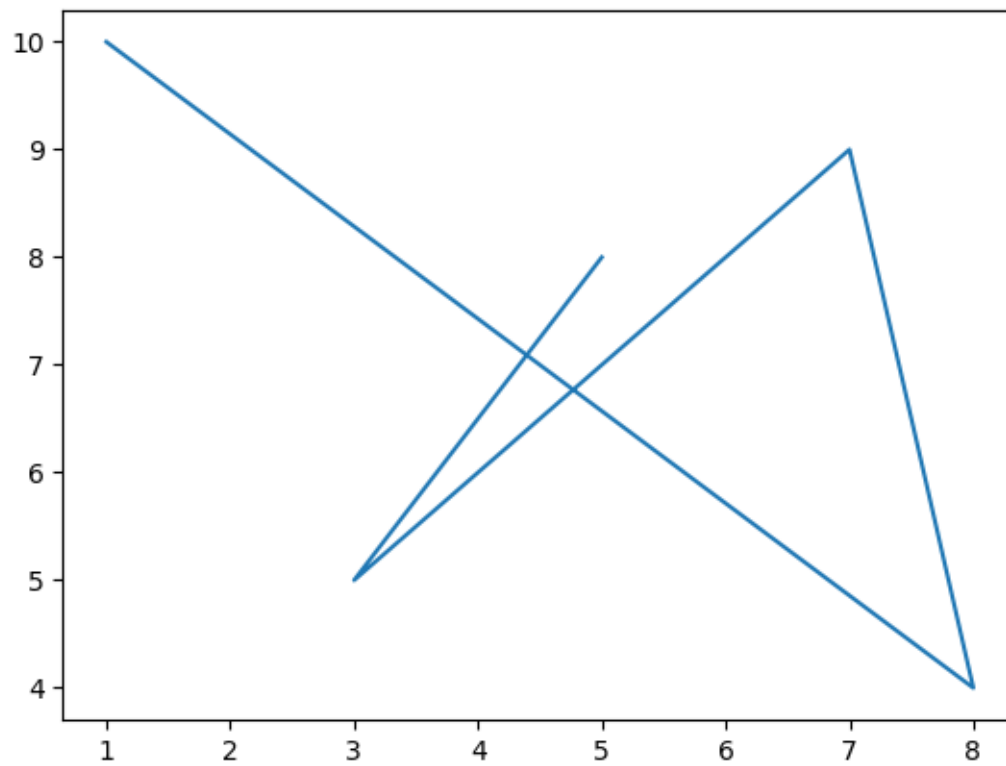
[58]:
```
x = [5,3,7,8,1]
y = [8,5,9,4,10]
plt.scatter(x,y)
plt.show
```

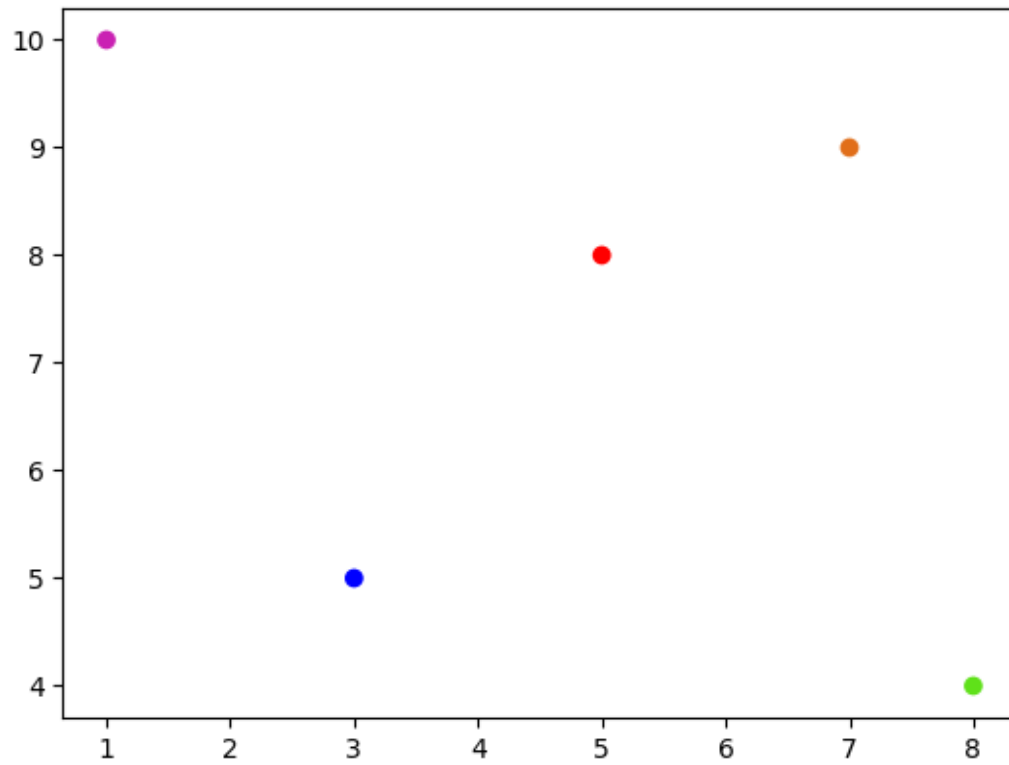[58]: <function matplotlib.pyplot.show(close=None, block=None)>

[63]:
```
data = [1,2,3,4,1,2,3,4,5,6,7,8,4,5,9,2,1,4,7,23,9,0]
```

[64]:
```
plt.hist(data)
plt.show()
```
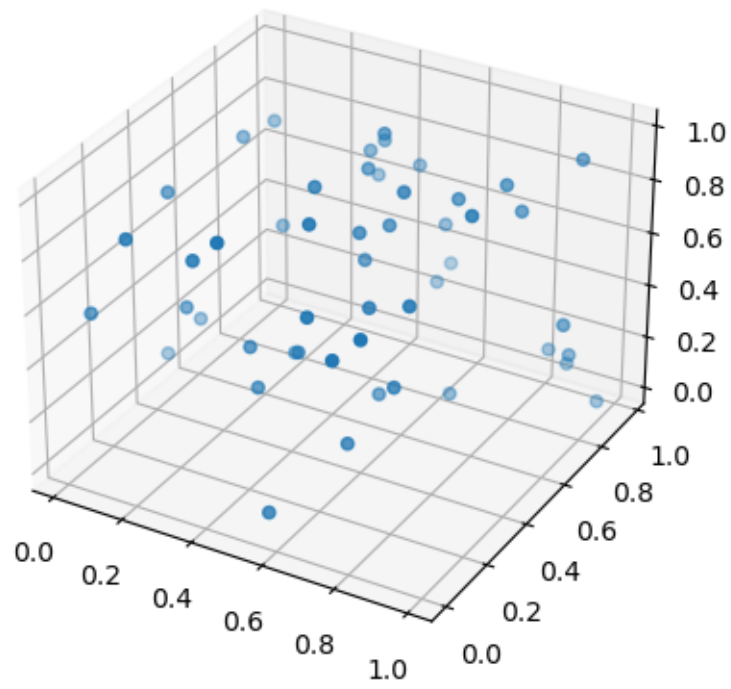
```
[70]: x = [5,3,7,8,1]
      y = [8,5,9,4,10]
      colour = ['red','blue','#E16E19','#5FE119','#CA21B3']
      plt.scatter(x,y , c = colour)
      plt.show
```

```
[70]: <function matplotlib.pyplot.show(close=None, block=None)>
```

```
[7]: x = np.random.rand(50)
     y = np.random.rand(50)
     z = np.random.rand(50)

     fig = plt.figure()
     ax = fig.add_subplot(projection = '3d')
     ax.scatter(x,y,z)
     plt.show()
```

[ ]:

[ ]: