ML 27 - Support Vector Machine Regressor By Virat Tiwari

December 28, 2023

1 Support Vector Machine Regressor By Virat Tiwari

[2]:
```
import pandas as pd
import numpy as np
import seaborn as sns
import matplotlib.pyplot as plt
```

[3]:
```
# Here we create a synthetic datapoints

from sklearn.datasets import make_regression
```

[5]:
```
x,y=make_regression(n_samples=1000,n_features=2,n_targets=1,noise=3.0)
```

[6]:
```
x
```

[6]:
```
array([[-0.66914703,  3.0028663 ],
       [ 0.73954957, -1.75204103],
       [ 0.87837178,  0.34802555],
       …,
       [-0.09746097,  0.4957376 ],
       [-0.61953614, -1.16702595],
       [ 0.56275329,  0.86669696]])
```

[7]:
```
y
```

[7]:
```
array([ 1.43678955e+02, -5.68113204e+01,  9.12838634e+01, -1.70866224e+02,
        8.56806291e+01,  2.92337125e+01, -7.79724586e+01,  9.11117894e+01,
       -1.08354859e+02, -2.47335784e+01, -2.73606168e+01, -3.34045547e+00,
       -1.08011290e+02, -8.25625949e+01, -1.55043557e+01,  7.91575068e+01,
        4.02750471e+01, -1.95363742e+02,  3.68849567e+01, -1.85019235e+01,
       -8.44034078e+00, -4.23611451e+01,  2.48196958e+01, -7.68678968e+01,
       -1.70165361e+02, -1.27609860e+02,  2.50987094e+01,  9.50424045e+00,
        1.81897034e+02,  1.63687853e+02,  2.05445979e+02, -1.50404983e+02,
        3.24615233e+01,  2.23082221e-04,  8.86516366e+01,  1.32280109e+02,
        1.50697995e+02,  1.24233753e+02, -3.10727764e+01,  1.45561010e+02,
       -1.42687777e+02,  2.23215314e+02,  5.94918306e+01,  5.76835187e+00,
        5.26207034e+01, -9.99981882e+01,  1.05393325e+02, -8.98667668e+01,
```

```
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-1.18375201e+01, -7.79248096e+01, -2.19815378e+01,  1.03841106e+02,
-1.49187728e+01, -9.98074050e+01, -2.51569589e+00, -2.07118069e+02,
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 1.95279029e+02, -5.08672228e+01,  7.36820097e+01,  1.07309787e+02,
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-3.87089537e+01, -4.40890384e+01,  1.00647764e+02,  1.95869421e+01,
-6.63988402e+01, -1.35506895e+02, -5.25155722e+01,  8.97136112e+01,
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-9.65255524e+00,  4.91869239e+01,  7.17077696e+01,  1.05026944e+02,
 1.65410638e+02,  2.01371354e+00,  1.99130253e+01,  1.10075573e+02,
 1.79717993e+01,  6.02947135e+00, -8.48010093e+01,  5.39048683e+01,
-1.58762512e+02, -1.45119259e+02,  7.38309830e+01, -2.42831211e+01,
 5.14450773e+01, -1.91352946e+02, -1.72258463e+02,  1.50823955e+02,
-3.63341861e+01,  9.95396001e+01, -8.14832816e+00,  1.01564129e+02,
-1.45664586e+02,  7.24748719e+01,  1.39869258e+01, -1.10645612e+02,
-6.94984763e+01,  4.19095060e+01, -4.70357093e+01, -7.24521686e+01,
-7.85267770e+01,  2.64138229e+02,  1.13899275e+01,  8.44582373e+01,
-9.11515655e+00, -1.33780758e+02, -1.97142302e+02,  2.23046553e+01,
-2.00250828e+01, -7.44284443e+01, -1.72825241e+02,  6.27296859e+01,
 1.14024201e+02, -4.31344132e+01,  8.33323336e+01, -2.89990402e+01,
 8.13991695e+00,  2.01512631e+01, -1.22162119e+02,  6.18549957e-01,
 1.23108484e+02, -1.27003606e+02, -1.50489528e+01, -3.60249799e+02,
 3.48077069e+01, -1.03514497e+02, -1.05997080e+02,  1.79993816e+02,
-3.87137418e+01,  7.57753929e-01, -4.28393418e+01,  1.05673455e+02,
 1.39035870e+02,  1.48355610e+01, -1.68191445e+02,  7.16115280e+01,
-1.10129072e+02, -7.61750306e+01,  6.62307652e+01,  3.89835209e+01,
-2.45009530e+01,  1.46410734e+02,  2.98048592e+01,  1.98294549e+02,
-6.31740798e+01,  9.56204528e+01, -3.26798889e+01,  1.85616760e+01,
```

```
 1.55250134e+02,  2.19593861e+01, -8.97123158e+01, -6.10399104e+00,
 1.62643295e+02, -5.84974893e+01, -1.35006150e+02,  5.63159102e+01,
 4.56369905e+01, -1.14677366e+02, -1.99307347e+02,  1.31765591e+02,
-8.10635136e+01,  7.07437618e+01,  1.29378652e+01, -1.42000789e+02,
 4.47765327e+01,  1.03233628e+02, -4.47593271e+01, -1.03895504e+02,
 8.53038339e+01,  8.04020156e+00,  2.07114914e+01,  1.51202158e-01,
 1.27636201e+02,  2.39904048e+02,  1.22262340e+02,  2.17533877e+01,
-3.80378989e+01,  1.55207912e+01,  2.21716657e+02, -1.29011548e+02,
-1.56513077e+01, -5.09174828e+01,  5.89598793e+01,  1.43012292e+02,
 6.64783037e+01, -1.50055077e+02,  5.41825451e+01, -2.27829770e+01,
-2.70809578e+01, -5.07394041e+01,  1.36992475e+02, -2.32388811e+01,
-2.86255379e+01, -5.03096400e+00,  9.82797496e+01, -5.26024282e+01,
-1.22050477e+02, -3.93085045e+00, -1.20779250e+02, -1.60858194e+02,
 1.91955264e+02,  5.16362617e+01,  1.21035569e+02,  1.17423438e+02,
-7.25746529e+01, -2.10589633e+02,  8.91187270e+01,  1.08238248e+02,
 1.79791079e+02,  2.06700195e+02, -4.36483027e+00, -5.44829656e+01,
 6.92425565e+01,  1.20941333e+02, -3.29855308e+01,  6.86389341e+01,
-4.58990313e+00, -6.65863935e+01,  1.15190348e+02,  5.36820591e+01,
-1.73196862e+01,  2.34043706e+01,  6.61509870e+01,  2.11219647e+02,
-8.88938750e+01, -3.19219840e+01,  1.59502918e+01,  7.08248366e+01,
-1.44625690e+02, -4.65334962e+01,  1.08997029e+02,  1.69102588e+02,
-2.42676733e+02, -7.31779169e+01, -2.52947149e+01,  7.51283709e+01,
 1.27713968e+00,  3.61816786e+01, -6.62115191e+01, -9.03013371e+01,
-3.99902326e+01,  2.15120030e+02,  2.05250215e+02, -1.97887590e+02,
-1.80988633e+01,  8.37460808e+01,  1.21327836e+02, -1.80399325e+02,
 1.86726662e+01,  8.95297935e+01,  1.41744767e+02, -1.54345834e+02,
 2.77588404e+01,  7.23618887e+00, -1.07438438e+02, -4.85293089e+01,
-1.48268291e+02,  4.41597253e+01, -3.03123583e+01,  2.22417636e+01,
 1.05176134e+01,  1.69010307e+02, -6.49662107e+01, -4.25483027e+00,
 3.66589561e+01, -3.04283452e+01,  2.24881043e+02, -1.82701560e+02,
-5.29413294e+01, -1.74821064e+02,  9.94436149e+01,  4.29850673e+01,
-7.90706639e+01,  7.66964906e+01,  2.88947204e+01, -1.46458343e+01,
 8.77879460e+01,  1.91455478e+02, -1.77589224e+01, -1.16343721e+01,
-6.31522852e+01,  8.32730111e+01, -8.46521829e+01, -1.15377653e+02,
 1.11809989e+02,  2.06335664e+02,  6.35279691e+01,  9.71033004e+01,
 3.59347068e+01, -1.25487509e+02, -2.05921839e+02, -7.17857046e+01,
 1.52141653e+02,  1.44398328e+01,  1.79073492e+01,  1.34516785e+02,
 8.46559837e+01, -1.67404107e+02, -1.61233033e+02,  1.01066286e+02,
 1.26546126e+02,  7.10287695e+01,  7.24747106e+01,  1.25102036e+02,
-1.06738509e+02, -9.00629056e+01,  7.55235394e+01,  8.80459962e+00,
 7.88162206e+01, -1.52918363e+02,  6.28542647e+01,  5.01162286e+01,
-1.49082874e+01,  6.02530459e+00, -1.52754394e+02, -7.89211224e+01,
 3.46268309e+01,  3.97992249e+01, -1.49547348e+02, -1.37683052e+02,
-6.95399182e+01,  1.99624921e+02, -5.57978491e+01,  3.94168408e+01,
-1.32897796e+02, -6.98189505e+01, -8.59283968e+01,  5.64840762e+01,
-4.12329213e+01, -1.42719064e+02, -3.36944339e+00,  1.57605935e+02,
 8.33545137e+00, -4.28815063e+01,  3.30043338e+01, -2.46279922e+01,
```

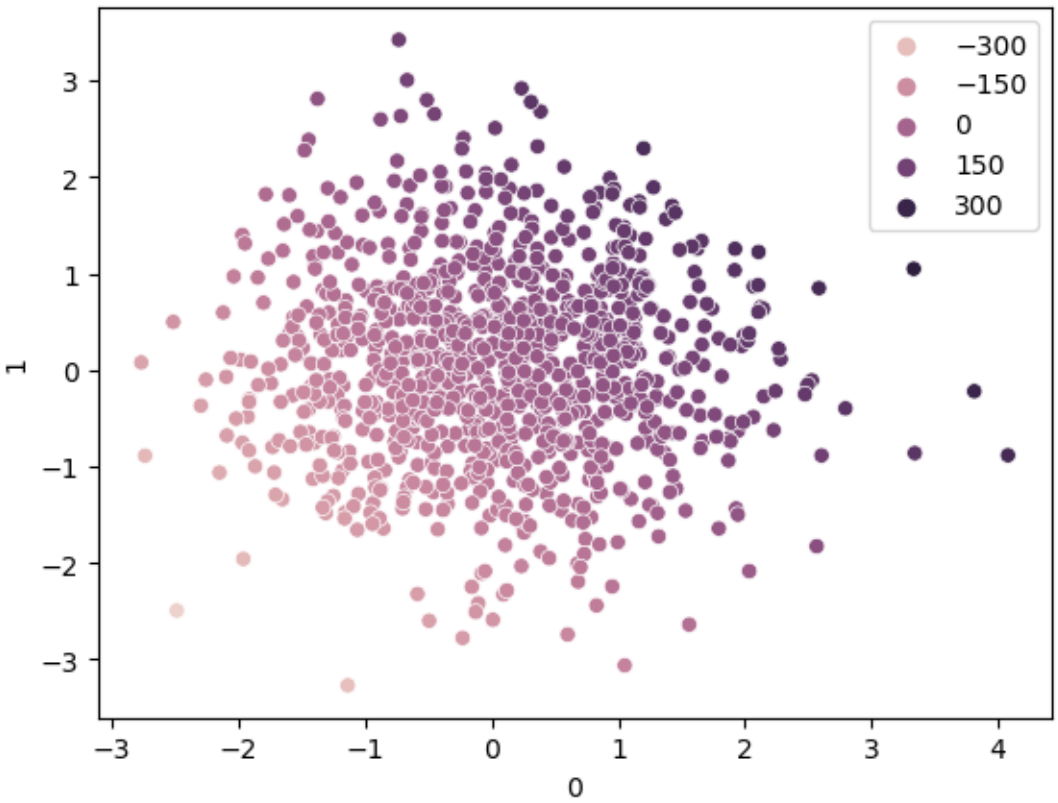
```
       -9.75845099e+01,  6.71856344e+01, -1.04369215e+02, -5.38336741e+01,
       -7.89858834e+01,  5.51450534e+01, -1.55159193e+02,  1.67147767e+01,
        1.63693406e+02,  1.84313468e+01, -1.28127360e+02,  9.80049722e+01])
```

[8]:
```
pd.DataFrame(x)[0]
```

[8]:
```
0     -0.669147
1      0.739550
2      0.878372
3     -1.052862
4      0.818460
         …
995    1.310300
996    1.679653
997   -0.097461
998   -0.619536
999    0.562753
Name: 0, Length: 1000, dtype: float64
```

[9]:
```
sns.scatterplot(x=pd.DataFrame(x)[0],y=pd.DataFrame(x)[1],hue=y)
```

[9]:
```
<AxesSubplot: xlabel='0', ylabel='1'>
```



[10]:
```
from sklearn.model_selection import train_test_split
x_train,x_test,y_train,y_test=train_test_split(x,y,test_size=0.
 ↪25,random_state=10)
```

[16]:
```
from sklearn.svm import SVR
```

[17]:
```
svr=SVR(kernel="linear")
```

[18]:
```
svr.fit(x_train,y_train)
```

[18]:
```
SVR(kernel='linear')
```

[19]:
```
svr.coef_
```

[19]:
```
array([[80.52081068, 63.99786342]])
```

[20]:
```
# PREDICTION

y_pred=svr.predict(x_test)
```

[21]:
```
y_pred
```

[21]:
```
array([ -50.78619048, -100.6698624 ,   92.50960009,  -34.45637451,
         21.1000446 ,  123.89232675,  -67.67529172,  -25.48777031,
         -4.22080043,  -13.93971997,  -80.2433813 ,  -64.80842279,
        116.2969725 ,  150.93276492,   96.93600875,   39.32893397,
         -3.5266477 ,    8.94305831,  121.20919264,  -68.43323432,
         -7.61015799,    0.63041379, -109.39979939,  105.24955626,
       -218.97309857,   36.28819815,   29.60996178,   97.4984852 ,
        -41.83910034,   25.68822946,  -80.47886782,   80.11742408,
         45.02050451,  -28.15546008,  104.73493892,  148.14230072,
        -15.6411896 ,  -86.86601056,   51.8612737 ,   38.26112501,
        -15.58580636, -115.2045172 ,  -83.28980498,  -35.65509259,
        -22.0358118 ,  -62.76441074, -136.62772765,  164.77855472,
         75.69570666,   69.71209089,    6.270792  ,   94.46128682,
        103.93811024, -145.91498385, -124.97812434,  -37.06592351,
        175.05651671,  -50.14365953,  -42.17737627,   20.44695406,
        -81.17103459, -126.91351804,  -94.66114919, -111.27137717,
        -40.01929558,  105.83699825,   30.39027105,  -19.17063689,
        -58.25352162, -116.23195976, -105.27043555,    8.14272069,
        -35.53986183,  111.49670478,    2.7670439 , -147.77213369,
        -55.72657875,  -82.44999242, -103.93051468,  -34.13208035,
         63.51843044, -109.1186558 , -127.16333447,   74.37223595,
        -52.17291274,   24.27938367,  114.4912967 ,  -42.88105053,
         64.92575768,   58.6306936 ,   92.32125651,   58.94755127,
        -99.49850734,   11.58797481,    0.5784934 ,   -4.0406265 ,
```

```
 -52.59789718,  202.62982303, -200.46322218,   -5.96252444,
-194.85579751,  -25.91223864,  -77.23086964,  118.47355403,
  18.32995531, -109.78173539,   41.89956871,  -53.15400644,
-191.60202519,  -40.45079372,   87.63625443,   81.77318443,
-206.87384634,   63.98093501,   30.3686259 ,  177.33532784,
  93.81979168,  115.32461054,  127.45552542,   11.87598146,
-143.46369812,  197.91249151,   86.70628081,   42.65419643,
-150.53330391,  -24.4997958 ,   -8.58328818,  135.80287308,
 -67.58914146,   80.38591552, -110.57721355,   31.92229766,
 161.57871161,  104.24681256,   61.20863016,  122.96210245,
 -35.12714169,   34.80748304,  220.59620115,  -65.6660657 ,
  54.84608507,   84.41824707,   -4.35603818, -112.92768899,
 -22.7305893 ,   98.53328043, -137.65911097,  173.30537548,
  31.71589616,  -59.42919992,   53.69977755,  -15.87607545,
 141.32142922, -123.73466724,  -47.45646051,   84.91590457,
   2.94298097,   41.27414836,   93.72190944,  -76.12478968,
 -48.86960402,  116.05052256,  202.42631339,   12.92836609,
  62.40794586,  -30.09954256,  121.40033618,  132.32334599,
  46.32914969,  -19.95179421,  -13.20552184,  106.90574149,
 -23.68058666,   85.86020569,   -9.01270876,    6.99359321,
 153.04021962,   -0.72166464,  -52.36398071,   29.81973401,
 -51.48547389,   16.65787565, -129.88337798,  125.59313024,
 101.6663096 , -100.2151671 , -144.87908565,  -40.93664708,
-102.06861632,  -33.54206211,   74.37477748,  -69.75758512,
 221.87758202,  -25.07016747,   47.50754714,  243.52544336,
 -54.51408208,  -78.9382441 ,  187.38748168,   72.33241363,
 -62.79634397,  -66.1082109 , -173.76297182,  -69.14093362,
 -26.47897889,  169.92485377,   11.60576061,   44.53576722,
-156.52840661, -110.11444755,  -40.7876127 , -158.15104119,
-155.34419761,    8.63480659,   46.56232972,   66.38431394,
  31.96371643,  202.04841614, -117.0267036 ,   51.701097  ,
  76.12685713, -128.73293347,  147.581828  ,    9.68788464,
 -10.34641531, -161.26192594,   72.11992702,  166.41669969,
-141.40085116,  106.39785985,  103.54098913,   65.65944244,
  53.83897237,  -85.36890421,   99.61675958,   68.87960522,
 135.73539554,   98.63176941,  -88.66000269,  -41.97357839,
 209.32711262,   -8.1298297 ,  -48.9713707 ,  130.23788517,
-153.16232492,  146.74760568,  -43.25801771,  -28.33601678,
  74.43114837,  -17.57080087])
```

[22]:
```
from sklearn.metrics import r2_score
```

[23]:
```
print(r2_score(y_test,y_pred))
```

```
0.998901182035587
```

2 Hyperparameter Tuning With SVR

[31]:
```
from sklearn.model_selection import GridSearchCV

# defining parameter range
param_grid = {'C': [0.1, 1, 10, 100, 1000],
              'gamma': [1, 0.1, 0.01, 0.001, 0.0001],
              'kernel':['linear'],
              'epsilon':[0.1,0.2,0.3]
              }
```

[32]:
```
grid=GridSearchCV(SVR(),param_grid=param_grid,refit=True,cv=5,verbose=3)
```

[34]:
```
grid.fit(x_train,y_train)
```

```
Fitting 5 folds for each of 75 candidates, totalling 375 fits
[CV 1/5] END C=0.1, epsilon=0.1, gamma=1, kernel=linear;, score=0.690 total
time=   0.0s
[CV 2/5] END C=0.1, epsilon=0.1, gamma=1, kernel=linear;, score=0.706 total
time=   0.0s
[CV 3/5] END C=0.1, epsilon=0.1, gamma=1, kernel=linear;, score=0.710 total
time=   0.0s
[CV 4/5] END C=0.1, epsilon=0.1, gamma=1, kernel=linear;, score=0.711 total
time=   0.0s
[CV 5/5] END C=0.1, epsilon=0.1, gamma=1, kernel=linear;, score=0.696 total
time=   0.0s
[CV 1/5] END C=0.1, epsilon=0.1, gamma=0.1, kernel=linear;, score=0.690 total
time=   0.0s
[CV 2/5] END C=0.1, epsilon=0.1, gamma=0.1, kernel=linear;, score=0.706 total
time=   0.0s
[CV 3/5] END C=0.1, epsilon=0.1, gamma=0.1, kernel=linear;, score=0.710 total
time=   0.0s
[CV 4/5] END C=0.1, epsilon=0.1, gamma=0.1, kernel=linear;, score=0.711 total
time=   0.0s
[CV 5/5] END C=0.1, epsilon=0.1, gamma=0.1, kernel=linear;, score=0.696 total
time=   0.0s
[CV 1/5] END C=0.1, epsilon=0.1, gamma=0.01, kernel=linear;, score=0.690 total
time=   0.0s
[CV 2/5] END C=0.1, epsilon=0.1, gamma=0.01, kernel=linear;, score=0.706 total
time=   0.0s
[CV 3/5] END C=0.1, epsilon=0.1, gamma=0.01, kernel=linear;, score=0.710 total
time=   0.0s
[CV 4/5] END C=0.1, epsilon=0.1, gamma=0.01, kernel=linear;, score=0.711 total
time=   0.0s
[CV 5/5] END C=0.1, epsilon=0.1, gamma=0.01, kernel=linear;, score=0.696 total
time=   0.0s
[CV 1/5] END C=0.1, epsilon=0.1, gamma=0.001, kernel=linear;, score=0.690 total
```

```
time=   0.0s
[CV 2/5] END C=0.1, epsilon=0.1, gamma=0.001, kernel=linear;, score=0.706 total
time=   0.0s
[CV 3/5] END C=0.1, epsilon=0.1, gamma=0.001, kernel=linear;, score=0.710 total
time=   0.0s
[CV 4/5] END C=0.1, epsilon=0.1, gamma=0.001, kernel=linear;, score=0.711 total
time=   0.0s
[CV 5/5] END C=0.1, epsilon=0.1, gamma=0.001, kernel=linear;, score=0.696 total
time=   0.0s
[CV 1/5] END C=0.1, epsilon=0.1, gamma=0.0001, kernel=linear;, score=0.690 total
time=   0.0s
[CV 2/5] END C=0.1, epsilon=0.1, gamma=0.0001, kernel=linear;, score=0.706 total
time=   0.0s
[CV 3/5] END C=0.1, epsilon=0.1, gamma=0.0001, kernel=linear;, score=0.710 total
time=   0.0s
[CV 4/5] END C=0.1, epsilon=0.1, gamma=0.0001, kernel=linear;, score=0.711 total
time=   0.0s
[CV 5/5] END C=0.1, epsilon=0.1, gamma=0.0001, kernel=linear;, score=0.696 total
time=   0.0s
[CV 1/5] END C=0.1, epsilon=0.2, gamma=1, kernel=linear;, score=0.690 total
time=   0.0s
[CV 2/5] END C=0.1, epsilon=0.2, gamma=1, kernel=linear;, score=0.706 total
time=   0.0s
[CV 3/5] END C=0.1, epsilon=0.2, gamma=1, kernel=linear;, score=0.710 total
time=   0.0s
[CV 4/5] END C=0.1, epsilon=0.2, gamma=1, kernel=linear;, score=0.711 total
time=   0.0s
[CV 5/5] END C=0.1, epsilon=0.2, gamma=1, kernel=linear;, score=0.696 total
time=   0.0s
[CV 1/5] END C=0.1, epsilon=0.2, gamma=0.1, kernel=linear;, score=0.690 total
time=   0.0s
[CV 2/5] END C=0.1, epsilon=0.2, gamma=0.1, kernel=linear;, score=0.706 total
time=   0.0s
[CV 3/5] END C=0.1, epsilon=0.2, gamma=0.1, kernel=linear;, score=0.710 total
time=   0.0s
[CV 4/5] END C=0.1, epsilon=0.2, gamma=0.1, kernel=linear;, score=0.711 total
time=   0.0s
[CV 5/5] END C=0.1, epsilon=0.2, gamma=0.1, kernel=linear;, score=0.696 total
time=   0.0s
[CV 1/5] END C=0.1, epsilon=0.2, gamma=0.01, kernel=linear;, score=0.690 total
time=   0.0s
[CV 2/5] END C=0.1, epsilon=0.2, gamma=0.01, kernel=linear;, score=0.706 total
time=   0.0s
[CV 3/5] END C=0.1, epsilon=0.2, gamma=0.01, kernel=linear;, score=0.710 total
time=   0.0s
[CV 4/5] END C=0.1, epsilon=0.2, gamma=0.01, kernel=linear;, score=0.711 total
time=   0.0s
[CV 5/5] END C=0.1, epsilon=0.2, gamma=0.01, kernel=linear;, score=0.696 total
```

```
time=   0.0s
[CV 1/5] END C=0.1, epsilon=0.2, gamma=0.001, kernel=linear;, score=0.690 total
time=   0.0s
[CV 2/5] END C=0.1, epsilon=0.2, gamma=0.001, kernel=linear;, score=0.706 total
time=   0.0s
[CV 3/5] END C=0.1, epsilon=0.2, gamma=0.001, kernel=linear;, score=0.710 total
time=   0.0s
[CV 4/5] END C=0.1, epsilon=0.2, gamma=0.001, kernel=linear;, score=0.711 total
time=   0.0s
[CV 5/5] END C=0.1, epsilon=0.2, gamma=0.001, kernel=linear;, score=0.696 total
time=   0.0s
[CV 1/5] END C=0.1, epsilon=0.2, gamma=0.0001, kernel=linear;, score=0.690 total
time=   0.0s
[CV 2/5] END C=0.1, epsilon=0.2, gamma=0.0001, kernel=linear;, score=0.706 total
time=   0.0s
[CV 3/5] END C=0.1, epsilon=0.2, gamma=0.0001, kernel=linear;, score=0.710 total
time=   0.0s
[CV 4/5] END C=0.1, epsilon=0.2, gamma=0.0001, kernel=linear;, score=0.711 total
time=   0.0s
[CV 5/5] END C=0.1, epsilon=0.2, gamma=0.0001, kernel=linear;, score=0.696 total
time=   0.0s
[CV 1/5] END C=0.1, epsilon=0.3, gamma=1, kernel=linear;, score=0.690 total
time=   0.0s
[CV 2/5] END C=0.1, epsilon=0.3, gamma=1, kernel=linear;, score=0.706 total
time=   0.0s
[CV 3/5] END C=0.1, epsilon=0.3, gamma=1, kernel=linear;, score=0.710 total
time=   0.0s
[CV 4/5] END C=0.1, epsilon=0.3, gamma=1, kernel=linear;, score=0.711 total
time=   0.0s
[CV 5/5] END C=0.1, epsilon=0.3, gamma=1, kernel=linear;, score=0.696 total
time=   0.0s
[CV 1/5] END C=0.1, epsilon=0.3, gamma=0.1, kernel=linear;, score=0.690 total
time=   0.0s
[CV 2/5] END C=0.1, epsilon=0.3, gamma=0.1, kernel=linear;, score=0.706 total
time=   0.0s
[CV 3/5] END C=0.1, epsilon=0.3, gamma=0.1, kernel=linear;, score=0.710 total
time=   0.0s
[CV 4/5] END C=0.1, epsilon=0.3, gamma=0.1, kernel=linear;, score=0.711 total
time=   0.0s
[CV 5/5] END C=0.1, epsilon=0.3, gamma=0.1, kernel=linear;, score=0.696 total
time=   0.0s
[CV 1/5] END C=0.1, epsilon=0.3, gamma=0.01, kernel=linear;, score=0.690 total
time=   0.0s
[CV 2/5] END C=0.1, epsilon=0.3, gamma=0.01, kernel=linear;, score=0.706 total
time=   0.0s
[CV 3/5] END C=0.1, epsilon=0.3, gamma=0.01, kernel=linear;, score=0.710 total
time=   0.0s
[CV 4/5] END C=0.1, epsilon=0.3, gamma=0.01, kernel=linear;, score=0.711 total
```

```
time=   0.0s
[CV 5/5] END C=0.1, epsilon=0.3, gamma=0.01, kernel=linear;, score=0.696 total
time=   0.0s
[CV 1/5] END C=0.1, epsilon=0.3, gamma=0.001, kernel=linear;, score=0.690 total
time=   0.0s
[CV 2/5] END C=0.1, epsilon=0.3, gamma=0.001, kernel=linear;, score=0.706 total
time=   0.0s
[CV 3/5] END C=0.1, epsilon=0.3, gamma=0.001, kernel=linear;, score=0.710 total
time=   0.0s
[CV 4/5] END C=0.1, epsilon=0.3, gamma=0.001, kernel=linear;, score=0.711 total
time=   0.0s
[CV 5/5] END C=0.1, epsilon=0.3, gamma=0.001, kernel=linear;, score=0.696 total
time=   0.0s
[CV 1/5] END C=0.1, epsilon=0.3, gamma=0.0001, kernel=linear;, score=0.690 total
time=   0.0s
[CV 2/5] END C=0.1, epsilon=0.3, gamma=0.0001, kernel=linear;, score=0.706 total
time=   0.0s
[CV 3/5] END C=0.1, epsilon=0.3, gamma=0.0001, kernel=linear;, score=0.710 total
time=   0.0s
[CV 4/5] END C=0.1, epsilon=0.3, gamma=0.0001, kernel=linear;, score=0.711 total
time=   0.0s
[CV 5/5] END C=0.1, epsilon=0.3, gamma=0.0001, kernel=linear;, score=0.696 total
time=   0.0s
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0.0s
[CV 2/5] END C=1, epsilon=0.1, gamma=1, kernel=linear;, score=0.999 total time=
0.0s
[CV 3/5] END C=1, epsilon=0.1, gamma=1, kernel=linear;, score=0.999 total time=
0.0s
[CV 4/5] END C=1, epsilon=0.1, gamma=1, kernel=linear;, score=0.999 total time=
0.0s
[CV 5/5] END C=1, epsilon=0.1, gamma=1, kernel=linear;, score=0.999 total time=
0.0s
[CV 1/5] END C=1, epsilon=0.1, gamma=0.1, kernel=linear;, score=0.999 total
time=   0.0s
[CV 2/5] END C=1, epsilon=0.1, gamma=0.1, kernel=linear;, score=0.999 total
time=   0.0s
[CV 3/5] END C=1, epsilon=0.1, gamma=0.1, kernel=linear;, score=0.999 total
time=   0.0s
[CV 4/5] END C=1, epsilon=0.1, gamma=0.1, kernel=linear;, score=0.999 total
time=   0.0s
[CV 5/5] END C=1, epsilon=0.1, gamma=0.1, kernel=linear;, score=0.999 total
time=   0.0s
[CV 1/5] END C=1, epsilon=0.1, gamma=0.01, kernel=linear;, score=0.999 total
time=   0.0s
[CV 2/5] END C=1, epsilon=0.1, gamma=0.01, kernel=linear;, score=0.999 total
time=   0.0s
[CV 3/5] END C=1, epsilon=0.1, gamma=0.01, kernel=linear;, score=0.999 total
```

```
time=   0.0s
[CV 4/5] END C=1, epsilon=0.1, gamma=0.01, kernel=linear;, score=0.999 total
time=   0.0s
[CV 5/5] END C=1, epsilon=0.1, gamma=0.01, kernel=linear;, score=0.999 total
time=   0.0s
[CV 1/5] END C=1, epsilon=0.1, gamma=0.001, kernel=linear;, score=0.999 total
time=   0.0s
[CV 2/5] END C=1, epsilon=0.1, gamma=0.001, kernel=linear;, score=0.999 total
time=   0.0s
[CV 3/5] END C=1, epsilon=0.1, gamma=0.001, kernel=linear;, score=0.999 total
time=   0.0s
[CV 4/5] END C=1, epsilon=0.1, gamma=0.001, kernel=linear;, score=0.999 total
time=   0.0s
[CV 5/5] END C=1, epsilon=0.1, gamma=0.001, kernel=linear;, score=0.999 total
time=   0.0s
[CV 1/5] END C=1, epsilon=0.1, gamma=0.0001, kernel=linear;, score=0.999 total
time=   0.0s
[CV 2/5] END C=1, epsilon=0.1, gamma=0.0001, kernel=linear;, score=0.999 total
time=   0.0s
[CV 3/5] END C=1, epsilon=0.1, gamma=0.0001, kernel=linear;, score=0.999 total
time=   0.0s
[CV 4/5] END C=1, epsilon=0.1, gamma=0.0001, kernel=linear;, score=0.999 total
time=   0.0s
[CV 5/5] END C=1, epsilon=0.1, gamma=0.0001, kernel=linear;, score=0.999 total
time=   0.0s
[CV 1/5] END C=1, epsilon=0.2, gamma=1, kernel=linear;, score=0.999 total time=
0.0s
[CV 2/5] END C=1, epsilon=0.2, gamma=1, kernel=linear;, score=0.999 total time=
0.0s
[CV 3/5] END C=1, epsilon=0.2, gamma=1, kernel=linear;, score=0.999 total time=
0.0s
[CV 4/5] END C=1, epsilon=0.2, gamma=1, kernel=linear;, score=0.999 total time=
0.0s
[CV 5/5] END C=1, epsilon=0.2, gamma=1, kernel=linear;, score=0.999 total time=
0.0s
[CV 1/5] END C=1, epsilon=0.2, gamma=0.1, kernel=linear;, score=0.999 total
time=   0.0s
[CV 2/5] END C=1, epsilon=0.2, gamma=0.1, kernel=linear;, score=0.999 total
time=   0.0s
[CV 3/5] END C=1, epsilon=0.2, gamma=0.1, kernel=linear;, score=0.999 total
time=   0.0s
[CV 4/5] END C=1, epsilon=0.2, gamma=0.1, kernel=linear;, score=0.999 total
time=   0.0s
[CV 5/5] END C=1, epsilon=0.2, gamma=0.1, kernel=linear;, score=0.999 total
time=   0.0s
[CV 1/5] END C=1, epsilon=0.2, gamma=0.01, kernel=linear;, score=0.999 total
time=   0.0s
[CV 2/5] END C=1, epsilon=0.2, gamma=0.01, kernel=linear;, score=0.999 total
```

```
time=   0.0s
[CV 3/5] END C=1, epsilon=0.2, gamma=0.01, kernel=linear;, score=0.999 total
time=   0.0s
[CV 4/5] END C=1, epsilon=0.2, gamma=0.01, kernel=linear;, score=0.999 total
time=   0.0s
[CV 5/5] END C=1, epsilon=0.2, gamma=0.01, kernel=linear;, score=0.999 total
time=   0.0s
[CV 1/5] END C=1, epsilon=0.2, gamma=0.001, kernel=linear;, score=0.999 total
time=   0.0s
[CV 2/5] END C=1, epsilon=0.2, gamma=0.001, kernel=linear;, score=0.999 total
time=   0.0s
[CV 3/5] END C=1, epsilon=0.2, gamma=0.001, kernel=linear;, score=0.999 total
time=   0.0s
[CV 4/5] END C=1, epsilon=0.2, gamma=0.001, kernel=linear;, score=0.999 total
time=   0.0s
[CV 5/5] END C=1, epsilon=0.2, gamma=0.001, kernel=linear;, score=0.999 total
time=   0.0s
[CV 1/5] END C=1, epsilon=0.2, gamma=0.0001, kernel=linear;, score=0.999 total
time=   0.0s
[CV 2/5] END C=1, epsilon=0.2, gamma=0.0001, kernel=linear;, score=0.999 total
time=   0.0s
[CV 3/5] END C=1, epsilon=0.2, gamma=0.0001, kernel=linear;, score=0.999 total
time=   0.0s
[CV 4/5] END C=1, epsilon=0.2, gamma=0.0001, kernel=linear;, score=0.999 total
time=   0.0s
[CV 5/5] END C=1, epsilon=0.2, gamma=0.0001, kernel=linear;, score=0.999 total
time=   0.0s
[CV 1/5] END C=1, epsilon=0.3, gamma=1, kernel=linear;, score=0.999 total time=
0.0s
[CV 2/5] END C=1, epsilon=0.3, gamma=1, kernel=linear;, score=0.999 total time=
0.0s
[CV 3/5] END C=1, epsilon=0.3, gamma=1, kernel=linear;, score=0.999 total time=
0.0s
[CV 4/5] END C=1, epsilon=0.3, gamma=1, kernel=linear;, score=0.999 total time=
0.0s
[CV 5/5] END C=1, epsilon=0.3, gamma=1, kernel=linear;, score=0.999 total time=
0.0s
[CV 1/5] END C=1, epsilon=0.3, gamma=0.1, kernel=linear;, score=0.999 total
time=   0.0s
[CV 2/5] END C=1, epsilon=0.3, gamma=0.1, kernel=linear;, score=0.999 total
time=   0.0s
[CV 3/5] END C=1, epsilon=0.3, gamma=0.1, kernel=linear;, score=0.999 total
time=   0.0s
[CV 4/5] END C=1, epsilon=0.3, gamma=0.1, kernel=linear;, score=0.999 total
time=   0.0s
[CV 5/5] END C=1, epsilon=0.3, gamma=0.1, kernel=linear;, score=0.999 total
time=   0.0s
[CV 1/5] END C=1, epsilon=0.3, gamma=0.01, kernel=linear;, score=0.999 total
```

```
time=   0.0s
[CV 2/5] END C=1, epsilon=0.3, gamma=0.01, kernel=linear;, score=0.999 total
time=   0.0s
[CV 3/5] END C=1, epsilon=0.3, gamma=0.01, kernel=linear;, score=0.999 total
time=   0.0s
[CV 4/5] END C=1, epsilon=0.3, gamma=0.01, kernel=linear;, score=0.999 total
time=   0.0s
[CV 5/5] END C=1, epsilon=0.3, gamma=0.01, kernel=linear;, score=0.999 total
time=   0.0s
[CV 1/5] END C=1, epsilon=0.3, gamma=0.001, kernel=linear;, score=0.999 total
time=   0.0s
[CV 2/5] END C=1, epsilon=0.3, gamma=0.001, kernel=linear;, score=0.999 total
time=   0.0s
[CV 3/5] END C=1, epsilon=0.3, gamma=0.001, kernel=linear;, score=0.999 total
time=   0.0s
[CV 4/5] END C=1, epsilon=0.3, gamma=0.001, kernel=linear;, score=0.999 total
time=   0.0s
[CV 5/5] END C=1, epsilon=0.3, gamma=0.001, kernel=linear;, score=0.999 total
time=   0.0s
[CV 1/5] END C=1, epsilon=0.3, gamma=0.0001, kernel=linear;, score=0.999 total
time=   0.0s
[CV 2/5] END C=1, epsilon=0.3, gamma=0.0001, kernel=linear;, score=0.999 total
time=   0.0s
[CV 3/5] END C=1, epsilon=0.3, gamma=0.0001, kernel=linear;, score=0.999 total
time=   0.0s
[CV 4/5] END C=1, epsilon=0.3, gamma=0.0001, kernel=linear;, score=0.999 total
time=   0.0s
[CV 5/5] END C=1, epsilon=0.3, gamma=0.0001, kernel=linear;, score=0.999 total
time=   0.0s
[CV 1/5] END C=10, epsilon=0.1, gamma=1, kernel=linear;, score=0.999 total time=
0.0s
[CV 2/5] END C=10, epsilon=0.1, gamma=1, kernel=linear;, score=0.999 total time=
0.0s
[CV 3/5] END C=10, epsilon=0.1, gamma=1, kernel=linear;, score=0.999 total time=
0.0s
[CV 4/5] END C=10, epsilon=0.1, gamma=1, kernel=linear;, score=0.999 total time=
0.0s
[CV 5/5] END C=10, epsilon=0.1, gamma=1, kernel=linear;, score=0.999 total time=
0.0s
[CV 1/5] END C=10, epsilon=0.1, gamma=0.1, kernel=linear;, score=0.999 total
time=   0.0s
[CV 2/5] END C=10, epsilon=0.1, gamma=0.1, kernel=linear;, score=0.999 total
time=   0.0s
[CV 3/5] END C=10, epsilon=0.1, gamma=0.1, kernel=linear;, score=0.999 total
time=   0.0s
[CV 4/5] END C=10, epsilon=0.1, gamma=0.1, kernel=linear;, score=0.999 total
time=   0.0s
[CV 5/5] END C=10, epsilon=0.1, gamma=0.1, kernel=linear;, score=0.999 total
```

```
time=   0.0s
[CV 1/5] END C=10, epsilon=0.1, gamma=0.01, kernel=linear;, score=0.999 total
time=   0.0s
[CV 2/5] END C=10, epsilon=0.1, gamma=0.01, kernel=linear;, score=0.999 total
time=   0.0s
[CV 3/5] END C=10, epsilon=0.1, gamma=0.01, kernel=linear;, score=0.999 total
time=   0.0s
[CV 4/5] END C=10, epsilon=0.1, gamma=0.01, kernel=linear;, score=0.999 total
time=   0.0s
[CV 5/5] END C=10, epsilon=0.1, gamma=0.01, kernel=linear;, score=0.999 total
time=   0.0s
[CV 1/5] END C=10, epsilon=0.1, gamma=0.001, kernel=linear;, score=0.999 total
time=   0.0s
[CV 2/5] END C=10, epsilon=0.1, gamma=0.001, kernel=linear;, score=0.999 total
time=   0.0s
[CV 3/5] END C=10, epsilon=0.1, gamma=0.001, kernel=linear;, score=0.999 total
time=   0.0s
[CV 4/5] END C=10, epsilon=0.1, gamma=0.001, kernel=linear;, score=0.999 total
time=   0.0s
[CV 5/5] END C=10, epsilon=0.1, gamma=0.001, kernel=linear;, score=0.999 total
time=   0.0s
[CV 1/5] END C=10, epsilon=0.1, gamma=0.0001, kernel=linear;, score=0.999 total
time=   0.0s
[CV 2/5] END C=10, epsilon=0.1, gamma=0.0001, kernel=linear;, score=0.999 total
time=   0.0s
[CV 3/5] END C=10, epsilon=0.1, gamma=0.0001, kernel=linear;, score=0.999 total
time=   0.0s
[CV 4/5] END C=10, epsilon=0.1, gamma=0.0001, kernel=linear;, score=0.999 total
time=   0.0s
[CV 5/5] END C=10, epsilon=0.1, gamma=0.0001, kernel=linear;, score=0.999 total
time=   0.0s
[CV 1/5] END C=10, epsilon=0.2, gamma=1, kernel=linear;, score=0.999 total time=
0.0s
[CV 2/5] END C=10, epsilon=0.2, gamma=1, kernel=linear;, score=0.999 total time=
0.0s
[CV 3/5] END C=10, epsilon=0.2, gamma=1, kernel=linear;, score=0.999 total time=
0.0s
[CV 4/5] END C=10, epsilon=0.2, gamma=1, kernel=linear;, score=0.999 total time=
0.0s
[CV 5/5] END C=10, epsilon=0.2, gamma=1, kernel=linear;, score=0.999 total time=
0.0s
[CV 1/5] END C=10, epsilon=0.2, gamma=0.1, kernel=linear;, score=0.999 total
time=   0.0s
[CV 2/5] END C=10, epsilon=0.2, gamma=0.1, kernel=linear;, score=0.999 total
time=   0.0s
[CV 3/5] END C=10, epsilon=0.2, gamma=0.1, kernel=linear;, score=0.999 total
time=   0.0s
[CV 4/5] END C=10, epsilon=0.2, gamma=0.1, kernel=linear;, score=0.999 total
```

```
time=   0.0s
[CV 5/5] END C=10, epsilon=0.2, gamma=0.1, kernel=linear;, score=0.999 total
time=   0.0s
[CV 1/5] END C=10, epsilon=0.2, gamma=0.01, kernel=linear;, score=0.999 total
time=   0.0s
[CV 2/5] END C=10, epsilon=0.2, gamma=0.01, kernel=linear;, score=0.999 total
time=   0.0s
[CV 3/5] END C=10, epsilon=0.2, gamma=0.01, kernel=linear;, score=0.999 total
time=   0.0s
[CV 4/5] END C=10, epsilon=0.2, gamma=0.01, kernel=linear;, score=0.999 total
