In [78]:

```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
from mpl_toolkits.mplot3d import Axes3D
```

In [79]:

```
plt.style.use('seaborn')
```

In [94]:

```
X_Train = pd.read_csv("Logistic_X_Train.csv")
Y_Train = pd.read_csv("Logistic_Y_Train.csv")
X_Test = pd.read_csv("Logistic_X_Test.csv")
#Y_test = pd.read_csv("SampleOutput.csv")

X_Train = X_Train.values
Y_Train = Y_Train.values
X_Test = X_Test.values
Y_Train = Y_Train.reshape((-1,))
#X_test = X_test.values
#Y_test = Y_test.values
```

In [95]:

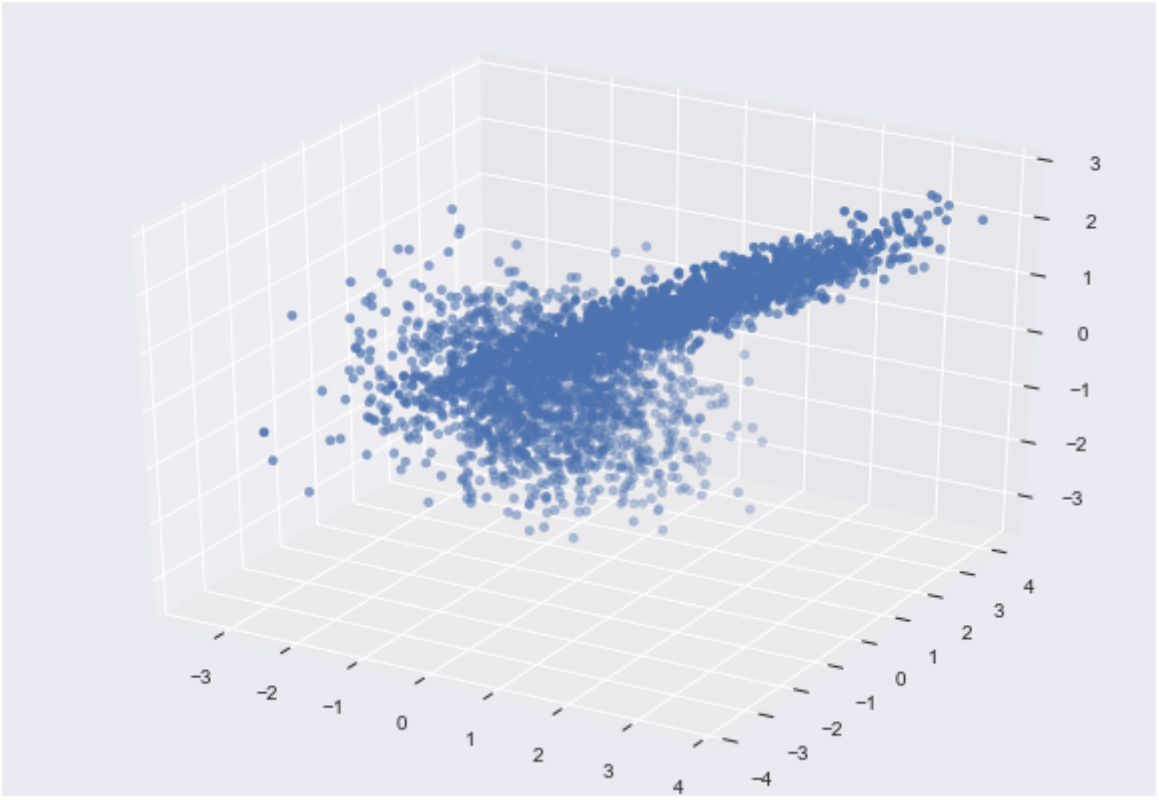
```
print(X_Train.shape)
print(Y_Train.shape)
print(X_Test.shape)
```

```
(3000, 3)
(3000,)
(1000, 3)
```

In [ ]:

In [96]:

```
# Data Visualize
fig = plt.figure()
axes = Axes3D(fig)
axes.scatter(X_Train[:,0],X_Train[:,1],X_Train[:,2], cmap='rainbow')
plt.show()
```



In [ ]:

In [ ]:

In [97]:

```
def hypothesis(x,w,b):
    h = np.dot(x,w) + b
    return sigmoid(h)

def sigmoid(z):
    return 1.0/(1.0 + np.exp(-1.0*z))

def error(y_true,x,w,b):
    m = x.shape[0]

    err = 0.0

    for i in range(m):
        hx = hypothesis(x[i],w,b)
        err += y_true[i]*np.log2(hx) + (1-y_true[i])*np.log2(1-hx)
    #print(err/m)
    return -err/m

def get_grads(y_true,x,w,b):

    grad_w = np.zeros(w.shape)
    grad_b = 0.0

    m = x.shape[0]

    for i in range(m):
        hx = hypothesis(x[i],w,b)

        grad_w += (y_true[i] - hx)*x[i]
        grad_b += (y_true[i] - hx)

    grad_b /= m
    grad_w /= m

    return [grad_w, grad_b]


def gradient_descent(x,y_true,w,b,learning_rate=0.1):

    err = error(y_true,x,w,b)
    [grad_w, grad_b] = get_grads(y_true,x,w,b)
```

```
    w = w + learning_rate * grad_w
    b = b + learning_rate * grad_b

    return err,w,b

def predict(x,w,b):

    confidence = hypothesis(x,w,b)
    if confidence < 0.5:
        return 0
    else:
        return 1

def get_acc(x_tst, y_tst,w,b):
    y_pred = []
    for i in range(y_tst.shape[0]):
        p = predict(x_tst[i],w,b)
        y_pred.append(p)

    y_pred = np.array(y_pred)

    return float((y_pred == y_tst).sum())/y_tst.shape[0]
```

In [98]:

```
loss = []
acc = []

W = 2*np.random.random((X_train.shape[1],))
b = 5*np.random.random()

print(W,b)
```

```
 [1.68892647 1.93889608 1.79623071] 4.984096915293896
```

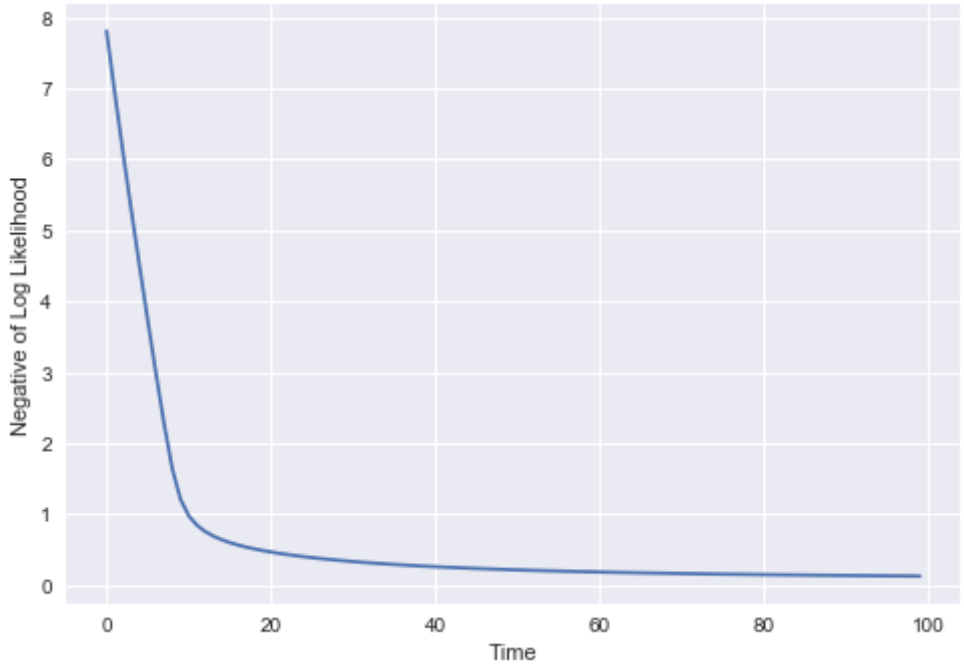
In [99]:

```
for i in range(100):
    l,W,b = gradient_descent(X_Train,Y_Train,W,b,learning_rate=0.5)
    #acc.append(get_acc(X_Train,Y_Train,W,b))
    loss.append(l)
print(loss)
```

```
[7.809202841108057, 6.937667429811879, 6.099807387880747, 5.291904676269709, 4.508606918413703, 3.7445346117280
84770686165094, 1.6448254538365439, 1.2135934127847687, 0.9812814895327971, 0.8470597884098668, 0.758287490395
6434212211902245, 0.6026048956341475, 0.5683397848345767, 0.5388731438670002, 0.5130640313687888, 0.490133863
0.4508484521747263, 0.4337832638173304, 0.41809920899131164, 0.40361064290207976, 0.39016851089012394, 0.3776
02226, 0.35500426828010584, 0.3447185655585892, 0.3350393706250097, 0.3259135264211124, 0.31729465421919867, 0
351795886, 0.2940948780211572, 0.28713954714550693, 0.2805275592092026, 0.27423551974627736, 0.268242197769509
07601624700366, 0.2518692808110636, 0.24689315471153328, 0.24213391228036002, 0.23757887483492846, 0.233216305
5, 0.22502580272680295, 0.22117834072996792, 0.2174841596464908, 0.21393506928685507, 0.21052341481462447, 0.20
11759556, 0.2010436650697107, 0.19811447961933068, 0.19529110892127233, 0.19256833581603092, 0.189941251294657
49559258499244, 0.18258922361893648, 0.18030125290271753, 0.17808835771143133, 0.1759470855186671, 0.173874174
0.16992126868593121, 0.16803559944979402, 0.1662069217671515, 0.16443276306491358, 0.16271078111766782, 0.1610
6432, 0.1578362694747772, 0.15630191834560322, 0.15480973381600235, 0.1533580095649978, 0.15194512486087114, 0
7901854491, 0.14792448434528277, 0.14665229800395435, 0.1454119710568905, 0.1442023039114904, 0.143022154153045
1407461044138412, 0.13964817821693387, 0.1385757115982565, 0.13752780460548492, 0.13650359824840422, 0.1355022
352, 0.13356516277695257, 0.13262791487128767, 0.13171061531798225, 0.13081260944776746, 0.12993327074926758]
```

In [100]:

```
plt.plot(loss)
plt.ylabel("Negative of Log Likelihood")
plt.xlabel("Time")
plt.show()
```



In [105]:

```
n = X_Test.shape[0]
Y_Pred = []
for i in range(n):
    p = predict(X_Test[i],W,b)
    Y_Pred.append(p)

print(len(Y_Pred))
```

```
1000
```

In [ ]:

```
# Saving File
df = pd.DataFrame(data=Y_Pred,columns=["label"])
df.to_csv("Logistic_Y_Pred.csv", label=False)
```

In [ ]:

In [ ]: