```
import pandas as pd
d=pd.read csv("CarPrice Assignment.csv")
                                            CarName fueltype
     car_ID symboling
aspiration \
                                alfa-romero giulia
                                                                       std
                                                           gas
1
           2
                       3
                               alfa-romero stelvio
                                                                       std
                                                           gas
                          alfa-romero Quadrifoglio
2
                                                                       std
           3
                                                           gas
                      2
                                        audi 100 ls
3
                                                           gas
                                                                       std
           5
                       2
                                         audi 100ls
                                                                       std
                                                           gas
                                                           . . .
                                   volvo 145e (sw)
200
        201
                      - 1
                                                           gas
                                                                       std
201
        202
                      - 1
                                        volvo 144ea
                                                                    turbo
                                                           gas
                                        volvo 244dl
202
        203
                      - 1
                                                                       std
                                                           gas
        204
                                          volvo 246
203
                      - 1
                                                       diesel
                                                                    turbo
204
        205
                      - 1
                                        volvo 264gl
                                                                    turbo
                                                           gas
    doornumber
                     carbody drivewheel enginelocation wheelbase
                 convertible
                                                    front
                                                                 88.6
0
            two
                                      rwd
                 convertible
                                                    front
                                                                 88.6
1
            two
                                      rwd
2
                   hatchback
           two
                                      rwd
                                                    front
                                                                 94.5
                                                                 99.8
3
           four
                        sedan
                                      fwd
                                                    front
4
           four
                                      4wd
                                                    front
                                                                 99.4
                        sedan
200
           four
                        sedan
                                      rwd
                                                    front
                                                                109.1
201
           four
                        sedan
                                      rwd
                                                    front
                                                                109.1
202
           four
                        sedan
                                      rwd
                                                    front
                                                                109.1
203
           four
                        sedan
                                      rwd
                                                    front
                                                                109.1
```

204	four	sedan		rwd		front	109.1	
	nginesize	fuelsystem	bore	ratio	stroke	compressi	ionratio	
horsepo 0	ower \ 130	mpfi		3.47	2.68		9.0	
111								
1 111	130	mpfi		3.47	2.68		9.0	
2	152	mpfi		2.68	3.47		9.0	
154	100	6 :		2 10	2 40		10.0	
3 102	109	mpfi		3.19	3.40		10.0	
4	136	mpfi		3.19	3.40		8.0	
115								
200	141	mpfi		3.78	3.15		9.5	
114 201	141	mpfi		3.78	3.15		8.7	
160	171	mp11		3.70	3.13		0.7	
202	173	mpfi		3.58	2.87		8.8	
134 203	145	idi		3.01	3.40		23.0	
106								
204 114	141	mpfi		3.78	3.15		9.5	
ре 0	eakrpm cit 5000	ympg highway 21	ympg 27	pri 13495				
1	5000	21	27	16500	. 0			
2	5000	19 24	26	16500				
3 4	5500 5500	24 18	30 22	13950 17450				
200 201	5400 5300	23 19	28 25	16845 19045				
202	5500	18	23	21485				
203	4800	26	27	22470				
204	5400	19	25	22625	. 0			
[205 rd	ows x 26 c	olumns]						
d.shape)							
(205, 2	26)							
d.head(()							
car_ doornum		ling		(CarName	fueltype	aspiration	1

0	1	3	al fa	romero g	iulia	asc.	std
two				_		gas	
1 two	2	3	alfa-r	omero st	elvio	gas	std
2 two	3	1 alfa	a-romero	Quadrif	oglio	gas	std
3 fou	4	2		audi 1	.00 ls	gas	std
4 fou	5	2		audi	100ls	gas	std
	carbody	drivewheel	enginel	ocation	wheelbase		
	inesize \ convertible	rwd		front	88.6		130
1 (convertible	rwd		front	88.6		130
2	hatchback	rwd		front	94.5		152
3	sedan	fwd		front	99.8		109
4	sedan	4wd		front	99.4		136
	fuelsystem	boreratio	stroko	compress	ionratio ho	nrsenower	r peakrpm
cit	ympg \			compi c33			
0 21	mpfi	3.47	2.68		9.0	111	L 5000
1 21	mpfi	3.47	2.68		9.0	111	L 5000
2	mpfi	2.68	3.47		9.0	154	5000
19 3	mpfi	3.19	3.40		10.0	102	2 5500
24 4	mpfi	3.19	3.40		8.0	115	5 5500
0 1 2 3 4	highwaympg 27 27 26 30 22 rows x 26 co	price 13495.0 16500.0 16500.0 13950.0 17450.0					
		J CUIII 15 J					
u.t.	ail()	mholing	C	arNama f	ueltype as	niration	doornumbor
\	_	ymboling					
200	201	-1 vo	olvo 145	e (sw)	gas	std	four

201	202				J J	C .
201	202	-1	volvo 144ea	gas	turbo	four
202	203	-1	volvo 244dl	gas	std	four
203	204	-1	volvo 246	diesel	turbo	four
204	205	-1	volvo 264gl	gas	turbo	four
fuel	carbody system	drivewheel	enginelocation w	neelbase .	engine	size
200	sedan	rwd	front	109.1 .		141
mpfi 201	sedan	rwd	front	109.1 .		141
mpfi 202	sedan	rwd	front	109.1 .		173
mpfi	L					
203 idi	sedan	rwd	front	109.1 .		145
204 mpfi	sedan	rwd	front	109.1 .		141
mp i i		tia atauta		h		: t
200	borerat 3	.78 3.15	compressionratio 9.5	norsepower 114	peakrpm c 5400	itympg \ 23
201 202		.78 3.15 .58 2.87	8.7 8.8	160 134	5300 5500	19 18
203	3	.01 3.40	23.0	106	4800	26
204	3	.78 3.15	9.5	114	5400	19
200	highway	ympg prio 28 16845				
201		25 19045	. 0			
202 203		23 21485 27 22470				
204		25 22625	. 0			
[5 r	ows x 26	6 columns]				
d.he	ead (<mark>15</mark>)					
	car_ID	symboling		CarName fue		
0 1	1 2	3	alfa-romero alfa-romero		gas gas	std std
2	3	3 1	alfa-romero Quadr	rifoglio	gas	std
4	4 5	2 2	aud	. 100 ls Ii 100ls	gas gas	std std
5 6	6 7	2 1		nudi fox Ii 100ls	gas gas	std std
7	8	1	au	ıdi 5000	gas	std
8	9	1	aı	ıdi 4000	gas	turbo

9 10 11 12 13 14	10 11 12 13 14 15	0 2 0 0 0	audi 5000	bmw 320 bmw 320 bmw 320 bmw 3 bmw 3	9i 9i ×1 ×3	gas gas gas gas gas gas	tı	std std std std std std
do wheel	ornumber base	carbody	drivewheel	enginel	ocation			
0	two	convertible	rwo	d	front		88.6	
1	two	convertible	rwo	d	front		88.6	
2	two	hatchback	rwo	d	front	(94.5	
3	four	sedan	fwo	d	front	(99.8	
4	four	sedan	4wc	d	front		99.4	
5	two	sedan	fwo	d	front		99.8	
6	four	sedan	fwo	d	front	1	05.8	
7	four	wagon	fwo	d	front	1	05.8	
8	four	sedan	fwo	d	front	1	05.8	
9	two	hatchback	4wc	d	front		99.5	
10	two	sedan	rwo	d	front	1	01.2	
11	four	sedan	rwo	d	front	1	01.2	
12	two	sedan	rwo	d	front	1	01.2	
13	four	sedan	rwo	d	front	1	01.2	
14	four	sedan	rwo	d	front	1	03.5	
	enginesize epower \	fuelsystem	boreratio	stroke	compres	ssionra	tio	
0 111	130	mpfi	3.47	2.68		(9.0	
1	130	mpfi	3.47	2.68			9.0	
111	152	mpfi	2.68	3.47			9.0	
154 3	109	mpfi	3.19	3.40		1	0.0	
102 4	136	mpfi	3.19	3.40			8.0	

115 5	130	6 mi	ofi	3.19	3.40		8.5	
110					3.40			
6 110	130		ofi	3.19	3.40		8.5	
7 110	130	6 m	ofi	3.19	3.40		8.5	
8	13	1 m	ofi	3.13	3.40		8.3	
140 9	13	1 m	ofi	3.13	3.40		7.0	
160 10	108		ofi		2.80		8.8	
101								
11 101	108	8 m	ofi	3.50	2.80		8.8	
12	16	4 m	ofi	3.31	3.19		9.0	
121 13	16	4 m	ofi	3.31	3.19		9.0	
121 14	164	4 mi	ofi	3.31	3.19		9.0	
121	10	T 11	31 <u>1</u>	3.31	3.13		3.0	
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14	peakrpm c: 5000 5000 5000 5500 5500 5500 5500 55	itympg hid 21 21 19 24 18 19 19 19 17 16 23 23 21 21 20	ghwaympg 27 27 26 30 22 25 25 25 20 22 29 29 28 28 25	20970.00 21105.00	0 0 0 0 0 0 0 0 0 7 0 0 0			
[15	rows x 26	columns]						
d.ta	ail(<mark>20</mark>)							
	—	symboling			CarName	fueltype		
asp: 185	iration \ 186	2	V	olkswagen	type 3	gas	std	d
186	187	2		kswagen 4		gas	sto	
187	188	2		gen super		diesel	turbo	
107	100	۷	VULKSWA	gen super	peerre	итезег	curbo	,

188	189	2	volkswagen da	sher	gas	std	l
189	190	3	vw da	sher	gas	std	l
190	191	3	vw ra	bbit	gas	std	İ
191	192	0	volkswagen ra	bbit	gas	std	l
192	193	0 volk	kswagen rabbit cu	ıstom di	esel	turbo)
193	194	0	volkswagen da	sher	gas	std	l
194	195	-2	volvo 145e	(sw)	gas	std	l
195	196	-1	volvo 1	.44ea	gas	std	l
196	197	-2	volvo 2	44dl	gas	std	l
197	198	-1	volvo	245	gas	std	l
198	199	-2	volvo 2	.64gl	gas	turbo)
199	200	-1	volvo di	esel.	gas	turbo)
200	201	-1	volvo 145e	(sw)	gas	std	l
201	202	-1	volvo 1	.44ea	gas	turbo)
202	203	-1	volvo 2	44dl	gas	std	l
203	204	-1	volvo	246 di	esel	turbo)
204	205	-1	volvo 2	.64gl	gas	turbo)
	doornumber	carbody	drivewheel engin	olocation	wheel	2260	
\		Carbody	di ivewileet eligili	ietocation	wileeti	base	•
185	four	sedan	fwd	front	Ġ	97.3	
186	four	sedan	fwd	front	Ć	97.3	
187	four	sedan	fwd	front	Ć	97.3	
188	four	sedan	fwd	front	ć	97.3	
189	two	convertible	fwd	front	Ġ	94.5	
190	two	hatchback	fwd	front	Ġ	94.5	
191	four	sedan	fwd	front	10	90.4	

192	four	sedan	fwd		front	100.4	
193	four	wagon	fwd		front	100.4	
194	four	sedan	rwd		front	104.3	
195	four	wagon	rwd		front	104.3	
196	four	sedan	rwd		front	104.3	
197	four	wagon	rwd		front	104.3	
198	four	sedan	rwd		front	104.3	
199	four	wagon	rwd		front	104.3	
200	four	sedan	rwd		front	109.1	
201	four	sedan	rwd		front	109.1	
202	four	sedan	rwd		front	109.1	
203	four	sedan	rwd		front	109.1	
204	four	sedan	rwd		front	109.1	
hors	enginesize sepower \	fuelsystem	boreratio	stroke d	compress	sionratio	
185	enginesize sepower \ 109	fuelsystem mpfi	boreratio 3.19	stroke o	compress	sionratio 9.0	
185 85 186	sepower \	-			compress		
185 85	sepower \ 109	mpfi	3.19	3.40	compress	9.0	
185 85 186 85 187 68	sepower \ 109 109 97	mpfi mpfi idi	3.19 3.19 3.01	3.40 3.40 3.40	compress	9.0 9.0 23.0	
185 85 186 85 187 68 188 100	109 109 97 109	mpfi mpfi idi mpfi	3.19 3.19 3.01 3.19	3.40 3.40 3.40 3.40	compress	9.0 9.0 23.0 10.0	
185 85 186 85 187 68 188 100 189	sepower \ 109 109 97	mpfi mpfi idi	3.19 3.19 3.01	3.40 3.40 3.40	compress	9.0 9.0 23.0	
185 85 186 85 187 68 188 100 189 90 190	109 109 97 109	mpfi mpfi idi mpfi	3.19 3.19 3.01 3.19	3.40 3.40 3.40 3.40	compress	9.0 9.0 23.0 10.0	
185 85 186 85 187 68 188 100 189 90 190 90	109 109 97 109 109	mpfi mpfi idi mpfi mpfi	3.19 3.19 3.01 3.19 3.19	3.40 3.40 3.40 3.40 3.40	compress	9.0 9.0 23.0 10.0 8.5	
185 85 186 85 187 68 188 100 189 90 190 90	sepower \ 109 109 97 109 109 109	mpfi mpfi idi mpfi mpfi mpfi	3.19 3.19 3.01 3.19 3.19	3.40 3.40 3.40 3.40 3.40 3.40	compress	9.0 9.0 23.0 10.0 8.5 8.5	
185 85 186 85 187 68 188 100 189 90 190 90 191 110 192 68	109 109 97 109 109 109 136 97	mpfi idi mpfi mpfi mpfi mpfi idi idi	3.19 3.01 3.19 3.19 3.19 3.19 3.19 3.19	3.40 3.40 3.40 3.40 3.40 3.40	compress	9.0 9.0 23.0 10.0 8.5 8.5 8.5	
185 85 186 85 187 68 188 100 190 90 191 110 192 68 193 88	109 109 97 109 109 109 136 97 109	mpfi idi mpfi mpfi mpfi mpfi idi mpfi mpfi mpfi mpfi	3.19 3.19 3.01 3.19 3.19 3.19 3.19 3.01 3.19	3.40 3.40 3.40 3.40 3.40 3.40 3.40 3.40	compress	9.0 9.0 23.0 10.0 8.5 8.5 23.0 9.0	
185 85 186 85 187 68 188 100 190 90 191 110 192 68 193 88 194	109 109 97 109 109 109 136 97	mpfi idi mpfi mpfi mpfi mpfi idi idi	3.19 3.01 3.19 3.19 3.19 3.19 3.19 3.19	3.40 3.40 3.40 3.40 3.40 3.40 3.40	compress	9.0 9.0 23.0 10.0 8.5 8.5 8.5	
185 85 186 85 187 68 188 100 190 90 191 110 192 68 193 88	109 109 97 109 109 109 136 97 109	mpfi idi mpfi mpfi mpfi mpfi idi mpfi mpfi mpfi mpfi	3.19 3.19 3.01 3.19 3.19 3.19 3.19 3.01 3.19	3.40 3.40 3.40 3.40 3.40 3.40 3.40 3.40	compress	9.0 9.0 23.0 10.0 8.5 8.5 23.0 9.0	

196		141	mpfi	3.78	3.15	9.5
114 197	-	141	mpfi	3.78	3.15	9.5
114		120	mnfi	2 62	2 15	7 5
198 162	•	130	mpfi	3.62	3.15	7.5
199		130	mpfi	3.62	3.15	7.5
162 200		141	mpfi	3.78	3.15	9.5
114 201		1 / 1	mnfi	2 70	2 15	8.7
160	•	141	mpfi	3.78	3.15	0.7
202 134	-	173	mpfi	3.58	2.87	8.8
203		145	idi	3.01	3.40	23.0
106 204		141	mpfi	3.78	3.15	9.5
114	-	141	шрт	3.70	3.13	9.5
185 186 187 188 189 190 191 192 193 194 195 196 197 198 199 200 201 202 203 204	5250 5250 4500 5500 5500 5500 4500 5400 54	18 26 19	highwaympg 34 34 42 32 29 29 24 38 31 28 28 28 22 22 22 22 23 25 25	8195.0 8495.0 9495.0 9995.0 11595.0 9980.0 13295.0 13845.0 12290.0 12940.0 13415.0 15985.0 16515.0 18420.0 18950.0 16845.0 19045.0 21485.0		
[20 r d.isn		6 columns]				
	car_ID dy \	symboling	CarName	fueltype	aspiration	doornumber
0 False	False	False	e False	False	False	False

False

False

False

False

False

False

False		- 1	- 1	- 1	- 1	_	
2 False	False	False	False	False	False	Fa	ılse
3 False	False	False	False	False	False	Fa	ılse
4 False	False	False	False	False	False	Fa	lse
200 False	False	False	False	False	False	Fa	lse
201 False	False	False	False	False	False	Fa	lse
202 False	False	False	False	False	False	Fa	ılse
203 False	False	False	False	False	False	Fa	ılse
204 False	False	False	False	False	False	Fa	lse
	drivewheel	engine ⁻	location	wheelbase	engi	nesize	
0	ystem \ False		False	False		False	
False 1 False	False		False	False		False	
2	False		False	False		False	
False	False		False	False		False	
False 4 False	False		False	False		False	
··							
200 Ealso	False		False	False		False	
False 201 False	False		False	False		False	
202 False	False		False	False		False	
203 False	False		False	False		False	
204 False	False		False	False		False	
	boreratio	stroke	compressi	onratio h	orsepower	peakrpm	citympg
0	False	False		False	False	False	False
1	False	False		False	False	False	False

