Subject : AML

Subject Code : 3CS1111

Roll No : 20MCED08

SVM and Gridsearch ¶

In [11]:
```
import pandas as pd
import numpy as np
```

In [12]:
```
from sklearn.model_selection import train_test_split

X_train, X_test, y_train, y_test = train_test_split(df_feat, np.ravel(df_targe
t), test_size = 0.30, random_state = 101)
# train the model on train set
model = SVC()
model.fit(X_train, y_train)

# print prediction results
predictions = model.predict(X_test)
print(classification_report(y_test, predictions))
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, 0.0
001], 'kernel': ['rbf']}

grid = GridSearchCV(SVC(), param_grid, refit = True, verbose = 3)

# fitting the model for grid search
grid.fit(X_train, y_train)
# print best parameter after tuning
print(grid.best_params_)

# print how our model looks after hyper-parameter tuning
print(grid.best_estimator_)
grid_predictions = grid.predict(X_test)
# print classification report
print(classification_report(y_test, grid_predictions))
```

```
              precision    recall  f1-score   support

           0       0.95      0.85      0.90        66
           1       0.91      0.97      0.94       105

    accuracy                           0.92       171
   macro avg       0.93      0.91      0.92       171
weighted avg       0.93      0.92      0.92       171

Fitting 5 folds for each of 25 candidates, totalling 125 fits
[CV] C=0.1, gamma=1, kernel=rbf ......................................
[CV] ........... C=0.1, gamma=1, kernel=rbf, score=0.637, total=   0.0s
[CV] C=0.1, gamma=1, kernel=rbf ......................................
[CV] ........... C=0.1, gamma=1, kernel=rbf, score=0.637, total=   0.0s
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[CV] ........... C=0.1, gamma=1, kernel=rbf, score=0.625, total=   0.0s
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[CV] ........... C=0.1, gamma=1, kernel=rbf, score=0.633, total=   0.0s
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[CV] ......... C=0.1, gamma=0.1, kernel=rbf, score=0.633, total=   0.0s
[CV] C=0.1, gamma=0.01, kernel=rbf ...................................

[Parallel(n_jobs=1)]: Using backend SequentialBackend with 1 concurrent worke
rs.
[Parallel(n_jobs=1)]: Done   1 out of   1 | elapsed:    0.0s remaining:    0.
0s
[Parallel(n_jobs=1)]: Done   2 out of   2 | elapsed:    0.0s remaining:    0.
0s
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[CV] ....... C=0.1, gamma=0.01, kernel=rbf, score=0.637, total=   0.0s
[CV] C=0.1, gamma=0.01, kernel=rbf ..................................
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[CV] ....... C=0.1, gamma=0.01, kernel=rbf, score=0.625, total=   0.0s
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[CV] ..... C=0.1, gamma=0.0001, kernel=rbf, score=0.938, total=   0.0s
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[CV] ..... C=0.1, gamma=0.0001, kernel=rbf, score=0.962, total=   0.0s
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[CV] ......... C=1, gamma=0.01, kernel=rbf, score=0.625, total=   0.0s
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[CV] ......... C=1, gamma=0.01, kernel=rbf, score=0.633, total=   0.0s
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[CV] C=1, gamma=0.01, kernel=rbf .....................................
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[CV] C=1, gamma=0.001, kernel=rbf ....................................
[CV] ........ C=1, gamma=0.001, kernel=rbf, score=0.900, total=   0.0s
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[CV] ......... C=10, gamma=0.1, kernel=rbf, score=0.625, total=   0.0s
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[CV] C=10, gamma=0.001, kernel=rbf ...................................
[CV] ....... C=10, gamma=0.001, kernel=rbf, score=0.887, total=   0.0s
[CV] C=10, gamma=0.001, kernel=rbf ...................................
[CV] ....... C=10, gamma=0.001, kernel=rbf, score=0.912, total=   0.0s
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[CV] ....... C=10, gamma=0.001, kernel=rbf, score=0.900, total=   0.0s
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[CV] ....... C=10, gamma=0.001, kernel=rbf, score=0.937, total=   0.0s
[CV] C=10, gamma=0.001, kernel=rbf ..................................
[CV] ....... C=10, gamma=0.001, kernel=rbf, score=0.924, total=   0.0s
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[CV] C=10, gamma=0.0001, kernel=rbf .................................
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[CV] ........ C=100, gamma=0.1, kernel=rbf, score=0.637, total=   0.0s
[CV] C=100, gamma=0.1, kernel=rbf ...................................
[CV] ........ C=100, gamma=0.1, kernel=rbf, score=0.625, total=   0.0s
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[CV] C=100, gamma=0.001, kernel=rbf .................................
[CV] ...... C=100, gamma=0.001, kernel=rbf, score=0.887, total=   0.0s
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[CV] ...... C=100, gamma=0.001, kernel=rbf, score=0.912, total=   0.0s
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[CV] ...... C=100, gamma=0.001, kernel=rbf, score=0.900, total=   0.0s
[CV] C=100, gamma=0.001, kernel=rbf .................................
[CV] ...... C=100, gamma=0.001, kernel=rbf, score=0.937, total=   0.0s
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[CV] ...... C=100, gamma=0.001, kernel=rbf, score=0.924, total=   0.0s
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[CV] ..... C=100, gamma=0.0001, kernel=rbf, score=0.925, total=   0.0s
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[CV] C=100, gamma=0.0001, kernel=rbf .............................
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[CV] ..... C=100, gamma=0.0001, kernel=rbf, score=0.975, total=   0.0s
[CV] C=100, gamma=0.0001, kernel=rbf .............................
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[CV] ..... C=1000, gamma=0.001, kernel=rbf, score=0.887, total=   0.0s
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[CV] C=1000, gamma=0.001, kernel=rbf .............................
[CV] ..... C=1000, gamma=0.001, kernel=rbf, score=0.924, total=   0.0s
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[CV] .... C=1000, gamma=0.0001, kernel=rbf, score=0.938, total=   0.0s
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[CV] .... C=1000, gamma=0.0001, kernel=rbf, score=0.912, total=   0.0s
[CV] C=1000, gamma=0.0001, kernel=rbf ............................
[CV] .... C=1000, gamma=0.0001, kernel=rbf, score=0.963, total=   0.0s
[CV] C=1000, gamma=0.0001, kernel=rbf ............................
[CV] .... C=1000, gamma=0.0001, kernel=rbf, score=0.924, total=   0.0s
[CV] C=1000, gamma=0.0001, kernel=rbf ............................
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[CV] .... C=1000, gamma=0.0001, kernel=rbf, score=0.962, total=   0.0s
{'C': 1, 'gamma': 0.0001, 'kernel': 'rbf'}
SVC(C=1, gamma=0.0001)
              precision    recall  f1-score   support

           0       0.94      0.89      0.91        66
           1       0.94      0.96      0.95       105

    accuracy                           0.94       171
   macro avg       0.94      0.93      0.93       171
weighted avg       0.94      0.94      0.94       171


[Parallel(n_jobs=1)]: Done 125 out of 125 | elapsed:    1.7s finished
```

In [13]:
```
from sklearn.metrics import classification_report, confusion_matrix
from sklearn.datasets import load_breast_cancer
from sklearn.svm import SVC

cancer = load_breast_cancer()

# The data set is presented in a dictionary form:
print(cancer.keys())
df_feat = pd.DataFrame(cancer['data'],
                       columns = cancer['feature_names'])

# cancer column is our target
df_target = pd.DataFrame(cancer['target'],
                     columns =['Cancer'])

print("Feature Variables: ")
print(df_feat.info())
print("Dataframe looks like : ")
print(df_feat.head())
from sklearn.model_selection import train_test_split

X_train, X_test, y_train, y_test = train_test_split(df_feat, np.ravel(df_targe
t), test_size = 0.30, random_state = 101)
# train the model on train set
model = SVC()
model.fit(X_train, y_train)

# print prediction results
predictions = model.predict(X_test)
print(classification_report(y_test, predictions))
```

```
dict_keys(['data', 'target', 'frame', 'target_names', 'DESCR', 'feature_name
s', 'filename'])
Feature Variables:
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 569 entries, 0 to 568
Data columns (total 30 columns):
 #   Column                   Non-Null Count  Dtype
---  ------                   --------------  -----
 0   mean radius              569 non-null    float64
 1   mean texture             569 non-null    float64
 2   mean perimeter           569 non-null    float64
 3   mean area                569 non-null    float64
 4   mean smoothness          569 non-null    float64
 5   mean compactness         569 non-null    float64
 6   mean concavity           569 non-null    float64
 7   mean concave points      569 non-null    float64
 8   mean symmetry            569 non-null    float64
 9   mean fractal dimension   569 non-null    float64
 10  radius error             569 non-null    float64
 11  texture error            569 non-null    float64
 12  perimeter error          569 non-null    float64
 13  area error               569 non-null    float64
 14  smoothness error         569 non-null    float64
 15  compactness error        569 non-null    float64
 16  concavity error          569 non-null    float64
 17  concave points error     569 non-null    float64
 18  symmetry error           569 non-null    float64
 19  fractal dimension error  569 non-null    float64
 20  worst radius             569 non-null    float64
 21  worst texture            569 non-null    float64
 22  worst perimeter          569 non-null    float64
 23  worst area               569 non-null    float64
 24  worst smoothness         569 non-null    float64
 25  worst compactness        569 non-null    float64
 26  worst concavity          569 non-null    float64
 27  worst concave points     569 non-null    float64
 28  worst symmetry           569 non-null    float64
 29  worst fractal dimension  569 non-null    float64
dtypes: float64(30)
memory usage: 133.5 KB
None
Dataframe looks like :
   mean radius  mean texture  mean perimeter  mean area  mean smoothness  \
0        17.99         10.38          122.80     1001.0          0.11840
1        20.57         17.77          132.90     1326.0          0.08474
2        19.69         21.25          130.00     1203.0          0.10960
3        11.42         20.38           77.58      386.1          0.14250
4        20.29         14.34          135.10     1297.0          0.10030

   mean compactness  mean concavity  mean concave points  mean symmetry  \
0           0.27760          0.3001              0.14710         0.2419
1           0.07864          0.0869              0.07017         0.1812
2           0.15990          0.1974              0.12790         0.2069
3           0.28390          0.2414              0.10520         0.2597
4           0.13280          0.1980              0.10430         0.1809

   mean fractal dimension  ...  worst radius  worst texture  worst perimeter
```

```
\
0                0.07871  ...         25.38          17.33           184.60
1                0.05667  ...         24.99          23.41           158.80
2                0.05999  ...         23.57          25.53           152.50
3                0.09744  ...         14.91          26.50            98.87
4                0.05883  ...         22.54          16.67           152.20

   worst area  worst smoothness  worst compactness  worst concavity  \
0      2019.0            0.1622             0.6656           0.7119
1      1956.0            0.1238             0.1866           0.2416
2      1709.0            0.1444             0.4245           0.4504
3       567.7            0.2098             0.8663           0.6869
4      1575.0            0.1374             0.2050           0.4000

   worst concave points  worst symmetry  worst fractal dimension
0                0.2654          0.4601                  0.11890
1                0.1860          0.2750                  0.08902
2                0.2430          0.3613                  0.08758
3                0.2575          0.6638                  0.17300
4                0.1625          0.2364                  0.07678

[5 rows x 30 columns]
              precision    recall  f1-score   support

           0       0.95      0.85      0.90        66
           1       0.91      0.97      0.94       105

    accuracy                           0.92       171
   macro avg       0.93      0.91      0.92       171
weighted avg       0.93      0.92      0.92       171
```

In [15]:
```
import numpy as np
import pandas as pd
from sklearn.metrics import classification_report, confusion_matrix
from sklearn.datasets import load_breast_cancer
from sklearn.svm import SVC

cancer = load_breast_cancer()

# The data set is presented in a dictionary form:
print(cancer.keys())
df_feat = pd.DataFrame(cancer['data'],
                       columns=cancer['feature_names'])

# cancer column is our target
df_target = pd.DataFrame(cancer['target'],
                         columns=['Cancer'])

print("Feature Variables: ")
print(df_feat.info())
print("Dataframe looks like : ")
print(df_feat.head())
from sklearn.model_selection import train_test_split

X_train, X_test, y_train, y_test = train_test_split(df_feat, np.ravel(df_targe
t), test_size=0.30, random_state=101)
# train the model on train set
model = SVC()
model.fit(X_train, y_train)

# print prediction results
predictions = model.predict(X_test)
print(classification_report(y_test, predictions))
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, 0.0
001], 'kernel': ['rbf']}

grid = GridSearchCV(SVC(), param_grid, refit=True, verbose=3)

# fitting the model for grid search
grid.fit(X_train, y_train)
# print best parameter after tuning
print(grid.best_params_)

# print how our model looks after hyper-parameter tuning
print(grid.best_estimator_)
grid_predictions = grid.predict(X_test)
# print classification report
print(classification_report(y_test, grid_predictions))
```

```
dict_keys(['data', 'target', 'frame', 'target_names', 'DESCR', 'feature_name
s', 'filename'])
Feature Variables:
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 569 entries, 0 to 568
Data columns (total 30 columns):
 #   Column                   Non-Null Count  Dtype
---  ------                   --------------  -----
 0   mean radius              569 non-null    float64
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 2   mean perimeter           569 non-null    float64
 3   mean area                569 non-null    float64
 4   mean smoothness          569 non-null    float64
 5   mean compactness         569 non-null    float64
 6   mean concavity           569 non-null    float64
 7   mean concave points      569 non-null    float64
 8   mean symmetry            569 non-null    float64
 9   mean fractal dimension   569 non-null    float64
 10  radius error             569 non-null    float64
 11  texture error            569 non-null    float64
 12  perimeter error          569 non-null    float64
 13  area error               569 non-null    float64
 14  smoothness error         569 non-null    float64
 15  compactness error        569 non-null    float64
 16  concavity error          569 non-null    float64
 17  concave points error     569 non-null    float64
 18  symmetry error           569 non-null    float64
 19  fractal dimension error  569 non-null    float64
 20  worst radius             569 non-null    float64
 21  worst texture            569 non-null    float64
 22  worst perimeter          569 non-null    float64
 23  worst area               569 non-null    float64
 24  worst smoothness         569 non-null    float64
 25  worst compactness        569 non-null    float64
 26  worst concavity          569 non-null    float64
 27  worst concave points     569 non-null    float64
 28  worst symmetry           569 non-null    float64
 29  worst fractal dimension  569 non-null    float64
dtypes: float64(30)
memory usage: 133.5 KB
None
Dataframe looks like :
   mean radius  mean texture  mean perimeter  mean area  mean smoothness  \
0        17.99         10.38          122.80     1001.0          0.11840
1        20.57         17.77          132.90     1326.0          0.08474
2        19.69         21.25          130.00     1203.0          0.10960
3        11.42         20.38           77.58      386.1          0.14250
4        20.29         14.34          135.10     1297.0          0.10030

   mean compactness  mean concavity  mean concave points  mean symmetry  \
0           0.27760          0.3001              0.14710         0.2419
1           0.07864          0.0869              0.07017         0.1812
2           0.15990          0.1974              0.12790         0.2069
3           0.28390          0.2414              0.10520         0.2597
4           0.13280          0.1980              0.10430         0.1809

   mean fractal dimension  ...  worst radius  worst texture  worst perimeter
```

```
\
0                0.07871  ...         25.38          17.33           184.60
1                0.05667  ...         24.99          23.41           158.80
2                0.05999  ...         23.57          25.53           152.50
3                0.09744  ...         14.91          26.50            98.87
4                0.05883  ...         22.54          16.67           152.20

   worst area  worst smoothness  worst compactness  worst concavity  \
0      2019.0            0.1622             0.6656           0.7119
1      1956.0            0.1238             0.1866           0.2416
2      1709.0            0.1444             0.4245           0.4504
3       567.7            0.2098             0.8663           0.6869
4      1575.0            0.1374             0.2050           0.4000

   worst concave points  worst symmetry  worst fractal dimension
0                0.2654          0.4601                  0.11890
1                0.1860          0.2750                  0.08902
2                0.2430          0.3613                  0.08758
3                0.2575          0.6638                  0.17300
4                0.1625          0.2364                  0.07678

[5 rows x 30 columns]
              precision    recall  f1-score   support

           0       0.95      0.85      0.90        66
           1       0.91      0.97      0.94       105

    accuracy                           0.92       171
   macro avg       0.93      0.91      0.92       171
weighted avg       0.93      0.92      0.92       171

Fitting 5 folds for each of 25 candidates, totalling 125 fits
[CV] C=0.1, gamma=1, kernel=rbf ......................................
[CV] .......... C=0.1, gamma=1, kernel=rbf, score=0.637, total=   0.0s
[CV] C=0.1, gamma=1, kernel=rbf ......................................
[CV] .......... C=0.1, gamma=1, kernel=rbf, score=0.637, total=   0.0s
[CV] C=0.1, gamma=1, kernel=rbf ......................................
[CV] .......... C=0.1, gamma=1, kernel=rbf, score=0.625, total=   0.0s
[CV] C=0.1, gamma=1, kernel=rbf ......................................
```

```
[Parallel(n_jobs=1)]: Using backend SequentialBackend with 1 concurrent worke
rs.
[Parallel(n_jobs=1)]: Done   1 out of   1 | elapsed:    0.0s remaining:    0.
0s
[Parallel(n_jobs=1)]: Done   2 out of   2 | elapsed:    0.0s remaining:    0.
0s
```

```
[CV] ..... C=0.1, gamma=1, kernel=rbf, score=0.633, total=   0.0s
[CV] C=0.1, gamma=1, kernel=rbf .....................................
[CV] ..... C=0.1, gamma=1, kernel=rbf, score=0.633, total=   0.0s
[CV] C=0.1, gamma=0.1, kernel=rbf ...................................
[CV] ..... C=0.1, gamma=0.1, kernel=rbf, score=0.637, total=   0.0s
[CV] C=0.1, gamma=0.1, kernel=rbf ...................................
[CV] ..... C=0.1, gamma=0.1, kernel=rbf, score=0.637, total=   0.0s
[CV] C=0.1, gamma=0.1, kernel=rbf ...................................
[CV] ..... C=0.1, gamma=0.1, kernel=rbf, score=0.625, total=   0.0s
[CV] C=0.1, gamma=0.1, kernel=rbf ...................................
[CV] ..... C=0.1, gamma=0.1, kernel=rbf, score=0.633, total=   0.0s
[CV] C=0.1, gamma=0.1, kernel=rbf ...................................
[CV] ..... C=0.1, gamma=0.1, kernel=rbf, score=0.633, total=   0.0s
[CV] C=0.1, gamma=0.01, kernel=rbf ..................................
[CV] ..... C=0.1, gamma=0.01, kernel=rbf, score=0.637, total=   0.0s
[CV] C=0.1, gamma=0.01, kernel=rbf ..................................
[CV] ..... C=0.1, gamma=0.01, kernel=rbf, score=0.637, total=   0.0s
[CV] C=0.1, gamma=0.01, kernel=rbf ..................................
[CV] ..... C=0.1, gamma=0.01, kernel=rbf, score=0.625, total=   0.0s
[CV] C=0.1, gamma=0.01, kernel=rbf ..................................
[CV] ..... C=0.1, gamma=0.01, kernel=rbf, score=0.633, total=   0.0s
[CV] C=0.1, gamma=0.01, kernel=rbf ..................................
[CV] ..... C=0.1, gamma=0.01, kernel=rbf, score=0.633, total=   0.0s
[CV] C=0.1, gamma=0.001, kernel=rbf .................................
[CV] ..... C=0.1, gamma=0.001, kernel=rbf, score=0.637, total=   0.0s
[CV] C=0.1, gamma=0.001, kernel=rbf .................................
[CV] ..... C=0.1, gamma=0.001, kernel=rbf, score=0.637, total=   0.0s
[CV] C=0.1, gamma=0.001, kernel=rbf .................................
[CV] ..... C=0.1, gamma=0.001, kernel=rbf, score=0.625, total=   0.0s
[CV] C=0.1, gamma=0.001, kernel=rbf .................................
[CV] ..... C=0.1, gamma=0.001, kernel=rbf, score=0.633, total=   0.0s
[CV] C=0.1, gamma=0.001, kernel=rbf .................................
[CV] ..... C=0.1, gamma=0.001, kernel=rbf, score=0.633, total=   0.0s
[CV] C=0.1, gamma=0.0001, kernel=rbf ................................
[CV] ..... C=0.1, gamma=0.0001, kernel=rbf, score=0.887, total=   0.0s
[CV] C=0.1, gamma=0.0001, kernel=rbf ................................
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[CV] C=0.1, gamma=0.0001, kernel=rbf ................................
[CV] ..... C=0.1, gamma=0.0001, kernel=rbf, score=0.962, total=   0.0s
[CV] C=0.1, gamma=0.0001, kernel=rbf ................................
[CV] ..... C=0.1, gamma=0.0001, kernel=rbf, score=0.886, total=   0.0s
[CV] C=1, gamma=1, kernel=rbf .......................................
[CV] ..... C=1, gamma=1, kernel=rbf, score=0.637, total=   0.0s
[CV] C=1, gamma=1, kernel=rbf .......................................
[CV] ..... C=1, gamma=1, kernel=rbf, score=0.637, total=   0.0s
[CV] C=1, gamma=1, kernel=rbf .......................................
[CV] ..... C=1, gamma=1, kernel=rbf, score=0.625, total=   0.0s
[CV] C=1, gamma=1, kernel=rbf .......................................
[CV] ..... C=1, gamma=1, kernel=rbf, score=0.633, total=   0.0s
[CV] C=1, gamma=1, kernel=rbf .......................................
[CV] ..... C=1, gamma=1, kernel=rbf, score=0.633, total=   0.0s
[CV] C=1, gamma=0.1, kernel=rbf .....................................
[CV] ..... C=1, gamma=0.1, kernel=rbf, score=0.637, total=   0.0s
[CV] C=1, gamma=0.1, kernel=rbf .....................................
[CV] ..... C=1, gamma=0.1, kernel=rbf, score=0.637, total=   0.0s
```

```
[CV] C=1, gamma=0.1, kernel=rbf ....................................
[CV] .......... C=1, gamma=0.1, kernel=rbf, score=0.625, total=   0.0s
[CV] C=1, gamma=0.1, kernel=rbf ....................................
[CV] .......... C=1, gamma=0.1, kernel=rbf, score=0.633, total=   0.0s
[CV] C=1, gamma=0.1, kernel=rbf ....................................
[CV] .......... C=1, gamma=0.1, kernel=rbf, score=0.633, total=   0.0s
[CV] C=1, gamma=0.01, kernel=rbf ...................................
[CV] ......... C=1, gamma=0.01, kernel=rbf, score=0.637, total=   0.0s
[CV] C=1, gamma=0.01, kernel=rbf ...................................
[CV] ......... C=1, gamma=0.01, kernel=rbf, score=0.637, total=   0.0s
[CV] C=1, gamma=0.01, kernel=rbf ...................................
[CV] ......... C=1, gamma=0.01, kernel=rbf, score=0.625, total=   0.0s
[CV] C=1, gamma=0.01, kernel=rbf ...................................
[CV] ......... C=1, gamma=0.01, kernel=rbf, score=0.633, total=   0.0s
[CV] C=1, gamma=0.01, kernel=rbf ...................................
[CV] ......... C=1, gamma=0.01, kernel=rbf, score=0.633, total=   0.0s
[CV] C=1, gamma=0.001, kernel=rbf ..................................
[CV] ........ C=1, gamma=0.001, kernel=rbf, score=0.900, total=   0.0s
[CV] C=1, gamma=0.001, kernel=rbf ..................................
[CV] ........ C=1, gamma=0.001, kernel=rbf, score=0.912, total=   0.0s
[CV] C=1, gamma=0.001, kernel=rbf ..................................
[CV] ........ C=1, gamma=0.001, kernel=rbf, score=0.925, total=   0.0s
[CV] C=1, gamma=0.001, kernel=rbf ..................................
[CV] ........ C=1, gamma=0.001, kernel=rbf, score=0.962, total=   0.0s
[CV] C=1, gamma=0.001, kernel=rbf ..................................
[CV] ........ C=1, gamma=0.001, kernel=rbf, score=0.937, total=   0.0s
[CV] C=1, gamma=0.0001, kernel=rbf .................................
[CV] ....... C=1, gamma=0.0001, kernel=rbf, score=0.912, total=   0.0s
[CV] C=1, gamma=0.0001, kernel=rbf .................................
[CV] ....... C=1, gamma=0.0001, kernel=rbf, score=0.950, total=   0.0s
[CV] C=1, gamma=0.0001, kernel=rbf .................................
[CV] ....... C=1, gamma=0.0001, kernel=rbf, score=0.975, total=   0.0s
[CV] C=1, gamma=0.0001, kernel=rbf .................................
[CV] ....... C=1, gamma=0.0001, kernel=rbf, score=0.962, total=   0.0s
[CV] C=1, gamma=0.0001, kernel=rbf .................................
[CV] ....... C=1, gamma=0.0001, kernel=rbf, score=0.937, total=   0.0s
[CV] C=10, gamma=1, kernel=rbf .....................................
[CV] ........... C=10, gamma=1, kernel=rbf, score=0.637, total=   0.0s
[CV] C=10, gamma=1, kernel=rbf .....................................
[CV] ........... C=10, gamma=1, kernel=rbf, score=0.637, total=   0.0s
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[CV] ........... C=10, gamma=1, kernel=rbf, score=0.625, total=   0.0s
[CV] C=10, gamma=1, kernel=rbf .....................................
[CV] ........... C=10, gamma=1, kernel=rbf, score=0.633, total=   0.0s
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[CV] ........... C=10, gamma=1, kernel=rbf, score=0.633, total=   0.0s
[CV] C=10, gamma=0.1, kernel=rbf ...................................
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[CV] C=10, gamma=0.1, kernel=rbf ...................................
[CV] ......... C=10, gamma=0.1, kernel=rbf, score=0.637, total=   0.0s
[CV] C=10, gamma=0.1, kernel=rbf ...................................
[CV] ......... C=10, gamma=0.1, kernel=rbf, score=0.625, total=   0.0s
[CV] C=10, gamma=0.1, kernel=rbf ...................................
[CV] ......... C=10, gamma=0.1, kernel=rbf, score=0.633, total=   0.0s
[CV] C=10, gamma=0.1, kernel=rbf ...................................
[CV] ......... C=10, gamma=0.1, kernel=rbf, score=0.633, total=   0.0s
[CV] C=10, gamma=0.01, kernel=rbf ..................................
```

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[CV] ........ C=10, gamma=0.01, kernel=rbf, score=0.637, total=   0.0s
[CV] C=10, gamma=0.01, kernel=rbf ....................................
[CV] ........ C=10, gamma=0.01, kernel=rbf, score=0.637, total=   0.0s
[CV] C=10, gamma=0.01, kernel=rbf ....................................
[CV] ........ C=10, gamma=0.01, kernel=rbf, score=0.613, total=   0.0s
[CV] C=10, gamma=0.01, kernel=rbf ....................................
[CV] ........ C=10, gamma=0.01, kernel=rbf, score=0.633, total=   0.0s
[CV] C=10, gamma=0.01, kernel=rbf ....................................
[CV] ........ C=10, gamma=0.01, kernel=rbf, score=0.633, total=   0.0s
[CV] C=10, gamma=0.001, kernel=rbf ...................................
[CV] ....... C=10, gamma=0.001, kernel=rbf, score=0.887, total=   0.0s
[CV] C=10, gamma=0.001, kernel=rbf ...................................
[CV] ....... C=10, gamma=0.001, kernel=rbf, score=0.912, total=   0.0s
[CV] C=10, gamma=0.001, kernel=rbf ...................................
[CV] ....... C=10, gamma=0.001, kernel=rbf, score=0.900, total=   0.0s
[CV] C=10, gamma=0.001, kernel=rbf ...................................
[CV] ....... C=10, gamma=0.001, kernel=rbf, score=0.937, total=   0.0s
[CV] C=10, gamma=0.001, kernel=rbf ...................................
[CV] ....... C=10, gamma=0.001, kernel=rbf, score=0.924, total=   0.0s
[CV] C=10, gamma=0.0001, kernel=rbf ..................................
[CV] ...... C=10, gamma=0.0001, kernel=rbf, score=0.950, total=   0.0s
[CV] C=10, gamma=0.0001, kernel=rbf ..................................
[CV] ...... C=10, gamma=0.0001, kernel=rbf, score=0.912, total=   0.0s
[CV] C=10, gamma=0.0001, kernel=rbf ..................................
[CV] ...... C=10, gamma=0.0001, kernel=rbf, score=0.975, total=   0.0s
[CV] C=10, gamma=0.0001, kernel=rbf ..................................
[CV] ...... C=10, gamma=0.0001, kernel=rbf, score=0.949, total=   0.0s
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[CV] .......... C=100, gamma=1, kernel=rbf, score=0.637, total=   0.0s
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[CV] .......... C=100, gamma=1, kernel=rbf, score=0.637, total=   0.0s
[CV] C=100, gamma=1, kernel=rbf ......................................
[CV] .......... C=100, gamma=1, kernel=rbf, score=0.625, total=   0.0s
[CV] C=100, gamma=1, kernel=rbf ......................................
[CV] .......... C=100, gamma=1, kernel=rbf, score=0.633, total=   0.0s
[CV] C=100, gamma=1, kernel=rbf ......................................
[CV] .......... C=100, gamma=1, kernel=rbf, score=0.633, total=   0.0s
[CV] C=100, gamma=0.1, kernel=rbf ....................................
[CV] ........ C=100, gamma=0.1, kernel=rbf, score=0.637, total=   0.0s
[CV] C=100, gamma=0.1, kernel=rbf ....................................
[CV] ........ C=100, gamma=0.1, kernel=rbf, score=0.637, total=   0.0s
[CV] C=100, gamma=0.1, kernel=rbf ....................................
[CV] ........ C=100, gamma=0.1, kernel=rbf, score=0.625, total=   0.0s
[CV] C=100, gamma=0.1, kernel=rbf ....................................
[CV] ........ C=100, gamma=0.1, kernel=rbf, score=0.633, total=   0.0s
[CV] C=100, gamma=0.1, kernel=rbf ....................................
[CV] ........ C=100, gamma=0.1, kernel=rbf, score=0.633, total=   0.0s
[CV] C=100, gamma=0.01, kernel=rbf ...................................
[CV] ....... C=100, gamma=0.01, kernel=rbf, score=0.637, total=   0.0s
[CV] C=100, gamma=0.01, kernel=rbf ...................................
[CV] ....... C=100, gamma=0.01, kernel=rbf, score=0.637, total=   0.0s
[CV] C=100, gamma=0.01, kernel=rbf ...................................
[CV] ....... C=100, gamma=0.01, kernel=rbf, score=0.613, total=   0.0s
[CV] C=100, gamma=0.01, kernel=rbf ...................................
[CV] ....... C=100, gamma=0.01, kernel=rbf, score=0.633, total=   0.0s
```

```
[CV] C=100, gamma=0.01, kernel=rbf ....................................
[CV] ....... C=100, gamma=0.01, kernel=rbf, score=0.633, total=   0.0s
[CV] C=100, gamma=0.001, kernel=rbf ...................................
[CV] ...... C=100, gamma=0.001, kernel=rbf, score=0.887, total=   0.0s
[CV] C=100, gamma=0.001, kernel=rbf ...................................
[CV] ...... C=100, gamma=0.001, kernel=rbf, score=0.912, total=   0.0s
[CV] C=100, gamma=0.001, kernel=rbf ...................................
[CV] ...... C=100, gamma=0.001, kernel=rbf, score=0.900, total=   0.0s
[CV] C=100, gamma=0.001, kernel=rbf ...................................
[CV] ...... C=100, gamma=0.001, kernel=rbf, score=0.937, total=   0.0s
[CV] C=100, gamma=0.001, kernel=rbf ...................................
[CV] ...... C=100, gamma=0.001, kernel=rbf, score=0.924, total=   0.0s
[CV] C=100, gamma=0.0001, kernel=rbf ..................................
[CV] ..... C=100, gamma=0.0001, kernel=rbf, score=0.925, total=   0.0s
[CV] C=100, gamma=0.0001, kernel=rbf ..................................
[CV] ..... C=100, gamma=0.0001, kernel=rbf, score=0.912, total=   0.1s
[CV] C=100, gamma=0.0001, kernel=rbf ..................................
[CV] ..... C=100, gamma=0.0001, kernel=rbf, score=0.975, total=   0.0s
[CV] C=100, gamma=0.0001, kernel=rbf ..................................
[CV] ..... C=100, gamma=0.0001, kernel=rbf, score=0.937, total=   0.0s
[CV] C=100, gamma=0.0001, kernel=rbf ..................................
[CV] ..... C=100, gamma=0.0001, kernel=rbf, score=0.949, total=   0.0s
[CV] C=1000, gamma=1, kernel=rbf ......................................
[CV] ......... C=1000, gamma=1, kernel=rbf, score=0.637, total=   0.0s
[CV] C=1000, gamma=1, kernel=rbf ......................................
[CV] ......... C=1000, gamma=1, kernel=rbf, score=0.637, total=   0.0s
[CV] C=1000, gamma=1, kernel=rbf ......................................
[CV] ......... C=1000, gamma=1, kernel=rbf, score=0.625, total=   0.0s
[CV] C=1000, gamma=1, kernel=rbf ......................................
[CV] ......... C=1000, gamma=1, kernel=rbf, score=0.633, total=   0.0s
[CV] C=1000, gamma=1, kernel=rbf ......................................
[CV] ......... C=1000, gamma=1, kernel=rbf, score=0.633, total=   0.0s
[CV] C=1000, gamma=0.1, kernel=rbf ....................................
[CV] ....... C=1000, gamma=0.1, kernel=rbf, score=0.637, total=   0.0s
[CV] C=1000, gamma=0.1, kernel=rbf ....................................
[CV] ....... C=1000, gamma=0.1, kernel=rbf, score=0.637, total=   0.0s
[CV] C=1000, gamma=0.1, kernel=rbf ....................................
[CV] ....... C=1000, gamma=0.1, kernel=rbf, score=0.625, total=   0.0s
[CV] C=1000, gamma=0.1, kernel=rbf ....................................
[CV] ....... C=1000, gamma=0.1, kernel=rbf, score=0.633, total=   0.0s
[CV] C=1000, gamma=0.1, kernel=rbf ....................................
[CV] ....... C=1000, gamma=0.1, kernel=rbf, score=0.633, total=   0.0s
[CV] C=1000, gamma=0.01, kernel=rbf ...................................
[CV] ...... C=1000, gamma=0.01, kernel=rbf, score=0.637, total=   0.0s
[CV] C=1000, gamma=0.01, kernel=rbf ...................................
[CV] ...... C=1000, gamma=0.01, kernel=rbf, score=0.637, total=   0.0s
[CV] C=1000, gamma=0.01, kernel=rbf ...................................
[CV] ...... C=1000, gamma=0.01, kernel=rbf, score=0.613, total=   0.0s
[CV] C=1000, gamma=0.01, kernel=rbf ...................................
[CV] ...... C=1000, gamma=0.01, kernel=rbf, score=0.633, total=   0.0s
[CV] C=1000, gamma=0.01, kernel=rbf ...................................
[CV] ...... C=1000, gamma=0.01, kernel=rbf, score=0.633, total=   0.0s
[CV] C=1000, gamma=0.001, kernel=rbf ..................................
[CV] ..... C=1000, gamma=0.001, kernel=rbf, score=0.887, total=   0.0s
[CV] C=1000, gamma=0.001, kernel=rbf ..................................
[CV] ..... C=1000, gamma=0.001, kernel=rbf, score=0.912, total=   0.0s
[CV] C=1000, gamma=0.001, kernel=rbf ..................................
```

```
[CV] ..... C=1000, gamma=0.001, kernel=rbf, score=0.900, total=   0.0s
[CV] C=1000, gamma=0.001, kernel=rbf .................................
[CV] ..... C=1000, gamma=0.001, kernel=rbf, score=0.937, total=   0.0s
[CV] C=1000, gamma=0.001, kernel=rbf .................................
[CV] ..... C=1000, gamma=0.001, kernel=rbf, score=0.924, total=   0.0s
[CV] C=1000, gamma=0.0001, kernel=rbf ................................
[CV] .... C=1000, gamma=0.0001, kernel=rbf, score=0.938, total=   0.0s
[CV] C=1000, gamma=0.0001, kernel=rbf ................................
[CV] .... C=1000, gamma=0.0001, kernel=rbf, score=0.912, total=   0.0s
[CV] C=1000, gamma=0.0001, kernel=rbf ................................
[CV] .... C=1000, gamma=0.0001, kernel=rbf, score=0.963, total=   0.0s
[CV] C=1000, gamma=0.0001, kernel=rbf ................................
[CV] .... C=1000, gamma=0.0001, kernel=rbf, score=0.924, total=   0.0s
[CV] C=1000, gamma=0.0001, kernel=rbf ................................
[CV] .... C=1000, gamma=0.0001, kernel=rbf, score=0.962, total=   0.0s
{'C': 1, 'gamma': 0.0001, 'kernel': 'rbf'}
SVC(C=1, gamma=0.0001)
              precision    recall  f1-score   support

           0       0.94      0.89      0.91        66
           1       0.94      0.96      0.95       105

    accuracy                           0.94       171
   macro avg       0.94      0.93      0.93       171
weighted avg       0.94      0.94      0.94       171


[Parallel(n_jobs=1)]: Done 125 out of 125 | elapsed:    1.8s finished
```

In [16]:
```
from sklearn.metrics import classification_report, confusion_matrix
from sklearn.datasets import load_breast_cancer
from sklearn.neural_network import MLPClassifier
from sklearn.svm import SVC
import pandas as pd
import numpy as np

cancer = load_breast_cancer()

# The data set is presented in a dictionary form:
print(cancer.keys())
df_feat = pd.DataFrame(cancer['data'],columns = cancer['feature_names'])

# cancer column is our target
df_target = pd.DataFrame(cancer['target'],columns =['Cancer'])

print("Feature Variables: ")
print(df_feat.info())
print("Dataframe looks like : ")
print(df_feat.head())
from sklearn.model_selection import train_test_split

X_train, X_test, y_train, y_test = train_test_split(df_feat, np.ravel(df_targe
t), test_size = 0.30, random_state = 101)
# train the model on train set
model = SVC()
model.fit(X_train, y_train)

# print prediction results
predictions = model.predict(X_test)
print(classification_report(y_test, predictions))

from sklearn.model_selection import GridSearchCV

# defining parameter range
param_grid = {'hidden_layer_sizes': [(1,), (10,), (10,5), (100,), (10,10)], 'a
ctivation': ['identity', 'logistic', 'tanh', 'relu'], 'solver': ['lbfgs', 'sg
d', 'adam']}
grid = GridSearchCV(MLPClassifier(), param_grid, refit = True, verbose = 3)

# fitting the model for grid search
grid.fit(X_train, y_train)
# print best parameter after tuning
print(grid.best_params_)

# print how our model looks after hyper-parameter tuning
print(grid.best_estimator_)
grid_predictions = grid.predict(X_test)
# print classification report
print(classification_report(y_test, grid_predictions))
```

```
dict_keys(['data', 'target', 'frame', 'target_names', 'DESCR', 'feature_name
s', 'filename'])
Feature Variables:
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 569 entries, 0 to 568
Data columns (total 30 columns):
 #   Column                   Non-Null Count  Dtype
---  ------                   --------------  -----
 0   mean radius              569 non-null    float64
 1   mean texture             569 non-null    float64
 2   mean perimeter           569 non-null    float64
 3   mean area                569 non-null    float64
 4   mean smoothness          569 non-null    float64
 5   mean compactness         569 non-null    float64
 6   mean concavity           569 non-null    float64
 7   mean concave points      569 non-null    float64
 8   mean symmetry            569 non-null    float64
 9   mean fractal dimension   569 non-null    float64
 10  radius error             569 non-null    float64
 11  texture error            569 non-null    float64
 12  perimeter error          569 non-null    float64
 13  area error               569 non-null    float64
 14  smoothness error         569 non-null    float64
 15  compactness error        569 non-null    float64
 16  concavity error          569 non-null    float64
 17  concave points error     569 non-null    float64
 18  symmetry error           569 non-null    float64
 19  fractal dimension error  569 non-null    float64
 20  worst radius             569 non-null    float64
 21  worst texture            569 non-null    float64
 22  worst perimeter          569 non-null    float64
 23  worst area               569 non-null    float64
 24  worst smoothness         569 non-null    float64
 25  worst compactness        569 non-null    float64
 26  worst concavity          569 non-null    float64
 27  worst concave points     569 non-null    float64
 28  worst symmetry           569 non-null    float64
 29  worst fractal dimension  569 non-null    float64
dtypes: float64(30)
memory usage: 133.5 KB
None
Dataframe looks like :
   mean radius  mean texture  mean perimeter  mean area  mean smoothness  \
0        17.99         10.38          122.80     1001.0          0.11840
1        20.57         17.77          132.90     1326.0          0.08474
2        19.69         21.25          130.00     1203.0          0.10960
3        11.42         20.38           77.58      386.1          0.14250
4        20.29         14.34          135.10     1297.0          0.10030

   mean compactness  mean concavity  mean concave points  mean symmetry  \
0           0.27760          0.3001              0.14710         0.2419
1           0.07864          0.0869              0.07017         0.1812
2           0.15990          0.1974              0.12790         0.2069
3           0.28390          0.2414              0.10520         0.2597
4           0.13280          0.1980              0.10430         0.1809

   mean fractal dimension  ...  worst radius  worst texture  worst perimeter
```

```
\
0                0.07871  ...         25.38          17.33           184.60
1                0.05667  ...         24.99          23.41           158.80
2                0.05999  ...         23.57          25.53           152.50
3                0.09744  ...         14.91          26.50            98.87
4                0.05883  ...         22.54          16.67           152.20

   worst area  worst smoothness  worst compactness  worst concavity  \
0      2019.0            0.1622             0.6656           0.7119
1      1956.0            0.1238             0.1866           0.2416
2      1709.0            0.1444             0.4245           0.4504
3       567.7            0.2098             0.8663           0.6869
4      1575.0            0.1374             0.2050           0.4000

   worst concave points  worst symmetry  worst fractal dimension
0                0.2654          0.4601                  0.11890
1                0.1860          0.2750                  0.08902
2                0.2430          0.3613                  0.08758
3                0.2575          0.6638                  0.17300
4                0.1625          0.2364                  0.07678

[5 rows x 30 columns]
              precision    recall  f1-score   support

           0       0.95      0.85      0.90        66
           1       0.91      0.97      0.94       105

    accuracy                           0.92       171
   macro avg       0.93      0.91      0.92       171
weighted avg       0.93      0.92      0.92       171

Fitting 5 folds for each of 60 candidates, totalling 300 fits
[CV] activation=identity, hidden_layer_sizes=(1,), solver=lbfgs ......
```

```
[Parallel(n_jobs=1)]: Using backend SequentialBackend with 1 concurrent worke
rs.

[CV]  activation=identity, hidden_layer_sizes=(1,), solver=lbfgs, score=0.86
3, total=   5.9s
[CV] activation=identity, hidden_layer_sizes=(1,), solver=lbfgs ......
[CV]  activation=identity, hidden_layer_sizes=(1,), solver=lbfgs, score=0.15
0, total=   0.0s
[CV] activation=identity, hidden_layer_sizes=(1,), solver=lbfgs ......
```

```
[Parallel(n_jobs=1)]: Done   1 out of   1 | elapsed:    5.8s remaining:    0.
0s
[Parallel(n_jobs=1)]: Done   2 out of   2 | elapsed:    5.8s remaining:    0.
0s
D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
y:471: ConvergenceWarning: lbfgs failed to converge (status=1):
STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
  self.n_iter_ = _check_optimize_result("lbfgs", opt_res, self.max_iter)
D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
y:471: ConvergenceWarning: lbfgs failed to converge (status=2):
ABNORMAL_TERMINATION_IN_LNSRCH.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
  self.n_iter_ = _check_optimize_result("lbfgs", opt_res, self.max_iter)
D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
y:471: ConvergenceWarning: lbfgs failed to converge (status=2):
ABNORMAL_TERMINATION_IN_LNSRCH.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
  self.n_iter_ = _check_optimize_result("lbfgs", opt_res, self.max_iter)

[CV]  activation=identity, hidden_layer_sizes=(1,), solver=lbfgs, score=1.00
0, total=   0.4s
[CV] activation=identity, hidden_layer_sizes=(1,), solver=lbfgs ......
[CV]  activation=identity, hidden_layer_sizes=(1,), solver=lbfgs, score=0.15
2, total=   0.0s
[CV] activation=identity, hidden_layer_sizes=(1,), solver=lbfgs ......
[CV]  activation=identity, hidden_layer_sizes=(1,), solver=lbfgs, score=0.63
3, total=   0.0s
[CV] activation=identity, hidden_layer_sizes=(1,), solver=sgd ........
[CV]  activation=identity, hidden_layer_sizes=(1,), solver=sgd, score=0.912,
total=   0.1s
[CV] activation=identity, hidden_layer_sizes=(1,), solver=sgd ........
[CV]  activation=identity, hidden_layer_sizes=(1,), solver=sgd, score=0.863,
total=   0.1s
[CV] activation=identity, hidden_layer_sizes=(1,), solver=sgd ........
[CV]  activation=identity, hidden_layer_sizes=(1,), solver=sgd, score=0.912,
total=   0.1s
[CV] activation=identity, hidden_layer_sizes=(1,), solver=sgd ........
[CV]  activation=identity, hidden_layer_sizes=(1,), solver=sgd, score=0.937,
total=   0.0s
[CV] activation=identity, hidden_layer_sizes=(1,), solver=sgd ........
[CV]  activation=identity, hidden_layer_sizes=(1,), solver=sgd, score=0.886,
total=   0.1s
[CV] activation=identity, hidden_layer_sizes=(1,), solver=adam .......
[CV]  activation=identity, hidden_layer_sizes=(1,), solver=adam, score=0.900,
total=   0.0s
[CV] activation=identity, hidden_layer_sizes=(1,), solver=adam .......
```

```
D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
y:582: ConvergenceWarning: Stochastic Optimizer: Maximum iterations (200) rea
ched and the optimization hasn't converged yet.
  warnings.warn(
D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
y:582: ConvergenceWarning: Stochastic Optimizer: Maximum iterations (200) rea
ched and the optimization hasn't converged yet.
  warnings.warn(

[CV]  activation=identity, hidden_layer_sizes=(1,), solver=adam, score=0.863,
total=   0.1s
[CV] activation=identity, hidden_layer_sizes=(1,), solver=adam .......
[CV]  activation=identity, hidden_layer_sizes=(1,), solver=adam, score=0.375,
total=   0.0s
[CV] activation=identity, hidden_layer_sizes=(1,), solver=adam .......
[CV]  activation=identity, hidden_layer_sizes=(1,), solver=adam, score=0.886,
total=   0.0s
[CV] activation=identity, hidden_layer_sizes=(1,), solver=adam .......
[CV]  activation=identity, hidden_layer_sizes=(1,), solver=adam, score=0.570,
total=   0.1s
[CV] activation=identity, hidden_layer_sizes=(10,), solver=lbfgs .....

D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
y:471: ConvergenceWarning: lbfgs failed to converge (status=1):
STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
  self.n_iter_ = _check_optimize_result("lbfgs", opt_res, self.max_iter)
D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
y:471: ConvergenceWarning: lbfgs failed to converge (status=1):
STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
  self.n_iter_ = _check_optimize_result("lbfgs", opt_res, self.max_iter)

[CV]  activation=identity, hidden_layer_sizes=(10,), solver=lbfgs, score=0.95
0, total=   0.2s
[CV] activation=identity, hidden_layer_sizes=(10,), solver=lbfgs .....
[CV]  activation=identity, hidden_layer_sizes=(10,), solver=lbfgs, score=0.93
8, total=   0.1s
[CV] activation=identity, hidden_layer_sizes=(10,), solver=lbfgs .....
```

```
D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
y:471: ConvergenceWarning: lbfgs failed to converge (status=1):
STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
  self.n_iter_ = _check_optimize_result("lbfgs", opt_res, self.max_iter)
D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
y:471: ConvergenceWarning: lbfgs failed to converge (status=2):
ABNORMAL_TERMINATION_IN_LNSRCH.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
  self.n_iter_ = _check_optimize_result("lbfgs", opt_res, self.max_iter)
D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
y:471: ConvergenceWarning: lbfgs failed to converge (status=2):
ABNORMAL_TERMINATION_IN_LNSRCH.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
  self.n_iter_ = _check_optimize_result("lbfgs", opt_res, self.max_iter)

[CV]  activation=identity, hidden_layer_sizes=(10,), solver=lbfgs, score=0.98
8, total=   0.3s
[CV] activation=identity, hidden_layer_sizes=(10,), solver=lbfgs .....
[CV]  activation=identity, hidden_layer_sizes=(10,), solver=lbfgs, score=0.63
3, total=   0.0s
[CV] activation=identity, hidden_layer_sizes=(10,), solver=lbfgs .....
[CV]  activation=identity, hidden_layer_sizes=(10,), solver=lbfgs, score=0.63
3, total=   0.0s
[CV] activation=identity, hidden_layer_sizes=(10,), solver=sgd .......
[CV]  activation=identity, hidden_layer_sizes=(10,), solver=sgd, score=0.900,
total=   0.0s
[CV] activation=identity, hidden_layer_sizes=(10,), solver=sgd .......
[CV]  activation=identity, hidden_layer_sizes=(10,), solver=sgd, score=0.900,
total=   0.0s
[CV] activation=identity, hidden_layer_sizes=(10,), solver=sgd .......
[CV]  activation=identity, hidden_layer_sizes=(10,), solver=sgd, score=0.850,
total=   0.0s
[CV] activation=identity, hidden_layer_sizes=(10,), solver=sgd .......
[CV]  activation=identity, hidden_layer_sizes=(10,), solver=sgd, score=0.949,
total=   0.0s
[CV] activation=identity, hidden_layer_sizes=(10,), solver=sgd .......
[CV]  activation=identity, hidden_layer_sizes=(10,), solver=sgd, score=0.899,
total=   0.0s
[CV] activation=identity, hidden_layer_sizes=(10,), solver=adam ......
[CV]  activation=identity, hidden_layer_sizes=(10,), solver=adam, score=0.90
0, total=   0.1s
[CV] activation=identity, hidden_layer_sizes=(10,), solver=adam ......
```

```
D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
y:582: ConvergenceWarning: Stochastic Optimizer: Maximum iterations (200) rea
ched and the optimization hasn't converged yet.
  warnings.warn(
D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
y:582: ConvergenceWarning: Stochastic Optimizer: Maximum iterations (200) rea
ched and the optimization hasn't converged yet.
  warnings.warn(

[CV]  activation=identity, hidden_layer_sizes=(10,), solver=adam, score=0.88
7, total=   0.1s
[CV] activation=identity, hidden_layer_sizes=(10,), solver=adam ......
[CV]  activation=identity, hidden_layer_sizes=(10,), solver=adam, score=0.88
7, total=   0.2s
[CV] activation=identity, hidden_layer_sizes=(10,), solver=adam ......
[CV]  activation=identity, hidden_layer_sizes=(10,), solver=adam, score=0.36
7, total=   0.0s
[CV] activation=identity, hidden_layer_sizes=(10,), solver=adam ......

D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
y:582: ConvergenceWarning: Stochastic Optimizer: Maximum iterations (200) rea
ched and the optimization hasn't converged yet.
  warnings.warn(
D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
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D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
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STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
  self.n_iter_ = _check_optimize_result("lbfgs", opt_res, self.max_iter)
D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
y:471: ConvergenceWarning: lbfgs failed to converge (status=2):
ABNORMAL_TERMINATION_IN_LNSRCH.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
  self.n_iter_ = _check_optimize_result("lbfgs", opt_res, self.max_iter)

[CV]  activation=identity, hidden_layer_sizes=(10,), solver=adam, score=0.84
8, total=   0.2s
[CV] activation=identity, hidden_layer_sizes=(10, 5), solver=lbfgs ...
[CV]  activation=identity, hidden_layer_sizes=(10, 5), solver=lbfgs, score=0.
925, total=   0.1s
[CV] activation=identity, hidden_layer_sizes=(10, 5), solver=lbfgs ...
[CV]  activation=identity, hidden_layer_sizes=(10, 5), solver=lbfgs, score=0.
637, total=   0.0s
[CV] activation=identity, hidden_layer_sizes=(10, 5), solver=lbfgs ...
```

```
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    https://scikit-learn.org/stable/modules/preprocessing.html
  self.n_iter_ = _check_optimize_result("lbfgs", opt_res, self.max_iter)

[CV]  activation=identity, hidden_layer_sizes=(10, 5), solver=lbfgs, score=0.
988, total=   0.2s
[CV] activation=identity, hidden_layer_sizes=(10, 5), solver=lbfgs ...
[CV]  activation=identity, hidden_layer_sizes=(10, 5), solver=lbfgs, score=0.
633, total=   0.1s
[CV] activation=identity, hidden_layer_sizes=(10, 5), solver=lbfgs ...
[CV]  activation=identity, hidden_layer_sizes=(10, 5), solver=lbfgs, score=0.
633, total=   0.0s
[CV] activation=identity, hidden_layer_sizes=(10, 5), solver=sgd .....

D:\anaconda\lib\site-packages\sklearn\utils\extmath.py:153: RuntimeWarning: o
verflow encountered in matmul
  ret = a @ b
D:\anaconda\lib\site-packages\sklearn\utils\extmath.py:153: RuntimeWarning: i
nvalid value encountered in matmul
  ret = a @ b
D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
y:582: ConvergenceWarning: Stochastic Optimizer: Maximum iterations (200) rea
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  warnings.warn(
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  ret = a @ b
D:\anaconda\lib\site-packages\sklearn\utils\extmath.py:153: RuntimeWarning: i
nvalid value encountered in matmul
  ret = a @ b

[CV]  activation=identity, hidden_layer_sizes=(10, 5), solver=sgd, score=0.36
2, total=   0.3s
[CV] activation=identity, hidden_layer_sizes=(10, 5), solver=sgd .....
[CV]  activation=identity, hidden_layer_sizes=(10, 5), solver=sgd, score=0.36
2, total=   0.1s
[CV] activation=identity, hidden_layer_sizes=(10, 5), solver=sgd .....
```

```
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nvalid value encountered in matmul
  ret = a @ b
D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
y:582: ConvergenceWarning: Stochastic Optimizer: Maximum iterations (200) rea
ched and the optimization hasn't converged yet.
  warnings.warn(

[CV]  activation=identity, hidden_layer_sizes=(10, 5), solver=sgd, score=0.37
5, total=   0.1s
[CV] activation=identity, hidden_layer_sizes=(10, 5), solver=sgd .....

D:\anaconda\lib\site-packages\sklearn\utils\extmath.py:153: RuntimeWarning: o
verflow encountered in matmul
  ret = a @ b
D:\anaconda\lib\site-packages\sklearn\utils\extmath.py:153: RuntimeWarning: i
nvalid value encountered in matmul
  ret = a @ b
D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
y:582: ConvergenceWarning: Stochastic Optimizer: Maximum iterations (200) rea
ched and the optimization hasn't converged yet.
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verflow encountered in matmul
  ret = a @ b
D:\anaconda\lib\site-packages\sklearn\utils\extmath.py:153: RuntimeWarning: i
nvalid value encountered in matmul
  ret = a @ b

[CV]  activation=identity, hidden_layer_sizes=(10, 5), solver=sgd, score=0.36
7, total=   0.3s
[CV] activation=identity, hidden_layer_sizes=(10, 5), solver=sgd .....
[CV]  activation=identity, hidden_layer_sizes=(10, 5), solver=sgd, score=0.36
7, total=   0.1s
[CV] activation=identity, hidden_layer_sizes=(10, 5), solver=adam ....

D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
y:582: ConvergenceWarning: Stochastic Optimizer: Maximum iterations (200) rea
ched and the optimization hasn't converged yet.
  warnings.warn(
D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
y:582: ConvergenceWarning: Stochastic Optimizer: Maximum iterations (200) rea
ched and the optimization hasn't converged yet.
  warnings.warn(
```

```
[CV]  activation=identity, hidden_layer_sizes=(10, 5), solver=adam, score=0.9
12, total=   0.2s
[CV] activation=identity, hidden_layer_sizes=(10, 5), solver=adam ....
[CV]  activation=identity, hidden_layer_sizes=(10, 5), solver=adam, score=0.3
62, total=   0.0s
[CV] activation=identity, hidden_layer_sizes=(10, 5), solver=adam ....

D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
y:582: ConvergenceWarning: Stochastic Optimizer: Maximum iterations (200) rea
ched and the optimization hasn't converged yet.
  warnings.warn(

[CV]  activation=identity, hidden_layer_sizes=(10, 5), solver=adam, score=0.8
87, total=   0.2s
[CV] activation=identity, hidden_layer_sizes=(10, 5), solver=adam ....

D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
y:582: ConvergenceWarning: Stochastic Optimizer: Maximum iterations (200) rea
ched and the optimization hasn't converged yet.
  warnings.warn(
D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
y:471: ConvergenceWarning: lbfgs failed to converge (status=2):
ABNORMAL_TERMINATION_IN_LNSRCH.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
  self.n_iter_ = _check_optimize_result("lbfgs", opt_res, self.max_iter)

[CV]  activation=identity, hidden_layer_sizes=(10, 5), solver=adam, score=0.9
62, total=   0.2s
[CV] activation=identity, hidden_layer_sizes=(10, 5), solver=adam ....
[CV]  activation=identity, hidden_layer_sizes=(10, 5), solver=adam, score=0.1
65, total=   0.0s
[CV] activation=identity, hidden_layer_sizes=(100,), solver=lbfgs ....
[CV]  activation=identity, hidden_layer_sizes=(100,), solver=lbfgs, score=0.3
12, total=   0.1s
[CV] activation=identity, hidden_layer_sizes=(100,), solver=lbfgs ....

D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
y:471: ConvergenceWarning: lbfgs failed to converge (status=1):
STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
  self.n_iter_ = _check_optimize_result("lbfgs", opt_res, self.max_iter)

[CV]  activation=identity, hidden_layer_sizes=(100,), solver=lbfgs, score=0.9
50, total=   0.4s
[CV] activation=identity, hidden_layer_sizes=(100,), solver=lbfgs ....
```

```
D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
y:471: ConvergenceWarning: lbfgs failed to converge (status=1):
STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
  self.n_iter_ = _check_optimize_result("lbfgs", opt_res, self.max_iter)
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Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
  self.n_iter_ = _check_optimize_result("lbfgs", opt_res, self.max_iter)

[CV]  activation=identity, hidden_layer_sizes=(100,), solver=lbfgs, score=1.0
00, total=   0.3s
[CV] activation=identity, hidden_layer_sizes=(100,), solver=lbfgs ....
[CV]  activation=identity, hidden_layer_sizes=(100,), solver=lbfgs, score=0.0
89, total=   0.1s
[CV] activation=identity, hidden_layer_sizes=(100,), solver=lbfgs ....

D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
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    https://scikit-learn.org/stable/modules/preprocessing.html
  self.n_iter_ = _check_optimize_result("lbfgs", opt_res, self.max_iter)

[CV]  activation=identity, hidden_layer_sizes=(100,), solver=lbfgs, score=0.9
62, total=   0.3s
[CV] activation=identity, hidden_layer_sizes=(100,), solver=sgd ......
[CV]  activation=identity, hidden_layer_sizes=(100,), solver=sgd, score=0.91
2, total=   0.1s
[CV] activation=identity, hidden_layer_sizes=(100,), solver=sgd ......
[CV]  activation=identity, hidden_layer_sizes=(100,), solver=sgd, score=0.87
5, total=   0.1s
[CV] activation=identity, hidden_layer_sizes=(100,), solver=sgd ......
[CV]  activation=identity, hidden_layer_sizes=(100,), solver=sgd, score=0.80
0, total=   0.0s
[CV] activation=identity, hidden_layer_sizes=(100,), solver=sgd ......
[CV]  activation=identity, hidden_layer_sizes=(100,), solver=sgd, score=0.51
9, total=   0.1s
[CV] activation=identity, hidden_layer_sizes=(100,), solver=sgd ......
[CV]  activation=identity, hidden_layer_sizes=(100,), solver=sgd, score=0.63
3, total=   0.1s
[CV] activation=identity, hidden_layer_sizes=(100,), solver=adam .....
[CV]  activation=identity, hidden_layer_sizes=(100,), solver=adam, score=0.92
5, total=   0.4s
[CV] activation=identity, hidden_layer_sizes=(100,), solver=adam .....
[CV]  activation=identity, hidden_layer_sizes=(100,), solver=adam, score=0.90
0, total=   0.1s
[CV] activation=identity, hidden_layer_sizes=(100,), solver=adam .....
```

```
D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
y:582: ConvergenceWarning: Stochastic Optimizer: Maximum iterations (200) rea
ched and the optimization hasn't converged yet.
  warnings.warn(

[CV]  activation=identity, hidden_layer_sizes=(100,), solver=adam, score=0.97
5, total=   0.4s
[CV] activation=identity, hidden_layer_sizes=(100,), solver=adam .....

D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
y:582: ConvergenceWarning: Stochastic Optimizer: Maximum iterations (200) rea
ched and the optimization hasn't converged yet.
  warnings.warn(

[CV]  activation=identity, hidden_layer_sizes=(100,), solver=adam, score=0.97
5, total=   0.4s
[CV] activation=identity, hidden_layer_sizes=(100,), solver=adam .....
[CV]  activation=identity, hidden_layer_sizes=(100,), solver=adam, score=0.92
4, total=   0.3s
[CV] activation=identity, hidden_layer_sizes=(10, 10), solver=lbfgs ..
[CV]  activation=identity, hidden_layer_sizes=(10, 10), solver=lbfgs, score=
0.637, total=   0.1s
[CV] activation=identity, hidden_layer_sizes=(10, 10), solver=lbfgs ..
[CV]  activation=identity, hidden_layer_sizes=(10, 10), solver=lbfgs, score=
0.312, total=   0.0s
[CV] activation=identity, hidden_layer_sizes=(10, 10), solver=lbfgs ..
[CV]  activation=identity, hidden_layer_sizes=(10, 10), solver=lbfgs, score=
0.988, total=   0.1s
[CV] activation=identity, hidden_layer_sizes=(10, 10), solver=lbfgs ..
```

```
D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
y:471: ConvergenceWarning: lbfgs failed to converge (status=2):
ABNORMAL_TERMINATION_IN_LNSRCH.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
  self.n_iter_ = _check_optimize_result("lbfgs", opt_res, self.max_iter)
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STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.

Increase the number of iterations (max_iter) or scale the data as shown in:
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  self.n_iter_ = _check_optimize_result("lbfgs", opt_res, self.max_iter)
D:\anaconda\lib\site-packages\sklearn\utils\extmath.py:153: RuntimeWarning: o
verflow encountered in matmul
  ret = a @ b
D:\anaconda\lib\site-packages\sklearn\utils\extmath.py:153: RuntimeWarning: i
nvalid value encountered in matmul
  ret = a @ b

[CV]  activation=identity, hidden_layer_sizes=(10, 10), solver=lbfgs, score=
0.949, total=   0.1s
[CV] activation=identity, hidden_layer_sizes=(10, 10), solver=lbfgs ..
[CV]  activation=identity, hidden_layer_sizes=(10, 10), solver=lbfgs, score=
0.949, total=   0.1s
[CV] activation=identity, hidden_layer_sizes=(10, 10), solver=sgd ....
```

```
D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
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D:\anaconda\lib\site-packages\sklearn\utils\extmath.py:153: RuntimeWarning: o
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D:\anaconda\lib\site-packages\sklearn\utils\extmath.py:153: RuntimeWarning: i
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  ret = a @ b
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nvalid value encountered in matmul
  ret = a @ b

[CV]  activation=identity, hidden_layer_sizes=(10, 10), solver=sgd, score=0.3
62, total=   0.1s
[CV] activation=identity, hidden_layer_sizes=(10, 10), solver=sgd ....
[CV]  activation=identity, hidden_layer_sizes=(10, 10), solver=sgd, score=0.3
62, total=   0.1s
[CV] activation=identity, hidden_layer_sizes=(10, 10), solver=sgd ....

D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
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  ret = a @ b
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  ret = a @ b
D:\anaconda\lib\site-packages\sklearn\utils\extmath.py:153: RuntimeWarning: i
nvalid value encountered in matmul
  ret = a @ b

[CV]  activation=identity, hidden_layer_sizes=(10, 10), solver=sgd, score=0.3
75, total=   0.1s
[CV] activation=identity, hidden_layer_sizes=(10, 10), solver=sgd ....
[CV]  activation=identity, hidden_layer_sizes=(10, 10), solver=sgd, score=0.3
67, total=   0.1s
[CV] activation=identity, hidden_layer_sizes=(10, 10), solver=sgd ....
```

```
D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
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  warnings.warn(
D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
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  warnings.warn(

[CV]  activation=identity, hidden_layer_sizes=(10, 10), solver=sgd, score=0.3
67, total=   0.1s
[CV] activation=identity, hidden_layer_sizes=(10, 10), solver=adam ...
[CV]  activation=identity, hidden_layer_sizes=(10, 10), solver=adam, score=0.
925, total=   0.2s
[CV] activation=identity, hidden_layer_sizes=(10, 10), solver=adam ...

D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
y:582: ConvergenceWarning: Stochastic Optimizer: Maximum iterations (200) rea
ched and the optimization hasn't converged yet.
  warnings.warn(

[CV]  activation=identity, hidden_layer_sizes=(10, 10), solver=adam, score=0.
938, total=   0.2s
[CV] activation=identity, hidden_layer_sizes=(10, 10), solver=adam ...
[CV]  activation=identity, hidden_layer_sizes=(10, 10), solver=adam, score=0.
912, total=   0.2s
[CV] activation=identity, hidden_layer_sizes=(10, 10), solver=adam ...

