In [1]:

```
import numpy as np
from sklearn.base import BaseEstimator,TransformerMixin, ClassifierMixin
from sklearn.preprocessing import LabelEncoder
import xgboost as xgb
import pandas as pd # data processing, CSV file I/O (e.g. pd.read_csv)
from sklearn.linear_model import ElasticNetCV, LassoLarsCV
from sklearn.ensemble import GradientBoostingRegressor
from sklearn.pipeline import make_pipeline, make_union
from sklearn.utils import check_array
from sklearn.preprocessing import StandardScaler
from sklearn.tree import DecisionTreeRegressor
from sklearn.random_projection import GaussianRandomProjection
from sklearn.random_projection import SparseRandomProjection
from sklearn.decomposition import PCA, FastICA
from sklearn.decomposition import TruncatedSVD
from sklearn.metrics import r2_score



class StackingEstimator(BaseEstimator, TransformerMixin):

    def __init__(self, estimator):
        self.estimator = estimator

    def fit(self, X, y=None, **fit_params):
        self.estimator.fit(X, y, **fit_params)
        return self
    def transform(self, X):
        X = check_array(X)
        X_transformed = np.copy(X)
        # add class probabilities as a synthetic feature
        if issubclass(self.estimator.__class__, ClassifierMixin) and
hasattr(self.estimator, 'predict_proba'):
            X_transformed = np.hstack((self.estimator.predict_proba(X), X))

        # add class prodiction as a synthetic feature
        X_transformed = np.hstack((np.reshape(self.estimator.predict(X), (-
1, 1)), X_transformed))

        return X_transformed


train = pd.read_csv('train.csv')
test = pd.read_csv('test.csv')
print(train)
```

```
D:\Anaconda3\lib\site-packages\sklearn\cross_validation.py:44: DeprecationW
arning: This module was deprecated in version 0.18 in favor of the model_se
lection module into which all the refactored classes and functions are move
d. Also note that the interface of the new CV iterators are different from
that of this module. This module will be removed in 0.20.
  "This module will be removed in 0.20.", DeprecationWarning)
```

```
        ID       y  X0  X1  X2 X3 X4  X5 X6 X8  ...   X375  X376  X377  X378
\
0        0  130.81   k   v  at  a  d   u  j  o  ...      0     0     1     0
```

1	6	88.53	k	t	av	e	d	y	l	o	...	1	0	0	(
2	7	76.26	az	w	n	c	d	x	j	x	...	0	0	0	(
3	9	80.62	az	t	n	f	d	x	l	e	...	0	0	0	(
4	13	78.02	az	v	n	f	d	h	d	n	...	0	0	0	(
5	18	92.93	t	b	e	c	d	g	h	s	...	0	0	1	(
6	24	128.76	al	r	e	f	d	f	h	s	...	0	0	0	(
7	25	91.91	o	l	as	f	d	f	j	a	...	0	0	0	(
8	27	108.67	w	s	as	e	d	f	i	h	...	1	0	0	(
9	30	126.99	j	b	aq	c	d	f	a	e	...	0	0	1	(
10	31	102.09	h	r	r	f	d	f	h	p	...	0	0	0	(
11	32	98.12	al	r	e	f	d	f	h	o	...	0	0	0	(
12	34	82.62	s	b	ai	c	d	f	g	m	...	0	0	1	(
13	36	94.12	al	r	e	f	d	j	h	o	...	0	0	0	(
14	37	99.15	o	s	as	e	d	j	g	m	...	1	0	0	(
15	38	93.64	n	l	ak	f	d	j	d	k	...	0	0	0	(
16	39	106.10	al	r	e	f	d	j	h	o	...	0	0	0	(
17	40	114.13	ay	aa	as	c	d	j	c	d	...	0	0	1	(
18	44	89.81	f	c	m	c	d	j	d	e	...	0	0	1	(
19	47	90.81	n	a	ak	f	d	j	i	s	...	0	0	0	(
20	48	90.56	f	s	m	c	d	j	j	i	...	0	0	1	(
21	49	94.57	t	aa	as	d	d	j	j	s	...	0	1	0	(
22	50	108.14	x	r	a	b	d	j	j	o	...	1	0	0	(
23	52	120.77	x	b	m	c	d	j	j	n	...	0	0	1	(
24	54	84.84	y	r	ak	d	d	j	d	s	...	0	0	0	(
25	60	93.59	o	s	m	c	d	j	i	v	...	0	0	1	(
26	61	104.07	aj	l	as	f	d	j	g	j	...	0	0	0	(
27	62	89.37	t	aa	as	c	d	j	d	b	...	1	0	0	(
28	66	90.08	f	s	as	c	d	j	c	q	...	1	0	0	(
29	67	128.19	x	b	m	c	d	j	j	n	...	0	0	1	(
...	...	...	..	..	..	..	..	..	..	..	...	...	...	...	..
4179	8354	85.93	al	a	ak	f	d	aa	l	t	...	0	0	0	(
4180	8356	90.45	ba	v	ai	a	d	aa	l	a	...	0	0	1	(
4181	8357	90.06	y	r	as	f	d	aa	g	v	...	0	0	0	(

4182	8362	90.38	z	v	ae	c	d	aa	g	r	...	1	0	0	(
4183	8367	95.56	z	aa	m	c	d	aa	l	s	...	1	0	0	(
4184	8368	109.00	w	s	as	c	d	aa	d	i	...	1	0	0	(
4185	8369	109.64	ak	v	ao	d	d	aa	g	p	...	0	1	0	(
4186	8371	131.98	j	f	ar	a	d	aa	j	n	...	0	0	1	(
4187	8373	98.15	aj	l	ae	f	d	aa	j	j	...	0	0	0	(
4188	8374	102.33	f	s	as	a	d	aa	d	t	...	0	0	1	(
4189	8375	102.42	aj	s	as	c	d	aa	d	q	...	1	0	0	(
4190	8378	89.11	n	s	ae	c	d	aa	j	f	...	1	0	0	(
4191	8382	88.93	z	v	ae	c	d	aa	d	r	...	1	0	0	(
4192	8383	103.03	aj	l	as	f	d	aa	j	n	...	0	0	0	(
4193	8384	107.24	ak	v	aw	c	d	aa	d	r	...	0	0	0	(
4194	8385	91.13	z	o	as	f	d	aa	i	j	...	0	0	0	(
4195	8387	86.23	o	l	ae	f	d	aa	g	j	...	0	0	0	(
4196	8390	99.93	y	o	m	f	d	aa	l	y	...	0	0	0	(
4197	8392	89.25	z	v	ae	c	d	aa	d	r	...	1	0	0	(
4198	8393	97.09	aw	a	ak	f	d	aa	h	o	...	0	0	0	(
4199	8395	88.24	t	aa	ay	c	d	aa	l	o	...	1	0	0	(
4200	8397	108.59	z	aa	e	c	d	aa	i	w	...	1	0	0	(
4201	8399	107.39	w	v	t	d	d	aa	h	g	...	0	1	0	(
4202	8402	123.34	ap	l	s	c	d	aa	d	r	...	0	0	0	(
4203	8403	85.71	aq	s	as	c	d	aa	a	g	...	1	0	0	(
4204	8405	107.39	ak	s	as	c	d	aa	d	q	...	1	0	0	(
4205	8406	108.77	j	o	t	d	d	aa	h	h	...	0	1	0	(
4206	8412	109.22	ak	v	r	a	d	aa	g	e	...	0	0	1	(
4207	8415	87.48	al	r	e	f	d	aa	l	u	...	0	0	0	(
4208	8417	110.85	z	r	ae	c	d	aa	g	w	...	1	0	0	(

	X379	X380	X382	X383	X384	X385
0	0	0	0	0	0	0
1	0	0	0	0	0	0
2	0	0	1	0	0	0

3	0	0	0	0	0	0
4	0	0	0	0	0	0
5	0	0	0	0	0	0
6	0	0	0	0	0	0
7	0	0	0	0	0	0
8	0	0	0	0	0	0
9	0	0	0	0	0	0
10	0	0	0	0	0	0
11	0	0	0	0	0	0
12	0	0	0	0	0	0
13	0	0	0	0	0	0
14	0	0	0	0	0	0
15	0	0	0	0	0	0
16	0	0	0	0	0	0
17	0	0	0	0	0	0
18	0	0	0	0	0	0
19	0	0	0	0	0	0
20	0	0	0	0	0	0
21	0	0	0	0	0	0
22	0	0	0	0	0	0
23	0	0	0	0	0	0
24	0	0	0	0	0	0
25	0	0	0	0	0	0
26	0	0	0	0	0	0
27	0	0	0	0	0	0
28	0	0	0	0	0	0
29	0	0	0	0	0	0
...	...	...	...	...	...	...
4179	0	0	0	0	0	0
4180	0	0	0	0	0	0
4181	0	0	0	0	0	0
4182	0	0	0	0	0	0
4183	0	0	0	0	0	0
4184	0	0	0	0	0	0
4185	0	0	0	0	0	0
4186	0	0	0	0	0	0
4187	0	0	0	0	0	0
4188	0	0	0	0	0	0
4189	0	0	0	0	0	0
4190	0	0	0	0	0	0
4191	0	0	0	0	0	0
4192	0	0	0	0	0	0
4193	0	0	0	0	0	0
4194	0	0	0	0	0	0
4195	0	0	0	0	0	0
4196	0	0	0	0	0	0
4197	0	0	0	0	0	0
4198	0	0	0	0	0	0
4199	0	0	0	0	0	0
4200	0	0	0	0	0	0
4201	0	0	0	0	0	0
4202	0	0	0	0	0	0
4203	0	0	0	0	0	0
4204	0	0	0	0	0	0
4205	0	0	0	0	0	0
4206	0	0	0	0	0	0
4207	0	0	0	0	0	0
4208	0	0	0	0	0	0

[4209 rows x 378 columns]

In [7]:

```
for c in train.columns:
    if train[c].dtype == 'object':
        lbl = LabelEncoder()
        lbl.fit(list(train[c].values) + list(test[c].values))
        train[c] = lbl.transform(list(train[c].values))
        test[c] = lbl.transform(list(test[c].values))



n_comp = 12

# tSVD
tsvd = TruncatedSVD(n_components=n_comp, random_state=420)
tsvd_results_train = tsvd.fit_transform(train.drop(["y"], axis=1))
tsvd_results_test = tsvd.transform(test)

# PCA
pca = PCA(n_components=n_comp, random_state=420)
pca2_results_train = pca.fit_transform(train.drop(["y"], axis=1))
pca2_results_test = pca.transform(test)

# ICA
ica = FastICA(n_components=n_comp, random_state=420)
ica2_results_train = ica.fit_transform(train.drop(["y"], axis=1))
ica2_results_test = ica.transform(test)

# GRP
grp = GaussianRandomProjection(n_components=n_comp, eps=0.1, random_state=4
20)
grp_results_train = grp.fit_transform(train.drop(["y"], axis=1))
grp_results_test = grp.transform(test)

# SRP
srp = SparseRandomProjection(n_components=n_comp, dense_output=True, random
_state=420)
srp_results_train = srp.fit_transform(train.drop(["y"], axis=1))
srp_results_test = srp.transform(test)

#save columns list before adding the decomposition components

usable_columns = list(set(train.columns) - set(['y']))

# Append decomposition components to datasets
for i in range(1, n_comp + 1):
    train['pca_' + str(i)] = pca2_results_train[:, i - 1]
    test['pca_' + str(i)] = pca2_results_test[:, i - 1]

    train['ica_' + str(i)] = ica2_results_train[:, i - 1]
    test['ica_' + str(i)] = ica2_results_test[:, i - 1]

    train['tsvd_' + str(i)] = tsvd_results_train[:, i - 1]
    test['tsvd_' + str(i)] = tsvd_results_test[:, i - 1]

    train['grp_' + str(i)] = grp_results_train[:, i - 1]
    test['grp_' + str(i)] = grp_results_test[:, i - 1]

    train['srp_' + str(i)] = srp_results_train[:, i - 1]
```

```
    train['srp_' + str(i)] = srp_results_train[:, i - 1]
    test['srp_' + str(i)] = srp_results_test[:, i - 1]

#usable_columns = list(set(train.columns) - set(['y']))

y_train = train['y'].values
y_mean = np.mean(y_train)
id_test = test['ID'].values
#finaltrainset and finaltestset are data to be used only the stacked model
(does not contain PCA, SVD... arrays)
finaltrainset = train[usable_columns].values
finaltestset = test[usable_columns].values


'''Train the xgb model then predict the test data'''

xgb_params = {
   'n_trees': 365,
    'eta': 0.2,#0.0045
    'max_depth': 8,
    'subsample': 0.75,
    'objective': 'reg:linear',
    'eval_metric': 'rmse',
    'base_score': y_mean, # base prediction = mean(target)
    'silent': 1
}
# NOTE: Make sure that the class is labeled 'class' in the data file

dtrain = xgb.DMatrix(train.drop('y', axis=1), y_train)
dtest = xgb.DMatrix(test)

num_boost_rounds = 1250
# train model
model = xgb.train(dict(xgb_params, silent=0), dtrain,
num_boost_round=num_boost_rounds)
y_pred = model.predict(dtest)

'''Train the stacked models then predict the test data'''

stacked_pipeline = make_pipeline(
    StackingEstimator(estimator=LassoLarsCV(normalize=True)),
    StackingEstimator(estimator=GradientBoostingRegressor(learning_rate=0.0
01, loss="huber", max_depth=3, max_features=0.55, min_samples_leaf=18, min_
samples_split=14, subsample=0.7)),
    LassoLarsCV()

)


stacked_pipeline.fit(finaltrainset, y_train)
results = stacked_pipeline.predict(finaltestset)

'''R2 Score on the entire Train data when averaging'''

print('R2 score on train data:')
print(r2_score(y_train,stacked_pipeline.predict(finaltrainset)*0.2855 + mod
el.predict(dtrain)*0.7145))

'''Average the preditionon test data  of both models then save it on a csv
file'''
```

```
sub = pd.DataFrame()
sub['ID'] = id_test
sub['y'] = y_pred*0.75 + results*0.25
sub.to_csv('stacked-models1.csv', index=False)


# Any results you write to the current directory are saved as output.
```

```
D:\Anaconda3\lib\site-packages\sklearn\decomposition\fastica_.py:116: UserW
arning: FastICA did not converge. Consider increasing tolerance or the maxi
mum number of iterations.
  warnings.warn('FastICA did not converge. Consider increasing '
D:\Anaconda3\lib\site-packages\sklearn\linear_model\least_angle.py:309: Con
vergenceWarning: Regressors in active set degenerate. Dropping a regressor,
after 12 iterations, i.e. alpha=1.511e-02, with an active set of 12 regress
ors, and the smallest cholesky pivot element being 1.490e-08
  ConvergenceWarning)
D:\Anaconda3\lib\site-packages\sklearn\linear_model\least_angle.py:377: Run
timeWarning: overflow encountered in true_divide
  g1 = arrayfuncs.min_pos((C - Cov) / (AA - corr_eq_dir + tiny))
D:\Anaconda3\lib\site-packages\sklearn\linear_model\least_angle.py:309: Con
vergenceWarning: Regressors in active set degenerate. Dropping a regressor,
after 17 iterations, i.e. alpha=9.614e-03, with an active set of 15 regress
ors, and the smallest cholesky pivot element being 1.490e-08
  ConvergenceWarning)
D:\Anaconda3\lib\site-packages\sklearn\linear_model\least_angle.py:309: Con
vergenceWarning: Regressors in active set degenerate. Dropping a regressor,
after 17 iterations, i.e. alpha=9.614e-03, with an active set of 15 regress
ors, and the smallest cholesky pivot element being 1.054e-08
  ConvergenceWarning)
D:\Anaconda3\lib\site-packages\sklearn\linear_model\least_angle.py:309: Con
vergenceWarning: Regressors in active set degenerate. Dropping a regressor,
after 32 iterations, i.e. alpha=5.253e-03, with an active set of 30 regress
ors, and the smallest cholesky pivot element being 2.220e-16
  ConvergenceWarning)
D:\Anaconda3\lib\site-packages\sklearn\linear_model\least_angle.py:309: Con
vergenceWarning: Regressors in active set degenerate. Dropping a regressor,
after 32 iterations, i.e. alpha=5.253e-03, with an active set of 30 regress
ors, and the smallest cholesky pivot element being 1.490e-08
  ConvergenceWarning)
D:\Anaconda3\lib\site-packages\sklearn\linear_model\least_angle.py:334: Con
vergenceWarning: Early stopping the lars path, as the residues are small an
d the current value of alpha is no longer well controlled. 33 iterations, a
lpha=5.241e-03, previous alpha=5.197e-03, with an active set of 30 regresso
rs.
  ConvergenceWarning)
D:\Anaconda3\lib\site-packages\sklearn\linear_model\least_angle.py:309: Con
vergenceWarning: Regressors in active set degenerate. Dropping a regressor,
after 9 iterations, i.e. alpha=1.788e-02, with an active set of 9 regressor
s, and the smallest cholesky pivot element being 1.490e-08
  ConvergenceWarning)
D:\Anaconda3\lib\site-packages\sklearn\linear_model\least_angle.py:309: Con
vergenceWarning: Regressors in active set degenerate. Dropping a regressor,
after 16 iterations, i.e. alpha=9.467e-03, with an active set of 14 regress
ors, and the smallest cholesky pivot element being 1.825e-08
  ConvergenceWarning)
D:\Anaconda3\lib\site-packages\sklearn\linear_model\least_angle.py:309: Con
vergenceWarning: Regressors in active set degenerate. Dropping a regressor,
after 17 iterations, i.e. alpha=9.418e-03, with an active set of 15 regress
ors, and the smallest cholesky pivot element being 1.490e-08
```

```
  ConvergenceWarning)
D:\Anaconda3\lib\site-packages\sklearn\linear_model\least_angle.py:309: Con
vergenceWarning: Regressors in active set degenerate. Dropping a regressor,
after 17 iterations, i.e. alpha=9.418e-03, with an active set of 15 regress
ors, and the smallest cholesky pivot element being 2.220e-16
  ConvergenceWarning)
D:\Anaconda3\lib\site-packages\sklearn\linear_model\least_angle.py:309: Con
vergenceWarning: Regressors in active set degenerate. Dropping a regressor,
after 19 iterations, i.e. alpha=8.942e-03, with an active set of 17 regress
ors, and the smallest cholesky pivot element being 2.220e-16
  ConvergenceWarning)
D:\Anaconda3\lib\site-packages\sklearn\linear_model\least_angle.py:309: Con
vergenceWarning: Regressors in active set degenerate. Dropping a regressor,
after 19 iterations, i.e. alpha=8.942e-03, with an active set of 17 regress
ors, and the smallest cholesky pivot element being 2.107e-08
  ConvergenceWarning)
D:\Anaconda3\lib\site-packages\sklearn\linear_model\least_angle.py:309: Con
vergenceWarning: Regressors in active set degenerate. Dropping a regressor,
after 19 iterations, i.e. alpha=8.942e-03, with an active set of 17 regress
ors, and the smallest cholesky pivot element being 1.490e-08
  ConvergenceWarning)
D:\Anaconda3\lib\site-packages\sklearn\linear_model\least_angle.py:334: Con
vergenceWarning: Early stopping the lars path, as the residues are small an
d the current value of alpha is no longer well controlled. 21 iterations, a
lpha=8.911e-03, previous alpha=8.899e-03, with an active set of 18 regresso
rs.
  ConvergenceWarning)
D:\Anaconda3\lib\site-packages\sklearn\linear_model\least_angle.py:309: Con
vergenceWarning: Regressors in active set degenerate. Dropping a regressor,
after 7 iterations, i.e. alpha=1.774e-02, with an active set of 7 regressor
s, and the smallest cholesky pivot element being 2.220e-16
  ConvergenceWarning)
D:\Anaconda3\lib\site-packages\sklearn\linear_model\least_angle.py:309: Con
vergenceWarning: Regressors in active set degenerate. Dropping a regressor,
after 11 iterations, i.e. alpha=1.278e-02, with an active set of 11 regress
ors, and the smallest cholesky pivot element being 2.220e-16
  ConvergenceWarning)
D:\Anaconda3\lib\site-packages\sklearn\linear_model\least_angle.py:309: Con
vergenceWarning: Regressors in active set degenerate. Dropping a regressor,
after 12 iterations, i.e. alpha=1.266e-02, with an active set of 12 regress
ors, and the smallest cholesky pivot element being 1.490e-08
  ConvergenceWarning)
D:\Anaconda3\lib\site-packages\sklearn\linear_model\least_angle.py:309: Con
vergenceWarning: Regressors in active set degenerate. Dropping a regressor,
after 13 iterations, i.e. alpha=1.204e-02, with an active set of 13 regress
ors, and the smallest cholesky pivot element being 1.490e-08
  ConvergenceWarning)
D:\Anaconda3\lib\site-packages\sklearn\linear_model\least_angle.py:309: Con
vergenceWarning: Regressors in active set degenerate. Dropping a regressor,
after 16 iterations, i.e. alpha=8.797e-03, with an active set of 16 regress
ors, and the smallest cholesky pivot element being 2.220e-16
  ConvergenceWarning)
D:\Anaconda3\lib\site-packages\sklearn\linear_model\least_angle.py:381: Run
timeWarning: overflow encountered in true_divide
  g2 = arrayfuncs.min_pos((C + Cov) / (AA + corr_eq_dir + tiny))
D:\Anaconda3\lib\site-packages\sklearn\linear_model\least_angle.py:309: Con
vergenceWarning: Regressors in active set degenerate. Dropping a regressor,
after 19 iterations, i.e. alpha=8.119e-03, with an active set of 19 regress
ors, and the smallest cholesky pivot element being 1.490e-08
  ConvergenceWarning)
```

```
D:\Anaconda3\lib\site-packages\sklearn\linear_model\least_angle.py:309: Con
vergenceWarning: Regressors in active set degenerate. Dropping a regressor,
after 19 iterations, i.e. alpha=8.119e-03, with an active set of 19 regress
ors, and the smallest cholesky pivot element being 1.054e-08
  ConvergenceWarning)
D:\Anaconda3\lib\site-packages\sklearn\linear_model\least_angle.py:309: Con
vergenceWarning: Regressors in active set degenerate. Dropping a regressor,
after 24 iterations, i.e. alpha=7.401e-03, with an active set of 24 regress
ors, and the smallest cholesky pivot element being 2.356e-08
  ConvergenceWarning)
D:\Anaconda3\lib\site-packages\sklearn\linear_model\least_angle.py:309: Con
vergenceWarning: Regressors in active set degenerate. Dropping a regressor,
after 24 iterations, i.e. alpha=7.401e-03, with an active set of 24 regress
ors, and the smallest cholesky pivot element being 2.220e-16
  ConvergenceWarning)
