

# BG\_and\_boost

February 24, 2022

```
[1]: import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
from sklearn.model_selection import train_test_split
from sklearn.metrics import classification_report, confusion_matrix
from sklearn.model_selection import KFold, cross_validate
from sklearn.model_selection import GridSearchCV
from sklearn.tree import DecisionTreeClassifier
from sklearn.ensemble import GradientBoostingClassifier, RandomForestClassifier
```

```
[2]: df = pd.read_csv("Churn.csv")
```

```
[3]: df.head()
```

```
[3]:   Account Length  VMail Message  Day Mins  Eve Mins  Night Mins  Intl Mins  \
0           128           25      265.1      197.4       244.7        10.0
1           107           26      161.6      195.5       254.4        13.7
2           137            0      243.4      121.2       162.6        12.2
3            84            0      299.4       61.9       196.9         6.6
4            75            0      166.7      148.3       186.9        10.1
```

```
   CustServ Calls  Churn  Intl Plan  VMail Plan  ...  Day Charge  Eve Calls  \
0                1     0          0           1  ...    45.07         99
1                1     0          0           1  ...    27.47        103
2                0     0          0           0  ...    41.38        110
3                2     0          1           0  ...    50.90         88
4                3     0          1           0  ...    28.34        122
```

```
   Eve Charge  Night Calls  Night Charge  Intl Calls  Intl Charge  State  \
0      16.78           91       11.01           3         2.70      KS
1      16.62          103       11.45           3         3.70      OH
2      10.30          104        7.32           5         3.29      NJ
3       5.26           89        8.86           7         1.78      OH
4      12.61          121        8.41           3         2.73      OK
```

```
   Area Code  Phone
0      415  382-4657
1      415  371-7191
```

```

2      415  358-1921
3      408  375-9999
4      415  330-6626

```

[5 rows x 21 columns]

```
[4]: df = df.drop( [ "State", "Area Code", "Phone"], axis = 1)
```

```
[5]: target = df["Churn"]
X = df.drop(["Churn"], axis= 1)
```

```
[6]: ## train and test split
x_train, x_test, y_train, y_test = train_test_split( X, target, test_size=0.2,
↳random_state=123)
```

```
[7]: tree_model = DecisionTreeClassifier(random_state = 1)

fold = KFold(n_splits=5)

par_tree = {
    'max_depth' : [8,10,12],
    'min_samples_leaf' : [5, 10]
}
```

```
[8]: grid_tree = GridSearchCV(tree_model,param_grid= par_tree, cv = fold, verbose =
↳1 )
```

```
[9]: grid_tree.fit(x_train, y_train)
```

Fitting 5 folds for each of 6 candidates, totalling 30 fits

```
[9]: GridSearchCV(cv=KFold(n_splits=5, random_state=None, shuffle=False),
    estimator=DecisionTreeClassifier(random_state=1),
    param_grid={'max_depth': [8, 10, 12], 'min_samples_leaf': [5, 10]},
    verbose=1)
```

```
[10]: grid_tree.best_estimator_
```

```
[10]: DecisionTreeClassifier(max_depth=8, min_samples_leaf=10, random_state=1)
```

```
[11]: grid_tree.cv_results_
```

```
[11]: {'mean_fit_time': array([0.01339517, 0.01278481, 0.01518097, 0.01460023,
0.01659999,
    0.01619987]),
    'std_fit_time': array([0.0010207 , 0.00039396, 0.00161134, 0.0007991 ,
0.00048996,
    0.00040004]),
```

```

'mean_score_time': array([0.0020195 , 0.00179939, 0.00221944, 0.00139952,
0.00180011,
    0.00139995]),
'std_score_time': array([3.24773365e-05, 4.00449237e-04, 3.97232915e-04,
4.89687873e-04,
    3.99614671e-04, 4.89921219e-04]),
'param_max_depth': masked_array(data=[8, 8, 10, 10, 12, 12],
    mask=[False, False, False, False, False, False],
    fill_value='?',
    dtype=object),
'param_min_samples_leaf': masked_array(data=[5, 10, 5, 10, 5, 10],
    mask=[False, False, False, False, False, False],
    fill_value='?',
    dtype=object),
'params': [{'max_depth': 8, 'min_samples_leaf': 5},
{'max_depth': 8, 'min_samples_leaf': 10},
{'max_depth': 10, 'min_samples_leaf': 5},
{'max_depth': 10, 'min_samples_leaf': 10},
{'max_depth': 12, 'min_samples_leaf': 5},
{'max_depth': 12, 'min_samples_leaf': 10}],
'split0_test_score': array([0.95131086, 0.95692884, 0.95131086, 0.95692884,
0.95131086,
    0.95692884]),
'split1_test_score': array([0.94934334, 0.94934334, 0.94746717, 0.94934334,
0.94934334,
    0.94934334]),
'split2_test_score': array([0.9380863 , 0.94746717, 0.9249531 , 0.94746717,
0.92870544,
    0.94746717]),
'split3_test_score': array([0.92870544, 0.92307692, 0.93058161, 0.92307692,
0.93058161,
    0.92307692]),
'split4_test_score': array([0.93433396, 0.93621013, 0.93433396, 0.93621013,
0.93433396,
    0.93621013]),
'mean_test_score': array([0.94035598, 0.94260528, 0.93772934, 0.94260528,
0.93885504,
    0.94260528]),
'std_test_score': array([0.00869406, 0.01180219, 0.01005121, 0.01180219,
0.00956092,
    0.01180219]),
'rank_test_score': array([4, 1, 6, 1, 5, 1])}

```

```
[12]: pred_tree = grid_tree.predict(x_test)
```

```
[13]: print(classification_report(y_test, pred_tree))
```

```

precision    recall  f1-score   support

```

0	0.96	0.97	0.96	572
1	0.79	0.74	0.76	95
accuracy			0.93	667
macro avg	0.87	0.85	0.86	667
weighted avg	0.93	0.93	0.93	667

```
[14]: rf_model = RandomForestClassifier(random_state=1)
```

```
[15]: par_rf = {
      'n_estimators' : [25,50,75] ,
      'max_depth' : [8,10,12] ,
      'max_features' : [4,5,6,7]
    }
```

```
[16]: grid_rf = GridSearchCV(rf_model, param_grid= par_rf, cv = fold, verbose = 1 )
```

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

Fitting 5 folds for each of 36 candidates, totalling 180 fits

```
[18]: GridSearchCV(cv=KFold(n_splits=5, random_state=None, shuffle=False),
                  estimator=RandomForestClassifier(random_state=1),
                  param_grid={'max_depth': [8, 10, 12], 'max_features': [4, 5, 6, 7],
                              'n_estimators': [25, 50, 75]}},
                  verbose=1)
```

```
[19]: grid_rf.best_estimator_
```

```
[19]: RandomForestClassifier(max_depth=12, max_features=6, n_estimators=50,
                           random_state=1)
```

```
[20]: print("Mean Accuracy of CV:", grid_rf.cv_results_["mean_test_score"].mean())
      print("Std of CV :", grid_rf.cv_results_["std_test_score"].mean())
```

Mean Accuracy of CV: 0.9493676993814019

Std of CV : 0.009954313546715414

```
[21]: pred_rf = grid_rf.predict(x_test)
```

```
[22]: print(classification_report(y_test, pred_rf))
```

	precision	recall	f1-score	support
0	0.96	0.98	0.97	572
1	0.85	0.77	0.81	95
accuracy			0.95	667

macro avg	0.91	0.87	0.89	667
weighted avg	0.95	0.95	0.95	667

```
[23]: gbc_model = GradientBoostingClassifier(random_state=1)
```

```
[29]: par_gbc = {
      'n_estimators' : [ 150, 250] ,
      'learning_rate' : [ 0.05, 0.01],
      'max_depth' : [3,4,5]
    }
```

```
[30]: grid_gbc = GridSearchCV(gbc_model, param_grid=par_gbc, cv = fold, verbose =1 )
```

```
[31]: grid_gbc.fit(x_train, y_train)
```

Fitting 5 folds for each of 12 candidates, totalling 60 fits

```
[31]: GridSearchCV(cv=KFold(n_splits=5, random_state=None, shuffle=False),
                  estimator=GradientBoostingClassifier(random_state=1),
                  param_grid={'learning_rate': [0.05, 0.01], 'max_depth': [3, 4, 5],
                              'n_estimators': [150, 250]}},
                  verbose=1)
```

```
[32]: grid_gbc.best_estimator_
```

```
[32]: GradientBoostingClassifier(learning_rate=0.05, max_depth=4, n_estimators=150,
                                random_state=1)
```

```
[33]: print("Mean Accuracy of CV:", grid_gbc.cv_results_["mean_test_score"].mean())
      print("Std of CV :", grid_gbc.cv_results_["std_test_score"].mean())
```

Mean Accuracy of CV: 0.9441366092571903  
Std of CV : 0.011447723499159552

```
[44]: pred_gird_gbc= grid_gbc.predict(x_test)
      print(classification_report(y_test, pred_gird_gbc))
```

	precision	recall	f1-score	support
0	0.96	0.99	0.98	572
1	0.92	0.77	0.84	95
accuracy			0.96	667
macro avg	0.94	0.88	0.91	667
weighted avg	0.96	0.96	0.96	667

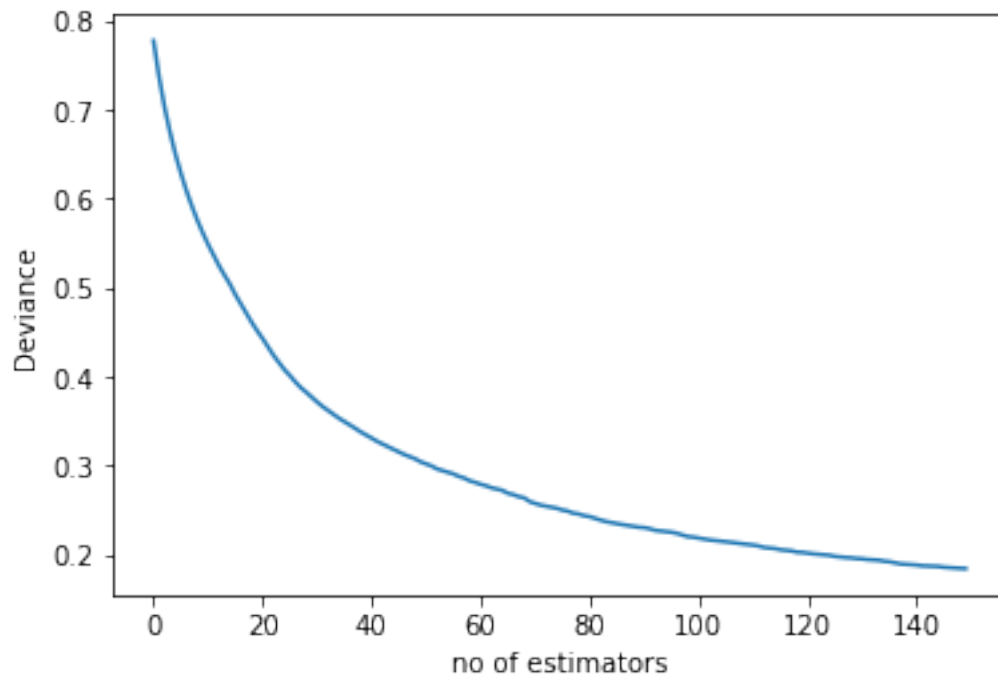
```
[34]: gbc = GradientBoostingClassifier(learning_rate=0.05, max_depth=4,
    ↪n_estimators=150,
    random_state=1)
```

```
[35]: gbc.fit(x_train, y_train)
```

```
[35]: GradientBoostingClassifier(learning_rate=0.05, max_depth=4, n_estimators=150,
    random_state=1)
```

```
[37]: plt.plot(gbc.train_score_)
plt.ylabel("Deviance")
plt.xlabel("no of estimators")
```

```
[37]: Text(0.5, 0, 'no of estimators')
```

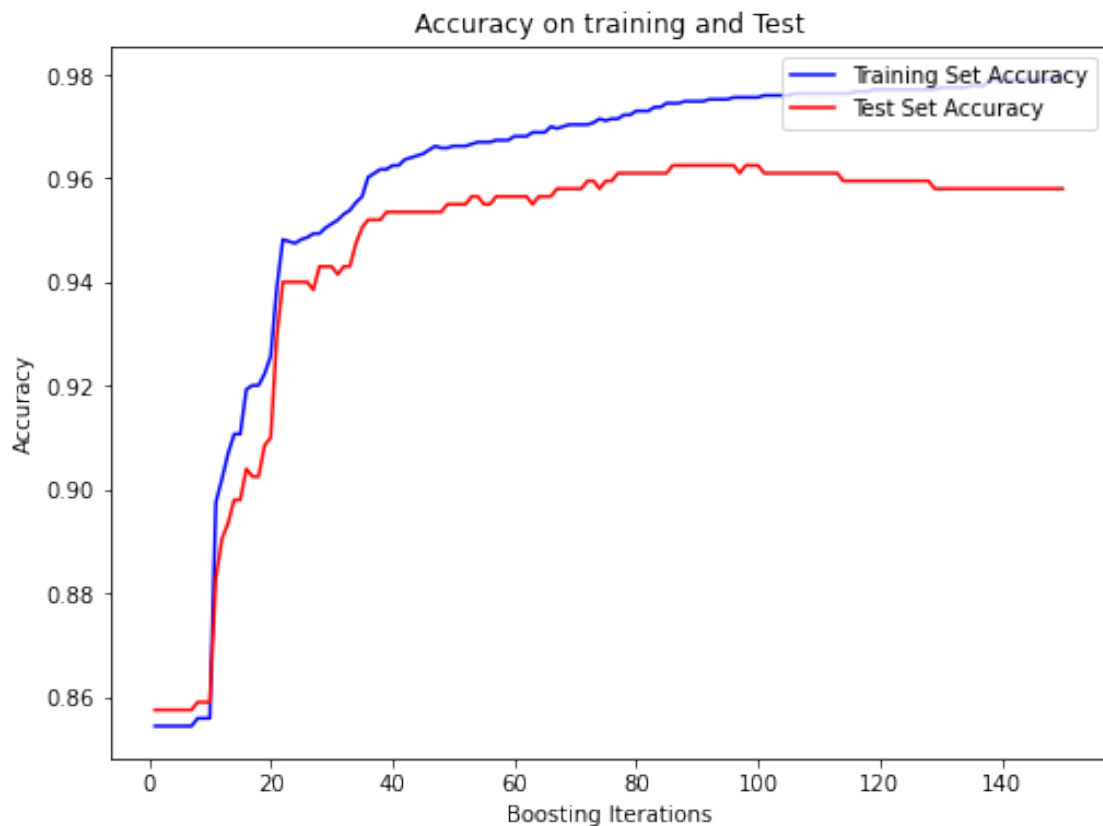


```
[38]: from sklearn.metrics import accuracy_score
train_score = np.zeros(gbc.n_estimators, dtype=np.float64)
test_score = np.zeros(gbc.n_estimators, dtype=np.float64)
## Generate staged prediction accuracy on trianing set
for i, y_pred in enumerate(gbc.staged_predict(x_train)):
    train_score[i] = accuracy_score(y_train, y_pred)
# Generate staged prediction accuracy on the test dataset
for i, y_pred in enumerate(gbc.staged_predict(x_test)):
    test_score[i] = accuracy_score(y_test, y_pred)
```

```
[39]: ## plot the performance on train vs test by iterations
```

```
plt.figure(figsize=(18, 6))
plt.subplot(1, 2, 1)
plt.title('Accuracy on training and Test')
plt.plot(np.arange(gbc.n_estimators) + 1, train_score, 'b-',
         label='Training Set Accuracy')
plt.plot(np.arange(gbc.n_estimators) + 1, test_score, 'r-',
         label='Test Set Accuracy')
plt.legend(loc='upper right')
plt.xlabel('Boosting Iterations')
plt.ylabel('Accuracy')
```

```
[39]: Text(0, 0.5, 'Accuracy')
```



```
[40]: gbc = GradientBoostingClassifier(learning_rate=0.05, max_depth=4,
    ↪ n_estimators=90,
    random_state=1)
```

```
[41]: gbc.fit(x_train, y_train)
```

```
[41]: GradientBoostingClassifier(learning_rate=0.05, max_depth=4, n_estimators=90,
                                random_state=1)
```

```
[42]: gbc_pred = gbc.predict(x_test)
```

```
[43]: print(classification_report(y_test, gbc_pred))
```

	precision	recall	f1-score	support
0	0.97	0.99	0.98	572
1	0.94	0.79	0.86	95
accuracy			0.96	667
macro avg	0.95	0.89	0.92	667
weighted avg	0.96	0.96	0.96	667

```
[56]: import xgboost as xgb
```

```
xgc = xgb.XGBClassifier(objective = 'binary:logistic')
```

```
param = {
    'n_estimators' : [50,75,90,120],
    'eta' : [0.1, 0.05],
    'max_depth' : [4,5]
}
```

```
[65]: grid_xgb = GridSearchCV(xgc, param_grid=param, cv = fold, verbose=0)
```

```
[66]: grid_xgb.fit(x_train, y_train, eval_set = [(x_train, y_train), (x_test,
→y_test)],
            eval_metric = ['logloss', 'error'])
```

```
[0]    validation_0-logloss:0.62188    validation_0-error:0.07277
validation_1-logloss:0.62394    validation_1-error:0.08546
[1]    validation_0-logloss:0.56324    validation_0-error:0.05889
validation_1-logloss:0.56659    validation_1-error:0.06897
[2]    validation_0-logloss:0.51397    validation_0-error:0.06977
validation_1-logloss:0.51860    validation_1-error:0.08846
[3]    validation_0-logloss:0.47256    validation_0-error:0.05851
validation_1-logloss:0.47799    validation_1-error:0.06897
[4]    validation_0-logloss:0.43700    validation_0-error:0.05851
validation_1-logloss:0.44342    validation_1-error:0.06897
[5]    validation_0-logloss:0.40644    validation_0-error:0.05664
validation_1-logloss:0.41402    validation_1-error:0.07046
[6]    validation_0-logloss:0.37993    validation_0-error:0.05664
validation_1-logloss:0.38928    validation_1-error:0.07046
[7]    validation_0-logloss:0.35691    validation_0-error:0.05664
```



validation\_1-logloss:0.36640      validation\_1-error:0.07046  
 [8]      validation\_0-logloss:0.33442      validation\_0-error:0.05626  
 validation\_1-logloss:0.34355      validation\_1-error:0.07046  
 [9]      validation\_0-logloss:0.31471      validation\_0-error:0.05439  
 validation\_1-logloss:0.32344      validation\_1-error:0.06147  
 [10]      validation\_0-logloss:0.29682      validation\_0-error:0.05664  
 validation\_1-logloss:0.30648      validation\_1-error:0.07046  
 [11]      validation\_0-logloss:0.28067      validation\_0-error:0.05289  
 validation\_1-logloss:0.29058      validation\_1-error:0.06447  
 [12]      validation\_0-logloss:0.26661      validation\_0-error:0.05026  
 validation\_1-logloss:0.27738      validation\_1-error:0.05997  
 [13]      validation\_0-logloss:0.25407      validation\_0-error:0.04576  
 validation\_1-logloss:0.26513      validation\_1-error:0.05697  
 [14]      validation\_0-logloss:0.24311      validation\_0-error:0.04389  
 validation\_1-logloss:0.25468      validation\_1-error:0.05697  
 [15]      validation\_0-logloss:0.23320      validation\_0-error:0.04088  
 validation\_1-logloss:0.24494      validation\_1-error:0.04947  
 [16]      validation\_0-logloss:0.22346      validation\_0-error:0.04088  
 validation\_1-logloss:0.23392      validation\_1-error:0.04648  
 [17]      validation\_0-logloss:0.21588      validation\_0-error:0.04013  
 validation\_1-logloss:0.22683      validation\_1-error:0.04648  
 [18]      validation\_0-logloss:0.20914      validation\_0-error:0.03826  
 validation\_1-logloss:0.22003      validation\_1-error:0.04648  
 [19]      validation\_0-logloss:0.20245      validation\_0-error:0.03713  
 validation\_1-logloss:0.21410      validation\_1-error:0.04648  
 [20]      validation\_0-logloss:0.19661      validation\_0-error:0.03864  
 validation\_1-logloss:0.20888      validation\_1-error:0.04498  
 [21]      validation\_0-logloss:0.19040      validation\_0-error:0.03788  
 validation\_1-logloss:0.20121      validation\_1-error:0.04348  
 [22]      validation\_0-logloss:0.18601      validation\_0-error:0.03601  
 validation\_1-logloss:0.19733      validation\_1-error:0.04348  
 [23]      validation\_0-logloss:0.18178      validation\_0-error:0.03563  
 validation\_1-logloss:0.19338      validation\_1-error:0.04198  
 [24]      validation\_0-logloss:0.17735      validation\_0-error:0.03563  
 validation\_1-logloss:0.18773      validation\_1-error:0.04048  
 [25]      validation\_0-logloss:0.17340      validation\_0-error:0.03526  
 validation\_1-logloss:0.18426      validation\_1-error:0.03748  
 [26]      validation\_0-logloss:0.16934      validation\_0-error:0.03526  
 validation\_1-logloss:0.17993      validation\_1-error:0.03748  
 [27]      validation\_0-logloss:0.16617      validation\_0-error:0.03488  
 validation\_1-logloss:0.17803      validation\_1-error:0.03598  
 [28]      validation\_0-logloss:0.16327      validation\_0-error:0.03413  
 validation\_1-logloss:0.17492      validation\_1-error:0.03598  
 [29]      validation\_0-logloss:0.16052      validation\_0-error:0.03376  
 validation\_1-logloss:0.17165      validation\_1-error:0.03598  
 [30]      validation\_0-logloss:0.15817      validation\_0-error:0.03376  
 validation\_1-logloss:0.16981      validation\_1-error:0.03598  
 [31]      validation\_0-logloss:0.15555      validation\_0-error:0.03301

validation\_1-logloss:0.16649      validation\_1-error:0.03598  
 [32]      validation\_0-logloss:0.15348      validation\_0-error:0.03226  
 validation\_1-logloss:0.16501      validation\_1-error:0.03598  
 [33]      validation\_0-logloss:0.15155      validation\_0-error:0.03188  
 validation\_1-logloss:0.16250      validation\_1-error:0.03598  
 [34]      validation\_0-logloss:0.14985      validation\_0-error:0.03226  
 validation\_1-logloss:0.15996      validation\_1-error:0.03748  
 [35]      validation\_0-logloss:0.14818      validation\_0-error:0.03188  
 validation\_1-logloss:0.15990      validation\_1-error:0.03748  
 [36]      validation\_0-logloss:0.14678      validation\_0-error:0.03226  
 validation\_1-logloss:0.15961      validation\_1-error:0.03598  
 [37]      validation\_0-logloss:0.14530      validation\_0-error:0.03263  
 validation\_1-logloss:0.15831      validation\_1-error:0.03448  
 [38]      validation\_0-logloss:0.14368      validation\_0-error:0.03151  
 validation\_1-logloss:0.15703      validation\_1-error:0.03598  
 [39]      validation\_0-logloss:0.14230      validation\_0-error:0.03113  
 validation\_1-logloss:0.15623      validation\_1-error:0.03298  
 [40]      validation\_0-logloss:0.14097      validation\_0-error:0.03076  
 validation\_1-logloss:0.15492      validation\_1-error:0.03448  
 [41]      validation\_0-logloss:0.14042      validation\_0-error:0.03076  
 validation\_1-logloss:0.15443      validation\_1-error:0.03448  
 [42]      validation\_0-logloss:0.13902      validation\_0-error:0.03076  
 validation\_1-logloss:0.15348      validation\_1-error:0.03448  
 [43]      validation\_0-logloss:0.13758      validation\_0-error:0.03076  
 validation\_1-logloss:0.15267      validation\_1-error:0.03448  
 [44]      validation\_0-logloss:0.13603      validation\_0-error:0.03038  
 validation\_1-logloss:0.15276      validation\_1-error:0.03448  
 [45]      validation\_0-logloss:0.13546      validation\_0-error:0.03076  
 validation\_1-logloss:0.15207      validation\_1-error:0.03448  
 [46]      validation\_0-logloss:0.13467      validation\_0-error:0.03001  
 validation\_1-logloss:0.15242      validation\_1-error:0.03448  
 [47]      validation\_0-logloss:0.13388      validation\_0-error:0.03001  
 validation\_1-logloss:0.15192      validation\_1-error:0.03448  
 [48]      validation\_0-logloss:0.13273      validation\_0-error:0.03038  
 validation\_1-logloss:0.15215      validation\_1-error:0.03598  
 [49]      validation\_0-logloss:0.13177      validation\_0-error:0.02963  
 validation\_1-logloss:0.15174      validation\_1-error:0.03598  
 [0]      validation\_0-logloss:0.62140      validation\_0-error:0.07164  
 validation\_1-logloss:0.62313      validation\_1-error:0.09145  
 [1]      validation\_0-logloss:0.56265      validation\_0-error:0.05476  
 validation\_1-logloss:0.56447      validation\_1-error:0.05997  
 [2]      validation\_0-logloss:0.51301      validation\_0-error:0.06489  
 validation\_1-logloss:0.51596      validation\_1-error:0.07796  
 [3]      validation\_0-logloss:0.47137      validation\_0-error:0.05476  
 validation\_1-logloss:0.47555      validation\_1-error:0.05997  
 [4]      validation\_0-logloss:0.43558      validation\_0-error:0.05251  
 validation\_1-logloss:0.44073      validation\_1-error:0.05397  
 [5]      validation\_0-logloss:0.40492      validation\_0-error:0.05214

validation\_1-logloss:0.41100 validation\_1-error:0.06297  
 [6] validation\_0-logloss:0.37836 validation\_0-error:0.05326  
 validation\_1-logloss:0.38544 validation\_1-error:0.06597  
 [7] validation\_0-logloss:0.35511 validation\_0-error:0.05214  
 validation\_1-logloss:0.36291 validation\_1-error:0.06147  
 [8] validation\_0-logloss:0.33367 validation\_0-error:0.05251  
 validation\_1-logloss:0.34079 validation\_1-error:0.05697  
 [9] validation\_0-logloss:0.31474 validation\_0-error:0.05251  
 validation\_1-logloss:0.32185 validation\_1-error:0.05547  
 [10] validation\_0-logloss:0.29648 validation\_0-error:0.05214  
 validation\_1-logloss:0.30432 validation\_1-error:0.05547  
 [11] validation\_0-logloss:0.28054 validation\_0-error:0.05289  
 validation\_1-logloss:0.28840 validation\_1-error:0.05697  
 [12] validation\_0-logloss:0.26654 validation\_0-error:0.05139  
 validation\_1-logloss:0.27443 validation\_1-error:0.05397  
 [13] validation\_0-logloss:0.25455 validation\_0-error:0.05101  
 validation\_1-logloss:0.26286 validation\_1-error:0.05397  
 [14] validation\_0-logloss:0.24327 validation\_0-error:0.04876  
 validation\_1-logloss:0.25264 validation\_1-error:0.05097  
 [15] validation\_0-logloss:0.23381 validation\_0-error:0.04013  
 validation\_1-logloss:0.24341 validation\_1-error:0.04648  
 [16] validation\_0-logloss:0.22515 validation\_0-error:0.04239  
 validation\_1-logloss:0.23544 validation\_1-error:0.05247  
 [17] validation\_0-logloss:0.21706 validation\_0-error:0.04126  
 validation\_1-logloss:0.22859 validation\_1-error:0.05397  
 [18] validation\_0-logloss:0.20897 validation\_0-error:0.04088  
 validation\_1-logloss:0.21887 validation\_1-error:0.04947  
 [19] validation\_0-logloss:0.20263 validation\_0-error:0.03901  
 validation\_1-logloss:0.21278 validation\_1-error:0.04798  
 [20] validation\_0-logloss:0.19688 validation\_0-error:0.03939  
 validation\_1-logloss:0.20793 validation\_1-error:0.04798  
 [21] validation\_0-logloss:0.19088 validation\_0-error:0.03826  
 validation\_1-logloss:0.20051 validation\_1-error:0.04648  
 [22] validation\_0-logloss:0.18627 validation\_0-error:0.03826  
 validation\_1-logloss:0.19622 validation\_1-error:0.04648  
 [23] validation\_0-logloss:0.18158 validation\_0-error:0.03751  
 validation\_1-logloss:0.19022 validation\_1-error:0.04648  
 [24] validation\_0-logloss:0.17793 validation\_0-error:0.03751  
 validation\_1-logloss:0.18732 validation\_1-error:0.04498  
 [25] validation\_0-logloss:0.17408 validation\_0-error:0.03713  
 validation\_1-logloss:0.18323 validation\_1-error:0.04498  
 [26] validation\_0-logloss:0.17114 validation\_0-error:0.03676  
 validation\_1-logloss:0.18122 validation\_1-error:0.04498  
 [27] validation\_0-logloss:0.16809 validation\_0-error:0.03563  
 validation\_1-logloss:0.17806 validation\_1-error:0.04498  
 [28] validation\_0-logloss:0.16530 validation\_0-error:0.03526  
 validation\_1-logloss:0.17593 validation\_1-error:0.04348  
 [29] validation\_0-logloss:0.16310 validation\_0-error:0.03526

```

validation_1-logloss:0.17339    validation_1-error:0.04348
[30]   validation_0-logloss:0.16052    validation_0-error:0.03563
validation_1-logloss:0.17105    validation_1-error:0.04348
[31]   validation_0-logloss:0.15768    validation_0-error:0.03488
validation_1-logloss:0.16930    validation_1-error:0.04348
[32]   validation_0-logloss:0.15564    validation_0-error:0.03451
validation_1-logloss:0.16762    validation_1-error:0.04348
[33]   validation_0-logloss:0.15424    validation_0-error:0.03526
validation_1-logloss:0.16674    validation_1-error:0.04348
[34]   validation_0-logloss:0.15238    validation_0-error:0.03563
validation_1-logloss:0.16500    validation_1-error:0.04348
[35]   validation_0-logloss:0.15101    validation_0-error:0.03526
validation_1-logloss:0.16421    validation_1-error:0.04348
[36]   validation_0-logloss:0.14999    validation_0-error:0.03526
validation_1-logloss:0.16366    validation_1-error:0.04198
[37]   validation_0-logloss:0.14845    validation_0-error:0.03563
validation_1-logloss:0.16288    validation_1-error:0.04348
[38]   validation_0-logloss:0.14710    validation_0-error:0.03413
validation_1-logloss:0.16221    validation_1-error:0.04348
[39]   validation_0-logloss:0.14569    validation_0-error:0.03376
validation_1-logloss:0.16193    validation_1-error:0.04498
[40]   validation_0-logloss:0.14383    validation_0-error:0.03338
validation_1-logloss:0.16135    validation_1-error:0.04498
[41]   validation_0-logloss:0.14303    validation_0-error:0.03376
validation_1-logloss:0.16121    validation_1-error:0.04498

```

C:\Users\sci\anaconda3\lib\site-packages\xgboost\sklearn.py:888: UserWarning:  
The use of label encoder in XGBClassifier is deprecated and will be removed in a  
future release. To remove this warning, do the following: 1) Pass option  
use\_label\_encoder=False when constructing XGBClassifier object; and 2) Encode  
your labels (y) as integers starting with 0, i.e. 0, 1, 2, ..., [num\_class - 1].  
warnings.warn(label\_encoder\_deprecation\_msg, UserWarning)

C:\Users\sci\anaconda3\lib\site-packages\xgboost\sklearn.py:888: UserWarning:  
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use\_label\_encoder=False when constructing XGBClassifier object; and 2) Encode  
your labels (y) as integers starting with 0, i.e. 0, 1, 2, ..., [num\_class - 1].  
warnings.warn(label\_encoder\_deprecation\_msg, UserWarning)

```

[42]   validation_0-logloss:0.14187    validation_0-error:0.03376
validation_1-logloss:0.16082    validation_1-error:0.04498
[43]   validation_0-logloss:0.14052    validation_0-error:0.03338
validation_1-logloss:0.15946    validation_1-error:0.04498
[44]   validation_0-logloss:0.13930    validation_0-error:0.03301
validation_1-logloss:0.15982    validation_1-error:0.04498
[45]   validation_0-logloss:0.13811    validation_0-error:0.03301
validation_1-logloss:0.15860    validation_1-error:0.04498
[46]   validation_0-logloss:0.13691    validation_0-error:0.03263
validation_1-logloss:0.15885    validation_1-error:0.04498

```

[47] validation\_0-logloss:0.13585 validation\_0-error:0.03263  
 validation\_1-logloss:0.15863 validation\_1-error:0.04498  
 [48] validation\_0-logloss:0.13493 validation\_0-error:0.03263  
 validation\_1-logloss:0.15847 validation\_1-error:0.04348  
 [49] validation\_0-logloss:0.13440 validation\_0-error:0.03263  
 validation\_1-logloss:0.15830 validation\_1-error:0.04348  
 [0] validation\_0-logloss:0.62126 validation\_0-error:0.07014  
 validation\_1-logloss:0.62301 validation\_1-error:0.08696  
 [1] validation\_0-logloss:0.56249 validation\_0-error:0.06864  
 validation\_1-logloss:0.56531 validation\_1-error:0.07946  
 [2] validation\_0-logloss:0.51301 validation\_0-error:0.06639  
 validation\_1-logloss:0.51618 validation\_1-error:0.08246  
 [3] validation\_0-logloss:0.47133 validation\_0-error:0.06639  
 validation\_1-logloss:0.47532 validation\_1-error:0.08246  
 [4] validation\_0-logloss:0.43432 validation\_0-error:0.05476  
 validation\_1-logloss:0.43892 validation\_1-error:0.05847  
 [5] validation\_0-logloss:0.40360 validation\_0-error:0.06602  
 validation\_1-logloss:0.40962 validation\_1-error:0.08396  
 [6] validation\_0-logloss:0.37547 validation\_0-error:0.05551  
 validation\_1-logloss:0.38175 validation\_1-error:0.06897  
 [7] validation\_0-logloss:0.35059 validation\_0-error:0.04914  
 validation\_1-logloss:0.35796 validation\_1-error:0.06297  
 [8] validation\_0-logloss:0.32898 validation\_0-error:0.04689  
 validation\_1-logloss:0.33659 validation\_1-error:0.05847  
 [9] validation\_0-logloss:0.30979 validation\_0-error:0.04464  
 validation\_1-logloss:0.31881 validation\_1-error:0.05697  
 [10] validation\_0-logloss:0.29335 validation\_0-error:0.04614  
 validation\_1-logloss:0.30327 validation\_1-error:0.05847  
 [11] validation\_0-logloss:0.27779 validation\_0-error:0.04426  
 validation\_1-logloss:0.28834 validation\_1-error:0.05547  
 [12] validation\_0-logloss:0.26348 validation\_0-error:0.04389  
 validation\_1-logloss:0.27317 validation\_1-error:0.05547  
 [13] validation\_0-logloss:0.25116 validation\_0-error:0.04314  
 validation\_1-logloss:0.26218 validation\_1-error:0.05697  
 [14] validation\_0-logloss:0.24026 validation\_0-error:0.04201  
 validation\_1-logloss:0.25123 validation\_1-error:0.05847  
 [15] validation\_0-logloss:0.23030 validation\_0-error:0.04088  
 validation\_1-logloss:0.24278 validation\_1-error:0.05847  
 [16] validation\_0-logloss:0.22143 validation\_0-error:0.04088  
 validation\_1-logloss:0.23425 validation\_1-error:0.05997  
 [17] validation\_0-logloss:0.21347 validation\_0-error:0.03976  
 validation\_1-logloss:0.22695 validation\_1-error:0.05847  
 [18] validation\_0-logloss:0.20629 validation\_0-error:0.03976  
 validation\_1-logloss:0.22036 validation\_1-error:0.05847  
 [19] validation\_0-logloss:0.19984 validation\_0-error:0.04013  
 validation\_1-logloss:0.21495 validation\_1-error:0.05547  
 [20] validation\_0-logloss:0.19433 validation\_0-error:0.03638  
 validation\_1-logloss:0.20969 validation\_1-error:0.05697

[21] validation\_0-logloss:0.18852 validation\_0-error:0.03638  
 validation\_1-logloss:0.20243 validation\_1-error:0.05247  
 [22] validation\_0-logloss:0.18424 validation\_0-error:0.03563  
 validation\_1-logloss:0.19886 validation\_1-error:0.05397  
 [23] validation\_0-logloss:0.17949 validation\_0-error:0.03526  
 validation\_1-logloss:0.19336 validation\_1-error:0.05247  
 [24] validation\_0-logloss:0.17541 validation\_0-error:0.03563  
 validation\_1-logloss:0.18868 validation\_1-error:0.05097  
 [25] validation\_0-logloss:0.17162 validation\_0-error:0.03376  
 validation\_1-logloss:0.18562 validation\_1-error:0.04798  
 [26] validation\_0-logloss:0.16821 validation\_0-error:0.03338  
 validation\_1-logloss:0.18305 validation\_1-error:0.04798  
 [27] validation\_0-logloss:0.16490 validation\_0-error:0.03301  
 validation\_1-logloss:0.17909 validation\_1-error:0.04498  
 [28] validation\_0-logloss:0.16184 validation\_0-error:0.03263  
 validation\_1-logloss:0.17689 validation\_1-error:0.04798  
 [29] validation\_0-logloss:0.15913 validation\_0-error:0.03263  
 validation\_1-logloss:0.17430 validation\_1-error:0.04648  
 [30] validation\_0-logloss:0.15683 validation\_0-error:0.03226  
 validation\_1-logloss:0.17204 validation\_1-error:0.04648  
 [31] validation\_0-logloss:0.15518 validation\_0-error:0.03226  
 validation\_1-logloss:0.17073 validation\_1-error:0.04798  
 [32] validation\_0-logloss:0.15301 validation\_0-error:0.03151  
 validation\_1-logloss:0.16956 validation\_1-error:0.04947  
 [33] validation\_0-logloss:0.15166 validation\_0-error:0.03188  
 validation\_1-logloss:0.16870 validation\_1-error:0.04648  
 [34] validation\_0-logloss:0.14961 validation\_0-error:0.03113  
 validation\_1-logloss:0.16599 validation\_1-error:0.04498  
 [35] validation\_0-logloss:0.14765 validation\_0-error:0.03113  
 validation\_1-logloss:0.16532 validation\_1-error:0.04348  
 [36] validation\_0-logloss:0.14584 validation\_0-error:0.03038  
 validation\_1-logloss:0.16288 validation\_1-error:0.04198  
 [37] validation\_0-logloss:0.14453 validation\_0-error:0.03001  
 validation\_1-logloss:0.16258 validation\_1-error:0.04198  
 [38] validation\_0-logloss:0.14301 validation\_0-error:0.03001  
 validation\_1-logloss:0.16051 validation\_1-error:0.04348  
 [39] validation\_0-logloss:0.14196 validation\_0-error:0.03038  
 validation\_1-logloss:0.16021 validation\_1-error:0.04348  
 [40] validation\_0-logloss:0.14131 validation\_0-error:0.03038  
 validation\_1-logloss:0.16000 validation\_1-error:0.04348  
 [41] validation\_0-logloss:0.14000 validation\_0-error:0.03038  
 validation\_1-logloss:0.15837 validation\_1-error:0.04498  
 [42] validation\_0-logloss:0.13899 validation\_0-error:0.03001  
 validation\_1-logloss:0.15809 validation\_1-error:0.04498  
 [43] validation\_0-logloss:0.13745 validation\_0-error:0.02963  
 validation\_1-logloss:0.15635 validation\_1-error:0.04198  
 [44] validation\_0-logloss:0.13587 validation\_0-error:0.02888  
 validation\_1-logloss:0.15591 validation\_1-error:0.04348

[45] validation\_0-logloss:0.13503 validation\_0-error:0.02851  
 validation\_1-logloss:0.15537 validation\_1-error:0.04348  
 [46] validation\_0-logloss:0.13406 validation\_0-error:0.02888  
 validation\_1-logloss:0.15404 validation\_1-error:0.04348  
 [47] validation\_0-logloss:0.13299 validation\_0-error:0.02851  
 validation\_1-logloss:0.15399 validation\_1-error:0.04348  
 [48] validation\_0-logloss:0.13171 validation\_0-error:0.02926  
 validation\_1-logloss:0.15311 validation\_1-error:0.04198  
 [49] validation\_0-logloss:0.13108 validation\_0-error:0.02851  
 validation\_1-logloss:0.15302 validation\_1-error:0.04348  
 [0] validation\_0-logloss:0.62077 validation\_0-error:0.07127  
 validation\_1-logloss:0.62326 validation\_1-error:0.09145  
 [1] validation\_0-logloss:0.56152 validation\_0-error:0.07089  
 validation\_1-logloss:0.56583 validation\_1-error:0.08846  
 [2] validation\_0-logloss:0.51231 validation\_0-error:0.07127  
 validation\_1-logloss:0.51891 validation\_1-error:0.08846  
 [3] validation\_0-logloss:0.46992 validation\_0-error:0.07089  
 validation\_1-logloss:0.47802 validation\_1-error:0.09145  
 [4] validation\_0-logloss:0.43456 validation\_0-error:0.07089  
 validation\_1-logloss:0.44444 validation\_1-error:0.09145  
 [5] validation\_0-logloss:0.40339 validation\_0-error:0.07089  
 validation\_1-logloss:0.41329 validation\_1-error:0.09145  
 [6] validation\_0-logloss:0.37649 validation\_0-error:0.07052  
 validation\_1-logloss:0.38790 validation\_1-error:0.09145  
 [7] validation\_0-logloss:0.35303 validation\_0-error:0.05701  
 validation\_1-logloss:0.36487 validation\_1-error:0.07046  
 [8] validation\_0-logloss:0.33127 validation\_0-error:0.05664  
 validation\_1-logloss:0.34306 validation\_1-error:0.07346  
 [9] validation\_0-logloss:0.31199 validation\_0-error:0.05514  
 validation\_1-logloss:0.32361 validation\_1-error:0.07046  
 [10] validation\_0-logloss:0.29366 validation\_0-error:0.05326  
 validation\_1-logloss:0.30623 validation\_1-error:0.06897  
 [11] validation\_0-logloss:0.27772 validation\_0-error:0.05364  
 validation\_1-logloss:0.29066 validation\_1-error:0.06897  
 [12] validation\_0-logloss:0.26394 validation\_0-error:0.05176  
 validation\_1-logloss:0.27842 validation\_1-error:0.06897  
 [13] validation\_0-logloss:0.25181 validation\_0-error:0.04876  
 validation\_1-logloss:0.26658 validation\_1-error:0.06147  
 [14] validation\_0-logloss:0.24123 validation\_0-error:0.04426  
 validation\_1-logloss:0.25701 validation\_1-error:0.06297  
 [15] validation\_0-logloss:0.23183 validation\_0-error:0.04351  
 validation\_1-logloss:0.24820 validation\_1-error:0.06147  
 [16] validation\_0-logloss:0.22302 validation\_0-error:0.04239  
 validation\_1-logloss:0.24008 validation\_1-error:0.05997  
 [17] validation\_0-logloss:0.21552 validation\_0-error:0.04163  
 validation\_1-logloss:0.23313 validation\_1-error:0.05847  
 [18] validation\_0-logloss:0.20882 validation\_0-error:0.04088  
 validation\_1-logloss:0.22700 validation\_1-error:0.05697

```

[19]    validation_0-logloss:0.20291    validation_0-error:0.04051
validation_1-logloss:0.22150    validation_1-error:0.05697
[20]    validation_0-logloss:0.19729    validation_0-error:0.04163
validation_1-logloss:0.21643    validation_1-error:0.05697
[21]    validation_0-logloss:0.19236    validation_0-error:0.04126
validation_1-logloss:0.21222    validation_1-error:0.05547
[22]    validation_0-logloss:0.18793    validation_0-error:0.04013
validation_1-logloss:0.20875    validation_1-error:0.05547
[23]    validation_0-logloss:0.18387    validation_0-error:0.03976
validation_1-logloss:0.20431    validation_1-error:0.05247
[24]    validation_0-logloss:0.17978    validation_0-error:0.03976
validation_1-logloss:0.20091    validation_1-error:0.05247
[25]    validation_0-logloss:0.17595    validation_0-error:0.03864
validation_1-logloss:0.19795    validation_1-error:0.05247
[26]    validation_0-logloss:0.17203    validation_0-error:0.03788
validation_1-logloss:0.19357    validation_1-error:0.05097

```

C:\Users\sci\anaconda3\lib\site-packages\xgboost\sklearn.py:888: UserWarning:  
The use of label encoder in XGBClassifier is deprecated and will be removed in a  
future release. To remove this warning, do the following: 1) Pass option  
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your labels (y) as integers starting with 0, i.e. 0, 1, 2, ..., [num\_class - 1].

```
warnings.warn(label_encoder_deprecation_msg, UserWarning)
```

C:\Users\sci\anaconda3\lib\site-packages\xgboost\sklearn.py:888: UserWarning:  
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your labels (y) as integers starting with 0, i.e. 0, 1, 2, ..., [num\_class - 1].

```
warnings.warn(label_encoder_deprecation_msg, UserWarning)
```

```

[27]    validation_0-logloss:0.16894    validation_0-error:0.03676
validation_1-logloss:0.19116    validation_1-error:0.05097
[28]    validation_0-logloss:0.16582    validation_0-error:0.03713
validation_1-logloss:0.18705    validation_1-error:0.04947
[29]    validation_0-logloss:0.16333    validation_0-error:0.03713
validation_1-logloss:0.18479    validation_1-error:0.04947
[30]    validation_0-logloss:0.16120    validation_0-error:0.03601
validation_1-logloss:0.18193    validation_1-error:0.04798
[31]    validation_0-logloss:0.15879    validation_0-error:0.03601
validation_1-logloss:0.18042    validation_1-error:0.04798
[32]    validation_0-logloss:0.15660    validation_0-error:0.03601
validation_1-logloss:0.17792    validation_1-error:0.04798
[33]    validation_0-logloss:0.15479    validation_0-error:0.03563
validation_1-logloss:0.17737    validation_1-error:0.04798
[34]    validation_0-logloss:0.15329    validation_0-error:0.03488
validation_1-logloss:0.17698    validation_1-error:0.04798
[35]    validation_0-logloss:0.15209    validation_0-error:0.03488
validation_1-logloss:0.17661    validation_1-error:0.04947
[36]    validation_0-logloss:0.15026    validation_0-error:0.03488

```



validation\_1-logloss:0.17438      validation\_1-error:0.04798  
[37]      validation\_0-logloss:0.14844      validation\_0-error:0.03488  
validation\_1-logloss:0.17338      validation\_1-error:0.04798  
[38]      validation\_0-logloss:0.14745      validation\_0-error:0.03413  
validation\_1-logloss:0.17348      validation\_1-error:0.04798  
[39]      validation\_0-logloss:0.14597      validation\_0-error:0.03413  
validation\_1-logloss:0.17219      validation\_1-error:0.04798  
[40]      validation\_0-logloss:0.14499      validation\_0-error:0.03376  
validation\_1-logloss:0.17234      validation\_1-error:0.04798  
[41]      validation\_0-logloss:0.14402      validation\_0-error:0.03376  
validation\_1-logloss:0.17270      validation\_1-error:0.04798  
[42]      validation\_0-logloss:0.14338      validation\_0-error:0.03338  
validation\_1-logloss:0.17249      validation\_1-error:0.04798  
[43]      validation\_0-logloss:0.14204      validation\_0-error:0.03338  
validation\_1-logloss:0.17121      validation\_1-error:0.04798  
[44]      validation\_0-logloss:0.14062      validation\_0-error:0.03226  
validation\_1-logloss:0.17064      validation\_1-error:0.04798  
[45]      validation\_0-logloss:0.13999      validation\_0-error:0.03263  
validation\_1-logloss:0.17061      validation\_1-error:0.04798  
[46]      validation\_0-logloss:0.13900      validation\_0-error:0.03226  
validation\_1-logloss:0.17083      validation\_1-error:0.04798  
[47]      validation\_0-logloss:0.13820      validation\_0-error:0.03151  
validation\_1-logloss:0.17008      validation\_1-error:0.04648  
[48]      validation\_0-logloss:0.13763      validation\_0-error:0.03113  
validation\_1-logloss:0.17005      validation\_1-error:0.04798  
[49]      validation\_0-logloss:0.13716      validation\_0-error:0.03113  
validation\_1-logloss:0.17027      validation\_1-error:0.04648  
[0]      validation\_0-logloss:0.62173      validation\_0-error:0.07277  
validation\_1-logloss:0.62358      validation\_1-error:0.08995  
[1]      validation\_0-logloss:0.56311      validation\_0-error:0.05664  
validation\_1-logloss:0.56579      validation\_1-error:0.06597  
[2]      validation\_0-logloss:0.51379      validation\_0-error:0.06977  
validation\_1-logloss:0.51841      validation\_1-error:0.08846  
[3]      validation\_0-logloss:0.47240      validation\_0-error:0.05664  
validation\_1-logloss:0.47782      validation\_1-error:0.06597  
[4]      validation\_0-logloss:0.43691      validation\_0-error:0.05664  
validation\_1-logloss:0.44378      validation\_1-error:0.06597  
[5]      validation\_0-logloss:0.40649      validation\_0-error:0.05626  
validation\_1-logloss:0.41349      validation\_1-error:0.06597  
[6]      validation\_0-logloss:0.37956      validation\_0-error:0.05626  
validation\_1-logloss:0.38714      validation\_1-error:0.06597  
[7]      validation\_0-logloss:0.35396      validation\_0-error:0.05514  
validation\_1-logloss:0.36200      validation\_1-error:0.06597  
[8]      validation\_0-logloss:0.33175      validation\_0-error:0.05514  
validation\_1-logloss:0.33980      validation\_1-error:0.06747  
[9]      validation\_0-logloss:0.31230      validation\_0-error:0.05476  
validation\_1-logloss:0.32146      validation\_1-error:0.06747  
[10]      validation\_0-logloss:0.29549      validation\_0-error:0.05439

validation\_1-logloss:0.30510      validation\_1-error:0.06597

[11]      validation\_0-logloss:0.27966      validation\_0-error:0.04689

validation\_1-logloss:0.29011      validation\_1-error:0.05847

[12]      validation\_0-logloss:0.26601      validation\_0-error:0.04501

validation\_1-logloss:0.27683      validation\_1-error:0.05697

[13]      validation\_0-logloss:0.25365      validation\_0-error:0.04276

validation\_1-logloss:0.26489      validation\_1-error:0.05547

[14]      validation\_0-logloss:0.24251      validation\_0-error:0.04314

validation\_1-logloss:0.25425      validation\_1-error:0.05697

[15]      validation\_0-logloss:0.23283      validation\_0-error:0.04276

validation\_1-logloss:0.24511      validation\_1-error:0.05697

[16]      validation\_0-logloss:0.22423      validation\_0-error:0.04201

validation\_1-logloss:0.23627      validation\_1-error:0.05697

[17]      validation\_0-logloss:0.21600      validation\_0-error:0.04314

validation\_1-logloss:0.22860      validation\_1-error:0.05397

[18]      validation\_0-logloss:0.20889      validation\_0-error:0.04314

validation\_1-logloss:0.22285      validation\_1-error:0.05547

[19]      validation\_0-logloss:0.20270      validation\_0-error:0.03939

validation\_1-logloss:0.21695      validation\_1-error:0.05397

[20]      validation\_0-logloss:0.19706      validation\_0-error:0.03901

validation\_1-logloss:0.21142      validation\_1-error:0.05247

[21]      validation\_0-logloss:0.19081      validation\_0-error:0.03751

validation\_1-logloss:0.20392      validation\_1-error:0.04947

[22]      validation\_0-logloss:0.18632      validation\_0-error:0.03751

validation\_1-logloss:0.20007      validation\_1-error:0.05397

[23]      validation\_0-logloss:0.18221      validation\_0-error:0.03638

validation\_1-logloss:0.19678      validation\_1-error:0.05397

[24]      validation\_0-logloss:0.17813      validation\_0-error:0.03638

validation\_1-logloss:0.19398      validation\_1-error:0.05397

[25]      validation\_0-logloss:0.17376      validation\_0-error:0.03638

validation\_1-logloss:0.18860      validation\_1-error:0.05247

[26]      validation\_0-logloss:0.17061      validation\_0-error:0.03676

validation\_1-logloss:0.18471      validation\_1-error:0.05097

[27]      validation\_0-logloss:0.16745      validation\_0-error:0.03638

validation\_1-logloss:0.18251      validation\_1-error:0.05097

[28]      validation\_0-logloss:0.16436      validation\_0-error:0.03638

validation\_1-logloss:0.18009      validation\_1-error:0.05247

[29]      validation\_0-logloss:0.16171      validation\_0-error:0.03638

validation\_1-logloss:0.17746      validation\_1-error:0.05097

[30]      validation\_0-logloss:0.15988      validation\_0-error:0.03601

validation\_1-logloss:0.17708      validation\_1-error:0.04947

[31]      validation\_0-logloss:0.15748      validation\_0-error:0.03563

validation\_1-logloss:0.17478      validation\_1-error:0.04947

[32]      validation\_0-logloss:0.15602      validation\_0-error:0.03563

validation\_1-logloss:0.17366      validation\_1-error:0.04947

[33]      validation\_0-logloss:0.15457      validation\_0-error:0.03638

validation\_1-logloss:0.17233      validation\_1-error:0.04947

[34]      validation\_0-logloss:0.15319      validation\_0-error:0.03601

validation\_1-logloss:0.17087      validation\_1-error:0.04947

[35]      validation\_0-logloss:0.15194      validation\_0-error:0.03526

validation\_1-logloss:0.17028      validation\_1-error:0.04947

[36]      validation\_0-logloss:0.14993      validation\_0-error:0.03451

validation\_1-logloss:0.16912      validation\_1-error:0.04798

[37]      validation\_0-logloss:0.14894      validation\_0-error:0.03413

validation\_1-logloss:0.16899      validation\_1-error:0.04947

[38]      validation\_0-logloss:0.14718      validation\_0-error:0.03376

validation\_1-logloss:0.16758      validation\_1-error:0.04947

[39]      validation\_0-logloss:0.14562      validation\_0-error:0.03376

validation\_1-logloss:0.16684      validation\_1-error:0.04947

[40]      validation\_0-logloss:0.14450      validation\_0-error:0.03376

validation\_1-logloss:0.16561      validation\_1-error:0.04648

[41]      validation\_0-logloss:0.14359      validation\_0-error:0.03376

validation\_1-logloss:0.16471      validation\_1-error:0.04648

[42]      validation\_0-logloss:0.14263      validation\_0-error:0.03338

validation\_1-logloss:0.16457      validation\_1-error:0.04648

[43]      validation\_0-logloss:0.14193      validation\_0-error:0.03301

validation\_1-logloss:0.16431      validation\_1-error:0.04648

[44]      validation\_0-logloss:0.14095      validation\_0-error:0.03338

validation\_1-logloss:0.16462      validation\_1-error:0.04648

[45]      validation\_0-logloss:0.14033      validation\_0-error:0.03338

validation\_1-logloss:0.16451      validation\_1-error:0.04648

[46]      validation\_0-logloss:0.13959      validation\_0-error:0.03301

validation\_1-logloss:0.16404      validation\_1-error:0.04648

[47]      validation\_0-logloss:0.13814      validation\_0-error:0.03338

validation\_1-logloss:0.16395      validation\_1-error:0.04648

[48]      validation\_0-logloss:0.13683      validation\_0-error:0.03301

validation\_1-logloss:0.16326      validation\_1-error:0.04648

[49]      validation\_0-logloss:0.13557      validation\_0-error:0.03301

validation\_1-logloss:0.16265      validation\_1-error:0.04648

[0]      validation\_0-logloss:0.62188      validation\_0-error:0.07277

validation\_1-logloss:0.62394      validation\_1-error:0.08546

[1]      validation\_0-logloss:0.56324      validation\_0-error:0.05889

validation\_1-logloss:0.56659      validation\_1-error:0.06897

[2]      validation\_0-logloss:0.51397      validation\_0-error:0.06977

validation\_1-logloss:0.51860      validation\_1-error:0.08846

[3]      validation\_0-logloss:0.47256      validation\_0-error:0.05851

validation\_1-logloss:0.47799      validation\_1-error:0.06897

[4]      validation\_0-logloss:0.43700      validation\_0-error:0.05851

validation\_1-logloss:0.44342      validation\_1-error:0.06897

[5]      validation\_0-logloss:0.40644      validation\_0-error:0.05664

validation\_1-logloss:0.41402      validation\_1-error:0.07046

[6]      validation\_0-logloss:0.37993      validation\_0-error:0.05664

validation\_1-logloss:0.38928      validation\_1-error:0.07046

[7]      validation\_0-logloss:0.35691      validation\_0-error:0.05664

validation\_1-logloss:0.36640      validation\_1-error:0.07046

[8]      validation\_0-logloss:0.33442      validation\_0-error:0.05626

validation\_1-logloss:0.34355      validation\_1-error:0.07046  
 [9]      validation\_0-logloss:0.31471      validation\_0-error:0.05439  
 validation\_1-logloss:0.32344      validation\_1-error:0.06147  
 [10]      validation\_0-logloss:0.29682      validation\_0-error:0.05664  
 validation\_1-logloss:0.30648      validation\_1-error:0.07046  
 [11]      validation\_0-logloss:0.28067      validation\_0-error:0.05289  
 validation\_1-logloss:0.29058      validation\_1-error:0.06447  
 [12]      validation\_0-logloss:0.26661      validation\_0-error:0.05026  
 validation\_1-logloss:0.27738      validation\_1-error:0.05997  
 [13]      validation\_0-logloss:0.25407      validation\_0-error:0.04576  
 validation\_1-logloss:0.26513      validation\_1-error:0.05697  
 [14]      validation\_0-logloss:0.24311      validation\_0-error:0.04389  
 validation\_1-logloss:0.25468      validation\_1-error:0.05697  
 [15]      validation\_0-logloss:0.23320      validation\_0-error:0.04088  
 validation\_1-logloss:0.24494      validation\_1-error:0.04947  
 [16]      validation\_0-logloss:0.22346      validation\_0-error:0.04088  
 validation\_1-logloss:0.23392      validation\_1-error:0.04648  
 [17]      validation\_0-logloss:0.21588      validation\_0-error:0.04013  
 validation\_1-logloss:0.22683      validation\_1-error:0.04648  
 [18]      validation\_0-logloss:0.20914      validation\_0-error:0.03826  
 validation\_1-logloss:0.22003      validation\_1-error:0.04648  
 [19]      validation\_0-logloss:0.20245      validation\_0-error:0.03713  
 validation\_1-logloss:0.21410      validation\_1-error:0.04648  
 [20]      validation\_0-logloss:0.19661      validation\_0-error:0.03864  
 validation\_1-logloss:0.20888      validation\_1-error:0.04498  
 [21]      validation\_0-logloss:0.19040      validation\_0-error:0.03788  
 validation\_1-logloss:0.20121      validation\_1-error:0.04348  
 [22]      validation\_0-logloss:0.18601      validation\_0-error:0.03601  
 validation\_1-logloss:0.19733      validation\_1-error:0.04348  
 [23]      validation\_0-logloss:0.18178      validation\_0-error:0.03563  
 validation\_1-logloss:0.19338      validation\_1-error:0.04198  
 [24]      validation\_0-logloss:0.17735      validation\_0-error:0.03563  
 validation\_1-logloss:0.18773      validation\_1-error:0.04048  
 [25]      validation\_0-logloss:0.17340      validation\_0-error:0.03526  
 validation\_1-logloss:0.18426      validation\_1-error:0.03748  
 [26]      validation\_0-logloss:0.16934      validation\_0-error:0.03526  
 validation\_1-logloss:0.17993      validation\_1-error:0.03748  
 [27]      validation\_0-logloss:0.16617      validation\_0-error:0.03488  
 validation\_1-logloss:0.17803      validation\_1-error:0.03598  
 [28]      validation\_0-logloss:0.16327      validation\_0-error:0.03413  
 validation\_1-logloss:0.17492      validation\_1-error:0.03598  
 [29]      validation\_0-logloss:0.16052      validation\_0-error:0.03376  
 validation\_1-logloss:0.17165      validation\_1-error:0.03598  
 [30]      validation\_0-logloss:0.15817      validation\_0-error:0.03376  
 validation\_1-logloss:0.16981      validation\_1-error:0.03598  
 [31]      validation\_0-logloss:0.15555      validation\_0-error:0.03301  
 validation\_1-logloss:0.16649      validation\_1-error:0.03598  
 [32]      validation\_0-logloss:0.15348      validation\_0-error:0.03226

```

validation_1-logloss:0.16501    validation_1-error:0.03598
[33]   validation_0-logloss:0.15155    validation_0-error:0.03188
validation_1-logloss:0.16250    validation_1-error:0.03598
[34]   validation_0-logloss:0.14985    validation_0-error:0.03226
validation_1-logloss:0.15996    validation_1-error:0.03748
[35]   validation_0-logloss:0.14818    validation_0-error:0.03188
validation_1-logloss:0.15990    validation_1-error:0.03748
[36]   validation_0-logloss:0.14678    validation_0-error:0.03226
validation_1-logloss:0.15961    validation_1-error:0.03598
[37]   validation_0-logloss:0.14530    validation_0-error:0.03263
validation_1-logloss:0.15831    validation_1-error:0.03448
[38]   validation_0-logloss:0.14368    validation_0-error:0.03151
validation_1-logloss:0.15703    validation_1-error:0.03598
[39]   validation_0-logloss:0.14230    validation_0-error:0.03113
validation_1-logloss:0.15623    validation_1-error:0.03298
[40]   validation_0-logloss:0.14097    validation_0-error:0.03076
validation_1-logloss:0.15492    validation_1-error:0.03448
[41]   validation_0-logloss:0.14042    validation_0-error:0.03076
validation_1-logloss:0.15443    validation_1-error:0.03448
[42]   validation_0-logloss:0.13902    validation_0-error:0.03076
validation_1-logloss:0.15348    validation_1-error:0.03448

```

C:\Users\sci\anaconda3\lib\site-packages\xgboost\sklearn.py:888: UserWarning:  
The use of label encoder in XGBClassifier is deprecated and will be removed in a  
future release. To remove this warning, do the following: 1) Pass option  
use\_label\_encoder=False when constructing XGBClassifier object; and 2) Encode  
your labels (y) as integers starting with 0, i.e. 0, 1, 2, ..., [num\_class - 1].

warnings.warn(label\_encoder\_deprecation\_msg, UserWarning)

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warnings.warn(label\_encoder\_deprecation\_msg, UserWarning)

```

[43]   validation_0-logloss:0.13758    validation_0-error:0.03076
validation_1-logloss:0.15267    validation_1-error:0.03448
[44]   validation_0-logloss:0.13603    validation_0-error:0.03038
validation_1-logloss:0.15276    validation_1-error:0.03448
[45]   validation_0-logloss:0.13546    validation_0-error:0.03076
validation_1-logloss:0.15207    validation_1-error:0.03448
[46]   validation_0-logloss:0.13467    validation_0-error:0.03001
validation_1-logloss:0.15242    validation_1-error:0.03448
[47]   validation_0-logloss:0.13388    validation_0-error:0.03001
validation_1-logloss:0.15192    validation_1-error:0.03448
[48]   validation_0-logloss:0.13273    validation_0-error:0.03038
validation_1-logloss:0.15215    validation_1-error:0.03598
[49]   validation_0-logloss:0.13177    validation_0-error:0.02963
validation_1-logloss:0.15174    validation_1-error:0.03598

```

[50] validation\_0-logloss:0.13108 validation\_0-error:0.02963  
validation\_1-logloss:0.15202 validation\_1-error:0.03448  
[51] validation\_0-logloss:0.13062 validation\_0-error:0.03001  
validation\_1-logloss:0.15225 validation\_1-error:0.03448  
[52] validation\_0-logloss:0.12971 validation\_0-error:0.03001  
validation\_1-logloss:0.15133 validation\_1-error:0.03448  
[53] validation\_0-logloss:0.12924 validation\_0-error:0.03001  
validation\_1-logloss:0.15081 validation\_1-error:0.03448  
[54] validation\_0-logloss:0.12858 validation\_0-error:0.03001  
validation\_1-logloss:0.14982 validation\_1-error:0.03448  
[55] validation\_0-logloss:0.12818 validation\_0-error:0.03001  
validation\_1-logloss:0.15001 validation\_1-error:0.03298  
[56] validation\_0-logloss:0.12785 validation\_0-error:0.03001  
validation\_1-logloss:0.14987 validation\_1-error:0.03148  
[57] validation\_0-logloss:0.12718 validation\_0-error:0.03001  
validation\_1-logloss:0.14922 validation\_1-error:0.03148  
[58] validation\_0-logloss:0.12621 validation\_0-error:0.03001  
validation\_1-logloss:0.14879 validation\_1-error:0.03148  
[59] validation\_0-logloss:0.12595 validation\_0-error:0.02963  
validation\_1-logloss:0.14909 validation\_1-error:0.03298  
[60] validation\_0-logloss:0.12537 validation\_0-error:0.02926  
validation\_1-logloss:0.14857 validation\_1-error:0.03298  
[61] validation\_0-logloss:0.12409 validation\_0-error:0.02963  
validation\_1-logloss:0.14821 validation\_1-error:0.03148  
[62] validation\_0-logloss:0.12330 validation\_0-error:0.02888  
validation\_1-logloss:0.14814 validation\_1-error:0.03148  
[63] validation\_0-logloss:0.12269 validation\_0-error:0.02888  
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[64] validation\_0-logloss:0.12232 validation\_0-error:0.02888  
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[66] validation\_0-logloss:0.12147 validation\_0-error:0.02851  
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[67] validation\_0-logloss:0.12093 validation\_0-error:0.02851  
validation\_1-logloss:0.14827 validation\_1-error:0.03148  
[68] validation\_0-logloss:0.12059 validation\_0-error:0.02813  
validation\_1-logloss:0.14823 validation\_1-error:0.03148  
[69] validation\_0-logloss:0.12011 validation\_0-error:0.02813  
validation\_1-logloss:0.14752 validation\_1-error:0.03148  
[70] validation\_0-logloss:0.11912 validation\_0-error:0.02851  
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[71] validation\_0-logloss:0.11880 validation\_0-error:0.02813  
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validation\_1-logloss:0.14662 validation\_1-error:0.03148

[74] validation\_0-logloss:0.11731 validation\_0-error:0.02813  
 validation\_1-logloss:0.14602 validation\_1-error:0.03148  
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 [3] validation\_0-logloss:0.47137 validation\_0-error:0.05476  
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 [4] validation\_0-logloss:0.43558 validation\_0-error:0.05251  
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 [5] validation\_0-logloss:0.40492 validation\_0-error:0.05214  
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 [18] validation\_0-logloss:0.20897 validation\_0-error:0.04088  
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[23] validation\_0-logloss:0.18158 validation\_0-error:0.03751  
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 [26] validation\_0-logloss:0.17114 validation\_0-error:0.03676  
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[71]    validation_0-logloss:0.12251    validation_0-error:0.03076
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[74]    validation_0-logloss:0.12122    validation_0-error:0.03001
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validation_1-logloss:0.35796    validation_1-error:0.06297
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validation_1-logloss:0.33659    validation_1-error:0.05847
[9]    validation_0-logloss:0.30979    validation_0-error:0.04464
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validation_1-logloss:0.26218    validation_1-error:0.05697
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[15]   validation_0-logloss:0.23030    validation_0-error:0.04088
validation_1-logloss:0.24278    validation_1-error:0.05847
[16]   validation_0-logloss:0.22143    validation_0-error:0.04088
validation_1-logloss:0.23425    validation_1-error:0.05997
[17]   validation_0-logloss:0.21347    validation_0-error:0.03976
validation_1-logloss:0.22695    validation_1-error:0.05847

```

C:\Users\sci\anaconda3\lib\site-packages\xgboost\sklearn.py:888: UserWarning:  
The use of label encoder in XGBClassifier is deprecated and will be removed in a  
future release. To remove this warning, do the following: 1) Pass option

```

use_label_encoder=False when constructing XGBClassifier object; and 2) Encode
your labels (y) as integers starting with 0, i.e. 0, 1, 2, ..., [num_class - 1].
warnings.warn(label_encoder_deprecation_msg, UserWarning)
C:\Users\sci\anaconda3\lib\site-packages\xgboost\sklearn.py:888: UserWarning:
The use of label encoder in XGBClassifier is deprecated and will be removed in a
future release. To remove this warning, do the following: 1) Pass option
use_label_encoder=False when constructing XGBClassifier object; and 2) Encode
your labels (y) as integers starting with 0, i.e. 0, 1, 2, ..., [num_class - 1].
warnings.warn(label_encoder_deprecation_msg, UserWarning)

```

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[18]    validation_0-logloss:0.20629    validation_0-error:0.03976
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[19]    validation_0-logloss:0.19984    validation_0-error:0.04013
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validation_1-logloss:0.20243    validation_1-error:0.05247
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validation_1-logloss:0.16532    validation_1-error:0.04348
[36]    validation_0-logloss:0.14584    validation_0-error:0.03038
validation_1-logloss:0.16288    validation_1-error:0.04198

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[7]      validation_0-logloss:0.35396      validation_0-error:0.05514
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validation_1-logloss:0.32146      validation_1-error:0.06747
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validation_1-logloss:0.27683      validation_1-error:0.05697
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validation_1-logloss:0.23627      validation_1-error:0.05697
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[21]     validation_0-logloss:0.19081      validation_0-error:0.03751
validation_1-logloss:0.20392      validation_1-error:0.04947

```

C:\Users\sci\anaconda3\lib\site-packages\xgboost\sklearn.py:888: UserWarning:  
The use of label encoder in XGBClassifier is deprecated and will be removed in a  
future release. To remove this warning, do the following: 1) Pass option  
use\_label\_encoder=False when constructing XGBClassifier object; and 2) Encode  
your labels (y) as integers starting with 0, i.e. 0, 1, 2, ..., [num\_class - 1].

warnings.warn(label\_encoder\_deprecation\_msg, UserWarning)

C:\Users\sci\anaconda3\lib\site-packages\xgboost\sklearn.py:888: UserWarning:  
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your labels (y) as integers starting with 0, i.e. 0, 1, 2, ..., [num\_class - 1].

warnings.warn(label\_encoder\_deprecation\_msg, UserWarning)

```

[22]     validation_0-logloss:0.18632      validation_0-error:0.03751
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```

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 [28]      validation\_0-logloss:0.16327      validation\_0-error:0.03413  
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 [69]      validation\_0-logloss:0.12011      validation\_0-error:0.02813

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validation_1-logloss:0.14752    validation_1-error:0.03148
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validation_1-logloss:0.14683    validation_1-error:0.03148
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validation_1-logloss:0.14675    validation_1-error:0.03148
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validation_1-logloss:0.14662    validation_1-error:0.03148
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validation_1-logloss:0.14602    validation_1-error:0.03148
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validation_1-logloss:0.14575    validation_1-error:0.03148
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validation_1-logloss:0.14617    validation_1-error:0.03148
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validation_1-logloss:0.14628    validation_1-error:0.03148
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validation_1-logloss:0.14583    validation_1-error:0.03148
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validation_1-logloss:0.14564    validation_1-error:0.03148
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validation_1-logloss:0.14488    validation_1-error:0.03148
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validation_1-logloss:0.14514    validation_1-error:0.03148
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validation_1-logloss:0.14466    validation_1-error:0.03148
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validation_1-logloss:0.14535    validation_1-error:0.03148
[89]   validation_0-logloss:0.10967    validation_0-error:0.02551
validation_1-logloss:0.14493    validation_1-error:0.03148

```

```

C:\Users\sci\anaconda3\lib\site-packages\xgboost\sklearn.py:888: UserWarning:
The use of label encoder in XGBClassifier is deprecated and will be removed in a
future release. To remove this warning, do the following: 1) Pass option
use_label_encoder=False when constructing XGBClassifier object; and 2) Encode
your labels (y) as integers starting with 0, i.e. 0, 1, 2, ..., [num_class - 1].
warnings.warn(label_encoder_deprecation_msg, UserWarning)

```

C:\Users\sci\anaconda3\lib\site-packages\xgboost\sklearn.py:888: UserWarning:  
The use of label encoder in XGBClassifier is deprecated and will be removed in a  
future release. To remove this warning, do the following: 1) Pass option  
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your labels (y) as integers starting with 0, i.e. 0, 1, 2, ..., [num\_class - 1].  
warnings.warn(label\_encoder\_deprecation\_msg, UserWarning)

[0]	validation_0-logloss:0.62140	validation_0-error:0.07164
	validation_1-logloss:0.62313	validation_1-error:0.09145
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 [35]      validation\_0-logloss:0.14765      validation\_0-error:0.03113  
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 [50]      validation\_0-logloss:0.12976      validation\_0-error:0.02851

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[51]      validation\_0-logloss:0.12940      validation\_0-error:0.02888  
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[58]      validation\_0-logloss:0.12469      validation\_0-error:0.02813  
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[59]      validation\_0-logloss:0.12414      validation\_0-error:0.02851  
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[60]      validation\_0-logloss:0.12384      validation\_0-error:0.02851  
validation\_1-logloss:0.15299      validation\_1-error:0.04198  
[61]      validation\_0-logloss:0.12325      validation\_0-error:0.02851  
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[62]      validation\_0-logloss:0.12260      validation\_0-error:0.02851  
validation\_1-logloss:0.15293      validation\_1-error:0.04198  
[63]      validation\_0-logloss:0.12214      validation\_0-error:0.02813  
validation\_1-logloss:0.15304      validation\_1-error:0.04048  
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[65]      validation\_0-logloss:0.12078      validation\_0-error:0.02851  
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[66]      validation\_0-logloss:0.12029      validation\_0-error:0.02851  
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[67]      validation\_0-logloss:0.12003      validation\_0-error:0.02851  
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[68]      validation\_0-logloss:0.11946      validation\_0-error:0.02851  
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[69]      validation\_0-logloss:0.11903      validation\_0-error:0.02813  
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[70]      validation\_0-logloss:0.11876      validation\_0-error:0.02813  
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[71]      validation\_0-logloss:0.11829      validation\_0-error:0.02813  
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[72]      validation\_0-logloss:0.11767      validation\_0-error:0.02776  
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[74]      validation\_0-logloss:0.11698      validation\_0-error:0.02851

```

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[75]    validation_0-logloss:0.11640    validation_0-error:0.02776
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validation_1-logloss:0.14952    validation_1-error:0.03748
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[81]    validation_0-logloss:0.11384    validation_0-error:0.02776
validation_1-logloss:0.14984    validation_1-error:0.03748
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validation_1-logloss:0.14929    validation_1-error:0.03748
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validation_1-logloss:0.14922    validation_1-error:0.03748
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validation_1-logloss:0.14966    validation_1-error:0.03898
[89]    validation_0-logloss:0.11034    validation_0-error:0.02776
validation_1-logloss:0.14977    validation_1-error:0.03748
[0]     validation_0-logloss:0.62077    validation_0-error:0.07127
validation_1-logloss:0.62326    validation_1-error:0.09145

```

```

C:\Users\sci\anaconda3\lib\site-packages\xgboost\sklearn.py:888: UserWarning:
The use of label encoder in XGBClassifier is deprecated and will be removed in a
future release. To remove this warning, do the following: 1) Pass option
use_label_encoder=False when constructing XGBClassifier object; and 2) Encode
your labels (y) as integers starting with 0, i.e. 0, 1, 2, ..., [num_class - 1].
warnings.warn(label_encoder_deprecation_msg, UserWarning)

```

```

C:\Users\sci\anaconda3\lib\site-packages\xgboost\sklearn.py:888: UserWarning:
The use of label encoder in XGBClassifier is deprecated and will be removed in a
future release. To remove this warning, do the following: 1) Pass option
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warnings.warn(label_encoder_deprecation_msg, UserWarning)

```

```

[1]     validation_0-logloss:0.56152    validation_0-error:0.07089
validation_1-logloss:0.56583    validation_1-error:0.08846

```

[2] validation\_0-logloss:0.51231 validation\_0-error:0.07127  
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 [10] validation\_0-logloss:0.29366 validation\_0-error:0.05326  
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[26] validation\_0-logloss:0.17203 validation\_0-error:0.03788  
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[80]    validation_0-logloss:0.11940    validation_0-error:0.03001
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[83]    validation_0-logloss:0.11832    validation_0-error:0.02926
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[84]    validation_0-logloss:0.11805    validation_0-error:0.02926
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[85]    validation_0-logloss:0.11718    validation_0-error:0.03001
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[86]    validation_0-logloss:0.11701    validation_0-error:0.02963
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validation_1-logloss:0.56659    validation_1-error:0.06897
[2]    validation_0-logloss:0.51397    validation_0-error:0.06977
validation_1-logloss:0.51860    validation_1-error:0.08846
[3]    validation_0-logloss:0.47256    validation_0-error:0.05851
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[4]    validation_0-logloss:0.43700    validation_0-error:0.05851
validation_1-logloss:0.44342    validation_1-error:0.06897

```

C:\Users\sci\anaconda3\lib\site-packages\xgboost\sklearn.py:888: UserWarning:  
The use of label encoder in XGBClassifier is deprecated and will be removed in a  
future release. To remove this warning, do the following: 1) Pass option  
use\_label\_encoder=False when constructing XGBClassifier object; and 2) Encode  
your labels (y) as integers starting with 0, i.e. 0, 1, 2, ..., [num\_class - 1].

warnings.warn(label\_encoder\_deprecation\_msg, UserWarning)

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warnings.warn(label\_encoder\_deprecation\_msg, UserWarning)

```

[5]    validation_0-logloss:0.40644    validation_0-error:0.05664
validation_1-logloss:0.41402    validation_1-error:0.07046
[6]    validation_0-logloss:0.37993    validation_0-error:0.05664
validation_1-logloss:0.38928    validation_1-error:0.07046
[7]    validation_0-logloss:0.35691    validation_0-error:0.05664

```

validation\_1-logloss:0.36640      validation\_1-error:0.07046  
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 validation\_1-logloss:0.34355      validation\_1-error:0.07046  
 [9]      validation\_0-logloss:0.31471      validation\_0-error:0.05439  
 validation\_1-logloss:0.32344      validation\_1-error:0.06147  
 [10]      validation\_0-logloss:0.29682      validation\_0-error:0.05664  
 validation\_1-logloss:0.30648      validation\_1-error:0.07046  
 [11]      validation\_0-logloss:0.28067      validation\_0-error:0.05289  
 validation\_1-logloss:0.29058      validation\_1-error:0.06447  
 [12]      validation\_0-logloss:0.26661      validation\_0-error:0.05026  
 validation\_1-logloss:0.27738      validation\_1-error:0.05997  
 [13]      validation\_0-logloss:0.25407      validation\_0-error:0.04576  
 validation\_1-logloss:0.26513      validation\_1-error:0.05697  
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```

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```

C:\Users\sci\anaconda3\lib\site-packages\xgboost\sklearn.py:888: UserWarning:  
The use of label encoder in XGBClassifier is deprecated and will be removed in a  
future release. To remove this warning, do the following: 1) Pass option  
use\_label\_encoder=False when constructing XGBClassifier object; and 2) Encode  
your labels (y) as integers starting with 0, i.e. 0, 1, 2, ..., [num\_class - 1].  
warnings.warn(label\_encoder\_deprecation\_msg, UserWarning)

```

[116] validation_0-logloss:0.10409    validation_0-error:0.02813
validation_1-logloss:0.15270    validation_1-error:0.04498
[117] validation_0-logloss:0.10347    validation_0-error:0.02813
validation_1-logloss:0.15286    validation_1-error:0.04498
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validation_1-logloss:0.15238    validation_1-error:0.04498
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validation_1-logloss:0.15271    validation_1-error:0.04498
[0]    validation_0-logloss:0.62126    validation_0-error:0.07014
validation_1-logloss:0.62301    validation_1-error:0.08696
[1]    validation_0-logloss:0.56249    validation_0-error:0.06864
validation_1-logloss:0.56531    validation_1-error:0.07946
[2]    validation_0-logloss:0.51301    validation_0-error:0.06639
validation_1-logloss:0.51618    validation_1-error:0.08246
[3]    validation_0-logloss:0.47133    validation_0-error:0.06639
validation_1-logloss:0.47532    validation_1-error:0.08246

```

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```

[100] validation_0-logloss:0.10643 validation_0-error:0.02701
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[119] validation_0-logloss:0.09992 validation_0-error:0.02438
validation_1-logloss:0.14800 validation_1-error:0.03898

```

```

C:\Users\sci\anaconda3\lib\site-packages\xgboost\sklearn.py:888: UserWarning:
The use of label encoder in XGBClassifier is deprecated and will be removed in a
future release. To remove this warning, do the following: 1) Pass option
use_label_encoder=False when constructing XGBClassifier object; and 2) Encode
your labels (y) as integers starting with 0, i.e. 0, 1, 2, ..., [num_class - 1].
warnings.warn(label_encoder_deprecation_msg, UserWarning)

```

```

[0] validation_0-logloss:0.62077 validation_0-error:0.07127

```

validation\_1-logloss:0.62326      validation\_1-error:0.09145  
 [1]      validation\_0-logloss:0.56152      validation\_0-error:0.07089  
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 [2]      validation\_0-logloss:0.51231      validation\_0-error:0.07127  
 validation\_1-logloss:0.51891      validation\_1-error:0.08846  
 [3]      validation\_0-logloss:0.46992      validation\_0-error:0.07089  
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 [4]      validation\_0-logloss:0.43456      validation\_0-error:0.07089  
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 [5]      validation\_0-logloss:0.40339      validation\_0-error:0.07089  
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 [8]      validation\_0-logloss:0.33127      validation\_0-error:0.05664  
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 [17]      validation\_0-logloss:0.21552      validation\_0-error:0.04163  
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validation_1-logloss:0.16675    validation_1-error:0.04648
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[108]  validation_0-logloss:0.10525    validation_0-error:0.02813
validation_1-logloss:0.16781    validation_1-error:0.04498
[109]  validation_0-logloss:0.10463    validation_0-error:0.02776
validation_1-logloss:0.16747    validation_1-error:0.04498
[110]  validation_0-logloss:0.10435    validation_0-error:0.02738
validation_1-logloss:0.16738    validation_1-error:0.04498
[111]  validation_0-logloss:0.10409    validation_0-error:0.02663
validation_1-logloss:0.16737    validation_1-error:0.04498
[112]  validation_0-logloss:0.10348    validation_0-error:0.02738
validation_1-logloss:0.16645    validation_1-error:0.04498
[113]  validation_0-logloss:0.10318    validation_0-error:0.02701
validation_1-logloss:0.16664    validation_1-error:0.04498
[114]  validation_0-logloss:0.10267    validation_0-error:0.02663
validation_1-logloss:0.16645    validation_1-error:0.04498
[115]  validation_0-logloss:0.10210    validation_0-error:0.02588
validation_1-logloss:0.16604    validation_1-error:0.04498
[116]  validation_0-logloss:0.10155    validation_0-error:0.02588
validation_1-logloss:0.16641    validation_1-error:0.04498
[117]  validation_0-logloss:0.10128    validation_0-error:0.02588
validation_1-logloss:0.16641    validation_1-error:0.04498

```

C:\Users\sci\anaconda3\lib\site-packages\xgboost\sklearn.py:888: UserWarning:  
The use of label encoder in XGBClassifier is deprecated and will be removed in a  
future release. To remove this warning, do the following: 1) Pass option  
use\_label\_encoder=False when constructing XGBClassifier object; and 2) Encode

your labels (y) as integers starting with 0, i.e. 0, 1, 2, ..., [num\_class - 1].  
warnings.warn(label\_encoder\_deprecation\_msg, UserWarning)

