House Price Predection

In [2]:
```python
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
```

1.Delete unnecessary column

2.Normalised the data with mean

In [6]:
```python
data = pd.read_csv('Housing Price data set.csv')
data=data.drop(['Unnamed: 0','driveway','recroom','fullbase','airco','prefarea', 'gashw'],axis=1)
mean = data.mean().iloc[0]
stddev = data.std().iloc[0]

data = (data - data.mean())/data.std()

data.head()
```

Out[6]:

	price	lotsize	bedrooms	bathrms	stories	garagepl
0	-0.978239	0.322732	0.047192	-0.568973	0.221501	0.357239
1	-1.109312	-0.530526	-1.308947	-0.568973	-0.930304	-0.803788
2	-0.697368	-0.964074	0.047192	-0.568973	-0.930304	-0.803788
3	-0.285425	0.691709	0.047192	-0.568973	0.221501	-0.803788
4	-0.266700	0.557955	-1.308947	-0.568973	-0.930304	-0.803788

3.Separate out the Feature and Target matrices and devide test and train with 0.9 split ratio

In [7]:
```python
data=np.asarray(data)
Y=data[:,0:1]
X=data[:,1:]
one = np.ones((len(X),1))
X = np.concatenate((one,X),axis=1)
split_ratio = 0.9
split = int(split_ratio * X.shape[0])
X_test = X[split+1:,:]
X_train = X[:split+1, :]
Y_test = Y[split+1:,:]
Y_train = Y[:split+1, :]
```

4.Compute cost function

5.Denormalise price function

6.Compute error function

7.plot graph function

In [8]:
```python
# helper Functions
def computeCost(X,y,theta,lam):
    tobesummed = np.power(((X.dot(theta.T))-y),2)+lam*np.sum(np.power(theta,2))
    return np.sum(tobesummed)/(2 * len(X))

def denormalise_price(price):
    global mean
    global stddev
    ret = price * stddev + mean
    return ret

def computeError(predicted, actual):
    error = 0
    for i in range(len(predicted)):
        error += abs(actual[i] - predicted[i]) / actual[i]
    error /= len(actual)
    return error[0]

def plotGraph(x,y,labelX='X',labelY='Y',title='X vs Y'):
  fig, ax = plt.subplots()
  ax.plot(x, y, 'r')
  ax.set_xlabel(labelX)
  ax.set_ylabel(labelY)
  ax.set_title(title)
```

7.Gradient descent with regularisation to fint minimum theta

In [9]:
```python
# Gradient Descent
def gradientDescent(X,y,theta,iters,alpha, lam):
    lam_matrix = lam * np.ones(theta.shape)
    lam_matrix[0][0] = 0
    for i in range(iters):
        theta = theta*(1- lam_matrix / len(X)) - (alpha/len(X)) * np.sum(X * (X @ theta.T - y), axis=0)

    return theta
```

7.Normal equation function with regularisation to find minimum theta

In [10]:
```python
#Normal equation
def normalEquation(X,Y,lam):
    lam_matrix = lam * np.identity(X.shape[1])
    lam_matrix[0][0] = 0
    theta = np.linalg.inv(X.T.dot(X) + lam_matrix).dot(X.T).dot(Y)
    return theta
```

8.Train the model with train data and predict the test data using gradient descent

9.compute the minimum error and lambda

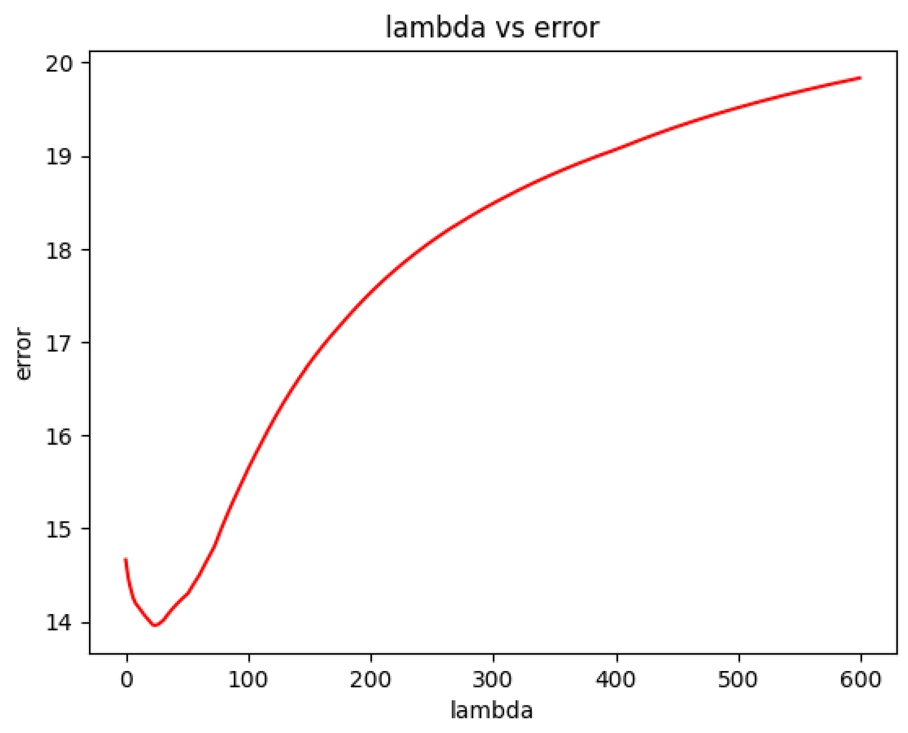
10.plot error vs lambda graph

In [11]:
```python
theta = np.zeros([1,X.shape[1]])
alpha = .1 #learning rate
iters = 500 #epoch
error_matrix = []
lam_range = 600 #maximam lamda
for lam in range(lam_range):
    g = gradientDescent(X_train,Y_train,theta,iters,alpha, lam)
    Cost = computeCost(X_train,Y_train,g,lam)

    Y_pred = X_test.dot(g.T)
    error = computeError(denormalise_price(Y_pred),denormalise_price(Y_test))
    error_matrix.append(error*100)
optimal_lambda = 0
min_error = 9999
for i in range(len(error_matrix)):
    if error_matrix[i] < min_error:
        optimal_lambda = i
        min_error = error_matrix[i]

print("min Error  : ", (min_error),'%')
print("Optimal Lambda : ", optimal_lambda)
plotGraph(np.arange(lam_range),error_matrix,'lambda','error','lambda vs error')
```

```
min Error  :  13.960611355440056 %
Optimal Lambda :  24
```



In [12]:
```python
print('pred price =',denormalise_price(Y_pred[2][0]),'actual price =',denormalise_price(Y_test[2][0]))
```

```
pred price = 64257.576649503186 actual price = 58500.0
```

11. Train the model with train data and predict the test data using Normal Equation

12. compute the minimum error and lambda

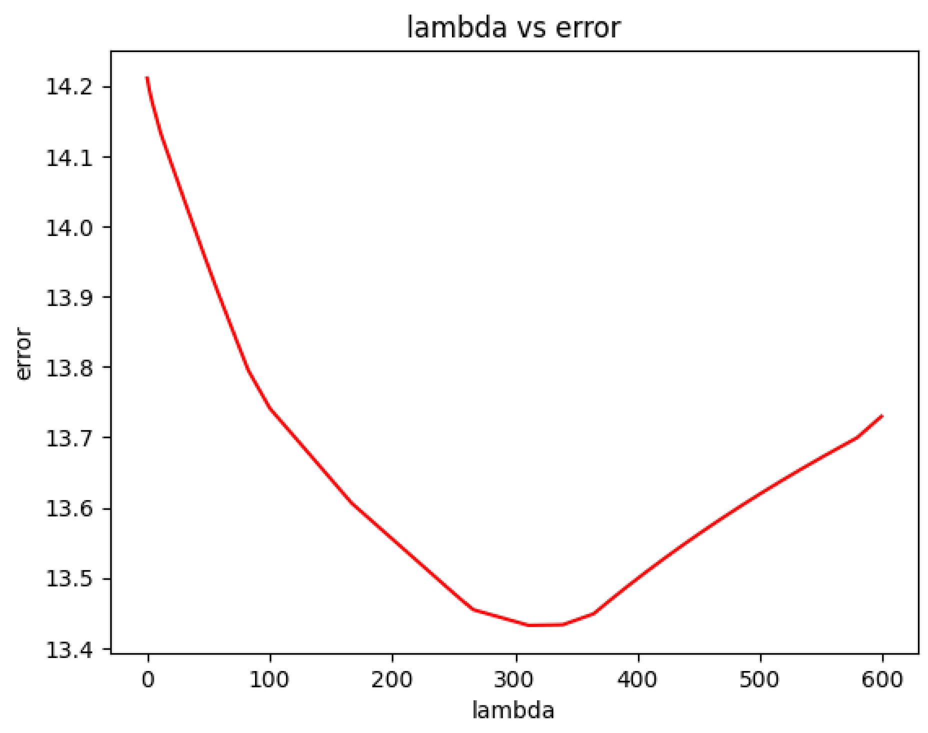
13. plot error vs lambda graph

In [14]:
```python
error_mat = []
lam_range = 600

for lam in range(lam_range):
    theta = normalEquation(X,Y,lam)
    Cost = computeCost(X_train,Y_train,theta.T,lam)
    Y_pred = X_test.dot(theta)
    error = computeError(denormalise_price(Y_pred),denormalise_price(Y_test))
    error_mat.append(error*100)

optimal_lambda = 0
min_error = 9999
for i in range(len(error_mat)):
    if error_mat[i] < min_error:
        optimal_lambda = i
        min_error = error_mat[i]
print("min Error : ", min_error)
print("Optimal Lambda : ", optimal_lambda)
plotGraph(np.arange(lam_range),error_mat,'lambda','error','lambda vs error')
```

```
min Error :  13.432288061521586
Optimal Lambda :  311
```



In [15]:
```python
print('pred price =',denormalise_price(Y_pred[2][0]),'actual price =',denormalise_price(Y_test[2])[0])
```

```
pred price = 57100.4263172447 actual price = 58500.0
```

In [ ]: