OLS Regularization

June 19, 2022

[1]:
```
#From https://www.statology.org/ridge-regression-in-python/
#Big note, some of the process here are done with all the data, but normally␣
↪the data must be splitted.
```

[2]:
```
pip --version
```

```
pip 22.1.2 from C:\Users\Jesus\Anaconda3\lib\site-packages\pip (python 3.7)

Note: you may need to restart the kernel to use updated packages.
```

[3]:
```
import pandas as pd
from numpy import arange
import numpy as np
#Ridge Regression
from sklearn.linear_model import Ridge
from sklearn.linear_model import RidgeCV
from sklearn.model_selection import RepeatedKFold
from sklearn.model_selection import train_test_split
#LASSO
from sklearn.linear_model import Lasso
from sklearn.linear_model import LassoCV
#Elastic Net
from sklearn.linear_model import ElasticNet
from sklearn.linear_model import ElasticNetCV
#Normal OLS
import statsmodels.api as sm
#Model Evaluation
import sklearn.metrics as sk_met
from statsmodels.tools.tools import pinv_extended
```

```
C:\Users\Jesus\Anaconda3\lib\site-packages\statsmodels\tools\_testing.py:19:
FutureWarning: pandas.util.testing is deprecated. Use the functions in the
public API at pandas.testing instead.
  import pandas.util.testing as tm
```

[4]:
```
#define URL where data is located
url = "https://raw.githubusercontent.com/Statology/Python-Guides/main/mtcars.
↪csv"
```

```python

#read in data
data_full = pd.read_csv(url)

#select subset of data
data = data_full[["mpg", "wt", "drat", "qsec", "hp"]]

#view first six rows of data
data[0:6]
```

[4]:

	mpg	wt	drat	qsec	hp
0	21.0	2.620	3.90	16.46	110
1	21.0	2.875	3.90	17.02	110
2	22.8	2.320	3.85	18.61	93
3	21.4	3.215	3.08	19.44	110
4	18.7	3.440	3.15	17.02	175
5	18.1	3.460	2.76	20.22	105

[5]:
```python
#Variable Split
X = data[["mpg", "wt", "drat", "qsec"]]
Y = data["hp"]
```

[6]:
```python
#Variable Split
X = data[["mpg", "wt", "drat", "qsec"]]
Y = data["hp"]

x_tr, x_ts, y_tr, y_ts = train_test_split(X, Y, test_size = 0.3, random_state =␣
↪2020)

#define cross-validation method to evaluate model
cv = RepeatedKFold(n_splits=10, n_repeats=3, random_state=1)

#define model
model = RidgeCV(alphas=arange(0, 10, 0.01), cv=cv,␣
↪scoring='neg_mean_squared_error')

#fit model
model.fit(x_tr, y_tr)

#display lambda that produced the lowest test MSE
print(model.alpha_)
```

```
9.99
```

[7]:
```python
y_pred = model.predict(x_ts)
print(model.coef_)
print(model.intercept_)
```

```python
print(model.feature_names_in_)
#Regression metrics
print("Explained Variance Score", sk_met.explained_variance_score(y_ts, y_pred))
print("Maximum Residual Error", sk_met.max_error(y_ts, y_pred))
print("R2 Score", sk_met.r2_score(y_ts, y_pred))
print("Mean Squared Error", sk_met.mean_squared_error(y_ts, y_pred))
print("Mean Absolute Error", sk_met.mean_absolute_error(y_ts, y_pred))
print("Mean Absolute Percentage Error", sk_met.
 ↪mean_absolute_percentage_error(y_ts, y_pred))
```

```
[ -6.23051378   6.05441872   0.34964483 -16.79973184]
556.0580370821446
['mpg' 'wt' 'drat' 'qsec']
Explained Variance Score 0.8747505820794923
Maximum Residual Error 48.35017105548184
R2 Score 0.793391225298731
Mean Squared Error 670.4124165016658
Mean Absolute Error 21.07904142090872
Mean Absolute Percentage Error 0.21081853685796048
```

[8]:
```python
#Ridge Regression with Statsmodel
#Normal OLS
X = sm.add_constant(X)
modelt = sm.OLS(Y, X)
#results = modelt.fit()
#results.params
n = X.shape[0]
penalty = np.array([0, 1., 1., 1., 1.]) / n
result2 = modelt.fit_regularized(alpha = penalty, L1_wt = 0)
print(result2.params)
```

```
C:\Users\Jesus\Anaconda3\lib\site-packages\statsmodels\tsa\tsatools.py:117:
FutureWarning: In a future version of pandas all arguments of concat except for
the argument 'objs' will be keyword-only
  x = pd.concat(x[::order], 1)
```

```
[493.43640225  -3.45547703  21.76947228   3.13962063 -20.09417385]
```

[9]:
```python
#Ridge Regression with Prediction
#define new observation
new = [24, 2.5, 3.5, 18.5]

#predict hp value using ridge regression model
model.predict([new])
```

```
C:\Users\Jesus\Anaconda3\lib\site-packages\sklearn\base.py:451: UserWarning: X
does not have valid feature names, but RidgeCV was fitted with feature names
  "X does not have valid feature names, but"
```

[9]: array([112.09047112])

[10]:
```
X = data[["mpg", "wt", "drat", "qsec"]]
Y = data["hp"]

x_tr, x_ts, y_tr, y_ts = train_test_split(X, Y, test_size = 0.3, random_state =␣
↪2020)

model_ridge = Ridge(alpha = 1, random_state = 1)

model_ridge.fit(x_tr, y_tr)
print(model_ridge.coef_)
print(model_ridge.intercept_)
print(model_ridge.feature_names_in_)
```

```
[ -3.99826993  20.76988821   2.91362711 -20.43485568]
518.8694662891259
['mpg' 'wt' 'drat' 'qsec']
```

[11]:
```
y_pred = model_ridge.predict(x_ts)
#Regression metrics
print("Explained Variance Score", sk_met.explained_variance_score(y_ts, y_pred))
print("Maximum Residual Error", sk_met.max_error(y_ts, y_pred))
print("R2 Score", sk_met.r2_score(y_ts, y_pred))
print("Mean Squared Error", sk_met.mean_squared_error(y_ts, y_pred))
print("Mean Absolute Error", sk_met.mean_absolute_error(y_ts, y_pred))
print("Mean Absolute Percentage Error", sk_met.
↪mean_absolute_percentage_error(y_ts, y_pred))
```

```
Explained Variance Score 0.8767637178401011
Maximum Residual Error 48.18112847869912
R2 Score 0.81515133584374
Mean Squared Error 599.8043394007989
Mean Absolute Error 20.189988510763442
Mean Absolute Percentage Error 0.18881405012297103
```

[12]:
```
#Recreating with Statsmodels
#https://stackoverflow.com/questions/72260808/
↪mismatch-between-statsmodels-and-sklearn-ridge-regression
#Normal OLS
n = x_tr.shape[0]
penalty = np.array([0, 1., 1., 1., 1.]) / n
x_tr = sm.add_constant(x_tr)
model_sm = sm.OLS(y_tr, x_tr)
result1 = model_sm.fit_regularized(alpha = penalty, L1_wt = 0)
print(result1.params)
```

```
[518.86946629  -3.99826993  20.76988821   2.91362711 -20.43485568]
```

```
C:\Users\Jesus\Anaconda3\lib\site-packages\statsmodels\tsa\tsatools.py:117:
FutureWarning: In a future version of pandas all arguments of concat except for
the argument 'objs' will be keyword-only
  x = pd.concat(x[::order], 1)
```

[13]:
```
#https://stackoverflow.com/questions/40072870/
↪statistical-summary-table-in-sklearn-linear-model-ridge
pinv_wexog,_ = pinv_extended(model_sm.wexog)
normalized_cov_params = np.dot(pinv_wexog, np.transpose(pinv_wexog))


final = sm.regression.linear_model.OLSResults(model_sm,
                                  result1.params,
                                  normalized_cov_params)
#print(final.summary())
x_ts = sm.add_constant(x_ts)
#x = X_test
#R2 = r2_score(y_ts, final.predict(x_ts))

p = final.pvalues
t = final.tvalues

#print(R2)
print(p)
print(t)
```

```
[2.27392005e-03 2.47775764e-01 3.23175362e-01 8.92685200e-01
 8.82654355e-04]
[ 3.58663387 -1.19688651  1.01750744  0.13694225 -4.02273092]
```

[14]:
```
X = data[["mpg", "wt", "drat", "qsec"]]
Y = data["hp"]

#LASSO
x_tr, x_ts, y_tr, y_ts = train_test_split(X, Y, test_size = 0.3, random_state =␣
↪2020)

model_lasso = Lasso(alpha = 1, random_state = 1)

model_lasso.fit(x_tr, y_tr)
print(model_lasso.coef_)
print(model_lasso.intercept_)
print(model_lasso.feature_names_in_)
```

```
[ -3.87153052  20.30345045   0.         -20.58855003]
531.0201741853589
['mpg' 'wt' 'drat' 'qsec']
```

[15]:
```python
#LASSO CV
#define cross-validation method to evaluate model
cv = RepeatedKFold(n_splits=10, n_repeats=3, random_state=1)

#define model
model_lcv = LassoCV(alphas=arange(0, 1, 0.01), cv=cv)

#fit model
model_lcv.fit(X, Y)

#display lambda that produced the lowest test MSE
print(model_lcv.alpha_)
print(model_lcv.coef_)
print(model_lcv.intercept_)
print(model_lcv.feature_names_in_)
```

```
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
```

```
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
```

```
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
```

```
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
```

```
0.99
[ -3.5078467   19.96671583   0.          -19.98996416]
509.7202889655141
['mpg' 'wt' 'drat' 'qsec']
```

[16]:
```
X = data[["mpg", "wt", "drat", "qsec"]]
Y = data["hp"]

#Elastic Net
x_tr, x_ts, y_tr, y_ts = train_test_split(X, Y, test_size = 0.3, random_state =␣
 ↪1)

model_net = ElasticNet(l1_ratio = .99, alpha = .99, random_state = 1)

model_net.fit(x_tr, y_tr)
print(model_net.coef_)
print(model_net.intercept_)
print(model_net.feature_names_in_)
```

```
[-10.37741725   1.65982667  -0.          -15.08990138]
614.222115111239
['mpg' 'wt' 'drat' 'qsec']
```

[17]:
```python
X = data[["mpg", "wt", "drat", "qsec"]]
Y = data["hp"]

#Elastic Net CV
#define cross-validation method to evaluate model
cv = RepeatedKFold(n_splits=10, n_repeats=3, random_state=1)

#define model
model_netcv = ElasticNetCV(l1_ratio = [.1, .5, .7, .9, .95, .99, 1],␣
 ↪alphas=arange(0, 1, 0.01), cv=cv)

#fit model
model_netcv.fit(X, Y)

#display lambda that produced the lowest test MSE
print(model_netcv.alpha_)
print(model_netcv.l1_ratio_)
print(model_netcv.coef_)
print(model_netcv.intercept_)
print(model_netcv.feature_names_in_)
```

```
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
```

```
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations.
Duality gap: 6627.821715886326, tolerance: 10.659275862068965
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
```

```
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
```

```
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations.
Duality gap: 12262.26473362821, tolerance: 11.509525
  positive,
```

```
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
```

```
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
```

```
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
```

```
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
```

```
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
```

```
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
```

```
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
```

```
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
```

```
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
```

```
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
```

```
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations.
Duality gap: 8077.759620884011, tolerance: 9.765482758620688
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
```

```
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
```

```
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
```

```
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations.
Duality gap: 6627.821715886355, tolerance: 10.659275862068965
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
```

```
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
```

```
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
```

```
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
```

```
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
```

```
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
```

```
0.99
0.99
[ -3.67854637  18.92743529   0.         -19.78821062]
512.892328805623
['mpg' 'wt' 'drat' 'qsec']
```

```
C:\Users\Jesus\Anaconda3\lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:644: UserWarning:
Coordinate descent with alpha=0 may lead to unexpected results and is
discouraged.
  positive,
```

[ ]:

```

```

[ ]:

```

```