```
"""
Registration : xxxx
Description  : Test of Central Limit Theorem
Author       : AKB
"""

import numpy as np
import matplotlib.pyplot as plt

def CLT(n,npts,a,b):
    x = np.random.uniform(a,b,(npts,n))
    mu = 0.5*(a+b)
    S = np.sqrt(n)*(np.sum(x,axis=1)/float(n) - mu)
    print ([max(S), min(S)])
    return S

#main
a, b, npts = -0.1, 0.1, 10000   # start, end and number of points
mu, sigma = 0, np.sqrt((1/12.0)*(b-a)**2) #mean and variance of gaussian

plt.subplot(2,2,1)
n = 1 # number_of_variables
S = CLT(n,npts,a,b)
k,bins,patches = plt.hist(S,'auto', density=True, color='mediumvioletred',
edgecolor='white')
plt.title('Only ' + str(n) + ' Variable', size=12)
plt.grid(axis='y'); plt.xticks(size=12);
plt.ylabel('$P(x)$', size=16); plt.yticks(size=12)

plt.subplot(2,2,2)
n = 2 # number_of_variables
S = CLT(n,npts,a,b)
k,bins,patches = plt.hist(S,'auto', density=True, color='royalblue', edgecolor='gold')
plt.plot(bins, 1/(sigma*np.sqrt(2*np.pi))*np.exp(-(bins-mu)**2/(2*sigma**2)),linewidth=2,
color='k',label=r'$P(x) = \frac{1}{\sqrt{2\pi\sigma^2}} e^{-(x-\mu)^2/{2\sigma^2}}$')
plt.title('Sum of ' + str(n) + ' Variables '+r'$(\mu= '+str(mu)+', \sigma= '+str(sigma)+
')$', size=12)
plt.legend(loc='best', prop={'size':12})
plt.grid(axis='y'); plt.xticks(size=12); plt.yticks(size=12)

plt.subplot(2,2,3)
n = 3 # number_of_variables
S = CLT(n,npts,a,b)
k,bins,patches = plt.hist(S,'auto', density=True, color='lightseagreen',
edgecolor='azure')
plt.plot(bins, 1/(sigma*np.sqrt(2*np.pi))*np.exp(-(bins-mu)**2/(2*sigma**2)),linewidth=2,
color='k',label=r'$P(x) = \frac{1}{\sqrt{2\pi\sigma^2}} e^{-(x-\mu)^2/{2\sigma^2}}$')
plt.legend(loc='best', prop={'size':12})
plt.title('Sum of ' + str(n) + ' Variables', size=12)
plt.grid(axis='y')
plt.xlabel('x', size=12); plt.xticks(size=12)
plt.ylabel('$P(x)$', size=16); plt.yticks(size=12)

plt.subplot(2,2,4)
n = 100 # number_of_variables
S = CLT(n,npts,a,b)
k,bins,patches = plt.hist(S,'auto', density=True, color='chocolate',
edgecolor='yellowgreen')
plt.plot(bins, 1/(sigma*np.sqrt(2*np.pi))*np.exp(-(bins-mu)**2/(2*sigma**2)),linewidth=2,
color='k',label=r'$P(x) = \frac{1}{\sqrt{2\pi\sigma^2}} e^{-(x-\mu)^2/{2\sigma^2}}$')
plt.title('Sum of ' + str(n) + ' Variables', size=12)
plt.legend(loc='best', prop={'size':12})
plt.grid(axis='y')
plt.xlabel('x', size=12); plt.xticks(size=12); plt.yticks(size=12)

plt.suptitle('Uniform to Gaussian using Central limit theorem', size=14, color="blue")
```

```
plt.tight_layout();
plt.show()
```