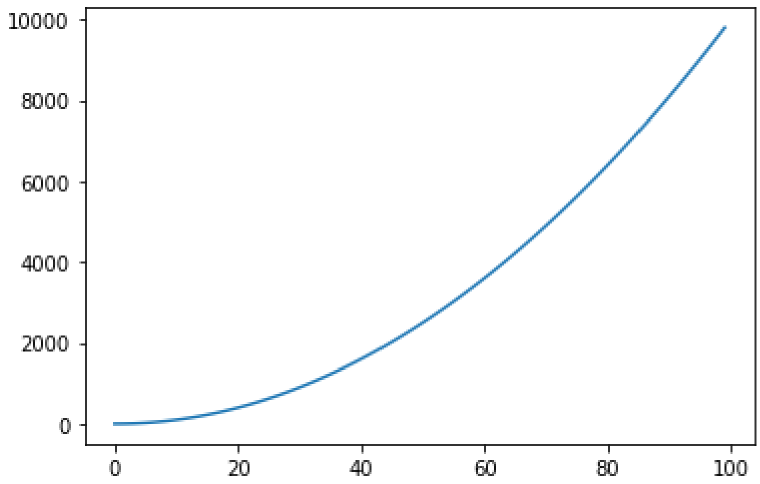
```
from pandas import Series, DataFrame
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
```

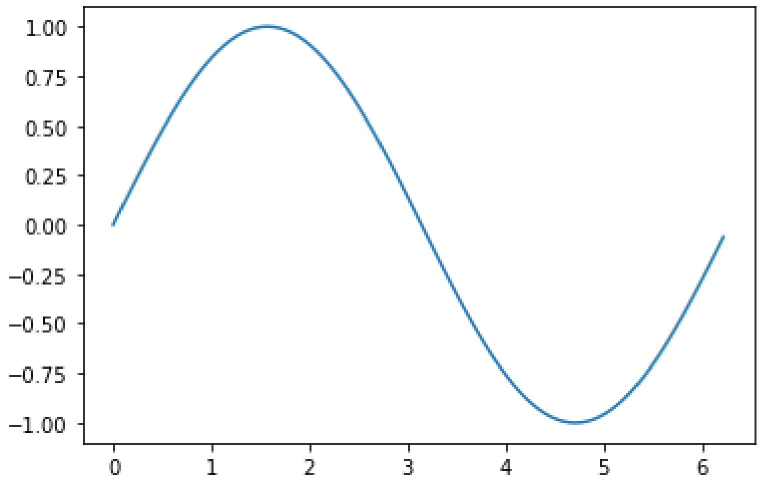
matplotlib를 이용한 데이터 시각화 프로그래밍

```
%matplotlib inline
```

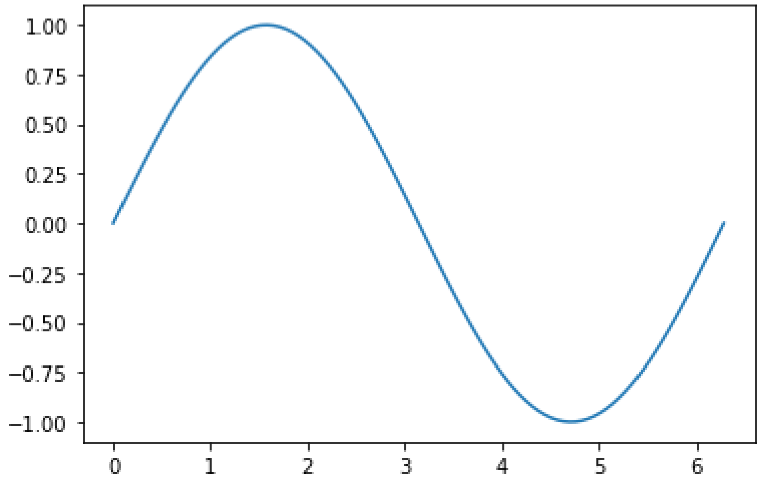
```
X = range(100)
Y = [value **2 for value in X]

plt.plot(X,Y)
plt.show()
```



```
import math

T = range(100)
X = [(2 * math.pi * t)/len(T) for t in T]
Y = [math.sin(value) for value in X]

plt.plot(X,Y)
plt.show()
```

