ml-assignment-3

September 24, 2024

ML Lab Assignment 3 -> Car Price Prediction

```
[2]:
    import pandas as pd
    data = pd.read_csv('/content/CarPrice_Assignment.csv')
[5]:
     data.head()
[5]:
        car_ID
                 symboling
                                                CarName fueltype aspiration doornumber
     0
              1
                          3
                                    alfa-romero giulia
                                                                           std
                                                                                       two
                                                              gas
              2
     1
                          3
                                   alfa-romero stelvio
                                                                           std
                                                              gas
                                                                                       two
     2
              3
                          1
                             alfa-romero Quadrifoglio
                                                              gas
                                                                           std
                                                                                       two
     3
              4
                          2
                                            audi 100 ls
                                                                           std
                                                                                      four
                                                              gas
     4
              5
                          2
                                             audi 1001s
                                                                                      four
                                                              gas
                                                                           std
             carbody drivewheel enginelocation
                                                  wheelbase
                                                                   enginesize
     0
        convertible
                             rwd
                                            front
                                                         88.6
                                                                           130
        convertible
     1
                             rwd
                                            front
                                                         88.6
                                                                           130
     2
          hatchback
                                                         94.5
                                                                           152
                             rwd
                                            front
     3
               sedan
                             fwd
                                            front
                                                         99.8
                                                                           109
     4
               sedan
                             4wd
                                                         99.4
                                                                           136
                                            front
        fuelsystem
                     boreratio
                                  stroke compressionratio horsepower
                                                                         peakrpm citympg
                           3.47
                                                        9.0
                                                                             5000
     0
               mpfi
                                    2.68
                                                                    111
                                                                                        21
                                                        9.0
               mpfi
                           3.47
                                    2.68
                                                                    111
                                                                             5000
                                                                                        21
     1
     2
               mpfi
                           2.68
                                    3.47
                                                        9.0
                                                                    154
                                                                             5000
                                                                                        19
     3
               mpfi
                           3.19
                                    3.40
                                                       10.0
                                                                    102
                                                                             5500
                                                                                        24
     4
               mpfi
                           3.19
                                    3.40
                                                        8.0
                                                                    115
                                                                             5500
                                                                                        18
        highwaympg
                        price
     0
                 27
                     13495.0
     1
                 27
                     16500.0
     2
                 26
                     16500.0
     3
                 30
                     13950.0
                 22
                     17450.0
     [5 rows x 26 columns]
```

```
[6]: data.dtypes==object
 [6]: car_ID
                           False
      symboling
                           False
      CarName
                            True
      fueltype
                            True
      aspiration
                            True
      doornumber
                            True
                            True
      carbody
      drivewheel
                            True
      enginelocation
                            True
                           False
      wheelbase
      carlength
                           False
                           False
      carwidth
      carheight
                           False
                           False
      curbweight
      enginetype
                            True
      cylindernumber
                            True
                           False
      enginesize
      fuelsystem
                            True
      boreratio
                           False
      stroke
                           False
      compressionratio
                           False
                           False
      horsepower
                           False
      peakrpm
                           False
      citympg
                           False
      highwaympg
      price
                           False
      dtype: bool
 [7]: data["enginetype"].unique()
 [7]: array(['dohc', 'ohcv', 'ohc', 'l', 'rotor', 'ohcf', 'dohcv'], dtype=object)
 [8]: data["carbody"].unique()
 [8]: array(['convertible', 'hatchback', 'sedan', 'wagon', 'hardtop'],
            dtype=object)
 [9]: data=pd.get_dummies(data,columns=["fueltype"])
[10]: data.drop("fueltype_gas",axis=1)
[10]:
                                                 CarName aspiration doornumber
           car_ID
                   symboling
      0
                1
                            3
                                     alfa-romero giulia
                                                                 std
                                                                            two
                2
                            3
      1
                                    alfa-romero stelvio
                                                                 std
                                                                            two
      2
                3
                              alfa-romero Quadrifoglio
                                                                 std
                                                                            two
```

3	4	2	aud	li 100 ls	std	four	
4	5	2	au	di 100ls	std	four	
	•••	•••		•••	•••		
200	201	-1	volvo 1	.45e (sw)	std	four	
201	202	-1	vol	.vo 144ea	turbo	four	
202	203	-1	vol	vo 244dl	std	four	
203	204	-1	Ţ	olvo 246	turbo	four	
204	205	-1	vol	vo 264gl	turbo	four	
	carbody	${\tt drivewheel}$	enginelocati	on wheelbas	e carlength	ı \	
0	convertible	rwd	fro	ont 88.	6 168.8	3 	
1	convertible	rwd	fro	ont 88.	6 168.8	3	
2	hatchback	rwd	fro	ont 94.	5 171.2	2	
3	sedan	fwd	fro	ont 99.	8 176.6	S	
4	sedan	4wd	fro	ont 99.	4 176.6	S	
	•••	•••	•••	***	*** ***		
200	sedan	rwd	fro	ont 109.	1 188.8	3	
201	sedan	rwd	fro	nt 109.	1 188.8	3 	
202	sedan	rwd	fro	nt 109.	1 188.8	3 	
203	sedan	rwd	fro	nt 109.	1 188.8	3 	
204	sedan	rwd	fro	nt 109.	1 188.8	3 	
	fuelsystem	boreratio	stroke compr	essionratio	horsepower	peakrpm	\
0	mpfi	3.47	2.68	9.0	111	5000	
1	mpfi	3.47	2.68	9.0	111	5000	
1 2	mpfi mpfi	3.47 2.68	2.68 3.47	9.0 9.0	111 154	5000 5000	
	_						
2	mpfi	2.68	3.47	9.0	154	5000	
2 3	mpfi mpfi	2.68 3.19	3.47 3.40	9.0 10.0	154 102 115	5000 5500	
2 3 4	mpfi mpfi mpfi	2.68 3.19	3.47 3.40	9.0 10.0 8.0	154 102 115	5000 5500	
2 3 4	mpfi mpfi mpfi 	2.68 3.19 3.19	3.47 3.40 3.40	9.0 10.0 8.0	154 102 115 	5000 5500 5500	
2 3 4 200	mpfi mpfi mpfi mpfi	2.68 3.19 3.19 3.78	3.47 3.40 3.40 	9.0 10.0 8.0 9.5	154 102 115 114	5000 5500 5500 5400	
2 3 4 200 201	mpfi mpfi mpfi mpfi mpfi	2.68 3.19 3.19 3.78 3.78	3.47 3.40 3.40 3.15 3.15	9.0 10.0 8.0 9.5 8.7	154 102 115 114 160	5000 5500 5500 5400 5300	
2 3 4 200 201 202	mpfi mpfi mpfi mpfi mpfi mpfi	2.68 3.19 3.19 3.78 3.78 3.58	3.47 3.40 3.40 3.15 3.15 2.87	9.0 10.0 8.0 9.5 8.7 8.8	154 102 115 114 160 134	5000 5500 5500 5400 5300 5500	
2 3 4 200 201 202 203	mpfi mpfi mpfi mpfi mpfi mpfi idi	2.68 3.19 3.19 3.78 3.78 3.58 3.01	3.47 3.40 3.40 3.15 3.15 2.87 3.40	9.0 10.0 8.0 9.5 8.7 8.8 23.0	154 102 115 114 160 134 106	5000 5500 5500 5400 5300 5500 4800	
2 3 4 200 201 202 203	mpfi mpfi mpfi mpfi mpfi mpfi idi mpfi	2.68 3.19 3.19 3.78 3.78 3.58 3.01 3.78	3.47 3.40 3.40 3.15 3.15 2.87 3.40 3.15	9.0 10.0 8.0 9.5 8.7 8.8 23.0	154 102 115 114 160 134 106	5000 5500 5500 5400 5300 5500 4800	
2 3 4 200 201 202 203	mpfi mpfi mpfi mpfi mpfi mpfi idi mpfi	2.68 3.19 3.19 3.78 3.78 3.58 3.01 3.78	3.47 3.40 3.40 3.15 3.15 2.87 3.40 3.15	9.0 10.0 8.0 9.5 8.7 8.8 23.0 9.5	154 102 115 114 160 134 106	5000 5500 5500 5400 5300 5500 4800	
2 3 4 200 201 202 203 204	mpfi mpfi mpfi mpfi mpfi mpfi idi mpfi citympg high	2.68 3.19 3.19 3.78 3.78 3.58 3.01 3.78	3.47 3.40 3.40 3.15 3.15 2.87 3.40 3.15	9.0 10.0 8.0 9.5 8.7 8.8 23.0 9.5	154 102 115 114 160 134 106	5000 5500 5500 5400 5300 5500 4800	
2 3 4 200 201 202 203 204	mpfi mpfi mpfi mpfi mpfi mpfi idi mpfi citympg high	2.68 3.19 3.19 3.78 3.78 3.58 3.01 3.78 awaympg I 27 134 27 165	3.47 3.40 3.40 3.15 3.15 2.87 3.40 3.15 Price fuelty	9.0 10.0 8.0 9.5 8.7 8.8 23.0 9.5 rpe_diesel False	154 102 115 114 160 134 106	5000 5500 5500 5400 5300 5500 4800	
2 3 4 200 201 202 203 204	mpfi mpfi mpfi mpfi mpfi mpfi mpfi mpfi	2.68 3.19 3.19 3.78 3.58 3.01 3.78 awaympg	3.47 3.40 3.40 3.15 3.15 2.87 3.40 3.15 price fuelty	9.0 10.0 8.0 9.5 8.7 8.8 23.0 9.5 rpe_diesel False False	154 102 115 114 160 134 106	5000 5500 5500 5400 5300 5500 4800	
2 3 4 200 201 202 203 204	mpfi mpfi mpfi mpfi mpfi mpfi mpfi idi mpfi idi 21 21 19	2.68 3.19 3.19 3.78 3.78 3.58 3.01 3.78 awaympg	3.47 3.40 3.40 3.15 3.15 2.87 3.40 3.15 Price fuelty 495.0 500.0	9.0 10.0 8.0 9.5 8.7 8.8 23.0 9.5 Tpe_diesel False False	154 102 115 114 160 134 106	5000 5500 5500 5400 5300 5500 4800	
2 3 4 200 201 202 203 204 0 1 2 3	mpfi mpfi mpfi mpfi mpfi idi mpfi citympg high 21 21 21 19 24	2.68 3.19 3.19 3.78 3.78 3.58 3.01 3.78 awaympg	3.47 3.40 3.40 3.15 3.15 2.87 3.40 3.15 Price fuelty 495.0 500.0 500.0	9.0 10.0 8.0 9.5 8.7 8.8 23.0 9.5 Tpe_diesel False False False	154 102 115 114 160 134 106	5000 5500 5500 5400 5300 5500 4800	
2 3 4 200 201 202 203 204 0 1 2 3	mpfi mpfi mpfi mpfi mpfi mpfi mpfi idi mpfi idi 1 1 21 21 19 24 18	2.68 3.19 3.19 3.78 3.78 3.58 3.01 3.78 27 168 26 168 30 138 22 174	3.47 3.40 3.40 3.15 3.15 2.87 3.40 3.15 Price fuelty 495.0 500.0 500.0	9.0 10.0 8.0 9.5 8.7 8.8 23.0 9.5 rpe_diesel False False False False False	154 102 115 114 160 134 106	5000 5500 5500 5400 5300 5500 4800	
2 3 4 200 201 202 203 204 0 1 2 3 4 	mpfi mpfi mpfi mpfi mpfi idi mpfi citympg high 21 21 19 24 18	2.68 3.19 3.19 3.78 3.78 3.58 3.01 3.78 awaympg	3.47 3.40 3.40 3.15 3.15 2.87 3.40 3.15 Price fuelty 495.0 500.0 500.0 950.0	9.0 10.0 8.0 9.5 8.7 8.8 23.0 9.5 Tpe_diesel False False False False False	154 102 115 114 160 134 106	5000 5500 5500 5400 5300 5500 4800	
2 3 4 200 201 202 203 204 0 1 2 3 4 200	mpfi mpfi mpfi mpfi mpfi idi mpfi idi 21 21 21 21 19 24 18 	2.68 3.19 3.19 3.78 3.78 3.58 3.01 3.78 27 168 26 168 30 138 22 174 28 168 25 190	3.47 3.40 3.40 3.15 3.15 2.87 3.40 3.15 Price fuelty 495.0 500.0 500.0 500.0 450.0	9.0 10.0 8.0 9.5 8.7 8.8 23.0 9.5 Tpe_diesel False False False False False	154 102 115 114 160 134 106	5000 5500 5500 5400 5300 5500 4800	
2 3 4 200 201 202 203 204 0 1 2 3 4 200 201	mpfi mpfi mpfi mpfi mpfi idi mpfi citympg high 21 21 19 24 18 23 19	2.68 3.19 3.19 3.78 3.78 3.58 3.01 3.78 27 168 26 168 30 138 22 174 28 168 25 190 23 214	3.47 3.40 3.40 3.15 3.15 2.87 3.40 3.15 Price fuelty 495.0 500.0 500.0 950.0 450.0	9.0 10.0 8.0 9.5 8.7 8.8 23.0 9.5 The_diesel False	154 102 115 114 160 134 106	5000 5500 5500 5400 5300 5500 4800	
2 3 4 200 201 202 203 204 0 1 2 3 4 200 201 202	mpfi mpfi mpfi mpfi mpfi mpfi idi mpfi citympg high 21 21 19 24 18 23 19 18	2.68 3.19 3.19 3.78 3.78 3.58 3.01 3.78 27 168 26 168 30 138 22 174 28 168 25 190 23 214 27 224	3.47 3.40 3.40 3.15 3.15 2.87 3.40 3.15 Price fuelty 495.0 500.0 500.0 950.0 450.0	9.0 10.0 8.0 9.5 8.7 8.8 23.0 9.5 Tpe_diesel False	154 102 115 114 160 134 106	5000 5500 5500 5400 5300 5500 4800	

[205 rows x 26 columns]

Importing Required Libraries

```
[11]: from sklearn import preprocessing
  from sklearn.model_selection import train_test_split
  from sklearn.linear_model import LinearRegression
  from sklearn.metrics import mean_squared_error, mean_absolute_error
  label_encoder = preprocessing.LabelEncoder()
```

Data Fitting

```
[12]: data["enginetype"]=label_encoder.fit_transform(data["enginetype"])
data["carbody"]=label_encoder.fit_transform(data["carbody"])
```

```
[13]: X=data[["horsepower","fueltype_diesel","enginesize","enginetype","carbody"]]
Y=data[["price"]]
```

Splitting The Data

```
[14]: X_train, X_test, Y_train, Y_test = train_test_split(X, Y, test_size=0.3)
```

```
[15]: model=LinearRegression()
model.fit(X_train,Y_train)
```

[15]: LinearRegression()

```
[16]: y_pred=model.predict(X_test)
```

```
[21]: import math
```

```
[22]: print('Mean_Squared_Error: ',mean_squared_error(Y_test,y_pred))
print('Mean_Absolute_Error: ',mean_absolute_error(Y_test,y_pred))
print('Root_Mean_Squared_Error: ',math.sqrt(mean_absolute_error(Y_test,y_pred)))
```

Mean_Squared_Error: 14670505.705612421
Mean_Absolute_Error: 2706.844316550658
Root_Mean_Squared_Error: 52.02734200928064