dl_1

April 11, 2024

[41]:
```
#load the dataset:
import pandas as pd
import tensorflow as tf
import keras
df=pd.read_csv('data.csv')
```

[42]:
```
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
```

[43]:
```
print(df.columns)
```

```
Index(['CRIM', 'ZN', 'INDUS', 'CHAS', 'NOX', 'RM', 'AGE', 'DIS', 'RAD', 'TAX',
       'PTRATIO', 'B', 'LSTAT', 'MEDV'],
      dtype='object')
```

[44]:
```
#preprocessing the dataset
from sklearn.preprocessing import StandardScaler
# Split the data into input and output variables
X=df.drop('MEDV',axis=1)
Y=df['MEDV']
```

[45]:
```
# Scale the input features
scaler = StandardScaler()
scaler.fit_transform(X)
print(X[:5])
```

```
      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
0  396.90   4.98
1  396.90   9.14
2  392.83   4.03
3  394.63   2.94
4  396.90   5.33
```

[46]:
```
#Split the dataset
from sklearn.model_selection import train_test_split
#Split the data into training and testing sets
X_train, X_test, Y_train, Y_test = train_test_split(X, Y, test_size=0.3,␣
 ↪random_state=42)
```

[47]:
```
#Print the shapes of the training and testing sets
print('Training set shape:', X_train.shape, Y_train.shape)
print('Testing set shape:', X_test.shape, Y_test.shape)
```

```
Training set shape: (354, 13) (354,)
Testing set shape: (152, 13) (152,)
```

[48]:
```
#: Define the model architecture
from keras.models import Sequential
from keras.layers import Dense, Dropout
```

[49]:
```
model =Sequential()
model.add(Dense(64,input_dim=13,activation='relu'))
model.add(Dropout(0.2))
model.add(Dense(32,activation='relu'))
model.add(Dense(1))
```

[50]:
```
# Display the model summary
print(model.summary())
```

```
Model: "sequential_2"
_________________________________________________________________
 Layer (type)                Output Shape              Param #
=================================================================
 dense_4 (Dense)             (None, 64)                896

 dropout_2 (Dropout)         (None, 64)                0

 dense_5 (Dense)             (None, 32)                2080
```

```
 dense_6 (Dense)             (None, 1)                 33

=================================================================
Total params: 3009 (11.75 KB)
Trainable params: 3009 (11.75 KB)
Non-trainable params: 0 (0.00 Byte)
_________________________________________________________________
None
```

[56]:
```
# Compile the model
from keras.losses import MeanSquaredError
model.compile(loss=MeanSquaredError(), optimizer='adam',␣
 ↪metrics=['mean_absolute_error'])
```

[60]:
```
#Train the model
from keras.callbacks import EarlyStopping
```

[61]:
```
early_stopping = EarlyStopping(monitor='val_loss', patience=5)
```

[62]:
```
history = model.fit(X_train, Y_train, validation_split=0.2, epochs=100,␣
 ↪batch_size=32, callbacks=[early_stopping])
```

```
Epoch 1/100
9/9 [==============================] - 0s 29ms/step - loss: 426.5981 -
mean_absolute_error: 18.2794 - val_loss: 389.5282 - val_mean_absolute_error:
17.8849
Epoch 2/100
9/9 [==============================] - 0s 14ms/step - loss: 422.9983 -
mean_absolute_error: 18.1799 - val_loss: 385.9483 - val_mean_absolute_error:
17.7846
Epoch 3/100
9/9 [==============================] - 0s 13ms/step - loss: 419.3287 -
mean_absolute_error: 18.0795 - val_loss: 382.3798 - val_mean_absolute_error:
17.6840
Epoch 4/100
9/9 [==============================] - 0s 12ms/step - loss: 415.6708 -
mean_absolute_error: 17.9794 - val_loss: 378.7936 - val_mean_absolute_error:
17.5823
Epoch 5/100
9/9 [==============================] - 0s 15ms/step - loss: 412.0344 -
mean_absolute_error: 17.8771 - val_loss: 375.1565 - val_mean_absolute_error:
17.4785
Epoch 6/100
9/9 [==============================] - 0s 12ms/step - loss: 408.2989 -
mean_absolute_error: 17.7741 - val_loss: 371.5348 - val_mean_absolute_error:
17.3746
Epoch 7/100
```

```
9/9 [==============================] - 0s 14ms/step - loss: 404.5873 -
mean_absolute_error: 17.6705 - val_loss: 367.8936 - val_mean_absolute_error:
17.2695
Epoch 8/100
9/9 [==============================] - 0s 14ms/step - loss: 400.8268 -
mean_absolute_error: 17.5662 - val_loss: 364.2647 - val_mean_absolute_error:
17.1641
Epoch 9/100
9/9 [==============================] - 0s 14ms/step - loss: 397.1424 -
mean_absolute_error: 17.4605 - val_loss: 360.5665 - val_mean_absolute_error:
17.0561
Epoch 10/100
9/9 [==============================] - 0s 12ms/step - loss: 393.3425 -
mean_absolute_error: 17.3534 - val_loss: 356.8911 - val_mean_absolute_error:
16.9480
Epoch 11/100
9/9 [==============================] - 0s 14ms/step - loss: 389.6096 -
mean_absolute_error: 17.2465 - val_loss: 353.1629 - val_mean_absolute_error:
16.8376
Epoch 12/100
9/9 [==============================] - 0s 13ms/step - loss: 385.7727 -
mean_absolute_error: 17.1374 - val_loss: 349.4699 - val_mean_absolute_error:
16.7276
Epoch 13/100
9/9 [==============================] - 0s 15ms/step - loss: 382.0236 -
mean_absolute_error: 17.0276 - val_loss: 345.7211 - val_mean_absolute_error:
16.6152
Epoch 14/100
9/9 [==============================] - 0s 14ms/step - loss: 378.1836 -
mean_absolute_error: 16.9171 - val_loss: 342.0026 - val_mean_absolute_error:
16.5029
Epoch 15/100
9/9 [==============================] - 0s 13ms/step - loss: 374.3977 -
mean_absolute_error: 16.8064 - val_loss: 338.2518 - val_mean_absolute_error:
16.3888
Epoch 16/100
9/9 [==============================] - 0s 15ms/step - loss: 370.5568 -
mean_absolute_error: 16.6946 - val_loss: 334.5292 - val_mean_absolute_error:
16.2749
Epoch 17/100
9/9 [==============================] - 0s 14ms/step - loss: 366.7586 -
mean_absolute_error: 16.5822 - val_loss: 330.7881 - val_mean_absolute_error:
16.1595
Epoch 18/100
9/9 [==============================] - 0s 14ms/step - loss: 362.9265 -
mean_absolute_error: 16.4688 - val_loss: 327.0470 - val_mean_absolute_error:
16.0434
Epoch 19/100
```

```
9/9 [==============================] - 0s 14ms/step - loss: 359.1450 -
mean_absolute_error: 16.3540 - val_loss: 323.2658 - val_mean_absolute_error:
15.9251
Epoch 20/100
9/9 [==============================] - 0s 18ms/step - loss: 355.3038 -
mean_absolute_error: 16.2385 - val_loss: 319.5060 - val_mean_absolute_error:
15.8066
Epoch 21/100
9/9 [==============================] - 0s 14ms/step - loss: 351.4385 -
mean_absolute_error: 16.1226 - val_loss: 315.7789 - val_mean_absolute_error:
15.6883
Epoch 22/100
9/9 [==============================] - 0s 15ms/step - loss: 347.6358 -
mean_absolute_error: 16.0054 - val_loss: 312.0322 - val_mean_absolute_error:
15.5684
Epoch 23/100
9/9 [==============================] - 0s 17ms/step - loss: 343.7915 -
mean_absolute_error: 15.8895 - val_loss: 308.3123 - val_mean_absolute_error:
15.4512
Epoch 24/100
9/9 [==============================] - 0s 17ms/step - loss: 339.9744 -
mean_absolute_error: 15.7731 - val_loss: 304.5915 - val_mean_absolute_error:
15.3342
Epoch 25/100
9/9 [==============================] - 0s 17ms/step - loss: 336.2062 -
mean_absolute_error: 15.6550 - val_loss: 300.8367 - val_mean_absolute_error:
15.2181
Epoch 26/100
9/9 [==============================] - 0s 14ms/step - loss: 332.3702 -
mean_absolute_error: 15.5379 - val_loss: 297.1183 - val_mean_absolute_error:
15.1023
Epoch 27/100
9/9 [==============================] - 0s 13ms/step - loss: 328.5612 -
mean_absolute_error: 15.4185 - val_loss: 293.4082 - val_mean_absolute_error:
14.9857
Epoch 28/100
9/9 [==============================] - 0s 13ms/step - loss: 324.7568 -
mean_absolute_error: 15.3008 - val_loss: 289.7114 - val_mean_absolute_error:
14.8686
Epoch 29/100
9/9 [==============================] - 0s 11ms/step - loss: 321.0193 -
mean_absolute_error: 15.1816 - val_loss: 285.9883 - val_mean_absolute_error:
14.7497
Epoch 30/100
9/9 [==============================] - 0s 12ms/step - loss: 317.2327 -
mean_absolute_error: 15.0610 - val_loss: 282.2900 - val_mean_absolute_error:
14.6306
Epoch 31/100
```

```
9/9 [==============================] - 0s 16ms/step - loss: 313.4734 -
mean_absolute_error: 14.9419 - val_loss: 278.6101 - val_mean_absolute_error:
14.5110
Epoch 32/100
9/9 [==============================] - 0s 15ms/step - loss: 309.6863 -
mean_absolute_error: 14.8203 - val_loss: 274.9778 - val_mean_absolute_error:
14.3919
Epoch 33/100
9/9 [==============================] - 0s 16ms/step - loss: 305.9767 -
mean_absolute_error: 14.7032 - val_loss: 271.3395 - val_mean_absolute_error:
14.2715
Epoch 34/100
9/9 [==============================] - 0s 14ms/step - loss: 302.2380 -
mean_absolute_error: 14.5852 - val_loss: 267.7290 - val_mean_absolute_error:
14.1510
Epoch 35/100
9/9 [==============================] - 0s 16ms/step - loss: 298.6014 -
mean_absolute_error: 14.4681 - val_loss: 264.0875 - val_mean_absolute_error:
14.0284
Epoch 36/100
9/9 [==============================] - 0s 14ms/step - loss: 294.8557 -
mean_absolute_error: 14.3507 - val_loss: 260.5110 - val_mean_absolute_error:
13.9068
Epoch 37/100
9/9 [==============================] - 0s 12ms/step - loss: 291.1591 -
mean_absolute_error: 14.2338 - val_loss: 256.9744 - val_mean_absolute_error:
13.7855
Epoch 38/100
9/9 [==============================] - 0s 16ms/step - loss: 287.5219 -
mean_absolute_error: 14.1161 - val_loss: 253.4410 - val_mean_absolute_error:
13.6631
Epoch 39/100
9/9 [==============================] - 0s 15ms/step - loss: 283.9893 -
mean_absolute_error: 13.9966 - val_loss: 249.8519 - val_mean_absolute_error:
13.5375
Epoch 40/100
9/9 [==============================] - 0s 15ms/step - loss: 280.3769 -
mean_absolute_error: 13.8772 - val_loss: 246.3084 - val_mean_absolute_error:
13.4124
Epoch 41/100
9/9 [==============================] - 0s 16ms/step - loss: 276.6636 -
mean_absolute_error: 13.7578 - val_loss: 242.9036 - val_mean_absolute_error:
13.2909
Epoch 42/100
9/9 [==============================] - 0s 15ms/step - loss: 273.2097 -
mean_absolute_error: 13.6381 - val_loss: 239.4271 - val_mean_absolute_error:
13.1657
Epoch 43/100
```

```
9/9 [==============================] - 0s 17ms/step - loss: 269.6489 -
mean_absolute_error: 13.5211 - val_loss: 235.9993 - val_mean_absolute_error:
13.0409
Epoch 44/100
9/9 [==============================] - 0s 13ms/step - loss: 266.1361 -
mean_absolute_error: 13.4012 - val_loss: 232.6043 - val_mean_absolute_error:
12.9161
Epoch 45/100
9/9 [==============================] - 0s 17ms/step - loss: 262.6840 -
mean_absolute_error: 13.2822 - val_loss: 229.2129 - val_mean_absolute_error:
12.7900
Epoch 46/100
9/9 [==============================] - 0s 13ms/step - loss: 259.1741 -
mean_absolute_error: 13.1608 - val_loss: 225.9023 - val_mean_absolute_error:
12.6657
Epoch 47/100
9/9 [==============================] - 0s 14ms/step - loss: 255.7557 -
mean_absolute_error: 13.0446 - val_loss: 222.6125 - val_mean_absolute_error:
12.5409
Epoch 48/100
9/9 [==============================] - 0s 14ms/step - loss: 252.4316 -
mean_absolute_error: 12.9281 - val_loss: 219.2882 - val_mean_absolute_error:
12.4134
Epoch 49/100
9/9 [==============================] - 0s 16ms/step - loss: 249.0415 -
mean_absolute_error: 12.8093 - val_loss: 216.0166 - val_mean_absolute_error:
12.2865
Epoch 50/100
9/9 [==============================] - 0s 16ms/step - loss: 245.6199 -
mean_absolute_error: 12.6914 - val_loss: 212.8412 - val_mean_absolute_error:
12.1619
Epoch 51/100
9/9 [==============================] - 0s 16ms/step - loss: 242.4331 -
mean_absolute_error: 12.5769 - val_loss: 209.5911 - val_mean_absolute_error:
12.0331
Epoch 52/100
9/9 [==============================] - 0s 14ms/step - loss: 239.0904 -
mean_absolute_error: 12.4611 - val_loss: 206.4344 - val_mean_absolute_error:
11.9064
Epoch 53/100
9/9 [==============================] - 0s 17ms/step - loss: 235.8184 -
mean_absolute_error: 12.3463 - val_loss: 203.3417 - val_mean_absolute_error:
11.7809
Epoch 54/100
9/9 [==============================] - 0s 15ms/step - loss: 232.6585 -
mean_absolute_error: 12.2316 - val_loss: 200.2253 - val_mean_absolute_error:
11.6530
Epoch 55/100
```

```
9/9 [==============================] - 0s 16ms/step - loss: 229.5211 -
mean_absolute_error: 12.1162 - val_loss: 197.1164 - val_mean_absolute_error:
11.5239
Epoch 56/100
9/9 [==============================] - 0s 16ms/step - loss: 226.2508 -
mean_absolute_error: 12.0014 - val_loss: 194.1584 - val_mean_absolute_error:
11.3995
Epoch 57/100
9/9 [==============================] - 0s 15ms/step - loss: 223.2443 -
mean_absolute_error: 11.8917 - val_loss: 191.1446 - val_mean_absolute_error:
11.2713
Epoch 58/100
9/9 [==============================] - 0s 16ms/step - loss: 220.1626 -
mean_absolute_error: 11.7773 - val_loss: 188.1718 - val_mean_absolute_error:
11.1449
Epoch 59/100
9/9 [==============================] - 0s 16ms/step - loss: 217.1018 -
mean_absolute_error: 11.6664 - val_loss: 185.2550 - val_mean_absolute_error:
11.0241
Epoch 60/100
9/9 [==============================] - 0s 16ms/step - loss: 214.0756 -
mean_absolute_error: 11.5558 - val_loss: 182.4031 - val_mean_absolute_error:
10.9057
Epoch 61/100
9/9 [==============================] - 0s 12ms/step - loss: 211.1848 -
mean_absolute_error: 11.4480 - val_loss: 179.5260 - val_mean_absolute_error:
10.7847
Epoch 62/100
9/9 [==============================] - 0s 16ms/step - loss: 208.2252 -
mean_absolute_error: 11.3377 - val_loss: 176.7215 - val_mean_absolute_error:
10.6652
Epoch 63/100
9/9 [==============================] - 0s 16ms/step - loss: 205.4000 -
mean_absolute_error: 11.2316 - val_loss: 173.9131 - val_mean_absolute_error:
10.5440
Epoch 64/100
9/9 [==============================] - 0s 19ms/step - loss: 202.5029 -
mean_absolute_error: 11.1212 - val_loss: 171.1985 - val_mean_absolute_error:
10.4253
Epoch 65/100
9/9 [==============================] - 0s 15ms/step - loss: 199.7482 -
mean_absolute_error: 11.0140 - val_loss: 168.4932 - val_mean_absolute_error:
10.3054
Epoch 66/100
9/9 [==============================] - 0s 15ms/step - loss: 196.9843 -
mean_absolute_error: 10.9086 - val_loss: 165.8334 - val_mean_absolute_error:
10.1859
Epoch 67/100
```

```
9/9 [==============================] - 0s 14ms/step - loss: 194.1810 -
mean_absolute_error: 10.8074 - val_loss: 163.2870 - val_mean_absolute_error:
10.0699
Epoch 68/100
9/9 [==============================] - 0s 16ms/step - loss: 191.5336 -
mean_absolute_error: 10.7029 - val_loss: 160.7482 - val_mean_absolute_error:
9.9527
Epoch 69/100
9/9 [==============================] - 0s 15ms/step - loss: 188.9820 -
mean_absolute_error: 10.6046 - val_loss: 158.1797 - val_mean_absolute_error:
9.8325
Epoch 70/100
9/9 [==============================] - 0s 14ms/step - loss: 186.3253 -
mean_absolute_error: 10.5046 - val_loss: 155.7127 - val_mean_absolute_error:
9.7172
Epoch 71/100
9/9 [==============================] - 0s 13ms/step - loss: 183.8196 -
mean_absolute_error: 10.4126 - val_loss: 153.2442 - val_mean_absolute_error:
9.6022
Epoch 72/100
9/9 [==============================] - 0s 13ms/step - loss: 181.2790 -
mean_absolute_error: 10.3142 - val_loss: 150.8475 - val_mean_absolute_error:
9.4924
Epoch 73/100
9/9 [==============================] - 0s 13ms/step - loss: 178.8351 -
mean_absolute_error: 10.2238 - val_loss: 148.4694 - val_mean_absolute_error:
9.3820
Epoch 74/100
9/9 [==============================] - 0s 13ms/step - loss: 176.3706 -
mean_absolute_error: 10.1324 - val_loss: 146.1629 - val_mean_absolute_error:
9.2732
Epoch 75/100
9/9 [==============================] - 0s 14ms/step - loss: 173.9708 -
mean_absolute_error: 10.0465 - val_loss: 143.9103 - val_mean_absolute_error:
9.1654
Epoch 76/100
9/9 [==============================] - 0s 14ms/step - loss: 171.6460 -
mean_absolute_error: 9.9595 - val_loss: 141.6890 - val_mean_absolute_error:
9.0575
Epoch 77/100
9/9 [==============================] - 0s 15ms/step - loss: 169.3334 -
mean_absolute_error: 9.8764 - val_loss: 139.5213 - val_mean_absolute_error:
8.9506
Epoch 78/100
9/9 [==============================] - 0s 13ms/step - loss: 167.0989 -
mean_absolute_error: 9.7935 - val_loss: 137.3877 - val_mean_absolute_error:
8.8469
Epoch 79/100
```

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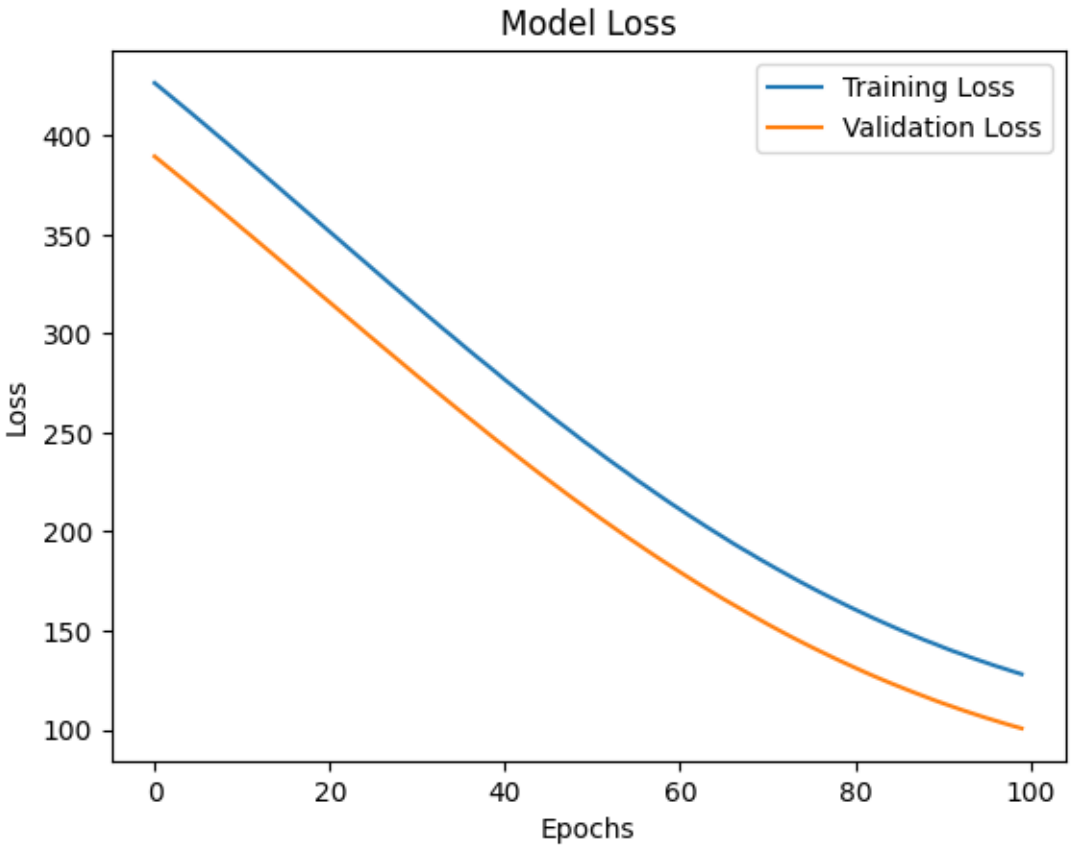
9/9 [==============================] - 0s 12ms/step - loss: 164.9127 -
mean_absolute_error: 9.7120 - val_loss: 135.2741 - val_mean_absolute_error:
8.7430
Epoch 80/100
9/9 [==============================] - 0s 12ms/step - loss: 162.7328 -
mean_absolute_error: 9.6303 - val_loss: 133.2173 - val_mean_absolute_error:
8.6403
Epoch 81/100
9/9 [==============================] - 0s 13ms/step - loss: 160.5987 -
mean_absolute_error: 9.5540 - val_loss: 131.1976 - val_mean_absolute_error:
8.5378
Epoch 82/100
9/9 [==============================] - 0s 13ms/step - loss: 158.5539 -
mean_absolute_error: 9.4743 - val_loss: 129.1827 - val_mean_absolute_error:
8.4375
Epoch 83/100
9/9 [==============================] - 0s 12ms/step - loss: 156.4576 -
mean_absolute_error: 9.3997 - val_loss: 127.2599 - val_mean_absolute_error:
8.3402
Epoch 84/100
9/9 [==============================] - 0s 13ms/step - loss: 154.4759 -
mean_absolute_error: 9.3257 - val_loss: 125.3665 - val_mean_absolute_error:
8.2427
Epoch 85/100
9/9 [==============================] - 0s 12ms/step - loss: 152.5063 -
mean_absolute_error: 9.2536 - val_loss: 123.5237 - val_mean_absolute_error:
8.1466
Epoch 86/100
9/9 [==============================] - 0s 12ms/step - loss: 150.5566 -
mean_absolute_error: 9.1817 - val_loss: 121.7508 - val_mean_absolute_error:
8.0591
Epoch 87/100
9/9 [==============================] - 0s 13ms/step - loss: 148.7110 -
mean_absolute_error: 9.1142 - val_loss: 119.9876 - val_mean_absolute_error:
7.9721
Epoch 88/100
9/9 [==============================] - 0s 14ms/step - loss: 146.8848 -
mean_absolute_error: 9.0455 - val_loss: 118.2536 - val_mean_absolute_error:
7.8870
Epoch 89/100
9/9 [==============================] - 0s 13ms/step - loss: 145.0662 -
mean_absolute_error: 8.9735 - val_loss: 116.5829 - val_mean_absolute_error:
7.8036
Epoch 90/100
9/9 [==============================] - 0s 13ms/step - loss: 143.3960 -
mean_absolute_error: 8.9074 - val_loss: 114.8783 - val_mean_absolute_error:
7.7169
Epoch 91/100
```

```
9/9 [==============================] - 0s 12ms/step - loss: 141.6155 -
mean_absolute_error: 8.8404 - val_loss: 113.2736 - val_mean_absolute_error:
7.6338
Epoch 92/100
9/9 [==============================] - 0s 15ms/step - loss: 139.8991 -
mean_absolute_error: 8.7753 - val_loss: 111.7496 - val_mean_absolute_error:
7.5551
Epoch 93/100
9/9 [==============================] - 0s 13ms/step - loss: 138.3529 -
mean_absolute_error: 8.7133 - val_loss: 110.1898 - val_mean_absolute_error:
7.4770
Epoch 94/100
9/9 [==============================] - 0s 15ms/step - loss: 136.7256 -
mean_absolute_error: 8.6502 - val_loss: 108.7093 - val_mean_absolute_error:
7.4026
Epoch 95/100
9/9 [==============================] - 0s 15ms/step - loss: 135.1899 -
mean_absolute_error: 8.5870 - val_loss: 107.2618 - val_mean_absolute_error:
7.3285
Epoch 96/100
9/9 [==============================] - 0s 17ms/step - loss: 133.6976 -
mean_absolute_error: 8.5295 - val_loss: 105.8343 - val_mean_absolute_error:
7.2540
Epoch 97/100
9/9 [==============================] - 0s 15ms/step - loss: 132.1787 -
mean_absolute_error: 8.4691 - val_loss: 104.4865 - val_mean_absolute_error:
7.1835
Epoch 98/100
9/9 [==============================] - 0s 13ms/step - loss: 130.7981 -
mean_absolute_error: 8.4111 - val_loss: 103.1286 - val_mean_absolute_error:
7.1132
Epoch 99/100
9/9 [==============================] - 0s 12ms/step - loss: 129.3571 -
mean_absolute_error: 8.3580 - val_loss: 101.8380 - val_mean_absolute_error:
7.0450
Epoch 100/100
9/9 [==============================] - 0s 15ms/step - loss: 127.9933 -
mean_absolute_error: 8.3022 - val_loss: 100.5967 - val_mean_absolute_error:
6.9780
```

[69]:
```python
# Plot the training and validation loss over epochs
import matplotlib.pyplot as plt
plt.plot(history.history['loss'], label='Training Loss')
plt.plot(history.history['val_loss'], label='Validation Loss')
plt.title('Model Loss')
plt.xlabel('Epochs')
plt.ylabel('Loss')
```

```
plt.legend()
plt.show()
```



[70]:
```
# Evaluate the model on the testing set loss,
mae = model.evaluate (X_test, Y_test)
# Print the mean absolute error
print('Mean Absolute Error:', mae)
```

```
5/5 [==============================] - 0s 4ms/step - loss: 92.3649 -
mean_absolute_error: 6.5983
Mean Absolute Error: [92.3648910522461, 6.5982770919799805]
```

[ ]:
```

```