D:\Anaconda3\lib\site-packages\sklearn\linear_model\least_angle.py:309: Con
vergenceWarning: Regressors in active set degenerate. Dropping a regressor,
after 29 iterations, i.e. alpha=6.376e-03, with an active set of 27 regress
ors, and the smallest cholesky pivot element being 2.220e-16
  ConvergenceWarning)
D:\Anaconda3\lib\site-packages\sklearn\linear_model\least_angle.py:309: Con
vergenceWarning: Regressors in active set degenerate. Dropping a regressor,
after 29 iterations, i.e. alpha=6.375e-03, with an active set of 27 regress
ors, and the smallest cholesky pivot element being 2.220e-16
  ConvergenceWarning)
D:\Anaconda3\lib\site-packages\sklearn\linear_model\least_angle.py:309: Con
vergenceWarning: Regressors in active set degenerate. Dropping a regressor,
after 30 iterations, i.e. alpha=6.301e-03, with an active set of 28 regress
ors, and the smallest cholesky pivot element being 1.490e-08
  ConvergenceWarning)
D:\Anaconda3\lib\site-packages\sklearn\linear_model\least_angle.py:309: Con
vergenceWarning: Regressors in active set degenerate. Dropping a regressor,
after 31 iterations, i.e. alpha=5.786e-03, with an active set of 29 regress
ors, and the smallest cholesky pivot element being 1.490e-08
  ConvergenceWarning)
D:\Anaconda3\lib\site-packages\sklearn\linear_model\least_angle.py:309: Con
vergenceWarning: Regressors in active set degenerate. Dropping a regressor,
after 36 iterations, i.e. alpha=5.319e-03, with an active set of 34 regress
ors, and the smallest cholesky pivot element being 1.054e-08
  ConvergenceWarning)
D:\Anaconda3\lib\site-packages\sklearn\linear_model\least_angle.py:309: Con
vergenceWarning: Regressors in active set degenerate. Dropping a regressor,
after 43 iterations, i.e. alpha=4.687e-03, with an active set of 41 regress
ors, and the smallest cholesky pivot element being 1.054e-08
  ConvergenceWarning)
D:\Anaconda3\lib\site-packages\sklearn\linear_model\least_angle.py:309: Con
vergenceWarning: Regressors in active set degenerate. Dropping a regressor,
after 56 iterations, i.e. alpha=4.242e-03, with an active set of 52 regress
ors, and the smallest cholesky pivot element being 4.470e-08
  ConvergenceWarning)
D:\Anaconda3\lib\site-packages\sklearn\linear_model\least_angle.py:309: Con
vergenceWarning: Regressors in active set degenerate. Dropping a regressor,
after 56 iterations, i.e. alpha=4.242e-03, with an active set of 52 regress
ors, and the smallest cholesky pivot element being 1.490e-08
  ConvergenceWarning)
D:\Anaconda3\lib\site-packages\sklearn\linear_model\least_angle.py:334: Con
vergenceWarning: Early stopping the lars path, as the residues are small an
d the current value of alpha is no longer well controlled. 59 iterations, a
lpha=4.299e-03, previous alpha=4.188e-03, with an active set of 52 regresso
rs.
  ConvergenceWarning)
```

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  ConvergenceWarning)
D:\Anaconda3\lib\site-packages\sklearn\linear_model\least_angle.py:309: Con
vergenceWarning: Regressors in active set degenerate. Dropping a regressor,
after 7 iterations, i.e. alpha=1.557e-02, with an active set of 7 regressor
s, and the smallest cholesky pivot element being 2.220e-16
  ConvergenceWarning)
D:\Anaconda3\lib\site-packages\sklearn\linear_model\least_angle.py:309: Con
vergenceWarning: Regressors in active set degenerate. Dropping a regressor,
after 7 iterations, i.e. alpha=1.557e-02, with an active set of 7 regressor
s, and the smallest cholesky pivot element being 1.490e-08
  ConvergenceWarning)
D:\Anaconda3\lib\site-packages\sklearn\linear_model\least_angle.py:309: Con
vergenceWarning: Regressors in active set degenerate. Dropping a regressor,
after 12 iterations, i.e. alpha=1.210e-02, with an active set of 12 regress
ors, and the smallest cholesky pivot element being 1.490e-08
  ConvergenceWarning)
D:\Anaconda3\lib\site-packages\sklearn\linear_model\least_angle.py:309: Con
vergenceWarning: Regressors in active set degenerate. Dropping a regressor,
after 12 iterations, i.e. alpha=1.210e-02, with an active set of 12 regress
ors, and the smallest cholesky pivot element being 2.220e-16
  ConvergenceWarning)
D:\Anaconda3\lib\site-packages\sklearn\linear_model\least_angle.py:309: Con
vergenceWarning: Regressors in active set degenerate. Dropping a regressor,
after 18 iterations, i.e. alpha=7.948e-03, with an active set of 16 regress
ors, and the smallest cholesky pivot element being 1.054e-08
  ConvergenceWarning)
D:\Anaconda3\lib\site-packages\sklearn\linear_model\least_angle.py:309: Con
vergenceWarning: Regressors in active set degenerate. Dropping a regressor,
after 20 iterations, i.e. alpha=7.774e-03, with an active set of 18 regress
ors, and the smallest cholesky pivot element being 2.220e-16
  ConvergenceWarning)
D:\Anaconda3\lib\site-packages\sklearn\linear_model\least_angle.py:309: Con
vergenceWarning: Regressors in active set degenerate. Dropping a regressor,
after 25 iterations, i.e. alpha=6.039e-03, with an active set of 21 regress
ors, and the smallest cholesky pivot element being 1.490e-08
  ConvergenceWarning)
D:\Anaconda3\lib\site-packages\sklearn\linear_model\least_angle.py:309: Con
vergenceWarning: Regressors in active set degenerate. Dropping a regressor,
after 27 iterations, i.e. alpha=5.855e-03, with an active set of 23 regress
ors, and the smallest cholesky pivot element being 1.054e-08
  ConvergenceWarning)
D:\Anaconda3\lib\site-packages\sklearn\linear_model\least_angle.py:309: Con
vergenceWarning: Regressors in active set degenerate. Dropping a regressor,
after 28 iterations, i.e. alpha=5.409e-03, with an active set of 24 regress
ors, and the smallest cholesky pivot element being 1.054e-08
  ConvergenceWarning)
D:\Anaconda3\lib\site-packages\sklearn\linear_model\least_angle.py:309: Con
vergenceWarning: Regressors in active set degenerate. Dropping a regressor,
after 30 iterations, i.e. alpha=5.109e-03, with an active set of 26 regress
ors, and the smallest cholesky pivot element being 1.490e-08
  ConvergenceWarning)
D:\Anaconda3\lib\site-packages\sklearn\linear_model\least_angle.py:309: Con
vergenceWarning: Regressors in active set degenerate. Dropping a regressor,
after 31 iterations, i.e. alpha=5.044e-03, with an active set of 27 regress
ors, and the smallest cholesky pivot element being 1.490e-08
  ConvergenceWarning)
D:\Anaconda3\lib\site-packages\sklearn\linear_model\least_angle.py:309: Con
vergenceWarning: Regressors in active set degenerate. Dropping a regressor,
after 35 iterations, i.e. alpha=4.811e-03, with an active set of 29 regress
ors, and the smallest cholesky pivot element being 2.220e-16
  ConvergenceWarning)
```

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  ConvergenceWarning)
D:\Anaconda3\lib\site-packages\sklearn\linear_model\least_angle.py:309: Con
vergenceWarning: Regressors in active set degenerate. Dropping a regressor,
after 7 iterations, i.e. alpha=6.277e-03, with an active set of 7 regressor
s, and the smallest cholesky pivot element being 2.220e-16
  ConvergenceWarning)
D:\Anaconda3\lib\site-packages\sklearn\linear_model\least_angle.py:309: Con
vergenceWarning: Regressors in active set degenerate. Dropping a regressor,
after 50 iterations, i.e. alpha=2.715e-03, with an active set of 46 regress
ors, and the smallest cholesky pivot element being 2.107e-08
  ConvergenceWarning)
D:\Anaconda3\lib\site-packages\sklearn\linear_model\least_angle.py:309: Con
vergenceWarning: Regressors in active set degenerate. Dropping a regressor,
after 50 iterations, i.e. alpha=2.715e-03, with an active set of 46 regress
ors, and the smallest cholesky pivot element being 2.220e-16
  ConvergenceWarning)
D:\Anaconda3\lib\site-packages\sklearn\linear_model\least_angle.py:309: Con
vergenceWarning: Regressors in active set degenerate. Dropping a regressor,
after 72 iterations, i.e. alpha=2.204e-03, with an active set of 68 regress
ors, and the smallest cholesky pivot element being 1.054e-08
  ConvergenceWarning)
D:\Anaconda3\lib\site-packages\sklearn\linear_model\least_angle.py:309: Con
vergenceWarning: Regressors in active set degenerate. Dropping a regressor,
after 76 iterations, i.e. alpha=2.181e-03, with an active set of 72 regress
ors, and the smallest cholesky pivot element being 2.107e-08
  ConvergenceWarning)
D:\Anaconda3\lib\site-packages\sklearn\linear_model\least_angle.py:309: Con
vergenceWarning: Regressors in active set degenerate. Dropping a regressor,
after 76 iterations, i.e. alpha=2.181e-03, with an active set of 72 regress
ors, and the smallest cholesky pivot element being 1.054e-08
  ConvergenceWarning)
D:\Anaconda3\lib\site-packages\sklearn\linear_model\least_angle.py:309: Con
vergenceWarning: Regressors in active set degenerate. Dropping a regressor,
after 78 iterations, i.e. alpha=2.159e-03, with an active set of 74 regress
ors, and the smallest cholesky pivot element being 2.220e-16
  ConvergenceWarning)
D:\Anaconda3\lib\site-packages\sklearn\linear_model\least_angle.py:309: Con
vergenceWarning: Regressors in active set degenerate. Dropping a regressor,
after 79 iterations, i.e. alpha=2.154e-03, with an active set of 75 regress
ors, and the smallest cholesky pivot element being 2.107e-08
  ConvergenceWarning)
D:\Anaconda3\lib\site-packages\sklearn\linear_model\least_angle.py:309: Con
vergenceWarning: Regressors in active set degenerate. Dropping a regressor,
after 81 iterations, i.e. alpha=2.055e-03, with an active set of 77 regress
ors, and the smallest cholesky pivot element being 2.220e-16
  ConvergenceWarning)
D:\Anaconda3\lib\site-packages\sklearn\linear_model\least_angle.py:309: Con
vergenceWarning: Regressors in active set degenerate. Dropping a regressor,
after 86 iterations, i.e. alpha=1.861e-03, with an active set of 82 regress
ors, and the smallest cholesky pivot element being 2.220e-16
  ConvergenceWarning)
D:\Anaconda3\lib\site-packages\sklearn\linear_model\least_angle.py:309: Con
vergenceWarning: Regressors in active set degenerate. Dropping a regressor,
after 87 iterations, i.e. alpha=1.859e-03, with an active set of 83 regress
ors, and the smallest cholesky pivot element being 2.220e-16
  ConvergenceWarning)
D:\Anaconda3\lib\site-packages\sklearn\linear_model\least_angle.py:309: Con
vergenceWarning: Regressors in active set degenerate. Dropping a regressor,
after 87 iterations, i.e. alpha=1.859e-03, with an active set of 83 regress
ors, and the smallest cholesky pivot element being 1.054e-08
  ConvergenceWarning)
```

```
  ConvergenceWarning)
D:\Anaconda3\lib\site-packages\sklearn\linear_model\least_angle.py:309: Con
vergenceWarning: Regressors in active set degenerate. Dropping a regressor,
after 87 iterations, i.e. alpha=1.859e-03, with an active set of 83 regress
ors, and the smallest cholesky pivot element being 1.490e-08
  ConvergenceWarning)
D:\Anaconda3\lib\site-packages\sklearn\linear_model\least_angle.py:334: Con
vergenceWarning: Early stopping the lars path, as the residues are small an
d the current value of alpha is no longer well controlled. 91 iterations, a
lpha=1.818e-03, previous alpha=1.813e-03, with an active set of 86 regresso
rs.
  ConvergenceWarning)
D:\Anaconda3\lib\site-packages\sklearn\linear_model\least_angle.py:309: Con
vergenceWarning: Regressors in active set degenerate. Dropping a regressor,
after 8 iterations, i.e. alpha=6.800e-03, with an active set of 8 regressor
s, and the smallest cholesky pivot element being 2.220e-16
  ConvergenceWarning)
D:\Anaconda3\lib\site-packages\sklearn\linear_model\least_angle.py:309: Con
vergenceWarning: Regressors in active set degenerate. Dropping a regressor,
after 16 iterations, i.e. alpha=4.885e-03, with an active set of 16 regress
ors, and the smallest cholesky pivot element being 2.220e-16
  ConvergenceWarning)
D:\Anaconda3\lib\site-packages\sklearn\linear_model\least_angle.py:309: Con
vergenceWarning: Regressors in active set degenerate. Dropping a regressor,
after 25 iterations, i.e. alpha=4.040e-03, with an active set of 25 regress
ors, and the smallest cholesky pivot element being 1.490e-08
  ConvergenceWarning)
D:\Anaconda3\lib\site-packages\sklearn\linear_model\least_angle.py:309: Con
vergenceWarning: Regressors in active set degenerate. Dropping a regressor,
after 25 iterations, i.e. alpha=4.040e-03, with an active set of 25 regress
ors, and the smallest cholesky pivot element being 1.054e-08
  ConvergenceWarning)
D:\Anaconda3\lib\site-packages\sklearn\linear_model\least_angle.py:309: Con
vergenceWarning: Regressors in active set degenerate. Dropping a regressor,
after 37 iterations, i.e. alpha=3.156e-03, with an active set of 35 regress
ors, and the smallest cholesky pivot element being 2.220e-16
  ConvergenceWarning)
D:\Anaconda3\lib\site-packages\sklearn\linear_model\least_angle.py:309: Con
vergenceWarning: Regressors in active set degenerate. Dropping a regressor,
after 43 iterations, i.e. alpha=2.998e-03, with an active set of 41 regress
ors, and the smallest cholesky pivot element being 1.490e-08
  ConvergenceWarning)
D:\Anaconda3\lib\site-packages\sklearn\linear_model\least_angle.py:309: Con
vergenceWarning: Regressors in active set degenerate. Dropping a regressor,
after 43 iterations, i.e. alpha=2.998e-03, with an active set of 41 regress
ors, and the smallest cholesky pivot element being 1.054e-08
  ConvergenceWarning)
D:\Anaconda3\lib\site-packages\sklearn\linear_model\least_angle.py:309: Con
vergenceWarning: Regressors in active set degenerate. Dropping a regressor,
after 52 iterations, i.e. alpha=2.392e-03, with an active set of 50 regress
ors, and the smallest cholesky pivot element being 2.107e-08
  ConvergenceWarning)
D:\Anaconda3\lib\site-packages\sklearn\linear_model\least_angle.py:309: Con
vergenceWarning: Regressors in active set degenerate. Dropping a regressor,
after 56 iterations, i.e. alpha=2.347e-03, with an active set of 54 regress
ors, and the smallest cholesky pivot element being 1.054e-08
  ConvergenceWarning)
D:\Anaconda3\lib\site-packages\sklearn\linear_model\least_angle.py:309: Con
vergenceWarning: Regressors in active set degenerate. Dropping a regressor,
after 56 iterations, i.e. alpha=2.347e-03, with an active set of 54 regress
ors, and the smallest cholesky pivot element being 2.107e-08
```

ConvergenceWarning)
D:\Anaconda3\lib\site-packages\sklearn\linear_model\least_angle.py:309: Con
vergenceWarning: Regressors in active set degenerate. Dropping a regressor,
after 57 iterations, i.e. alpha=2.328e-03, with an active set of 55 regress
ors, and the smallest cholesky pivot element being 1.490e-08
ConvergenceWarning)
D:\Anaconda3\lib\site-packages\sklearn\linear_model\least_angle.py:309: Con
vergenceWarning: Regressors in active set degenerate. Dropping a regressor,
after 61 iterations, i.e. alpha=2.179e-03, with an active set of 59 regress
ors, and the smallest cholesky pivot element being 1.490e-08
ConvergenceWarning)
D:\Anaconda3\lib\site-packages\sklearn\linear_model\least_angle.py:309: Con
vergenceWarning: Regressors in active set degenerate. Dropping a regressor,
after 69 iterations, i.e. alpha=2.061e-03, with an active set of 67 regress
ors, and the smallest cholesky pivot element being 2.220e-16
ConvergenceWarning)
D:\Anaconda3\lib\site-packages\sklearn\linear_model\least_angle.py:309: Con
vergenceWarning: Regressors in active set degenerate. Dropping a regressor,
after 70 iterations, i.e. alpha=2.049e-03, with an active set of 68 regress
ors, and the smallest cholesky pivot element being 1.054e-08
ConvergenceWarning)
D:\Anaconda3\lib\site-packages\sklearn\linear_model\least_angle.py:309: Con
vergenceWarning: Regressors in active set degenerate. Dropping a regressor,
after 73 iterations, i.e. alpha=2.008e-03, with an active set of 69 regress
ors, and the smallest cholesky pivot element being 1.490e-08
ConvergenceWarning)
D:\Anaconda3\lib\site-packages\sklearn\linear_model\least_angle.py:309: Con
vergenceWarning: Regressors in active set degenerate. Dropping a regressor,
after 79 iterations, i.e. alpha=1.853e-03, with an active set of 73 regress
ors, and the smallest cholesky pivot element being 1.825e-08
ConvergenceWarning)
D:\Anaconda3\lib\site-packages\sklearn\linear_model\least_angle.py:309: Con
vergenceWarning: Regressors in active set degenerate. Dropping a regressor,
after 82 iterations, i.e. alpha=1.800e-03, with an active set of 76 regress
ors, and the smallest cholesky pivot element being 1.054e-08
ConvergenceWarning)
D:\Anaconda3\lib\site-packages\sklearn\linear_model\least_angle.py:309: Con
vergenceWarning: Regressors in active set degenerate. Dropping a regressor,
after 93 iterations, i.e. alpha=1.582e-03, with an active set of 87 regress
ors, and the smallest cholesky pivot element being 2.107e-08
ConvergenceWarning)
D:\Anaconda3\lib\site-packages\sklearn\linear_model\least_angle.py:309: Con
vergenceWarning: Regressors in active set degenerate. Dropping a regressor,
after 95 iterations, i.e. alpha=1.567e-03, with an active set of 89 regress
ors, and the smallest cholesky pivot element being 1.490e-08
ConvergenceWarning)
D:\Anaconda3\lib\site-packages\sklearn\linear_model\least_angle.py:309: Con
vergenceWarning: Regressors in active set degenerate. Dropping a regressor,
after 97 iterations, i.e. alpha=1.556e-03, with an active set of 91 regress
ors, and the smallest cholesky pivot element being 1.825e-08
ConvergenceWarning)
D:\Anaconda3\lib\site-packages\sklearn\linear_model\least_angle.py:334: Con
vergenceWarning: Early stopping the lars path, as the residues are small an
d the current value of alpha is no longer well controlled. 99 iterations, a
lpha=1.547e-03, previous alpha=1.543e-03, with an active set of 92 regresso
rs.
ConvergenceWarning)
D:\Anaconda3\lib\site-packages\sklearn\linear_model\least_angle.py:309: Con
vergenceWarning: Regressors in active set degenerate. Dropping a regressor,
after 5 iterations, i.e. alpha=7.844e-03, with an active set of 5 regressor

```
s, and the smallest cholesky pivot element being 1.490e-08
  ConvergenceWarning)
D:\Anaconda3\lib\site-packages\sklearn\linear_model\least_angle.py:309: Con
vergenceWarning: Regressors in active set degenerate. Dropping a regressor,
after 7 iterations, i.e. alpha=6.697e-03, with an active set of 7 regressor
s, and the smallest cholesky pivot element being 2.220e-16
  ConvergenceWarning)
D:\Anaconda3\lib\site-packages\sklearn\linear_model\least_angle.py:309: Con
vergenceWarning: Regressors in active set degenerate. Dropping a regressor,
after 11 iterations, i.e. alpha=5.790e-03, with an active set of 11 regress
ors, and the smallest cholesky pivot element being 1.490e-08
  ConvergenceWarning)
D:\Anaconda3\lib\site-packages\sklearn\linear_model\least_angle.py:309: Con
vergenceWarning: Regressors in active set degenerate. Dropping a regressor,
after 11 iterations, i.e. alpha=5.790e-03, with an active set of 11 regress
ors, and the smallest cholesky pivot element being 2.220e-16
  ConvergenceWarning)
D:\Anaconda3\lib\site-packages\sklearn\linear_model\least_angle.py:309: Con
vergenceWarning: Regressors in active set degenerate. Dropping a regressor,
after 20 iterations, i.e. alpha=4.350e-03, with an active set of 20 regress
ors, and the smallest cholesky pivot element being 1.490e-08
  ConvergenceWarning)
D:\Anaconda3\lib\site-packages\sklearn\linear_model\least_angle.py:309: Con
vergenceWarning: Regressors in active set degenerate. Dropping a regressor,
after 27 iterations, i.e. alpha=4.019e-03, with an active set of 27 regress
ors, and the smallest cholesky pivot element being 2.220e-16
  ConvergenceWarning)
D:\Anaconda3\lib\site-packages\sklearn\linear_model\least_angle.py:309: Con
vergenceWarning: Regressors in active set degenerate. Dropping a regressor,
after 29 iterations, i.e. alpha=3.948e-03, with an active set of 29 regress
ors, and the smallest cholesky pivot element being 1.490e-08
  ConvergenceWarning)
D:\Anaconda3\lib\site-packages\sklearn\linear_model\least_angle.py:309: Con
vergenceWarning: Regressors in active set degenerate. Dropping a regressor,
after 37 iterations, i.e. alpha=3.297e-03, with an active set of 37 regress
ors, and the smallest cholesky pivot element being 1.490e-08
  ConvergenceWarning)
D:\Anaconda3\lib\site-packages\sklearn\linear_model\least_angle.py:309: Con
vergenceWarning: Regressors in active set degenerate. Dropping a regressor,
after 55 iterations, i.e. alpha=2.797e-03, with an active set of 55 regress
ors, and the smallest cholesky pivot element being 1.054e-08
  ConvergenceWarning)
D:\Anaconda3\lib\site-packages\sklearn\linear_model\least_angle.py:334: Con
vergenceWarning: Early stopping the lars path, as the residues are small an
d the current value of alpha is no longer well controlled. 57 iterations, a
lpha=2.799e-03, previous alpha=2.793e-03, with an active set of 56 regresso
rs.
  ConvergenceWarning)
```

```
R2 score on train data:
0.966024961023
```