

Example A4.1B: Random Variable Gaussian, different variance

```
In [2]: import OpenAIUQ as auq
import numpy as np
import pandas as pd
import matplotlib
import matplotlib.pyplot as plt
from scipy import stats
from scipy.stats import pearsonr
from openseespy.postprocessing.Get_Rendering import *

matplotlib.rcParams.update({'font.size':16})
```

Define Gaussian random variables

```
In [3]: #=====
#variable x1

#define mean
m1=1
#define standard deviation
s1=0.949
#Define distribution: 'Gaussian','Lognormal'
x1=auq.dist('Gaussian')
#Evaluate the parameters through the method of the moments
x1.Momentfit(m1,s1)

#=====
#variable x2

#define mean
m2=-1
#define standard deviation
s2=0.548
#Define distribution: 'Gaussian','Lognormal'
x2=auq.dist('Gaussian')
#Evaluate the parameters through the method of the moments
x2.Momentfit(m2,s2)
```

Define joint distribution

```
In [4]: #Define vector basic variables
x=[x1,x2]

#Define Correlation
R=[[1,0.77],
   [0.77,1]]
R=np.array(R)

#Define Joint distribution
X=auq.dist2(x,R,'Gaussian')
```

Attributes Joint distribution

```
In [5]: X.mu
```

Out[5]: array([1., -1.])

In [6]: X.Sigma

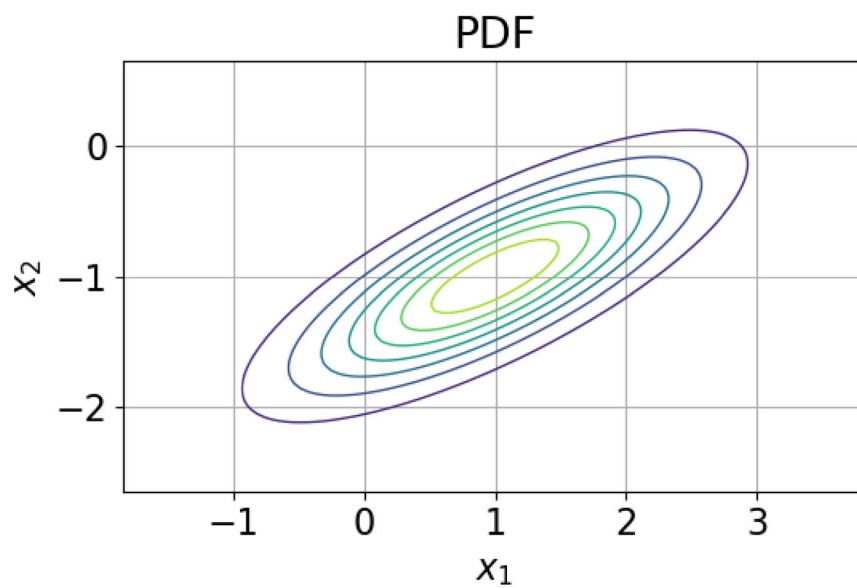
Out[6]: array([[0.900601 , 0.40044004],
[0.40044004, 0.300304]])

In [7]: X.R

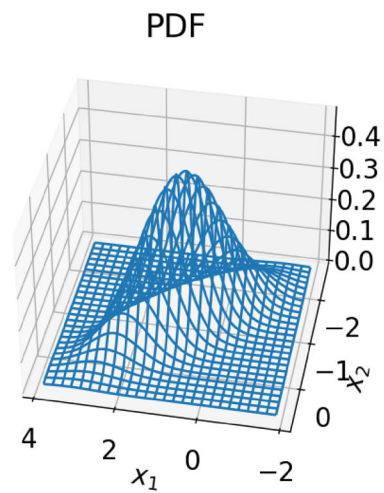
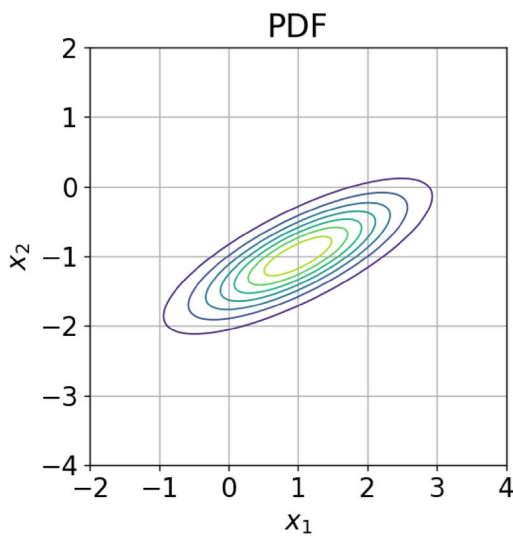
Out[7]: array([[1. , 0.77],
[0.77, 1.]])

Plot joint distribution

```
In [8]: X.plot(  
    numfig=1,  
    figsize=(6, 6),  
    dpi=80,  
    plot_type='contour',  
    sec=[1, 2],  
    points=101,  
    space='x',  
    lim=[[-3, 3], [-3, 3]],  
    origin='MPP',  
    samples=0,  
    view=[35, 60],  
    ratio='equal',  
    #limx=[[-2,4], [-3,1]]  
    #xticks=[-2,0,1,2,4]  
    #yticks=[-3,-2,-1,0,1]  
)
```



```
In [9]: X.plot_w2(
    numfig=1,
    figsize=(10, 5),
    dpi=100,
    sec=[1, 2],
    points=101,
    space='x',
    lim=[[-3, 3], [-3, 3]],
    origin='MPP',
    samples=0,
    view=[35, 60],
    ratio='equal',
    #limx=[[-2,4],[-3,1]],
    xticks=[-2,-1,0,1,2,3,4],
    yticks=[-4,-3,-2,-1,0,1,2]
)
```



Generate samples

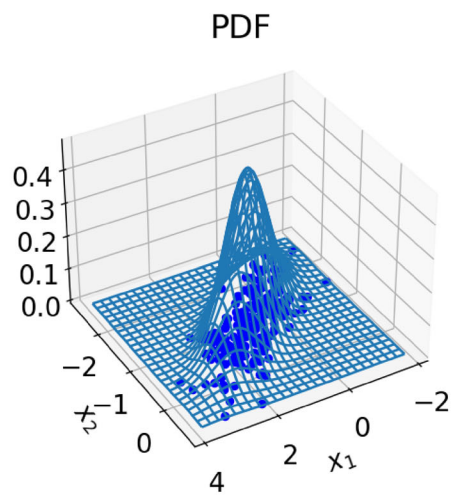
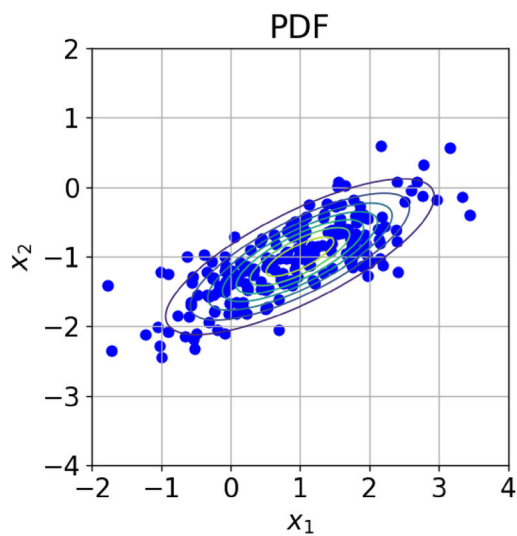
```
In [10]: X.gen_samples(num=20)
```

```
In [11]: X.samples
```

```
Out[11]: array([[ 0.0724018 , -0.68892384],
 [ 1.50856512, -1.30095967],
 [ 0.05672477, -1.23420293],
 [ 1.18288877, -1.51835879],
 [ 1.96530116, -0.3595514 ],
 [ 1.3996676 , -0.69127485],
 [-0.15146682, -1.52119844],
 [ 1.33323868, -1.45470676],
 [ 1.35625819, -1.00479949],
 [-0.19279262, -1.1874291 ],
 [ 1.84509747, -1.17203318],
 [ 1.6165688 , -1.04007496],
 [ 1.32745332, -0.90463177],
 [-0.65177772, -2.19931004],
 [-0.89657584, -1.79887613],
 [ 0.6954909 , -1.54929119],
 [ 0.13752072, -1.7238659 ],
 [ 2.05682732, -1.79526373],
 [ 0.1286695 , -1.08468632],
 [ 0.86985235, -1.07350336]])
```

```
In [12]: X.plot_w2(
```

```
numfig=1,  
figsize=(10, 5),  
dpi=100,  
sec=[1, 2],  
points=101,  
space='x',  
lim=[[-3, 3], [-3, 3]],  
origin='MPP',  
samples=200,  
view=[35, 60],  
ratio='equal',  
#limx=[[-2,4],[-3,1]],  
xticks=[-2,-1,0,1,2,3,4],  
yticks=[-4,-3,-2,-1,0,1,2]  
)
```



In []: