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In [2]:
```
import tensorflow as tf from tensorflow import keras
from tensorflow.keras import layers import numpy as np
import pandas as pd from sklearn.model_selection
import train_test_split from sklearn.preprocessing
import StandardScaler
```

In [3]:
```
df = pd.read_csv('Boston_house_Pricing_data.csv') print(df.head())
```

```
      CRIM      ZN INDUS CHAS      NOX       RM AGE         DIS RAD TAX PTRATIO \
0 0.00632 18.0 2.31           0 0.538 6.575 65.2 4.0900          1 296       15.3
1 0.02731 0.0 7.07            0 0.469 6.421 78.9 4.9671          2 242       17.8
2 0.02729 0.0 7.07            0 0.469 7.185 61.1 4.9671          2 242       17.8
3 0.03237 0.0 2.18            0 0.458 6.998 45.8 6.0622          3 222       18.7
4 0.06905 0.0 2.18            0 0.458 7.147 54.2 6.0622          3 222       18.7

        B LSTAT MEDV
0  396.90 4.98 24.0
1  396.90 9.14 21.6
2  392.83 4.03 34.7
3  394.63 2.94 33.4
4  396.90 5.33 36.2
```

In [4]:
```
df.fillna(df.median(), inplace=True)

X = df.drop(columns=["MEDV"]) y
= df["MEDV"]
```

In [5]:
```
scaler=StandardScaler() x_scale=scaler.fit_transform(X)
```

In [6]:
```
X_train, X_test, y_train, y_test = train_test_split(x_scale, y, test_size=0.2, random_state=42)
```

In [7]:
```
X_train.shape,X_test.shape
```

Out[7]: ((404, 13), (102, 13))

In [8]:
```
y_train.shape,y_test.shape
```

Out[8]: ((404,), (102,))

In [9]:
```
model          =          keras.Sequential([
    keras.Input(shape=(X_train.shape[1],)),
    layers.Dense(64,     activation='relu'),
    layers.Dense(32,     activation='relu'),
    layers.Dense(1)
])
```

In [10]:
```
model.summary()
```

Model: "sequential"

Layer (type)	Output Shape	Param #
dense (Dense)	(None, 64)	896
dense_1 (Dense)	(None, 32)	2,080
dense_2 (Dense)	(None, 1)	33

Total params: 3,009 (11.75 KB)

Trainable params: 3,009 (11.75 KB) **Non-trainable params:** 0 (0.00 B)