2	False	False	False	False	False	Fals
3	False	False	False	False	False	Fals
4	False	False	False	False	False	Fals
200	False	False	False	False	False	Fals
201	False	False	False	False	False	Fals
202	False	False	False	False	False	Fals
203	False	False	False	False	False	Fals
204	False	False	False	False	False	Fals
0 1 2 3 4 200 201 202 203 204 [205 rows d.isna(). car_ID symboling CarName fueltype aspiratio doornumbe carbody drivewhee engineloc wheelbase carlength carwidth carheight	n r l ation	False False False False False False False False False Olumns]				

```
enginetype
                     0
cylindernumber
                     0
enginesize
                     0
                     0
fuelsystem
                     0
boreratio
                     0
stroke
                     0
compressionratio
horsepower
                     0
                     0
peakrpm
                     0
citympg
                     0
highwaympg
                     0
price
dtype: int64
d.dtypes
                       int64
car ID
symboling
                       int64
CarName
                      object
fueltype
                      object
aspiration
                      object
doornumber
                      object
carbody
                      object
drivewheel
                      object
enginelocation
                      object
wheelbase
                     float64
carlength
                     float64
carwidth
                     float64
carheight
                     float64
curbweight
                       int64
enginetype
                      object
cylindernumber
                      object
enginesize
                       int64
fuelsystem
                      object
boreratio
                     float64
stroke
                     float64
compressionratio
                     float64
horsepower
                       int64
peakrpm
                       int64
citympg
                       int64
highwaympg
                       int64
price
                     float64
dtype: object
(d==0).sum()
                      0
car ID
                     67
symboling
CarName
                      0
                      0
fueltype
```

```
0
aspiration
                      0
doornumber
carbody
                      0
drivewheel
                      0
                      0
enginelocation
wheelbase
                      0
                      0
carlength
carwidth
                      0
                      0
carheight
curbweight
                      0
                      0
enginetype
cylindernumber
                      0
                      0
enginesize
                      0
fuelsystem
boreratio
                      0
                      0
stroke
                      0
compressionratio
                      0
horsepower
                      0
peakrpm
                      0
citympg
                      0
highwaympg
                      0
price
dtype: int64
d.mean(numeric only=True)
                       103.000000
car ID
symboling
                         0.834146
wheelbase
                        98.756585
carlength
                       174.049268
carwidth
                        65.907805
                        53.724878
carheight
curbweight
                      2555.565854
                       126.907317
enginesize
boreratio
                         3.329756
                         3.255415
stroke
compressionratio
                        10.142537
                       104.117073
horsepower
                      5125.121951
peakrpm
citympg
                        25.219512
                        30.751220
highwaympg
                     13276.710571
price
dtype: float64
d.mean(numeric only=True).sum()
21757.393887804876
import numpy as np
from sklearn.model_selection import train_test_split
```

x=d[["car_ID","symboling","CarName","fueltype","aspiration","doornumbe
r","carbody","drivewheel","enginelocation","wheelbase","carlength","ca
rwidth","carheight","curbweight","enginetype","cylindernumber","engine
size","fuelsystem","boreratio","stroke","compressionratio","horsepower
","peakrpm","citympg","highwaympg"]]

y=d[["price"]]

Χ

asni	car_ID ration	symboling	CarName	fueltype	
0	1	` 3	alfa-romero giulia	gas	std
1	2	3	alfa-romero stelvio	gas	std
2	3	1	alfa-romero Quadrifoglio	gas	std
3	4	2	audi 100 ls	gas	std
4	5	2	audi 100ls	gas	std
200	201	-1	volvo 145e (sw)	gas	std
201	202	-1	volvo 144ea	gas	turbo
202	203	-1	volvo 244dl	gas	std
203	204	-1	volvo 246	diesel	turbo
204	205	-1	volvo 264gl	gas	turbo

doornumber	carbody	drivewheel	enginelocation	wheelbase	
two	convertible	rwd	front	88.6	
two	convertible	rwd	front	88.6	
two	hatchback	rwd	front	94.5	
•		C 1	c .	00.0	
four	sedan	TWO	front	99.8	
four	codan	Aud	front	00 4	
Tout	Seuaii	4wu	110110	99.4	
		• • •			• • •
four	sedan	rwd	front	109.1	
four	sedan	rwd	front	109.1	
	two two four four four	two convertible two convertible two hatchback four sedan four sedan four sedan	two convertible rwd two convertible rwd two hatchback rwd four sedan fwd four sedan 4wd four sedan rwd	two convertible rwd front two convertible rwd front two hatchback rwd front four sedan fwd front four sedan 4wd front four sedan rwd front	two convertible rwd front 88.6 two convertible rwd front 88.6 two hatchback rwd front 94.5 four sedan fwd front 99.8 four sedan 4wd front 99.4 four sedan rwd front 109.1

```
202
           four
                         sedan
                                                      front
                                                                   109.1
                                        rwd
                                                      front
           four
203
                         sedan
                                        rwd
                                                                   109.1
204
           four
                         sedan
                                                      front
                                                                   109.1
                                        rwd
      cylindernumber
                       enginesize
                                     fuelsystem
                                                   boreratio stroke \
0
                 four
                                130
                                                         3.47
                                                                2.68
                                            mpfi
1
                 four
                                130
                                                         3.47
                                            mpfi
                                                                2.68
2
                  six
                               152
                                                         2.68
                                                                3.47
                                            mpfi
3
                 four
                                109
                                            mpfi
                                                         3.19
                                                                 3.40
4
                 five
                                136
                                            mpfi
                                                         3.19
                                                                3.40
                                             . . .
200
                                                         3.78
                                                                3.15
                 four
                                141
                                            mpfi
201
                 four
                                141
                                            mpfi
                                                         3.78
                                                                3.15
202
                                173
                                                         3.58
                                                                2.87
                  six
                                            mpfi
203
                                145
                                             idi
                                                         3.01
                                                                3.40
                  six
204
                 four
                                141
                                            mpfi
                                                         3.78
                                                                3.15
    compressionratio
                        horsepower peakrpm citympg
                                                          highwaympg
0
                   9.0
                                 111
                                         5000
                                                                   27
                                                     21
1
                   9.0
                                         5000
                                                                   27
                                 111
                                                     21
2
                   9.0
                                 154
                                         5000
                                                     19
                                                                   26
3
                  10.0
                                                     24
                                 102
                                         5500
                                                                   30
4
                   8.0
                                 115
                                         5500
                                                     18
                                                                   22
                                                                  . . .
                                          . . .
200
                   9.5
                                 114
                                         5400
                                                     23
                                                                   28
201
                   8.7
                                 160
                                                     19
                                                                   25
                                         5300
202
                                                                   23
                   8.8
                                 134
                                         5500
                                                     18
203
                  23.0
                                 106
                                         4800
                                                     26
                                                                   27
                                                                   25
204
                   9.5
                                 114
                                                     19
                                         5400
[205 rows x 25 columns]
У
        price
     13495.0
0
1
      16500.0
2
     16500.0
3
     13950.0
4
      17450.0
200
     16845.0
201
     19045.0
202
     21485.0
203
     22470.0
204
     22625.0
```

[205 rows x 1 columns] x_train,x_test,y_train,y_test=train_test_split(x,y,random_state=0,test $_{\text{size}=0.25}$ x train car ID symboling CarName fueltype aspiration \ 163 toyota corolla liftback 164 1 gas std mazda glc custom 61 62 std gas 75 76 1 mercury cougar gas turbo 106 107 1 nissan clipper std gas mazda glc deluxe 63 64 diesel std buick electra 225 custom 67 68 diesel turbo 192 193 volkswagen rabbit custom diesel turbo 117 118 0 peugeot 604sl turbo gas 47 48 jaguar xj gas std 172 173 2 toyota cressida std gas carbody drivewheel enginelocation wheelbase doornumber 163 sedan rwd front 94.5 two 61 two hatchback fwd front 98.8 75 hatchback front 102.7 two rwd 106 two hatchback rwd front 99.2 63 four sedan fwd front 98.8 . . . 67 four front 110.0 sedan rwd 192 four sedan fwd front 100.4 117 four sedan front 108.0 rwd

47	four		sedan	rwd	front	113.0	
172	two	conve	ertible	rwd	front	98.4	
163 61 75 106 63	cylindernu	umber four four four six four	enginesize 98 122 140 181 122	fuelsyste 2bb 2bb mpf mpf id	l 3.19 l 3.39 i 3.78 i 3.43	3.03 3.39 3.12 3.27 3.39	
67 192 117 47 172		five four four six four	183 97 134 258 146	id id id mpf mpf mpf	i 3.58 i 3.01 i 3.61 i 3.63	3.64 3.40 3.21 4.17 3.50	
163 61 75 106 63	compression	9.0 8.6 8.0 9.0 22.7	horsepower 70 84 175 160 64	peakrpm 4800 4800 5000 5200 4650	citympg high 29 26 19 19 36	1waympg 34 32 24 25 42	
67 192 117 47 172		21.5 23.0 7.0 8.1 9.3	123 68 142 176 116	4350 4500 5600 4750 4800	22 33 18 15 24	25 38 24 19 30	
[153	rows x 25	colum	ns]				
y_tr	ain						
163 61 75 106 63 67 192 117 47	price 8058.0 10595.0 16503.0 18399.0 10795.0 25552.0 13845.0 18150.0 32250.0 17669.0						

[153 rows x 1 columns]

x_test				
C	ar ID	symboling	CarName	fueltype
aspira			ca. Hallic	
52	53	1	mazda rx2 coupe	gas
std		_	a_aa	90.5
181	182	-1	toyouta tercel	gas
std		_	10,00.10.001	90.5
5	6	2	audi fox	gas
std		_		9
18	19	2	chevrolet impala	gas
std				J
188	189	2	volkswagen dasher	gas
std				J
170	171	2	toyota tercel	gas
std			, , , , , , , , , , , , , , , , , , , ,	5
76	77	2	mitsubishi mirage	gas
std			j	3
154	155	0	toyota corolla 1600 (sw)	gas
std				J
104	105	3	nissan teana	gas
std				5
33	34	1	honda accord cvcc	gas
std				
12	13	0	bmw x1	gas
std				
129	130	1	porsche cayenne	gas
std				_
55	56	3	mazda 626	gas
std				
66	67	0	mazda rx-7 gs	diesel
std				
45	46	0	isuzu D-Max V-Cross	gas
std				
169	170	2	toyota starlet	gas
std				
130	131	0	renault 12tl	gas
std				
7	8	1	audi 5000	gas
std				
37	38	0	honda accord	gas
std				
152	153	1	toyota corolla 1200	gas
std		_		
80	81	3	mitsubishi mirage g4	gas
turbo				
111	112	0	peugeot 504	gas
std		_		
131	132	2	renault 5 gtl	gas
std				

171	172	2	toyota corolla	gas
std 179	180	3	toyota corona	0.25
std	100	J	toyota corona	gas
138	139	2	subaru	gas
std				J
156	157	0	toyota mark ii	gas
std				
113	114	0	peugeot 504	gas
std	160	0	hh	
161 std	162	0	toyota corolla	gas
89	90	1	Nissan versa	0.25
std	90	1	NISSAII VEISA	gas
183	184	2	volkswagen 1131 deluxe sedan	gas
std	10 7	2	TOTAL STATE OF THE STATE	943
193	194	0	volkswagen dasher	gas
std				3 2
125	126	3	porsche macan	gas
std			•	_
173	174	-1	toyota corolla	gas
std				
92	93	1	nissan latio	gas
std				
16	17	0	bmw x5	gas
std				
189	190	3	vw dasher	gas
std	127	2	anah 00mla	
136	137	3	saab 99gle	gas
turbo 22	23	1	dodge challenger se	asc
std	23	T	douge chartenger se	gas
74	75	1	buick regal sport coupe (turbo)	gas
std	, 3	_	autor regar sport coupe (turbo)	945
44	45	1	isuzu D-Max	gas
std				3
4	5	2	audi 100ls	gas
std				
71	72	-1	buick opel isuzu deluxe	gas
std				
134	135	3	saab 99le	gas
std		_	_	
145	146	0	subaru r2	gas
turbo	122	1	.1	
122	123	1	plymouth fury gran sedan	gas
std 26	27	1	dodgo col+ /c//	a 26
26 std	27	1	dodge colt (sw)	gas
83	84	3	mitsubishi g4	asc
03	04	J	mircsubishir 94	gas

turbo 149	150	Θ		subaru d	l gas	
turbo					3	
186 std	187	2	VO	lkswagen 411 (sw	_	
8 turbo	9	1		audi 400	0 gas	
90 std	91	1		nissan gt-	r diesel	
	rnumber	carbody	drivewheel	enginelocation	wheelbase	
\ 52	two	hatchback	fwd	front	93.1	
181	four	wagon	rwd	front	104.5	
5	two	sedan	fwd	front	99.8	
18	two	hatchback	fwd	front	88.4	
188	four	sedan	fwd	front	97.3	
170	two	hardtop	rwd	front	98.4	
76	two	hatchback	fwd	front	93.7	
154	four	wagon	4wd	front	95.7	
104	two	hatchback	rwd	front	91.3	
33	two	hatchback	fwd	front	93.7	
12	two	sedan	rwd	front	101.2	
129	two	hatchback	rwd	front	98.4	
55	two	hatchback	rwd	front	95.3	
66	four	sedan	rwd	front	104.9	
45	four	sedan	fwd	front	94.5	
169	two	hatchback	rwd	front	98.4	
130	four	wagon	fwd	front	96.1	
7	four	wagon	fwd	front	105.8	
37	two	hatchback	fwd	front	96.5	
152	four	hatchback	fwd	front	95.7	

80	two	hatchback	fwd	front	96.3
111	four	sedan	rwd	front	107.9
131	two	hatchback	fwd	front	96.1
171	two	hatchback	rwd	front	98.4
179	two	hatchback	rwd	front	102.9
138	two	hatchback	fwd	front	93.7
156	four	sedan	fwd	front	95.7
113	four	wagon	rwd	front	114.2
161	four	hatchback	fwd	front	95.7
89	two	sedan	fwd	front	94.5
183	two	sedan	fwd	front	97.3
193	four	wagon	fwd	front	100.4
125	two	hatchback	rwd	front	94.5
173	four	sedan	fwd	front	102.4
92	four	sedan	fwd	front	94.5
16	two	sedan	rwd	front	103.5
189	two	convertible	fwd	front	94.5
136	two	hatchback	fwd	front	99.1
22	two	hatchback	fwd	front	93.7
74	two	hardtop	rwd	front	112.0
44	two	sedan	fwd	front	94.5
4	four	sedan	4wd	front	99.4
71	four	sedan	rwd	front	115.6
134	two	hatchback	fwd	front	99.1
145	four	sedan	4wd	front	97.0
122	four	sedan	fwd	front	93.7

26 four sedan fwd front 93.7 83 two hatchback fwd front 95.9 149 four wagon 4wd front 96.9 186 four sedan fwd front 97.3 8 four sedan fwd front 97.3 90 two sedan fwd front 97.3 90 two sedan fwd front 94.5 181 six 161 mpfi 3.03 3.150 181 six
149 four wagon 4wd front 96.9 186 four sedan fwd front 97.3 8 four sedan fwd front 105.8 90 two sedan fwd front 94.5 52 four 91 2bbl 3.03 3.150 181 six 161 mpfi 3.27 3.350 5 five 136 mpfi 3.19 3.400 18 three 61 2bbl 2.91 3.030 188 four 109 mpfi 3.19 3.400 170 four 146 mpfi 3.62 3.500 76 four 92 2bbl 2.97 3.230 154 four 92 2bbl 3.05 3.030 104 six 181 mpfi 3.43 3.270 33 four 92 1bbl 2.91 3.410 12 six 164 mpfi 3.31
186 four sedan fwd front 97.3 8 four sedan fwd front 105.8 90 two sedan fwd front 94.5 cylindernumber enginesize fuelsystem boreratio stroke \ 52 four 91 2bbl 3.03 3.150 181 six 161 mpfi 3.27 3.350 5 five 136 mpfi 3.19 3.400 18 three 61 2bbl 2.91 3.030 188 four 109 mpfi 3.19 3.400 170 four 146 mpfi 3.62 3.500 76 four 92 2bbl 2.97 3.230 154 four 92 2bbl 3.05 3.030 104 six 181 mpfi 3.43 3.270 33 four 92 1bbl 2.91 3.410 12 six 164 mpfi 3.31 3.190 129 eight 203 mpfi 3.94 3.110 55 two 70 4bbl 3.33 3.255 66 four 134 idi 3.43 3.640 45 four 90 2bbl 3.03 3.110
8 four sedan fwd front 105.8 90 two sedan fwd front 94.5 cylindernumber enginesize fuelsystem boreratio stroke \ 52 four 91 2bbl 3.03 3.150 181 six 161 mpfi 3.27 3.350 5 five 136 mpfi 3.19 3.400 18 three 61 2bbl 2.91 3.030 188 four 109 mpfi 3.19 3.400 170 four 146 mpfi 3.62 3.500 76 four 92 2bbl 2.97 3.230 154 four 92 2bbl 2.97 3.230 154 four 92 2bbl 3.05 3.030 104 six 181 mpfi 3.43 3.270 33 four 92 1bbl 2.91 3.410 12 six 164 mpfi 3.31 3.190 129 eight 203 mpfi 3.94 3.110 55 two 70 4bbl 3.33 3.255 66 four 134 idi 3.43 3.640 45 four 90 2bbl 3.03 3.110
cylindernumber enginesize fuelsystem boreratio stroke \ 52 four 91 2bbl 3.03 3.150 181 six 161 mpfi 3.27 3.350 5 five 136 mpfi 3.19 3.400 18 three 61 2bbl 2.91 3.030 188 four 109 mpfi 3.19 3.400 170 four 146 mpfi 3.62 3.500 76 four 92 2bbl 2.97 3.230 154 four 92 2bbl 3.05 3.030 104 six 181 mpfi 3.43 3.270 33 four 92 1bbl 2.91 3.410 12 six 164 mpfi 3.31 3.190 129 eight 203 mpfi 3.94 3.110 55 two 70 <t< td=""></t<>
cylindernumber enginesize fuelsystem boreratio stroke \ 52
52 four 91 2bbl 3.03 3.150 181 six 161 mpfi 3.27 3.350 5 five 136 mpfi 3.19 3.400 18 three 61 2bbl 2.91 3.030 188 four 109 mpfi 3.19 3.400 170 four 146 mpfi 3.62 3.500 76 four 92 2bbl 2.97 3.230 154 four 92 2bbl 3.05 3.030 104 six 181 mpfi 3.43 3.270 33 four 92 1bbl 2.91 3.410 12 six 164 mpfi 3.31 3.190 129 eight 203 mpfi 3.94 3.110 55 two 70 4bbl 3.33 3.255 66 four 134 idi 3.43 3.640 45 four 90 2bbl 3.03 3.110
130 four 132 mpfi 3.46 3.900 7 five 136 mpfi 3.19 3.400 37 four 110 lbbl 3.15 3.580 152 four 92 2bbl 3.05 3.030 80 four 110 spdi 3.17 3.460 111 four 120 mpfi 3.46 2.190 131 four 132 mpfi 3.46 3.900 171 four 146 mpfi 3.62 3.500 179 six 171 mpfi 3.27 3.350 138 four 97 2bbl 3.62 2.360 156 four 98 2bbl 3.19 3.030 113 four 120 mpfi 3.46 2.190 161 four 98 2bbl 3.19 3.030 89 four 97 2bbl 3.15 3.290 183 four 109 mpfi 3.19

136 ff 22 ff 74 ei 44 ff 4 ff 71 ei 134 ff 145 ff 122 ff 26 ff 83 ff 149 ff 186 ff 8	six 209 four 109 four 90 ght 304 four 90 five 136 ght 234 four 121 four 98 four 98 four 90 four 156 four 108 four 109 four 109 four 109	mpfi mpfi 2bbl mpfi 2bbl mpfi mpfi mpfi 2bbl 2bbl spdi mpfi mpfi mpfi idi	3.62 3.390 3.19 3.400 3.54 3.070 2.97 3.230 3.80 3.350 3.03 3.110 3.19 3.400 3.46 3.100 2.54 2.070 3.62 2.640 2.97 3.230 2.97 3.230 3.59 3.860 3.62 2.640 3.19 3.400 3.13 3.400 2.99 3.470
compressions 52 181 5 18 188 170 76 154 104 33 12 129 55 66 45 169 130 7 37 152 80 111 131 171 179 138 156 113 161 89	Tatio horsepowe 9.0 6 9.2 15 8.5 11 9.5 4 10.0 10 9.3 11 9.4 6 9.0 6 9.0 16 9.2 7 9.0 12 10.0 28 9.4 10 22.0 7 9.6 7 9.3 11 8.7 9 8.5 11 9.0 8 9.0 6 7.5 11 8.4 9 8.7 9 9.3 11 9.0 8 9.0 6 7.5 11 8.4 9 9.0 7 9.3 16 9.0 7 9.3 16 9.0 7 9.3 16 9.0 7	8 5000 6 5200 9 5500 8 5100 9 5500 6 4800 8 5500 2 4800 9 5200 6 6000 1 4250 8 5750 1 6000 2 4200 0 5400 6 4800 5 5000 6 5500 5 5000 9 4900 0 4800 5 5000 0 4800 5 5000 0 4800 5 5000 0 4800 5 5000 0 4800	highwaympg 31

183	9.0	85	5250	27	34	
193	9.0	88	5500	25	31	
125	9.5	143	5500	19	27	
173	8.7	92	4200	29	34	
92	9.4	69	5200	31	37	
16	8.0	182	5400	16	22	
189	8.5	90	5500	24	29	
136	9.0	160	5500	19	26	
22	9.4	68	5500	31	38	
74	8.0	184	4500	14	16	
44	9.6	70	5400	38	43	
4	8.0	115	5500	18	22	
71	8.3	155	4750	16	18	
134	9.3	110	5250	21	28	
145	7.7	111	4800	24	29	
122	9.4	68	5500	31	38	
26	9.4	68	5500	31	38	
83	7.0	145	5000	19	24	
149	7.7	111	4800	23	23	
186	9.0	85	5250	27	34	
8	8.3	140	5500	17	20	
90	21.9	55	4800	45	50	

[52 rows x 25 columns]

y_test

price 52 6795.0 181 15750.0 5 15250.0 18 5151.0 188 9995.0 170 11199.0 76 5389.0 154 7898.0 104 17199.0 33 6529.0 12 20970.0 129 31400.5 55 10945.0 66 18344.0 8916.5 45 169 9989.0 130 9295.0 7 18920.0 37 7895.0 152 6488.0 80 9959.0 111 15580.0

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131
      9895.0
     11549.0
171
179
     15998.0
138
      5118.0
156
      6938.0
113
     16695.0
161
      8358.0
89
      5499.0
183
      7975.0
193
     12290.0
125
     22018.0
173
      8948.0
92
      6849.0
16
     41315.0
189
     11595.0
136
     18150.0
22
     6377.0
74
     45400.0
44
     8916.5
4
     17450.0
71
     34184.0
134
     15040.0
145
     11259.0
122
     7609.0
26
     7609.0
83
     14869.0
     11694.0
149
186
     8495.0
     23875.0
8
90
     7099.0
x_train.shape
(153, 25)
y train.shape
(153, 1)
x_test.shape
(52, 25)
y_test.shape
(52, 1)
subset1=d[["car ID",
"CarName", "fueltype", "drivewheel", "wheelbase", "carlength", "curbweight"
,"stroke","horsepower","highwaympg"]]
```

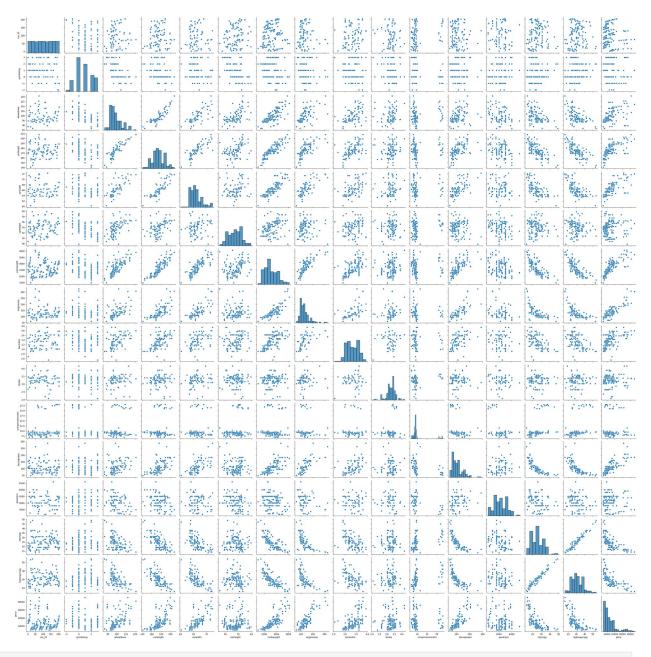
subs	et1					
whee	car_ID lbase \		CarName	fueltype	drivewheel	
0	1	alfa-rom	ero giulia	gas	rwd	88.6
1	2	alfa-rome	ro stelvio	gas	rwd	88.6
2	3 a	alfa-romero Qu	adrifoglio	gas	rwd	94.5
3	4	â	udi 100 ls	gas	fwd	99.8
4	5		audi 100ls	gas	4wd	99.4
200	201	volvo	145e (sw)	gas	rwd	109.1
201	202	V	olvo 144ea	gas	rwd	109.1
202	203	V	olvo 244dl	gas	rwd	109.1
203	204		volvo 246	diesel	rwd	109.1
204	205	V	olvo 264gl	gas	rwd	109.1
	comlona+h	a aughuaight	atraka be		h i ah yaymaa	
0 1 2 3 4	carlength 168.8 168.8 171.2 176.6	3 2548 3 2548 2 2823 5 2337 5 2824	2.68 2.68 3.47 3.40 3.40	orsepower 111 111 154 102 115	highwaympg 27 27 26 30 22	
200 201 202 203 204	188.8 188.8 188.8 188.8 188.8	3 2952 3 3049 3 3012 3 3217	3.15 3.15 2.87 3.40 3.15	114 160 134 106 114	28 25 23 27 25	
[205	rows x 10	columns]				
subs	et2=d.iloc	[0:100,0:26]				
subs	et2					
0 1 2 3	car_ID sy 1 2 3 4	/mboling 3 3 1 alfa 2	alfa-romer romero Qua-	ero giulia ro stelvio	gas gas	oiration \ std std std std std

	_						
4	5	2		audi 1	.00ls	gas	std
94	95	 1		nissan	leaf		std
95	96	1		nissan		gas gas	std
96	97	ī		nissan l	_	gas	std
97	98	1		nissan		gas	std
98	99	2		nissan cli		gas	std
						3	
	rnumber	carbody	drive	wheel engin	elocation		
wheelba		\			C	00.0	
0	two	convertible		rwd	front	88.6	
1	two	convertible		rwd	front	88.6	
_	CWO	CONVENCIBLE		ı wa	110116	0010	• • •
2	two	hatchback		rwd	front	94.5	
	_						
3	four	sedan		fwd	front	99.8	
4	four	sedan		4wd	front	99.4	
7	Tour	Scaan		-wu	TTOTIC	33.4	
94	two	sedan		fwd	front	94.5	
95	two	hatchback		fwd	front	94.5	
93	LWO	Hatchback		i wu	110110	94.5	
96	four	sedan		fwd	front	94.5	
	_						
97	four	wagon		fwd	front	94.5	
98	two	hardtop		fwd	front	95.1	
50	CWO	патасор		· wa	110110	33.1	• • •
	lindernu		size	fuelsystem	boreration	o stroke	
	ssionrat		120	e:	2.4	7 2 60	
0 9.0		Tour	130	mpfi	3.47	7 2.68	
1		four	130	mpfi	3.47	7 2.68	
9.0		1001	130	ШРІТ	314	2.00	
2		six	152	mpfi	2.68	3.47	
9.0				•			
3		four	109	mpfi	3.19	3.40	
10.0							
4		five	136	mpfi	3.19	9 3.40	
8.0							
• •							
 94		four	97	2bbl	3.1	5 3.29	
9.4		1001	31	2000	5.1.	5.23	
95		four	97	2bbl	3.1	5 3.29	

9.4		£	07	2661	2 15	2 20
96 9.4		four	97	2bbl	3.15	3.29
97		four	97	2bbl	3.15	3.29
9.4 98		four	97	2bbl	3.15	3.29
9.4						
subs	rows x 2	ver peakrpm 111 5000 111 5000 154 5000 102 5500 115 5500 69 5200 69 5200 69 5200 69 5200 69 5200 69 5200 125 columns	21 21 21 19 24 18 31 31 31 31 31	highwaympg 27 27 26 30 22 37 37 37 37 37	rivewheel","	wheelbase"]]
300.			Ca	rNama fualty	no dintivovihoo	l whoolboo
0	car_ID 1		a-romero g		as rw	rd 88.6
1 2	2		a-romero st ero Quadrif	-	as rw as rw	
2	4	acra rome	audi 1	00 ls g	as fw	rd 99.8
4	5		audi	3	as 4w 	
200	201		volvo 145e	(sw) g	as rw	rd 109.1
201 202	202 203		volvo volvo		as rw as rw	
203	204			o 246 dies	el rw	
204	205		volvo	264g t g	as rw	rd 109.1
[205	5 rows x	5 columns				
subs	set4=d[d	["fueltype'	']=="gas"]			
subs	set4					
asp	<pre>car_ID iration</pre>	symboling)	Car	Name fueltyp	e
0	1	3	B al	fa-romero gi	ulia ga	s std
1	2	3	3 alf	a-romero ste	lvio ga	s std

2	3	1 alfa	a-romero Quadr	rifoglio	gas	std
3	4	2	audi	. 100 ls	gas	std
4	5	2	aud	li 100ls	gas	std
199	200	-1	volvo	diesel	gas	turbo
200	201	-1	volvo 14	5e (sw)	gas	std
201	202	-1	volv	o 144ea	gas	turbo
202	203	-1	volv	o 244dl	gas	std
204	205	-1	volv	o 264gl	gas	turbo
\	doornumber	carbody	drivewheel er	iginelocation	n wneet	.base
0	two	convertible	rwd	front	t	88.6
1	two	convertible	rwd	front	t	88.6
2	two	hatchback	rwd	fron	t	94.5
3	four	sedan	fwd	fron	t	99.8
4	four	sedan	4wd	front	t	99.4
				• •		
199	four	wagon	rwd	front	t 1	104.3
200	four	sedan	rwd	front	t 1	109.1
201	four	sedan	rwd	front	t 1	109.1
202	four	sedan	rwd	front	t 1	109.1
204	four	sedan	rwd	front	t 1	109.1
		C - 1 1	h			
hors	enginesize sepower \	fuelsystem	boreratio s	stroke compre	essionra	3 τ10
0 111	130	mpfi	3.47	2.68		9.0
1 1 111	130	mpfi	3.47	2.68		9.0
111						

-	150	. .		2 60	2 47	2 2	
2 154	152	mpfi		2.68	3.47	9.0	
3	109	mpfi		3.19	3.40	10.0	
102	105	mp11		3.13	3.40	10.0	
4	136	mpfi		3.19	3.40	8.0	
115							
199	130	mpfi		3.62	3.15	7.5	
162	150	mp11		3.02	5.15	7.5	
200	141	mpfi		3.78	3.15	9.5	
114							
201	141	mpfi		3.78	3.15	8.7	
160 202	173	mpfi		3.58	2.87	8.8	
134	1/3	llibit		3.30	2.07	0.0	
204	141	mpfi		3.78	3.15	9.5	
114							
		و ما دوا دوا دوا دوا					
0	peakrpm cityn 5000	npg highway 21	111pg 27	price 13495.0			
0 1 2 3	5000	21	27	16500.0			
2	5000	19	26	16500.0			
3	5500	24	30	13950.0			
4	5500	18	22	17450.0			
199	5100	 17	22	18950.0			
200	5400	23	28	16845.0			
201	5300	19	25	19045.0			
202	5500	18	23	21485.0			
204	5400	19	25	22625.0			
[185 rows x 26 columns]							
<pre>import matplotlib.pyplot as plot</pre>							
import seaborn as sb							
sb.pairplot(d)							
<pre><seaborn.axisgrid.pairgrid 0x7f762eae3760="" at=""></seaborn.axisgrid.pairgrid></pre>							



sb.pairplot(d,hue="fueltype")

<seaborn.axisgrid.PairGrid at 0x7f7622d4e2e0>