

Exercise1 01

```
import math
import matplotlib
%matplotlib inline
from matplotlib import pyplot as plt
from mpl_toolkits.mplot3d import Axes3D
import numpy
R=numpy.arange(-4,4+1e-9,0.1)
X,Y=numpy.meshgrid(R,R)
F=(1/(sum(sum((math.e)**(-0.5*(X**2+Y**2))))))*((math.e)**(-0.5*(X**2+Y**2)))
fig=plt.figure(figsize=(10,6))
ax=plt.axes(projection='3d')
ax.scatter(X, Y, F, s=1, alpha=0.5)
```

Exercise2 01

```
import math
import matplotlib
%matplotlib inline
from matplotlib import pyplot as plt
from mpl_toolkits.mplot3d import Axes3D
import numpy
R=numpy.arange(-4,4+1e-9,0.1)
X,Y=numpy.meshgrid(R,R)
Z1=(math.e)**(-0.5*((X+0.5)**2+2*(Y+0.5)**2))
Z2=(math.e)**(-0.5*((X-0.5)**2+2*(Y-0.5)**2))
F1=(1/(sum(sum(Z1))))*Z1
F2=(1/(sum(sum(Z2))))*Z2
fig=plt.figure(figsize=(10,6))
ax=plt.axes(projection='3d')
ax.scatter(X, Y, F1, s=1, alpha=0.5, color='blue')
ax.scatter(X, Y, F2, s=1, alpha=0.5, color='red')
```

Exercise2 02

```
import math
import matplotlib
%matplotlib inline
from matplotlib import pyplot as plt
from mpl_toolkits.mplot3d import Axes3D
import numpy
R=numpy.arange(-4,4+1e-9,0.1)
X,Y=numpy.meshgrid(R,R)
Z=((math.e)**(-0.5*((X+0.5)**2+2*(Y+0.5)**2)))*0.9+((math.e)**(-0.5*((X-0.5)**2+2*(Y-0.5)**2)))*0.1
F=(1/(sum(sum(Z))))*Z
fig=plt.figure(figsize=(10,6))
ax=plt.axes(projection='3d')
ax.scatter(X, Y, F, s=1, alpha=0.5)
```

Exercise2 03

```
import math
import matplotlib
%matplotlib inline
from matplotlib import pyplot as plt
from mpl_toolkits.mplot3d import Axes3D
import numpy
R=numpy.arange(-4,4+1e-9,0.1)
X,Y=numpy.meshgrid(R,R)
Z1=(math.e)**(-0.5*((X+0.5)**2+2*(Y+0.5)**2))
Z2=(math.e)**(-0.5*((X-0.5)**2+2*(Y-0.5)**2))
F1=(1/(sum(sum(Z1))))*Z1
F2=(1/(sum(sum(Z2))))*Z2
F=0.9*F1+0.1*F2
G1=F1*0.9/F
G2=F2*0.1/F
fig=plt.figure(figsize=(10,6))
ax=plt.axes(projection='3d')
ax.scatter(X, Y, G1, s=1, alpha=0.5, color='blue')
ax.scatter(X, Y, G2, s=1, alpha=0.5, color='red')
G3=numpy.minimum(F1*0.9, F2*0.1)
error = sum(sum(G3))
print(error)
```

Exercise3 01

```
import math
import matplotlib
%matplotlib inline
from matplotlib import pyplot as plt
from mpl_toolkits.mplot3d import Axes3D
import numpy
R=numpy.arange(-4,4+1e-9,0.1)
X,Y=numpy.meshgrid(R,R)
Z1=(math.e)**(-0.5*((X+0.5)**2+2*(Y+0.5)**2))
Z2=(math.e)**(-2*((X-0.5)**2)-4*(Y-0.5)**2)
F1=(1/(sum(sum(Z1))))*Z1
F2=(1/(sum(sum(Z2))))*Z2
F=0.9*F1+0.1*F2
G1=F1*0.9/F
G2=F2*0.1/F
fig=plt.figure(figsize=(10,6))
ax=plt.axes(projection='3d')
ax.scatter(X, Y, G1, s=1, alpha=0.5, color='blue')
ax.scatter(X, Y, G2, s=1, alpha=0.5, color='red')
#Byes error rate
G3=numpy.minimum(F1*0.9, F2*0.1)
error = sum(sum(G3))
print(error)
```