In [11]:
```
model.compile(optimizer='adam', loss='mse', metrics=['mae'])
```

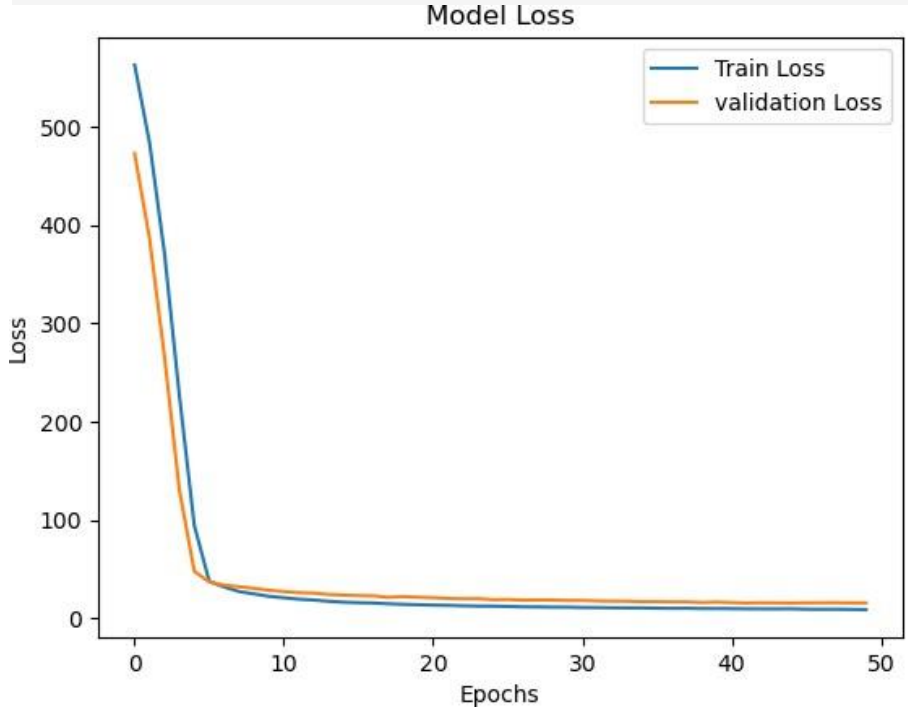
In [12]:
```
from keras.callbacks import EarlyStopping
early_stopping=EarlyStopping(monitor='val_loss',patience=5,restore_best_weights=True) history=model.fit(X_train, y_train,
epochs=100, batch_size=16, validation_split=0.2,callbacks=[early_stopping], verbose
```

```
Epoch 1/100
21/21 ━━━━━━━━━━━━━━━━━━━━ 3s 32ms/step - loss: 578.1560 - mae: 22.0062 - val_loss: 472.4944 - val_mae: 20.1006
Epoch 2/100
21/21 ━━━━━━━━━━━━━━━━━━━━ 1s 20ms/step - loss: 494.8170 - mae: 20.1821 - val_loss: 386.0308 - val_mae: 17.8640
Epoch 3/100
21/21 ━━━━━━━━━━━━━━━━━━━━ 0s 14ms/step - loss: 377.0428 - mae: 17.2001 - val_loss: 266.2468 - val_mae: 14.4302
Epoch 4/100
21/21 ━━━━━━━━━━━━━━━━━━━━ 1s 13ms/step - loss: 259.9522 - mae: 14.0513 - val_loss: 130.1721 - val_mae: 9.6527
Epoch 5/100
21/21 ━━━━━━━━━━━━━━━━━━━━ 0s 12ms/step - loss: 138.2744 - mae: 9.2415 - val_loss: 47.7127 - val_mae: 4.7996
Epoch 6/100
21/21 ━━━━━━━━━━━━━━━━━━━━ 0s 12ms/step - loss: 39.3076 - mae: 4.3490 - val_loss: 36.9681 - val_mae: 4.1145
Epoch 7/100
21/21 ━━━━━━━━━━━━━━━━━━━━ 0s 12ms/step - loss: 36.8857 - mae: 4.3461 - val_loss: 33.5937 - val_mae: 3.8864
Epoch 8/100
21/21 ━━━━━━━━━━━━━━━━━━━━ 0s 12ms/step - loss: 22.1247 - mae: 3.6111 - val_loss: 32.0546 - val_mae: 3.7398
Epoch 9/100
21/21 ━━━━━━━━━━━━━━━━━━━━ 0s 12ms/step - loss: 28.2616 - mae: 3.7532 - val_loss: 30.3792 - val_mae: 3.6246
Epoch 10/100
21/21 ━━━━━━━━━━━━━━━━━━━━ 0s 11ms/step - loss: 18.5773 - mae: 3.2400 - val_loss: 28.4606 - val_mae: 3.4902
Epoch 11/100
21/21 ━━━━━━━━━━━━━━━━━━━━ 0s 11ms/step - loss: 23.5681 - mae: 3.5524 - val_loss: 27.1670 - val_mae: 3.3845
Epoch 12/100
21/21 ━━━━━━━━━━━━━━━━━━━━ 0s 12ms/step - loss: 19.8154 - mae: 3.2796 - val_loss: 26.0053 - val_mae: 3.2994
Epoch 13/100
21/21 ━━━━━━━━━━━━━━━━━━━━ 0s 12ms/step - loss: 18.0839 - mae: 3.1256 - val_loss: 25.6835 - val_mae: 3.2699
Epoch 14/100
21/21 ━━━━━━━━━━━━━━━━━━━━ 0s 12ms/step - loss: 16.8736 - mae: 3.0350 - val_loss: 24.1527 - val_mae: 3.1888
Epoch 15/100
21/21 ━━━━━━━━━━━━━━━━━━━━ 0s 12ms/step - loss: 17.9931 - mae: 3.0826 - val_loss: 23.5468 - val_mae: 3.1321
Epoch 16/100
21/21 ━━━━━━━━━━━━━━━━━━━━ 0s 12ms/step - loss: 15.0387 - mae: 2.7858 - val_loss: 23.0349 - val_mae: 3.1007
Epoch 17/100
21/21 ━━━━━━━━━━━━━━━━━━━━ 0s 12ms/step - loss: 15.0146 - mae: 2.8758 - val_loss: 22.7670 - val_mae: 3.0893
Epoch 18/100
21/21 ━━━━━━━━━━━━━━━━━━━━ 0s 13ms/step - loss: 15.1782 - mae: 2.8608 - val_loss: 21.2640 - val_mae: 2.9940
Epoch 19/100
21/21 ━━━━━━━━━━━━━━━━━━━━ 0s 11ms/step - loss: 12.2465 - mae: 2.5650 - val_loss: 22.0675 - val_mae: 3.0413
Epoch 20/100
21/21 ━━━━━━━━━━━━━━━━━━━━ 0s 11ms/step - loss: 13.5696 - mae: 2.7416 - val_loss: 21.3571 - val_mae: 2.9873 Epoch
21/100
21/21 ━━━━━━━━━━━━━━━━━━━━ 0s 11ms/step - loss: 11.8027 - mae: 2.5818 - val_loss: 20.9437 - val_mae: 2.9896
Epoch 22/100
21/21 ━━━━━━━━━━━━━━━━━━━━ 0s 12ms/step - loss: 14.9748 - mae: 2.7601 - val_loss: 20.1443 - val_mae: 2.8942
Epoch 23/100
21/21 ━━━━━━━━━━━━━━━━━━━━ 0s 12ms/step - loss: 12.2697 - mae: 2.5921 - val_loss: 19.7539 - val_mae: 2.8632
Epoch 24/100
21/21 ━━━━━━━━━━━━━━━━━━━━ 0s 12ms/step - loss: 10.9252 - mae: 2.4634 - val_loss: 19.9128 - val_mae: 2.9152
Epoch 25/100
21/21 ━━━━━━━━━━━━━━━━━━━━ 0s 13ms/step - loss: 14.7995 - mae: 2.7666 - val_loss: 18.8649 - val_mae: 2.8261
Epoch 26/100
21/21 ━━━━━━━━━━━━━━━━━━━━ 0s 12ms/step - loss: 10.9939 - mae: 2.4870 - val_loss: 19.1143 - val_mae: 2.8856
Epoch 27/100
21/21 ━━━━━━━━━━━━━━━━━━━━ 0s 11ms/step - loss: 12.2490 - mae: 2.5036 - val_loss: 18.4333 - val_mae: 2.7957
Epoch 28/100
21/21 ━━━━━━━━━━━━━━━━━━━━ 0s 11ms/step - loss: 13.1319 - mae: 2.5843 - val_loss: 18.6199 - val_mae: 2.8341
Epoch 29/100
21/21 ━━━━━━━━━━━━━━━━━━━━ 0s 12ms/step - loss: 11.3085 - mae: 2.4400 - val_loss: 18.5711 - val_mae: 2.8427
Epoch 30/100
21/21 ━━━━━━━━━━━━━━━━━━━━ 0s 11ms/step - loss: 11.0451 - mae: 2.4008 - val_loss: 18.0744 - val_mae: 2.8014
Epoch 31/100
21/21 ━━━━━━━━━━━━━━━━━━━━ 0s 11ms/step - loss: 9.5473 - mae: 2.3051 - val_loss: 18.1648 - val_mae: 2.8148
Epoch 32/100
21/21 ━━━━━━━━━━━━━━━━━━━━ 0s 12ms/step - loss: 11.8861 - mae: 2.4982 - val_loss: 17.6861 - val_mae: 2.7528
Epoch 33/100
21/21 ━━━━━━━━━━━━━━━━━━━━ 0s 11ms/step - loss: 10.4820 - mae: 2.3941 - val_loss: 17.4192 - val_mae: 2.7539
Epoch 34/100
21/21 ━━━━━━━━━━━━━━━━━━━━ 0s 12ms/step - loss: 9.9429 - mae: 2.2825 - val_loss: 17.3671 - val_mae: 2.7510
Epoch 35/100
21/21 ━━━━━━━━━━━━━━━━━━━━ 0s 10ms/step - loss: 9.7343 - mae: 2.2677 - val_loss: 16.8415 - val_mae: 2.7262
Epoch 36/100
21/21 ━━━━━━━━━━━━━━━━━━━━ 0s 12ms/step - loss: 10.2175 - mae: 2.3443 - val_loss: 16.8166 - val_mae: 2.7245
Epoch 37/100
21/21 ━━━━━━━━━━━━━━━━━━━━ 0s 12ms/step - loss: 8.2204 - mae: 2.1410 - val_loss: 16.6221 - val_mae: 2.7236
```

```
Epoch 38/100
21/21 ━━━━━━━━━━━━━━━━━━━━ 0s 12ms/step - loss: 9.7953 - mae: 2.3001 - val_loss: 16.6115 - val_mae: 2.7099
Epoch 39/100
21/21 ━━━━━━━━━━━━━━━━━━━━ 0s 11ms/step - loss: 8.6650 - mae: 2.1767 - val_loss: 15.9632 - val_mae: 2.6621
Epoch 40/100
21/21 ━━━━━━━━━━━━━━━━━━━━ 0s 12ms/step - loss: 11.4083 - mae: 2.3820 - val_loss: 16.4133 - val_mae: 2.7180
Epoch 41/100
21/21 ━━━━━━━━━━━━━━━━━━━━ 0s 13ms/step - loss: 10.2176 - mae: 2.3578 - val_loss: 15.9471 - val_mae: 2.6872
Epoch 42/100
21/21 ━━━━━━━━━━━━━━━━━━━━ 0s 11ms/step - loss: 10.0840 - mae: 2.2921 - val_loss: 15.5191 - val_mae: 2.6951
Epoch 43/100
21/21 ━━━━━━━━━━━━━━━━━━━━ 0s 11ms/step - loss: 10.0058 - mae: 2.2828 - val_loss: 15.7973 - val_mae: 2.7186
Epoch 44/100
21/21 ━━━━━━━━━━━━━━━━━━━━ 0s 11ms/step - loss: 8.6668 - mae: 2.2004 - val_loss: 15.6494 - val_mae: 2.6921
Epoch 45/100
21/21 ━━━━━━━━━━━━━━━━━━━━ 0s 12ms/step - loss: 7.9820 - mae: 2.1612 - val_loss: 15.4665 - val_mae: 2.7195
Epoch 46/100
21/21 ━━━━━━━━━━━━━━━━━━━━ 0s 12ms/step - loss: 10.0360 - mae: 2.3422 - val_loss: 15.7498 - val_mae: 2.6940
Epoch 47/100
21/21 ━━━━━━━━━━━━━━━━━━━━ 0s 12ms/step - loss: 7.8272 - mae: 2.1090 - val_loss: 15.7399 - val_mae: 2.6993
Epoch 48/100
21/21 ━━━━━━━━━━━━━━━━━━━━ 0s 12ms/step - loss: 7.8618 - mae: 2.0752 - val_loss: 15.8406 - val_mae: 2.7387
Epoch 49/100
21/21 ━━━━━━━━━━━━━━━━━━━━ 0s 12ms/step - loss: 9.5864 - mae: 2.2698 - val_loss: 15.6020 - val_mae: 2.6959
Epoch 50/100
21/21 ━━━━━━━━━━━━━━━━━━━━ 0s 12ms/step - loss: 9.4567 - mae: 2.2437 - val_loss: 15.5948 - val_mae: 2.7022
```

In [17]:

```
import matplotlib.pyplot as plt
plt.plot(history.history['loss'],label='Train Loss')
plt.plot(history.history['val_loss'],label='validation Loss')
plt.title('Model Loss') plt.xlabel('Epochs') plt.ylabel('Loss')
plt.legend() plt.show()
```



In [18]:

```
loss, mae = model.evaluate(X_test, y_test, verbose=1)
print(f"Test Loss:{loss}") print(f"Test MAE: {mae}")
```

```
4/4 ━━━━━━━━━━━━━━━━━━━━ 0s 22ms/step - loss: 10.3116 - mae: 2.3416
Test Loss:13.63278579711914
Test MAE: 2.5116779804229736
```

In [19]:

```
y_pred=model.predict(X_test) y_pred=y_pred.flatten()
```

```
4/4 ━━━━━━━━━━━━━━━━━━━━ 0s 17ms/step
```

In [20]:

```
result_df=pd.DataFrame({'Actual':y_test.values,'Predicted':y_pred}) print(result_df.head())
```

```
    Actual

0   23.6
1   29.228245
2   32.4
3   33.508198
4   18.431713
5   13.6
6   27.675169
7   16.754784
8   22.8
9   16.1
```

```

```

0
1
2
3
4

In [ ]: