In [1]:

```
import pandas as pd
import matplotlib.pyplot as plt
import numpy as np
```

In [2]:

```
data=pd.read_csv("C://Users//prasa//Downloads//Brain Tumor.csv")
```

In [3]:

```
data.drop('Image',axis=1,inplace=True)
data.drop('Variance',axis=1,inplace=True)
data.drop('Contrast',axis=1,inplace=True)
```

In [4]:

```
data.head(5)
data.columns
```

Out[4]:

```
Index(['Class', 'Mean', 'Standard Deviation', 'Entropy', 'Skewness',
       'Kurtosis', 'Energy', 'ASM', 'Homogeneity', 'Dissimilarity',
       'Correlation', 'Coarseness'],
      dtype='object')
```

In [5]:

```
import seaborn as sns
```

In [6]:

```
data.isnull().sum()
```

Out[6]:

```
Class                 0
Mean                  0
Standard Deviation    0
Entropy               0
Skewness              0
Kurtosis              0
Energy                0
ASM                   0
Homogeneity           0
Dissimilarity         0
Correlation           0
Coarseness            0
dtype: int64
```

In [7]:

```
data.shape
```

Out[7]:

```
(3762, 12)
```

In [8]:

```
#plt.figure(figsize=(10,10))
#sns.pairplot(data,hue='Class')
#plt.show()
```

In [9]:

```
#plt.figure(figsize=(15,15))
#sns.heatmap(data.corr(),annot=True)
#plt.show()
```

In [10]:

```
data.head(10)
data.drop('Correlation',axis=1,inplace=True)
```

In [11]:

```
data.drop('Coarseness',axis=1,inplace=True)
```

In [12]:

```
data.head(2)
Y=data[['Class']]
X=data
```

In [13]:

```
X.drop('Class',axis=1,inplace=True)
```

In [14]:

```
X.head(2)
```

Out[14]:

	Mean	Standard Deviation	Entropy	Skewness	Kurtosis	Energy	ASM	Homogeneity	Dissimilarity
0	6.535339	24.891522	0.109059	4.276477	18.900575	0.293314	0.086033	0.530941	4.473346
1	8.749969	28.389393	0.266538	3.718116	14.464618	0.475051	0.225674	0.651352	3.220072

In [15]:

```
Y.shape
```

Out[15]:

```
(3762, 1)
```

In [16]:

```
X=X.values
```

In [17]:

```
X.shape
```

Out[17]:

```
(3762, 9)
```

In [18]:

```
Y=Y.values
```

In [19]:

```
from sklearn.model_selection import train_test_split
```

In [20]:

```
X_train, X_test, y_train, y_test = train_test_split(X, Y, test_size = 0.4)
```

In [21]:

```
def sigmoid(x):
    return 1 / (1 + np.exp(-x))
```

In [22]:

```
X_Train=X_train.T
X_Train.shape
Y_Train=y_train.T
Y_Train.shape
X_Test=X_test.T
Y_Test=y_test.T
Y_Train.shape
```

Out[22]:

```
(1, 2257)
```

In [23]:

```
def model(X,Y,iterations,learning_rate):
    m=X_Train.shape[1]# No of data
    n=X_Train.shape[0]# No of features
    w=np.zeros((n,1))
    b=0
    cost_list=[]
    for i in range(iterations):

            z=np.dot(w.T,X)+b
            A=sigmoid(z)
            cost = (-1/m)*(np.sum(Y*(np.log(A))+(1-Y)*(np.log(1-A))))
            dw=(1/m)*np.dot(A-Y,X.T)
            db=(1/m)*np.sum(A-Y)
            w=w-(learning_rate*dw.T)
            b=b-(learning_rate*db)
            cost_list.append(cost)
            if(i%500 == 0):
                print("cost after "+str(i)+" iterations is ",cost)
    return w,b,cost_list
```

In [24]:

```
iterations=15000
learning_rate=0.00025
w,b,cost=model(X_Train,Y_Train,iterations,learning_rate)
```

```
cost after 0 iterations is  0.6931471805599453
cost after 500 iterations is  0.6331644618962742
cost after 1000 iterations is  0.6191478523041438
cost after 1500 iterations is  0.6084639196133651
cost after 2000 iterations is  0.5999777900396469
cost after 2500 iterations is  0.5930109635070441
cost after 3000 iterations is  0.5870232070206771
cost after 3500 iterations is  0.5817251871334392
cost after 4000 iterations is  0.5769180477941521
cost after 4500 iterations is  0.5724733018976524
cost after 5000 iterations is  0.5683069535818454
cost after 5500 iterations is  0.5643631126283437
cost after 6000 iterations is  0.5606037270262219
cost after 6500 iterations is  0.5570021724684548
cost after 7000 iterations is  0.5535392428347234
cost after 7500 iterations is  0.5502006273388421
cost after 8000 iterations is  0.5469753082479004
cost after 8500 iterations is  0.543854530992893
cost after 9000 iterations is  0.5408311327767006
cost after 9500 iterations is  0.5378990979123432
cost after 10000 iterations is  0.5350532582416884
cost after 10500 iterations is  0.5322890876212261
cost after 11000 iterations is  0.5296025582781103
cost after 11500 iterations is  0.5269900384786371
cost after 12000 iterations is  0.5244482182153514
cost after 12500 iterations is  0.521974054199731
cost after 13000 iterations is  0.5195647283698049
cost after 13500 iterations is  0.5172176160092092
cost after 14000 iterations is  0.5149302608087359
cost after 14500 iterations is  0.5127003550197273
```

In [25]:

```
def prediction(w,b,X,Y):
    z=np.dot(w.T,X)+b
    A=sigmoid(z)
    A=A>0.5
    A=np.array(A)
    acc=(1-np.sum(np.absolute(A-Y))/Y.shape[1])*100
    return acc
```

In [26]:

```
w.shape
```

Out[26]:

```
(9, 1)
```

In [27]:

```
accuracy=prediction(w,b,X_Test,Y_Test)
```

In [28]:

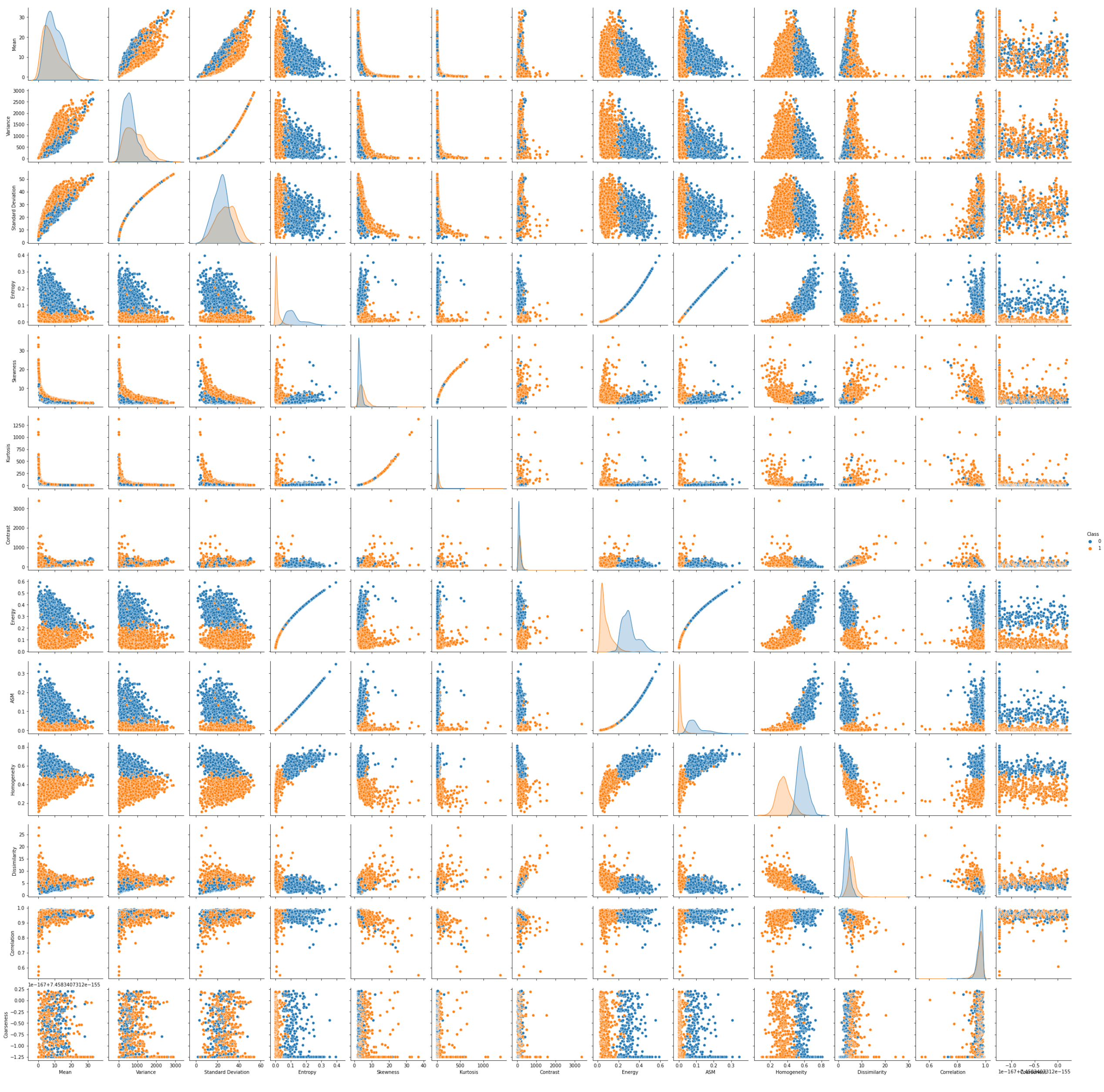
```
print("The accuracy of our model is ",accuracy,"%")
```

```
The accuracy of our model is  81.3953488372093 %
```

In [29]:

```
plt.figure(figsize=(10,10))
data=pd.read_csv("C://Users//prasa//Downloads//Brain Tumor.csv")
sns.pairplot(data,hue='Class')
plt.show()
```

```
<Figure size 720x720 with 0 Axes>
```

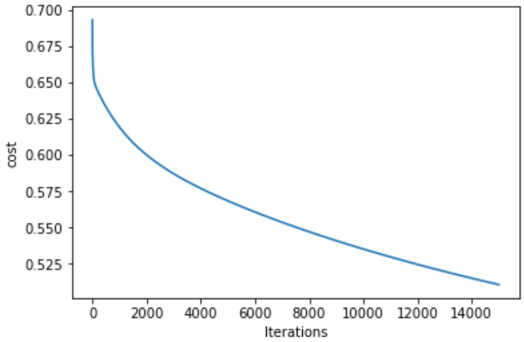


In [31]:

```
plt.plot(np.arange(iterations),cost)
plt.xlabel('Iterations')
plt.ylabel('cost')
```

Out[31]:

```
Text(0, 0.5, 'cost')
```



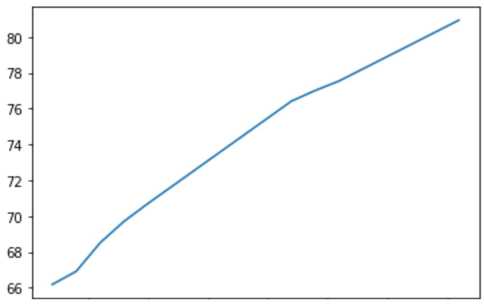
In [44]:

```
# Hyper parameter tuning
iter=[1000,2000,3000,4000,5000,11000,12000,13000,18000]
learning_rate=0.0002
acc=[]
def hyper_parameter_tuning(iter,learning_rate,X_train,Y_train,X_test,Y_Test):
    for i in range(len(iter)):
            w,b,cost=model(X_Train,Y_Train,iter[i],learning_rate)
            accur=prediction(w,b,X_Test,Y_Test)
            acc.append(accur)
hyper_parameter_tuning(iter,learning_rate,X_Train,Y_Train,X_test,Y_Test)
plt.plot(iter,acc)
```

```
cost after 17000 iterations is  0.5167557482542702
cost after 17500 iterations is  0.5149305648773932
```

Out[44]:

```
[<matplotlib.lines.Line2D at 0x1a427d26b50>]
```



In [45]:

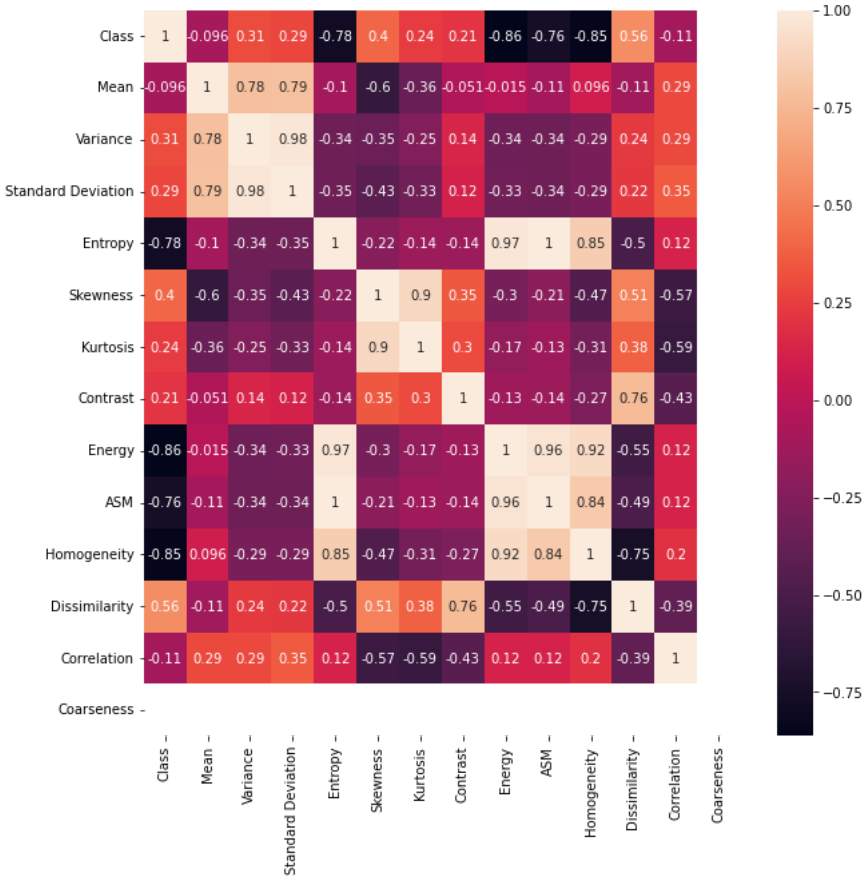
```
max(acc)
```

Out[45]:

```
80.93023255813954
```

In [46]:

```python
plt.figure(figsize=(10,10))
sns.heatmap(data.corr(),annot=True)
plt.show()
```



In [ ]: