```
# Importing Necesarry Packages
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
from sklearn.datasets import load_boston
from sklearn.model_selection import train_test_split
from sklearn.preprocessing import StandardScaler
from sklearn.metrics import r2_score
from sklearn.metrics import mean_squared_error
import keras
from keras.layers import Dense, Activation,Dropout
from keras.models import Sequential
import warnings
warnings.filterwarnings("ignore")
```

```
# Loading Data
boston = load_boston()
data = pd.DataFrame(boston.data)
data.columns = boston.feature_names
data['PRICE'] = boston.target
data.head()
```

	CRIM	ZN	INDUS	CHAS	NOX	RM	AGE	DIS	RAD	TAX	PTRATIO	B	LSTAT
0	0.00632	18.0	2.31	0.0	0.538	6.575	65.2	4.0900	1.0	296.0	15.3	396.90	4.98
1	0.02731	0.0	7.07	0.0	0.469	6.421	78.9	4.9671	2.0	242.0	17.8	396.90	9.14
2	0.02729	0.0	7.07	0.0	0.469	7.185	61.1	4.9671	2.0	242.0	17.8	392.83	4.03
3	0.03237	0.0	2.18	0.0	0.458	6.998	45.8	6.0622	3.0	222.0	18.7	394.63	2.94
4	0.06905	0.0	2.18	0.0	0.458	7.147	54.2	6.0622	3.0	222.0	18.7	396.90	5.33

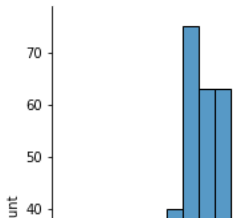
```
# Data Exploration
print(data.shape)
print(data.dtypes)
print(data.isnull().sum())
print(data.describe())
```

```
(506, 14)
CRIM       float64
ZN         float64
INDUS      float64
CHAS       float64
NOX        float64
RM         float64
AGE        float64
DIS        float64
RAD        float64
TAX        float64
PTRATIO    float64
B          float64
LSTAT      float64
PRICE      float64
dtype: object
CRIM       0
ZN         0
INDUS      0
CHAS       0
NOX        0
RM         0
AGE        0
DIS        0
RAD        0
TAX        0
PTRATIO    0
B          0
LSTAT      0
PRICE      0
dtype: int64
              CRIM          ZN       INDUS        CHAS         NOX          RM  \
count  506.000000  506.000000  506.000000  506.000000  506.000000  506.000000
mean     3.613524   11.363636   11.136779    0.069170    0.554695    6.284634
std      8.601545   23.322453    6.860353    0.253994    0.115878    0.702617
```

```
min      0.006320    0.000000    0.460000    0.000000    0.385000    3.561000
25%      0.082045    0.000000    5.190000    0.000000    0.449000    5.885500
50%      0.256510    0.000000    9.690000    0.000000    0.538000    6.208500
75%      3.677083   12.500000   18.100000    0.000000    0.624000    6.623500
max     88.976200  100.000000   27.740000    1.000000    0.871000    8.780000

              AGE         DIS         RAD         TAX     PTRATIO           B  \
count  506.000000  506.000000  506.000000  506.000000  506.000000  506.000000
mean    68.574901    3.795043    9.549407  408.237154   18.455534  356.674032
std     28.148861    2.105710    8.707259  168.537116    2.164946   91.294864
min      2.900000    1.129600    1.000000  187.000000   12.600000    0.320000
25%     45.025000    2.100175    4.000000  279.000000   17.400000  375.377500
50%     77.500000    3.207450    5.000000  330.000000   19.050000  391.440000
75%     94.075000    5.188425   24.000000  666.000000   20.200000  396.225000
max    100.000000   12.126500   24.000000  711.000000   22.000000  396.900000

            LSTAT       PRICE
count  506.000000  506.000000
mean    12.653063   22.532806
std      7.141062    9.197104
min      1.730000    5.000000
25%      6.950000   17.025000
```

```
# Data Visualization
sns.displot(data.PRICE)

correlation = data.corr()
correlation.loc['PRICE']

fig,axes = plt.subplots(figsize=(15,12))
sns.heatmap(correlation,square = True,annot = True)
```

```
<AxesSubplot:>
```




```
# Splitting Data into testing and training data
X = data.iloc[:,:-1]
y= data.PRICE
X_train, X_test, y_train, y_test = train_test_split(X,y, test_size = 0.2, random_state = 4)

# Normalizing the data
sc = StandardScaler()
X_train = sc.fit_transform(X_train)
X_test = sc.transform(X_test)
```



```
# Model Building
model = Sequential()
model.add(Dense(128,activation  = 'relu',input_dim =13))
model.add(Dense(64,activation  = 'relu'))
model.add(Dense(32,activation  = 'relu'))
model.add(Dense(16,activation  = 'relu'))
model.add(Dense(1))
model.compile(optimizer = 'adam',loss = 'mean_squared_error')
model.summary()
```

```
Model: "sequential"
_________________________________________________________________
 Layer (type)                Output Shape              Param #
=================================================================
 dense (Dense)               (None, 128)               1792

 dense_1 (Dense)             (None, 64)                8256

 dense_2 (Dense)             (None, 32)                2080

 dense_3 (Dense)             (None, 16)                528

 dense_4 (Dense)             (None, 1)                 17

=================================================================
Total params: 12,673
Trainable params: 12,673
Non-trainable params: 0
_________________________________________________________________
```



```
# Fitting the data to the model
model.fit(X_train, y_train, epochs = 100)
```

```
Epoch 1/100
13/13 [==============================] - 1s 1ms/step - loss: 572.2520
Epoch 2/100
13/13 [==============================] - 0s 1ms/step - loss: 541.6292
Epoch 3/100
13/13 [==============================] - 0s 1ms/step - loss: 473.6244
Epoch 4/100
13/13 [==============================] - 0s 917us/step - loss: 312.4244
Epoch 5/100
13/13 [==============================] - 0s 1ms/step - loss: 112.6376
Epoch 6/100
13/13 [==============================] - 0s 1ms/step - loss: 61.5438
Epoch 7/100
13/13 [==============================] - 0s 1ms/step - loss: 38.5271
Epoch 8/100
13/13 [==============================] - 0s 918us/step - loss: 28.4949
Epoch 9/100
13/13 [==============================] - 0s 918us/step - loss: 24.2137
Epoch 10/100
13/13 [==============================] - 0s 1ms/step - loss: 21.3957
Epoch 11/100
13/13 [==============================] - 0s 834us/step - loss: 19.1263
Epoch 12/100
13/13 [==============================] - 0s 1ms/step - loss: 17.6134
Epoch 13/100
13/13 [==============================] - 0s 918us/step - loss: 16.6028
```

```
Epoch 14/100
13/13 [==============================] - 0s 1ms/step - loss: 15.3106
Epoch 15/100
13/13 [==============================] - 0s 834us/step - loss: 14.5605
Epoch 16/100
13/13 [==============================] - 0s 917us/step - loss: 13.8504
Epoch 17/100
13/13 [==============================] - 0s 918us/step - loss: 13.3533
Epoch 18/100
13/13 [==============================] - 0s 918us/step - loss: 12.9414
Epoch 19/100
13/13 [==============================] - 0s 918us/step - loss: 12.3699
Epoch 20/100
13/13 [==============================] - 0s 917us/step - loss: 12.1141
Epoch 21/100
13/13 [==============================] - 0s 834us/step - loss: 11.8200
Epoch 22/100
13/13 [==============================] - 0s 834us/step - loss: 11.4488
Epoch 23/100
13/13 [==============================] - 0s 918us/step - loss: 11.1978
Epoch 24/100
13/13 [==============================] - 0s 918us/step - loss: 10.7235
Epoch 25/100
13/13 [==============================] - 0s 834us/step - loss: 10.5966
Epoch 26/100
13/13 [==============================] - 0s 918us/step - loss: 10.4092
Epoch 27/100
13/13 [==============================] - 0s 1ms/step - loss: 10.0838
Epoch 28/100
13/13 [==============================] - 0s 1ms/step - loss: 10.0911
Epoch 29/100
13/13 [==============================] - 0s 917us/step - loss: 9.9088
```

```
# Evaluating the model
y_pred = model.predict(X_test)
r2 = r2_score(y_test, y_pred)
rmse = (np.sqrt(mean_squared_error(y_test, y_pred)))
print("R2 Score = ", r2)
print("RMSE Score = ", rmse)
```

```
4/4 [==============================] - 0s 1ms/step
R2 Score =  0.898351679499482
RMSE Score =  3.072789229093155
```