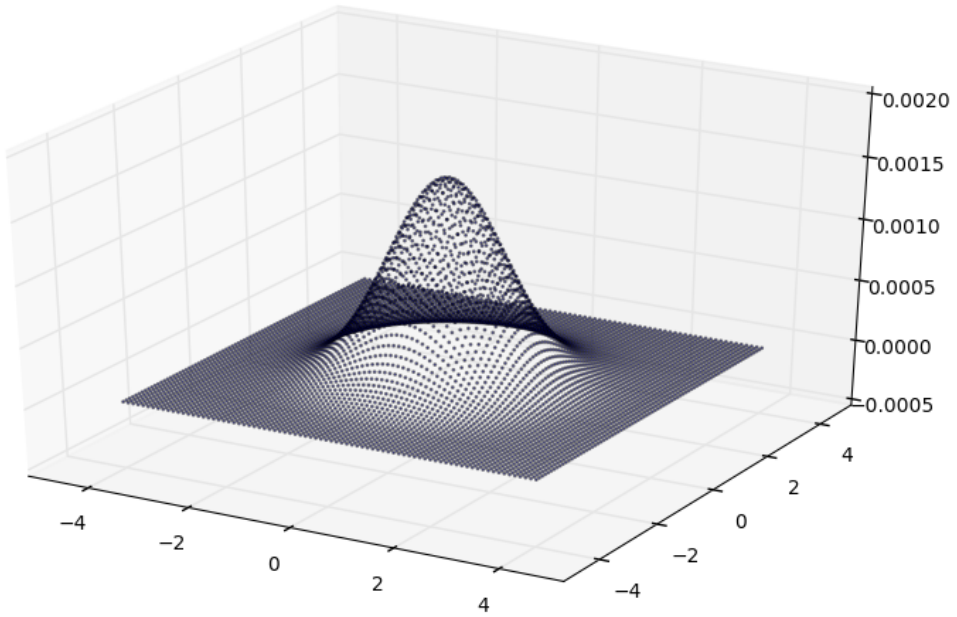
Exercise01

November 3, 2016

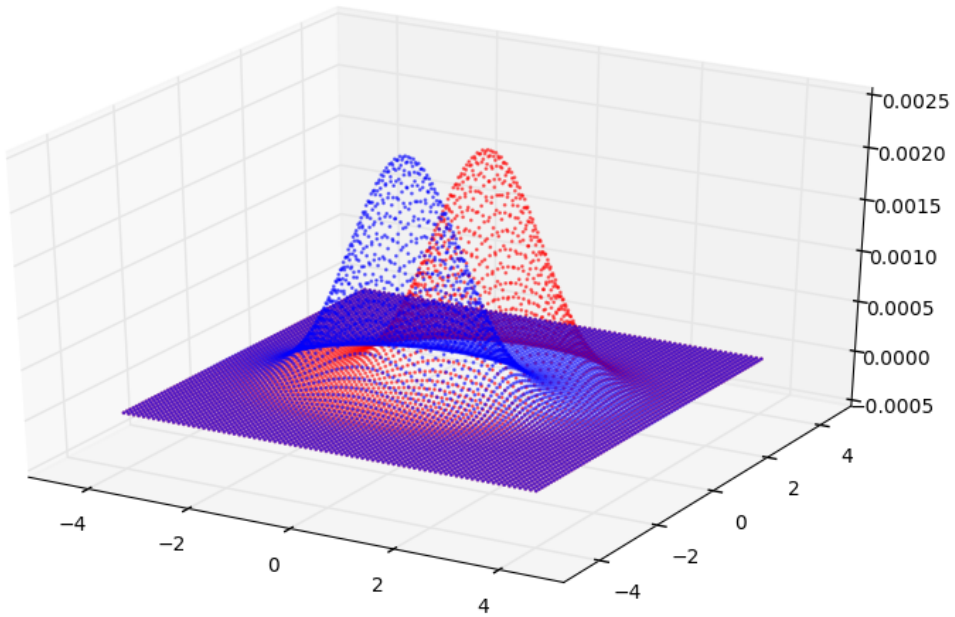
In [2]:
```
## Exercise1 01

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)
Z=sum(sum((math.e)**(-0.5*(X**2+Y**2))))
F=(1/Z)*((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)
```

Out[2]:
```
<mpl_toolkits.mplot3d.art3d.Path3DCollection at 0x10cfda470>
```



In [15]:
```
## 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')
```

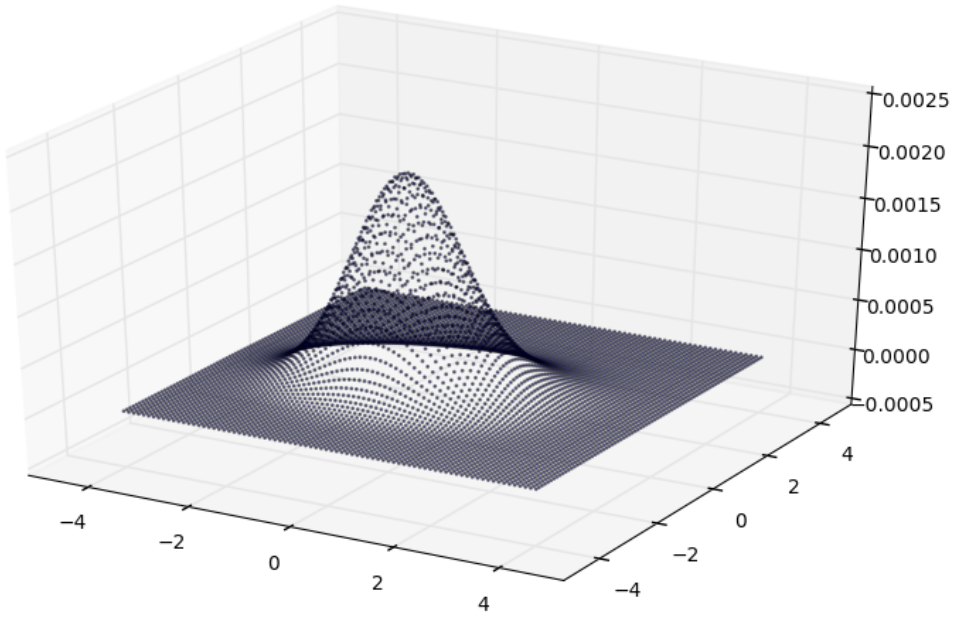
Out[15]: <mpl_toolkits.mplot3d.art3d.Path3DCollection at 0x1125cf8d0>



In [3]:
```
## 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)
Z1=((math.e)**(-0.5*((X+0.5)**2+2*(Y+0.5)**2)))*0.9
Z2=((math.e)**(-0.5*((X-0.5)**2+2*(Y-0.5)**2)))*0.1
Z=Z1+Z2
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)
```

Out[3]: <mpl_toolkits.mplot3d.art3d.Path3DCollection at 0x10fad4b00>

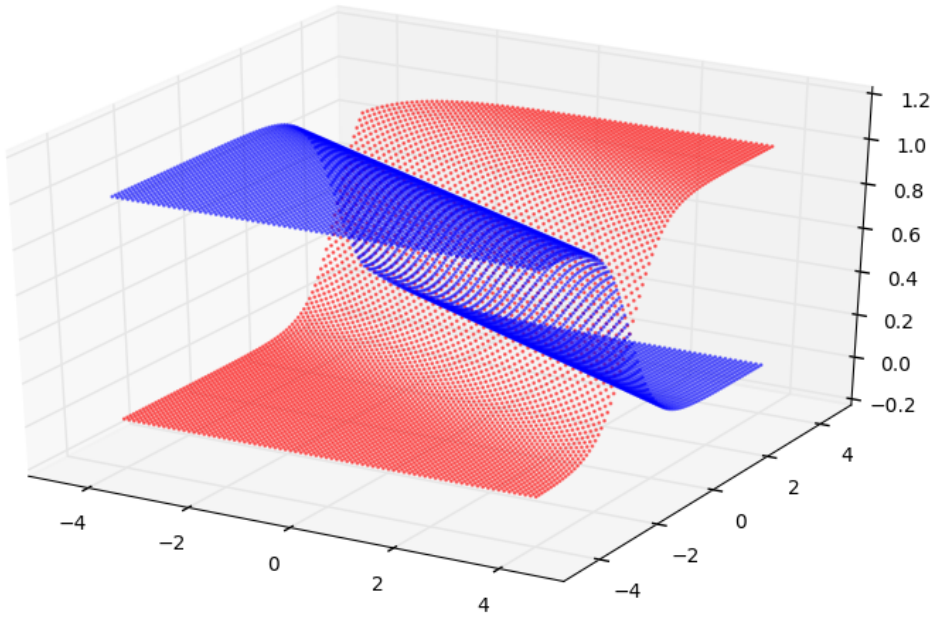


In [4]: *## Exercise2 03*

```
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)
```

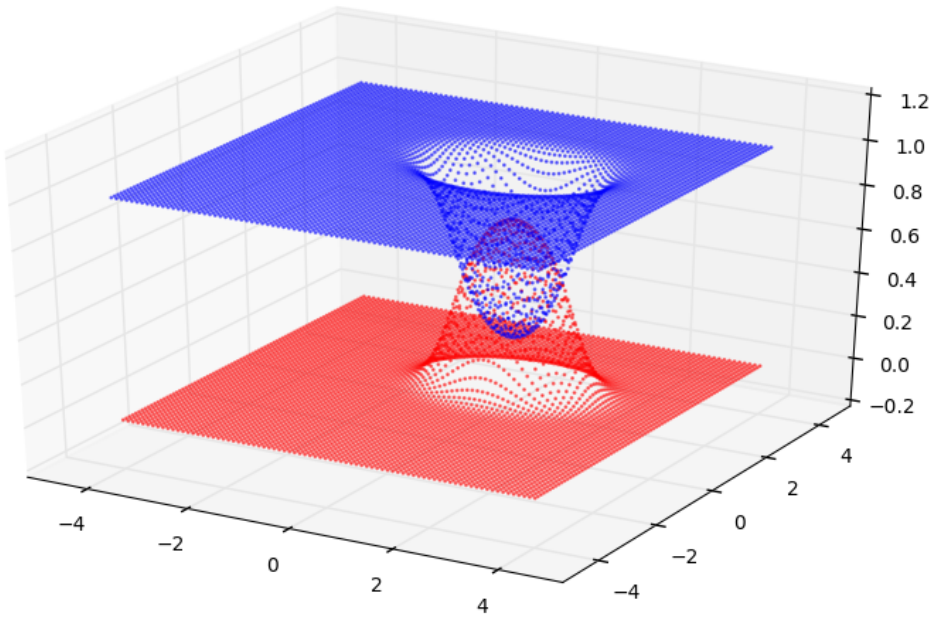
```
0.0804211752474
```



In [66]: *## 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)
```

```
0.072907805557
```


1.2
1.0
0.8
0.6
0.4
0.2
0.0
−0.2
−4
−2
0
2
4
4
2
0
−2
−4