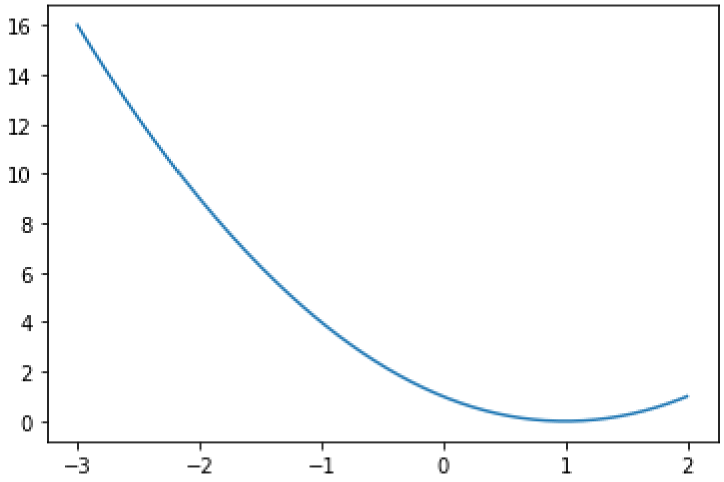


```
X = np.linspace(0, 2*np.pi, 100)
Y = np.sin(X)

plt.plot(X, Y)
plt.show()
```



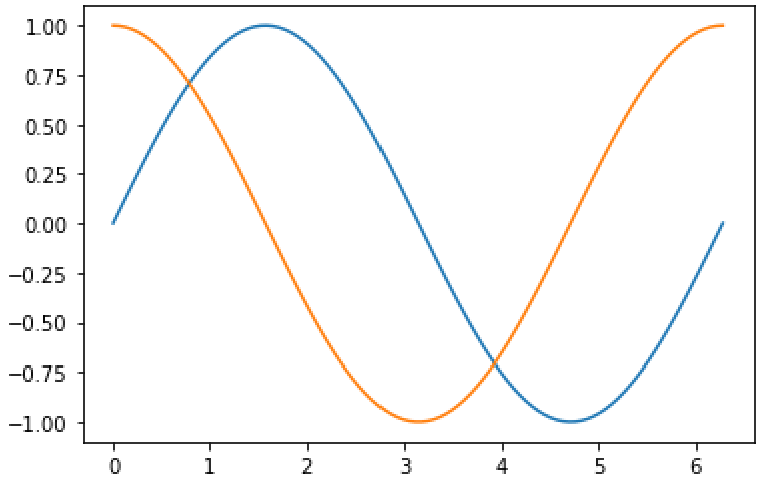
넘파이 패키지

```
X = np.linspace(-3, 2, 200)
Y = X ** 2 - 2 * X + 1

plt.plot(X, Y)
plt.show()
```

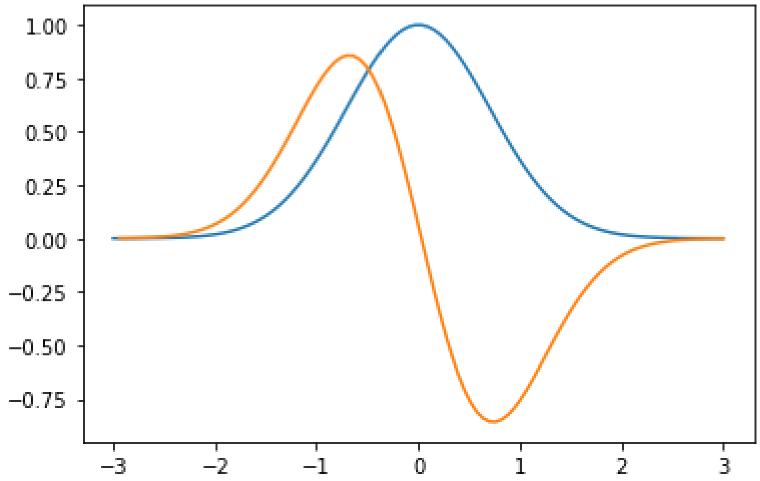


다중 곡선

```
X = np.linspace(0, 2*np.pi, 100)
Ya = np.sin(X)
Yb = np.cos(X)

plt.plot(X, Ya)
plt.plot(X, Yb)
plt.show()
```



```
def plot_slope(X, Y) :
    Xs = X[1:] - X[:-1]
    Ys = Y[1:] - Y[:-1]
    plt.plot(X[1:], Ys/Xs)

X = np.linspace(-3, 3, 100)
Y = np.exp(-X ** 2)

plt.plot(X,Y)
plot_slope(X,Y)
plt.show()
```

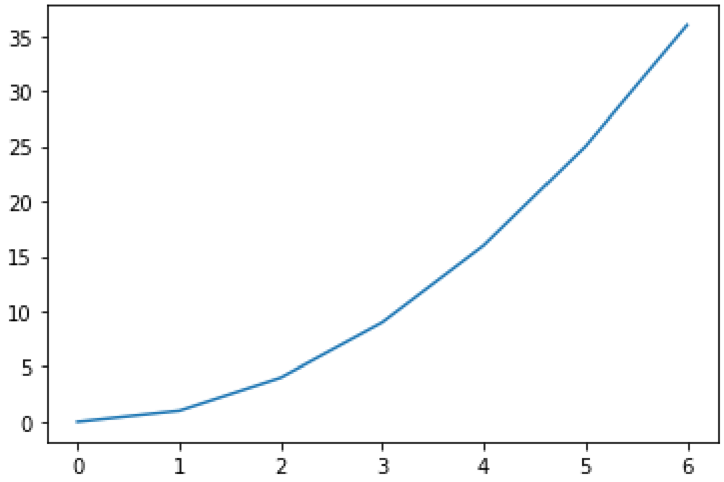


```
f = open('./data/my_data.txt','w')
f.write('0 0')
f.write('₩n1 1')
f.write('₩n2 4')
f.write('₩n3 9')
f.write('₩n4 16')
f.write('₩n5 25')
f.write('₩n6 36')
f.close()

f = open('./data/my_data.txt')
txt = f.read()
print(txt)
f.close()
```

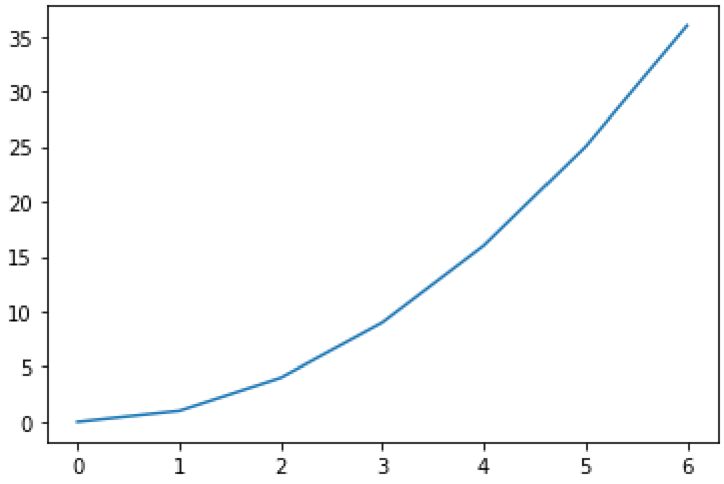
```
0 0
1 1
2 4
3 9
4 16
5 25
6 36
```

```
X, Y = [], []
for line in open('./data/my_data.txt','r') :
    values = [float(s) for s in line.split()]   #스플릿시 튜플로 가져옴
    print(values)
    X.append(values[0])
    Y.append(values[1])

plt.plot(X,Y)
plt.show()
```

```
[0.0, 0.0]
[1.0, 1.0]
[2.0, 4.0]
[3.0, 9.0]
[4.0, 16.0]
[5.0, 25.0]
[6.0, 36.0]
```



```
with open('./data/my_data.txt', 'r') as f :
    X, Y = zip(*[[float(s) for s in line.split()] for line in f])

plt.plot(X, Y)
plt.show()
```

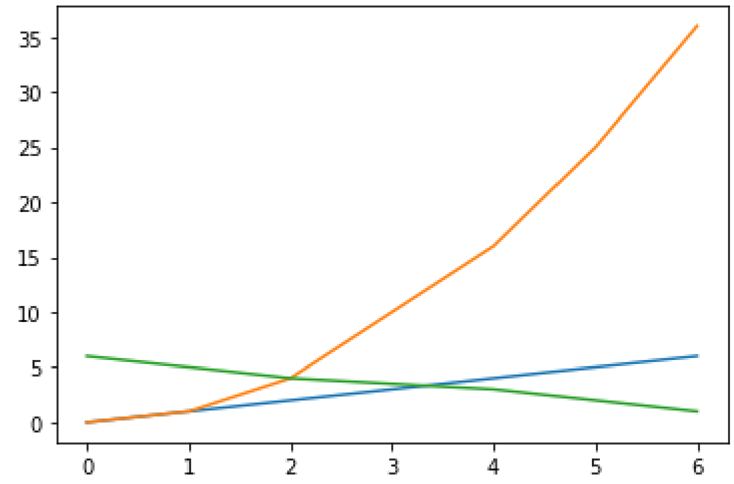


```
f = open('my_data2.txt', 'w')
f.write('0  0  6')
f.write('₩n1  1  5')
f.write('₩n2  4  4')
f.write('₩n4 16  3')
f.write('₩n5 25  2')
f.write('₩n6 36  1')
f.close()


f = open('my_data2.txt')
txt = f.read()
print(txt)
f.close()
```

```
0  0  6
1  1  5
2  4  4
4 16  3
5 25  2
6 36  1
```

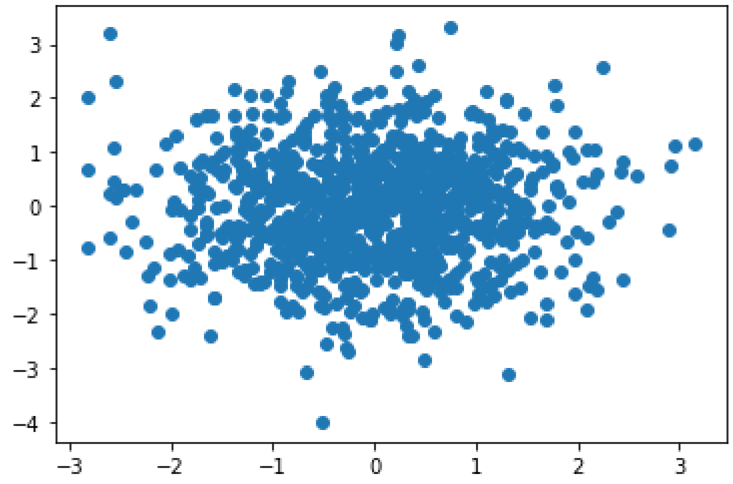
```
data = np.loadtxt('my_data2.txt')
print(data.T)
for column in data.T :
    plt.plot(data[:,0],column)

plt.show()
```

```
[[ 0.   1.   2.   4.   5.   6.]
 [ 0.   1.   4.  16.  25.  36.]
 [ 6.   5.   4.   3.   2.   1.]]
```



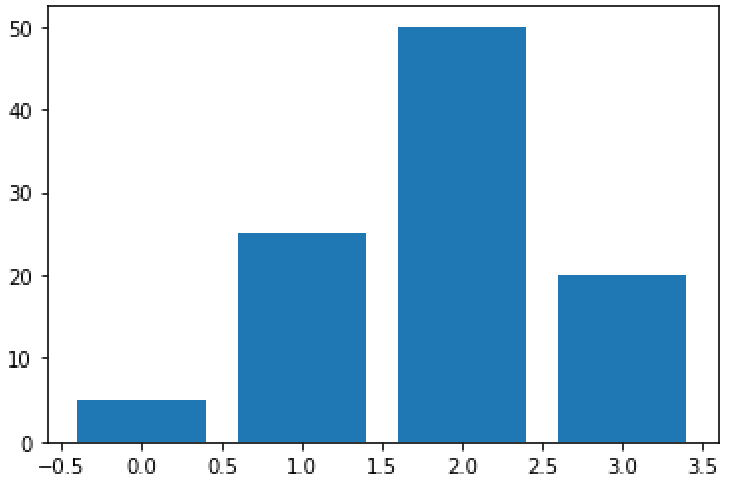
점 그리기

```
data = np.random.randn(1024,2)

plt.scatter(data[:,0],data[:,1])
plt.show()
```

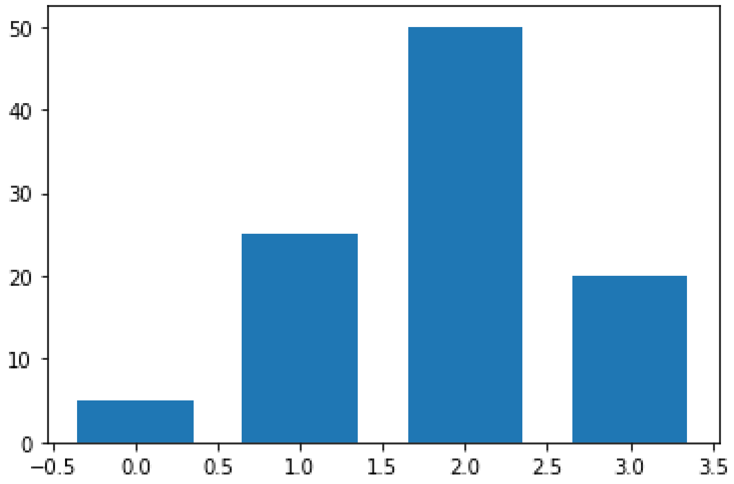


막대차트 그리기

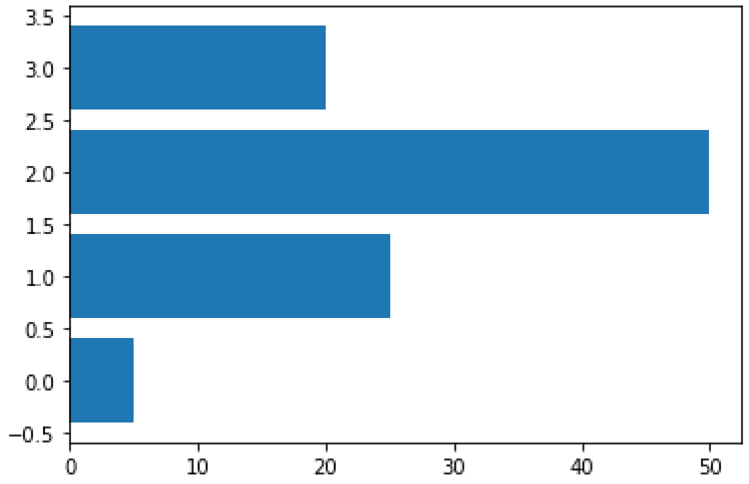
```
data = [5., 25., 50., 20.]

plt.bar(range(len(data)),data)
plt.show()
```



```
# 막대의 굵기

plt.bar(range(len(data)),data,width=.7)
plt.show()
```

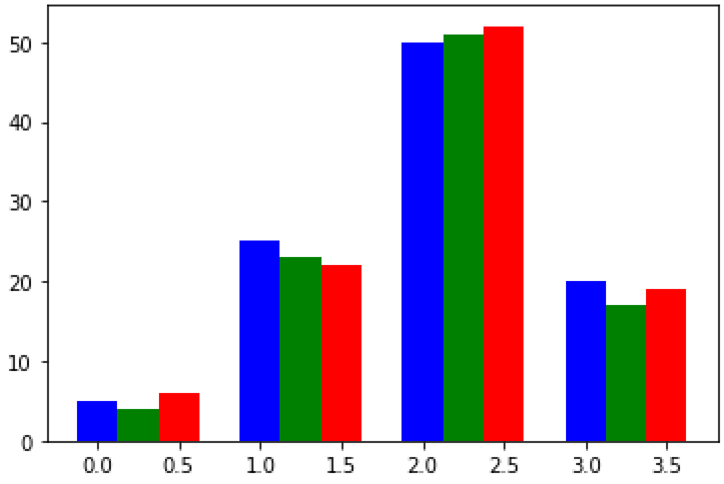


```
# 수평 막대 ( barh )

plt.barh(range(len(data)),data)
plt.show()
```

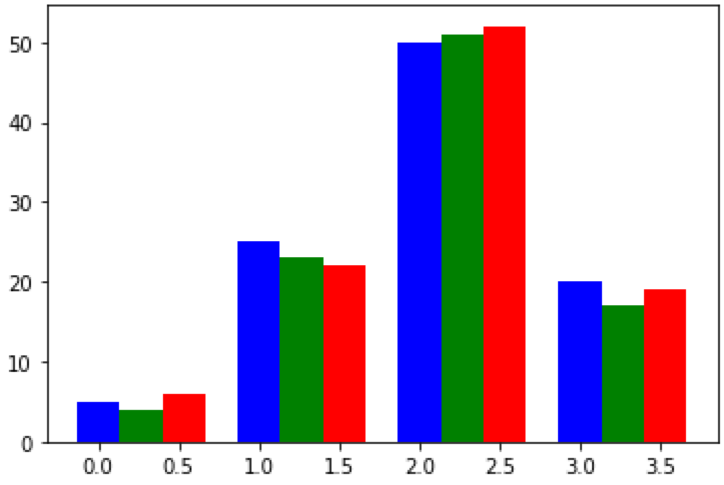


다중 막대 차트 그리기

```
data = [[5., 25., 50., 20.],
        [4., 23., 51., 17.],
        [6., 22., 52., 19.]]

X = np.arange(4)
plt.bar(X + 0.00, data[0], color='b', width = .25)
plt.bar(X + 0.25, data[1], color='g', width = .25)
plt.bar(X + .5, data[2], color='r', width = .25)

plt.show()
```

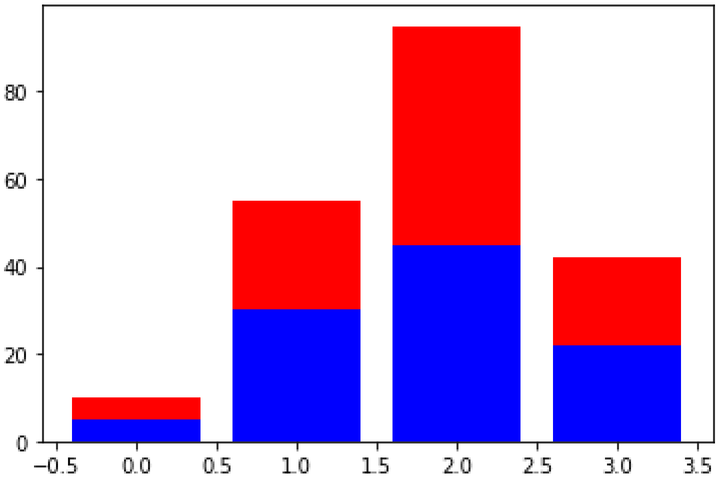


```
# 반복자 enumerate는 현재 행과 해당 첨자 둘 다 반환

data = [[5., 25., 50., 20.],
        [4., 23., 51., 17.],
        [6., 22., 52., 19.]]

color_list = ['b','g','r']
gap = .8 / len(data)

for i, row in enumerate(data) :
    X = np.arange(len(row))
    plt.bar(X + i*gap, row,
           width = gap,
           color = color_list[i % len(color_list)])

plt.show()
```

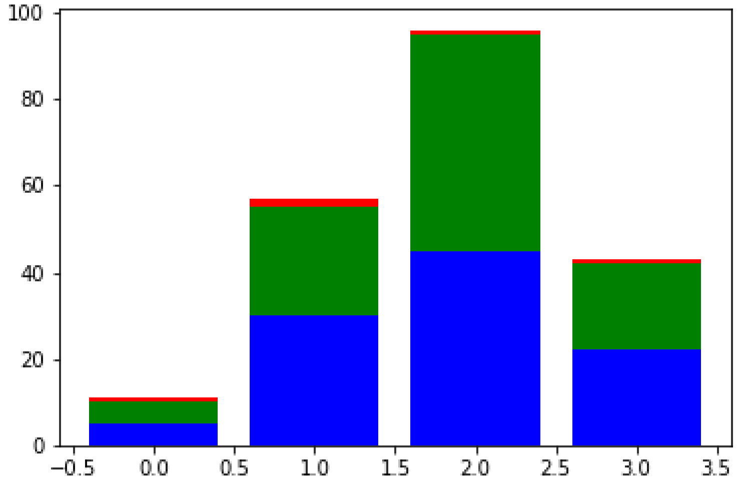


분할 막대 차트 그리기

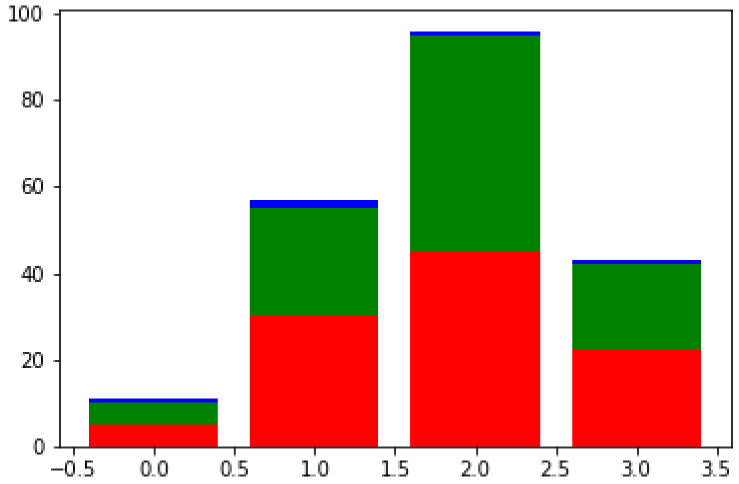
```
A = [5.,30.,45.,22.]
B = [5.,25.,50.,20.]

X = range(4)

plt.bar(X, A, color='b')
plt.bar(X, B, color='r', bottom = A)
plt.show()
```



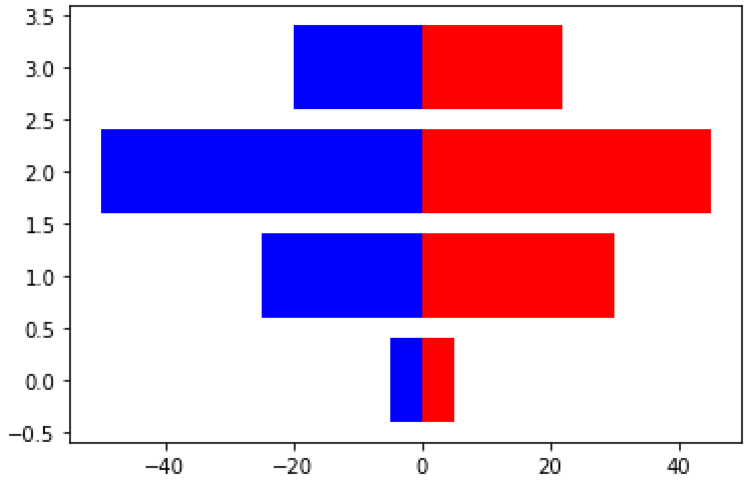
```
A = np.array([5.,30.,45.,22.])
B = np.array([5.,25.,50.,20.])
C = np.array([1.,2.,1.,1.])
X = range(4)

plt.bar(X,A,color='b')
plt.bar(X,B,color='g',bottom=A)
plt.bar(X,C,color='r',bottom=A+B)
plt.show()
```



```
data = np.array([[5.,30.,45.,22.],
                [5.,25.,50.,20.],
                [1.,2.,1.,1.]])
color_list = ['r','g','b']

X = np.arange(data.shape[1])    # 열의 갯수

for i in range(data.shape[0]) :
    plt.bar(X, data[i],
           bottom = np.sum(data[:i],axis=0),
           color = color_list[i % len(color_list)])

plt.show()
```

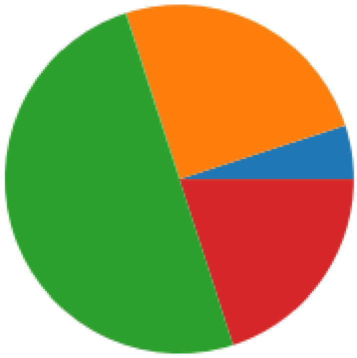


```
women_pop = np.array([5.,30.,45.,22.])
men_pop = np.array([5.,25.,50.,20.])
X = np.arange(4)

plt.barh(X, women_pop, color='r')
plt.barh(X, -men_pop, color='b')
plt.show()
```

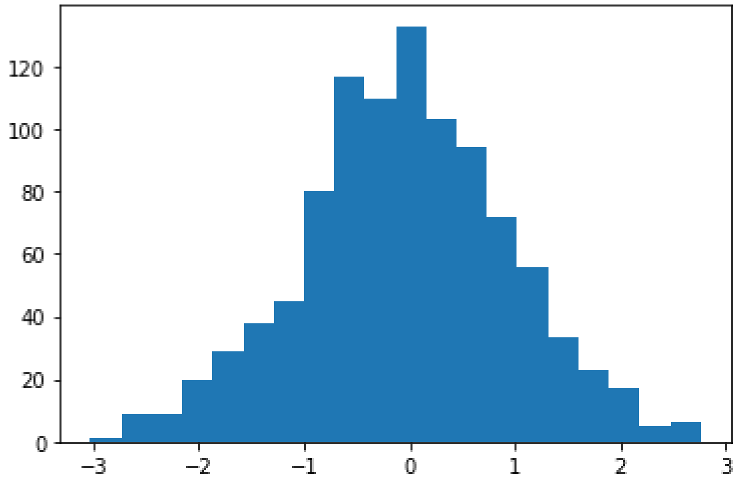


원형 차트

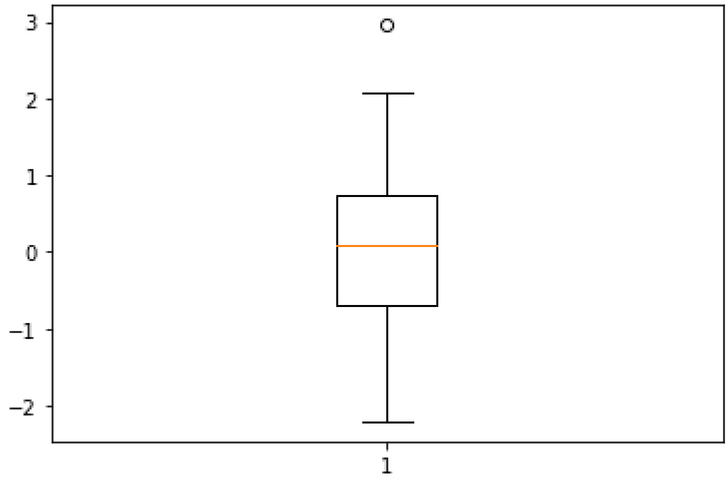
```
data = [5.,25.,50.,20.]

plt.pie(data)
plt.show()
```



```
X = np.random.randn(1000)

plt.hist(X, bins=20)
plt.show()
```

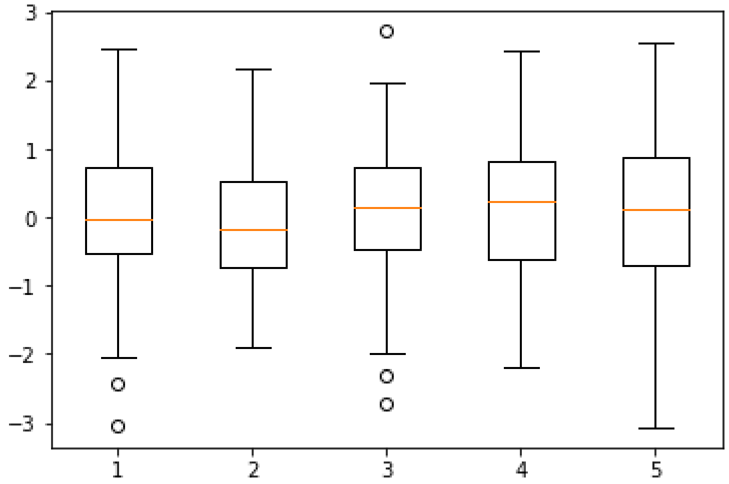


```
data = np.random.randn(100)

plt.boxplot(data)
plt.show()
```



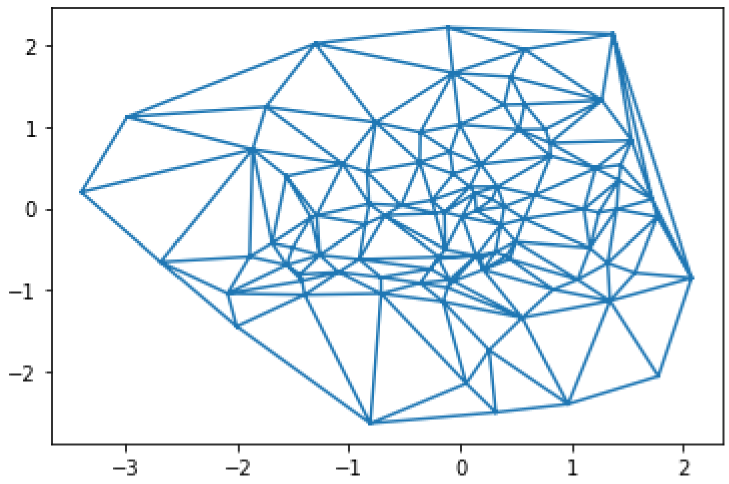
```
data = np.random.randn(100,5)
```

```
plt.boxplot(data)
plt.show()
```



삼각화 그리기

```
import matplotlib.tri as tri

data = np.random.randn(100,2)

triangles = tri.Triangulation(data[:,0],data[:,1])

plt.triplot(triangles)
plt.show()
```


2
1
0
−1
−2
−3
−2
−1
0
1
2