time=   0.0s
[CV 5/5] END C=10, epsilon=0.2, gamma=0.01, kernel=linear;, score=0.999 total
time=   0.0s
[CV 1/5] END C=10, epsilon=0.2, gamma=0.001, kernel=linear;, score=0.999 total
time=   0.0s
[CV 2/5] END C=10, epsilon=0.2, gamma=0.001, kernel=linear;, score=0.999 total
time=   0.0s
[CV 3/5] END C=10, epsilon=0.2, gamma=0.001, kernel=linear;, score=0.999 total
time=   0.0s
[CV 4/5] END C=10, epsilon=0.2, gamma=0.001, kernel=linear;, score=0.999 total
time=   0.0s
[CV 5/5] END C=10, epsilon=0.2, gamma=0.001, kernel=linear;, score=0.999 total
time=   0.0s
[CV 1/5] END C=10, epsilon=0.2, gamma=0.0001, kernel=linear;, score=0.999 total
time=   0.0s
[CV 2/5] END C=10, epsilon=0.2, gamma=0.0001, kernel=linear;, score=0.999 total
time=   0.0s
[CV 3/5] END C=10, epsilon=0.2, gamma=0.0001, kernel=linear;, score=0.999 total
time=   0.0s
[CV 4/5] END C=10, epsilon=0.2, gamma=0.0001, kernel=linear;, score=0.999 total
time=   0.0s
[CV 5/5] END C=10, epsilon=0.2, gamma=0.0001, kernel=linear;, score=0.999 total
time=   0.0s
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0.0s
[CV 2/5] END C=10, epsilon=0.3, gamma=1, kernel=linear;, score=0.999 total time=
0.0s
[CV 3/5] END C=10, epsilon=0.3, gamma=1, kernel=linear;, score=0.999 total time=
0.0s
[CV 4/5] END C=10, epsilon=0.3, gamma=1, kernel=linear;, score=0.999 total time=
0.0s
[CV 5/5] END C=10, epsilon=0.3, gamma=1, kernel=linear;, score=0.999 total time=
0.0s
[CV 1/5] END C=10, epsilon=0.3, gamma=0.1, kernel=linear;, score=0.999 total
time=   0.0s
[CV 2/5] END C=10, epsilon=0.3, gamma=0.1, kernel=linear;, score=0.999 total
time=   0.0s
[CV 3/5] END C=10, epsilon=0.3, gamma=0.1, kernel=linear;, score=0.999 total
```

```
time=   0.0s
[CV 4/5] END C=10, epsilon=0.3, gamma=0.1, kernel=linear;, score=0.999 total
time=   0.0s
[CV 5/5] END C=10, epsilon=0.3, gamma=0.1, kernel=linear;, score=0.999 total
time=   0.0s
[CV 1/5] END C=10, epsilon=0.3, gamma=0.01, kernel=linear;, score=0.999 total
time=   0.0s
[CV 2/5] END C=10, epsilon=0.3, gamma=0.01, kernel=linear;, score=0.999 total
time=   0.0s
[CV 3/5] END C=10, epsilon=0.3, gamma=0.01, kernel=linear;, score=0.999 total
time=   0.0s
[CV 4/5] END C=10, epsilon=0.3, gamma=0.01, kernel=linear;, score=0.999 total
time=   0.0s
[CV 5/5] END C=10, epsilon=0.3, gamma=0.01, kernel=linear;, score=0.999 total
time=   0.0s
[CV 1/5] END C=10, epsilon=0.3, gamma=0.001, kernel=linear;, score=0.999 total
time=   0.0s
[CV 2/5] END C=10, epsilon=0.3, gamma=0.001, kernel=linear;, score=0.999 total
time=   0.0s
[CV 3/5] END C=10, epsilon=0.3, gamma=0.001, kernel=linear;, score=0.999 total
time=   0.0s
[CV 4/5] END C=10, epsilon=0.3, gamma=0.001, kernel=linear;, score=0.999 total
time=   0.0s
[CV 5/5] END C=10, epsilon=0.3, gamma=0.001, kernel=linear;, score=0.999 total
time=   0.0s
[CV 1/5] END C=10, epsilon=0.3, gamma=0.0001, kernel=linear;, score=0.999 total
time=   0.0s
[CV 2/5] END C=10, epsilon=0.3, gamma=0.0001, kernel=linear;, score=0.999 total
time=   0.0s
[CV 3/5] END C=10, epsilon=0.3, gamma=0.0001, kernel=linear;, score=0.999 total
time=   0.0s
[CV 4/5] END C=10, epsilon=0.3, gamma=0.0001, kernel=linear;, score=0.999 total
time=   0.0s
[CV 5/5] END C=10, epsilon=0.3, gamma=0.0001, kernel=linear;, score=0.999 total
time=   0.0s
[CV 1/5] END C=100, epsilon=0.1, gamma=1, kernel=linear;, score=0.999 total
time=   0.1s
[CV 2/5] END C=100, epsilon=0.1, gamma=1, kernel=linear;, score=0.999 total
time=   0.1s
[CV 3/5] END C=100, epsilon=0.1, gamma=1, kernel=linear;, score=0.999 total
time=   0.1s
[CV 4/5] END C=100, epsilon=0.1, gamma=1, kernel=linear;, score=0.999 total
time=   0.1s
[CV 5/5] END C=100, epsilon=0.1, gamma=1, kernel=linear;, score=0.999 total
time=   0.1s
[CV 1/5] END C=100, epsilon=0.1, gamma=0.1, kernel=linear;, score=0.999 total
time=   0.1s
[CV 2/5] END C=100, epsilon=0.1, gamma=0.1, kernel=linear;, score=0.999 total
```

```
time=   0.1s
[CV 3/5] END C=100, epsilon=0.1, gamma=0.1, kernel=linear;, score=0.999 total
time=   0.1s
[CV 4/5] END C=100, epsilon=0.1, gamma=0.1, kernel=linear;, score=0.999 total
time=   0.1s
[CV 5/5] END C=100, epsilon=0.1, gamma=0.1, kernel=linear;, score=0.999 total
time=   0.1s
[CV 1/5] END C=100, epsilon=0.1, gamma=0.01, kernel=linear;, score=0.999 total
time=   0.1s
[CV 2/5] END C=100, epsilon=0.1, gamma=0.01, kernel=linear;, score=0.999 total
time=   0.2s
[CV 3/5] END C=100, epsilon=0.1, gamma=0.01, kernel=linear;, score=0.999 total
time=   0.1s
[CV 4/5] END C=100, epsilon=0.1, gamma=0.01, kernel=linear;, score=0.999 total
time=   0.1s
[CV 5/5] END C=100, epsilon=0.1, gamma=0.01, kernel=linear;, score=0.999 total
time=   0.1s
[CV 1/5] END C=100, epsilon=0.1, gamma=0.001, kernel=linear;, score=0.999 total
time=   0.1s
[CV 2/5] END C=100, epsilon=0.1, gamma=0.001, kernel=linear;, score=0.999 total
time=   0.1s
[CV 3/5] END C=100, epsilon=0.1, gamma=0.001, kernel=linear;, score=0.999 total
time=   0.1s
[CV 4/5] END C=100, epsilon=0.1, gamma=0.001, kernel=linear;, score=0.999 total
time=   0.1s
[CV 5/5] END C=100, epsilon=0.1, gamma=0.001, kernel=linear;, score=0.999 total
time=   0.1s
[CV 1/5] END C=100, epsilon=0.1, gamma=0.0001, kernel=linear;, score=0.999 total
time=   0.1s
[CV 2/5] END C=100, epsilon=0.1, gamma=0.0001, kernel=linear;, score=0.999 total
time=   0.1s
[CV 3/5] END C=100, epsilon=0.1, gamma=0.0001, kernel=linear;, score=0.999 total
time=   0.1s
[CV 4/5] END C=100, epsilon=0.1, gamma=0.0001, kernel=linear;, score=0.999 total
time=   0.1s
[CV 5/5] END C=100, epsilon=0.1, gamma=0.0001, kernel=linear;, score=0.999 total
time=   0.1s
[CV 1/5] END C=100, epsilon=0.2, gamma=1, kernel=linear;, score=0.999 total
time=   0.1s
[CV 2/5] END C=100, epsilon=0.2, gamma=1, kernel=linear;, score=0.999 total
time=   0.1s
[CV 3/5] END C=100, epsilon=0.2, gamma=1, kernel=linear;, score=0.999 total
time=   0.1s
[CV 4/5] END C=100, epsilon=0.2, gamma=1, kernel=linear;, score=0.999 total
time=   0.1s
[CV 5/5] END C=100, epsilon=0.2, gamma=1, kernel=linear;, score=0.999 total
time=   0.1s
[CV 1/5] END C=100, epsilon=0.2, gamma=0.1, kernel=linear;, score=0.999 total
```

```
time=   0.1s
[CV 2/5] END C=100, epsilon=0.2, gamma=0.1, kernel=linear;, score=0.999 total
time=   0.1s
[CV 3/5] END C=100, epsilon=0.2, gamma=0.1, kernel=linear;, score=0.999 total
time=   0.1s
[CV 4/5] END C=100, epsilon=0.2, gamma=0.1, kernel=linear;, score=0.999 total
time=   0.1s
[CV 5/5] END C=100, epsilon=0.2, gamma=0.1, kernel=linear;, score=0.999 total
time=   0.1s
[CV 1/5] END C=100, epsilon=0.2, gamma=0.01, kernel=linear;, score=0.999 total
time=   0.1s
[CV 2/5] END C=100, epsilon=0.2, gamma=0.01, kernel=linear;, score=0.999 total
time=   0.1s
[CV 3/5] END C=100, epsilon=0.2, gamma=0.01, kernel=linear;, score=0.999 total
time=   0.1s
[CV 4/5] END C=100, epsilon=0.2, gamma=0.01, kernel=linear;, score=0.999 total
time=   0.1s
[CV 5/5] END C=100, epsilon=0.2, gamma=0.01, kernel=linear;, score=0.999 total
time=   0.1s
[CV 1/5] END C=100, epsilon=0.2, gamma=0.001, kernel=linear;, score=0.999 total
time=   0.1s
[CV 2/5] END C=100, epsilon=0.2, gamma=0.001, kernel=linear;, score=0.999 total
time=   0.1s
[CV 3/5] END C=100, epsilon=0.2, gamma=0.001, kernel=linear;, score=0.999 total
time=   0.1s
[CV 4/5] END C=100, epsilon=0.2, gamma=0.001, kernel=linear;, score=0.999 total
time=   0.1s
[CV 5/5] END C=100, epsilon=0.2, gamma=0.001, kernel=linear;, score=0.999 total
time=   0.1s
[CV 1/5] END C=100, epsilon=0.2, gamma=0.0001, kernel=linear;, score=0.999 total
time=   0.1s
[CV 2/5] END C=100, epsilon=0.2, gamma=0.0001, kernel=linear;, score=0.999 total
time=   0.1s
[CV 3/5] END C=100, epsilon=0.2, gamma=0.0001, kernel=linear;, score=0.999 total
time=   0.1s
[CV 4/5] END C=100, epsilon=0.2, gamma=0.0001, kernel=linear;, score=0.999 total
time=   0.1s
[CV 5/5] END C=100, epsilon=0.2, gamma=0.0001, kernel=linear;, score=0.999 total
time=   0.1s
[CV 1/5] END C=100, epsilon=0.3, gamma=1, kernel=linear;, score=0.999 total
time=   0.1s
[CV 2/5] END C=100, epsilon=0.3, gamma=1, kernel=linear;, score=0.999 total
time=   0.1s
[CV 3/5] END C=100, epsilon=0.3, gamma=1, kernel=linear;, score=0.999 total
time=   0.1s
[CV 4/5] END C=100, epsilon=0.3, gamma=1, kernel=linear;, score=0.999 total
time=   0.1s
[CV 5/5] END C=100, epsilon=0.3, gamma=1, kernel=linear;, score=0.999 total
```

```
time=   0.1s
[CV 1/5] END C=100, epsilon=0.3, gamma=0.1, kernel=linear;, score=0.999 total
time=   0.1s
[CV 2/5] END C=100, epsilon=0.3, gamma=0.1, kernel=linear;, score=0.999 total
time=   0.1s
[CV 3/5] END C=100, epsilon=0.3, gamma=0.1, kernel=linear;, score=0.999 total
time=   0.1s
[CV 4/5] END C=100, epsilon=0.3, gamma=0.1, kernel=linear;, score=0.999 total
time=   0.1s
[CV 5/5] END C=100, epsilon=0.3, gamma=0.1, kernel=linear;, score=0.999 total
time=   0.1s
[CV 1/5] END C=100, epsilon=0.3, gamma=0.01, kernel=linear;, score=0.999 total
time=   0.1s
[CV 2/5] END C=100, epsilon=0.3, gamma=0.01, kernel=linear;, score=0.999 total
time=   0.1s
[CV 3/5] END C=100, epsilon=0.3, gamma=0.01, kernel=linear;, score=0.999 total
time=   0.1s
[CV 4/5] END C=100, epsilon=0.3, gamma=0.01, kernel=linear;, score=0.999 total
time=   0.1s
[CV 5/5] END C=100, epsilon=0.3, gamma=0.01, kernel=linear;, score=0.999 total
time=   0.1s
[CV 1/5] END C=100, epsilon=0.3, gamma=0.001, kernel=linear;, score=0.999 total
time=   0.1s
[CV 2/5] END C=100, epsilon=0.3, gamma=0.001, kernel=linear;, score=0.999 total
time=   0.1s
[CV 3/5] END C=100, epsilon=0.3, gamma=0.001, kernel=linear;, score=0.999 total
time=   0.1s
[CV 4/5] END C=100, epsilon=0.3, gamma=0.001, kernel=linear;, score=0.999 total
time=   0.1s
[CV 5/5] END C=100, epsilon=0.3, gamma=0.001, kernel=linear;, score=0.999 total
time=   0.1s
[CV 1/5] END C=100, epsilon=0.3, gamma=0.0001, kernel=linear;, score=0.999 total
time=   0.2s
[CV 2/5] END C=100, epsilon=0.3, gamma=0.0001, kernel=linear;, score=0.999 total
time=   0.1s
[CV 3/5] END C=100, epsilon=0.3, gamma=0.0001, kernel=linear;, score=0.999 total
time=   0.1s
[CV 4/5] END C=100, epsilon=0.3, gamma=0.0001, kernel=linear;, score=0.999 total
time=   0.1s
[CV 5/5] END C=100, epsilon=0.3, gamma=0.0001, kernel=linear;, score=0.999 total
time=   0.1s
[CV 1/5] END C=1000, epsilon=0.1, gamma=1, kernel=linear;, score=0.999 total
time=   0.8s
[CV 2/5] END C=1000, epsilon=0.1, gamma=1, kernel=linear;, score=0.999 total
time=   0.9s
[CV 3/5] END C=1000, epsilon=0.1, gamma=1, kernel=linear;, score=0.999 total
time=   0.9s
[CV 4/5] END C=1000, epsilon=0.1, gamma=1, kernel=linear;, score=0.999 total
```

```
time=   1.3s
[CV 5/5] END C=1000, epsilon=0.1, gamma=1, kernel=linear;, score=0.999 total
time=   0.8s
[CV 1/5] END C=1000, epsilon=0.1, gamma=0.1, kernel=linear;, score=0.999 total
time=   0.8s
[CV 2/5] END C=1000, epsilon=0.1, gamma=0.1, kernel=linear;, score=0.999 total
time=   0.9s
[CV 3/5] END C=1000, epsilon=0.1, gamma=0.1, kernel=linear;, score=0.999 total
time=   0.9s
[CV 4/5] END C=1000, epsilon=0.1, gamma=0.1, kernel=linear;, score=0.999 total
time=   1.3s
[CV 5/5] END C=1000, epsilon=0.1, gamma=0.1, kernel=linear;, score=0.999 total
time=   0.8s
[CV 1/5] END C=1000, epsilon=0.1, gamma=0.01, kernel=linear;, score=0.999 total
time=   0.8s
[CV 2/5] END C=1000, epsilon=0.1, gamma=0.01, kernel=linear;, score=0.999 total
time=   0.9s
[CV 3/5] END C=1000, epsilon=0.1, gamma=0.01, kernel=linear;, score=0.999 total
time=   0.9s
[CV 4/5] END C=1000, epsilon=0.1, gamma=0.01, kernel=linear;, score=0.999 total
time=   1.3s
[CV 5/5] END C=1000, epsilon=0.1, gamma=0.01, kernel=linear;, score=0.999 total
time=   0.8s
[CV 1/5] END C=1000, epsilon=0.1, gamma=0.001, kernel=linear;, score=0.999 total
time=   0.8s
[CV 2/5] END C=1000, epsilon=0.1, gamma=0.001, kernel=linear;, score=0.999 total
time=   0.9s
[CV 3/5] END C=1000, epsilon=0.1, gamma=0.001, kernel=linear;, score=0.999 total
time=   0.9s
[CV 4/5] END C=1000, epsilon=0.1, gamma=0.001, kernel=linear;, score=0.999 total
time=   1.3s
[CV 5/5] END C=1000, epsilon=0.1, gamma=0.001, kernel=linear;, score=0.999 total
time=   0.8s
[CV 1/5] END C=1000, epsilon=0.1, gamma=0.0001, kernel=linear;, score=0.999
total time=   0.8s
[CV 2/5] END C=1000, epsilon=0.1, gamma=0.0001, kernel=linear;, score=0.999
total time=   0.9s
[CV 3/5] END C=1000, epsilon=0.1, gamma=0.0001, kernel=linear;, score=0.999
total time=   0.9s
[CV 4/5] END C=1000, epsilon=0.1, gamma=0.0001, kernel=linear;, score=0.999
total time=   1.3s
[CV 5/5] END C=1000, epsilon=0.1, gamma=0.0001, kernel=linear;, score=0.999
total time=   0.8s
[CV 1/5] END C=1000, epsilon=0.2, gamma=1, kernel=linear;, score=0.999 total
time=   0.7s
[CV 2/5] END C=1000, epsilon=0.2, gamma=1, kernel=linear;, score=0.999 total
time=   0.9s
[CV 3/5] END C=1000, epsilon=0.2, gamma=1, kernel=linear;, score=0.999 total
```

```
time=   0.9s
[CV 4/5] END C=1000, epsilon=0.2, gamma=1, kernel=linear;, score=0.999 total
time=   1.0s
[CV 5/5] END C=1000, epsilon=0.2, gamma=1, kernel=linear;, score=0.999 total
time=   0.8s
[CV 1/5] END C=1000, epsilon=0.2, gamma=0.1, kernel=linear;, score=0.999 total
time=   0.7s
[CV 2/5] END C=1000, epsilon=0.2, gamma=0.1, kernel=linear;, score=0.999 total
time=   0.9s
[CV 3/5] END C=1000, epsilon=0.2, gamma=0.1, kernel=linear;, score=0.999 total
time=   0.9s
[CV 4/5] END C=1000, epsilon=0.2, gamma=0.1, kernel=linear;, score=0.999 total
time=   1.0s
[CV 5/5] END C=1000, epsilon=0.2, gamma=0.1, kernel=linear;, score=0.999 total
time=   0.8s
[CV 1/5] END C=1000, epsilon=0.2, gamma=0.01, kernel=linear;, score=0.999 total
time=   0.8s
[CV 2/5] END C=1000, epsilon=0.2, gamma=0.01, kernel=linear;, score=0.999 total
time=   0.9s
[CV 3/5] END C=1000, epsilon=0.2, gamma=0.01, kernel=linear;, score=0.999 total
time=   0.9s
[CV 4/5] END C=1000, epsilon=0.2, gamma=0.01, kernel=linear;, score=0.999 total
time=   1.0s
[CV 5/5] END C=1000, epsilon=0.2, gamma=0.01, kernel=linear;, score=0.999 total
time=   0.8s
[CV 1/5] END C=1000, epsilon=0.2, gamma=0.001, kernel=linear;, score=0.999 total
time=   0.7s
[CV 2/5] END C=1000, epsilon=0.2, gamma=0.001, kernel=linear;, score=0.999 total
time=   0.9s
[CV 3/5] END C=1000, epsilon=0.2, gamma=0.001, kernel=linear;, score=0.999 total
time=   0.9s
[CV 4/5] END C=1000, epsilon=0.2, gamma=0.001, kernel=linear;, score=0.999 total
time=   1.0s
[CV 5/5] END C=1000, epsilon=0.2, gamma=0.001, kernel=linear;, score=0.999 total
time=   0.8s
[CV 1/5] END C=1000, epsilon=0.2, gamma=0.0001, kernel=linear;, score=0.999
total time=   0.7s
[CV 2/5] END C=1000, epsilon=0.2, gamma=0.0001, kernel=linear;, score=0.999
total time=   0.9s
[CV 3/5] END C=1000, epsilon=0.2, gamma=0.0001, kernel=linear;, score=0.999
total time=   0.9s
[CV 4/5] END C=1000, epsilon=0.2, gamma=0.0001, kernel=linear;, score=0.999
total time=   1.0s
[CV 5/5] END C=1000, epsilon=0.2, gamma=0.0001, kernel=linear;, score=0.999
total time=   0.8s
[CV 1/5] END C=1000, epsilon=0.3, gamma=1, kernel=linear;, score=0.999 total
time=   1.3s
[CV 2/5] END C=1000, epsilon=0.3, gamma=1, kernel=linear;, score=0.999 total
```

```
time=   0.8s
[CV 3/5] END C=1000, epsilon=0.3, gamma=1, kernel=linear;, score=0.999 total
time=   1.0s
[CV 4/5] END C=1000, epsilon=0.3, gamma=1, kernel=linear;, score=0.999 total
time=   0.8s
[CV 5/5] END C=1000, epsilon=0.3, gamma=1, kernel=linear;, score=0.999 total
time=   1.0s
[CV 1/5] END C=1000, epsilon=0.3, gamma=0.1, kernel=linear;, score=0.999 total
time=   1.3s
[CV 2/5] END C=1000, epsilon=0.3, gamma=0.1, kernel=linear;, score=0.999 total
time=   0.8s
[CV 3/5] END C=1000, epsilon=0.3, gamma=0.1, kernel=linear;, score=0.999 total
time=   1.0s
[CV 4/5] END C=1000, epsilon=0.3, gamma=0.1, kernel=linear;, score=0.999 total
time=   0.8s
[CV 5/5] END C=1000, epsilon=0.3, gamma=0.1, kernel=linear;, score=0.999 total
time=   1.0s
[CV 1/5] END C=1000, epsilon=0.3, gamma=0.01, kernel=linear;, score=0.999 total
time=   1.3s
[CV 2/5] END C=1000, epsilon=0.3, gamma=0.01, kernel=linear;, score=0.999 total
time=   0.8s
[CV 3/5] END C=1000, epsilon=0.3, gamma=0.01, kernel=linear;, score=0.999 total
time=   1.0s
[CV 4/5] END C=1000, epsilon=0.3, gamma=0.01, kernel=linear;, score=0.999 total
time=   0.8s
[CV 5/5] END C=1000, epsilon=0.3, gamma=0.01, kernel=linear;, score=0.999 total
time=   1.0s
[CV 1/5] END C=1000, epsilon=0.3, gamma=0.001, kernel=linear;, score=0.999 total
time=   1.3s
[CV 2/5] END C=1000, epsilon=0.3, gamma=0.001, kernel=linear;, score=0.999 total
time=   0.8s
[CV 3/5] END C=1000, epsilon=0.3, gamma=0.001, kernel=linear;, score=0.999 total
time=   1.0s
[CV 4/5] END C=1000, epsilon=0.3, gamma=0.001, kernel=linear;, score=0.999 total
time=   0.8s
[CV 5/5] END C=1000, epsilon=0.3, gamma=0.001, kernel=linear;, score=0.999 total
time=   1.0s
[CV 1/5] END C=1000, epsilon=0.3, gamma=0.0001, kernel=linear;, score=0.999
total time=   1.3s
[CV 2/5] END C=1000, epsilon=0.3, gamma=0.0001, kernel=linear;, score=0.999
total time=   0.8s
[CV 3/5] END C=1000, epsilon=0.3, gamma=0.0001, kernel=linear;, score=0.999
total time=   1.0s
[CV 4/5] END C=1000, epsilon=0.3, gamma=0.0001, kernel=linear;, score=0.999
total time=   0.8s
[CV 5/5] END C=1000, epsilon=0.3, gamma=0.0001, kernel=linear;, score=0.999
total time=   1.0s
```

[34]:
```
GridSearchCV(cv=5, estimator=SVR(),
             param_grid={'C': [0.1, 1, 10, 100, 1000],
                         'epsilon': [0.1, 0.2, 0.3],
                         'gamma': [1, 0.1, 0.01, 0.001, 0.0001],
                         'kernel': ['linear']},
             verbose=3)
```

[35]:
```
grid.best_params_
```

[35]:
```
{'C': 1000, 'epsilon': 0.3, 'gamma': 1, 'kernel': 'linear'}
```

[36]:
```
# PREDICTION

y_pred4=grid.predict(x_test)
print(r2_score(y_test,y_pred4))
```

```
0.9989804732900989
```

[ ]:
```

```