D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
y:582: ConvergenceWarning: Stochastic Optimizer: Maximum iterations (200) rea
ched and the optimization hasn't converged yet.
  warnings.warn(
```

```
[CV]  activation=identity, hidden_layer_sizes=(10, 10), solver=adam, score=0.
937, total=   0.2s
[CV] activation=identity, hidden_layer_sizes=(10, 10), solver=adam ...
[CV]  activation=identity, hidden_layer_sizes=(10, 10), solver=adam, score=0.
924, total=   0.2s
[CV] activation=logistic, hidden_layer_sizes=(1,), solver=lbfgs ......
[CV]  activation=logistic, hidden_layer_sizes=(1,), solver=lbfgs, score=0.63
7, total=   0.0s
[CV] activation=logistic, hidden_layer_sizes=(1,), solver=lbfgs ......
[CV]  activation=logistic, hidden_layer_sizes=(1,), solver=lbfgs, score=0.63
7, total=   0.0s
[CV] activation=logistic, hidden_layer_sizes=(1,), solver=lbfgs ......
[CV]  activation=logistic, hidden_layer_sizes=(1,), solver=lbfgs, score=0.62
5, total=   0.0s
[CV] activation=logistic, hidden_layer_sizes=(1,), solver=lbfgs ......
[CV]  activation=logistic, hidden_layer_sizes=(1,), solver=lbfgs, score=0.63
3, total=   0.0s
[CV] activation=logistic, hidden_layer_sizes=(1,), solver=lbfgs ......
[CV]  activation=logistic, hidden_layer_sizes=(1,), solver=lbfgs, score=0.63
3, total=   0.0s
[CV] activation=logistic, hidden_layer_sizes=(1,), solver=sgd ........
[CV]  activation=logistic, hidden_layer_sizes=(1,), solver=sgd, score=0.637,
total=   0.1s
[CV] activation=logistic, hidden_layer_sizes=(1,), solver=sgd ........
[CV]  activation=logistic, hidden_layer_sizes=(1,), solver=sgd, score=0.637,
total=   0.1s
[CV] activation=logistic, hidden_layer_sizes=(1,), solver=sgd ........
[CV]  activation=logistic, hidden_layer_sizes=(1,), solver=sgd, score=0.625,
total=   0.0s
[CV] activation=logistic, hidden_layer_sizes=(1,), solver=sgd ........
[CV]  activation=logistic, hidden_layer_sizes=(1,), solver=sgd, score=0.633,
total=   0.1s
[CV] activation=logistic, hidden_layer_sizes=(1,), solver=sgd ........
[CV]  activation=logistic, hidden_layer_sizes=(1,), solver=sgd, score=0.633,
total=   0.1s
[CV] activation=logistic, hidden_layer_sizes=(1,), solver=adam .......
[CV]  activation=logistic, hidden_layer_sizes=(1,), solver=adam, score=0.362,
total=   0.0s
[CV] activation=logistic, hidden_layer_sizes=(1,), solver=adam .......
[CV]  activation=logistic, hidden_layer_sizes=(1,), solver=adam, score=0.637,
total=   0.1s
[CV] activation=logistic, hidden_layer_sizes=(1,), solver=adam .......

D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
y:582: ConvergenceWarning: Stochastic Optimizer: Maximum iterations (200) rea
ched and the optimization hasn't converged yet.
  warnings.warn(
D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
y:582: ConvergenceWarning: Stochastic Optimizer: Maximum iterations (200) rea
ched and the optimization hasn't converged yet.
  warnings.warn(
```

```
[CV]  activation=logistic, hidden_layer_sizes=(1,), solver=adam, score=0.925,
total=   0.1s
[CV] activation=logistic, hidden_layer_sizes=(1,), solver=adam .......
[CV]  activation=logistic, hidden_layer_sizes=(1,), solver=adam, score=0.633,
total=   0.0s
[CV] activation=logistic, hidden_layer_sizes=(1,), solver=adam .......
[CV]  activation=logistic, hidden_layer_sizes=(1,), solver=adam, score=0.367,
total=   0.1s
[CV] activation=logistic, hidden_layer_sizes=(10,), solver=lbfgs .....
[CV]  activation=logistic, hidden_layer_sizes=(10,), solver=lbfgs, score=0.63
7, total=   0.0s
[CV] activation=logistic, hidden_layer_sizes=(10,), solver=lbfgs .....
[CV]  activation=logistic, hidden_layer_sizes=(10,), solver=lbfgs, score=0.88
7, total=   0.1s
[CV] activation=logistic, hidden_layer_sizes=(10,), solver=lbfgs .....

D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
y:582: ConvergenceWarning: Stochastic Optimizer: Maximum iterations (200) rea
ched and the optimization hasn't converged yet.
  warnings.warn(

[CV]  activation=logistic, hidden_layer_sizes=(10,), solver=lbfgs, score=0.62
5, total=   0.0s
[CV] activation=logistic, hidden_layer_sizes=(10,), solver=lbfgs .....
[CV]  activation=logistic, hidden_layer_sizes=(10,), solver=lbfgs, score=0.63
3, total=   0.0s
[CV] activation=logistic, hidden_layer_sizes=(10,), solver=lbfgs .....
[CV]  activation=logistic, hidden_layer_sizes=(10,), solver=lbfgs, score=0.63
3, total=   0.0s
[CV] activation=logistic, hidden_layer_sizes=(10,), solver=sgd .......
[CV]  activation=logistic, hidden_layer_sizes=(10,), solver=sgd, score=0.637,
total=   0.0s
[CV] activation=logistic, hidden_layer_sizes=(10,), solver=sgd .......
[CV]  activation=logistic, hidden_layer_sizes=(10,), solver=sgd, score=0.637,
total=   0.1s
[CV] activation=logistic, hidden_layer_sizes=(10,), solver=sgd .......

D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
y:582: ConvergenceWarning: Stochastic Optimizer: Maximum iterations (200) rea
ched and the optimization hasn't converged yet.
  warnings.warn(
D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
y:582: ConvergenceWarning: Stochastic Optimizer: Maximum iterations (200) rea
ched and the optimization hasn't converged yet.
  warnings.warn(

[CV]  activation=logistic, hidden_layer_sizes=(10,), solver=sgd, score=0.900,
total=   0.1s
[CV] activation=logistic, hidden_layer_sizes=(10,), solver=sgd .......
[CV]  activation=logistic, hidden_layer_sizes=(10,), solver=sgd, score=0.633,
total=   0.1s
[CV] activation=logistic, hidden_layer_sizes=(10,), solver=sgd .......
[CV]  activation=logistic, hidden_layer_sizes=(10,), solver=sgd, score=0.633,
total=   0.1s
[CV] activation=logistic, hidden_layer_sizes=(10,), solver=adam ......
```

```
D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
y:582: ConvergenceWarning: Stochastic Optimizer: Maximum iterations (200) rea
ched and the optimization hasn't converged yet.
  warnings.warn(
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ched and the optimization hasn't converged yet.
  warnings.warn(

[CV]  activation=logistic, hidden_layer_sizes=(10,), solver=adam, score=0.90
0, total=   0.1s
[CV] activation=logistic, hidden_layer_sizes=(10,), solver=adam ......
[CV]  activation=logistic, hidden_layer_sizes=(10,), solver=adam, score=0.90
0, total=   0.1s
[CV] activation=logistic, hidden_layer_sizes=(10,), solver=adam ......

D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
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ched and the optimization hasn't converged yet.
  warnings.warn(
D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
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ched and the optimization hasn't converged yet.
  warnings.warn(

[CV]  activation=logistic, hidden_layer_sizes=(10,), solver=adam, score=0.91
2, total=   0.1s
[CV] activation=logistic, hidden_layer_sizes=(10,), solver=adam ......
[CV]  activation=logistic, hidden_layer_sizes=(10,), solver=adam, score=0.97
5, total=   0.1s
[CV] activation=logistic, hidden_layer_sizes=(10,), solver=adam ......

D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
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ched and the optimization hasn't converged yet.
  warnings.warn(
D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
y:471: ConvergenceWarning: lbfgs failed to converge (status=1):
STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
  self.n_iter_ = _check_optimize_result("lbfgs", opt_res, self.max_iter)
```

```
[CV]  activation=logistic, hidden_layer_sizes=(10,), solver=adam, score=0.91
1, total=   0.1s
[CV] activation=logistic, hidden_layer_sizes=(10, 5), solver=lbfgs ...
[CV]  activation=logistic, hidden_layer_sizes=(10, 5), solver=lbfgs, score=0.
637, total=   0.0s
[CV] activation=logistic, hidden_layer_sizes=(10, 5), solver=lbfgs ...
[CV]  activation=logistic, hidden_layer_sizes=(10, 5), solver=lbfgs, score=0.
900, total=   0.2s
[CV] activation=logistic, hidden_layer_sizes=(10, 5), solver=lbfgs ...
[CV]  activation=logistic, hidden_layer_sizes=(10, 5), solver=lbfgs, score=0.
625, total=   0.0s
[CV] activation=logistic, hidden_layer_sizes=(10, 5), solver=lbfgs ...
[CV]  activation=logistic, hidden_layer_sizes=(10, 5), solver=lbfgs, score=0.
937, total=   0.2s
[CV] activation=logistic, hidden_layer_sizes=(10, 5), solver=lbfgs ...

D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
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[CV]  activation=logistic, hidden_layer_sizes=(10, 5), solver=lbfgs, score=0.
873, total=   0.1s
[CV] activation=logistic, hidden_layer_sizes=(10, 5), solver=sgd .....
[CV]  activation=logistic, hidden_layer_sizes=(10, 5), solver=sgd, score=0.63
7, total=   0.1s
[CV] activation=logistic, hidden_layer_sizes=(10, 5), solver=sgd .....

D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
y:582: ConvergenceWarning: Stochastic Optimizer: Maximum iterations (200) rea
ched and the optimization hasn't converged yet.
  warnings.warn(

[CV]  activation=logistic, hidden_layer_sizes=(10, 5), solver=sgd, score=0.63
7, total=   0.2s
[CV] activation=logistic, hidden_layer_sizes=(10, 5), solver=sgd .....
[CV]  activation=logistic, hidden_layer_sizes=(10, 5), solver=sgd, score=0.62
5, total=   0.1s
[CV] activation=logistic, hidden_layer_sizes=(10, 5), solver=sgd .....
[CV]  activation=logistic, hidden_layer_sizes=(10, 5), solver=sgd, score=0.63
3, total=   0.1s
[CV] activation=logistic, hidden_layer_sizes=(10, 5), solver=sgd .....
[CV]  activation=logistic, hidden_layer_sizes=(10, 5), solver=sgd, score=0.63
3, total=   0.1s
[CV] activation=logistic, hidden_layer_sizes=(10, 5), solver=adam ....
[CV]  activation=logistic, hidden_layer_sizes=(10, 5), solver=adam, score=0.9
00, total=   0.2s
[CV] activation=logistic, hidden_layer_sizes=(10, 5), solver=adam ....
```

```
D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
y:582: ConvergenceWarning: Stochastic Optimizer: Maximum iterations (200) rea
ched and the optimization hasn't converged yet.
  warnings.warn(
D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
y:582: ConvergenceWarning: Stochastic Optimizer: Maximum iterations (200) rea
ched and the optimization hasn't converged yet.
  warnings.warn(

[CV]  activation=logistic, hidden_layer_sizes=(10, 5), solver=adam, score=0.6
37, total=   0.2s
[CV] activation=logistic, hidden_layer_sizes=(10, 5), solver=adam ....

D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
y:582: ConvergenceWarning: Stochastic Optimizer: Maximum iterations (200) rea
ched and the optimization hasn't converged yet.
  warnings.warn(

[CV]  activation=logistic, hidden_layer_sizes=(10, 5), solver=adam, score=0.9
38, total=   0.2s
[CV] activation=logistic, hidden_layer_sizes=(10, 5), solver=adam ....

D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
y:582: ConvergenceWarning: Stochastic Optimizer: Maximum iterations (200) rea
ched and the optimization hasn't converged yet.
  warnings.warn(
D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
y:582: ConvergenceWarning: Stochastic Optimizer: Maximum iterations (200) rea
ched and the optimization hasn't converged yet.
  warnings.warn(

[CV]  activation=logistic, hidden_layer_sizes=(10, 5), solver=adam, score=0.9
75, total=   0.2s
[CV] activation=logistic, hidden_layer_sizes=(10, 5), solver=adam ....
[CV]  activation=logistic, hidden_layer_sizes=(10, 5), solver=adam, score=0.6
33, total=   0.2s
[CV] activation=logistic, hidden_layer_sizes=(100,), solver=lbfgs ....

D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
y:471: ConvergenceWarning: lbfgs failed to converge (status=1):
STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
  self.n_iter_ = _check_optimize_result("lbfgs", opt_res, self.max_iter)

[CV]  activation=logistic, hidden_layer_sizes=(100,), solver=lbfgs, score=0.9
38, total=   0.6s
[CV] activation=logistic, hidden_layer_sizes=(100,), solver=lbfgs ....

D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
y:471: ConvergenceWarning: lbfgs failed to converge (status=1):
STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
  self.n_iter_ = _check_optimize_result("lbfgs", opt_res, self.max_iter)
```

```
[CV]  activation=logistic, hidden_layer_sizes=(100,), solver=lbfgs, score=0.9
12, total=   0.6s
[CV] activation=logistic, hidden_layer_sizes=(100,), solver=lbfgs ....

D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
y:471: ConvergenceWarning: lbfgs failed to converge (status=1):
STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
  self.n_iter_ = _check_optimize_result("lbfgs", opt_res, self.max_iter)

[CV]  activation=logistic, hidden_layer_sizes=(100,), solver=lbfgs, score=0.9
63, total=   4.7s
[CV] activation=logistic, hidden_layer_sizes=(100,), solver=lbfgs ....

D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
y:471: ConvergenceWarning: lbfgs failed to converge (status=1):
STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
  self.n_iter_ = _check_optimize_result("lbfgs", opt_res, self.max_iter)

[CV]  activation=logistic, hidden_layer_sizes=(100,), solver=lbfgs, score=0.9
11, total=   0.5s
[CV] activation=logistic, hidden_layer_sizes=(100,), solver=lbfgs ....

D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
y:471: ConvergenceWarning: lbfgs failed to converge (status=1):
STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
  self.n_iter_ = _check_optimize_result("lbfgs", opt_res, self.max_iter)

[CV]  activation=logistic, hidden_layer_sizes=(100,), solver=lbfgs, score=0.9
37, total=   0.5s
[CV] activation=logistic, hidden_layer_sizes=(100,), solver=sgd ......
[CV]  activation=logistic, hidden_layer_sizes=(100,), solver=sgd, score=0.91
2, total=   0.4s
[CV] activation=logistic, hidden_layer_sizes=(100,), solver=sgd ......

D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
y:582: ConvergenceWarning: Stochastic Optimizer: Maximum iterations (200) rea
ched and the optimization hasn't converged yet.
  warnings.warn(

[CV]  activation=logistic, hidden_layer_sizes=(100,), solver=sgd, score=0.87
5, total=   0.5s
[CV] activation=logistic, hidden_layer_sizes=(100,), solver=sgd ......

D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
y:582: ConvergenceWarning: Stochastic Optimizer: Maximum iterations (200) rea
ched and the optimization hasn't converged yet.
  warnings.warn(
```

```
[CV]  activation=logistic, hidden_layer_sizes=(100,), solver=sgd, score=0.90
0, total=   0.5s
[CV] activation=logistic, hidden_layer_sizes=(100,), solver=sgd ......

D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
y:582: ConvergenceWarning: Stochastic Optimizer: Maximum iterations (200) rea
ched and the optimization hasn't converged yet.
  warnings.warn(

[CV]  activation=logistic, hidden_layer_sizes=(100,), solver=sgd, score=0.93
7, total=   0.5s
[CV] activation=logistic, hidden_layer_sizes=(100,), solver=sgd ......

D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
y:582: ConvergenceWarning: Stochastic Optimizer: Maximum iterations (200) rea
ched and the optimization hasn't converged yet.
  warnings.warn(

[CV]  activation=logistic, hidden_layer_sizes=(100,), solver=sgd, score=0.92
4, total=   0.5s
[CV] activation=logistic, hidden_layer_sizes=(100,), solver=adam .....

D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
y:582: ConvergenceWarning: Stochastic Optimizer: Maximum iterations (200) rea
ched and the optimization hasn't converged yet.
  warnings.warn(

[CV]  activation=logistic, hidden_layer_sizes=(100,), solver=adam, score=0.92
5, total=   0.4s
[CV] activation=logistic, hidden_layer_sizes=(100,), solver=adam .....

D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
y:582: ConvergenceWarning: Stochastic Optimizer: Maximum iterations (200) rea
ched and the optimization hasn't converged yet.
  warnings.warn(

[CV]  activation=logistic, hidden_layer_sizes=(100,), solver=adam, score=0.88
7, total=   0.5s
[CV] activation=logistic, hidden_layer_sizes=(100,), solver=adam .....

D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
y:582: ConvergenceWarning: Stochastic Optimizer: Maximum iterations (200) rea
ched and the optimization hasn't converged yet.
  warnings.warn(

[CV]  activation=logistic, hidden_layer_sizes=(100,), solver=adam, score=0.96
3, total=   0.5s
[CV] activation=logistic, hidden_layer_sizes=(100,), solver=adam .....

D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
y:582: ConvergenceWarning: Stochastic Optimizer: Maximum iterations (200) rea
ched and the optimization hasn't converged yet.
  warnings.warn(

[CV]  activation=logistic, hidden_layer_sizes=(100,), solver=adam, score=0.97
5, total=   0.5s
[CV] activation=logistic, hidden_layer_sizes=(100,), solver=adam .....
```

```
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ched and the optimization hasn't converged yet.
  warnings.warn(

[CV]  activation=logistic, hidden_layer_sizes=(100,), solver=adam, score=0.93
7, total=   0.5s
[CV] activation=logistic, hidden_layer_sizes=(10, 10), solver=lbfgs ..
[CV]  activation=logistic, hidden_layer_sizes=(10, 10), solver=lbfgs, score=
0.637, total=   0.0s
[CV] activation=logistic, hidden_layer_sizes=(10, 10), solver=lbfgs ..
[CV]  activation=logistic, hidden_layer_sizes=(10, 10), solver=lbfgs, score=
0.637, total=   0.0s
[CV] activation=logistic, hidden_layer_sizes=(10, 10), solver=lbfgs ..
[CV]  activation=logistic, hidden_layer_sizes=(10, 10), solver=lbfgs, score=
0.625, total=   0.0s
[CV] activation=logistic, hidden_layer_sizes=(10, 10), solver=lbfgs ..
[CV]  activation=logistic, hidden_layer_sizes=(10, 10), solver=lbfgs, score=
0.633, total=   0.0s
[CV] activation=logistic, hidden_layer_sizes=(10, 10), solver=lbfgs ..
[CV]  activation=logistic, hidden_layer_sizes=(10, 10), solver=lbfgs, score=
0.633, total=   0.0s
[CV] activation=logistic, hidden_layer_sizes=(10, 10), solver=sgd ....
[CV]  activation=logistic, hidden_layer_sizes=(10, 10), solver=sgd, score=0.6
37, total=   0.1s
[CV] activation=logistic, hidden_layer_sizes=(10, 10), solver=sgd ....
[CV]  activation=logistic, hidden_layer_sizes=(10, 10), solver=sgd, score=0.6
37, total=   0.0s
[CV] activation=logistic, hidden_layer_sizes=(10, 10), solver=sgd ....
[CV]  activation=logistic, hidden_layer_sizes=(10, 10), solver=sgd, score=0.6
25, total=   0.1s
[CV] activation=logistic, hidden_layer_sizes=(10, 10), solver=sgd ....
[CV]  activation=logistic, hidden_layer_sizes=(10, 10), solver=sgd, score=0.6
33, total=   0.0s
[CV] activation=logistic, hidden_layer_sizes=(10, 10), solver=sgd ....
[CV]  activation=logistic, hidden_layer_sizes=(10, 10), solver=sgd, score=0.6
33, total=   0.1s
[CV] activation=logistic, hidden_layer_sizes=(10, 10), solver=adam ...

D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
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  warnings.warn(
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ched and the optimization hasn't converged yet.
  warnings.warn(

[CV]  activation=logistic, hidden_layer_sizes=(10, 10), solver=adam, score=0.
637, total=   0.2s
[CV] activation=logistic, hidden_layer_sizes=(10, 10), solver=adam ...
[CV]  activation=logistic, hidden_layer_sizes=(10, 10), solver=adam, score=0.
938, total=   0.2s
[CV] activation=logistic, hidden_layer_sizes=(10, 10), solver=adam ...
[CV]  activation=logistic, hidden_layer_sizes=(10, 10), solver=adam, score=0.
625, total=   0.0s
[CV] activation=logistic, hidden_layer_sizes=(10, 10), solver=adam ...
```

```
D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
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  warnings.warn(
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y:582: ConvergenceWarning: Stochastic Optimizer: Maximum iterations (200) rea
ched and the optimization hasn't converged yet.
  warnings.warn(

[CV]  activation=logistic, hidden_layer_sizes=(10, 10), solver=adam, score=0.
975, total=   0.2s
[CV] activation=logistic, hidden_layer_sizes=(10, 10), solver=adam ...
[CV]  activation=logistic, hidden_layer_sizes=(10, 10), solver=adam, score=0.
911, total=   0.2s
[CV] activation=tanh, hidden_layer_sizes=(1,), solver=lbfgs ..........
[CV]  activation=tanh, hidden_layer_sizes=(1,), solver=lbfgs, score=0.637, to
tal=   0.0s
[CV] activation=tanh, hidden_layer_sizes=(1,), solver=lbfgs ..........
[CV]  activation=tanh, hidden_layer_sizes=(1,), solver=lbfgs, score=0.637, to
tal=   0.0s
[CV] activation=tanh, hidden_layer_sizes=(1,), solver=lbfgs ..........
[CV]  activation=tanh, hidden_layer_sizes=(1,), solver=lbfgs, score=0.625, to
tal=   0.0s
[CV] activation=tanh, hidden_layer_sizes=(1,), solver=lbfgs ..........
[CV]  activation=tanh, hidden_layer_sizes=(1,), solver=lbfgs, score=0.633, to
tal=   0.0s
[CV] activation=tanh, hidden_layer_sizes=(1,), solver=lbfgs ..........
[CV]  activation=tanh, hidden_layer_sizes=(1,), solver=lbfgs, score=0.633, to
tal=   0.0s
[CV] activation=tanh, hidden_layer_sizes=(1,), solver=sgd ............
[CV]  activation=tanh, hidden_layer_sizes=(1,), solver=sgd, score=0.637, tota
l=   0.0s
[CV] activation=tanh, hidden_layer_sizes=(1,), solver=sgd ............
[CV]  activation=tanh, hidden_layer_sizes=(1,), solver=sgd, score=0.637, tota
l=   0.1s
[CV] activation=tanh, hidden_layer_sizes=(1,), solver=sgd ............

D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
y:582: ConvergenceWarning: Stochastic Optimizer: Maximum iterations (200) rea
ched and the optimization hasn't converged yet.
  warnings.warn(
D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
y:582: ConvergenceWarning: Stochastic Optimizer: Maximum iterations (200) rea
ched and the optimization hasn't converged yet.
  warnings.warn(

[CV]  activation=tanh, hidden_layer_sizes=(1,), solver=sgd, score=0.625, tota
l=   0.1s
[CV] activation=tanh, hidden_layer_sizes=(1,), solver=sgd ............
[CV]  activation=tanh, hidden_layer_sizes=(1,), solver=sgd, score=0.633, tota
l=   0.1s
[CV] activation=tanh, hidden_layer_sizes=(1,), solver=sgd ............
```

```
D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
y:582: ConvergenceWarning: Stochastic Optimizer: Maximum iterations (200) rea
ched and the optimization hasn't converged yet.
  warnings.warn(
D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
y:582: ConvergenceWarning: Stochastic Optimizer: Maximum iterations (200) rea
ched and the optimization hasn't converged yet.
  warnings.warn(

[CV]  activation=tanh, hidden_layer_sizes=(1,), solver=sgd, score=0.633, tota
l=   0.1s
[CV] activation=tanh, hidden_layer_sizes=(1,), solver=adam ...........
[CV]  activation=tanh, hidden_layer_sizes=(1,), solver=adam, score=0.637, tot
al=   0.1s
[CV] activation=tanh, hidden_layer_sizes=(1,), solver=adam ...........
[CV]  activation=tanh, hidden_layer_sizes=(1,), solver=adam, score=0.637, tot
al=   0.0s
[CV] activation=tanh, hidden_layer_sizes=(1,), solver=adam ...........

D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
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ched and the optimization hasn't converged yet.
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  warnings.warn(

[CV]  activation=tanh, hidden_layer_sizes=(1,), solver=adam, score=0.625, tot
al=   0.1s
[CV] activation=tanh, hidden_layer_sizes=(1,), solver=adam ...........
[CV]  activation=tanh, hidden_layer_sizes=(1,), solver=adam, score=0.633, tot
al=   0.0s
[CV] activation=tanh, hidden_layer_sizes=(1,), solver=adam ...........
[CV]  activation=tanh, hidden_layer_sizes=(1,), solver=adam, score=0.633, tot
al=   0.1s
[CV] activation=tanh, hidden_layer_sizes=(10,), solver=lbfgs .........
[CV]  activation=tanh, hidden_layer_sizes=(10,), solver=lbfgs, score=0.637, t
otal=   0.0s
[CV] activation=tanh, hidden_layer_sizes=(10,), solver=lbfgs .........
[CV]  activation=tanh, hidden_layer_sizes=(10,), solver=lbfgs, score=0.637, t
otal=   0.0s
[CV] activation=tanh, hidden_layer_sizes=(10,), solver=lbfgs .........
[CV]  activation=tanh, hidden_layer_sizes=(10,), solver=lbfgs, score=0.625, t
otal=   0.0s
[CV] activation=tanh, hidden_layer_sizes=(10,), solver=lbfgs .........
```

```
D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
y:582: ConvergenceWarning: Stochastic Optimizer: Maximum iterations (200) rea
ched and the optimization hasn't converged yet.
  warnings.warn(
D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
y:471: ConvergenceWarning: lbfgs failed to converge (status=1):
STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
  self.n_iter_ = _check_optimize_result("lbfgs", opt_res, self.max_iter)

[CV]  activation=tanh, hidden_layer_sizes=(10,), solver=lbfgs, score=0.949, t
otal=   0.1s
[CV] activation=tanh, hidden_layer_sizes=(10,), solver=lbfgs .........
[CV]  activation=tanh, hidden_layer_sizes=(10,), solver=lbfgs, score=0.924, t
otal=   0.1s
[CV] activation=tanh, hidden_layer_sizes=(10,), solver=sgd ...........
[CV]  activation=tanh, hidden_layer_sizes=(10,), solver=sgd, score=0.900, tot
al=   0.1s
[CV] activation=tanh, hidden_layer_sizes=(10,), solver=sgd ...........
[CV]  activation=tanh, hidden_layer_sizes=(10,), solver=sgd, score=0.637, tot
al=   0.0s
[CV] activation=tanh, hidden_layer_sizes=(10,), solver=sgd ...........
[CV]  activation=tanh, hidden_layer_sizes=(10,), solver=sgd, score=0.625, tot
al=   0.0s
[CV] activation=tanh, hidden_layer_sizes=(10,), solver=sgd ...........
[CV]  activation=tanh, hidden_layer_sizes=(10,), solver=sgd, score=0.949, tot
al=   0.1s
[CV] activation=tanh, hidden_layer_sizes=(10,), solver=sgd ...........
[CV]  activation=tanh, hidden_layer_sizes=(10,), solver=sgd, score=0.633, tot
al=   0.0s
[CV] activation=tanh, hidden_layer_sizes=(10,), solver=adam ..........

D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
y:582: ConvergenceWarning: Stochastic Optimizer: Maximum iterations (200) rea
ched and the optimization hasn't converged yet.
  warnings.warn(
D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
y:582: ConvergenceWarning: Stochastic Optimizer: Maximum iterations (200) rea
ched and the optimization hasn't converged yet.
  warnings.warn(

[CV]  activation=tanh, hidden_layer_sizes=(10,), solver=adam, score=0.875, to
tal=   0.1s
[CV] activation=tanh, hidden_layer_sizes=(10,), solver=adam ..........
[CV]  activation=tanh, hidden_layer_sizes=(10,), solver=adam, score=0.925, to
tal=   0.1s
[CV] activation=tanh, hidden_layer_sizes=(10,), solver=adam ..........
```

```
D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
y:582: ConvergenceWarning: Stochastic Optimizer: Maximum iterations (200) rea
ched and the optimization hasn't converged yet.
  warnings.warn(
D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
y:582: ConvergenceWarning: Stochastic Optimizer: Maximum iterations (200) rea
ched and the optimization hasn't converged yet.
  warnings.warn(

[CV]  activation=tanh, hidden_layer_sizes=(10,), solver=adam, score=0.912, to
tal=   0.1s
[CV] activation=tanh, hidden_layer_sizes=(10,), solver=adam .........
[CV]  activation=tanh, hidden_layer_sizes=(10,), solver=adam, score=0.949, to
tal=   0.1s
[CV] activation=tanh, hidden_layer_sizes=(10,), solver=adam .........
[CV]  activation=tanh, hidden_layer_sizes=(10,), solver=adam, score=0.633, to
tal=   0.0s
[CV] activation=tanh, hidden_layer_sizes=(10, 5), solver=lbfgs .......

D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
y:471: ConvergenceWarning: lbfgs failed to converge (status=1):
STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
  self.n_iter_ = _check_optimize_result("lbfgs", opt_res, self.max_iter)

[CV]  activation=tanh, hidden_layer_sizes=(10, 5), solver=lbfgs, score=0.912,
total=   0.1s
[CV] activation=tanh, hidden_layer_sizes=(10, 5), solver=lbfgs .......
[CV]  activation=tanh, hidden_layer_sizes=(10, 5), solver=lbfgs, score=0.900,
total=   0.1s
[CV] activation=tanh, hidden_layer_sizes=(10, 5), solver=lbfgs .......

D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
y:471: ConvergenceWarning: lbfgs failed to converge (status=1):
STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
  self.n_iter_ = _check_optimize_result("lbfgs", opt_res, self.max_iter)
```

```
[CV]  activation=tanh, hidden_layer_sizes=(10, 5), solver=lbfgs, score=0.950,
total=   0.1s
[CV] activation=tanh, hidden_layer_sizes=(10, 5), solver=lbfgs .......
[CV]  activation=tanh, hidden_layer_sizes=(10, 5), solver=lbfgs, score=0.633,
total=   0.0s
[CV] activation=tanh, hidden_layer_sizes=(10, 5), solver=lbfgs .......
[CV]  activation=tanh, hidden_layer_sizes=(10, 5), solver=lbfgs, score=0.633,
total=   0.0s
[CV] activation=tanh, hidden_layer_sizes=(10, 5), solver=sgd .........
[CV]  activation=tanh, hidden_layer_sizes=(10, 5), solver=sgd, score=0.637, t
otal=   0.0s
[CV] activation=tanh, hidden_layer_sizes=(10, 5), solver=sgd .........
[CV]  activation=tanh, hidden_layer_sizes=(10, 5), solver=sgd, score=0.750, t
otal=   0.1s
[CV] activation=tanh, hidden_layer_sizes=(10, 5), solver=sgd .........
[CV]  activation=tanh, hidden_layer_sizes=(10, 5), solver=sgd, score=0.625, t
otal=   0.1s
[CV] activation=tanh, hidden_layer_sizes=(10, 5), solver=sgd .........
[CV]  activation=tanh, hidden_layer_sizes=(10, 5), solver=sgd, score=0.633, t
otal=   0.1s
[CV] activation=tanh, hidden_layer_sizes=(10, 5), solver=sgd .........
[CV]  activation=tanh, hidden_layer_sizes=(10, 5), solver=sgd, score=0.633, t
otal=   0.1s
[CV] activation=tanh, hidden_layer_sizes=(10, 5), solver=adam ........
[CV]  activation=tanh, hidden_layer_sizes=(10, 5), solver=adam, score=0.637,
total=   0.0s
[CV] activation=tanh, hidden_layer_sizes=(10, 5), solver=adam ........
[CV]  activation=tanh, hidden_layer_sizes=(10, 5), solver=adam, score=0.637,
total=   0.0s
[CV] activation=tanh, hidden_layer_sizes=(10, 5), solver=adam ........
[CV]  activation=tanh, hidden_layer_sizes=(10, 5), solver=adam, score=0.625,
total=   0.0s
[CV] activation=tanh, hidden_layer_sizes=(10, 5), solver=adam ........

D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
y:582: ConvergenceWarning: Stochastic Optimizer: Maximum iterations (200) rea
ched and the optimization hasn't converged yet.
  warnings.warn(

[CV]  activation=tanh, hidden_layer_sizes=(10, 5), solver=adam, score=0.962,
total=   0.2s
[CV] activation=tanh, hidden_layer_sizes=(10, 5), solver=adam ........
[CV]  activation=tanh, hidden_layer_sizes=(10, 5), solver=adam, score=0.633,
total=   0.0s
[CV] activation=tanh, hidden_layer_sizes=(100,), solver=lbfgs ........

D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
y:471: ConvergenceWarning: lbfgs failed to converge (status=1):
STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
  self.n_iter_ = _check_optimize_result("lbfgs", opt_res, self.max_iter)

[CV]  activation=tanh, hidden_layer_sizes=(100,), solver=lbfgs, score=0.938,
total=   0.5s
[CV] activation=tanh, hidden_layer_sizes=(100,), solver=lbfgs ........
```

```
D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
y:471: ConvergenceWarning: lbfgs failed to converge (status=1):
STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
  self.n_iter_ = _check_optimize_result("lbfgs", opt_res, self.max_iter)

[CV]  activation=tanh, hidden_layer_sizes=(100,), solver=lbfgs, score=0.875,
total=   0.5s
[CV] activation=tanh, hidden_layer_sizes=(100,), solver=lbfgs ........

D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
y:471: ConvergenceWarning: lbfgs failed to converge (status=1):
STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
  self.n_iter_ = _check_optimize_result("lbfgs", opt_res, self.max_iter)

[CV]  activation=tanh, hidden_layer_sizes=(100,), solver=lbfgs, score=0.900,
total=   0.4s
[CV] activation=tanh, hidden_layer_sizes=(100,), solver=lbfgs ........

D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
y:471: ConvergenceWarning: lbfgs failed to converge (status=1):
STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
  self.n_iter_ = _check_optimize_result("lbfgs", opt_res, self.max_iter)

[CV]  activation=tanh, hidden_layer_sizes=(100,), solver=lbfgs, score=0.975,
total=   0.5s
[CV] activation=tanh, hidden_layer_sizes=(100,), solver=lbfgs ........

D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
y:471: ConvergenceWarning: lbfgs failed to converge (status=1):
STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
  self.n_iter_ = _check_optimize_result("lbfgs", opt_res, self.max_iter)
```

```
[CV]  activation=tanh, hidden_layer_sizes=(100,), solver=lbfgs, score=0.937,
total=   0.5s
[CV] activation=tanh, hidden_layer_sizes=(100,), solver=sgd .........
[CV]  activation=tanh, hidden_layer_sizes=(100,), solver=sgd, score=0.775, to
tal=   0.2s
[CV] activation=tanh, hidden_layer_sizes=(100,), solver=sgd .........
[CV]  activation=tanh, hidden_layer_sizes=(100,), solver=sgd, score=0.838, to
tal=   0.3s
[CV] activation=tanh, hidden_layer_sizes=(100,), solver=sgd .........
[CV]  activation=tanh, hidden_layer_sizes=(100,), solver=sgd, score=0.925, to
tal=   0.2s
[CV] activation=tanh, hidden_layer_sizes=(100,), solver=sgd .........
[CV]  activation=tanh, hidden_layer_sizes=(100,), solver=sgd, score=0.949, to
tal=   0.1s
[CV] activation=tanh, hidden_layer_sizes=(100,), solver=sgd .........
[CV]  activation=tanh, hidden_layer_sizes=(100,), solver=sgd, score=0.924, to
tal=   0.3s
[CV] activation=tanh, hidden_layer_sizes=(100,), solver=adam .........
[CV]  activation=tanh, hidden_layer_sizes=(100,), solver=adam, score=0.912, t
otal=   0.3s
[CV] activation=tanh, hidden_layer_sizes=(100,), solver=adam .........

D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
y:582: ConvergenceWarning: Stochastic Optimizer: Maximum iterations (200) rea
ched and the optimization hasn't converged yet.
  warnings.warn(

[CV]  activation=tanh, hidden_layer_sizes=(100,), solver=adam, score=0.912, t
otal=   0.5s
[CV] activation=tanh, hidden_layer_sizes=(100,), solver=adam .........

D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
y:582: ConvergenceWarning: Stochastic Optimizer: Maximum iterations (200) rea
ched and the optimization hasn't converged yet.
  warnings.warn(

[CV]  activation=tanh, hidden_layer_sizes=(100,), solver=adam, score=0.900, t
otal=   0.6s
[CV] activation=tanh, hidden_layer_sizes=(100,), solver=adam .........

D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
y:582: ConvergenceWarning: Stochastic Optimizer: Maximum iterations (200) rea
ched and the optimization hasn't converged yet.
  warnings.warn(

[CV]  activation=tanh, hidden_layer_sizes=(100,), solver=adam, score=0.962, t
otal=   0.5s
[CV] activation=tanh, hidden_layer_sizes=(100,), solver=adam .........

D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
y:582: ConvergenceWarning: Stochastic Optimizer: Maximum iterations (200) rea
ched and the optimization hasn't converged yet.
  warnings.warn(
```

```
[CV]  activation=tanh, hidden_layer_sizes=(100,), solver=adam, score=0.924, t
otal=   0.5s
[CV] activation=tanh, hidden_layer_sizes=(10, 10), solver=lbfgs ......
[CV]  activation=tanh, hidden_layer_sizes=(10, 10), solver=lbfgs, score=0.92
5, total=   0.1s
[CV] activation=tanh, hidden_layer_sizes=(10, 10), solver=lbfgs ......
[CV]  activation=tanh, hidden_layer_sizes=(10, 10), solver=lbfgs, score=0.88
7, total=   0.2s
[CV] activation=tanh, hidden_layer_sizes=(10, 10), solver=lbfgs ......
[CV]  activation=tanh, hidden_layer_sizes=(10, 10), solver=lbfgs, score=0.90
0, total=   0.1s
[CV] activation=tanh, hidden_layer_sizes=(10, 10), solver=lbfgs ......

D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
y:471: ConvergenceWarning: lbfgs failed to converge (status=1):
STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
  self.n_iter_ = _check_optimize_result("lbfgs", opt_res, self.max_iter)
D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
y:471: ConvergenceWarning: lbfgs failed to converge (status=1):
STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
  self.n_iter_ = _check_optimize_result("lbfgs", opt_res, self.max_iter)

[CV]  activation=tanh, hidden_layer_sizes=(10, 10), solver=lbfgs, score=0.96
2, total=   0.2s
[CV] activation=tanh, hidden_layer_sizes=(10, 10), solver=lbfgs ......
[CV]  activation=tanh, hidden_layer_sizes=(10, 10), solver=lbfgs, score=0.63
3, total=   0.0s
[CV] activation=tanh, hidden_layer_sizes=(10, 10), solver=sgd ........
[CV]  activation=tanh, hidden_layer_sizes=(10, 10), solver=sgd, score=0.637,
total=   0.0s
[CV] activation=tanh, hidden_layer_sizes=(10, 10), solver=sgd ........

D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
y:582: ConvergenceWarning: Stochastic Optimizer: Maximum iterations (200) rea
ched and the optimization hasn't converged yet.
  warnings.warn(

[CV]  activation=tanh, hidden_layer_sizes=(10, 10), solver=sgd, score=0.875,
total=   0.2s
[CV] activation=tanh, hidden_layer_sizes=(10, 10), solver=sgd ........
[CV]  activation=tanh, hidden_layer_sizes=(10, 10), solver=sgd, score=0.900,
total=   0.0s
[CV] activation=tanh, hidden_layer_sizes=(10, 10), solver=sgd ........

D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
y:582: ConvergenceWarning: Stochastic Optimizer: Maximum iterations (200) rea
ched and the optimization hasn't converged yet.
  warnings.warn(
```

```
[CV]  activation=tanh, hidden_layer_sizes=(10, 10), solver=sgd, score=0.949,
total=   0.2s
[CV] activation=tanh, hidden_layer_sizes=(10, 10), solver=sgd ........
[CV]  activation=tanh, hidden_layer_sizes=(10, 10), solver=sgd, score=0.835,
total=   0.0s
[CV] activation=tanh, hidden_layer_sizes=(10, 10), solver=adam .......

D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
y:582: ConvergenceWarning: Stochastic Optimizer: Maximum iterations (200) rea
ched and the optimization hasn't converged yet.
  warnings.warn(

[CV]  activation=tanh, hidden_layer_sizes=(10, 10), solver=adam, score=0.863,
total=   0.2s
[CV] activation=tanh, hidden_layer_sizes=(10, 10), solver=adam .......
[CV]  activation=tanh, hidden_layer_sizes=(10, 10), solver=adam, score=0.637,
total=   0.0s
[CV] activation=tanh, hidden_layer_sizes=(10, 10), solver=adam .......

D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
y:582: ConvergenceWarning: Stochastic Optimizer: Maximum iterations (200) rea
ched and the optimization hasn't converged yet.
  warnings.warn(

[CV]  activation=tanh, hidden_layer_sizes=(10, 10), solver=adam, score=0.950,
total=   0.2s
[CV] activation=tanh, hidden_layer_sizes=(10, 10), solver=adam .......

D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
y:582: ConvergenceWarning: Stochastic Optimizer: Maximum iterations (200) rea
ched and the optimization hasn't converged yet.
  warnings.warn(

[CV]  activation=tanh, hidden_layer_sizes=(10, 10), solver=adam, score=0.899,
total=   0.2s
[CV] activation=tanh, hidden_layer_sizes=(10, 10), solver=adam .......

D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
y:582: ConvergenceWarning: Stochastic Optimizer: Maximum iterations (200) rea
ched and the optimization hasn't converged yet.
  warnings.warn(
```

```
[CV]  activation=tanh, hidden_layer_sizes=(10, 10), solver=adam, score=0.873,
total=   0.2s
[CV] activation=relu, hidden_layer_sizes=(1,), solver=lbfgs .........
[CV]  activation=relu, hidden_layer_sizes=(1,), solver=lbfgs, score=0.637, to
tal=   0.0s
[CV] activation=relu, hidden_layer_sizes=(1,), solver=lbfgs .........
[CV]  activation=relu, hidden_layer_sizes=(1,), solver=lbfgs, score=0.637, to
tal=   0.0s
[CV] activation=relu, hidden_layer_sizes=(1,), solver=lbfgs .........
[CV]  activation=relu, hidden_layer_sizes=(1,), solver=lbfgs, score=0.625, to
tal=   0.0s
[CV] activation=relu, hidden_layer_sizes=(1,), solver=lbfgs .........
[CV]  activation=relu, hidden_layer_sizes=(1,), solver=lbfgs, score=0.633, to
tal=   0.0s
[CV] activation=relu, hidden_layer_sizes=(1,), solver=lbfgs .........
[CV]  activation=relu, hidden_layer_sizes=(1,), solver=lbfgs, score=0.633, to
tal=   0.0s
[CV] activation=relu, hidden_layer_sizes=(1,), solver=sgd ............
[CV]  activation=relu, hidden_layer_sizes=(1,), solver=sgd, score=0.637, tota
l=   0.1s
[CV] activation=relu, hidden_layer_sizes=(1,), solver=sgd ............

D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
y:582: ConvergenceWarning: Stochastic Optimizer: Maximum iterations (200) rea
ched and the optimization hasn't converged yet.
  warnings.warn(
D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
y:582: ConvergenceWarning: Stochastic Optimizer: Maximum iterations (200) rea
ched and the optimization hasn't converged yet.
  warnings.warn(

[CV]  activation=relu, hidden_layer_sizes=(1,), solver=sgd, score=0.362, tota
l=   0.2s
[CV] activation=relu, hidden_layer_sizes=(1,), solver=sgd ............
[CV]  activation=relu, hidden_layer_sizes=(1,), solver=sgd, score=0.625, tota
l=   0.1s
[CV] activation=relu, hidden_layer_sizes=(1,), solver=sgd ............

D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
y:582: ConvergenceWarning: Stochastic Optimizer: Maximum iterations (200) rea
ched and the optimization hasn't converged yet.
  warnings.warn(
D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
y:582: ConvergenceWarning: Stochastic Optimizer: Maximum iterations (200) rea
ched and the optimization hasn't converged yet.
  warnings.warn(
```

```
[CV]  activation=relu, hidden_layer_sizes=(1,), solver=sgd, score=0.367, tota
l=   0.1s
[CV] activation=relu, hidden_layer_sizes=(1,), solver=sgd .....
[CV]  activation=relu, hidden_layer_sizes=(1,), solver=sgd, score=0.633, tota
l=   0.0s
[CV] activation=relu, hidden_layer_sizes=(1,), solver=adam .....
[CV]  activation=relu, hidden_layer_sizes=(1,), solver=adam, score=0.362, tot
al=   0.1s
[CV] activation=relu, hidden_layer_sizes=(1,), solver=adam .....
[CV]  activation=relu, hidden_layer_sizes=(1,), solver=adam, score=0.637, tot
al=   0.0s
[CV] activation=relu, hidden_layer_sizes=(1,), solver=adam .....

D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
y:582: ConvergenceWarning: Stochastic Optimizer: Maximum iterations (200) rea
ched and the optimization hasn't converged yet.
  warnings.warn(
D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
y:582: ConvergenceWarning: Stochastic Optimizer: Maximum iterations (200) rea
ched and the optimization hasn't converged yet.
  warnings.warn(

[CV]  activation=relu, hidden_layer_sizes=(1,), solver=adam, score=0.625, tot
al=   0.1s
[CV] activation=relu, hidden_layer_sizes=(1,), solver=adam .....
[CV]  activation=relu, hidden_layer_sizes=(1,), solver=adam, score=0.633, tot
al=   0.2s
[CV] activation=relu, hidden_layer_sizes=(1,), solver=adam .....

D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
y:471: ConvergenceWarning: lbfgs failed to converge (status=2):
ABNORMAL_TERMINATION_IN_LNSRCH.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
  self.n_iter_ = _check_optimize_result("lbfgs", opt_res, self.max_iter)
D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
y:471: ConvergenceWarning: lbfgs failed to converge (status=2):
ABNORMAL_TERMINATION_IN_LNSRCH.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
  self.n_iter_ = _check_optimize_result("lbfgs", opt_res, self.max_iter)

[CV]  activation=relu, hidden_layer_sizes=(1,), solver=adam, score=0.886, tot
al=   0.0s
[CV] activation=relu, hidden_layer_sizes=(10,), solver=lbfgs .....
[CV]  activation=relu, hidden_layer_sizes=(10,), solver=lbfgs, score=0.163, t
otal=   0.0s
[CV] activation=relu, hidden_layer_sizes=(10,), solver=lbfgs .....
[CV]  activation=relu, hidden_layer_sizes=(10,), solver=lbfgs, score=0.925, t
otal=   0.1s
[CV] activation=relu, hidden_layer_sizes=(10,), solver=lbfgs .....
[CV]  activation=relu, hidden_layer_sizes=(10,), solver=lbfgs, score=0.625, t
otal=   0.0s
[CV] activation=relu, hidden_layer_sizes=(10,), solver=lbfgs .....
```

```
D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
y:471: ConvergenceWarning: lbfgs failed to converge (status=1):
STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
  self.n_iter_ = _check_optimize_result("lbfgs", opt_res, self.max_iter)
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STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
  self.n_iter_ = _check_optimize_result("lbfgs", opt_res, self.max_iter)

[CV]  activation=relu, hidden_layer_sizes=(10,), solver=lbfgs, score=0.911, t
otal=   0.1s
[CV] activation=relu, hidden_layer_sizes=(10,), solver=lbfgs .........
[CV]  activation=relu, hidden_layer_sizes=(10,), solver=lbfgs, score=0.949, t
otal=   0.1s
[CV] activation=relu, hidden_layer_sizes=(10,), solver=sgd ...........

D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
y:582: ConvergenceWarning: Stochastic Optimizer: Maximum iterations (200) rea
ched and the optimization hasn't converged yet.
  warnings.warn(
D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
y:582: ConvergenceWarning: Stochastic Optimizer: Maximum iterations (200) rea
ched and the optimization hasn't converged yet.
  warnings.warn(

[CV]  activation=relu, hidden_layer_sizes=(10,), solver=sgd, score=0.637, tot
al=   0.1s
[CV] activation=relu, hidden_layer_sizes=(10,), solver=sgd ...........
[CV]  activation=relu, hidden_layer_sizes=(10,), solver=sgd, score=0.637, tot
al=   0.1s
[CV] activation=relu, hidden_layer_sizes=(10,), solver=sgd ...........
[CV]  activation=relu, hidden_layer_sizes=(10,), solver=sgd, score=0.375, tot
al=   0.0s
[CV] activation=relu, hidden_layer_sizes=(10,), solver=sgd ...........
[CV]  activation=relu, hidden_layer_sizes=(10,), solver=sgd, score=0.633, tot
al=   0.1s
[CV] activation=relu, hidden_layer_sizes=(10,), solver=sgd ...........
[CV]  activation=relu, hidden_layer_sizes=(10,), solver=sgd, score=0.633, tot
al=   0.1s
[CV] activation=relu, hidden_layer_sizes=(10,), solver=adam ..........

D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
y:582: ConvergenceWarning: Stochastic Optimizer: Maximum iterations (200) rea
ched and the optimization hasn't converged yet.
  warnings.warn(
D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
y:582: ConvergenceWarning: Stochastic Optimizer: Maximum iterations (200) rea
ched and the optimization hasn't converged yet.
  warnings.warn(
```

```
[CV]  activation=relu, hidden_layer_sizes=(10,), solver=adam, score=0.887, to
tal=   0.2s
[CV] activation=relu, hidden_layer_sizes=(10,), solver=adam .........
[CV]  activation=relu, hidden_layer_sizes=(10,), solver=adam, score=0.887, to
tal=   0.2s
[CV] activation=relu, hidden_layer_sizes=(10,), solver=adam .........
[CV]  activation=relu, hidden_layer_sizes=(10,), solver=adam, score=0.925, to
tal=   0.0s
[CV] activation=relu, hidden_layer_sizes=(10,), solver=adam .........

D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
y:582: ConvergenceWarning: Stochastic Optimizer: Maximum iterations (200) rea
ched and the optimization hasn't converged yet.
  warnings.warn(

[CV]  activation=relu, hidden_layer_sizes=(10,), solver=adam, score=0.633, to
tal=   0.0s
[CV] activation=relu, hidden_layer_sizes=(10,), solver=adam .........
[CV]  activation=relu, hidden_layer_sizes=(10,), solver=adam, score=0.937, to
tal=   0.2s
[CV] activation=relu, hidden_layer_sizes=(10, 5), solver=lbfgs .......

D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
y:582: ConvergenceWarning: Stochastic Optimizer: Maximum iterations (200) rea
ched and the optimization hasn't converged yet.
  warnings.warn(
D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
y:471: ConvergenceWarning: lbfgs failed to converge (status=1):
STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
  self.n_iter_ = _check_optimize_result("lbfgs", opt_res, self.max_iter)
D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
y:471: ConvergenceWarning: lbfgs failed to converge (status=1):
STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
  self.n_iter_ = _check_optimize_result("lbfgs", opt_res, self.max_iter)

[CV]  activation=relu, hidden_layer_sizes=(10, 5), solver=lbfgs, score=0.950,
total=   0.2s
[CV] activation=relu, hidden_layer_sizes=(10, 5), solver=lbfgs .......
[CV]  activation=relu, hidden_layer_sizes=(10, 5), solver=lbfgs, score=0.887,
total=   0.2s
[CV] activation=relu, hidden_layer_sizes=(10, 5), solver=lbfgs .......

D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
y:471: ConvergenceWarning: lbfgs failed to converge (status=1):
STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
  self.n_iter_ = _check_optimize_result("lbfgs", opt_res, self.max_iter)
```

```
[CV]  activation=relu, hidden_layer_sizes=(10, 5), solver=lbfgs, score=0.925,
total=   0.2s
[CV] activation=relu, hidden_layer_sizes=(10, 5), solver=lbfgs .......
[CV]  activation=relu, hidden_layer_sizes=(10, 5), solver=lbfgs, score=0.633,
total=   0.0s
[CV] activation=relu, hidden_layer_sizes=(10, 5), solver=lbfgs .......
[CV]  activation=relu, hidden_layer_sizes=(10, 5), solver=lbfgs, score=0.924,
total=   0.1s
[CV] activation=relu, hidden_layer_sizes=(10, 5), solver=sgd .........
[CV]  activation=relu, hidden_layer_sizes=(10, 5), solver=sgd, score=0.750, t
otal=   0.0s
[CV] activation=relu, hidden_layer_sizes=(10, 5), solver=sgd .........
[CV]  activation=relu, hidden_layer_sizes=(10, 5), solver=sgd, score=0.637, t
otal=   0.1s
[CV] activation=relu, hidden_layer_sizes=(10, 5), solver=sgd .........

D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
y:582: ConvergenceWarning: Stochastic Optimizer: Maximum iterations (200) rea
ched and the optimization hasn't converged yet.
  warnings.warn(

[CV]  activation=relu, hidden_layer_sizes=(10, 5), solver=sgd, score=0.625, t
otal=   0.2s
[CV] activation=relu, hidden_layer_sizes=(10, 5), solver=sgd .........
[CV]  activation=relu, hidden_layer_sizes=(10, 5), solver=sgd, score=0.633, t
otal=   0.1s
[CV] activation=relu, hidden_layer_sizes=(10, 5), solver=sgd .........

D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
y:582: ConvergenceWarning: Stochastic Optimizer: Maximum iterations (200) rea
ched and the optimization hasn't converged yet.
  warnings.warn(

[CV]  activation=relu, hidden_layer_sizes=(10, 5), solver=sgd, score=0.911, t
otal=   0.2s
[CV] activation=relu, hidden_layer_sizes=(10, 5), solver=adam ........
[CV]  activation=relu, hidden_layer_sizes=(10, 5), solver=adam, score=0.637,
total=   0.0s
[CV] activation=relu, hidden_layer_sizes=(10, 5), solver=adam ........

D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
y:582: ConvergenceWarning: Stochastic Optimizer: Maximum iterations (200) rea
ched and the optimization hasn't converged yet.
  warnings.warn(

[CV]  activation=relu, hidden_layer_sizes=(10, 5), solver=adam, score=0.875,
total=   0.2s
[CV] activation=relu, hidden_layer_sizes=(10, 5), solver=adam ........

D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
y:582: ConvergenceWarning: Stochastic Optimizer: Maximum iterations (200) rea
ched and the optimization hasn't converged yet.
  warnings.warn(
```

```
[CV]  activation=relu, hidden_layer_sizes=(10, 5), solver=adam, score=0.963,
total=   0.2s
[CV] activation=relu, hidden_layer_sizes=(10, 5), solver=adam ........
[CV]  activation=relu, hidden_layer_sizes=(10, 5), solver=adam, score=0.633,
total=   0.0s
[CV] activation=relu, hidden_layer_sizes=(10, 5), solver=adam ........
[CV]  activation=relu, hidden_layer_sizes=(10, 5), solver=adam, score=0.367,
total=   0.0s
[CV] activation=relu, hidden_layer_sizes=(100,), solver=lbfgs ........
[CV]  activation=relu, hidden_layer_sizes=(100,), solver=lbfgs, score=0.950,
total=   0.5s
[CV] activation=relu, hidden_layer_sizes=(100,), solver=lbfgs ........

D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
y:471: ConvergenceWarning: lbfgs failed to converge (status=1):
STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
  self.n_iter_ = _check_optimize_result("lbfgs", opt_res, self.max_iter)

[CV]  activation=relu, hidden_layer_sizes=(100,), solver=lbfgs, score=0.925,
total=   0.7s
[CV] activation=relu, hidden_layer_sizes=(100,), solver=lbfgs ........

D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
y:471: ConvergenceWarning: lbfgs failed to converge (status=1):
STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
  self.n_iter_ = _check_optimize_result("lbfgs", opt_res, self.max_iter)

[CV]  activation=relu, hidden_layer_sizes=(100,), solver=lbfgs, score=0.963,
total=   0.6s
[CV] activation=relu, hidden_layer_sizes=(100,), solver=lbfgs ........

D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
y:471: ConvergenceWarning: lbfgs failed to converge (status=1):
STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
  self.n_iter_ = _check_optimize_result("lbfgs", opt_res, self.max_iter)

[CV]  activation=relu, hidden_layer_sizes=(100,), solver=lbfgs, score=0.937,
total=   0.6s
[CV] activation=relu, hidden_layer_sizes=(100,), solver=lbfgs ........

D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
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STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
  self.n_iter_ = _check_optimize_result("lbfgs", opt_res, self.max_iter)
```

```
[CV]  activation=relu, hidden_layer_sizes=(100,), solver=lbfgs, score=0.949,
total=   0.7s
[CV] activation=relu, hidden_layer_sizes=(100,), solver=sgd .........
[CV]  activation=relu, hidden_layer_sizes=(100,), solver=sgd, score=0.362, to
tal=   0.1s
[CV] activation=relu, hidden_layer_sizes=(100,), solver=sgd .........
[CV]  activation=relu, hidden_layer_sizes=(100,), solver=sgd, score=0.350, to
tal=   0.1s
[CV] activation=relu, hidden_layer_sizes=(100,), solver=sgd .........
[CV]  activation=relu, hidden_layer_sizes=(100,), solver=sgd, score=0.625, to
tal=   0.1s

D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
y:582: ConvergenceWarning: Stochastic Optimizer: Maximum iterations (200) rea
ched and the optimization hasn't converged yet.
  warnings.warn(

[CV] activation=relu, hidden_layer_sizes=(100,), solver=sgd .........
[CV]  activation=relu, hidden_layer_sizes=(100,), solver=sgd, score=0.937, to
tal=   0.6s
[CV] activation=relu, hidden_layer_sizes=(100,), solver=sgd .........
[CV]  activation=relu, hidden_layer_sizes=(100,), solver=sgd, score=0.899, to
tal=   0.1s
[CV] activation=relu, hidden_layer_sizes=(100,), solver=adam .........
[CV]  activation=relu, hidden_layer_sizes=(100,), solver=adam, score=0.925, t
otal=   0.4s
[CV] activation=relu, hidden_layer_sizes=(100,), solver=adam .........

D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
y:582: ConvergenceWarning: Stochastic Optimizer: Maximum iterations (200) rea
ched and the optimization hasn't converged yet.
  warnings.warn(

[CV]  activation=relu, hidden_layer_sizes=(100,), solver=adam, score=0.925, t
otal=   0.6s
[CV] activation=relu, hidden_layer_sizes=(100,), solver=adam .........

D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
y:582: ConvergenceWarning: Stochastic Optimizer: Maximum iterations (200) rea
ched and the optimization hasn't converged yet.
  warnings.warn(

[CV]  activation=relu, hidden_layer_sizes=(100,), solver=adam, score=0.950, t
otal=   0.6s
[CV] activation=relu, hidden_layer_sizes=(100,), solver=adam .........
[CV]  activation=relu, hidden_layer_sizes=(100,), solver=adam, score=0.949, t
otal=   0.5s
[CV] activation=relu, hidden_layer_sizes=(100,), solver=adam .........
[CV]  activation=relu, hidden_layer_sizes=(100,), solver=adam, score=0.924, t
otal=   0.5s
[CV] activation=relu, hidden_layer_sizes=(10, 10), solver=lbfgs ......
[CV]  activation=relu, hidden_layer_sizes=(10, 10), solver=lbfgs, score=0.50
0, total=   0.0s
[CV] activation=relu, hidden_layer_sizes=(10, 10), solver=lbfgs ......
```

```
D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
y:471: ConvergenceWarning: lbfgs failed to converge (status=2):
ABNORMAL_TERMINATION_IN_LNSRCH.

Increase the number of iterations (max_iter) or scale the data as shown in:
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    https://scikit-learn.org/stable/modules/preprocessing.html
  self.n_iter_ = _check_optimize_result("lbfgs", opt_res, self.max_iter)

[CV]  activation=relu, hidden_layer_sizes=(10, 10), solver=lbfgs, score=0.92
5, total=   0.2s
[CV] activation=relu, hidden_layer_sizes=(10, 10), solver=lbfgs ......

D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
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    https://scikit-learn.org/stable/modules/preprocessing.html
  self.n_iter_ = _check_optimize_result("lbfgs", opt_res, self.max_iter)

[CV]  activation=relu, hidden_layer_sizes=(10, 10), solver=lbfgs, score=0.96
3, total=   0.2s
[CV] activation=relu, hidden_layer_sizes=(10, 10), solver=lbfgs ......
[CV]  activation=relu, hidden_layer_sizes=(10, 10), solver=lbfgs, score=0.94
9, total=   0.2s
[CV] activation=relu, hidden_layer_sizes=(10, 10), solver=lbfgs ......

D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
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Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
  self.n_iter_ = _check_optimize_result("lbfgs", opt_res, self.max_iter)
```

```
[CV]  activation=relu, hidden_layer_sizes=(10, 10), solver=lbfgs, score=0.93
7, total=   0.2s
[CV] activation=relu, hidden_layer_sizes=(10, 10), solver=sgd ........
[CV]  activation=relu, hidden_layer_sizes=(10, 10), solver=sgd, score=0.637,
total=   0.0s
[CV] activation=relu, hidden_layer_sizes=(10, 10), solver=sgd ........
[CV]  activation=relu, hidden_layer_sizes=(10, 10), solver=sgd, score=0.637,
total=   0.0s
[CV] activation=relu, hidden_layer_sizes=(10, 10), solver=sgd ........
[CV]  activation=relu, hidden_layer_sizes=(10, 10), solver=sgd, score=0.625,
total=   0.0s
[CV] activation=relu, hidden_layer_sizes=(10, 10), solver=sgd ........
[CV]  activation=relu, hidden_layer_sizes=(10, 10), solver=sgd, score=0.633,
total=   0.0s
[CV] activation=relu, hidden_layer_sizes=(10, 10), solver=sgd ........
[CV]  activation=relu, hidden_layer_sizes=(10, 10), solver=sgd, score=0.633,
total=   0.0s
[CV] activation=relu, hidden_layer_sizes=(10, 10), solver=adam .......

D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
y:582: ConvergenceWarning: Stochastic Optimizer: Maximum iterations (200) rea
ched and the optimization hasn't converged yet.
  warnings.warn(

[CV]  activation=relu, hidden_layer_sizes=(10, 10), solver=adam, score=0.900,
total=   0.2s
[CV] activation=relu, hidden_layer_sizes=(10, 10), solver=adam .......

D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
y:582: ConvergenceWarning: Stochastic Optimizer: Maximum iterations (200) rea
ched and the optimization hasn't converged yet.
  warnings.warn(

[CV]  activation=relu, hidden_layer_sizes=(10, 10), solver=adam, score=0.875,
total=   0.2s
[CV] activation=relu, hidden_layer_sizes=(10, 10), solver=adam .......

D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
y:582: ConvergenceWarning: Stochastic Optimizer: Maximum iterations (200) rea
ched and the optimization hasn't converged yet.
  warnings.warn(

[CV]  activation=relu, hidden_layer_sizes=(10, 10), solver=adam, score=0.938,
total=   0.2s
[CV] activation=relu, hidden_layer_sizes=(10, 10), solver=adam .......

D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
y:582: ConvergenceWarning: Stochastic Optimizer: Maximum iterations (200) rea
ched and the optimization hasn't converged yet.
  warnings.warn(

[CV]  activation=relu, hidden_layer_sizes=(10, 10), solver=adam, score=0.937,
total=   0.2s
[CV] activation=relu, hidden_layer_sizes=(10, 10), solver=adam .......
```

```
D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
y:582: ConvergenceWarning: Stochastic Optimizer: Maximum iterations (200) rea
ched and the optimization hasn't converged yet.
  warnings.warn(
[Parallel(n_jobs=1)]: Done 300 out of 300 | elapsed:   56.1s finished
D:\anaconda\lib\site-packages\sklearn\neural_network\_multilayer_perceptron.p
y:471: ConvergenceWarning: lbfgs failed to converge (status=2):
ABNORMAL_TERMINATION_IN_LNSRCH.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
  self.n_iter_ = _check_optimize_result("lbfgs", opt_res, self.max_iter)
D:\anaconda\lib\site-packages\sklearn\metrics\_classification.py:1221: Undefi
nedMetricWarning: Precision and F-score are ill-defined and being set to 0.0
in labels with no predicted samples. Use `zero_division` parameter to control
this behavior.
  _warn_prf(average, modifier, msg_start, len(result))

[CV]  activation=relu, hidden_layer_sizes=(10, 10), solver=adam, score=0.911,
total=   0.2s
{'activation': 'relu', 'hidden_layer_sizes': (100,), 'solver': 'lbfgs'}
MLPClassifier(solver='lbfgs')
              precision    recall  f1-score   support

           0       0.00      0.00      0.00        66
           1       0.61      1.00      0.76       105

    accuracy                           0.61       171
   macro avg       0.31      0.50      0.38       171
weighted avg       0.38      0.61      0.47       171
```