```
[118] validation_0-logloss:0.10103 validation_0-error:0.02551
validation_1-logloss:0.16635 validation_1-error:0.04498
[119] validation_0-logloss:0.10058 validation_0-error:0.02551
validation_1-logloss:0.16655 validation_1-error:0.04498
[0] validation_0-logloss:0.62173 validation_0-error:0.07277
validation_1-logloss:0.62358 validation_1-error:0.08995
[1] validation_0-logloss:0.56311 validation_0-error:0.05664
validation_1-logloss:0.56579 validation_1-error:0.06597
[2] validation_0-logloss:0.51379 validation_0-error:0.06977
validation_1-logloss:0.51841 validation_1-error:0.08846
[3] validation_0-logloss:0.47240 validation_0-error:0.05664
validation_1-logloss:0.47782 validation_1-error:0.06597
[4] validation_0-logloss:0.43691 validation_0-error:0.05664
validation_1-logloss:0.44378 validation_1-error:0.06597
[5] validation_0-logloss:0.40649 validation_0-error:0.05626
validation_1-logloss:0.41349 validation_1-error:0.06597
[6] validation_0-logloss:0.37956 validation_0-error:0.05626
validation_1-logloss:0.38714 validation_1-error:0.06597
[7] validation_0-logloss:0.35396 validation_0-error:0.05514
validation_1-logloss:0.36200 validation_1-error:0.06597
[8] validation_0-logloss:0.33175 validation_0-error:0.05514
validation_1-logloss:0.33980 validation_1-error:0.06747
[9] validation_0-logloss:0.31230 validation_0-error:0.05476
validation_1-logloss:0.32146 validation_1-error:0.06747
[10] validation_0-logloss:0.29549 validation_0-error:0.05439
validation_1-logloss:0.30510 validation_1-error:0.06597
[11] validation_0-logloss:0.27966 validation_0-error:0.04689
validation_1-logloss:0.29011 validation_1-error:0.05847
[12] validation_0-logloss:0.26601 validation_0-error:0.04501
validation_1-logloss:0.27683 validation_1-error:0.05697
[13] validation_0-logloss:0.25365 validation_0-error:0.04276
validation_1-logloss:0.26489 validation_1-error:0.05547
[14] validation_0-logloss:0.24251 validation_0-error:0.04314
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[15] validation_0-logloss:0.23283 validation_0-error:0.04276
validation_1-logloss:0.24511 validation_1-error:0.05697
[16] validation_0-logloss:0.22423 validation_0-error:0.04201
validation_1-logloss:0.23627 validation_1-error:0.05697
[17] validation_0-logloss:0.21600 validation_0-error:0.04314
validation_1-logloss:0.22860 validation_1-error:0.05397
[18] validation_0-logloss:0.20889 validation_0-error:0.04314
validation_1-logloss:0.22285 validation_1-error:0.05547
[19] validation_0-logloss:0.20270 validation_0-error:0.03939
validation_1-logloss:0.21695 validation_1-error:0.05397
[20] validation_0-logloss:0.19706 validation_0-error:0.03901
```

validation\_1-logloss:0.21142      validation\_1-error:0.05247  
 [21]      validation\_0-logloss:0.19081      validation\_0-error:0.03751  
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 [22]      validation\_0-logloss:0.18632      validation\_0-error:0.03751  
 validation\_1-logloss:0.20007      validation\_1-error:0.05397  
 [23]      validation\_0-logloss:0.18221      validation\_0-error:0.03638  
 validation\_1-logloss:0.19678      validation\_1-error:0.05397  
 [24]      validation\_0-logloss:0.17813      validation\_0-error:0.03638  
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 [25]      validation\_0-logloss:0.17376      validation\_0-error:0.03638  
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 [27]      validation\_0-logloss:0.16745      validation\_0-error:0.03638  
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 [28]      validation\_0-logloss:0.16436      validation\_0-error:0.03638  
 validation\_1-logloss:0.18009      validation\_1-error:0.05247  
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 [31]      validation\_0-logloss:0.15748      validation\_0-error:0.03563  
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 [32]      validation\_0-logloss:0.15602      validation\_0-error:0.03563  
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 [33]      validation\_0-logloss:0.15457      validation\_0-error:0.03638  
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 [35]      validation\_0-logloss:0.15194      validation\_0-error:0.03526  
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 [36]      validation\_0-logloss:0.14993      validation\_0-error:0.03451  
 validation\_1-logloss:0.16912      validation\_1-error:0.04798  
 [37]      validation\_0-logloss:0.14894      validation\_0-error:0.03413  
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 [38]      validation\_0-logloss:0.14718      validation\_0-error:0.03376  
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validation\_1-logloss:0.16462      validation\_1-error:0.04648  
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 [55]      validation\_0-logloss:0.13133      validation\_0-error:0.03226  
 validation\_1-logloss:0.16236      validation\_1-error:0.04648  
 [56]      validation\_0-logloss:0.13062      validation\_0-error:0.03226  
 validation\_1-logloss:0.16165      validation\_1-error:0.04648  
 [57]      validation\_0-logloss:0.12970      validation\_0-error:0.03226  
 validation\_1-logloss:0.16181      validation\_1-error:0.04648  
 [58]      validation\_0-logloss:0.12913      validation\_0-error:0.03263  
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 [59]      validation\_0-logloss:0.12834      validation\_0-error:0.03226  
 validation\_1-logloss:0.16090      validation\_1-error:0.04648  
 [60]      validation\_0-logloss:0.12789      validation\_0-error:0.03113  
 validation\_1-logloss:0.16055      validation\_1-error:0.04648  
 [61]      validation\_0-logloss:0.12726      validation\_0-error:0.03151  
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 [62]      validation\_0-logloss:0.12678      validation\_0-error:0.03113  
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 [63]      validation\_0-logloss:0.12646      validation\_0-error:0.03076  
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 [65]      validation\_0-logloss:0.12580      validation\_0-error:0.03113  
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 [66]      validation\_0-logloss:0.12525      validation\_0-error:0.03113  
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 [67]      validation\_0-logloss:0.12489      validation\_0-error:0.03113  
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 [68]      validation\_0-logloss:0.12448      validation\_0-error:0.03113

validation\_1-logloss:0.16145      validation\_1-error:0.04498  
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 [71]      validation\_0-logloss:0.12343      validation\_0-error:0.03038  
 validation\_1-logloss:0.16182      validation\_1-error:0.04498  
 [72]      validation\_0-logloss:0.12237      validation\_0-error:0.03038  
 validation\_1-logloss:0.16213      validation\_1-error:0.04498  
 [73]      validation\_0-logloss:0.12186      validation\_0-error:0.03001  
 validation\_1-logloss:0.16182      validation\_1-error:0.04498  
 [74]      validation\_0-logloss:0.12149      validation\_0-error:0.03001  
 validation\_1-logloss:0.16218      validation\_1-error:0.04498  
 [75]      validation\_0-logloss:0.12125      validation\_0-error:0.03001  
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 [76]      validation\_0-logloss:0.12079      validation\_0-error:0.03001  
 validation\_1-logloss:0.16288      validation\_1-error:0.04498  
 [77]      validation\_0-logloss:0.12048      validation\_0-error:0.03038  
 validation\_1-logloss:0.16251      validation\_1-error:0.04648  
 [78]      validation\_0-logloss:0.12008      validation\_0-error:0.03001  
 validation\_1-logloss:0.16256      validation\_1-error:0.04648  
 [79]      validation\_0-logloss:0.11961      validation\_0-error:0.03038  
 validation\_1-logloss:0.16282      validation\_1-error:0.04498  
 [80]      validation\_0-logloss:0.11940      validation\_0-error:0.03001  
 validation\_1-logloss:0.16272      validation\_1-error:0.04648  
 [81]      validation\_0-logloss:0.11911      validation\_0-error:0.03001  
 validation\_1-logloss:0.16278      validation\_1-error:0.04648  
 [82]      validation\_0-logloss:0.11878      validation\_0-error:0.02926  
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 [83]      validation\_0-logloss:0.11832      validation\_0-error:0.02926  
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 [84]      validation\_0-logloss:0.11805      validation\_0-error:0.02926  
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 [85]      validation\_0-logloss:0.11718      validation\_0-error:0.03001  
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 [86]      validation\_0-logloss:0.11701      validation\_0-error:0.02963  
 validation\_1-logloss:0.16361      validation\_1-error:0.04498  
 [87]      validation\_0-logloss:0.11670      validation\_0-error:0.02963  
 validation\_1-logloss:0.16343      validation\_1-error:0.04498  
 [88]      validation\_0-logloss:0.11615      validation\_0-error:0.02963  
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 [89]      validation\_0-logloss:0.11569      validation\_0-error:0.02926  
 validation\_1-logloss:0.16395      validation\_1-error:0.04498  
 [90]      validation\_0-logloss:0.11535      validation\_0-error:0.02926  
 validation\_1-logloss:0.16386      validation\_1-error:0.04498  
 [91]      validation\_0-logloss:0.11501      validation\_0-error:0.02963  
 validation\_1-logloss:0.16390      validation\_1-error:0.04498  
 [92]      validation\_0-logloss:0.11462      validation\_0-error:0.02963

```

validation_1-logloss:0.16423    validation_1-error:0.04648
[93]   validation_0-logloss:0.11410    validation_0-error:0.03001
validation_1-logloss:0.16376    validation_1-error:0.04648
[94]   validation_0-logloss:0.11393    validation_0-error:0.03001
validation_1-logloss:0.16373    validation_1-error:0.04648
[95]   validation_0-logloss:0.11354    validation_0-error:0.03001
validation_1-logloss:0.16363    validation_1-error:0.04648
[96]   validation_0-logloss:0.11331    validation_0-error:0.03001
validation_1-logloss:0.16351    validation_1-error:0.04498
[97]   validation_0-logloss:0.11299    validation_0-error:0.02963
validation_1-logloss:0.16356    validation_1-error:0.04498
[98]   validation_0-logloss:0.11271    validation_0-error:0.02963
validation_1-logloss:0.16353    validation_1-error:0.04498

```

C:\Users\sci\anaconda3\lib\site-packages\xgboost\sklearn.py:888: UserWarning:  
The use of label encoder in XGBClassifier is deprecated and will be removed in a  
future release. To remove this warning, do the following: 1) Pass option  
use\_label\_encoder=False when constructing XGBClassifier object; and 2) Encode  
your labels (y) as integers starting with 0, i.e. 0, 1, 2, ..., [num\_class - 1].  
warnings.warn(label\_encoder\_deprecation\_msg, UserWarning)

```

[99]   validation_0-logloss:0.11187    validation_0-error:0.02963
validation_1-logloss:0.16367    validation_1-error:0.04498
[100]  validation_0-logloss:0.11162    validation_0-error:0.02926
validation_1-logloss:0.16353    validation_1-error:0.04498
[101]  validation_0-logloss:0.11130    validation_0-error:0.02926
validation_1-logloss:0.16330    validation_1-error:0.04498
[102]  validation_0-logloss:0.11103    validation_0-error:0.02926
validation_1-logloss:0.16335    validation_1-error:0.04498
[103]  validation_0-logloss:0.11068    validation_0-error:0.02926
validation_1-logloss:0.16373    validation_1-error:0.04498
[104]  validation_0-logloss:0.11016    validation_0-error:0.02888
validation_1-logloss:0.16287    validation_1-error:0.04498
[105]  validation_0-logloss:0.10980    validation_0-error:0.02888
validation_1-logloss:0.16283    validation_1-error:0.04498
[106]  validation_0-logloss:0.10960    validation_0-error:0.02888
validation_1-logloss:0.16293    validation_1-error:0.04498
[107]  validation_0-logloss:0.10919    validation_0-error:0.02851
validation_1-logloss:0.16277    validation_1-error:0.04498
[108]  validation_0-logloss:0.10894    validation_0-error:0.02813
validation_1-logloss:0.16267    validation_1-error:0.04648
[109]  validation_0-logloss:0.10875    validation_0-error:0.02813
validation_1-logloss:0.16276    validation_1-error:0.04648
[110]  validation_0-logloss:0.10854    validation_0-error:0.02813
validation_1-logloss:0.16299    validation_1-error:0.04648
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validation_1-logloss:0.16320    validation_1-error:0.04648
[112]  validation_0-logloss:0.10806    validation_0-error:0.02851
validation_1-logloss:0.16343    validation_1-error:0.04648

```



[113] validation\_0-logloss:0.10773 validation\_0-error:0.02851  
validation\_1-logloss:0.16411 validation\_1-error:0.04648  
[114] validation\_0-logloss:0.10754 validation\_0-error:0.02851  
validation\_1-logloss:0.16401 validation\_1-error:0.04648  
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[116] validation\_0-logloss:0.10688 validation\_0-error:0.02851  
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[117] validation\_0-logloss:0.10650 validation\_0-error:0.02851  
validation\_1-logloss:0.16399 validation\_1-error:0.04648  
[118] validation\_0-logloss:0.10627 validation\_0-error:0.02851  
validation\_1-logloss:0.16409 validation\_1-error:0.04648  
[119] validation\_0-logloss:0.10587 validation\_0-error:0.02851  
validation\_1-logloss:0.16356 validation\_1-error:0.04648  
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validation\_1-logloss:0.61867 validation\_1-error:0.06447  
[1] validation\_0-logloss:0.55288 validation\_0-error:0.04726  
validation\_1-logloss:0.55768 validation\_1-error:0.06147  
[2] validation\_0-logloss:0.50018 validation\_0-error:0.04764  
validation\_1-logloss:0.50634 validation\_1-error:0.06297  
[3] validation\_0-logloss:0.45547 validation\_0-error:0.04726  
validation\_1-logloss:0.46285 validation\_1-error:0.06147  
[4] validation\_0-logloss:0.41734 validation\_0-error:0.04726  
validation\_1-logloss:0.42669 validation\_1-error:0.06147  
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validation\_1-logloss:0.39375 validation\_1-error:0.06297  
[6] validation\_0-logloss:0.35590 validation\_0-error:0.04726  
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[7] validation\_0-logloss:0.33133 validation\_0-error:0.04689  
validation\_1-logloss:0.34297 validation\_1-error:0.06147  
[8] validation\_0-logloss:0.30817 validation\_0-error:0.04726  
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[9] validation\_0-logloss:0.28743 validation\_0-error:0.04689  
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[10] validation\_0-logloss:0.26928 validation\_0-error:0.04539  
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[12] validation\_0-logloss:0.23946 validation\_0-error:0.04163  
validation\_1-logloss:0.25274 validation\_1-error:0.05097  
[13] validation\_0-logloss:0.22691 validation\_0-error:0.04239  
validation\_1-logloss:0.24068 validation\_1-error:0.05247  
[14] validation\_0-logloss:0.21621 validation\_0-error:0.03976  
validation\_1-logloss:0.23013 validation\_1-error:0.04798  
[15] validation\_0-logloss:0.20645 validation\_0-error:0.03788  
validation\_1-logloss:0.22102 validation\_1-error:0.04498  
[16] validation\_0-logloss:0.19709 validation\_0-error:0.03638  
validation\_1-logloss:0.21219 validation\_1-error:0.04348

[17] validation\_0-logloss:0.18923 validation\_0-error:0.03601  
validation\_1-logloss:0.20516 validation\_1-error:0.04198  
[18] validation\_0-logloss:0.18306 validation\_0-error:0.03488  
validation\_1-logloss:0.19873 validation\_1-error:0.04348  
[19] validation\_0-logloss:0.17640 validation\_0-error:0.03151  
validation\_1-logloss:0.19296 validation\_1-error:0.04198  
[20] validation\_0-logloss:0.17058 validation\_0-error:0.03076  
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[22] validation\_0-logloss:0.16141 validation\_0-error:0.03076  
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[23] validation\_0-logloss:0.15784 validation\_0-error:0.03038  
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[24] validation\_0-logloss:0.15410 validation\_0-error:0.03001  
validation\_1-logloss:0.17437 validation\_1-error:0.03898  
[25] validation\_0-logloss:0.15067 validation\_0-error:0.03001  
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[26] validation\_0-logloss:0.14731 validation\_0-error:0.03001  
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[27] validation\_0-logloss:0.14433 validation\_0-error:0.02963  
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[28] validation\_0-logloss:0.14134 validation\_0-error:0.02926  
validation\_1-logloss:0.16449 validation\_1-error:0.03898  
[29] validation\_0-logloss:0.13885 validation\_0-error:0.02851  
validation\_1-logloss:0.16222 validation\_1-error:0.03898  
[30] validation\_0-logloss:0.13593 validation\_0-error:0.02813  
validation\_1-logloss:0.16079 validation\_1-error:0.03898  
[31] validation\_0-logloss:0.13392 validation\_0-error:0.02813  
validation\_1-logloss:0.15923 validation\_1-error:0.03898  
[32] validation\_0-logloss:0.13144 validation\_0-error:0.02738  
validation\_1-logloss:0.15701 validation\_1-error:0.03898  
[33] validation\_0-logloss:0.12927 validation\_0-error:0.02851  
validation\_1-logloss:0.15500 validation\_1-error:0.03898  
[34] validation\_0-logloss:0.12641 validation\_0-error:0.02738  
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[35] validation\_0-logloss:0.12454 validation\_0-error:0.02813  
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[36] validation\_0-logloss:0.12209 validation\_0-error:0.02813  
validation\_1-logloss:0.15238 validation\_1-error:0.03898  
[37] validation\_0-logloss:0.12085 validation\_0-error:0.02813  
validation\_1-logloss:0.15147 validation\_1-error:0.03898  
[38] validation\_0-logloss:0.11906 validation\_0-error:0.02888  
validation\_1-logloss:0.15074 validation\_1-error:0.03898  
[39] validation\_0-logloss:0.11806 validation\_0-error:0.02813  
validation\_1-logloss:0.15006 validation\_1-error:0.03898  
[40] validation\_0-logloss:0.11655 validation\_0-error:0.02738  
validation\_1-logloss:0.14875 validation\_1-error:0.03898

[41] validation\_0-logloss:0.11470 validation\_0-error:0.02738  
 validation\_1-logloss:0.14812 validation\_1-error:0.03748  
 [42] validation\_0-logloss:0.11402 validation\_0-error:0.02701  
 validation\_1-logloss:0.14724 validation\_1-error:0.03598  
 [43] validation\_0-logloss:0.11282 validation\_0-error:0.02701  
 validation\_1-logloss:0.14725 validation\_1-error:0.03448  
 [44] validation\_0-logloss:0.11137 validation\_0-error:0.02701  
 validation\_1-logloss:0.14732 validation\_1-error:0.03748  
 [45] validation\_0-logloss:0.11073 validation\_0-error:0.02701  
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 [46] validation\_0-logloss:0.10943 validation\_0-error:0.02663  
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 [47] validation\_0-logloss:0.10877 validation\_0-error:0.02663  
 validation\_1-logloss:0.14608 validation\_1-error:0.03748  
 [48] validation\_0-logloss:0.10775 validation\_0-error:0.02626  
 validation\_1-logloss:0.14637 validation\_1-error:0.03748  
 [49] validation\_0-logloss:0.10673 validation\_0-error:0.02663  
 validation\_1-logloss:0.14568 validation\_1-error:0.03598  
 [0] validation\_0-logloss:0.61565 validation\_0-error:0.04839  
 validation\_1-logloss:0.61723 validation\_1-error:0.05997  
 [1] validation\_0-logloss:0.55172 validation\_0-error:0.04539  
 validation\_1-logloss:0.55447 validation\_1-error:0.05697  
 [2] validation\_0-logloss:0.49874 validation\_0-error:0.04651  
 validation\_1-logloss:0.50336 validation\_1-error:0.05997  
 [3] validation\_0-logloss:0.45368 validation\_0-error:0.04539  
 validation\_1-logloss:0.45917 validation\_1-error:0.05697  
 [4] validation\_0-logloss:0.41537 validation\_0-error:0.04539  
 validation\_1-logloss:0.42147 validation\_1-error:0.05097  
 [5] validation\_0-logloss:0.38260 validation\_0-error:0.04501  
 validation\_1-logloss:0.38868 validation\_1-error:0.05397  
 [6] validation\_0-logloss:0.35419 validation\_0-error:0.04501  
 validation\_1-logloss:0.36148 validation\_1-error:0.05247  
 [7] validation\_0-logloss:0.32923 validation\_0-error:0.04464  
 validation\_1-logloss:0.33708 validation\_1-error:0.05097  
 [8] validation\_0-logloss:0.30632 validation\_0-error:0.04389  
 validation\_1-logloss:0.31420 validation\_1-error:0.05247  
 [9] validation\_0-logloss:0.28619 validation\_0-error:0.04426  
 validation\_1-logloss:0.29393 validation\_1-error:0.05097  
 [10] validation\_0-logloss:0.26873 validation\_0-error:0.04426  
 validation\_1-logloss:0.27662 validation\_1-error:0.05247  
 [11] validation\_0-logloss:0.25348 validation\_0-error:0.04314  
 validation\_1-logloss:0.26139 validation\_1-error:0.05397  
 [12] validation\_0-logloss:0.23986 validation\_0-error:0.04201  
 validation\_1-logloss:0.24795 validation\_1-error:0.04947  
 [13] validation\_0-logloss:0.22768 validation\_0-error:0.03939  
 validation\_1-logloss:0.23638 validation\_1-error:0.04498  
 [14] validation\_0-logloss:0.21693 validation\_0-error:0.03901  
 validation\_1-logloss:0.22615 validation\_1-error:0.04498

```

[15]    validation_0-logloss:0.20732    validation_0-error:0.03826
validation_1-logloss:0.21707    validation_1-error:0.04348
[16]    validation_0-logloss:0.19832    validation_0-error:0.03751
validation_1-logloss:0.20945    validation_1-error:0.04198
[17]    validation_0-logloss:0.19010    validation_0-error:0.03713
validation_1-logloss:0.20280    validation_1-error:0.04198
[18]    validation_0-logloss:0.18282    validation_0-error:0.03788
validation_1-logloss:0.19690    validation_1-error:0.04198
[19]    validation_0-logloss:0.17621    validation_0-error:0.03713
validation_1-logloss:0.19145    validation_1-error:0.04198
[20]    validation_0-logloss:0.17032    validation_0-error:0.03676
validation_1-logloss:0.18670    validation_1-error:0.04348
[21]    validation_0-logloss:0.16521    validation_0-error:0.03713
validation_1-logloss:0.18335    validation_1-error:0.04348
[22]    validation_0-logloss:0.16126    validation_0-error:0.03601
validation_1-logloss:0.17853    validation_1-error:0.04198
[23]    validation_0-logloss:0.15673    validation_0-error:0.03526
validation_1-logloss:0.17511    validation_1-error:0.04198
[24]    validation_0-logloss:0.15314    validation_0-error:0.03488
validation_1-logloss:0.17192    validation_1-error:0.03898
[25]    validation_0-logloss:0.15029    validation_0-error:0.03376
validation_1-logloss:0.16843    validation_1-error:0.03898
[26]    validation_0-logloss:0.14739    validation_0-error:0.03338
validation_1-logloss:0.16567    validation_1-error:0.04048
[27]    validation_0-logloss:0.14393    validation_0-error:0.03226
validation_1-logloss:0.16311    validation_1-error:0.03898
[28]    validation_0-logloss:0.14180    validation_0-error:0.03263
validation_1-logloss:0.16062    validation_1-error:0.03898
[29]    validation_0-logloss:0.13945    validation_0-error:0.03226
validation_1-logloss:0.15940    validation_1-error:0.04048
[30]    validation_0-logloss:0.13661    validation_0-error:0.03151
validation_1-logloss:0.15794    validation_1-error:0.03898

```

C:\Users\sci\anaconda3\lib\site-packages\xgboost\sklearn.py:888: UserWarning:  
The use of label encoder in XGBClassifier is deprecated and will be removed in a  
future release. To remove this warning, do the following: 1) Pass option  
use\_label\_encoder=False when constructing XGBClassifier object; and 2) Encode  
your labels (y) as integers starting with 0, i.e. 0, 1, 2, ..., [num\_class - 1].

warnings.warn(label\_encoder\_deprecation\_msg, UserWarning)

C:\Users\sci\anaconda3\lib\site-packages\xgboost\sklearn.py:888: UserWarning:  
The use of label encoder in XGBClassifier is deprecated and will be removed in a  
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use\_label\_encoder=False when constructing XGBClassifier object; and 2) Encode  
your labels (y) as integers starting with 0, i.e. 0, 1, 2, ..., [num\_class - 1].

warnings.warn(label\_encoder\_deprecation\_msg, UserWarning)

```

[31]    validation_0-logloss:0.13512    validation_0-error:0.03151
validation_1-logloss:0.15635    validation_1-error:0.03898
[32]    validation_0-logloss:0.13253    validation_0-error:0.03113

```

validation\_1-logloss:0.15549      validation\_1-error:0.03898  
 [33]      validation\_0-logloss:0.13086      validation\_0-error:0.03113  
 validation\_1-logloss:0.15418      validation\_1-error:0.03748  
 [34]      validation\_0-logloss:0.12954      validation\_0-error:0.03038  
 validation\_1-logloss:0.15345      validation\_1-error:0.03748  
 [35]      validation\_0-logloss:0.12837      validation\_0-error:0.03038  
 validation\_1-logloss:0.15202      validation\_1-error:0.03748  
 [36]      validation\_0-logloss:0.12696      validation\_0-error:0.03038  
 validation\_1-logloss:0.15171      validation\_1-error:0.03748  
 [37]      validation\_0-logloss:0.12542      validation\_0-error:0.03038  
 validation\_1-logloss:0.15095      validation\_1-error:0.03748  
 [38]      validation\_0-logloss:0.12469      validation\_0-error:0.03001  
 validation\_1-logloss:0.15049      validation\_1-error:0.03748  
 [39]      validation\_0-logloss:0.12346      validation\_0-error:0.03038  
 validation\_1-logloss:0.14921      validation\_1-error:0.03598  
 [40]      validation\_0-logloss:0.12273      validation\_0-error:0.03001  
 validation\_1-logloss:0.14920      validation\_1-error:0.03748  
 [41]      validation\_0-logloss:0.12140      validation\_0-error:0.03001  
 validation\_1-logloss:0.14880      validation\_1-error:0.03598  
 [42]      validation\_0-logloss:0.12061      validation\_0-error:0.02963  
 validation\_1-logloss:0.14869      validation\_1-error:0.03598  
 [43]      validation\_0-logloss:0.11957      validation\_0-error:0.02963  
 validation\_1-logloss:0.14834      validation\_1-error:0.03598  
 [44]      validation\_0-logloss:0.11822      validation\_0-error:0.02963  
 validation\_1-logloss:0.14805      validation\_1-error:0.03598  
 [45]      validation\_0-logloss:0.11642      validation\_0-error:0.02963  
 validation\_1-logloss:0.14742      validation\_1-error:0.03598  
 [46]      validation\_0-logloss:0.11565      validation\_0-error:0.02963  
 validation\_1-logloss:0.14733      validation\_1-error:0.03598  
 [47]      validation\_0-logloss:0.11481      validation\_0-error:0.03001  
 validation\_1-logloss:0.14671      validation\_1-error:0.03598  
 [48]      validation\_0-logloss:0.11309      validation\_0-error:0.02963  
 validation\_1-logloss:0.14667      validation\_1-error:0.03598  
 [49]      validation\_0-logloss:0.11215      validation\_0-error:0.02963  
 validation\_1-logloss:0.14672      validation\_1-error:0.03598  
 [0]      validation\_0-logloss:0.61606      validation\_0-error:0.05439  
 validation\_1-logloss:0.61678      validation\_1-error:0.05697  
 [1]      validation\_0-logloss:0.55295      validation\_0-error:0.05326  
 validation\_1-logloss:0.55393      validation\_1-error:0.05247  
 [2]      validation\_0-logloss:0.50032      validation\_0-error:0.05326  
 validation\_1-logloss:0.50182      validation\_1-error:0.05097  
 [3]      validation\_0-logloss:0.45516      validation\_0-error:0.05064  
 validation\_1-logloss:0.45843      validation\_1-error:0.05697  
 [4]      validation\_0-logloss:0.41603      validation\_0-error:0.04689  
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 [5]      validation\_0-logloss:0.38168      validation\_0-error:0.04651  
 validation\_1-logloss:0.38565      validation\_1-error:0.05247  
 [6]      validation\_0-logloss:0.35259      validation\_0-error:0.04276

validation\_1-logloss:0.35754      validation\_1-error:0.05547  
 [7]      validation\_0-logloss:0.32671      validation\_0-error:0.04051  
 validation\_1-logloss:0.33316      validation\_1-error:0.05697  
 [8]      validation\_0-logloss:0.30413      validation\_0-error:0.04051  
 validation\_1-logloss:0.31113      validation\_1-error:0.05847  
 [9]      validation\_0-logloss:0.28422      validation\_0-error:0.03751  
 validation\_1-logloss:0.29215      validation\_1-error:0.05097  
 [10]      validation\_0-logloss:0.26682      validation\_0-error:0.03526  
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 [11]      validation\_0-logloss:0.25151      validation\_0-error:0.03488  
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 [12]      validation\_0-logloss:0.23740      validation\_0-error:0.03338  
 validation\_1-logloss:0.24880      validation\_1-error:0.04648  
 [13]      validation\_0-logloss:0.22547      validation\_0-error:0.03413  
 validation\_1-logloss:0.23799      validation\_1-error:0.04498  
 [14]      validation\_0-logloss:0.21454      validation\_0-error:0.03413  
 validation\_1-logloss:0.22846      validation\_1-error:0.04348  
 [15]      validation\_0-logloss:0.20512      validation\_0-error:0.03226  
 validation\_1-logloss:0.22055      validation\_1-error:0.04648  
 [16]      validation\_0-logloss:0.19640      validation\_0-error:0.03113  
 validation\_1-logloss:0.21244      validation\_1-error:0.04498  
 [17]      validation\_0-logloss:0.18903      validation\_0-error:0.03113  
 validation\_1-logloss:0.20558      validation\_1-error:0.04498  
 [18]      validation\_0-logloss:0.18243      validation\_0-error:0.03113  
 validation\_1-logloss:0.19914      validation\_1-error:0.04498  
 [19]      validation\_0-logloss:0.17634      validation\_0-error:0.03038  
 validation\_1-logloss:0.19455      validation\_1-error:0.04498  
 [20]      validation\_0-logloss:0.17098      validation\_0-error:0.03001  
 validation\_1-logloss:0.18978      validation\_1-error:0.04498  
 [21]      validation\_0-logloss:0.16606      validation\_0-error:0.03076  
 validation\_1-logloss:0.18625      validation\_1-error:0.04498  
 [22]      validation\_0-logloss:0.16126      validation\_0-error:0.02963  
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 [23]      validation\_0-logloss:0.15751      validation\_0-error:0.02851  
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 [25]      validation\_0-logloss:0.15038      validation\_0-error:0.02851  
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 [26]      validation\_0-logloss:0.14739      validation\_0-error:0.02813  
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 [28]      validation\_0-logloss:0.14189      validation\_0-error:0.02851  
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 [29]      validation\_0-logloss:0.13936      validation\_0-error:0.02813  
 validation\_1-logloss:0.16522      validation\_1-error:0.04348  
 [30]      validation\_0-logloss:0.13727      validation\_0-error:0.02776

validation\_1-logloss:0.16309      validation\_1-error:0.04348  
 [31]      validation\_0-logloss:0.13512      validation\_0-error:0.02701  
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 [33]      validation\_0-logloss:0.12931      validation\_0-error:0.02701  
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 [34]      validation\_0-logloss:0.12746      validation\_0-error:0.02626  
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 [35]      validation\_0-logloss:0.12490      validation\_0-error:0.02663  
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 [36]      validation\_0-logloss:0.12353      validation\_0-error:0.02738  
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 [37]      validation\_0-logloss:0.12196      validation\_0-error:0.02663  
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 [38]      validation\_0-logloss:0.12040      validation\_0-error:0.02663  
 validation\_1-logloss:0.15364      validation\_1-error:0.04198  
 [39]      validation\_0-logloss:0.11951      validation\_0-error:0.02663  
 validation\_1-logloss:0.15331      validation\_1-error:0.03898  
 [40]      validation\_0-logloss:0.11850      validation\_0-error:0.02626  
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 [41]      validation\_0-logloss:0.11719      validation\_0-error:0.02701  
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 [42]      validation\_0-logloss:0.11626      validation\_0-error:0.02663  
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 [43]      validation\_0-logloss:0.11494      validation\_0-error:0.02701  
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 [44]      validation\_0-logloss:0.11429      validation\_0-error:0.02738  
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 [45]      validation\_0-logloss:0.11249      validation\_0-error:0.02663  
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 [46]      validation\_0-logloss:0.11173      validation\_0-error:0.02701  
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 [47]      validation\_0-logloss:0.11098      validation\_0-error:0.02701  
 validation\_1-logloss:0.14941      validation\_1-error:0.03748  
 [48]      validation\_0-logloss:0.10999      validation\_0-error:0.02738  
 validation\_1-logloss:0.14805      validation\_1-error:0.03748  
 [49]      validation\_0-logloss:0.10954      validation\_0-error:0.02738  
 validation\_1-logloss:0.14797      validation\_1-error:0.03598  
 [0]      validation\_0-logloss:0.61545      validation\_0-error:0.04989  
 validation\_1-logloss:0.61817      validation\_1-error:0.07046  
 [1]      validation\_0-logloss:0.55171      validation\_0-error:0.04876  
 validation\_1-logloss:0.55672      validation\_1-error:0.07046  
 [2]      validation\_0-logloss:0.49845      validation\_0-error:0.04839  
 validation\_1-logloss:0.50531      validation\_1-error:0.07196  
 [3]      validation\_0-logloss:0.45329      validation\_0-error:0.04764  
 validation\_1-logloss:0.46160      validation\_1-error:0.07196  
 [4]      validation\_0-logloss:0.41480      validation\_0-error:0.04839

validation\_1-logloss:0.42355      validation\_1-error:0.07196  
[5]      validation\_0-logloss:0.38197      validation\_0-error:0.04726  
validation\_1-logloss:0.39193      validation\_1-error:0.07046  
[6]      validation\_0-logloss:0.35303      validation\_0-error:0.04689  
validation\_1-logloss:0.36511      validation\_1-error:0.07046  
[7]      validation\_0-logloss:0.32795      validation\_0-error:0.04614  
validation\_1-logloss:0.34127      validation\_1-error:0.06897  
[8]      validation\_0-logloss:0.30618      validation\_0-error:0.04239  
validation\_1-logloss:0.32055      validation\_1-error:0.05997  
[9]      validation\_0-logloss:0.28742      validation\_0-error:0.04239  
validation\_1-logloss:0.30389      validation\_1-error:0.06897  
[10]      validation\_0-logloss:0.26975      validation\_0-error:0.04351  
validation\_1-logloss:0.28606      validation\_1-error:0.06147  
[11]      validation\_0-logloss:0.25427      validation\_0-error:0.04501  
validation\_1-logloss:0.27075      validation\_1-error:0.06297  
[12]      validation\_0-logloss:0.24042      validation\_0-error:0.04051  
validation\_1-logloss:0.25754      validation\_1-error:0.05847  
[13]      validation\_0-logloss:0.22826      validation\_0-error:0.03939  
validation\_1-logloss:0.24613      validation\_1-error:0.05697  
[14]      validation\_0-logloss:0.21746      validation\_0-error:0.04013  
validation\_1-logloss:0.23526      validation\_1-error:0.05547  
[15]      validation\_0-logloss:0.20794      validation\_0-error:0.03976  
validation\_1-logloss:0.22565      validation\_1-error:0.05397  
[16]      validation\_0-logloss:0.19957      validation\_0-error:0.03788  
validation\_1-logloss:0.21822      validation\_1-error:0.05397  
[17]      validation\_0-logloss:0.19145      validation\_0-error:0.03751  
validation\_1-logloss:0.21044      validation\_1-error:0.05097  
[18]      validation\_0-logloss:0.18446      validation\_0-error:0.03676  
validation\_1-logloss:0.20411      validation\_1-error:0.04947  
[19]      validation\_0-logloss:0.17807      validation\_0-error:0.03638  
validation\_1-logloss:0.19880      validation\_1-error:0.04947  
[20]      validation\_0-logloss:0.17291      validation\_0-error:0.03676  
validation\_1-logloss:0.19500      validation\_1-error:0.04947  
[21]      validation\_0-logloss:0.16771      validation\_0-error:0.03601  
validation\_1-logloss:0.19130      validation\_1-error:0.04947  
[22]      validation\_0-logloss:0.16313      validation\_0-error:0.03601  
validation\_1-logloss:0.18765      validation\_1-error:0.04947  
[23]      validation\_0-logloss:0.15836      validation\_0-error:0.03601  
validation\_1-logloss:0.18577      validation\_1-error:0.04947  
[24]      validation\_0-logloss:0.15471      validation\_0-error:0.03601  
validation\_1-logloss:0.18294      validation\_1-error:0.04798  
[25]      validation\_0-logloss:0.15054      validation\_0-error:0.03526  
validation\_1-logloss:0.18051      validation\_1-error:0.04798  
[26]      validation\_0-logloss:0.14689      validation\_0-error:0.03488  
validation\_1-logloss:0.17826      validation\_1-error:0.04648  
[27]      validation\_0-logloss:0.14428      validation\_0-error:0.03376  
validation\_1-logloss:0.17674      validation\_1-error:0.04498  
[28]      validation\_0-logloss:0.14211      validation\_0-error:0.03338



```
validation_1-logloss:0.17412    validation_1-error:0.04648
[29]    validation_0-logloss:0.13900    validation_0-error:0.03301
validation_1-logloss:0.17290    validation_1-error:0.04498
[30]    validation_0-logloss:0.13725    validation_0-error:0.03226
validation_1-logloss:0.17107    validation_1-error:0.04498
```

C:\Users\sci\anaconda3\lib\site-packages\xgboost\sklearn.py:888: UserWarning:  
The use of label encoder in XGBClassifier is deprecated and will be removed in a  
future release. To remove this warning, do the following: 1) Pass option  
use\_label\_encoder=False when constructing XGBClassifier object; and 2) Encode  
your labels (y) as integers starting with 0, i.e. 0, 1, 2, ..., [num\_class - 1].

```
warnings.warn(label_encoder_deprecation_msg, UserWarning)
```

C:\Users\sci\anaconda3\lib\site-packages\xgboost\sklearn.py:888: UserWarning:  
The use of label encoder in XGBClassifier is deprecated and will be removed in a  
future release. To remove this warning, do the following: 1) Pass option  
use\_label\_encoder=False when constructing XGBClassifier object; and 2) Encode  
your labels (y) as integers starting with 0, i.e. 0, 1, 2, ..., [num\_class - 1].

```
warnings.warn(label_encoder_deprecation_msg, UserWarning)
```

```
[31]    validation_0-logloss:0.13425    validation_0-error:0.03151
validation_1-logloss:0.16994    validation_1-error:0.04348
[32]    validation_0-logloss:0.13271    validation_0-error:0.03151
validation_1-logloss:0.16792    validation_1-error:0.04198
[33]    validation_0-logloss:0.13064    validation_0-error:0.03151
validation_1-logloss:0.16693    validation_1-error:0.04048
[34]    validation_0-logloss:0.12860    validation_0-error:0.03188
validation_1-logloss:0.16588    validation_1-error:0.04198
[35]    validation_0-logloss:0.12625    validation_0-error:0.03151
validation_1-logloss:0.16437    validation_1-error:0.04198
[36]    validation_0-logloss:0.12462    validation_0-error:0.03151
validation_1-logloss:0.16459    validation_1-error:0.04198
[37]    validation_0-logloss:0.12311    validation_0-error:0.03113
validation_1-logloss:0.16455    validation_1-error:0.04198
[38]    validation_0-logloss:0.12143    validation_0-error:0.03151
validation_1-logloss:0.16447    validation_1-error:0.04198
[39]    validation_0-logloss:0.12035    validation_0-error:0.03151
validation_1-logloss:0.16350    validation_1-error:0.04048
[40]    validation_0-logloss:0.11922    validation_0-error:0.03151
validation_1-logloss:0.16378    validation_1-error:0.04048
[41]    validation_0-logloss:0.11848    validation_0-error:0.03113
validation_1-logloss:0.16242    validation_1-error:0.04048
[42]    validation_0-logloss:0.11751    validation_0-error:0.03076
validation_1-logloss:0.16285    validation_1-error:0.04048
[43]    validation_0-logloss:0.11665    validation_0-error:0.03076
validation_1-logloss:0.16189    validation_1-error:0.04048
[44]    validation_0-logloss:0.11506    validation_0-error:0.03038
validation_1-logloss:0.16202    validation_1-error:0.04198
[45]    validation_0-logloss:0.11355    validation_0-error:0.03001
validation_1-logloss:0.16172    validation_1-error:0.04198
```

[46] validation\_0-logloss:0.11199 validation\_0-error:0.03001  
 validation\_1-logloss:0.16120 validation\_1-error:0.04348  
 [47] validation\_0-logloss:0.11081 validation\_0-error:0.02963  
 validation\_1-logloss:0.16091 validation\_1-error:0.04348  
 [48] validation\_0-logloss:0.10983 validation\_0-error:0.02926  
 validation\_1-logloss:0.16088 validation\_1-error:0.04348  
 [49] validation\_0-logloss:0.10895 validation\_0-error:0.02926  
 validation\_1-logloss:0.16081 validation\_1-error:0.04348  
 [0] validation\_0-logloss:0.61582 validation\_0-error:0.05064  
 validation\_1-logloss:0.61818 validation\_1-error:0.06747  
 [1] validation\_0-logloss:0.55229 validation\_0-error:0.04726  
 validation\_1-logloss:0.55660 validation\_1-error:0.06597  
 [2] validation\_0-logloss:0.49964 validation\_0-error:0.04689  
 validation\_1-logloss:0.50529 validation\_1-error:0.06297  
 [3] validation\_0-logloss:0.45437 validation\_0-error:0.04689  
 validation\_1-logloss:0.46189 validation\_1-error:0.06597  
 [4] validation\_0-logloss:0.41662 validation\_0-error:0.04539  
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 [5] validation\_0-logloss:0.38385 validation\_0-error:0.04614  
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 [6] validation\_0-logloss:0.35538 validation\_0-error:0.04539  
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 [7] validation\_0-logloss:0.33069 validation\_0-error:0.04501  
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 [8] validation\_0-logloss:0.30717 validation\_0-error:0.04501  
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 [9] validation\_0-logloss:0.28698 validation\_0-error:0.04426  
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 [10] validation\_0-logloss:0.26928 validation\_0-error:0.04276  
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 [11] validation\_0-logloss:0.25326 validation\_0-error:0.03901  
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 [12] validation\_0-logloss:0.23927 validation\_0-error:0.03751  
 validation\_1-logloss:0.25365 validation\_1-error:0.05247  
 [13] validation\_0-logloss:0.22708 validation\_0-error:0.03751  
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 [14] validation\_0-logloss:0.21613 validation\_0-error:0.03751  
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 [15] validation\_0-logloss:0.20626 validation\_0-error:0.03638  
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 [16] validation\_0-logloss:0.19709 validation\_0-error:0.03638  
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 [17] validation\_0-logloss:0.18958 validation\_0-error:0.03601  
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 [18] validation\_0-logloss:0.18252 validation\_0-error:0.03451  
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 [19] validation\_0-logloss:0.17668 validation\_0-error:0.03413  
 validation\_1-logloss:0.19726 validation\_1-error:0.04798

[20] validation\_0-logloss:0.17124 validation\_0-error:0.03451  
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 [21] validation\_0-logloss:0.16594 validation\_0-error:0.03413  
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 [22] validation\_0-logloss:0.16169 validation\_0-error:0.03338  
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 [23] validation\_0-logloss:0.15795 validation\_0-error:0.03301  
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 [24] validation\_0-logloss:0.15417 validation\_0-error:0.03301  
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 [25] validation\_0-logloss:0.15071 validation\_0-error:0.03263  
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 [26] validation\_0-logloss:0.14747 validation\_0-error:0.03188  
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 [28] validation\_0-logloss:0.14194 validation\_0-error:0.03113  
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 [31] validation\_0-logloss:0.13368 validation\_0-error:0.03076  
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 [32] validation\_0-logloss:0.13139 validation\_0-error:0.03038  
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 [33] validation\_0-logloss:0.12956 validation\_0-error:0.03001  
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 [34] validation\_0-logloss:0.12808 validation\_0-error:0.03001  
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 [35] validation\_0-logloss:0.12644 validation\_0-error:0.03001  
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 [36] validation\_0-logloss:0.12481 validation\_0-error:0.02926  
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 [37] validation\_0-logloss:0.12374 validation\_0-error:0.02926  
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 [38] validation\_0-logloss:0.12191 validation\_0-error:0.02888  
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 [39] validation\_0-logloss:0.12061 validation\_0-error:0.02851  
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 [40] validation\_0-logloss:0.11919 validation\_0-error:0.02851  
 validation\_1-logloss:0.15351 validation\_1-error:0.04498  
 [41] validation\_0-logloss:0.11792 validation\_0-error:0.02851  
 validation\_1-logloss:0.15339 validation\_1-error:0.04348  
 [42] validation\_0-logloss:0.11616 validation\_0-error:0.02851  
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 [43] validation\_0-logloss:0.11539 validation\_0-error:0.02851  
 validation\_1-logloss:0.15381 validation\_1-error:0.04498

[44] validation\_0-logloss:0.11381 validation\_0-error:0.02813  
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 [45] validation\_0-logloss:0.11299 validation\_0-error:0.02813  
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 [46] validation\_0-logloss:0.11233 validation\_0-error:0.02776  
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 [47] validation\_0-logloss:0.11137 validation\_0-error:0.02776  
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 [48] validation\_0-logloss:0.11046 validation\_0-error:0.02776  
 validation\_1-logloss:0.15316 validation\_1-error:0.04498  
 [49] validation\_0-logloss:0.10909 validation\_0-error:0.02738  
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 [0] validation\_0-logloss:0.61605 validation\_0-error:0.04801  
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 [1] validation\_0-logloss:0.55288 validation\_0-error:0.04726  
 validation\_1-logloss:0.55768 validation\_1-error:0.06147  
 [2] validation\_0-logloss:0.50018 validation\_0-error:0.04764  
 validation\_1-logloss:0.50634 validation\_1-error:0.06297  
 [3] validation\_0-logloss:0.45547 validation\_0-error:0.04726  
 validation\_1-logloss:0.46285 validation\_1-error:0.06147  
 [4] validation\_0-logloss:0.41734 validation\_0-error:0.04726  
 validation\_1-logloss:0.42669 validation\_1-error:0.06147  
 [5] validation\_0-logloss:0.38440 validation\_0-error:0.04764  
 validation\_1-logloss:0.39375 validation\_1-error:0.06297  
 [6] validation\_0-logloss:0.35590 validation\_0-error:0.04726  
 validation\_1-logloss:0.36561 validation\_1-error:0.06297  
 [7] validation\_0-logloss:0.33133 validation\_0-error:0.04689  
 validation\_1-logloss:0.34297 validation\_1-error:0.06147  
 [8] validation\_0-logloss:0.30817 validation\_0-error:0.04726  
 validation\_1-logloss:0.31959 validation\_1-error:0.06297  
 [9] validation\_0-logloss:0.28743 validation\_0-error:0.04689  
 validation\_1-logloss:0.29934 validation\_1-error:0.06297  
 [10] validation\_0-logloss:0.26928 validation\_0-error:0.04539  
 validation\_1-logloss:0.28167 validation\_1-error:0.05997  
 [11] validation\_0-logloss:0.25376 validation\_0-error:0.04163  
 validation\_1-logloss:0.26623 validation\_1-error:0.05247  
 [12] validation\_0-logloss:0.23946 validation\_0-error:0.04163  
 validation\_1-logloss:0.25274 validation\_1-error:0.05097  
 [13] validation\_0-logloss:0.22691 validation\_0-error:0.04239  
 validation\_1-logloss:0.24068 validation\_1-error:0.05247  
 [14] validation\_0-logloss:0.21621 validation\_0-error:0.03976  
 validation\_1-logloss:0.23013 validation\_1-error:0.04798  
 [15] validation\_0-logloss:0.20645 validation\_0-error:0.03788  
 validation\_1-logloss:0.22102 validation\_1-error:0.04498  
 [16] validation\_0-logloss:0.19709 validation\_0-error:0.03638  
 validation\_1-logloss:0.21219 validation\_1-error:0.04348  
 [17] validation\_0-logloss:0.18923 validation\_0-error:0.03601  
 validation\_1-logloss:0.20516 validation\_1-error:0.04198

```

[18]    validation_0-logloss:0.18306    validation_0-error:0.03488
validation_1-logloss:0.19873    validation_1-error:0.04348
[19]    validation_0-logloss:0.17640    validation_0-error:0.03151
validation_1-logloss:0.19296    validation_1-error:0.04198
[20]    validation_0-logloss:0.17058    validation_0-error:0.03076
validation_1-logloss:0.18783    validation_1-error:0.04048
[21]    validation_0-logloss:0.16612    validation_0-error:0.03076
validation_1-logloss:0.18293    validation_1-error:0.04048
[22]    validation_0-logloss:0.16141    validation_0-error:0.03076
validation_1-logloss:0.17966    validation_1-error:0.03898
[23]    validation_0-logloss:0.15784    validation_0-error:0.03038
validation_1-logloss:0.17574    validation_1-error:0.03898
[24]    validation_0-logloss:0.15410    validation_0-error:0.03001
validation_1-logloss:0.17437    validation_1-error:0.03898
[25]    validation_0-logloss:0.15067    validation_0-error:0.03001
validation_1-logloss:0.17091    validation_1-error:0.03898

```

C:\Users\sci\anaconda3\lib\site-packages\xgboost\sklearn.py:888: UserWarning:  
The use of label encoder in XGBClassifier is deprecated and will be removed in a  
future release. To remove this warning, do the following: 1) Pass option  
use\_label\_encoder=False when constructing XGBClassifier object; and 2) Encode  
your labels (y) as integers starting with 0, i.e. 0, 1, 2, ..., [num\_class - 1].

```
warnings.warn(label_encoder_deprecation_msg, UserWarning)
```

C:\Users\sci\anaconda3\lib\site-packages\xgboost\sklearn.py:888: UserWarning:  
The use of label encoder in XGBClassifier is deprecated and will be removed in a  
future release. To remove this warning, do the following: 1) Pass option  
use\_label\_encoder=False when constructing XGBClassifier object; and 2) Encode  
your labels (y) as integers starting with 0, i.e. 0, 1, 2, ..., [num\_class - 1].

```
warnings.warn(label_encoder_deprecation_msg, UserWarning)
```

```

[26]    validation_0-logloss:0.14731    validation_0-error:0.03001
validation_1-logloss:0.16930    validation_1-error:0.03898
[27]    validation_0-logloss:0.14433    validation_0-error:0.02963
validation_1-logloss:0.16648    validation_1-error:0.03898
[28]    validation_0-logloss:0.14134    validation_0-error:0.02926
validation_1-logloss:0.16449    validation_1-error:0.03898
[29]    validation_0-logloss:0.13885    validation_0-error:0.02851
validation_1-logloss:0.16222    validation_1-error:0.03898
[30]    validation_0-logloss:0.13593    validation_0-error:0.02813
validation_1-logloss:0.16079    validation_1-error:0.03898
[31]    validation_0-logloss:0.13392    validation_0-error:0.02813
validation_1-logloss:0.15923    validation_1-error:0.03898
[32]    validation_0-logloss:0.13144    validation_0-error:0.02738
validation_1-logloss:0.15701    validation_1-error:0.03898
[33]    validation_0-logloss:0.12927    validation_0-error:0.02851
validation_1-logloss:0.15500    validation_1-error:0.03898
[34]    validation_0-logloss:0.12641    validation_0-error:0.02738
validation_1-logloss:0.15441    validation_1-error:0.03898
[35]    validation_0-logloss:0.12454    validation_0-error:0.02813

```

validation\_1-logloss:0.15273      validation\_1-error:0.03898  
 [36]      validation\_0-logloss:0.12209      validation\_0-error:0.02813  
 validation\_1-logloss:0.15238      validation\_1-error:0.03898  
 [37]      validation\_0-logloss:0.12085      validation\_0-error:0.02813  
 validation\_1-logloss:0.15147      validation\_1-error:0.03898  
 [38]      validation\_0-logloss:0.11906      validation\_0-error:0.02888  
 validation\_1-logloss:0.15074      validation\_1-error:0.03898  
 [39]      validation\_0-logloss:0.11806      validation\_0-error:0.02813  
 validation\_1-logloss:0.15006      validation\_1-error:0.03898  
 [40]      validation\_0-logloss:0.11655      validation\_0-error:0.02738  
 validation\_1-logloss:0.14875      validation\_1-error:0.03898  
 [41]      validation\_0-logloss:0.11470      validation\_0-error:0.02738  
 validation\_1-logloss:0.14812      validation\_1-error:0.03748  
 [42]      validation\_0-logloss:0.11402      validation\_0-error:0.02701  
 validation\_1-logloss:0.14724      validation\_1-error:0.03598  
 [43]      validation\_0-logloss:0.11282      validation\_0-error:0.02701  
 validation\_1-logloss:0.14725      validation\_1-error:0.03448  
 [44]      validation\_0-logloss:0.11137      validation\_0-error:0.02701  
 validation\_1-logloss:0.14732      validation\_1-error:0.03748  
 [45]      validation\_0-logloss:0.11073      validation\_0-error:0.02701  
 validation\_1-logloss:0.14640      validation\_1-error:0.03598  
 [46]      validation\_0-logloss:0.10943      validation\_0-error:0.02663  
 validation\_1-logloss:0.14610      validation\_1-error:0.03748  
 [47]      validation\_0-logloss:0.10877      validation\_0-error:0.02663  
 validation\_1-logloss:0.14608      validation\_1-error:0.03748  
 [48]      validation\_0-logloss:0.10775      validation\_0-error:0.02626  
 validation\_1-logloss:0.14637      validation\_1-error:0.03748  
 [49]      validation\_0-logloss:0.10673      validation\_0-error:0.02663  
 validation\_1-logloss:0.14568      validation\_1-error:0.03598  
 [50]      validation\_0-logloss:0.10521      validation\_0-error:0.02626  
 validation\_1-logloss:0.14635      validation\_1-error:0.03748  
 [51]      validation\_0-logloss:0.10447      validation\_0-error:0.02626  
 validation\_1-logloss:0.14574      validation\_1-error:0.03748  
 [52]      validation\_0-logloss:0.10403      validation\_0-error:0.02588  
 validation\_1-logloss:0.14595      validation\_1-error:0.03748  
 [53]      validation\_0-logloss:0.10301      validation\_0-error:0.02588  
 validation\_1-logloss:0.14545      validation\_1-error:0.03898  
 [54]      validation\_0-logloss:0.10225      validation\_0-error:0.02551  
 validation\_1-logloss:0.14566      validation\_1-error:0.03748  
 [55]      validation\_0-logloss:0.10191      validation\_0-error:0.02513  
 validation\_1-logloss:0.14552      validation\_1-error:0.03748  
 [56]      validation\_0-logloss:0.10129      validation\_0-error:0.02513  
 validation\_1-logloss:0.14504      validation\_1-error:0.03748  
 [57]      validation\_0-logloss:0.10070      validation\_0-error:0.02476  
 validation\_1-logloss:0.14504      validation\_1-error:0.03748  
 [58]      validation\_0-logloss:0.10005      validation\_0-error:0.02513  
 validation\_1-logloss:0.14525      validation\_1-error:0.03598  
 [59]      validation\_0-logloss:0.09964      validation\_0-error:0.02513

validation\_1-logloss:0.14514      validation\_1-error:0.03748  
[60]      validation\_0-logloss:0.09941      validation\_0-error:0.02476  
validation\_1-logloss:0.14489      validation\_1-error:0.03748  
[61]      validation\_0-logloss:0.09876      validation\_0-error:0.02476  
validation\_1-logloss:0.14457      validation\_1-error:0.03748  
[62]      validation\_0-logloss:0.09844      validation\_0-error:0.02513  
validation\_1-logloss:0.14492      validation\_1-error:0.03748  
[63]      validation\_0-logloss:0.09803      validation\_0-error:0.02513  
validation\_1-logloss:0.14509      validation\_1-error:0.03748  
[64]      validation\_0-logloss:0.09747      validation\_0-error:0.02513  
validation\_1-logloss:0.14452      validation\_1-error:0.03748  
[65]      validation\_0-logloss:0.09718      validation\_0-error:0.02438  
validation\_1-logloss:0.14475      validation\_1-error:0.03748  
[66]      validation\_0-logloss:0.09610      validation\_0-error:0.02363  
validation\_1-logloss:0.14425      validation\_1-error:0.03748  
[67]      validation\_0-logloss:0.09566      validation\_0-error:0.02363  
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[68]      validation\_0-logloss:0.09482      validation\_0-error:0.02401  
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[69]      validation\_0-logloss:0.09387      validation\_0-error:0.02363  
validation\_1-logloss:0.14406      validation\_1-error:0.03748  
[70]      validation\_0-logloss:0.09341      validation\_0-error:0.02363  
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[71]      validation\_0-logloss:0.09266      validation\_0-error:0.02326  
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validation\_1-logloss:0.14388      validation\_1-error:0.03748  
[73]      validation\_0-logloss:0.09173      validation\_0-error:0.02326  
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[0]      validation\_0-logloss:0.61565      validation\_0-error:0.04839  
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[2]      validation\_0-logloss:0.49874      validation\_0-error:0.04651  
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[3]      validation\_0-logloss:0.45368      validation\_0-error:0.04539  
validation\_1-logloss:0.45917      validation\_1-error:0.05697  
[4]      validation\_0-logloss:0.41537      validation\_0-error:0.04539  
validation\_1-logloss:0.42147      validation\_1-error:0.05097  
[5]      validation\_0-logloss:0.38260      validation\_0-error:0.04501  
validation\_1-logloss:0.38868      validation\_1-error:0.05397  
[6]      validation\_0-logloss:0.35419      validation\_0-error:0.04501  
validation\_1-logloss:0.36148      validation\_1-error:0.05247  
[7]      validation\_0-logloss:0.32923      validation\_0-error:0.04464  
validation\_1-logloss:0.33708      validation\_1-error:0.05097  
[8]      validation\_0-logloss:0.30632      validation\_0-error:0.04389

validation\_1-logloss:0.31420      validation\_1-error:0.05247

[9]      validation\_0-logloss:0.28619      validation\_0-error:0.04426

validation\_1-logloss:0.29393      validation\_1-error:0.05097

[10]      validation\_0-logloss:0.26873      validation\_0-error:0.04426

validation\_1-logloss:0.27662      validation\_1-error:0.05247

[11]      validation\_0-logloss:0.25348      validation\_0-error:0.04314

validation\_1-logloss:0.26139      validation\_1-error:0.05397

[12]      validation\_0-logloss:0.23986      validation\_0-error:0.04201

validation\_1-logloss:0.24795      validation\_1-error:0.04947

[13]      validation\_0-logloss:0.22768      validation\_0-error:0.03939

validation\_1-logloss:0.23638      validation\_1-error:0.04498

[14]      validation\_0-logloss:0.21693      validation\_0-error:0.03901

validation\_1-logloss:0.22615      validation\_1-error:0.04498

[15]      validation\_0-logloss:0.20732      validation\_0-error:0.03826

validation\_1-logloss:0.21707      validation\_1-error:0.04348

[16]      validation\_0-logloss:0.19832      validation\_0-error:0.03751

validation\_1-logloss:0.20945      validation\_1-error:0.04198

[17]      validation\_0-logloss:0.19010      validation\_0-error:0.03713

validation\_1-logloss:0.20280      validation\_1-error:0.04198

[18]      validation\_0-logloss:0.18282      validation\_0-error:0.03788

validation\_1-logloss:0.19690      validation\_1-error:0.04198

[19]      validation\_0-logloss:0.17621      validation\_0-error:0.03713

validation\_1-logloss:0.19145      validation\_1-error:0.04198

[20]      validation\_0-logloss:0.17032      validation\_0-error:0.03676

validation\_1-logloss:0.18670      validation\_1-error:0.04348

[21]      validation\_0-logloss:0.16521      validation\_0-error:0.03713

validation\_1-logloss:0.18335      validation\_1-error:0.04348

[22]      validation\_0-logloss:0.16126      validation\_0-error:0.03601

validation\_1-logloss:0.17853      validation\_1-error:0.04198

[23]      validation\_0-logloss:0.15673      validation\_0-error:0.03526

validation\_1-logloss:0.17511      validation\_1-error:0.04198

[24]      validation\_0-logloss:0.15314      validation\_0-error:0.03488

validation\_1-logloss:0.17192      validation\_1-error:0.03898

[25]      validation\_0-logloss:0.15029      validation\_0-error:0.03376

validation\_1-logloss:0.16843      validation\_1-error:0.03898

[26]      validation\_0-logloss:0.14739      validation\_0-error:0.03338

validation\_1-logloss:0.16567      validation\_1-error:0.04048

[27]      validation\_0-logloss:0.14393      validation\_0-error:0.03226

validation\_1-logloss:0.16311      validation\_1-error:0.03898

[28]      validation\_0-logloss:0.14180      validation\_0-error:0.03263

validation\_1-logloss:0.16062      validation\_1-error:0.03898

[29]      validation\_0-logloss:0.13945      validation\_0-error:0.03226

validation\_1-logloss:0.15940      validation\_1-error:0.04048

[30]      validation\_0-logloss:0.13661      validation\_0-error:0.03151

validation\_1-logloss:0.15794      validation\_1-error:0.03898

[31]      validation\_0-logloss:0.13512      validation\_0-error:0.03151

validation\_1-logloss:0.15635      validation\_1-error:0.03898

[32]      validation\_0-logloss:0.13253      validation\_0-error:0.03113



validation\_1-logloss:0.15549      validation\_1-error:0.03898  
 [33]      validation\_0-logloss:0.13086      validation\_0-error:0.03113  
 validation\_1-logloss:0.15418      validation\_1-error:0.03748  
 [34]      validation\_0-logloss:0.12954      validation\_0-error:0.03038  
 validation\_1-logloss:0.15345      validation\_1-error:0.03748  
 [35]      validation\_0-logloss:0.12837      validation\_0-error:0.03038  
 validation\_1-logloss:0.15202      validation\_1-error:0.03748  
 [36]      validation\_0-logloss:0.12696      validation\_0-error:0.03038  
 validation\_1-logloss:0.15171      validation\_1-error:0.03748  
 [37]      validation\_0-logloss:0.12542      validation\_0-error:0.03038  
 validation\_1-logloss:0.15095      validation\_1-error:0.03748  
 [38]      validation\_0-logloss:0.12469      validation\_0-error:0.03001  
 validation\_1-logloss:0.15049      validation\_1-error:0.03748  
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 validation\_1-logloss:0.14921      validation\_1-error:0.03598  
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 [42]      validation\_0-logloss:0.12061      validation\_0-error:0.02963  
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 [43]      validation\_0-logloss:0.11957      validation\_0-error:0.02963  
 validation\_1-logloss:0.14834      validation\_1-error:0.03598  
 [44]      validation\_0-logloss:0.11822      validation\_0-error:0.02963  
 validation\_1-logloss:0.14805      validation\_1-error:0.03598  
 [45]      validation\_0-logloss:0.11642      validation\_0-error:0.02963  
 validation\_1-logloss:0.14742      validation\_1-error:0.03598  
 [46]      validation\_0-logloss:0.11565      validation\_0-error:0.02963  
 validation\_1-logloss:0.14733      validation\_1-error:0.03598  
 [47]      validation\_0-logloss:0.11481      validation\_0-error:0.03001  
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 [48]      validation\_0-logloss:0.11309      validation\_0-error:0.02963  
 validation\_1-logloss:0.14667      validation\_1-error:0.03598  
 [49]      validation\_0-logloss:0.11215      validation\_0-error:0.02963  
 validation\_1-logloss:0.14672      validation\_1-error:0.03598  
 [50]      validation\_0-logloss:0.11158      validation\_0-error:0.02963  
 validation\_1-logloss:0.14652      validation\_1-error:0.03598  
 [51]      validation\_0-logloss:0.11034      validation\_0-error:0.02888  
 validation\_1-logloss:0.14627      validation\_1-error:0.03448  
 [52]      validation\_0-logloss:0.10954      validation\_0-error:0.02888  
 validation\_1-logloss:0.14648      validation\_1-error:0.03448  
 [53]      validation\_0-logloss:0.10872      validation\_0-error:0.02888  
 validation\_1-logloss:0.14662      validation\_1-error:0.03448  
 [54]      validation\_0-logloss:0.10799      validation\_0-error:0.02813  
 validation\_1-logloss:0.14631      validation\_1-error:0.03448  
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 validation\_1-logloss:0.14644      validation\_1-error:0.03598  
 [56]      validation\_0-logloss:0.10663      validation\_0-error:0.02813

```

validation_1-logloss:0.14647    validation_1-error:0.03448
[57]   validation_0-logloss:0.10564    validation_0-error:0.02813
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validation_1-logloss:0.14656    validation_1-error:0.03448
[59]   validation_0-logloss:0.10422    validation_0-error:0.02776
validation_1-logloss:0.14664    validation_1-error:0.03448
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validation_1-logloss:0.14676    validation_1-error:0.03598
[61]   validation_0-logloss:0.10329    validation_0-error:0.02738
validation_1-logloss:0.14654    validation_1-error:0.03598
[62]   validation_0-logloss:0.10277    validation_0-error:0.02738
validation_1-logloss:0.14655    validation_1-error:0.03598
[63]   validation_0-logloss:0.10230    validation_0-error:0.02663
validation_1-logloss:0.14642    validation_1-error:0.03748
[64]   validation_0-logloss:0.10187    validation_0-error:0.02701
validation_1-logloss:0.14640    validation_1-error:0.03448
[65]   validation_0-logloss:0.10150    validation_0-error:0.02701
validation_1-logloss:0.14661    validation_1-error:0.03448
[66]   validation_0-logloss:0.10105    validation_0-error:0.02663
validation_1-logloss:0.14640    validation_1-error:0.03598
[67]   validation_0-logloss:0.10011    validation_0-error:0.02626
validation_1-logloss:0.14655    validation_1-error:0.03598
[68]   validation_0-logloss:0.09961    validation_0-error:0.02626
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[69]   validation_0-logloss:0.09871    validation_0-error:0.02663
validation_1-logloss:0.14688    validation_1-error:0.03748
[70]   validation_0-logloss:0.09811    validation_0-error:0.02663
validation_1-logloss:0.14694    validation_1-error:0.03598
[71]   validation_0-logloss:0.09735    validation_0-error:0.02663
validation_1-logloss:0.14733    validation_1-error:0.03598
[72]   validation_0-logloss:0.09713    validation_0-error:0.02663
validation_1-logloss:0.14738    validation_1-error:0.03598
[73]   validation_0-logloss:0.09660    validation_0-error:0.02663
validation_1-logloss:0.14742    validation_1-error:0.03598
[74]   validation_0-logloss:0.09541    validation_0-error:0.02663
validation_1-logloss:0.14753    validation_1-error:0.03598

```

```

C:\Users\sci\anaconda3\lib\site-packages\xgboost\sklearn.py:888: UserWarning:
The use of label encoder in XGBClassifier is deprecated and will be removed in a
future release. To remove this warning, do the following: 1) Pass option
use_label_encoder=False when constructing XGBClassifier object; and 2) Encode
your labels (y) as integers starting with 0, i.e. 0, 1, 2, ..., [num_class - 1].

```

```

warnings.warn(label_encoder_deprecation_msg, UserWarning)

```

```

C:\Users\sci\anaconda3\lib\site-packages\xgboost\sklearn.py:888: UserWarning:
The use of label encoder in XGBClassifier is deprecated and will be removed in a
future release. To remove this warning, do the following: 1) Pass option
use_label_encoder=False when constructing XGBClassifier object; and 2) Encode

```

your labels (y) as integers starting with 0, i.e. 0, 1, 2, ..., [num\_class - 1].  
warnings.warn(label\_encoder\_deprecation\_msg, UserWarning)

[0]	validation_0-logloss:0.61606	validation_0-error:0.05439
	validation_1-logloss:0.61678	validation_1-error:0.05697
[1]	validation_0-logloss:0.55295	validation_0-error:0.05326
	validation_1-logloss:0.55393	validation_1-error:0.05247
[2]	validation_0-logloss:0.50032	validation_0-error:0.05326
	validation_1-logloss:0.50182	validation_1-error:0.05097
[3]	validation_0-logloss:0.45516	validation_0-error:0.05064
	validation_1-logloss:0.45843	validation_1-error:0.05697
[4]	validation_0-logloss:0.41603	validation_0-error:0.04689
	validation_1-logloss:0.41985	validation_1-error:0.05247
[5]	validation_0-logloss:0.38168	validation_0-error:0.04651
	validation_1-logloss:0.38565	validation_1-error:0.05247
[6]	validation_0-logloss:0.35259	validation_0-error:0.04276
	validation_1-logloss:0.35754	validation_1-error:0.05547
[7]	validation_0-logloss:0.32671	validation_0-error:0.04051
	validation_1-logloss:0.33316	validation_1-error:0.05697
[8]	validation_0-logloss:0.30413	validation_0-error:0.04051
	validation_1-logloss:0.31113	validation_1-error:0.05847
[9]	validation_0-logloss:0.28422	validation_0-error:0.03751
	validation_1-logloss:0.29215	validation_1-error:0.05097
[10]	validation_0-logloss:0.26682	validation_0-error:0.03526
	validation_1-logloss:0.27571	validation_1-error:0.04798
[11]	validation_0-logloss:0.25151	validation_0-error:0.03488
	validation_1-logloss:0.26181	validation_1-error:0.04947
[12]	validation_0-logloss:0.23740	validation_0-error:0.03338
	validation_1-logloss:0.24880	validation_1-error:0.04648
[13]	validation_0-logloss:0.22547	validation_0-error:0.03413
	validation_1-logloss:0.23799	validation_1-error:0.04498
[14]	validation_0-logloss:0.21454	validation_0-error:0.03413
	validation_1-logloss:0.22846	validation_1-error:0.04348
[15]	validation_0-logloss:0.20512	validation_0-error:0.03226
	validation_1-logloss:0.22055	validation_1-error:0.04648
[16]	validation_0-logloss:0.19640	validation_0-error:0.03113
	validation_1-logloss:0.21244	validation_1-error:0.04498
[17]	validation_0-logloss:0.18903	validation_0-error:0.03113
	validation_1-logloss:0.20558	validation_1-error:0.04498
[18]	validation_0-logloss:0.18243	validation_0-error:0.03113
	validation_1-logloss:0.19914	validation_1-error:0.04498
[19]	validation_0-logloss:0.17634	validation_0-error:0.03038
	validation_1-logloss:0.19455	validation_1-error:0.04498
[20]	validation_0-logloss:0.17098	validation_0-error:0.03001
	validation_1-logloss:0.18978	validation_1-error:0.04498
[21]	validation_0-logloss:0.16606	validation_0-error:0.03076
	validation_1-logloss:0.18625	validation_1-error:0.04498
[22]	validation_0-logloss:0.16126	validation_0-error:0.02963

validation\_1-logloss:0.18161 validation\_1-error:0.04498  
 [23] validation\_0-logloss:0.15751 validation\_0-error:0.02851  
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 [24] validation\_0-logloss:0.15361 validation\_0-error:0.02851  
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 [26] validation\_0-logloss:0.14739 validation\_0-error:0.02813  
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 validation\_1-logloss:0.15314 validation\_1-error:0.03748  
 [41] validation\_0-logloss:0.11719 validation\_0-error:0.02701  
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 [42] validation\_0-logloss:0.11626 validation\_0-error:0.02663  
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 [44] validation\_0-logloss:0.11429 validation\_0-error:0.02738  
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 [49]      validation\_0-logloss:0.10954      validation\_0-error:0.02738  
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 [50]      validation\_0-logloss:0.10881      validation\_0-error:0.02738  
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 [70]      validation\_0-logloss:0.09621      validation\_0-error:0.02738

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[71]      validation\_0-logloss:0.09575      validation\_0-error:0.02738  
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[3]      validation\_0-logloss:0.45329      validation\_0-error:0.04764  
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[7]      validation\_0-logloss:0.32795      validation\_0-error:0.04614  
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[8]      validation\_0-logloss:0.30618      validation\_0-error:0.04239  
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[9]      validation\_0-logloss:0.28742      validation\_0-error:0.04239  
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 [46]      validation\_0-logloss:0.11199      validation\_0-error:0.03001  
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 [52]      validation\_0-logloss:0.10693      validation\_0-error:0.02926  
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 [54]      validation\_0-logloss:0.10506      validation\_0-error:0.02851  
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 [57]      validation\_0-logloss:0.10327      validation\_0-error:0.02776  
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 [58]      validation\_0-logloss:0.10293      validation\_0-error:0.02776  
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 [59]      validation\_0-logloss:0.10228      validation\_0-error:0.02813  
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 [67]      validation\_0-logloss:0.09663      validation\_0-error:0.02588



```

validation_1-logloss:0.16173    validation_1-error:0.04648
[68]   validation_0-logloss:0.09580    validation_0-error:0.02626
validation_1-logloss:0.16131    validation_1-error:0.04498
[69]   validation_0-logloss:0.09546    validation_0-error:0.02588
validation_1-logloss:0.16145    validation_1-error:0.04498
[70]   validation_0-logloss:0.09519    validation_0-error:0.02588
validation_1-logloss:0.16080    validation_1-error:0.04498
[71]   validation_0-logloss:0.09435    validation_0-error:0.02588
validation_1-logloss:0.16067    validation_1-error:0.04498
[72]   validation_0-logloss:0.09414    validation_0-error:0.02588
validation_1-logloss:0.16055    validation_1-error:0.04498
[73]   validation_0-logloss:0.09372    validation_0-error:0.02551
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[74]   validation_0-logloss:0.09349    validation_0-error:0.02551
validation_1-logloss:0.16047    validation_1-error:0.04648
[0]    validation_0-logloss:0.61582    validation_0-error:0.05064
validation_1-logloss:0.61818    validation_1-error:0.06747

```

C:\Users\sci\anaconda3\lib\site-packages\xgboost\sklearn.py:888: UserWarning:  
The use of label encoder in XGBClassifier is deprecated and will be removed in a  
future release. To remove this warning, do the following: 1) Pass option  
use\_label\_encoder=False when constructing XGBClassifier object; and 2) Encode  
your labels (y) as integers starting with 0, i.e. 0, 1, 2, ..., [num\_class - 1].

warnings.warn(label\_encoder\_deprecation\_msg, UserWarning)

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warnings.warn(label\_encoder\_deprecation\_msg, UserWarning)

```

[1]   validation_0-logloss:0.55229    validation_0-error:0.04726
validation_1-logloss:0.55660    validation_1-error:0.06597
[2]   validation_0-logloss:0.49964    validation_0-error:0.04689
validation_1-logloss:0.50529    validation_1-error:0.06297
[3]   validation_0-logloss:0.45437    validation_0-error:0.04689
validation_1-logloss:0.46189    validation_1-error:0.06597
[4]   validation_0-logloss:0.41662    validation_0-error:0.04539
validation_1-logloss:0.42536    validation_1-error:0.06447
[5]   validation_0-logloss:0.38385    validation_0-error:0.04614
validation_1-logloss:0.39418    validation_1-error:0.06447
[6]   validation_0-logloss:0.35538    validation_0-error:0.04539
validation_1-logloss:0.36566    validation_1-error:0.06297
[7]   validation_0-logloss:0.33069    validation_0-error:0.04501
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[8]   validation_0-logloss:0.30717    validation_0-error:0.04501
validation_1-logloss:0.31941    validation_1-error:0.06297
[9]   validation_0-logloss:0.28698    validation_0-error:0.04426
validation_1-logloss:0.29997    validation_1-error:0.06297

```

[10] validation\_0-logloss:0.26928 validation\_0-error:0.04276  
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[55] validation\_0-logloss:0.10191 validation\_0-error:0.02513  
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 [77] validation\_0-logloss:0.08895 validation\_0-error:0.02326  
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```

[79]    validation_0-logloss:0.08769    validation_0-error:0.02288
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[80]    validation_0-logloss:0.08666    validation_0-error:0.02326
validation_1-logloss:0.14422    validation_1-error:0.03898
[81]    validation_0-logloss:0.08623    validation_0-error:0.02326
validation_1-logloss:0.14402    validation_1-error:0.03898
[82]    validation_0-logloss:0.08586    validation_0-error:0.02326
validation_1-logloss:0.14414    validation_1-error:0.03898
[83]    validation_0-logloss:0.08513    validation_0-error:0.02288
validation_1-logloss:0.14399    validation_1-error:0.03898
[84]    validation_0-logloss:0.08464    validation_0-error:0.02288
validation_1-logloss:0.14392    validation_1-error:0.03598
[85]    validation_0-logloss:0.08368    validation_0-error:0.02288
validation_1-logloss:0.14380    validation_1-error:0.03748
[86]    validation_0-logloss:0.08347    validation_0-error:0.02288
validation_1-logloss:0.14344    validation_1-error:0.03898
[87]    validation_0-logloss:0.08291    validation_0-error:0.02251
validation_1-logloss:0.14342    validation_1-error:0.03898
[88]    validation_0-logloss:0.08262    validation_0-error:0.02251
validation_1-logloss:0.14334    validation_1-error:0.03898
[89]    validation_0-logloss:0.08231    validation_0-error:0.02251
validation_1-logloss:0.14345    validation_1-error:0.03748

```

C:\Users\sci\anaconda3\lib\site-packages\xgboost\sklearn.py:888: UserWarning:  
The use of label encoder in XGBClassifier is deprecated and will be removed in a  
future release. To remove this warning, do the following: 1) Pass option  
use\_label\_encoder=False when constructing XGBClassifier object; and 2) Encode  
your labels (y) as integers starting with 0, i.e. 0, 1, 2, ..., [num\_class - 1].  
warnings.warn(label\_encoder\_deprecation\_msg, UserWarning)

```

[0]    validation_0-logloss:0.61565    validation_0-error:0.04839
validation_1-logloss:0.61723    validation_1-error:0.05997
[1]    validation_0-logloss:0.55172    validation_0-error:0.04539
validation_1-logloss:0.55447    validation_1-error:0.05697
[2]    validation_0-logloss:0.49874    validation_0-error:0.04651
validation_1-logloss:0.50336    validation_1-error:0.05997
[3]    validation_0-logloss:0.45368    validation_0-error:0.04539
validation_1-logloss:0.45917    validation_1-error:0.05697
[4]    validation_0-logloss:0.41537    validation_0-error:0.04539
validation_1-logloss:0.42147    validation_1-error:0.05097
[5]    validation_0-logloss:0.38260    validation_0-error:0.04501
validation_1-logloss:0.38868    validation_1-error:0.05397
[6]    validation_0-logloss:0.35419    validation_0-error:0.04501
validation_1-logloss:0.36148    validation_1-error:0.05247
[7]    validation_0-logloss:0.32923    validation_0-error:0.04464
validation_1-logloss:0.33708    validation_1-error:0.05097
[8]    validation_0-logloss:0.30632    validation_0-error:0.04389
validation_1-logloss:0.31420    validation_1-error:0.05247
[9]    validation_0-logloss:0.28619    validation_0-error:0.04426

```



validation\_1-logloss:0.29393      validation\_1-error:0.05097

[10]      validation\_0-logloss:0.26873      validation\_0-error:0.04426  
validation\_1-logloss:0.27662      validation\_1-error:0.05247

[11]      validation\_0-logloss:0.25348      validation\_0-error:0.04314  
validation\_1-logloss:0.26139      validation\_1-error:0.05397

[12]      validation\_0-logloss:0.23986      validation\_0-error:0.04201  
validation\_1-logloss:0.24795      validation\_1-error:0.04947

[13]      validation\_0-logloss:0.22768      validation\_0-error:0.03939  
validation\_1-logloss:0.23638      validation\_1-error:0.04498

[14]      validation\_0-logloss:0.21693      validation\_0-error:0.03901  
validation\_1-logloss:0.22615      validation\_1-error:0.04498

[15]      validation\_0-logloss:0.20732      validation\_0-error:0.03826  
validation\_1-logloss:0.21707      validation\_1-error:0.04348

[16]      validation\_0-logloss:0.19832      validation\_0-error:0.03751  
validation\_1-logloss:0.20945      validation\_1-error:0.04198

[17]      validation\_0-logloss:0.19010      validation\_0-error:0.03713  
validation\_1-logloss:0.20280      validation\_1-error:0.04198

[18]      validation\_0-logloss:0.18282      validation\_0-error:0.03788  
validation\_1-logloss:0.19690      validation\_1-error:0.04198

[19]      validation\_0-logloss:0.17621      validation\_0-error:0.03713  
validation\_1-logloss:0.19145      validation\_1-error:0.04198

[20]      validation\_0-logloss:0.17032      validation\_0-error:0.03676  
validation\_1-logloss:0.18670      validation\_1-error:0.04348

[21]      validation\_0-logloss:0.16521      validation\_0-error:0.03713  
validation\_1-logloss:0.18335      validation\_1-error:0.04348

[22]      validation\_0-logloss:0.16126      validation\_0-error:0.03601  
validation\_1-logloss:0.17853      validation\_1-error:0.04198

[23]      validation\_0-logloss:0.15673      validation\_0-error:0.03526  
validation\_1-logloss:0.17511      validation\_1-error:0.04198

[24]      validation\_0-logloss:0.15314      validation\_0-error:0.03488  
validation\_1-logloss:0.17192      validation\_1-error:0.03898

[25]      validation\_0-logloss:0.15029      validation\_0-error:0.03376  
validation\_1-logloss:0.16843      validation\_1-error:0.03898

[26]      validation\_0-logloss:0.14739      validation\_0-error:0.03338  
validation\_1-logloss:0.16567      validation\_1-error:0.04048

[27]      validation\_0-logloss:0.14393      validation\_0-error:0.03226  
validation\_1-logloss:0.16311      validation\_1-error:0.03898

[28]      validation\_0-logloss:0.14180      validation\_0-error:0.03263  
validation\_1-logloss:0.16062      validation\_1-error:0.03898

[29]      validation\_0-logloss:0.13945      validation\_0-error:0.03226  
validation\_1-logloss:0.15940      validation\_1-error:0.04048

[30]      validation\_0-logloss:0.13661      validation\_0-error:0.03151  
validation\_1-logloss:0.15794      validation\_1-error:0.03898

[31]      validation\_0-logloss:0.13512      validation\_0-error:0.03151  
validation\_1-logloss:0.15635      validation\_1-error:0.03898

[32]      validation\_0-logloss:0.13253      validation\_0-error:0.03113  
validation\_1-logloss:0.15549      validation\_1-error:0.03898

[33]      validation\_0-logloss:0.13086      validation\_0-error:0.03113

validation\_1-logloss:0.15418      validation\_1-error:0.03748  
 [34]      validation\_0-logloss:0.12954      validation\_0-error:0.03038  
 validation\_1-logloss:0.15345      validation\_1-error:0.03748  
 [35]      validation\_0-logloss:0.12837      validation\_0-error:0.03038  
 validation\_1-logloss:0.15202      validation\_1-error:0.03748  
 [36]      validation\_0-logloss:0.12696      validation\_0-error:0.03038  
 validation\_1-logloss:0.15171      validation\_1-error:0.03748  
 [37]      validation\_0-logloss:0.12542      validation\_0-error:0.03038  
 validation\_1-logloss:0.15095      validation\_1-error:0.03748  
 [38]      validation\_0-logloss:0.12469      validation\_0-error:0.03001  
 validation\_1-logloss:0.15049      validation\_1-error:0.03748  
 [39]      validation\_0-logloss:0.12346      validation\_0-error:0.03038  
 validation\_1-logloss:0.14921      validation\_1-error:0.03598  
 [40]      validation\_0-logloss:0.12273      validation\_0-error:0.03001  
 validation\_1-logloss:0.14920      validation\_1-error:0.03748  
 [41]      validation\_0-logloss:0.12140      validation\_0-error:0.03001  
 validation\_1-logloss:0.14880      validation\_1-error:0.03598  
 [42]      validation\_0-logloss:0.12061      validation\_0-error:0.02963  
 validation\_1-logloss:0.14869      validation\_1-error:0.03598  
 [43]      validation\_0-logloss:0.11957      validation\_0-error:0.02963  
 validation\_1-logloss:0.14834      validation\_1-error:0.03598  
 [44]      validation\_0-logloss:0.11822      validation\_0-error:0.02963  
 validation\_1-logloss:0.14805      validation\_1-error:0.03598  
 [45]      validation\_0-logloss:0.11642      validation\_0-error:0.02963  
 validation\_1-logloss:0.14742      validation\_1-error:0.03598  
 [46]      validation\_0-logloss:0.11565      validation\_0-error:0.02963  
 validation\_1-logloss:0.14733      validation\_1-error:0.03598  
 [47]      validation\_0-logloss:0.11481      validation\_0-error:0.03001  
 validation\_1-logloss:0.14671      validation\_1-error:0.03598  
 [48]      validation\_0-logloss:0.11309      validation\_0-error:0.02963  
 validation\_1-logloss:0.14667      validation\_1-error:0.03598  
 [49]      validation\_0-logloss:0.11215      validation\_0-error:0.02963  
 validation\_1-logloss:0.14672      validation\_1-error:0.03598  
 [50]      validation\_0-logloss:0.11158      validation\_0-error:0.02963  
 validation\_1-logloss:0.14652      validation\_1-error:0.03598  
 [51]      validation\_0-logloss:0.11034      validation\_0-error:0.02888  
 validation\_1-logloss:0.14627      validation\_1-error:0.03448  
 [52]      validation\_0-logloss:0.10954      validation\_0-error:0.02888  
 validation\_1-logloss:0.14648      validation\_1-error:0.03448  
 [53]      validation\_0-logloss:0.10872      validation\_0-error:0.02888  
 validation\_1-logloss:0.14662      validation\_1-error:0.03448  
 [54]      validation\_0-logloss:0.10799      validation\_0-error:0.02813  
 validation\_1-logloss:0.14631      validation\_1-error:0.03448  
 [55]      validation\_0-logloss:0.10762      validation\_0-error:0.02813  
 validation\_1-logloss:0.14644      validation\_1-error:0.03598  
 [56]      validation\_0-logloss:0.10663      validation\_0-error:0.02813  
 validation\_1-logloss:0.14647      validation\_1-error:0.03448  
 [57]      validation\_0-logloss:0.10564      validation\_0-error:0.02813

validation\_1-logloss:0.14627      validation\_1-error:0.03448  
 [58]      validation\_0-logloss:0.10476      validation\_0-error:0.02813  
 validation\_1-logloss:0.14656      validation\_1-error:0.03448  
 [59]      validation\_0-logloss:0.10422      validation\_0-error:0.02776  
 validation\_1-logloss:0.14664      validation\_1-error:0.03448  
 [60]      validation\_0-logloss:0.10364      validation\_0-error:0.02738  
 validation\_1-logloss:0.14676      validation\_1-error:0.03598  
 [61]      validation\_0-logloss:0.10329      validation\_0-error:0.02738  
 validation\_1-logloss:0.14654      validation\_1-error:0.03598  
 [62]      validation\_0-logloss:0.10277      validation\_0-error:0.02738  
 validation\_1-logloss:0.14655      validation\_1-error:0.03598  
 [63]      validation\_0-logloss:0.10230      validation\_0-error:0.02663  
 validation\_1-logloss:0.14642      validation\_1-error:0.03748  
 [64]      validation\_0-logloss:0.10187      validation\_0-error:0.02701  
 validation\_1-logloss:0.14640      validation\_1-error:0.03448  
 [65]      validation\_0-logloss:0.10150      validation\_0-error:0.02701  
 validation\_1-logloss:0.14661      validation\_1-error:0.03448  
 [66]      validation\_0-logloss:0.10105      validation\_0-error:0.02663  
 validation\_1-logloss:0.14640      validation\_1-error:0.03598  
 [67]      validation\_0-logloss:0.10011      validation\_0-error:0.02626  
 validation\_1-logloss:0.14655      validation\_1-error:0.03598  
 [68]      validation\_0-logloss:0.09961      validation\_0-error:0.02626  
 validation\_1-logloss:0.14649      validation\_1-error:0.03748  
 [69]      validation\_0-logloss:0.09871      validation\_0-error:0.02663  
 validation\_1-logloss:0.14688      validation\_1-error:0.03748  
 [70]      validation\_0-logloss:0.09811      validation\_0-error:0.02663  
 validation\_1-logloss:0.14694      validation\_1-error:0.03598  
 [71]      validation\_0-logloss:0.09735      validation\_0-error:0.02663  
 validation\_1-logloss:0.14733      validation\_1-error:0.03598  
 [72]      validation\_0-logloss:0.09713      validation\_0-error:0.02663  
 validation\_1-logloss:0.14738      validation\_1-error:0.03598  
 [73]      validation\_0-logloss:0.09660      validation\_0-error:0.02663  
 validation\_1-logloss:0.14742      validation\_1-error:0.03598  
 [74]      validation\_0-logloss:0.09541      validation\_0-error:0.02663  
 validation\_1-logloss:0.14753      validation\_1-error:0.03598  
 [75]      validation\_0-logloss:0.09507      validation\_0-error:0.02663  
 validation\_1-logloss:0.14769      validation\_1-error:0.03598  
 [76]      validation\_0-logloss:0.09480      validation\_0-error:0.02663  
 validation\_1-logloss:0.14771      validation\_1-error:0.03598  
 [77]      validation\_0-logloss:0.09387      validation\_0-error:0.02663  
 validation\_1-logloss:0.14811      validation\_1-error:0.03598  
 [78]      validation\_0-logloss:0.09365      validation\_0-error:0.02663  
 validation\_1-logloss:0.14827      validation\_1-error:0.03598  
 [79]      validation\_0-logloss:0.09342      validation\_0-error:0.02663  
 validation\_1-logloss:0.14844      validation\_1-error:0.03598  
 [80]      validation\_0-logloss:0.09209      validation\_0-error:0.02663  
 validation\_1-logloss:0.14863      validation\_1-error:0.03298  
 [81]      validation\_0-logloss:0.09135      validation\_0-error:0.02663

```

validation_1-logloss:0.14837    validation_1-error:0.03298
[82]   validation_0-logloss:0.09087    validation_0-error:0.02663
validation_1-logloss:0.14823    validation_1-error:0.03448
[83]   validation_0-logloss:0.09051    validation_0-error:0.02663
validation_1-logloss:0.14850    validation_1-error:0.03448
[84]   validation_0-logloss:0.09008    validation_0-error:0.02663
validation_1-logloss:0.14850    validation_1-error:0.03598
[85]   validation_0-logloss:0.08945    validation_0-error:0.02626
validation_1-logloss:0.14863    validation_1-error:0.03598
[86]   validation_0-logloss:0.08891    validation_0-error:0.02626
validation_1-logloss:0.14865    validation_1-error:0.03598

```

C:\Users\sci\anaconda3\lib\site-packages\xgboost\sklearn.py:888: UserWarning:  
The use of label encoder in XGBClassifier is deprecated and will be removed in a  
future release. To remove this warning, do the following: 1) Pass option  
use\_label\_encoder=False when constructing XGBClassifier object; and 2) Encode  
your labels (y) as integers starting with 0, i.e. 0, 1, 2, ..., [num\_class - 1].  
warnings.warn(label\_encoder\_deprecation\_msg, UserWarning)

```

[87]   validation_0-logloss:0.08865    validation_0-error:0.02588
validation_1-logloss:0.14841    validation_1-error:0.03598
[88]   validation_0-logloss:0.08805    validation_0-error:0.02588
validation_1-logloss:0.14869    validation_1-error:0.03598
[89]   validation_0-logloss:0.08771    validation_0-error:0.02588
validation_1-logloss:0.14871    validation_1-error:0.03598
[0]    validation_0-logloss:0.61606    validation_0-error:0.05439
validation_1-logloss:0.61678    validation_1-error:0.05697
[1]    validation_0-logloss:0.55295    validation_0-error:0.05326
validation_1-logloss:0.55393    validation_1-error:0.05247
[2]    validation_0-logloss:0.50032    validation_0-error:0.05326
validation_1-logloss:0.50182    validation_1-error:0.05097
[3]    validation_0-logloss:0.45516    validation_0-error:0.05064
validation_1-logloss:0.45843    validation_1-error:0.05697
[4]    validation_0-logloss:0.41603    validation_0-error:0.04689
validation_1-logloss:0.41985    validation_1-error:0.05247
[5]    validation_0-logloss:0.38168    validation_0-error:0.04651
validation_1-logloss:0.38565    validation_1-error:0.05247
[6]    validation_0-logloss:0.35259    validation_0-error:0.04276
validation_1-logloss:0.35754    validation_1-error:0.05547
[7]    validation_0-logloss:0.32671    validation_0-error:0.04051
validation_1-logloss:0.33316    validation_1-error:0.05697
[8]    validation_0-logloss:0.30413    validation_0-error:0.04051
validation_1-logloss:0.31113    validation_1-error:0.05847
[9]    validation_0-logloss:0.28422    validation_0-error:0.03751
validation_1-logloss:0.29215    validation_1-error:0.05097
[10]   validation_0-logloss:0.26682    validation_0-error:0.03526
validation_1-logloss:0.27571    validation_1-error:0.04798
[11]   validation_0-logloss:0.25151    validation_0-error:0.03488
validation_1-logloss:0.26181    validation_1-error:0.04947

```

[12] validation\_0-logloss:0.23740 validation\_0-error:0.03338  
 validation\_1-logloss:0.24880 validation\_1-error:0.04648  
 [13] validation\_0-logloss:0.22547 validation\_0-error:0.03413  
 validation\_1-logloss:0.23799 validation\_1-error:0.04498  
 [14] validation\_0-logloss:0.21454 validation\_0-error:0.03413  
 validation\_1-logloss:0.22846 validation\_1-error:0.04348  
 [15] validation\_0-logloss:0.20512 validation\_0-error:0.03226  
 validation\_1-logloss:0.22055 validation\_1-error:0.04648  
 [16] validation\_0-logloss:0.19640 validation\_0-error:0.03113  
 validation\_1-logloss:0.21244 validation\_1-error:0.04498  
 [17] validation\_0-logloss:0.18903 validation\_0-error:0.03113  
 validation\_1-logloss:0.20558 validation\_1-error:0.04498  
 [18] validation\_0-logloss:0.18243 validation\_0-error:0.03113  
 validation\_1-logloss:0.19914 validation\_1-error:0.04498  
 [19] validation\_0-logloss:0.17634 validation\_0-error:0.03038  
 validation\_1-logloss:0.19455 validation\_1-error:0.04498  
 [20] validation\_0-logloss:0.17098 validation\_0-error:0.03001  
 validation\_1-logloss:0.18978 validation\_1-error:0.04498  
 [21] validation\_0-logloss:0.16606 validation\_0-error:0.03076  
 validation\_1-logloss:0.18625 validation\_1-error:0.04498  
 [22] validation\_0-logloss:0.16126 validation\_0-error:0.02963  
 validation\_1-logloss:0.18161 validation\_1-error:0.04498  
 [23] validation\_0-logloss:0.15751 validation\_0-error:0.02851  
 validation\_1-logloss:0.17931 validation\_1-error:0.04498  
 [24] validation\_0-logloss:0.15361 validation\_0-error:0.02851  
 validation\_1-logloss:0.17568 validation\_1-error:0.04498  
 [25] validation\_0-logloss:0.15038 validation\_0-error:0.02851  
 validation\_1-logloss:0.17350 validation\_1-error:0.04498  
 [26] validation\_0-logloss:0.14739 validation\_0-error:0.02813  
 validation\_1-logloss:0.17048 validation\_1-error:0.04348  
 [27] validation\_0-logloss:0.14439 validation\_0-error:0.02813  
 validation\_1-logloss:0.16822 validation\_1-error:0.04348  
 [28] validation\_0-logloss:0.14189 validation\_0-error:0.02851  
 validation\_1-logloss:0.16592 validation\_1-error:0.04348  
 [29] validation\_0-logloss:0.13936 validation\_0-error:0.02813  
 validation\_1-logloss:0.16522 validation\_1-error:0.04348  
 [30] validation\_0-logloss:0.13727 validation\_0-error:0.02776  
 validation\_1-logloss:0.16309 validation\_1-error:0.04348  
 [31] validation\_0-logloss:0.13512 validation\_0-error:0.02701  
 validation\_1-logloss:0.16072 validation\_1-error:0.04348  
 [32] validation\_0-logloss:0.13202 validation\_0-error:0.02701  
 validation\_1-logloss:0.15937 validation\_1-error:0.04198  
 [33] validation\_0-logloss:0.12931 validation\_0-error:0.02701  
 validation\_1-logloss:0.15878 validation\_1-error:0.04198  
 [34] validation\_0-logloss:0.12746 validation\_0-error:0.02626  
 validation\_1-logloss:0.15680 validation\_1-error:0.04198  
 [35] validation\_0-logloss:0.12490 validation\_0-error:0.02663  
 validation\_1-logloss:0.15596 validation\_1-error:0.04198

[36] validation\_0-logloss:0.12353 validation\_0-error:0.02738  
validation\_1-logloss:0.15593 validation\_1-error:0.04198  
[37] validation\_0-logloss:0.12196 validation\_0-error:0.02663  
validation\_1-logloss:0.15551 validation\_1-error:0.04198  
[38] validation\_0-logloss:0.12040 validation\_0-error:0.02663  
validation\_1-logloss:0.15364 validation\_1-error:0.04198  
[39] validation\_0-logloss:0.11951 validation\_0-error:0.02663  
validation\_1-logloss:0.15331 validation\_1-error:0.03898  
[40] validation\_0-logloss:0.11850 validation\_0-error:0.02626  
validation\_1-logloss:0.15314 validation\_1-error:0.03748  
[41] validation\_0-logloss:0.11719 validation\_0-error:0.02701  
validation\_1-logloss:0.15309 validation\_1-error:0.03748  
[42] validation\_0-logloss:0.11626 validation\_0-error:0.02663  
validation\_1-logloss:0.15199 validation\_1-error:0.03748  
[43] validation\_0-logloss:0.11494 validation\_0-error:0.02701  
validation\_1-logloss:0.15204 validation\_1-error:0.03748  
[44] validation\_0-logloss:0.11429 validation\_0-error:0.02738  
validation\_1-logloss:0.15097 validation\_1-error:0.03748  
[45] validation\_0-logloss:0.11249 validation\_0-error:0.02663  
validation\_1-logloss:0.15057 validation\_1-error:0.03748  
[46] validation\_0-logloss:0.11173 validation\_0-error:0.02701  
validation\_1-logloss:0.14944 validation\_1-error:0.03748  
[47] validation\_0-logloss:0.11098 validation\_0-error:0.02701  
validation\_1-logloss:0.14941 validation\_1-error:0.03748  
[48] validation\_0-logloss:0.10999 validation\_0-error:0.02738  
validation\_1-logloss:0.14805 validation\_1-error:0.03748  
[49] validation\_0-logloss:0.10954 validation\_0-error:0.02738  
validation\_1-logloss:0.14797 validation\_1-error:0.03598  
[50] validation\_0-logloss:0.10881 validation\_0-error:0.02738  
validation\_1-logloss:0.14754 validation\_1-error:0.03598  
[51] validation\_0-logloss:0.10811 validation\_0-error:0.02738  
validation\_1-logloss:0.14772 validation\_1-error:0.03748  
[52] validation\_0-logloss:0.10761 validation\_0-error:0.02738  
validation\_1-logloss:0.14780 validation\_1-error:0.03748  
[53] validation\_0-logloss:0.10703 validation\_0-error:0.02738  
validation\_1-logloss:0.14710 validation\_1-error:0.03748  
[54] validation\_0-logloss:0.10585 validation\_0-error:0.02738  
validation\_1-logloss:0.14762 validation\_1-error:0.03748  
[55] validation\_0-logloss:0.10506 validation\_0-error:0.02776  
validation\_1-logloss:0.14700 validation\_1-error:0.03748  
[56] validation\_0-logloss:0.10431 validation\_0-error:0.02776  
validation\_1-logloss:0.14674 validation\_1-error:0.03748  
[57] validation\_0-logloss:0.10386 validation\_0-error:0.02776  
validation\_1-logloss:0.14666 validation\_1-error:0.03748  
[58] validation\_0-logloss:0.10358 validation\_0-error:0.02738  
validation\_1-logloss:0.14688 validation\_1-error:0.03748  
[59] validation\_0-logloss:0.10261 validation\_0-error:0.02738  
validation\_1-logloss:0.14724 validation\_1-error:0.03598

```

[60]    validation_0-logloss:0.10227    validation_0-error:0.02738
validation_1-logloss:0.14712    validation_1-error:0.03598
[61]    validation_0-logloss:0.10135    validation_0-error:0.02738
validation_1-logloss:0.14770    validation_1-error:0.03748
[62]    validation_0-logloss:0.10090    validation_0-error:0.02738
validation_1-logloss:0.14780    validation_1-error:0.03748
[63]    validation_0-logloss:0.10043    validation_0-error:0.02738
validation_1-logloss:0.14818    validation_1-error:0.03748
[64]    validation_0-logloss:0.09935    validation_0-error:0.02738
validation_1-logloss:0.14845    validation_1-error:0.03598

```

C:\Users\sci\anaconda3\lib\site-packages\xgboost\sklearn.py:888: UserWarning:  
The use of label encoder in XGBClassifier is deprecated and will be removed in a  
future release. To remove this warning, do the following: 1) Pass option  
use\_label\_encoder=False when constructing XGBClassifier object; and 2) Encode  
your labels (y) as integers starting with 0, i.e. 0, 1, 2, ..., [num\_class - 1].  
warnings.warn(label\_encoder\_deprecation\_msg, UserWarning)

```

[65]    validation_0-logloss:0.09880    validation_0-error:0.02738
validation_1-logloss:0.14866    validation_1-error:0.03448
[66]    validation_0-logloss:0.09817    validation_0-error:0.02738
validation_1-logloss:0.14854    validation_1-error:0.03598
[67]    validation_0-logloss:0.09764    validation_0-error:0.02738
validation_1-logloss:0.14865    validation_1-error:0.03598
[68]    validation_0-logloss:0.09714    validation_0-error:0.02738
validation_1-logloss:0.14867    validation_1-error:0.03748
[69]    validation_0-logloss:0.09668    validation_0-error:0.02701
validation_1-logloss:0.14907    validation_1-error:0.03598
[70]    validation_0-logloss:0.09621    validation_0-error:0.02738
validation_1-logloss:0.14819    validation_1-error:0.03598
[71]    validation_0-logloss:0.09575    validation_0-error:0.02738
validation_1-logloss:0.14839    validation_1-error:0.03598
[72]    validation_0-logloss:0.09529    validation_0-error:0.02738
validation_1-logloss:0.14864    validation_1-error:0.03598
[73]    validation_0-logloss:0.09483    validation_0-error:0.02701
validation_1-logloss:0.14866    validation_1-error:0.03598
[74]    validation_0-logloss:0.09424    validation_0-error:0.02701
validation_1-logloss:0.14765    validation_1-error:0.03598
[75]    validation_0-logloss:0.09373    validation_0-error:0.02701
validation_1-logloss:0.14749    validation_1-error:0.03748
[76]    validation_0-logloss:0.09322    validation_0-error:0.02663
validation_1-logloss:0.14701    validation_1-error:0.03748
[77]    validation_0-logloss:0.09271    validation_0-error:0.02701
validation_1-logloss:0.14694    validation_1-error:0.03748
[78]    validation_0-logloss:0.09236    validation_0-error:0.02663
validation_1-logloss:0.14692    validation_1-error:0.03748
[79]    validation_0-logloss:0.09200    validation_0-error:0.02626
validation_1-logloss:0.14679    validation_1-error:0.03748
[80]    validation_0-logloss:0.09139    validation_0-error:0.02626

```

validation\_1-logloss:0.14648      validation\_1-error:0.03748  
 [81]      validation\_0-logloss:0.09064      validation\_0-error:0.02588  
 validation\_1-logloss:0.14673      validation\_1-error:0.03748  
 [82]      validation\_0-logloss:0.09022      validation\_0-error:0.02588  
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 [83]      validation\_0-logloss:0.08985      validation\_0-error:0.02663  
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 [84]      validation\_0-logloss:0.08943      validation\_0-error:0.02626  
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 [85]      validation\_0-logloss:0.08896      validation\_0-error:0.02626  
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 [86]      validation\_0-logloss:0.08867      validation\_0-error:0.02626  
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 [87]      validation\_0-logloss:0.08832      validation\_0-error:0.02626  
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 [88]      validation\_0-logloss:0.08817      validation\_0-error:0.02626  
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 [89]      validation\_0-logloss:0.08798      validation\_0-error:0.02626  
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 [0]      validation\_0-logloss:0.61545      validation\_0-error:0.04989  
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 [1]      validation\_0-logloss:0.55171      validation\_0-error:0.04876  
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 [2]      validation\_0-logloss:0.49845      validation\_0-error:0.04839  
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 [3]      validation\_0-logloss:0.45329      validation\_0-error:0.04764  
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 [4]      validation\_0-logloss:0.41480      validation\_0-error:0.04839  
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 [5]      validation\_0-logloss:0.38197      validation\_0-error:0.04726  
 validation\_1-logloss:0.39193      validation\_1-error:0.07046  
 [6]      validation\_0-logloss:0.35303      validation\_0-error:0.04689  
 validation\_1-logloss:0.36511      validation\_1-error:0.07046  
 [7]      validation\_0-logloss:0.32795      validation\_0-error:0.04614  
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 [8]      validation\_0-logloss:0.30618      validation\_0-error:0.04239  
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 [9]      validation\_0-logloss:0.28742      validation\_0-error:0.04239  
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 [10]      validation\_0-logloss:0.26975      validation\_0-error:0.04351  
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 [11]      validation\_0-logloss:0.25427      validation\_0-error:0.04501  
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 [14]      validation\_0-logloss:0.21746      validation\_0-error:0.04013



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 [19] validation\_0-logloss:0.17807 validation\_0-error:0.03638  
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 [20] validation\_0-logloss:0.17291 validation\_0-error:0.03676  
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 [21] validation\_0-logloss:0.16771 validation\_0-error:0.03601  
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 [26] validation\_0-logloss:0.14689 validation\_0-error:0.03488  
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 [32] validation\_0-logloss:0.13271 validation\_0-error:0.03151  
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 [33] validation\_0-logloss:0.13064 validation\_0-error:0.03151  
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 [36] validation\_0-logloss:0.12462 validation\_0-error:0.03151  
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 [37] validation\_0-logloss:0.12311 validation\_0-error:0.03113  
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 [38] validation\_0-logloss:0.12143 validation\_0-error:0.03151

validation\_1-logloss:0.16447      validation\_1-error:0.04198  
 [39]      validation\_0-logloss:0.12035      validation\_0-error:0.03151  
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 [40]      validation\_0-logloss:0.11922      validation\_0-error:0.03151  
 validation\_1-logloss:0.16378      validation\_1-error:0.04048  
 [41]      validation\_0-logloss:0.11848      validation\_0-error:0.03113  
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 [42]      validation\_0-logloss:0.11751      validation\_0-error:0.03076  
 validation\_1-logloss:0.16285      validation\_1-error:0.04048  
 [43]      validation\_0-logloss:0.11665      validation\_0-error:0.03076  
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 [44]      validation\_0-logloss:0.11506      validation\_0-error:0.03038  
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 [45]      validation\_0-logloss:0.11355      validation\_0-error:0.03001  
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 [46]      validation\_0-logloss:0.11199      validation\_0-error:0.03001  
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 [47]      validation\_0-logloss:0.11081      validation\_0-error:0.02963  
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 [48]      validation\_0-logloss:0.10983      validation\_0-error:0.02926  
 validation\_1-logloss:0.16088      validation\_1-error:0.04348  
 [49]      validation\_0-logloss:0.10895      validation\_0-error:0.02926  
 validation\_1-logloss:0.16081      validation\_1-error:0.04348  
 [50]      validation\_0-logloss:0.10814      validation\_0-error:0.02926  
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 [52]      validation\_0-logloss:0.10693      validation\_0-error:0.02926  
 validation\_1-logloss:0.16066      validation\_1-error:0.04498  
 [53]      validation\_0-logloss:0.10624      validation\_0-error:0.02926  
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 [54]      validation\_0-logloss:0.10506      validation\_0-error:0.02851  
 validation\_1-logloss:0.16065      validation\_1-error:0.04798  
 [55]      validation\_0-logloss:0.10413      validation\_0-error:0.02813  
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 [56]      validation\_0-logloss:0.10366      validation\_0-error:0.02813  
 validation\_1-logloss:0.16142      validation\_1-error:0.04498  
 [57]      validation\_0-logloss:0.10327      validation\_0-error:0.02776  
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 [58]      validation\_0-logloss:0.10293      validation\_0-error:0.02776  
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 [59]      validation\_0-logloss:0.10228      validation\_0-error:0.02813  
 validation\_1-logloss:0.16142      validation\_1-error:0.04648  
 [60]      validation\_0-logloss:0.10114      validation\_0-error:0.02738  
 validation\_1-logloss:0.16159      validation\_1-error:0.04648  
 [61]      validation\_0-logloss:0.10044      validation\_0-error:0.02663  
 validation\_1-logloss:0.16219      validation\_1-error:0.04648  
 [62]      validation\_0-logloss:0.10014      validation\_0-error:0.02663

```

validation_1-logloss:0.16170    validation_1-error:0.04648
[63]   validation_0-logloss:0.09903    validation_0-error:0.02663
validation_1-logloss:0.16182    validation_1-error:0.04648
[64]   validation_0-logloss:0.09867    validation_0-error:0.02663
validation_1-logloss:0.16213    validation_1-error:0.04648
[65]   validation_0-logloss:0.09797    validation_0-error:0.02626
validation_1-logloss:0.16266    validation_1-error:0.04648
[66]   validation_0-logloss:0.09762    validation_0-error:0.02663
validation_1-logloss:0.16222    validation_1-error:0.04648
[67]   validation_0-logloss:0.09663    validation_0-error:0.02588
validation_1-logloss:0.16173    validation_1-error:0.04648
[68]   validation_0-logloss:0.09580    validation_0-error:0.02626
validation_1-logloss:0.16131    validation_1-error:0.04498
[69]   validation_0-logloss:0.09546    validation_0-error:0.02588
validation_1-logloss:0.16145    validation_1-error:0.04498
[70]   validation_0-logloss:0.09519    validation_0-error:0.02588
validation_1-logloss:0.16080    validation_1-error:0.04498
[71]   validation_0-logloss:0.09435    validation_0-error:0.02588
validation_1-logloss:0.16067    validation_1-error:0.04498
[72]   validation_0-logloss:0.09414    validation_0-error:0.02588
validation_1-logloss:0.16055    validation_1-error:0.04498
[73]   validation_0-logloss:0.09372    validation_0-error:0.02551
validation_1-logloss:0.16052    validation_1-error:0.04498
[74]   validation_0-logloss:0.09349    validation_0-error:0.02551
validation_1-logloss:0.16047    validation_1-error:0.04648
[75]   validation_0-logloss:0.09288    validation_0-error:0.02513
validation_1-logloss:0.16090    validation_1-error:0.04498
[76]   validation_0-logloss:0.09236    validation_0-error:0.02513
validation_1-logloss:0.16036    validation_1-error:0.04498
[77]   validation_0-logloss:0.09215    validation_0-error:0.02513
validation_1-logloss:0.16031    validation_1-error:0.04498
[78]   validation_0-logloss:0.09170    validation_0-error:0.02513
validation_1-logloss:0.16045    validation_1-error:0.04348
[79]   validation_0-logloss:0.09147    validation_0-error:0.02476
validation_1-logloss:0.16015    validation_1-error:0.04198
[80]   validation_0-logloss:0.09059    validation_0-error:0.02476
validation_1-logloss:0.15965    validation_1-error:0.04198
[81]   validation_0-logloss:0.09032    validation_0-error:0.02513
validation_1-logloss:0.15970    validation_1-error:0.04198

```

```

C:\Users\sci\anaconda3\lib\site-packages\xgboost\sklearn.py:888: UserWarning:
The use of label encoder in XGBClassifier is deprecated and will be removed in a
future release. To remove this warning, do the following: 1) Pass option
use_label_encoder=False when constructing XGBClassifier object; and 2) Encode
your labels (y) as integers starting with 0, i.e. 0, 1, 2, ..., [num_class - 1].
  warnings.warn(label_encoder_deprecation_msg, UserWarning)

```

```

[82]   validation_0-logloss:0.09005    validation_0-error:0.02476
validation_1-logloss:0.15967    validation_1-error:0.04198

```

[83] validation\_0-logloss:0.08957 validation\_0-error:0.02438  
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 [84] validation\_0-logloss:0.08909 validation\_0-error:0.02438  
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 [85] validation\_0-logloss:0.08888 validation\_0-error:0.02438  
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 [86] validation\_0-logloss:0.08843 validation\_0-error:0.02476  
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 [87] validation\_0-logloss:0.08817 validation\_0-error:0.02476  
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 [88] validation\_0-logloss:0.08793 validation\_0-error:0.02438  
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 [89] validation\_0-logloss:0.08722 validation\_0-error:0.02401  
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 [0] validation\_0-logloss:0.61582 validation\_0-error:0.05064  
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 [1] validation\_0-logloss:0.55229 validation\_0-error:0.04726  
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 [2] validation\_0-logloss:0.49964 validation\_0-error:0.04689  
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 [3] validation\_0-logloss:0.45437 validation\_0-error:0.04689  
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 [5] validation\_0-logloss:0.38385 validation\_0-error:0.04614  
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 [6] validation\_0-logloss:0.35538 validation\_0-error:0.04539  
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 [7] validation\_0-logloss:0.33069 validation\_0-error:0.04501  
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 [8] validation\_0-logloss:0.30717 validation\_0-error:0.04501  
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 [9] validation\_0-logloss:0.28698 validation\_0-error:0.04426  
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 [11] validation\_0-logloss:0.25326 validation\_0-error:0.03901  
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 [13] validation\_0-logloss:0.22708 validation\_0-error:0.03751  
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[17] validation\_0-logloss:0.18958 validation\_0-error:0.03601  
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```
[89]    validation_0-logloss:0.08515    validation_0-error:0.02476
validation_1-logloss:0.15349    validation_1-error:0.03898
```

```
C:\Users\sci\anaconda3\lib\site-packages\xgboost\sklearn.py:888: UserWarning:
The use of label encoder in XGBClassifier is deprecated and will be removed in a
future release. To remove this warning, do the following: 1) Pass option
use_label_encoder=False when constructing XGBClassifier object; and 2) Encode
your labels (y) as integers starting with 0, i.e. 0, 1, 2, ..., [num_class - 1].
warnings.warn(label_encoder_deprecation_msg, UserWarning)
```

```
C:\Users\sci\anaconda3\lib\site-packages\xgboost\sklearn.py:888: UserWarning:
The use of label encoder in XGBClassifier is deprecated and will be removed in a
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warnings.warn(label_encoder_deprecation_msg, UserWarning)
```

```
[0]    validation_0-logloss:0.61605    validation_0-error:0.04801
validation_1-logloss:0.61867    validation_1-error:0.06447
[1]    validation_0-logloss:0.55288    validation_0-error:0.04726
validation_1-logloss:0.55768    validation_1-error:0.06147
[2]    validation_0-logloss:0.50018    validation_0-error:0.04764
validation_1-logloss:0.50634    validation_1-error:0.06297
[3]    validation_0-logloss:0.45547    validation_0-error:0.04726
validation_1-logloss:0.46285    validation_1-error:0.06147
[4]    validation_0-logloss:0.41734    validation_0-error:0.04726
validation_1-logloss:0.42669    validation_1-error:0.06147
[5]    validation_0-logloss:0.38440    validation_0-error:0.04764
validation_1-logloss:0.39375    validation_1-error:0.06297
[6]    validation_0-logloss:0.35590    validation_0-error:0.04726
validation_1-logloss:0.36561    validation_1-error:0.06297
[7]    validation_0-logloss:0.33133    validation_0-error:0.04689
validation_1-logloss:0.34297    validation_1-error:0.06147
[8]    validation_0-logloss:0.30817    validation_0-error:0.04726
validation_1-logloss:0.31959    validation_1-error:0.06297
[9]    validation_0-logloss:0.28743    validation_0-error:0.04689
validation_1-logloss:0.29934    validation_1-error:0.06297
[10]   validation_0-logloss:0.26928    validation_0-error:0.04539
validation_1-logloss:0.28167    validation_1-error:0.05997
[11]   validation_0-logloss:0.25376    validation_0-error:0.04163
validation_1-logloss:0.26623    validation_1-error:0.05247
[12]   validation_0-logloss:0.23946    validation_0-error:0.04163
validation_1-logloss:0.25274    validation_1-error:0.05097
[13]   validation_0-logloss:0.22691    validation_0-error:0.04239
validation_1-logloss:0.24068    validation_1-error:0.05247
[14]   validation_0-logloss:0.21621    validation_0-error:0.03976
validation_1-logloss:0.23013    validation_1-error:0.04798
[15]   validation_0-logloss:0.20645    validation_0-error:0.03788
validation_1-logloss:0.22102    validation_1-error:0.04498
[16]   validation_0-logloss:0.19709    validation_0-error:0.03638
```



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 [17]      validation\_0-logloss:0.18923      validation\_0-error:0.03601  
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 validation\_1-logloss:0.14343 validation\_1-error:0.04198  
 [107] validation\_0-logloss:0.07512 validation\_0-error:0.02138  
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 [108] validation\_0-logloss:0.07452 validation\_0-error:0.02213  
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 [109] validation\_0-logloss:0.07435 validation\_0-error:0.02176  
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 [110] validation\_0-logloss:0.07409 validation\_0-error:0.02213  
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 [111] validation\_0-logloss:0.07371 validation\_0-error:0.02213  
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 [112] validation\_0-logloss:0.07299 validation\_0-error:0.02176

validation\_1-logloss:0.14374      validation\_1-error:0.04198  
[113]    validation\_0-logloss:0.07244      validation\_0-error:0.02176  
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[114]    validation\_0-logloss:0.07220      validation\_0-error:0.02063  
validation\_1-logloss:0.14366      validation\_1-error:0.04198  
[115]    validation\_0-logloss:0.07161      validation\_0-error:0.02063  
validation\_1-logloss:0.14403      validation\_1-error:0.04198  
[116]    validation\_0-logloss:0.07145      validation\_0-error:0.02063  
validation\_1-logloss:0.14394      validation\_1-error:0.04048  
[117]    validation\_0-logloss:0.07132      validation\_0-error:0.02063  
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[118]    validation\_0-logloss:0.07109      validation\_0-error:0.02063  
validation\_1-logloss:0.14388      validation\_1-error:0.04048  
[119]    validation\_0-logloss:0.07040      validation\_0-error:0.02025  
validation\_1-logloss:0.14417      validation\_1-error:0.04048  
[0]      validation\_0-logloss:0.61565      validation\_0-error:0.04839  
validation\_1-logloss:0.61723      validation\_1-error:0.05997  
[1]      validation\_0-logloss:0.55172      validation\_0-error:0.04539  
validation\_1-logloss:0.55447      validation\_1-error:0.05697  
[2]      validation\_0-logloss:0.49874      validation\_0-error:0.04651  
validation\_1-logloss:0.50336      validation\_1-error:0.05997  
[3]      validation\_0-logloss:0.45368      validation\_0-error:0.04539  
validation\_1-logloss:0.45917      validation\_1-error:0.05697  
[4]      validation\_0-logloss:0.41537      validation\_0-error:0.04539  
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[5]      validation\_0-logloss:0.38260      validation\_0-error:0.04501  
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[6]      validation\_0-logloss:0.35419      validation\_0-error:0.04501  
validation\_1-logloss:0.36148      validation\_1-error:0.05247  
[7]      validation\_0-logloss:0.32923      validation\_0-error:0.04464  
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[8]      validation\_0-logloss:0.30632      validation\_0-error:0.04389  
validation\_1-logloss:0.31420      validation\_1-error:0.05247  
[9]      validation\_0-logloss:0.28619      validation\_0-error:0.04426  
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[10]     validation\_0-logloss:0.26873      validation\_0-error:0.04426  
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[11]     validation\_0-logloss:0.25348      validation\_0-error:0.04314  
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[12]     validation\_0-logloss:0.23986      validation\_0-error:0.04201  
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[13]     validation\_0-logloss:0.22768      validation\_0-error:0.03939  
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[14]     validation\_0-logloss:0.21693      validation\_0-error:0.03901  
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[15]     validation\_0-logloss:0.20732      validation\_0-error:0.03826  
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[16]     validation\_0-logloss:0.19832      validation\_0-error:0.03751

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 [17]      validation\_0-logloss:0.19010      validation\_0-error:0.03713  
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 [19]      validation\_0-logloss:0.17621      validation\_0-error:0.03713  
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 [20]      validation\_0-logloss:0.17032      validation\_0-error:0.03676  
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 [21]      validation\_0-logloss:0.16521      validation\_0-error:0.03713  
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 [22]      validation\_0-logloss:0.16126      validation\_0-error:0.03601  
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 [23]      validation\_0-logloss:0.15673      validation\_0-error:0.03526  
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 [24]      validation\_0-logloss:0.15314      validation\_0-error:0.03488  
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 [25]      validation\_0-logloss:0.15029      validation\_0-error:0.03376  
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 [26]      validation\_0-logloss:0.14739      validation\_0-error:0.03338  
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 [27]      validation\_0-logloss:0.14393      validation\_0-error:0.03226  
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 [28]      validation\_0-logloss:0.14180      validation\_0-error:0.03263  
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 [29]      validation\_0-logloss:0.13945      validation\_0-error:0.03226  
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 [30]      validation\_0-logloss:0.13661      validation\_0-error:0.03151  
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 [31]      validation\_0-logloss:0.13512      validation\_0-error:0.03151  
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 [32]      validation\_0-logloss:0.13253      validation\_0-error:0.03113  
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 [33]      validation\_0-logloss:0.13086      validation\_0-error:0.03113  
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 [34]      validation\_0-logloss:0.12954      validation\_0-error:0.03038  
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 [35]      validation\_0-logloss:0.12837      validation\_0-error:0.03038  
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 [36]      validation\_0-logloss:0.12696      validation\_0-error:0.03038  
 validation\_1-logloss:0.15171      validation\_1-error:0.03748  
 [37]      validation\_0-logloss:0.12542      validation\_0-error:0.03038  
 validation\_1-logloss:0.15095      validation\_1-error:0.03748  
 [38]      validation\_0-logloss:0.12469      validation\_0-error:0.03001  
 validation\_1-logloss:0.15049      validation\_1-error:0.03748  
 [39]      validation\_0-logloss:0.12346      validation\_0-error:0.03038  
 validation\_1-logloss:0.14921      validation\_1-error:0.03598  
 [40]      validation\_0-logloss:0.12273      validation\_0-error:0.03001

validation\_1-logloss:0.14920      validation\_1-error:0.03748  
[41]      validation\_0-logloss:0.12140      validation\_0-error:0.03001  
validation\_1-logloss:0.14880      validation\_1-error:0.03598  
[42]      validation\_0-logloss:0.12061      validation\_0-error:0.02963  
validation\_1-logloss:0.14869      validation\_1-error:0.03598  
[43]      validation\_0-logloss:0.11957      validation\_0-error:0.02963  
validation\_1-logloss:0.14834      validation\_1-error:0.03598  
[44]      validation\_0-logloss:0.11822      validation\_0-error:0.02963  
validation\_1-logloss:0.14805      validation\_1-error:0.03598  
[45]      validation\_0-logloss:0.11642      validation\_0-error:0.02963  
validation\_1-logloss:0.14742      validation\_1-error:0.03598  
[46]      validation\_0-logloss:0.11565      validation\_0-error:0.02963  
validation\_1-logloss:0.14733      validation\_1-error:0.03598  
[47]      validation\_0-logloss:0.11481      validation\_0-error:0.03001  
validation\_1-logloss:0.14671      validation\_1-error:0.03598  
[48]      validation\_0-logloss:0.11309      validation\_0-error:0.02963  
validation\_1-logloss:0.14667      validation\_1-error:0.03598  
[49]      validation\_0-logloss:0.11215      validation\_0-error:0.02963  
validation\_1-logloss:0.14672      validation\_1-error:0.03598  
[50]      validation\_0-logloss:0.11158      validation\_0-error:0.02963  
validation\_1-logloss:0.14652      validation\_1-error:0.03598  
[51]      validation\_0-logloss:0.11034      validation\_0-error:0.02888  
validation\_1-logloss:0.14627      validation\_1-error:0.03448  
[52]      validation\_0-logloss:0.10954      validation\_0-error:0.02888  
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[53]      validation\_0-logloss:0.10872      validation\_0-error:0.02888  
validation\_1-logloss:0.14662      validation\_1-error:0.03448  
[54]      validation\_0-logloss:0.10799      validation\_0-error:0.02813  
validation\_1-logloss:0.14631      validation\_1-error:0.03448  
[55]      validation\_0-logloss:0.10762      validation\_0-error:0.02813  
validation\_1-logloss:0.14644      validation\_1-error:0.03598  
[56]      validation\_0-logloss:0.10663      validation\_0-error:0.02813  
validation\_1-logloss:0.14647      validation\_1-error:0.03448  
[57]      validation\_0-logloss:0.10564      validation\_0-error:0.02813  
validation\_1-logloss:0.14627      validation\_1-error:0.03448  
[58]      validation\_0-logloss:0.10476      validation\_0-error:0.02813  
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[59]      validation\_0-logloss:0.10422      validation\_0-error:0.02776  
validation\_1-logloss:0.14664      validation\_1-error:0.03448  
[60]      validation\_0-logloss:0.10364      validation\_0-error:0.02738  
validation\_1-logloss:0.14676      validation\_1-error:0.03598  
[61]      validation\_0-logloss:0.10329      validation\_0-error:0.02738  
validation\_1-logloss:0.14654      validation\_1-error:0.03598  
[62]      validation\_0-logloss:0.10277      validation\_0-error:0.02738  
validation\_1-logloss:0.14655      validation\_1-error:0.03598  
[63]      validation\_0-logloss:0.10230      validation\_0-error:0.02663  
validation\_1-logloss:0.14642      validation\_1-error:0.03748  
[64]      validation\_0-logloss:0.10187      validation\_0-error:0.02701

```

validation_1-logloss:0.14640    validation_1-error:0.03448
[65]   validation_0-logloss:0.10150    validation_0-error:0.02701
validation_1-logloss:0.14661    validation_1-error:0.03448
[66]   validation_0-logloss:0.10105    validation_0-error:0.02663
validation_1-logloss:0.14640    validation_1-error:0.03598
[67]   validation_0-logloss:0.10011    validation_0-error:0.02626
validation_1-logloss:0.14655    validation_1-error:0.03598
[68]   validation_0-logloss:0.09961    validation_0-error:0.02626
validation_1-logloss:0.14649    validation_1-error:0.03748
[69]   validation_0-logloss:0.09871    validation_0-error:0.02663
validation_1-logloss:0.14688    validation_1-error:0.03748
[70]   validation_0-logloss:0.09811    validation_0-error:0.02663
validation_1-logloss:0.14694    validation_1-error:0.03598
[71]   validation_0-logloss:0.09735    validation_0-error:0.02663
validation_1-logloss:0.14733    validation_1-error:0.03598
[72]   validation_0-logloss:0.09713    validation_0-error:0.02663
validation_1-logloss:0.14738    validation_1-error:0.03598
[73]   validation_0-logloss:0.09660    validation_0-error:0.02663
validation_1-logloss:0.14742    validation_1-error:0.03598
[74]   validation_0-logloss:0.09541    validation_0-error:0.02663
validation_1-logloss:0.14753    validation_1-error:0.03598
[75]   validation_0-logloss:0.09507    validation_0-error:0.02663
validation_1-logloss:0.14769    validation_1-error:0.03598
[76]   validation_0-logloss:0.09480    validation_0-error:0.02663
validation_1-logloss:0.14771    validation_1-error:0.03598
[77]   validation_0-logloss:0.09387    validation_0-error:0.02663
validation_1-logloss:0.14811    validation_1-error:0.03598
[78]   validation_0-logloss:0.09365    validation_0-error:0.02663
validation_1-logloss:0.14827    validation_1-error:0.03598
[79]   validation_0-logloss:0.09342    validation_0-error:0.02663
validation_1-logloss:0.14844    validation_1-error:0.03598
[80]   validation_0-logloss:0.09209    validation_0-error:0.02663
validation_1-logloss:0.14863    validation_1-error:0.03298
[81]   validation_0-logloss:0.09135    validation_0-error:0.02663
validation_1-logloss:0.14837    validation_1-error:0.03298
[82]   validation_0-logloss:0.09087    validation_0-error:0.02663
validation_1-logloss:0.14823    validation_1-error:0.03448

```

```

C:\Users\sci\anaconda3\lib\site-packages\xgboost\sklearn.py:888: UserWarning:
The use of label encoder in XGBClassifier is deprecated and will be removed in a
future release. To remove this warning, do the following: 1) Pass option
use_label_encoder=False when constructing XGBClassifier object; and 2) Encode
your labels (y) as integers starting with 0, i.e. 0, 1, 2, ..., [num_class - 1].
  warnings.warn(label_encoder_deprecation_msg, UserWarning)

```

```

[83]   validation_0-logloss:0.09051    validation_0-error:0.02663
validation_1-logloss:0.14850    validation_1-error:0.03448
[84]   validation_0-logloss:0.09008    validation_0-error:0.02663
validation_1-logloss:0.14850    validation_1-error:0.03598

```



[85] validation\_0-logloss:0.08945 validation\_0-error:0.02626  
 validation\_1-logloss:0.14863 validation\_1-error:0.03598  
 [86] validation\_0-logloss:0.08891 validation\_0-error:0.02626  
 validation\_1-logloss:0.14865 validation\_1-error:0.03598  
 [87] validation\_0-logloss:0.08865 validation\_0-error:0.02588  
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 [88] validation\_0-logloss:0.08805 validation\_0-error:0.02588  
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 [89] validation\_0-logloss:0.08771 validation\_0-error:0.02588  
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 [90] validation\_0-logloss:0.08694 validation\_0-error:0.02588  
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 [91] validation\_0-logloss:0.08671 validation\_0-error:0.02588  
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 [94] validation\_0-logloss:0.08519 validation\_0-error:0.02588  
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 [95] validation\_0-logloss:0.08438 validation\_0-error:0.02626  
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 [96] validation\_0-logloss:0.08370 validation\_0-error:0.02626  
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 [97] validation\_0-logloss:0.08349 validation\_0-error:0.02626  
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 [98] validation\_0-logloss:0.08325 validation\_0-error:0.02626  
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 [100] validation\_0-logloss:0.08209 validation\_0-error:0.02626  
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 [101] validation\_0-logloss:0.08119 validation\_0-error:0.02588  
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 [102] validation\_0-logloss:0.08032 validation\_0-error:0.02588  
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 [103] validation\_0-logloss:0.07996 validation\_0-error:0.02551  
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[109] validation\_0-logloss:0.07761 validation\_0-error:0.02476  
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 [3] validation\_0-logloss:0.45516 validation\_0-error:0.05064  
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 [5] validation\_0-logloss:0.38168 validation\_0-error:0.04651  
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 [7] validation\_0-logloss:0.32671 validation\_0-error:0.04051  
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 [8] validation\_0-logloss:0.30413 validation\_0-error:0.04051  
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 [9] validation\_0-logloss:0.28422 validation\_0-error:0.03751  
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 [83] validation\_0-logloss:0.08985 validation\_0-error:0.02663  
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```

[85]    validation_0-logloss:0.08896    validation_0-error:0.02626
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[86]    validation_0-logloss:0.08867    validation_0-error:0.02626
validation_1-logloss:0.14623    validation_1-error:0.03748
[87]    validation_0-logloss:0.08832    validation_0-error:0.02626
validation_1-logloss:0.14671    validation_1-error:0.03898
[88]    validation_0-logloss:0.08817    validation_0-error:0.02626
validation_1-logloss:0.14675    validation_1-error:0.04048
[89]    validation_0-logloss:0.08798    validation_0-error:0.02626
validation_1-logloss:0.14709    validation_1-error:0.04048
[90]    validation_0-logloss:0.08737    validation_0-error:0.02551
validation_1-logloss:0.14685    validation_1-error:0.03898
[91]    validation_0-logloss:0.08711    validation_0-error:0.02513
validation_1-logloss:0.14653    validation_1-error:0.03898
[92]    validation_0-logloss:0.08652    validation_0-error:0.02551
validation_1-logloss:0.14666    validation_1-error:0.04048
[93]    validation_0-logloss:0.08613    validation_0-error:0.02551
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[94]    validation_0-logloss:0.08585    validation_0-error:0.02476
validation_1-logloss:0.14687    validation_1-error:0.03898
[95]    validation_0-logloss:0.08528    validation_0-error:0.02438
validation_1-logloss:0.14677    validation_1-error:0.03898
[96]    validation_0-logloss:0.08454    validation_0-error:0.02438
validation_1-logloss:0.14702    validation_1-error:0.04048
[97]    validation_0-logloss:0.08414    validation_0-error:0.02438
validation_1-logloss:0.14661    validation_1-error:0.04048
[98]    validation_0-logloss:0.08375    validation_0-error:0.02438
validation_1-logloss:0.14673    validation_1-error:0.04048

```

C:\Users\sci\anaconda3\lib\site-packages\xgboost\sklearn.py:888: UserWarning:  
The use of label encoder in XGBClassifier is deprecated and will be removed in a  
future release. To remove this warning, do the following: 1) Pass option  
use\_label\_encoder=False when constructing XGBClassifier object; and 2) Encode  
your labels (y) as integers starting with 0, i.e. 0, 1, 2, ..., [num\_class - 1].  
warnings.warn(label\_encoder\_deprecation\_msg, UserWarning)

```

[99]    validation_0-logloss:0.08351    validation_0-error:0.02438
validation_1-logloss:0.14661    validation_1-error:0.04048
[100]   validation_0-logloss:0.08296    validation_0-error:0.02401
validation_1-logloss:0.14706    validation_1-error:0.04048
[101]   validation_0-logloss:0.08269    validation_0-error:0.02401
validation_1-logloss:0.14741    validation_1-error:0.04048
[102]   validation_0-logloss:0.08233    validation_0-error:0.02401
validation_1-logloss:0.14752    validation_1-error:0.04048
[103]   validation_0-logloss:0.08204    validation_0-error:0.02363
validation_1-logloss:0.14736    validation_1-error:0.03898
[104]   validation_0-logloss:0.08173    validation_0-error:0.02363
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[105]   validation_0-logloss:0.08151    validation_0-error:0.02326

```

validation\_1-logloss:0.14724      validation\_1-error:0.04048  
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[112]    validation\_0-logloss:0.07938      validation\_0-error:0.02288  
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[113]    validation\_0-logloss:0.07915      validation\_0-error:0.02288  
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[114]    validation\_0-logloss:0.07882      validation\_0-error:0.02288  
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[115]    validation\_0-logloss:0.07866      validation\_0-error:0.02288  
validation\_1-logloss:0.14739      validation\_1-error:0.03598  
[116]    validation\_0-logloss:0.07849      validation\_0-error:0.02288  
validation\_1-logloss:0.14727      validation\_1-error:0.03748  
[117]    validation\_0-logloss:0.07796      validation\_0-error:0.02251  
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[118]    validation\_0-logloss:0.07773      validation\_0-error:0.02288  
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[3]      validation\_0-logloss:0.45329      validation\_0-error:0.04764  
validation\_1-logloss:0.46160      validation\_1-error:0.07196  
[4]      validation\_0-logloss:0.41480      validation\_0-error:0.04839  
validation\_1-logloss:0.42355      validation\_1-error:0.07196  
[5]      validation\_0-logloss:0.38197      validation\_0-error:0.04726  
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[6]      validation\_0-logloss:0.35303      validation\_0-error:0.04689  
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[7]      validation\_0-logloss:0.32795      validation\_0-error:0.04614  
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[8]      validation\_0-logloss:0.30618      validation\_0-error:0.04239  
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[9]      validation\_0-logloss:0.28742      validation\_0-error:0.04239

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[33]      validation\_0-logloss:0.13064      validation\_0-error:0.03151



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```

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C:\Users\sci\anaconda3\lib\site-packages\xgboost\sklearn.py:888: UserWarning:
The use of label encoder in XGBClassifier is deprecated and will be removed in a
future release. To remove this warning, do the following: 1) Pass option
use_label_encoder=False when constructing XGBClassifier object; and 2) Encode
your labels (y) as integers starting with 0, i.e. 0, 1, 2, ..., [num_class - 1].
warnings.warn(label_encoder_deprecation_msg, UserWarning)

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[78] validation\_0-logloss:0.09056 validation\_0-error:0.02626  
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 [95] validation\_0-logloss:0.08173 validation\_0-error:0.02438  
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 [96] validation\_0-logloss:0.08124 validation\_0-error:0.02438  
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 [101] validation\_0-logloss:0.07984 validation\_0-error:0.02326  
 validation\_1-logloss:0.15472 validation\_1-error:0.04048



C:\Users\sci\anaconda3\lib\site-packages\xgboost\sklearn.py:888: UserWarning:  
The use of label encoder in XGBClassifier is deprecated and will be removed in a  
future release. To remove this warning, do the following: 1) Pass option  
use\_label\_encoder=False when constructing XGBClassifier object; and 2) Encode  
your labels (y) as integers starting with 0, i.e. 0, 1, 2, ..., [num\_class - 1].  
warnings.warn(label\_encoder\_deprecation\_msg, UserWarning)

```
[102] validation_0-logloss:0.07943 validation_0-error:0.02326
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validation_1-logloss:0.15519 validation_1-error:0.04048
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validation_1-logloss:0.15555 validation_1-error:0.04048
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validation_1-logloss:0.62520 validation_1-error:0.06897
[2] validation_0-logloss:0.59327 validation_0-error:0.07014
```

validation\_1-logloss:0.59593      validation\_1-error:0.08846  
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 [19]      validation\_0-logloss:0.31710      validation\_0-error:0.05514  
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 [41]      validation\_0-logloss:0.19841      validation\_0-error:0.03713  
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 [44]      validation\_0-logloss:0.19008      validation\_0-error:0.03563  
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 [3]      validation\_0-logloss:0.56488      validation\_0-error:0.06564  
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 [4]      validation\_0-logloss:0.53949      validation\_0-error:0.05326  
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 [6]      validation\_0-logloss:0.49448      validation\_0-error:0.05289  
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 [7]      validation\_0-logloss:0.47437      validation\_0-error:0.05251  
 validation\_1-logloss:0.47874      validation\_1-error:0.05397  
 [8]      validation\_0-logloss:0.45587      validation\_0-error:0.05251  
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 [9]      validation\_0-logloss:0.43873      validation\_0-error:0.05251  
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 [10]      validation\_0-logloss:0.42282      validation\_0-error:0.05251  
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 [11]      validation\_0-logloss:0.40796      validation\_0-error:0.05251  
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 [12]      validation\_0-logloss:0.39412      validation\_0-error:0.05251  
 validation\_1-logloss:0.40060      validation\_1-error:0.05397  
 [13]      validation\_0-logloss:0.38123      validation\_0-error:0.05251  
 validation\_1-logloss:0.38834      validation\_1-error:0.05397  
 [14]      validation\_0-logloss:0.36919      validation\_0-error:0.05251  
 validation\_1-logloss:0.37644      validation\_1-error:0.05397  
 [15]      validation\_0-logloss:0.35734      validation\_0-error:0.05326  
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 [16]      validation\_0-logloss:0.34634      validation\_0-error:0.05364  
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 [19]      validation\_0-logloss:0.31621      validation\_0-error:0.05364  
 validation\_1-logloss:0.32277      validation\_1-error:0.05547  
 [20]      validation\_0-logloss:0.30685      validation\_0-error:0.05401  
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 [21]      validation\_0-logloss:0.29816      validation\_0-error:0.05401  
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 [22]      validation\_0-logloss:0.28995      validation\_0-error:0.05326  
 validation\_1-logloss:0.29697      validation\_1-error:0.05697  
 [23]      validation\_0-logloss:0.28238      validation\_0-error:0.05289  
 validation\_1-logloss:0.28959      validation\_1-error:0.05397  
 [24]      validation\_0-logloss:0.27520      validation\_0-error:0.05326

```

validation_1-logloss:0.28299    validation_1-error:0.05547
[25]    validation_0-logloss:0.26848    validation_0-error:0.05289
validation_1-logloss:0.27616    validation_1-error:0.05397
[26]    validation_0-logloss:0.26228    validation_0-error:0.05289
validation_1-logloss:0.27025    validation_1-error:0.05247

```

C:\Users\sci\anaconda3\lib\site-packages\xgboost\sklearn.py:888: UserWarning:  
The use of label encoder in XGBClassifier is deprecated and will be removed in a  
future release. To remove this warning, do the following: 1) Pass option  
use\_label\_encoder=False when constructing XGBClassifier object; and 2) Encode  
your labels (y) as integers starting with 0, i.e. 0, 1, 2, ..., [num\_class - 1].

```
warnings.warn(label_encoder_deprecation_msg, UserWarning)
```

C:\Users\sci\anaconda3\lib\site-packages\xgboost\sklearn.py:888: UserWarning:  
The use of label encoder in XGBClassifier is deprecated and will be removed in a  
future release. To remove this warning, do the following: 1) Pass option  
use\_label\_encoder=False when constructing XGBClassifier object; and 2) Encode  
your labels (y) as integers starting with 0, i.e. 0, 1, 2, ..., [num\_class - 1].

```
warnings.warn(label_encoder_deprecation_msg, UserWarning)
```

```

[27]    validation_0-logloss:0.25627    validation_0-error:0.05139
validation_1-logloss:0.26466    validation_1-error:0.04947
[28]    validation_0-logloss:0.25044    validation_0-error:0.05139
validation_1-logloss:0.25882    validation_1-error:0.04947
[29]    validation_0-logloss:0.24524    validation_0-error:0.04989
validation_1-logloss:0.25348    validation_1-error:0.04947
[30]    validation_0-logloss:0.24031    validation_0-error:0.04276
validation_1-logloss:0.24868    validation_1-error:0.04498
[31]    validation_0-logloss:0.23569    validation_0-error:0.04314
validation_1-logloss:0.24416    validation_1-error:0.04648
[32]    validation_0-logloss:0.23107    validation_0-error:0.04389
validation_1-logloss:0.24003    validation_1-error:0.04798
[33]    validation_0-logloss:0.22665    validation_0-error:0.04389
validation_1-logloss:0.23598    validation_1-error:0.04798
[34]    validation_0-logloss:0.22258    validation_0-error:0.04276
validation_1-logloss:0.23229    validation_1-error:0.04798
[35]    validation_0-logloss:0.21855    validation_0-error:0.04276
validation_1-logloss:0.22869    validation_1-error:0.04798
[36]    validation_0-logloss:0.21435    validation_0-error:0.04239
validation_1-logloss:0.22373    validation_1-error:0.04798
[37]    validation_0-logloss:0.21097    validation_0-error:0.04239
validation_1-logloss:0.22071    validation_1-error:0.04798
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validation_1-logloss:0.21675    validation_1-error:0.04648
[39]    validation_0-logloss:0.20428    validation_0-error:0.04088
validation_1-logloss:0.21376    validation_1-error:0.04648
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validation_1-logloss:0.21103    validation_1-error:0.04648
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validation_1-logloss:0.20724    validation_1-error:0.04648

```

[42] validation\_0-logloss:0.19538 validation\_0-error:0.04088  
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 validation\_1-logloss:0.19973 validation\_1-error:0.04348  
 [45] validation\_0-logloss:0.18790 validation\_0-error:0.03939  
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 [46] validation\_0-logloss:0.18535 validation\_0-error:0.03901  
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```
[38] validation_0-logloss:0.20768 validation_0-error:0.03976
validation_1-logloss:0.22561 validation_1-error:0.05697
```

```
C:\Users\sci\anaconda3\lib\site-packages\xgboost\sklearn.py:888: UserWarning:
The use of label encoder in XGBClassifier is deprecated and will be removed in a
future release. To remove this warning, do the following: 1) Pass option
use_label_encoder=False when constructing XGBClassifier object; and 2) Encode
your labels (y) as integers starting with 0, i.e. 0, 1, 2, ..., [num_class - 1].
warnings.warn(label_encoder_deprecation_msg, UserWarning)
```

```
C:\Users\sci\anaconda3\lib\site-packages\xgboost\sklearn.py:888: UserWarning:
The use of label encoder in XGBClassifier is deprecated and will be removed in a
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warnings.warn(label_encoder_deprecation_msg, UserWarning)
```

```
[39] validation_0-logloss:0.20461 validation_0-error:0.04013
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[45] validation_0-logloss:0.18973 validation_0-error:0.03939
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[48] validation_0-logloss:0.18309 validation_0-error:0.03976
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[4] validation_0-logloss:0.54010 validation_0-error:0.05664
validation_1-logloss:0.54368 validation_1-error:0.06597
[5] validation_0-logloss:0.51683 validation_0-error:0.06789
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 [8]      validation\_0-logloss:0.45711      validation\_0-error:0.05664  
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[49] validation\_0-logloss:0.17932 validation\_0-error:0.03676  
validation\_1-logloss:0.19365 validation\_1-error:0.05097

[0] validation\_0-logloss:0.65660 validation\_0-error:0.07277  
validation\_1-logloss:0.65761 validation\_1-error:0.08546

[1] validation\_0-logloss:0.62351 validation\_0-error:0.05889  
validation\_1-logloss:0.62520 validation\_1-error:0.06897

[2] validation\_0-logloss:0.59327 validation\_0-error:0.07014  
validation\_1-logloss:0.59593 validation\_1-error:0.08846

[3] validation\_0-logloss:0.56571 validation\_0-error:0.05851

validation\_1-logloss:0.56896      validation\_1-error:0.06897

[4]      validation\_0-logloss:0.54028      validation\_0-error:0.05851

validation\_1-logloss:0.54405      validation\_1-error:0.06897

[5]      validation\_0-logloss:0.51705      validation\_0-error:0.05889

validation\_1-logloss:0.52141      validation\_1-error:0.06897

[6]      validation\_0-logloss:0.49546      validation\_0-error:0.05851

validation\_1-logloss:0.50043      validation\_1-error:0.06897

[7]      validation\_0-logloss:0.47571      validation\_0-error:0.05851

validation\_1-logloss:0.48110      validation\_1-error:0.06897

[8]      validation\_0-logloss:0.45725      validation\_0-error:0.05851

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[9]      validation\_0-logloss:0.44024      validation\_0-error:0.05851

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[10]      validation\_0-logloss:0.42433      validation\_0-error:0.05851

validation\_1-logloss:0.43172      validation\_1-error:0.06897

[11]      validation\_0-logloss:0.40961      validation\_0-error:0.05851

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[12]      validation\_0-logloss:0.39581      validation\_0-error:0.05664

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[13]      validation\_0-logloss:0.38299      validation\_0-error:0.05664

validation\_1-logloss:0.39141      validation\_1-error:0.07046

[14]      validation\_0-logloss:0.37100      validation\_0-error:0.05664

validation\_1-logloss:0.38021      validation\_1-error:0.07046

[15]      validation\_0-logloss:0.35988      validation\_0-error:0.05664

validation\_1-logloss:0.36957      validation\_1-error:0.07046

[16]      validation\_0-logloss:0.34820      validation\_0-error:0.05626

validation\_1-logloss:0.35758      validation\_1-error:0.07046

[17]      validation\_0-logloss:0.33723      validation\_0-error:0.05626

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[18]      validation\_0-logloss:0.32702      validation\_0-error:0.05476

validation\_1-logloss:0.33613      validation\_1-error:0.06747

[19]      validation\_0-logloss:0.31710      validation\_0-error:0.05514

validation\_1-logloss:0.32652      validation\_1-error:0.06747

[20]      validation\_0-logloss:0.30785      validation\_0-error:0.05439

validation\_1-logloss:0.31774      validation\_1-error:0.06747

[21]      validation\_0-logloss:0.29898      validation\_0-error:0.05364

validation\_1-logloss:0.30898      validation\_1-error:0.06747

[22]      validation\_0-logloss:0.29068      validation\_0-error:0.05364

validation\_1-logloss:0.30091      validation\_1-error:0.06747

[23]      validation\_0-logloss:0.28295      validation\_0-error:0.05514

validation\_1-logloss:0.29356      validation\_1-error:0.06747

[24]      validation\_0-logloss:0.27570      validation\_0-error:0.05064

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[25]      validation\_0-logloss:0.26886      validation\_0-error:0.04989

validation\_1-logloss:0.28010      validation\_1-error:0.05997

[26]      validation\_0-logloss:0.26235      validation\_0-error:0.04951

validation\_1-logloss:0.27357      validation\_1-error:0.05997

[27]      validation\_0-logloss:0.25629      validation\_0-error:0.04651

```

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[28]   validation_0-logloss:0.25057    validation_0-error:0.04389
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[29]   validation_0-logloss:0.24520    validation_0-error:0.04201
validation_1-logloss:0.25676    validation_1-error:0.05547
[30]   validation_0-logloss:0.24012    validation_0-error:0.04239
validation_1-logloss:0.25193    validation_1-error:0.05547
[31]   validation_0-logloss:0.23537    validation_0-error:0.04163
validation_1-logloss:0.24732    validation_1-error:0.05397
[32]   validation_0-logloss:0.23098    validation_0-error:0.04088
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[33]   validation_0-logloss:0.22665    validation_0-error:0.04013
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[34]   validation_0-logloss:0.22243    validation_0-error:0.04013
validation_1-logloss:0.23467    validation_1-error:0.04947
[35]   validation_0-logloss:0.21867    validation_0-error:0.04013
validation_1-logloss:0.23132    validation_1-error:0.04947
[36]   validation_0-logloss:0.21443    validation_0-error:0.03901
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[37]   validation_0-logloss:0.21108    validation_0-error:0.03788
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[38]   validation_0-logloss:0.20779    validation_0-error:0.03788
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[39]   validation_0-logloss:0.20456    validation_0-error:0.03826
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[40]   validation_0-logloss:0.20171    validation_0-error:0.03788
validation_1-logloss:0.21441    validation_1-error:0.04648
[41]   validation_0-logloss:0.19841    validation_0-error:0.03713
validation_1-logloss:0.21052    validation_1-error:0.04348

```

C:\Users\sci\anaconda3\lib\site-packages\xgboost\sklearn.py:888: UserWarning:  
The use of label encoder in XGBClassifier is deprecated and will be removed in a  
future release. To remove this warning, do the following: 1) Pass option  
use\_label\_encoder=False when constructing XGBClassifier object; and 2) Encode  
your labels (y) as integers starting with 0, i.e. 0, 1, 2, ..., [num\_class - 1].

warnings.warn(label\_encoder\_deprecation\_msg, UserWarning)

C:\Users\sci\anaconda3\lib\site-packages\xgboost\sklearn.py:888: UserWarning:  
The use of label encoder in XGBClassifier is deprecated and will be removed in a  
future release. To remove this warning, do the following: 1) Pass option  
use\_label\_encoder=False when constructing XGBClassifier object; and 2) Encode  
your labels (y) as integers starting with 0, i.e. 0, 1, 2, ..., [num\_class - 1].

warnings.warn(label\_encoder\_deprecation\_msg, UserWarning)

```

[42]   validation_0-logloss:0.19570    validation_0-error:0.03676
validation_1-logloss:0.20822    validation_1-error:0.04348
[43]   validation_0-logloss:0.19295    validation_0-error:0.03638
validation_1-logloss:0.20544    validation_1-error:0.04648
[44]   validation_0-logloss:0.19008    validation_0-error:0.03563
validation_1-logloss:0.20206    validation_1-error:0.04498

```

[45] validation\_0-logloss:0.18789 validation\_0-error:0.03601  
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 [46] validation\_0-logloss:0.18526 validation\_0-error:0.03526  
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 [49] validation\_0-logloss:0.17875 validation\_0-error:0.03488  
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 [14] validation\_0-logloss:0.36519 validation\_0-error:0.04726  
 validation\_1-logloss:0.37152 validation\_1-error:0.05997

```
[15]    validation_0-logloss:0.35354    validation_0-error:0.04801
validation_1-logloss:0.36017    validation_1-error:0.05697
[16]    validation_0-logloss:0.34257    validation_0-error:0.04801
validation_1-logloss:0.34921    validation_1-error:0.05547
[17]    validation_0-logloss:0.33193    validation_0-error:0.04876
validation_1-logloss:0.33927    validation_1-error:0.05547
```

C:\Users\sci\anaconda3\lib\site-packages\xgboost\sklearn.py:888: UserWarning:  
The use of label encoder in XGBClassifier is deprecated and will be removed in a  
future release. To remove this warning, do the following: 1) Pass option  
use\_label\_encoder=False when constructing XGBClassifier object; and 2) Encode  
your labels (y) as integers starting with 0, i.e. 0, 1, 2, ..., [num\_class - 1].

```
warnings.warn(label_encoder_deprecation_msg, UserWarning)
```

C:\Users\sci\anaconda3\lib\site-packages\xgboost\sklearn.py:888: UserWarning:  
The use of label encoder in XGBClassifier is deprecated and will be removed in a  
future release. To remove this warning, do the following: 1) Pass option  
use\_label\_encoder=False when constructing XGBClassifier object; and 2) Encode  
your labels (y) as integers starting with 0, i.e. 0, 1, 2, ..., [num\_class - 1].

```
warnings.warn(label_encoder_deprecation_msg, UserWarning)
```

```
[18]    validation_0-logloss:0.32201    validation_0-error:0.04801
validation_1-logloss:0.32957    validation_1-error:0.05397
[19]    validation_0-logloss:0.31274    validation_0-error:0.04614
validation_1-logloss:0.32093    validation_1-error:0.05397
[20]    validation_0-logloss:0.30398    validation_0-error:0.04464
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[21]    validation_0-logloss:0.29541    validation_0-error:0.04426
validation_1-logloss:0.30441    validation_1-error:0.05097
[22]    validation_0-logloss:0.28743    validation_0-error:0.04314
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[23]    validation_0-logloss:0.27983    validation_0-error:0.04314
validation_1-logloss:0.28917    validation_1-error:0.05097
[24]    validation_0-logloss:0.27276    validation_0-error:0.04389
validation_1-logloss:0.28247    validation_1-error:0.05097
[25]    validation_0-logloss:0.26602    validation_0-error:0.04389
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[26]    validation_0-logloss:0.25993    validation_0-error:0.04389
validation_1-logloss:0.27061    validation_1-error:0.05397
[27]    validation_0-logloss:0.25396    validation_0-error:0.04276
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[28]    validation_0-logloss:0.24857    validation_0-error:0.04201
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[29]    validation_0-logloss:0.24283    validation_0-error:0.04163
validation_1-logloss:0.25327    validation_1-error:0.05097
[30]    validation_0-logloss:0.23763    validation_0-error:0.04126
validation_1-logloss:0.24871    validation_1-error:0.05247
[31]    validation_0-logloss:0.23274    validation_0-error:0.04088
validation_1-logloss:0.24411    validation_1-error:0.05397
[32]    validation_0-logloss:0.22811    validation_0-error:0.04126
```

validation\_1-logloss:0.24011 validation\_1-error:0.05397  
 [33] validation\_0-logloss:0.22375 validation\_0-error:0.04013  
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 [36] validation\_0-logloss:0.21217 validation\_0-error:0.04051  
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 [37] validation\_0-logloss:0.20874 validation\_0-error:0.03864  
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validation\_1-logloss:0.17856      validation\_1-error:0.04798  
[68]      validation\_0-logloss:0.15507      validation\_0-error:0.03488  
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[70]      validation\_0-logloss:0.15332      validation\_0-error:0.03526  
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validation\_1-logloss:0.65742      validation\_1-error:0.08995  
[1]      validation\_0-logloss:0.62335      validation\_0-error:0.06789  
validation\_1-logloss:0.62519      validation\_1-error:0.08546  
[2]      validation\_0-logloss:0.59312      validation\_0-error:0.06977

```
validation_1-logloss:0.59544    validation_1-error:0.08846
[3]    validation_0-logloss:0.56551    validation_0-error:0.06789
validation_1-logloss:0.56873    validation_1-error:0.08546
```

C:\Users\sci\anaconda3\lib\site-packages\xgboost\sklearn.py:888: UserWarning:  
The use of label encoder in XGBClassifier is deprecated and will be removed in a  
future release. To remove this warning, do the following: 1) Pass option  
use\_label\_encoder=False when constructing XGBClassifier object; and 2) Encode  
your labels (y) as integers starting with 0, i.e. 0, 1, 2, ..., [num\_class - 1].

```
warnings.warn(label_encoder_deprecation_msg, UserWarning)
```

C:\Users\sci\anaconda3\lib\site-packages\xgboost\sklearn.py:888: UserWarning:  
The use of label encoder in XGBClassifier is deprecated and will be removed in a  
future release. To remove this warning, do the following: 1) Pass option  
use\_label\_encoder=False when constructing XGBClassifier object; and 2) Encode  
your labels (y) as integers starting with 0, i.e. 0, 1, 2, ..., [num\_class - 1].

```
warnings.warn(label_encoder_deprecation_msg, UserWarning)
```

```
[4]    validation_0-logloss:0.54010    validation_0-error:0.05664
validation_1-logloss:0.54368    validation_1-error:0.06597
[5]    validation_0-logloss:0.51683    validation_0-error:0.06789
validation_1-logloss:0.52120    validation_1-error:0.08546
[6]    validation_0-logloss:0.49530    validation_0-error:0.05664
validation_1-logloss:0.50006    validation_1-error:0.06597
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validation_1-logloss:0.48077    validation_1-error:0.06597
[8]    validation_0-logloss:0.45711    validation_0-error:0.05664
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[9]    validation_0-logloss:0.44010    validation_0-error:0.05664
validation_1-logloss:0.44638    validation_1-error:0.06597
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validation_1-logloss:0.41696    validation_1-error:0.06597
[12]   validation_0-logloss:0.39566    validation_0-error:0.05626
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validation_1-logloss:0.39058    validation_1-error:0.06597
[14]   validation_0-logloss:0.36938    validation_0-error:0.05551
validation_1-logloss:0.37747    validation_1-error:0.06597
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validation_1-logloss:0.32474    validation_1-error:0.06897
```

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 [69] validation\_0-logloss:0.15201 validation\_0-error:0.03226  
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 [70] validation\_0-logloss:0.15091 validation\_0-error:0.03113  
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 validation\_1-logloss:0.16152 validation\_1-error:0.03298  
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```

[89]    validation_0-logloss:0.13897    validation_0-error:0.03038
validation_1-logloss:0.15514    validation_1-error:0.03298
[0]    validation_0-logloss:0.65635    validation_0-error:0.07164
validation_1-logloss:0.65721    validation_1-error:0.09145

```

C:\Users\sci\anaconda3\lib\site-packages\xgboost\sklearn.py:888: UserWarning:  
The use of label encoder in XGBClassifier is deprecated and will be removed in a  
future release. To remove this warning, do the following: 1) Pass option  
use\_label\_encoder=False when constructing XGBClassifier object; and 2) Encode  
your labels (y) as integers starting with 0, i.e. 0, 1, 2, ..., [num\_class - 1].

```
warnings.warn(label_encoder_deprecation_msg, UserWarning)
```

C:\Users\sci\anaconda3\lib\site-packages\xgboost\sklearn.py:888: UserWarning:  
The use of label encoder in XGBClassifier is deprecated and will be removed in a  
future release. To remove this warning, do the following: 1) Pass option  
use\_label\_encoder=False when constructing XGBClassifier object; and 2) Encode  
your labels (y) as integers starting with 0, i.e. 0, 1, 2, ..., [num\_class - 1].

```
warnings.warn(label_encoder_deprecation_msg, UserWarning)
```

```

[1]    validation_0-logloss:0.62301    validation_0-error:0.07127
validation_1-logloss:0.62467    validation_1-error:0.09145
[2]    validation_0-logloss:0.59274    validation_0-error:0.06602
validation_1-logloss:0.59444    validation_1-error:0.07946
[3]    validation_0-logloss:0.56488    validation_0-error:0.06564
validation_1-logloss:0.56722    validation_1-error:0.07946
[4]    validation_0-logloss:0.53949    validation_0-error:0.05326
validation_1-logloss:0.54207    validation_1-error:0.06597
[5]    validation_0-logloss:0.51600    validation_0-error:0.06452
validation_1-logloss:0.51943    validation_1-error:0.07496
[6]    validation_0-logloss:0.49448    validation_0-error:0.05289
validation_1-logloss:0.49825    validation_1-error:0.05847
[7]    validation_0-logloss:0.47437    validation_0-error:0.05251
validation_1-logloss:0.47874    validation_1-error:0.05397
[8]    validation_0-logloss:0.45587    validation_0-error:0.05251
validation_1-logloss:0.46044    validation_1-error:0.05397
[9]    validation_0-logloss:0.43873    validation_0-error:0.05251
validation_1-logloss:0.44395    validation_1-error:0.05397
[10]   validation_0-logloss:0.42282    validation_0-error:0.05251
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[12]   validation_0-logloss:0.39412    validation_0-error:0.05251
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[13]   validation_0-logloss:0.38123    validation_0-error:0.05251
validation_1-logloss:0.38834    validation_1-error:0.05397
[14]   validation_0-logloss:0.36919    validation_0-error:0.05251
validation_1-logloss:0.37644    validation_1-error:0.05397
[15]   validation_0-logloss:0.35734    validation_0-error:0.05326
validation_1-logloss:0.36420    validation_1-error:0.05547
[16]   validation_0-logloss:0.34634    validation_0-error:0.05364

```

validation\_1-logloss:0.35275      validation\_1-error:0.05847  
 [17]      validation\_0-logloss:0.33598      validation\_0-error:0.05364  
 validation\_1-logloss:0.34220      validation\_1-error:0.05847  
 [18]      validation\_0-logloss:0.32619      validation\_0-error:0.05364  
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 [19]      validation\_0-logloss:0.31621      validation\_0-error:0.05364  
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 [21]      validation\_0-logloss:0.29816      validation\_0-error:0.05401  
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 [22]      validation\_0-logloss:0.28995      validation\_0-error:0.05326  
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 [23]      validation\_0-logloss:0.28238      validation\_0-error:0.05289  
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[32]      validation\_0-logloss:0.22811      validation\_0-error:0.04126

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[34]      validation\_0-logloss:0.21969      validation\_0-error:0.04051

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[35]      validation\_0-logloss:0.21593      validation\_0-error:0.04013

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[36]      validation\_0-logloss:0.21217      validation\_0-error:0.04051

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[38]      validation\_0-logloss:0.20537      validation\_0-error:0.03864

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[39]      validation\_0-logloss:0.20178      validation\_0-error:0.03901

validation\_1-logloss:0.21513      validation\_1-error:0.05397

[40]      validation\_0-logloss:0.19883      validation\_0-error:0.03864

validation\_1-logloss:0.21271      validation\_1-error:0.05397

[41]      validation\_0-logloss:0.19613      validation\_0-error:0.03676

validation\_1-logloss:0.21013      validation\_1-error:0.05547

[42]      validation\_0-logloss:0.19309      validation\_0-error:0.03713

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[43]      validation\_0-logloss:0.19069      validation\_0-error:0.03638

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[44]      validation\_0-logloss:0.18811      validation\_0-error:0.03601

validation\_1-logloss:0.20250      validation\_1-error:0.05247

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validation\_1-logloss:0.19980      validation\_1-error:0.05547

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 validation\_1-logloss:0.17035      validation\_1-error:0.04498  
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 [66]      validation\_0-logloss:0.15226      validation\_0-error:0.03226  
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 [68]      validation\_0-logloss:0.15033      validation\_0-error:0.03226  
 validation\_1-logloss:0.16606      validation\_1-error:0.04198  
 [69]      validation\_0-logloss:0.14932      validation\_0-error:0.03226  
 validation\_1-logloss:0.16483      validation\_1-error:0.04198  
 [70]      validation\_0-logloss:0.14846      validation\_0-error:0.03188

```

validation_1-logloss:0.16465    validation_1-error:0.04198
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[72]   validation_0-logloss:0.14685    validation_0-error:0.03113
validation_1-logloss:0.16268    validation_1-error:0.04198
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validation_1-logloss:0.16236    validation_1-error:0.04198
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validation_1-logloss:0.16145    validation_1-error:0.04198
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validation_1-logloss:0.16108    validation_1-error:0.04198
[76]   validation_0-logloss:0.14403    validation_0-error:0.03113
validation_1-logloss:0.16037    validation_1-error:0.04198
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validation_1-logloss:0.15997    validation_1-error:0.04198
[78]   validation_0-logloss:0.14268    validation_0-error:0.03038
validation_1-logloss:0.15976    validation_1-error:0.04348
[79]   validation_0-logloss:0.14186    validation_0-error:0.03001
validation_1-logloss:0.15912    validation_1-error:0.04348
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validation_1-logloss:0.15881    validation_1-error:0.04198
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validation_1-logloss:0.15813    validation_1-error:0.04198
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validation_1-logloss:0.15798    validation_1-error:0.04198
[83]   validation_0-logloss:0.13940    validation_0-error:0.03001
validation_1-logloss:0.15746    validation_1-error:0.04048
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validation_1-logloss:0.15674    validation_1-error:0.04048
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validation_1-logloss:0.15660    validation_1-error:0.04048
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validation_1-logloss:0.15623    validation_1-error:0.04048
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validation_1-logloss:0.15615    validation_1-error:0.04048
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validation_1-logloss:0.15543    validation_1-error:0.04048
[0]    validation_0-logloss:0.65600    validation_0-error:0.07127
validation_1-logloss:0.65724    validation_1-error:0.09145

```

```

C:\Users\sci\anaconda3\lib\site-packages\xgboost\sklearn.py:888: UserWarning:
The use of label encoder in XGBClassifier is deprecated and will be removed in a
future release. To remove this warning, do the following: 1) Pass option
use_label_encoder=False when constructing XGBClassifier object; and 2) Encode
your labels (y) as integers starting with 0, i.e. 0, 1, 2, ..., [num_class - 1].
warnings.warn(label_encoder_deprecation_msg, UserWarning)

```



C:\Users\sci\anaconda3\lib\site-packages\xgboost\sklearn.py:888: UserWarning:  
The use of label encoder in XGBClassifier is deprecated and will be removed in a  
future release. To remove this warning, do the following: 1) Pass option  
use\_label\_encoder=False when constructing XGBClassifier object; and 2) Encode  
your labels (y) as integers starting with 0, i.e. 0, 1, 2, ..., [num\_class - 1].  
warnings.warn(label\_encoder\_deprecation\_msg, UserWarning)

```
[1]    validation_0-logloss:0.62239    validation_0-error:0.07127
validation_1-logloss:0.62482    validation_1-error:0.09145
[2]    validation_0-logloss:0.59182    validation_0-error:0.07127
validation_1-logloss:0.59530    validation_1-error:0.08846
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validation_1-logloss:0.56846    validation_1-error:0.08846
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validation_1-logloss:0.54387    validation_1-error:0.08846
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validation\_1-logloss:0.17196      validation\_1-error:0.04798  
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[83]      validation\_0-logloss:0.14425      validation\_0-error:0.03376  
validation\_1-logloss:0.16895      validation\_1-error:0.04798  
[84]      validation\_0-logloss:0.14367      validation\_0-error:0.03376  
validation\_1-logloss:0.16823      validation\_1-error:0.04648  
[85]      validation\_0-logloss:0.14320      validation\_0-error:0.03413  
validation\_1-logloss:0.16809      validation\_1-error:0.04648  
[86]      validation\_0-logloss:0.14268      validation\_0-error:0.03413  
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[87]      validation\_0-logloss:0.14195      validation\_0-error:0.03413  
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[88]      validation\_0-logloss:0.14165      validation\_0-error:0.03413  
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[89]      validation\_0-logloss:0.14115      validation\_0-error:0.03376  
validation\_1-logloss:0.16780      validation\_1-error:0.04648  
[0]      validation\_0-logloss:0.65651      validation\_0-error:0.07277  
validation\_1-logloss:0.65742      validation\_1-error:0.08995  
[1]      validation\_0-logloss:0.62335      validation\_0-error:0.06789  
validation\_1-logloss:0.62519      validation\_1-error:0.08546  
[2]      validation\_0-logloss:0.59312      validation\_0-error:0.06977  
validation\_1-logloss:0.59544      validation\_1-error:0.08846  
[3]      validation\_0-logloss:0.56551      validation\_0-error:0.06789

validation\_1-logloss:0.56873      validation\_1-error:0.08546  
 [4]      validation\_0-logloss:0.54010      validation\_0-error:0.05664  
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 [5]      validation\_0-logloss:0.51683      validation\_0-error:0.06789  
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 [6]      validation\_0-logloss:0.49530      validation\_0-error:0.05664  
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 [7]      validation\_0-logloss:0.47549      validation\_0-error:0.05664  
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 [8]      validation\_0-logloss:0.45711      validation\_0-error:0.05664  
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 [22]      validation\_0-logloss:0.28952      validation\_0-error:0.04839  
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 [25]      validation\_0-logloss:0.26789      validation\_0-error:0.04501  
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 [27]      validation\_0-logloss:0.25541      validation\_0-error:0.04351

validation\_1-logloss:0.26690      validation\_1-error:0.05697

[28]      validation\_0-logloss:0.24966      validation\_0-error:0.04314

validation\_1-logloss:0.26138      validation\_1-error:0.05547

[29]      validation\_0-logloss:0.24436      validation\_0-error:0.04426

validation\_1-logloss:0.25626      validation\_1-error:0.05697

[30]      validation\_0-logloss:0.23912      validation\_0-error:0.04314

validation\_1-logloss:0.25112      validation\_1-error:0.05697

[31]      validation\_0-logloss:0.23428      validation\_0-error:0.04239

validation\_1-logloss:0.24652      validation\_1-error:0.05547

[32]      validation\_0-logloss:0.22982      validation\_0-error:0.04239

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[33]      validation\_0-logloss:0.22560      validation\_0-error:0.04276

validation\_1-logloss:0.23813      validation\_1-error:0.05697

[34]      validation\_0-logloss:0.22154      validation\_0-error:0.04201

validation\_1-logloss:0.23434      validation\_1-error:0.05547

[35]      validation\_0-logloss:0.21749      validation\_0-error:0.04276

validation\_1-logloss:0.23042      validation\_1-error:0.05547

[36]      validation\_0-logloss:0.21387      validation\_0-error:0.04201

validation\_1-logloss:0.22709      validation\_1-error:0.05547

[37]      validation\_0-logloss:0.21046      validation\_0-error:0.03939

validation\_1-logloss:0.22358      validation\_1-error:0.05397

[38]      validation\_0-logloss:0.20733      validation\_0-error:0.03901

validation\_1-logloss:0.22083      validation\_1-error:0.05397

[39]      validation\_0-logloss:0.20404      validation\_0-error:0.03976

validation\_1-logloss:0.21775      validation\_1-error:0.05397

[40]      validation\_0-logloss:0.20110      validation\_0-error:0.03976

validation\_1-logloss:0.21456      validation\_1-error:0.05247

[41]      validation\_0-logloss:0.19834      validation\_0-error:0.03939

validation\_1-logloss:0.21200      validation\_1-error:0.05247

[42]      validation\_0-logloss:0.19575      validation\_0-error:0.03901

validation\_1-logloss:0.20967      validation\_1-error:0.05247

[43]      validation\_0-logloss:0.19300      validation\_0-error:0.03826

validation\_1-logloss:0.20703      validation\_1-error:0.05247

[44]      validation\_0-logloss:0.19065      validation\_0-error:0.03864

validation\_1-logloss:0.20483      validation\_1-error:0.05247

[45]      validation\_0-logloss:0.18830      validation\_0-error:0.03788

validation\_1-logloss:0.20283      validation\_1-error:0.05247

[46]      validation\_0-logloss:0.18552      validation\_0-error:0.03826

validation\_1-logloss:0.19944      validation\_1-error:0.04947

[47]      validation\_0-logloss:0.18350      validation\_0-error:0.03788

validation\_1-logloss:0.19772      validation\_1-error:0.04947

[48]      validation\_0-logloss:0.18100      validation\_0-error:0.03751

validation\_1-logloss:0.19472      validation\_1-error:0.05097

[49]      validation\_0-logloss:0.17932      validation\_0-error:0.03676

validation\_1-logloss:0.19365      validation\_1-error:0.05097

[50]      validation\_0-logloss:0.17705      validation\_0-error:0.03601

validation\_1-logloss:0.19081      validation\_1-error:0.04947

[51]      validation\_0-logloss:0.17547      validation\_0-error:0.03601

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 [53] validation\_0-logloss:0.17172 validation\_0-error:0.03638  
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 [66] validation\_0-logloss:0.15723 validation\_0-error:0.03601  
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 [72] validation\_0-logloss:0.15274 validation\_0-error:0.03563  
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 [73] validation\_0-logloss:0.15214 validation\_0-error:0.03563  
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 [74] validation\_0-logloss:0.15161 validation\_0-error:0.03563  
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 [75] validation\_0-logloss:0.15066 validation\_0-error:0.03526

```

validation_1-logloss:0.17171    validation_1-error:0.04798
[76]    validation_0-logloss:0.15021    validation_0-error:0.03526
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[77]    validation_0-logloss:0.14973    validation_0-error:0.03526
validation_1-logloss:0.17135    validation_1-error:0.04798
[78]    validation_0-logloss:0.14912    validation_0-error:0.03451
validation_1-logloss:0.17100    validation_1-error:0.04798
[79]    validation_0-logloss:0.14827    validation_0-error:0.03451
validation_1-logloss:0.17077    validation_1-error:0.04648
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validation_1-logloss:0.17088    validation_1-error:0.04648
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validation_1-logloss:0.17072    validation_1-error:0.04648
[82]    validation_0-logloss:0.14604    validation_0-error:0.03451
validation_1-logloss:0.16944    validation_1-error:0.04648
[83]    validation_0-logloss:0.14564    validation_0-error:0.03451
validation_1-logloss:0.16945    validation_1-error:0.04648
[84]    validation_0-logloss:0.14523    validation_0-error:0.03451
validation_1-logloss:0.16924    validation_1-error:0.04648
[85]    validation_0-logloss:0.14453    validation_0-error:0.03451
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[86]    validation_0-logloss:0.14361    validation_0-error:0.03451
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[87]    validation_0-logloss:0.14338    validation_0-error:0.03451
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[88]    validation_0-logloss:0.14253    validation_0-error:0.03413
validation_1-logloss:0.16684    validation_1-error:0.04498
[89]    validation_0-logloss:0.14228    validation_0-error:0.03451
validation_1-logloss:0.16662    validation_1-error:0.04498

```

C:\Users\sci\anaconda3\lib\site-packages\xgboost\sklearn.py:888: UserWarning:  
The use of label encoder in XGBClassifier is deprecated and will be removed in a  
future release. To remove this warning, do the following: 1) Pass option  
use\_label\_encoder=False when constructing XGBClassifier object; and 2) Encode  
your labels (y) as integers starting with 0, i.e. 0, 1, 2, ..., [num\_class - 1].

warnings.warn(label\_encoder\_deprecation\_msg, UserWarning)

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warnings.warn(label\_encoder\_deprecation\_msg, UserWarning)

```

[0]    validation_0-logloss:0.65660    validation_0-error:0.07277
validation_1-logloss:0.65761    validation_1-error:0.08546
[1]    validation_0-logloss:0.62351    validation_0-error:0.05889
validation_1-logloss:0.62520    validation_1-error:0.06897
[2]    validation_0-logloss:0.59327    validation_0-error:0.07014
validation_1-logloss:0.59593    validation_1-error:0.08846

```



[3] validation\_0-logloss:0.56571 validation\_0-error:0.05851  
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 [4] validation\_0-logloss:0.54028 validation\_0-error:0.05851  
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 [90] validation\_0-logloss:0.13891 validation\_0-error:0.03301  
 validation\_1-logloss:0.16004 validation\_1-error:0.04048  
 [91] validation\_0-logloss:0.13864 validation\_0-error:0.03301  
 validation\_1-logloss:0.15990 validation\_1-error:0.04048  
 [92] validation\_0-logloss:0.13802 validation\_0-error:0.03301  
 validation\_1-logloss:0.15969 validation\_1-error:0.04048  
 [93] validation\_0-logloss:0.13750 validation\_0-error:0.03263  
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 [94] validation\_0-logloss:0.13697 validation\_0-error:0.03263  
 validation\_1-logloss:0.15963 validation\_1-error:0.04048  
 [95] validation\_0-logloss:0.13667 validation\_0-error:0.03263  
 validation\_1-logloss:0.15937 validation\_1-error:0.04048  
 [96] validation\_0-logloss:0.13637 validation\_0-error:0.03263  
 validation\_1-logloss:0.15913 validation\_1-error:0.04048  
 [97] validation\_0-logloss:0.13609 validation\_0-error:0.03263  
 validation\_1-logloss:0.15922 validation\_1-error:0.04048  
 [98] validation\_0-logloss:0.13557 validation\_0-error:0.03226  
 validation\_1-logloss:0.15908 validation\_1-error:0.04048

```

[99]    validation_0-logloss:0.13533    validation_0-error:0.03226
validation_1-logloss:0.15880    validation_1-error:0.04048
[100]   validation_0-logloss:0.13499    validation_0-error:0.03226
validation_1-logloss:0.15866    validation_1-error:0.04198
[101]   validation_0-logloss:0.13475    validation_0-error:0.03226
validation_1-logloss:0.15859    validation_1-error:0.04198
[102]   validation_0-logloss:0.13447    validation_0-error:0.03226
validation_1-logloss:0.15852    validation_1-error:0.04348
[103]   validation_0-logloss:0.13416    validation_0-error:0.03188
validation_1-logloss:0.15854    validation_1-error:0.04348
[104]   validation_0-logloss:0.13385    validation_0-error:0.03188
validation_1-logloss:0.15844    validation_1-error:0.04348
[105]   validation_0-logloss:0.13365    validation_0-error:0.03188
validation_1-logloss:0.15813    validation_1-error:0.04348
[106]   validation_0-logloss:0.13338    validation_0-error:0.03188
validation_1-logloss:0.15837    validation_1-error:0.04348
[107]   validation_0-logloss:0.13311    validation_0-error:0.03188
validation_1-logloss:0.15842    validation_1-error:0.04348
[108]   validation_0-logloss:0.13285    validation_0-error:0.03188
validation_1-logloss:0.15861    validation_1-error:0.04348
[109]   validation_0-logloss:0.13271    validation_0-error:0.03151
validation_1-logloss:0.15864    validation_1-error:0.04348

```

C:\Users\sci\anaconda3\lib\site-packages\xgboost\sklearn.py:888: UserWarning:  
The use of label encoder in XGBClassifier is deprecated and will be removed in a  
future release. To remove this warning, do the following: 1) Pass option  
use\_label\_encoder=False when constructing XGBClassifier object; and 2) Encode  
your labels (y) as integers starting with 0, i.e. 0, 1, 2, ..., [num\_class - 1].  
warnings.warn(label\_encoder\_deprecation\_msg, UserWarning)

```

[110]   validation_0-logloss:0.13246    validation_0-error:0.03151
validation_1-logloss:0.15841    validation_1-error:0.04198
[111]   validation_0-logloss:0.13208    validation_0-error:0.03113
validation_1-logloss:0.15826    validation_1-error:0.04198
[112]   validation_0-logloss:0.13176    validation_0-error:0.03151
validation_1-logloss:0.15835    validation_1-error:0.04198
[113]   validation_0-logloss:0.13135    validation_0-error:0.03151
validation_1-logloss:0.15834    validation_1-error:0.04198
[114]   validation_0-logloss:0.13108    validation_0-error:0.03151
validation_1-logloss:0.15828    validation_1-error:0.04198
[115]   validation_0-logloss:0.13090    validation_0-error:0.03151
validation_1-logloss:0.15846    validation_1-error:0.04198
[116]   validation_0-logloss:0.13063    validation_0-error:0.03151
validation_1-logloss:0.15842    validation_1-error:0.04048
[117]   validation_0-logloss:0.13040    validation_0-error:0.03151
validation_1-logloss:0.15834    validation_1-error:0.04048
[118]   validation_0-logloss:0.13029    validation_0-error:0.03151
validation_1-logloss:0.15844    validation_1-error:0.04048
[119]   validation_0-logloss:0.13007    validation_0-error:0.03151

```

validation\_1-logloss:0.15847      validation\_1-error:0.04048  
 [0]      validation\_0-logloss:0.65627      validation\_0-error:0.07014  
 validation\_1-logloss:0.65714      validation\_1-error:0.08696  
 [1]      validation\_0-logloss:0.62292      validation\_0-error:0.07014  
 validation\_1-logloss:0.62462      validation\_1-error:0.08696  
 [2]      validation\_0-logloss:0.59264      validation\_0-error:0.06827  
 validation\_1-logloss:0.59488      validation\_1-error:0.08546  
 [3]      validation\_0-logloss:0.56486      validation\_0-error:0.06827  
 validation\_1-logloss:0.56742      validation\_1-error:0.08546  
 [4]      validation\_0-logloss:0.53942      validation\_0-error:0.06639  
 validation\_1-logloss:0.54231      validation\_1-error:0.08246  
 [5]      validation\_0-logloss:0.51600      validation\_0-error:0.06639  
 validation\_1-logloss:0.51928      validation\_1-error:0.08246  
 [6]      validation\_0-logloss:0.49442      validation\_0-error:0.06639  
 validation\_1-logloss:0.49800      validation\_1-error:0.08246  
 [7]      validation\_0-logloss:0.47446      validation\_0-error:0.05514  
 validation\_1-logloss:0.47815      validation\_1-error:0.06297  
 [8]      validation\_0-logloss:0.45552      validation\_0-error:0.05439  
 validation\_1-logloss:0.45915      validation\_1-error:0.05847  
 [9]      validation\_0-logloss:0.43787      validation\_0-error:0.05439  
 validation\_1-logloss:0.44190      validation\_1-error:0.05997  
 [10]      validation\_0-logloss:0.42171      validation\_0-error:0.05476  
 validation\_1-logloss:0.42654      validation\_1-error:0.05997  
 [11]      validation\_0-logloss:0.40621      validation\_0-error:0.05401  
 validation\_1-logloss:0.41120      validation\_1-error:0.06597  
 [12]      validation\_0-logloss:0.39171      validation\_0-error:0.05401  
 validation\_1-logloss:0.39732      validation\_1-error:0.06597  
 [13]      validation\_0-logloss:0.37809      validation\_0-error:0.05364  
 validation\_1-logloss:0.38412      validation\_1-error:0.06747  
 [14]      validation\_0-logloss:0.36519      validation\_0-error:0.04726  
 validation\_1-logloss:0.37152      validation\_1-error:0.05997  
 [15]      validation\_0-logloss:0.35354      validation\_0-error:0.04801  
 validation\_1-logloss:0.36017      validation\_1-error:0.05697  
 [16]      validation\_0-logloss:0.34257      validation\_0-error:0.04801  
 validation\_1-logloss:0.34921      validation\_1-error:0.05547  
 [17]      validation\_0-logloss:0.33193      validation\_0-error:0.04876  
 validation\_1-logloss:0.33927      validation\_1-error:0.05547  
 [18]      validation\_0-logloss:0.32201      validation\_0-error:0.04801  
 validation\_1-logloss:0.32957      validation\_1-error:0.05397  
 [19]      validation\_0-logloss:0.31274      validation\_0-error:0.04614  
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 [20]      validation\_0-logloss:0.30398      validation\_0-error:0.04464  
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 [21]      validation\_0-logloss:0.29541      validation\_0-error:0.04426  
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 [22]      validation\_0-logloss:0.28743      validation\_0-error:0.04314  
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 [23]      validation\_0-logloss:0.27983      validation\_0-error:0.04314

validation\_1-logloss:0.28917      validation\_1-error:0.05097  
 [24]      validation\_0-logloss:0.27276      validation\_0-error:0.04389  
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 [25]      validation\_0-logloss:0.26602      validation\_0-error:0.04389  
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 [26]      validation\_0-logloss:0.25993      validation\_0-error:0.04389  
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 [35]      validation\_0-logloss:0.21593      validation\_0-error:0.04013  
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 [36]      validation\_0-logloss:0.21217      validation\_0-error:0.04051  
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 [37]      validation\_0-logloss:0.20874      validation\_0-error:0.03864  
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 [42]      validation\_0-logloss:0.19309      validation\_0-error:0.03713  
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 [43]      validation\_0-logloss:0.19069      validation\_0-error:0.03638  
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 [47]      validation\_0-logloss:0.18118      validation\_0-error:0.03488

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 [55]      validation\_0-logloss:0.16645      validation\_0-error:0.03376  
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 [57]      validation\_0-logloss:0.16321      validation\_0-error:0.03376  
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 [59]      validation\_0-logloss:0.16032      validation\_0-error:0.03376  
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 [60]      validation\_0-logloss:0.15895      validation\_0-error:0.03376  
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 [63]      validation\_0-logloss:0.15523      validation\_0-error:0.03188  
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 [64]      validation\_0-logloss:0.15419      validation\_0-error:0.03226  
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 [65]      validation\_0-logloss:0.15305      validation\_0-error:0.03226  
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 [67]      validation\_0-logloss:0.15124      validation\_0-error:0.03226  
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 [68]      validation\_0-logloss:0.15033      validation\_0-error:0.03226  
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 [69]      validation\_0-logloss:0.14932      validation\_0-error:0.03226  
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 [70]      validation\_0-logloss:0.14846      validation\_0-error:0.03188  
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 [71]      validation\_0-logloss:0.14763      validation\_0-error:0.03151

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[73] validation\_0-logloss:0.14626 validation\_0-error:0.03151  
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validation\_1-logloss:0.15466 validation\_1-error:0.04048  
[95] validation\_0-logloss:0.13326 validation\_0-error:0.02813

```

validation_1-logloss:0.15475    validation_1-error:0.04048
[96]   validation_0-logloss:0.13281    validation_0-error:0.02813
validation_1-logloss:0.15415    validation_1-error:0.04048
[97]   validation_0-logloss:0.13219    validation_0-error:0.02851
validation_1-logloss:0.15403    validation_1-error:0.03898
[98]   validation_0-logloss:0.13197    validation_0-error:0.02851
validation_1-logloss:0.15423    validation_1-error:0.03898
[99]   validation_0-logloss:0.13139    validation_0-error:0.02851
validation_1-logloss:0.15371    validation_1-error:0.03898
[100]  validation_0-logloss:0.13095    validation_0-error:0.02813
validation_1-logloss:0.15343    validation_1-error:0.03898
[101]  validation_0-logloss:0.13061    validation_0-error:0.02776
validation_1-logloss:0.15302    validation_1-error:0.03898
[102]  validation_0-logloss:0.13022    validation_0-error:0.02776
validation_1-logloss:0.15312    validation_1-error:0.03898
[103]  validation_0-logloss:0.12979    validation_0-error:0.02813
validation_1-logloss:0.15270    validation_1-error:0.03898
[104]  validation_0-logloss:0.12960    validation_0-error:0.02813
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[105]  validation_0-logloss:0.12919    validation_0-error:0.02813
validation_1-logloss:0.15280    validation_1-error:0.03898
[106]  validation_0-logloss:0.12892    validation_0-error:0.02813
validation_1-logloss:0.15282    validation_1-error:0.03898
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validation_1-logloss:0.15213    validation_1-error:0.03898
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validation_1-logloss:0.15191    validation_1-error:0.03898
[116]  validation_0-logloss:0.12579    validation_0-error:0.02776
validation_1-logloss:0.15191    validation_1-error:0.03898
[117]  validation_0-logloss:0.12548    validation_0-error:0.02776
validation_1-logloss:0.15197    validation_1-error:0.03898

```

```

C:\Users\sci\anaconda3\lib\site-packages\xgboost\sklearn.py:888: UserWarning:
The use of label encoder in XGBClassifier is deprecated and will be removed in a

```

future release. To remove this warning, do the following: 1) Pass option `use_label_encoder=False` when constructing `XGBClassifier` object; and 2) Encode your labels (`y`) as integers starting with 0, i.e. 0, 1, 2, ..., [`num_class` - 1].

```
warnings.warn(label_encoder_deprecation_msg, UserWarning)
```

```
[118] validation_0-logloss:0.12511 validation_0-error:0.02776
validation_1-logloss:0.15194 validation_1-error:0.03898
[119] validation_0-logloss:0.12479 validation_0-error:0.02776
validation_1-logloss:0.15193 validation_1-error:0.03898
[0] validation_0-logloss:0.65600 validation_0-error:0.07127
validation_1-logloss:0.65724 validation_1-error:0.09145
[1] validation_0-logloss:0.62239 validation_0-error:0.07127
validation_1-logloss:0.62482 validation_1-error:0.09145
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validation_1-logloss:0.59530 validation_1-error:0.08846
[3] validation_0-logloss:0.56399 validation_0-error:0.07127
validation_1-logloss:0.56846 validation_1-error:0.08846
[4] validation_0-logloss:0.53854 validation_0-error:0.07127
validation_1-logloss:0.54387 validation_1-error:0.08846
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[6] validation_0-logloss:0.49352 validation_0-error:0.07127
validation_1-logloss:0.50012 validation_1-error:0.08846
[7] validation_0-logloss:0.47330 validation_0-error:0.07089
validation_1-logloss:0.48052 validation_1-error:0.08846
[8] validation_0-logloss:0.45494 validation_0-error:0.07089
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[12] validation_0-logloss:0.39279 validation_0-error:0.07089
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[13] validation_0-logloss:0.37958 validation_0-error:0.07052
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[14] validation_0-logloss:0.36749 validation_0-error:0.06977
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validation_1-logloss:0.34626 validation_1-error:0.07346
[18] validation_0-logloss:0.32429 validation_0-error:0.05476
validation_1-logloss:0.33632 validation_1-error:0.07196
[19] validation_0-logloss:0.31505 validation_0-error:0.05589
```



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 [20]      validation\_0-logloss:0.30542      validation\_0-error:0.05439  
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 [22]      validation\_0-logloss:0.28834      validation\_0-error:0.05401  
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 [23]      validation\_0-logloss:0.28067      validation\_0-error:0.05439  
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 [27]      validation\_0-logloss:0.25450      validation\_0-error:0.04989  
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 [28]      validation\_0-logloss:0.24882      validation\_0-error:0.04876  
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 [83]      validation\_0-logloss:0.14425      validation\_0-error:0.03376  
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 [91]      validation\_0-logloss:0.14036      validation\_0-error:0.03338

validation\_1-logloss:0.16701      validation\_1-error:0.04648

C:\Users\sci\anaconda3\lib\site-packages\xgboost\sklearn.py:888: UserWarning:  
The use of label encoder in XGBClassifier is deprecated and will be removed in a  
future release. To remove this warning, do the following: 1) Pass option  
use\_label\_encoder=False when constructing XGBClassifier object; and 2) Encode  
your labels (y) as integers starting with 0, i.e. 0, 1, 2, ..., [num\_class - 1].

warnings.warn(label\_encoder\_deprecation\_msg, UserWarning)

```
[92]      validation_0-logloss:0.13990      validation_0-error:0.03301
validation_1-logloss:0.16690      validation_1-error:0.04648
[93]      validation_0-logloss:0.13923      validation_0-error:0.03301
validation_1-logloss:0.16657      validation_1-error:0.04648
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[96]      validation_0-logloss:0.13802      validation_0-error:0.03301
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[97]      validation_0-logloss:0.13752      validation_0-error:0.03301
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validation_1-logloss:0.16332      validation_1-error:0.04648
[107]      validation_0-logloss:0.13292      validation_0-error:0.03263
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validation_1-logloss:0.16320      validation_1-error:0.04648
```

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```

C:\Users\sci\anaconda3\lib\site-packages\xgboost\sklearn.py:888: UserWarning:  
The use of label encoder in XGBClassifier is deprecated and will be removed in a  
future release. To remove this warning, do the following: 1) Pass option  
use\_label\_encoder=False when constructing XGBClassifier object; and 2) Encode  
your labels (y) as integers starting with 0, i.e. 0, 1, 2, ..., [num\_class - 1].  
warnings.warn(label\_encoder\_deprecation\_msg, UserWarning)

```

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 validation\_1-logloss:0.50581      validation\_1-error:0.05397  
 [6]      validation\_0-logloss:0.47838      validation\_0-error:0.04501  
 validation\_1-logloss:0.48278      validation\_1-error:0.05247  
 [7]      validation\_0-logloss:0.45691      validation\_0-error:0.04539  
 validation\_1-logloss:0.46171      validation\_1-error:0.04947  
 [8]      validation\_0-logloss:0.43717      validation\_0-error:0.04501  
 validation\_1-logloss:0.44212      validation\_1-error:0.05097  
 [9]      validation\_0-logloss:0.41881      validation\_0-error:0.04501  
 validation\_1-logloss:0.42422      validation\_1-error:0.04947  
 [10]      validation\_0-logloss:0.40164      validation\_0-error:0.04539

```

validation_1-logloss:0.40748    validation_1-error:0.04947
[11]    validation_0-logloss:0.38586    validation_0-error:0.04539
validation_1-logloss:0.39199    validation_1-error:0.04947
[12]    validation_0-logloss:0.37106    validation_0-error:0.04539
validation_1-logloss:0.37761    validation_1-error:0.04947
[13]    validation_0-logloss:0.35735    validation_0-error:0.04539
validation_1-logloss:0.36408    validation_1-error:0.04947
[14]    validation_0-logloss:0.34431    validation_0-error:0.04539
validation_1-logloss:0.35132    validation_1-error:0.04947
[15]    validation_0-logloss:0.33159    validation_0-error:0.04539
validation_1-logloss:0.33863    validation_1-error:0.04947
[16]    validation_0-logloss:0.31977    validation_0-error:0.04464
validation_1-logloss:0.32678    validation_1-error:0.05097
[17]    validation_0-logloss:0.30858    validation_0-error:0.04464
validation_1-logloss:0.31574    validation_1-error:0.05247
[18]    validation_0-logloss:0.29821    validation_0-error:0.04426
validation_1-logloss:0.30545    validation_1-error:0.05247
[19]    validation_0-logloss:0.28861    validation_0-error:0.04351
validation_1-logloss:0.29585    validation_1-error:0.05397
[20]    validation_0-logloss:0.27953    validation_0-error:0.04389
validation_1-logloss:0.28692    validation_1-error:0.05397
[21]    validation_0-logloss:0.27094    validation_0-error:0.04539
validation_1-logloss:0.27829    validation_1-error:0.05547
[22]    validation_0-logloss:0.26288    validation_0-error:0.04389
validation_1-logloss:0.27059    validation_1-error:0.05397
[23]    validation_0-logloss:0.25540    validation_0-error:0.04314
validation_1-logloss:0.26310    validation_1-error:0.05097
[24]    validation_0-logloss:0.24837    validation_0-error:0.04239
validation_1-logloss:0.25612    validation_1-error:0.05247
[25]    validation_0-logloss:0.24184    validation_0-error:0.04051
validation_1-logloss:0.24971    validation_1-error:0.04947
[26]    validation_0-logloss:0.23556    validation_0-error:0.03976
validation_1-logloss:0.24374    validation_1-error:0.04798

```

```

C:\Users\sci\anaconda3\lib\site-packages\xgboost\sklearn.py:888: UserWarning:
The use of label encoder in XGBClassifier is deprecated and will be removed in a
future release. To remove this warning, do the following: 1) Pass option
use_label_encoder=False when constructing XGBClassifier object; and 2) Encode
your labels (y) as integers starting with 0, i.e. 0, 1, 2, ..., [num_class - 1].
warnings.warn(label_encoder_deprecation_msg, UserWarning)

```

```

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The use of label encoder in XGBClassifier is deprecated and will be removed in a
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use_label_encoder=False when constructing XGBClassifier object; and 2) Encode
your labels (y) as integers starting with 0, i.e. 0, 1, 2, ..., [num_class - 1].
warnings.warn(label_encoder_deprecation_msg, UserWarning)

```

```

[27]    validation_0-logloss:0.22964    validation_0-error:0.03939
validation_1-logloss:0.23813    validation_1-error:0.04798

```

[28] validation\_0-logloss:0.22388 validation\_0-error:0.03864  
 validation\_1-logloss:0.23269 validation\_1-error:0.04498  
 [29] validation\_0-logloss:0.21863 validation\_0-error:0.03788  
 validation\_1-logloss:0.22776 validation\_1-error:0.04348  
 [30] validation\_0-logloss:0.21363 validation\_0-error:0.03676  
 validation\_1-logloss:0.22313 validation\_1-error:0.04348  
 [31] validation\_0-logloss:0.20867 validation\_0-error:0.03713  
 validation\_1-logloss:0.21884 validation\_1-error:0.04198  
 [32] validation\_0-logloss:0.20403 validation\_0-error:0.03713  
 validation\_1-logloss:0.21490 validation\_1-error:0.04198  
 [33] validation\_0-logloss:0.19949 validation\_0-error:0.03788  
 validation\_1-logloss:0.21128 validation\_1-error:0.04198  
 [34] validation\_0-logloss:0.19518 validation\_0-error:0.03826  
 validation\_1-logloss:0.20757 validation\_1-error:0.04198  
 [35] validation\_0-logloss:0.19125 validation\_0-error:0.03826  
 validation\_1-logloss:0.20453 validation\_1-error:0.04198  
 [36] validation\_0-logloss:0.18745 validation\_0-error:0.03826  
 validation\_1-logloss:0.20134 validation\_1-error:0.04198  
 [37] validation\_0-logloss:0.18391 validation\_0-error:0.03788  
 validation\_1-logloss:0.19816 validation\_1-error:0.04348  
 [38] validation\_0-logloss:0.18063 validation\_0-error:0.03788  
 validation\_1-logloss:0.19563 validation\_1-error:0.04348  
 [39] validation\_0-logloss:0.17739 validation\_0-error:0.03826  
 validation\_1-logloss:0.19276 validation\_1-error:0.04648  
 [40] validation\_0-logloss:0.17447 validation\_0-error:0.03826  
 validation\_1-logloss:0.19058 validation\_1-error:0.04498  
 [41] validation\_0-logloss:0.17156 validation\_0-error:0.03676  
 validation\_1-logloss:0.18828 validation\_1-error:0.04498  
 [42] validation\_0-logloss:0.16880 validation\_0-error:0.03713  
 validation\_1-logloss:0.18578 validation\_1-error:0.04648  
 [43] validation\_0-logloss:0.16659 validation\_0-error:0.03638  
 validation\_1-logloss:0.18313 validation\_1-error:0.04498  
 [44] validation\_0-logloss:0.16414 validation\_0-error:0.03676  
 validation\_1-logloss:0.18105 validation\_1-error:0.04498  
 [45] validation\_0-logloss:0.16184 validation\_0-error:0.03676  
 validation\_1-logloss:0.17977 validation\_1-error:0.04498  
 [46] validation\_0-logloss:0.15995 validation\_0-error:0.03601  
 validation\_1-logloss:0.17748 validation\_1-error:0.04498  
 [47] validation\_0-logloss:0.15796 validation\_0-error:0.03563  
 validation\_1-logloss:0.17555 validation\_1-error:0.04348  
 [48] validation\_0-logloss:0.15607 validation\_0-error:0.03451  
 validation\_1-logloss:0.17372 validation\_1-error:0.04348  
 [49] validation\_0-logloss:0.15431 validation\_0-error:0.03451  
 validation\_1-logloss:0.17220 validation\_1-error:0.04198  
 [0] validation\_0-logloss:0.65361 validation\_0-error:0.05439  
 validation\_1-logloss:0.65397 validation\_1-error:0.05697  
 [1] validation\_0-logloss:0.61795 validation\_0-error:0.05176  
 validation\_1-logloss:0.61848 validation\_1-error:0.05397

[2] validation\_0-logloss:0.58546 validation\_0-error:0.05214  
 validation\_1-logloss:0.58611 validation\_1-error:0.05247  
 [3] validation\_0-logloss:0.55559 validation\_0-error:0.05139  
 validation\_1-logloss:0.55699 validation\_1-error:0.05547  
 [4] validation\_0-logloss:0.52842 validation\_0-error:0.05251  
 validation\_1-logloss:0.53003 validation\_1-error:0.05097  
 [5] validation\_0-logloss:0.50329 validation\_0-error:0.05251  
 validation\_1-logloss:0.50553 validation\_1-error:0.05097  
 [6] validation\_0-logloss:0.48001 validation\_0-error:0.05176  
 validation\_1-logloss:0.48265 validation\_1-error:0.05547  
 [7] validation\_0-logloss:0.45867 validation\_0-error:0.05026  
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 [8] validation\_0-logloss:0.43827 validation\_0-error:0.04689  
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 [9] validation\_0-logloss:0.41971 validation\_0-error:0.04614  
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 [10] validation\_0-logloss:0.40215 validation\_0-error:0.04651  
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 [11] validation\_0-logloss:0.38587 validation\_0-error:0.04314  
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 [12] validation\_0-logloss:0.37042 validation\_0-error:0.04239  
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 [13] validation\_0-logloss:0.35640 validation\_0-error:0.04201  
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 [14] validation\_0-logloss:0.34279 validation\_0-error:0.04163  
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 [15] validation\_0-logloss:0.33004 validation\_0-error:0.03901  
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 [16] validation\_0-logloss:0.31811 validation\_0-error:0.03901  
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 [17] validation\_0-logloss:0.30705 validation\_0-error:0.03751  
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 [18] validation\_0-logloss:0.29663 validation\_0-error:0.03713  
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 [19] validation\_0-logloss:0.28675 validation\_0-error:0.03601  
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 [20] validation\_0-logloss:0.27747 validation\_0-error:0.03526  
 validation\_1-logloss:0.28615 validation\_1-error:0.04947  
 [21] validation\_0-logloss:0.26873 validation\_0-error:0.03526  
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 [22] validation\_0-logloss:0.26052 validation\_0-error:0.03526  
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 [23] validation\_0-logloss:0.25295 validation\_0-error:0.03488  
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 [24] validation\_0-logloss:0.24592 validation\_0-error:0.03451  
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 [25] validation\_0-logloss:0.23911 validation\_0-error:0.03488  
 validation\_1-logloss:0.25048 validation\_1-error:0.04498

[26] validation\_0-logloss:0.23287 validation\_0-error:0.03301  
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 [27] validation\_0-logloss:0.22700 validation\_0-error:0.03413  
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 [28] validation\_0-logloss:0.22145 validation\_0-error:0.03376  
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 [29] validation\_0-logloss:0.21623 validation\_0-error:0.03301  
 validation\_1-logloss:0.22965 validation\_1-error:0.04348  
 [30] validation\_0-logloss:0.21115 validation\_0-error:0.03226  
 validation\_1-logloss:0.22507 validation\_1-error:0.04348  
 [31] validation\_0-logloss:0.20637 validation\_0-error:0.03226  
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 [32] validation\_0-logloss:0.20189 validation\_0-error:0.03113  
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 [33] validation\_0-logloss:0.19778 validation\_0-error:0.03151  
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 [34] validation\_0-logloss:0.19406 validation\_0-error:0.03151  
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 [35] validation\_0-logloss:0.19040 validation\_0-error:0.03151  
 validation\_1-logloss:0.20626 validation\_1-error:0.04348  
 [36] validation\_0-logloss:0.18694 validation\_0-error:0.03038  
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 [37] validation\_0-logloss:0.18370 validation\_0-error:0.03113  
 validation\_1-logloss:0.20022 validation\_1-error:0.04348  
 [38] validation\_0-logloss:0.18042 validation\_0-error:0.03113  
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 [39] validation\_0-logloss:0.17786 validation\_0-error:0.03076  
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 [40] validation\_0-logloss:0.17492 validation\_0-error:0.03151  
 validation\_1-logloss:0.19290 validation\_1-error:0.04498  
 [41] validation\_0-logloss:0.17205 validation\_0-error:0.03038  
 validation\_1-logloss:0.19052 validation\_1-error:0.04348  
 [42] validation\_0-logloss:0.16932 validation\_0-error:0.03001  
 validation\_1-logloss:0.18827 validation\_1-error:0.04498  
 [43] validation\_0-logloss:0.16680 validation\_0-error:0.03001  
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 [44] validation\_0-logloss:0.16458 validation\_0-error:0.02963  
 validation\_1-logloss:0.18404 validation\_1-error:0.04498  
 [45] validation\_0-logloss:0.16225 validation\_0-error:0.02926  
 validation\_1-logloss:0.18184 validation\_1-error:0.04498  
 [46] validation\_0-logloss:0.16033 validation\_0-error:0.02926  
 validation\_1-logloss:0.18061 validation\_1-error:0.04498  
 [47] validation\_0-logloss:0.15815 validation\_0-error:0.02888  
 validation\_1-logloss:0.17865 validation\_1-error:0.04348  
 [48] validation\_0-logloss:0.15629 validation\_0-error:0.02888  
 validation\_1-logloss:0.17734 validation\_1-error:0.04498  
 [49] validation\_0-logloss:0.15450 validation\_0-error:0.02851  
 validation\_1-logloss:0.17550 validation\_1-error:0.04348



[0] validation\_0-logloss:0.65329 validation\_0-error:0.04989  
 validation\_1-logloss:0.65464 validation\_1-error:0.07046  
 [1] validation\_0-logloss:0.61719 validation\_0-error:0.04914  
 validation\_1-logloss:0.61986 validation\_1-error:0.07046  
 [2] validation\_0-logloss:0.58435 validation\_0-error:0.04914  
 validation\_1-logloss:0.58815 validation\_1-error:0.07046  
 [3] validation\_0-logloss:0.55429 validation\_0-error:0.04839  
 validation\_1-logloss:0.55907 validation\_1-error:0.07196  
 [4] validation\_0-logloss:0.52684 validation\_0-error:0.04839  
 validation\_1-logloss:0.53237 validation\_1-error:0.07196  
 [5] validation\_0-logloss:0.50165 validation\_0-error:0.04839  
 validation\_1-logloss:0.50816 validation\_1-error:0.07196  
 [6] validation\_0-logloss:0.47850 validation\_0-error:0.04764  
 validation\_1-logloss:0.48549 validation\_1-error:0.07196  
 [7] validation\_0-logloss:0.45709 validation\_0-error:0.04951  
 validation\_1-logloss:0.46511 validation\_1-error:0.07196  
 [8] validation\_0-logloss:0.43709 validation\_0-error:0.04876  
 validation\_1-logloss:0.44518 validation\_1-error:0.07196  
 [9] validation\_0-logloss:0.41837 validation\_0-error:0.04726  
 validation\_1-logloss:0.42711 validation\_1-error:0.07196  
 [10] validation\_0-logloss:0.40110 validation\_0-error:0.04726  
 validation\_1-logloss:0.41061 validation\_1-error:0.07196  
 [11] validation\_0-logloss:0.38526 validation\_0-error:0.04726  
 validation\_1-logloss:0.39515 validation\_1-error:0.07046  
 [12] validation\_0-logloss:0.37023 validation\_0-error:0.04689  
 validation\_1-logloss:0.38104 validation\_1-error:0.07046  
 [13] validation\_0-logloss:0.35624 validation\_0-error:0.04689  
 validation\_1-logloss:0.36802 validation\_1-error:0.07046  
 [14] validation\_0-logloss:0.34321 validation\_0-error:0.04576  
 validation\_1-logloss:0.35536 validation\_1-error:0.06897  
 [15] validation\_0-logloss:0.33110 validation\_0-error:0.04576  
 validation\_1-logloss:0.34383 validation\_1-error:0.06897  
 [16] validation\_0-logloss:0.31977 validation\_0-error:0.04464  
 validation\_1-logloss:0.33376 validation\_1-error:0.06897  
 [17] validation\_0-logloss:0.30924 validation\_0-error:0.04389  
 validation\_1-logloss:0.32373 validation\_1-error:0.06897  
 [18] validation\_0-logloss:0.29882 validation\_0-error:0.04464  
 validation\_1-logloss:0.31355 validation\_1-error:0.06597  
 [19] validation\_0-logloss:0.28907 validation\_0-error:0.04501  
 validation\_1-logloss:0.30398 validation\_1-error:0.06447  
 [20] validation\_0-logloss:0.28000 validation\_0-error:0.04614  
 validation\_1-logloss:0.29476 validation\_1-error:0.06447  
 [21] validation\_0-logloss:0.27152 validation\_0-error:0.04651  
 validation\_1-logloss:0.28640 validation\_1-error:0.06447  
 [22] validation\_0-logloss:0.26336 validation\_0-error:0.04314  
 validation\_1-logloss:0.27858 validation\_1-error:0.05997  
 [23] validation\_0-logloss:0.25574 validation\_0-error:0.04126  
 validation\_1-logloss:0.27129 validation\_1-error:0.05997

```

[24]    validation_0-logloss:0.24857    validation_0-error:0.04163
validation_1-logloss:0.26424    validation_1-error:0.05847
[25]    validation_0-logloss:0.24179    validation_0-error:0.04013
validation_1-logloss:0.25759    validation_1-error:0.05847
[26]    validation_0-logloss:0.23549    validation_0-error:0.04088
validation_1-logloss:0.25130    validation_1-error:0.05697
[27]    validation_0-logloss:0.22962    validation_0-error:0.04051
validation_1-logloss:0.24540    validation_1-error:0.05547
[28]    validation_0-logloss:0.22400    validation_0-error:0.04051
validation_1-logloss:0.24006    validation_1-error:0.05397

```

C:\Users\sci\anaconda3\lib\site-packages\xgboost\sklearn.py:888: UserWarning:  
The use of label encoder in XGBClassifier is deprecated and will be removed in a  
future release. To remove this warning, do the following: 1) Pass option  
use\_label\_encoder=False when constructing XGBClassifier object; and 2) Encode  
your labels (y) as integers starting with 0, i.e. 0, 1, 2, ..., [num\_class - 1].

```
warnings.warn(label_encoder_deprecation_msg, UserWarning)
```

C:\Users\sci\anaconda3\lib\site-packages\xgboost\sklearn.py:888: UserWarning:  
The use of label encoder in XGBClassifier is deprecated and will be removed in a  
future release. To remove this warning, do the following: 1) Pass option  
use\_label\_encoder=False when constructing XGBClassifier object; and 2) Encode  
your labels (y) as integers starting with 0, i.e. 0, 1, 2, ..., [num\_class - 1].

```
warnings.warn(label_encoder_deprecation_msg, UserWarning)
```

```

[29]    validation_0-logloss:0.21887    validation_0-error:0.03976
validation_1-logloss:0.23467    validation_1-error:0.05397
[30]    validation_0-logloss:0.21396    validation_0-error:0.03976
validation_1-logloss:0.22988    validation_1-error:0.05247
[31]    validation_0-logloss:0.20934    validation_0-error:0.03788
validation_1-logloss:0.22536    validation_1-error:0.05247
[32]    validation_0-logloss:0.20497    validation_0-error:0.03751
validation_1-logloss:0.22141    validation_1-error:0.05097
[33]    validation_0-logloss:0.20061    validation_0-error:0.03751
validation_1-logloss:0.21710    validation_1-error:0.04947
[34]    validation_0-logloss:0.19655    validation_0-error:0.03713
validation_1-logloss:0.21312    validation_1-error:0.04798
[35]    validation_0-logloss:0.19269    validation_0-error:0.03713
validation_1-logloss:0.20947    validation_1-error:0.04798
[36]    validation_0-logloss:0.18935    validation_0-error:0.03676
validation_1-logloss:0.20619    validation_1-error:0.04648
[37]    validation_0-logloss:0.18605    validation_0-error:0.03638
validation_1-logloss:0.20334    validation_1-error:0.04648
[38]    validation_0-logloss:0.18270    validation_0-error:0.03601
validation_1-logloss:0.20053    validation_1-error:0.04648
[39]    validation_0-logloss:0.17955    validation_0-error:0.03526
validation_1-logloss:0.19787    validation_1-error:0.04798
[40]    validation_0-logloss:0.17656    validation_0-error:0.03601
validation_1-logloss:0.19596    validation_1-error:0.04798
[41]    validation_0-logloss:0.17375    validation_0-error:0.03563

```

validation\_1-logloss:0.19367 validation\_1-error:0.04798  
 [42] validation\_0-logloss:0.17128 validation\_0-error:0.03563  
 validation\_1-logloss:0.19183 validation\_1-error:0.04798  
 [43] validation\_0-logloss:0.16875 validation\_0-error:0.03563  
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 [44] validation\_0-logloss:0.16636 validation\_0-error:0.03563  
 validation\_1-logloss:0.18861 validation\_1-error:0.04798  
 [45] validation\_0-logloss:0.16421 validation\_0-error:0.03563  
 validation\_1-logloss:0.18730 validation\_1-error:0.04648  
 [46] validation\_0-logloss:0.16179 validation\_0-error:0.03526  
 validation\_1-logloss:0.18604 validation\_1-error:0.04648  
 [47] validation\_0-logloss:0.15946 validation\_0-error:0.03526  
 validation\_1-logloss:0.18497 validation\_1-error:0.04648  
 [48] validation\_0-logloss:0.15734 validation\_0-error:0.03526  
 validation\_1-logloss:0.18374 validation\_1-error:0.04648  
 [49] validation\_0-logloss:0.15560 validation\_0-error:0.03488  
 validation\_1-logloss:0.18228 validation\_1-error:0.04648  
 [0] validation\_0-logloss:0.65348 validation\_0-error:0.05064  
 validation\_1-logloss:0.65465 validation\_1-error:0.06747  
 [1] validation\_0-logloss:0.61768 validation\_0-error:0.05026  
 validation\_1-logloss:0.61976 validation\_1-error:0.06747  
 [2] validation\_0-logloss:0.58481 validation\_0-error:0.04876  
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 [3] validation\_0-logloss:0.55494 validation\_0-error:0.04876  
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 [4] validation\_0-logloss:0.52767 validation\_0-error:0.04876  
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 [5] validation\_0-logloss:0.50257 validation\_0-error:0.04764  
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 [8] validation\_0-logloss:0.43836 validation\_0-error:0.04614  
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 [15] validation\_0-logloss:0.33358 validation\_0-error:0.04576

validation\_1-logloss:0.34445      validation\_1-error:0.06297

[16]      validation\_0-logloss:0.32137      validation\_0-error:0.04576

validation\_1-logloss:0.33266      validation\_1-error:0.06297

[17]      validation\_0-logloss:0.31016      validation\_0-error:0.04501

validation\_1-logloss:0.32201      validation\_1-error:0.06297

[18]      validation\_0-logloss:0.29962      validation\_0-error:0.04351

validation\_1-logloss:0.31167      validation\_1-error:0.06147

[19]      validation\_0-logloss:0.28978      validation\_0-error:0.04276

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[20]      validation\_0-logloss:0.28036      validation\_0-error:0.04276

validation\_1-logloss:0.29316      validation\_1-error:0.06147

[21]      validation\_0-logloss:0.27170      validation\_0-error:0.04276

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[22]      validation\_0-logloss:0.26336      validation\_0-error:0.03976

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[23]      validation\_0-logloss:0.25574      validation\_0-error:0.03939

validation\_1-logloss:0.26933      validation\_1-error:0.05847

[24]      validation\_0-logloss:0.24844      validation\_0-error:0.03788

validation\_1-logloss:0.26245      validation\_1-error:0.05397

[25]      validation\_0-logloss:0.24151      validation\_0-error:0.03788

validation\_1-logloss:0.25601      validation\_1-error:0.05247

[26]      validation\_0-logloss:0.23508      validation\_0-error:0.03751

validation\_1-logloss:0.24927      validation\_1-error:0.05247

[27]      validation\_0-logloss:0.22920      validation\_0-error:0.03751

validation\_1-logloss:0.24359      validation\_1-error:0.05247

[28]      validation\_0-logloss:0.22341      validation\_0-error:0.03751

validation\_1-logloss:0.23809      validation\_1-error:0.05247

[29]      validation\_0-logloss:0.21801      validation\_0-error:0.03751

validation\_1-logloss:0.23301      validation\_1-error:0.05247

[30]      validation\_0-logloss:0.21304      validation\_0-error:0.03751

validation\_1-logloss:0.22826      validation\_1-error:0.05247

[31]      validation\_0-logloss:0.20821      validation\_0-error:0.03601

validation\_1-logloss:0.22356      validation\_1-error:0.05247

[32]      validation\_0-logloss:0.20377      validation\_0-error:0.03601

validation\_1-logloss:0.21941      validation\_1-error:0.05097

[33]      validation\_0-logloss:0.19939      validation\_0-error:0.03563

validation\_1-logloss:0.21574      validation\_1-error:0.05097

[34]      validation\_0-logloss:0.19515      validation\_0-error:0.03563

validation\_1-logloss:0.21227      validation\_1-error:0.05097

[35]      validation\_0-logloss:0.19137      validation\_0-error:0.03601

validation\_1-logloss:0.20891      validation\_1-error:0.05097

[36]      validation\_0-logloss:0.18789      validation\_0-error:0.03526

validation\_1-logloss:0.20633      validation\_1-error:0.04947

[37]      validation\_0-logloss:0.18432      validation\_0-error:0.03526

validation\_1-logloss:0.20329      validation\_1-error:0.05097

[38]      validation\_0-logloss:0.18124      validation\_0-error:0.03451

validation\_1-logloss:0.20043      validation\_1-error:0.04798

[39]      validation\_0-logloss:0.17839      validation\_0-error:0.03451

validation\_1-logloss:0.19793      validation\_1-error:0.04798  
[40]      validation\_0-logloss:0.17549      validation\_0-error:0.03451  
validation\_1-logloss:0.19565      validation\_1-error:0.04798  
[41]      validation\_0-logloss:0.17268      validation\_0-error:0.03413  
validation\_1-logloss:0.19320      validation\_1-error:0.04798  
[42]      validation\_0-logloss:0.17008      validation\_0-error:0.03413  
validation\_1-logloss:0.19129      validation\_1-error:0.04798  
[43]      validation\_0-logloss:0.16749      validation\_0-error:0.03413  
validation\_1-logloss:0.18880      validation\_1-error:0.04648  
[44]      validation\_0-logloss:0.16512      validation\_0-error:0.03338  
validation\_1-logloss:0.18697      validation\_1-error:0.04798  
[45]      validation\_0-logloss:0.16301      validation\_0-error:0.03338  
validation\_1-logloss:0.18536      validation\_1-error:0.04648  
[46]      validation\_0-logloss:0.16080      validation\_0-error:0.03301  
validation\_1-logloss:0.18297      validation\_1-error:0.04648  
[47]      validation\_0-logloss:0.15868      validation\_0-error:0.03301  
validation\_1-logloss:0.18113      validation\_1-error:0.04648  
[48]      validation\_0-logloss:0.15685      validation\_0-error:0.03301  
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[2]      validation\_0-logloss:0.58535      validation\_0-error:0.04914  
validation\_1-logloss:0.58902      validation\_1-error:0.06447  
[3]      validation\_0-logloss:0.55554      validation\_0-error:0.04726  
validation\_1-logloss:0.56018      validation\_1-error:0.06147  
[4]      validation\_0-logloss:0.52831      validation\_0-error:0.04726  
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[5]      validation\_0-logloss:0.50329      validation\_0-error:0.04764  
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[6]      validation\_0-logloss:0.48026      validation\_0-error:0.04876  
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[9]      validation\_0-logloss:0.42043      validation\_0-error:0.04726  
validation\_1-logloss:0.42892      validation\_1-error:0.06147  
[10]      validation\_0-logloss:0.40344      validation\_0-error:0.04726  
validation\_1-logloss:0.41277      validation\_1-error:0.06147  
[11]      validation\_0-logloss:0.38752      validation\_0-error:0.04726  
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[12]      validation\_0-logloss:0.37263      validation\_0-error:0.04689  
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[13]      validation\_0-logloss:0.35879      validation\_0-error:0.04689

```

validation_1-logloss:0.36900    validation_1-error:0.06147
[14]   validation_0-logloss:0.34606    validation_0-error:0.04689
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[15]   validation_0-logloss:0.33409    validation_0-error:0.04689
validation_1-logloss:0.34522    validation_1-error:0.06147
[16]   validation_0-logloss:0.32290    validation_0-error:0.04689
validation_1-logloss:0.33432    validation_1-error:0.06147
[17]   validation_0-logloss:0.31134    validation_0-error:0.04689
validation_1-logloss:0.32267    validation_1-error:0.06147
[18]   validation_0-logloss:0.30070    validation_0-error:0.04689
validation_1-logloss:0.31197    validation_1-error:0.06147
[19]   validation_0-logloss:0.29063    validation_0-error:0.04651
validation_1-logloss:0.30210    validation_1-error:0.06147
[20]   validation_0-logloss:0.28130    validation_0-error:0.04501
validation_1-logloss:0.29290    validation_1-error:0.05397
[21]   validation_0-logloss:0.27240    validation_0-error:0.04426
validation_1-logloss:0.28427    validation_1-error:0.05247
[22]   validation_0-logloss:0.26386    validation_0-error:0.04389
validation_1-logloss:0.27605    validation_1-error:0.05247
[23]   validation_0-logloss:0.25586    validation_0-error:0.04351
validation_1-logloss:0.26821    validation_1-error:0.05247

```

C:\Users\sci\anaconda3\lib\site-packages\xgboost\sklearn.py:888: UserWarning:  
The use of label encoder in XGBClassifier is deprecated and will be removed in a  
future release. To remove this warning, do the following: 1) Pass option  
use\_label\_encoder=False when constructing XGBClassifier object; and 2) Encode  
your labels (y) as integers starting with 0, i.e. 0, 1, 2, ..., [num\_class - 1].

warnings.warn(label\_encoder\_deprecation\_msg, UserWarning)

C:\Users\sci\anaconda3\lib\site-packages\xgboost\sklearn.py:888: UserWarning:  
The use of label encoder in XGBClassifier is deprecated and will be removed in a  
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use\_label\_encoder=False when constructing XGBClassifier object; and 2) Encode  
your labels (y) as integers starting with 0, i.e. 0, 1, 2, ..., [num\_class - 1].

warnings.warn(label\_encoder\_deprecation\_msg, UserWarning)

```

[24]   validation_0-logloss:0.24843    validation_0-error:0.04239
validation_1-logloss:0.26122    validation_1-error:0.04947
[25]   validation_0-logloss:0.24170    validation_0-error:0.04163
validation_1-logloss:0.25455    validation_1-error:0.04947
[26]   validation_0-logloss:0.23512    validation_0-error:0.04201
validation_1-logloss:0.24846    validation_1-error:0.04947
[27]   validation_0-logloss:0.22898    validation_0-error:0.04201
validation_1-logloss:0.24289    validation_1-error:0.04947
[28]   validation_0-logloss:0.22340    validation_0-error:0.04163
validation_1-logloss:0.23707    validation_1-error:0.04798
[29]   validation_0-logloss:0.21794    validation_0-error:0.04163
validation_1-logloss:0.23204    validation_1-error:0.04648
[30]   validation_0-logloss:0.21280    validation_0-error:0.03901
validation_1-logloss:0.22755    validation_1-error:0.04648

```

[31] validation\_0-logloss:0.20842 validation\_0-error:0.03864  
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 [36] validation\_0-logloss:0.18798 validation\_0-error:0.03638  
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 [37] validation\_0-logloss:0.18424 validation\_0-error:0.03263  
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 [38] validation\_0-logloss:0.18135 validation\_0-error:0.03376  
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 [39] validation\_0-logloss:0.17803 validation\_0-error:0.03301  
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 [41] validation\_0-logloss:0.17263 validation\_0-error:0.03076  
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 [42] validation\_0-logloss:0.16989 validation\_0-error:0.03076  
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 [51] validation\_0-logloss:0.15136 validation\_0-error:0.03001  
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 [52] validation\_0-logloss:0.14953 validation\_0-error:0.02963  
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```

[1]      validation_0-logloss:0.61795      validation_0-error:0.05176
validation_1-logloss:0.61848      validation_1-error:0.05397
[2]      validation_0-logloss:0.58546      validation_0-error:0.05214
validation_1-logloss:0.58611      validation_1-error:0.05247
[3]      validation_0-logloss:0.55559      validation_0-error:0.05139
validation_1-logloss:0.55699      validation_1-error:0.05547
[4]      validation_0-logloss:0.52842      validation_0-error:0.05251
validation_1-logloss:0.53003      validation_1-error:0.05097

```

C:\Users\sci\anaconda3\lib\site-packages\xgboost\sklearn.py:888: UserWarning:  
The use of label encoder in XGBClassifier is deprecated and will be removed in a  
future release. To remove this warning, do the following: 1) Pass option  
use\_label\_encoder=False when constructing XGBClassifier object; and 2) Encode  
your labels (y) as integers starting with 0, i.e. 0, 1, 2, ..., [num\_class - 1].

```
warnings.warn(label_encoder_deprecation_msg, UserWarning)
```

C:\Users\sci\anaconda3\lib\site-packages\xgboost\sklearn.py:888: UserWarning:  
The use of label encoder in XGBClassifier is deprecated and will be removed in a  
future release. To remove this warning, do the following: 1) Pass option  
use\_label\_encoder=False when constructing XGBClassifier object; and 2) Encode  
your labels (y) as integers starting with 0, i.e. 0, 1, 2, ..., [num\_class - 1].

```
warnings.warn(label_encoder_deprecation_msg, UserWarning)
```

```

[5]      validation_0-logloss:0.50329      validation_0-error:0.05251
validation_1-logloss:0.50553      validation_1-error:0.05097
[6]      validation_0-logloss:0.48001      validation_0-error:0.05176
validation_1-logloss:0.48265      validation_1-error:0.05547
[7]      validation_0-logloss:0.45867      validation_0-error:0.05026
validation_1-logloss:0.46176      validation_1-error:0.05697
[8]      validation_0-logloss:0.43827      validation_0-error:0.04689
validation_1-logloss:0.44185      validation_1-error:0.05247
[9]      validation_0-logloss:0.41971      validation_0-error:0.04614
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[10]     validation_0-logloss:0.40215      validation_0-error:0.04651
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validation_1-logloss:0.39117      validation_1-error:0.05547
[12]     validation_0-logloss:0.37042      validation_0-error:0.04239
validation_1-logloss:0.37611      validation_1-error:0.05697
[13]     validation_0-logloss:0.35640      validation_0-error:0.04201
validation_1-logloss:0.36233      validation_1-error:0.05547
[14]     validation_0-logloss:0.34279      validation_0-error:0.04163
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[18]     validation_0-logloss:0.29663      validation_0-error:0.03713

```

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validation\_1-logloss:0.28640      validation\_1-error:0.06447

[22]      validation\_0-logloss:0.26336      validation\_0-error:0.04314

validation\_1-logloss:0.27858      validation\_1-error:0.05997

[23]      validation\_0-logloss:0.25574      validation\_0-error:0.04126

validation\_1-logloss:0.27129      validation\_1-error:0.05997

[24]      validation\_0-logloss:0.24857      validation\_0-error:0.04163

validation\_1-logloss:0.26424      validation\_1-error:0.05847

[25]      validation\_0-logloss:0.24179      validation\_0-error:0.04013

validation\_1-logloss:0.25759      validation\_1-error:0.05847

[26]      validation\_0-logloss:0.23549      validation\_0-error:0.04088

validation\_1-logloss:0.25130      validation\_1-error:0.05697

[27]      validation\_0-logloss:0.22962      validation\_0-error:0.04051

validation\_1-logloss:0.24540      validation\_1-error:0.05547

[28]      validation\_0-logloss:0.22400      validation\_0-error:0.04051

validation\_1-logloss:0.24006      validation\_1-error:0.05397

[29]      validation\_0-logloss:0.21887      validation\_0-error:0.03976

validation\_1-logloss:0.23467      validation\_1-error:0.05397

[30]      validation\_0-logloss:0.21396      validation\_0-error:0.03976

validation\_1-logloss:0.22988      validation\_1-error:0.05247

[31]      validation\_0-logloss:0.20934      validation\_0-error:0.03788

validation\_1-logloss:0.22536      validation\_1-error:0.05247

[32]      validation\_0-logloss:0.20497      validation\_0-error:0.03751

validation\_1-logloss:0.22141      validation\_1-error:0.05097

[33]      validation\_0-logloss:0.20061      validation\_0-error:0.03751

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[34]      validation\_0-logloss:0.19655      validation\_0-error:0.03713

validation\_1-logloss:0.21312      validation\_1-error:0.04798

[35]      validation\_0-logloss:0.19269      validation\_0-error:0.03713

validation\_1-logloss:0.20947      validation\_1-error:0.04798

[36]      validation\_0-logloss:0.18935      validation\_0-error:0.03676

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[37]      validation\_0-logloss:0.18605      validation\_0-error:0.03638

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[38]      validation\_0-logloss:0.18270      validation\_0-error:0.03601

validation\_1-logloss:0.20053      validation\_1-error:0.04648

[39]      validation\_0-logloss:0.17955      validation\_0-error:0.03526



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 [59]      validation\_0-logloss:0.14042      validation\_0-error:0.03301  
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 [62]      validation\_0-logloss:0.13742      validation\_0-error:0.03263  
 validation\_1-logloss:0.17069      validation\_1-error:0.04498  
 [63]      validation\_0-logloss:0.13664      validation\_0-error:0.03226

```

validation_1-logloss:0.17013    validation_1-error:0.04498
[64]   validation_0-logloss:0.13532    validation_0-error:0.03188
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[65]   validation_0-logloss:0.13464    validation_0-error:0.03188
validation_1-logloss:0.16881    validation_1-error:0.04498
[66]   validation_0-logloss:0.13395    validation_0-error:0.03188
validation_1-logloss:0.16795    validation_1-error:0.04498
[67]   validation_0-logloss:0.13287    validation_0-error:0.03188
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[68]   validation_0-logloss:0.13187    validation_0-error:0.03188
validation_1-logloss:0.16701    validation_1-error:0.04498
[69]   validation_0-logloss:0.13085    validation_0-error:0.03188
validation_1-logloss:0.16690    validation_1-error:0.04498
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[71]   validation_0-logloss:0.12863    validation_0-error:0.03113
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[72]   validation_0-logloss:0.12783    validation_0-error:0.03113
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[73]   validation_0-logloss:0.12698    validation_0-error:0.03076
validation_1-logloss:0.16649    validation_1-error:0.04648
[74]   validation_0-logloss:0.12624    validation_0-error:0.03076
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validation_1-logloss:0.65465    validation_1-error:0.06747
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validation_1-logloss:0.61976    validation_1-error:0.06747
[2]    validation_0-logloss:0.58481    validation_0-error:0.04876
validation_1-logloss:0.58796    validation_1-error:0.06297
[3]    validation_0-logloss:0.55494    validation_0-error:0.04876
validation_1-logloss:0.55910    validation_1-error:0.06297
[4]    validation_0-logloss:0.52767    validation_0-error:0.04876
validation_1-logloss:0.53243    validation_1-error:0.06297

```

```

C:\Users\sci\anaconda3\lib\site-packages\xgboost\sklearn.py:888: UserWarning:
The use of label encoder in XGBClassifier is deprecated and will be removed in a
future release. To remove this warning, do the following: 1) Pass option
use_label_encoder=False when constructing XGBClassifier object; and 2) Encode
your labels (y) as integers starting with 0, i.e. 0, 1, 2, ..., [num_class - 1].
warnings.warn(label_encoder_deprecation_msg, UserWarning)

```

```

C:\Users\sci\anaconda3\lib\site-packages\xgboost\sklearn.py:888: UserWarning:
The use of label encoder in XGBClassifier is deprecated and will be removed in a
future release. To remove this warning, do the following: 1) Pass option
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your labels (y) as integers starting with 0, i.e. 0, 1, 2, ..., [num_class - 1].
warnings.warn(label_encoder_deprecation_msg, UserWarning)

```

```

[5]    validation_0-logloss:0.50257    validation_0-error:0.04764
validation_1-logloss:0.50833    validation_1-error:0.06447

```

[6] validation\_0-logloss:0.47952 validation\_0-error:0.04764  
validation\_1-logloss:0.48595 validation\_1-error:0.06297  
[7] validation\_0-logloss:0.45817 validation\_0-error:0.04689  
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[8] validation\_0-logloss:0.43836 validation\_0-error:0.04614  
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[9] validation\_0-logloss:0.42013 validation\_0-error:0.04539  
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 [25] validation\_0-logloss:0.24170 validation\_0-error:0.04163  
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[27] validation\_0-logloss:0.22898 validation\_0-error:0.04201  
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 [28] validation\_0-logloss:0.22340 validation\_0-error:0.04163  
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 [43] validation\_0-logloss:0.16775 validation\_0-error:0.03076  
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 [44] validation\_0-logloss:0.16519 validation\_0-error:0.03076  
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[51] validation\_0-logloss:0.15136 validation\_0-error:0.03001  
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 [64] validation\_0-logloss:0.13340 validation\_0-error:0.02851  
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 [66] validation\_0-logloss:0.13083 validation\_0-error:0.02851  
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 [71] validation\_0-logloss:0.12513 validation\_0-error:0.02851  
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 [72] validation\_0-logloss:0.12425 validation\_0-error:0.02851  
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 [73] validation\_0-logloss:0.12365 validation\_0-error:0.02851  
 validation\_1-logloss:0.15227 validation\_1-error:0.03898  
 [74] validation\_0-logloss:0.12291 validation\_0-error:0.02813  
 validation\_1-logloss:0.15238 validation\_1-error:0.03898



```

[75]    validation_0-logloss:0.12210    validation_0-error:0.02813
validation_1-logloss:0.15162    validation_1-error:0.03898
[76]    validation_0-logloss:0.12126    validation_0-error:0.02813
validation_1-logloss:0.15160    validation_1-error:0.03898
[77]    validation_0-logloss:0.12037    validation_0-error:0.02813
validation_1-logloss:0.15137    validation_1-error:0.03748
[78]    validation_0-logloss:0.11989    validation_0-error:0.02776
validation_1-logloss:0.15104    validation_1-error:0.03748
[79]    validation_0-logloss:0.11927    validation_0-error:0.02738
validation_1-logloss:0.15082    validation_1-error:0.03748
[80]    validation_0-logloss:0.11868    validation_0-error:0.02738
validation_1-logloss:0.15059    validation_1-error:0.03748
[81]    validation_0-logloss:0.11809    validation_0-error:0.02738
validation_1-logloss:0.15066    validation_1-error:0.03748
[82]    validation_0-logloss:0.11760    validation_0-error:0.02738
validation_1-logloss:0.15044    validation_1-error:0.03748
[83]    validation_0-logloss:0.11675    validation_0-error:0.02738
validation_1-logloss:0.15004    validation_1-error:0.03748
[84]    validation_0-logloss:0.11639    validation_0-error:0.02738
validation_1-logloss:0.14975    validation_1-error:0.03748
[85]    validation_0-logloss:0.11601    validation_0-error:0.02738
validation_1-logloss:0.14950    validation_1-error:0.03748
[86]    validation_0-logloss:0.11522    validation_0-error:0.02738
validation_1-logloss:0.14913    validation_1-error:0.03748
[87]    validation_0-logloss:0.11484    validation_0-error:0.02701
validation_1-logloss:0.14892    validation_1-error:0.03748

```

C:\Users\sci\anaconda3\lib\site-packages\xgboost\sklearn.py:888: UserWarning:  
The use of label encoder in XGBClassifier is deprecated and will be removed in a  
future release. To remove this warning, do the following: 1) Pass option  
use\_label\_encoder=False when constructing XGBClassifier object; and 2) Encode  
your labels (y) as integers starting with 0, i.e. 0, 1, 2, ..., [num\_class - 1].  
warnings.warn(label\_encoder\_deprecation\_msg, UserWarning)

```

[88]    validation_0-logloss:0.11396    validation_0-error:0.02701
validation_1-logloss:0.14887    validation_1-error:0.03898
[89]    validation_0-logloss:0.11335    validation_0-error:0.02701
validation_1-logloss:0.14879    validation_1-error:0.03898
[0]    validation_0-logloss:0.65340    validation_0-error:0.04839
validation_1-logloss:0.65419    validation_1-error:0.05997
[1]    validation_0-logloss:0.61735    validation_0-error:0.04764
validation_1-logloss:0.61899    validation_1-error:0.05997
[2]    validation_0-logloss:0.58454    validation_0-error:0.04801
validation_1-logloss:0.58712    validation_1-error:0.05997
[3]    validation_0-logloss:0.55450    validation_0-error:0.04801
validation_1-logloss:0.55758    validation_1-error:0.05997
[4]    validation_0-logloss:0.52703    validation_0-error:0.04801
validation_1-logloss:0.53044    validation_1-error:0.05997
[5]    validation_0-logloss:0.50170    validation_0-error:0.04501

```

validation\_1-logloss:0.50581 validation\_1-error:0.05397  
 [6] validation\_0-logloss:0.47838 validation\_0-error:0.04501  
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 [7] validation\_0-logloss:0.45691 validation\_0-error:0.04539  
 validation\_1-logloss:0.46171 validation\_1-error:0.04947  
 [8] validation\_0-logloss:0.43717 validation\_0-error:0.04501  
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 [9] validation\_0-logloss:0.41881 validation\_0-error:0.04501  
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 [16] validation\_0-logloss:0.31977 validation\_0-error:0.04464  
 validation\_1-logloss:0.32678 validation\_1-error:0.05097  
 [17] validation\_0-logloss:0.30858 validation\_0-error:0.04464  
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 [18] validation\_0-logloss:0.29821 validation\_0-error:0.04426  
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 [24] validation\_0-logloss:0.24837 validation\_0-error:0.04239  
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 [29] validation\_0-logloss:0.21863 validation\_0-error:0.03788

validation\_1-logloss:0.22776      validation\_1-error:0.04348

[30]      validation\_0-logloss:0.21363      validation\_0-error:0.03676

validation\_1-logloss:0.22313      validation\_1-error:0.04348

[31]      validation\_0-logloss:0.20867      validation\_0-error:0.03713

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[32]      validation\_0-logloss:0.20403      validation\_0-error:0.03713

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[33]      validation\_0-logloss:0.19949      validation\_0-error:0.03788

validation\_1-logloss:0.21128      validation\_1-error:0.04198

[34]      validation\_0-logloss:0.19518      validation\_0-error:0.03826

validation\_1-logloss:0.20757      validation\_1-error:0.04198

[35]      validation\_0-logloss:0.19125      validation\_0-error:0.03826

validation\_1-logloss:0.20453      validation\_1-error:0.04198

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[37]      validation\_0-logloss:0.18391      validation\_0-error:0.03788

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[38]      validation\_0-logloss:0.18063      validation\_0-error:0.03788

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[39]      validation\_0-logloss:0.17739      validation\_0-error:0.03826

validation\_1-logloss:0.19276      validation\_1-error:0.04648

[40]      validation\_0-logloss:0.17447      validation\_0-error:0.03826

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[41]      validation\_0-logloss:0.17156      validation\_0-error:0.03676

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[42]      validation\_0-logloss:0.16880      validation\_0-error:0.03713

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[43]      validation\_0-logloss:0.16659      validation\_0-error:0.03638

validation\_1-logloss:0.18313      validation\_1-error:0.04498

[44]      validation\_0-logloss:0.16414      validation\_0-error:0.03676

validation\_1-logloss:0.18105      validation\_1-error:0.04498

[45]      validation\_0-logloss:0.16184      validation\_0-error:0.03676

validation\_1-logloss:0.17977      validation\_1-error:0.04498

[46]      validation\_0-logloss:0.15995      validation\_0-error:0.03601

validation\_1-logloss:0.17748      validation\_1-error:0.04498

[47]      validation\_0-logloss:0.15796      validation\_0-error:0.03563

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[48]      validation\_0-logloss:0.15607      validation\_0-error:0.03451

validation\_1-logloss:0.17372      validation\_1-error:0.04348

[49]      validation\_0-logloss:0.15431      validation\_0-error:0.03451

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[50]      validation\_0-logloss:0.15281      validation\_0-error:0.03376

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[52]      validation\_0-logloss:0.14942      validation\_0-error:0.03338

validation\_1-logloss:0.16785      validation\_1-error:0.04198

[53]      validation\_0-logloss:0.14813      validation\_0-error:0.03301

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validation\_1-logloss:0.15124      validation\_1-error:0.04048  
[74]      validation\_0-logloss:0.12698      validation\_0-error:0.03038  
validation\_1-logloss:0.15079      validation\_1-error:0.04048  
[75]      validation\_0-logloss:0.12642      validation\_0-error:0.03038  
validation\_1-logloss:0.15054      validation\_1-error:0.04048  
[76]      validation\_0-logloss:0.12571      validation\_0-error:0.03076  
validation\_1-logloss:0.15000      validation\_1-error:0.04048  
[77]      validation\_0-logloss:0.12498      validation\_0-error:0.03038

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validation_1-logloss:0.14999    validation_1-error:0.04048
[78]   validation_0-logloss:0.12451    validation_0-error:0.03113
validation_1-logloss:0.14954    validation_1-error:0.03748
[79]   validation_0-logloss:0.12380    validation_0-error:0.03001
validation_1-logloss:0.14932    validation_1-error:0.04048
[80]   validation_0-logloss:0.12320    validation_0-error:0.03038
validation_1-logloss:0.14930    validation_1-error:0.03898
[81]   validation_0-logloss:0.12275    validation_0-error:0.03038
validation_1-logloss:0.14878    validation_1-error:0.03898
[82]   validation_0-logloss:0.12208    validation_0-error:0.03038
validation_1-logloss:0.14847    validation_1-error:0.03748
[83]   validation_0-logloss:0.12164    validation_0-error:0.03001
validation_1-logloss:0.14836    validation_1-error:0.03748
[84]   validation_0-logloss:0.12111    validation_0-error:0.03001
validation_1-logloss:0.14847    validation_1-error:0.03898
[85]   validation_0-logloss:0.12052    validation_0-error:0.03001
validation_1-logloss:0.14808    validation_1-error:0.03748
[86]   validation_0-logloss:0.11994    validation_0-error:0.03001
validation_1-logloss:0.14796    validation_1-error:0.03748
[87]   validation_0-logloss:0.11955    validation_0-error:0.03001
validation_1-logloss:0.14791    validation_1-error:0.03748
[88]   validation_0-logloss:0.11925    validation_0-error:0.03001
validation_1-logloss:0.14775    validation_1-error:0.03748
[89]   validation_0-logloss:0.11876    validation_0-error:0.02963
validation_1-logloss:0.14773    validation_1-error:0.03898

```

C:\Users\sci\anaconda3\lib\site-packages\xgboost\sklearn.py:888: UserWarning:  
The use of label encoder in XGBClassifier is deprecated and will be removed in a  
future release. To remove this warning, do the following: 1) Pass option  
use\_label\_encoder=False when constructing XGBClassifier object; and 2) Encode  
your labels (y) as integers starting with 0, i.e. 0, 1, 2, ..., [num\_class - 1].  
warnings.warn(label\_encoder\_deprecation\_msg, UserWarning)

```

[0]   validation_0-logloss:0.65361    validation_0-error:0.05439
validation_1-logloss:0.65397    validation_1-error:0.05697
[1]   validation_0-logloss:0.61795    validation_0-error:0.05176
validation_1-logloss:0.61848    validation_1-error:0.05397
[2]   validation_0-logloss:0.58546    validation_0-error:0.05214
validation_1-logloss:0.58611    validation_1-error:0.05247
[3]   validation_0-logloss:0.55559    validation_0-error:0.05139
validation_1-logloss:0.55699    validation_1-error:0.05547
[4]   validation_0-logloss:0.52842    validation_0-error:0.05251
validation_1-logloss:0.53003    validation_1-error:0.05097
[5]   validation_0-logloss:0.50329    validation_0-error:0.05251
validation_1-logloss:0.50553    validation_1-error:0.05097
[6]   validation_0-logloss:0.48001    validation_0-error:0.05176
validation_1-logloss:0.48265    validation_1-error:0.05547
[7]   validation_0-logloss:0.45867    validation_0-error:0.05026
validation_1-logloss:0.46176    validation_1-error:0.05697

```

[8] validation\_0-logloss:0.43827 validation\_0-error:0.04689  
 validation\_1-logloss:0.44185 validation\_1-error:0.05247  
 [9] validation\_0-logloss:0.41971 validation\_0-error:0.04614  
 validation\_1-logloss:0.42423 validation\_1-error:0.05397  
 [10] validation\_0-logloss:0.40215 validation\_0-error:0.04651  
 validation\_1-logloss:0.40692 validation\_1-error:0.05397  
 [11] validation\_0-logloss:0.38587 validation\_0-error:0.04314  
 validation\_1-logloss:0.39117 validation\_1-error:0.05547  
 [12] validation\_0-logloss:0.37042 validation\_0-error:0.04239  
 validation\_1-logloss:0.37611 validation\_1-error:0.05697  
 [13] validation\_0-logloss:0.35640 validation\_0-error:0.04201  
 validation\_1-logloss:0.36233 validation\_1-error:0.05547  
 [14] validation\_0-logloss:0.34279 validation\_0-error:0.04163  
 validation\_1-logloss:0.34910 validation\_1-error:0.05697  
 [15] validation\_0-logloss:0.33004 validation\_0-error:0.03901  
 validation\_1-logloss:0.33680 validation\_1-error:0.05547  
 [16] validation\_0-logloss:0.31811 validation\_0-error:0.03901  
 validation\_1-logloss:0.32498 validation\_1-error:0.05397  
 [17] validation\_0-logloss:0.30705 validation\_0-error:0.03751  
 validation\_1-logloss:0.31423 validation\_1-error:0.05247  
 [18] validation\_0-logloss:0.29663 validation\_0-error:0.03713  
 validation\_1-logloss:0.30448 validation\_1-error:0.05097  
 [19] validation\_0-logloss:0.28675 validation\_0-error:0.03601  
 validation\_1-logloss:0.29527 validation\_1-error:0.05247  
 [20] validation\_0-logloss:0.27747 validation\_0-error:0.03526  
 validation\_1-logloss:0.28615 validation\_1-error:0.04947  
 [21] validation\_0-logloss:0.26873 validation\_0-error:0.03526  
 validation\_1-logloss:0.27806 validation\_1-error:0.04798  
 [22] validation\_0-logloss:0.26052 validation\_0-error:0.03526  
 validation\_1-logloss:0.27008 validation\_1-error:0.04648  
 [23] validation\_0-logloss:0.25295 validation\_0-error:0.03488  
 validation\_1-logloss:0.26311 validation\_1-error:0.04498  
 [24] validation\_0-logloss:0.24592 validation\_0-error:0.03451  
 validation\_1-logloss:0.25651 validation\_1-error:0.04498  
 [25] validation\_0-logloss:0.23911 validation\_0-error:0.03488  
 validation\_1-logloss:0.25048 validation\_1-error:0.04498  
 [26] validation\_0-logloss:0.23287 validation\_0-error:0.03301  
 validation\_1-logloss:0.24489 validation\_1-error:0.04348  
 [27] validation\_0-logloss:0.22700 validation\_0-error:0.03413  
 validation\_1-logloss:0.23937 validation\_1-error:0.04348  
 [28] validation\_0-logloss:0.22145 validation\_0-error:0.03376  
 validation\_1-logloss:0.23437 validation\_1-error:0.04348  
 [29] validation\_0-logloss:0.21623 validation\_0-error:0.03301  
 validation\_1-logloss:0.22965 validation\_1-error:0.04348  
 [30] validation\_0-logloss:0.21115 validation\_0-error:0.03226  
 validation\_1-logloss:0.22507 validation\_1-error:0.04348  
 [31] validation\_0-logloss:0.20637 validation\_0-error:0.03226  
 validation\_1-logloss:0.22081 validation\_1-error:0.04348

[32] validation\_0-logloss:0.20189 validation\_0-error:0.03113  
 validation\_1-logloss:0.21689 validation\_1-error:0.04348  
 [33] validation\_0-logloss:0.19778 validation\_0-error:0.03151  
 validation\_1-logloss:0.21306 validation\_1-error:0.04498  
 [34] validation\_0-logloss:0.19406 validation\_0-error:0.03151  
 validation\_1-logloss:0.20982 validation\_1-error:0.04348  
 [35] validation\_0-logloss:0.19040 validation\_0-error:0.03151  
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 [36] validation\_0-logloss:0.18694 validation\_0-error:0.03038  
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 [37] validation\_0-logloss:0.18370 validation\_0-error:0.03113  
 validation\_1-logloss:0.20022 validation\_1-error:0.04348  
 [38] validation\_0-logloss:0.18042 validation\_0-error:0.03113  
 validation\_1-logloss:0.19740 validation\_1-error:0.04498  
 [39] validation\_0-logloss:0.17786 validation\_0-error:0.03076  
 validation\_1-logloss:0.19520 validation\_1-error:0.04498  
 [40] validation\_0-logloss:0.17492 validation\_0-error:0.03151  
 validation\_1-logloss:0.19290 validation\_1-error:0.04498  
 [41] validation\_0-logloss:0.17205 validation\_0-error:0.03038  
 validation\_1-logloss:0.19052 validation\_1-error:0.04348  
 [42] validation\_0-logloss:0.16932 validation\_0-error:0.03001  
 validation\_1-logloss:0.18827 validation\_1-error:0.04498  
 [43] validation\_0-logloss:0.16680 validation\_0-error:0.03001  
 validation\_1-logloss:0.18574 validation\_1-error:0.04348  
 [44] validation\_0-logloss:0.16458 validation\_0-error:0.02963  
 validation\_1-logloss:0.18404 validation\_1-error:0.04498  
 [45] validation\_0-logloss:0.16225 validation\_0-error:0.02926  
 validation\_1-logloss:0.18184 validation\_1-error:0.04498  
 [46] validation\_0-logloss:0.16033 validation\_0-error:0.02926  
 validation\_1-logloss:0.18061 validation\_1-error:0.04498  
 [47] validation\_0-logloss:0.15815 validation\_0-error:0.02888  
 validation\_1-logloss:0.17865 validation\_1-error:0.04348  
 [48] validation\_0-logloss:0.15629 validation\_0-error:0.02888  
 validation\_1-logloss:0.17734 validation\_1-error:0.04498  
 [49] validation\_0-logloss:0.15450 validation\_0-error:0.02851  
 validation\_1-logloss:0.17550 validation\_1-error:0.04348  
 [50] validation\_0-logloss:0.15276 validation\_0-error:0.02851  
 validation\_1-logloss:0.17418 validation\_1-error:0.04348  
 [51] validation\_0-logloss:0.15103 validation\_0-error:0.02813  
 validation\_1-logloss:0.17233 validation\_1-error:0.04348  
 [52] validation\_0-logloss:0.14950 validation\_0-error:0.02813  
 validation\_1-logloss:0.17090 validation\_1-error:0.04348  
 [53] validation\_0-logloss:0.14782 validation\_0-error:0.02813  
 validation\_1-logloss:0.16998 validation\_1-error:0.04348  
 [54] validation\_0-logloss:0.14632 validation\_0-error:0.02776  
 validation\_1-logloss:0.16856 validation\_1-error:0.04348  
 [55] validation\_0-logloss:0.14482 validation\_0-error:0.02776  
 validation\_1-logloss:0.16761 validation\_1-error:0.04348

[56] validation\_0-logloss:0.14355 validation\_0-error:0.02776  
validation\_1-logloss:0.16639 validation\_1-error:0.04348  
[57] validation\_0-logloss:0.14207 validation\_0-error:0.02813  
validation\_1-logloss:0.16542 validation\_1-error:0.04048  
[58] validation\_0-logloss:0.14094 validation\_0-error:0.02813  
validation\_1-logloss:0.16431 validation\_1-error:0.04048  
[59] validation\_0-logloss:0.13973 validation\_0-error:0.02776  
validation\_1-logloss:0.16351 validation\_1-error:0.04198  
[60] validation\_0-logloss:0.13851 validation\_0-error:0.02738  
validation\_1-logloss:0.16218 validation\_1-error:0.04048  
[61] validation\_0-logloss:0.13679 validation\_0-error:0.02701  
validation\_1-logloss:0.16168 validation\_1-error:0.04048  
[62] validation\_0-logloss:0.13575 validation\_0-error:0.02701  
validation\_1-logloss:0.16074 validation\_1-error:0.04048  
[63] validation\_0-logloss:0.13429 validation\_0-error:0.02701  
validation\_1-logloss:0.16013 validation\_1-error:0.04048  
[64] validation\_0-logloss:0.13281 validation\_0-error:0.02701  
validation\_1-logloss:0.15979 validation\_1-error:0.04048  
[65] validation\_0-logloss:0.13149 validation\_0-error:0.02701  
validation\_1-logloss:0.15939 validation\_1-error:0.04048  
[66] validation\_0-logloss:0.13027 validation\_0-error:0.02701  
validation\_1-logloss:0.15866 validation\_1-error:0.04198  
[67] validation\_0-logloss:0.12932 validation\_0-error:0.02701  
validation\_1-logloss:0.15778 validation\_1-error:0.04048  
[68] validation\_0-logloss:0.12790 validation\_0-error:0.02663  
validation\_1-logloss:0.15768 validation\_1-error:0.04048  
[69] validation\_0-logloss:0.12703 validation\_0-error:0.02626  
validation\_1-logloss:0.15660 validation\_1-error:0.04048  
[70] validation\_0-logloss:0.12575 validation\_0-error:0.02701  
validation\_1-logloss:0.15627 validation\_1-error:0.04048  
[71] validation\_0-logloss:0.12495 validation\_0-error:0.02663  
validation\_1-logloss:0.15527 validation\_1-error:0.04048  
[72] validation\_0-logloss:0.12424 validation\_0-error:0.02738  
validation\_1-logloss:0.15523 validation\_1-error:0.03898  
[73] validation\_0-logloss:0.12350 validation\_0-error:0.02701  
validation\_1-logloss:0.15431 validation\_1-error:0.03898  
[74] validation\_0-logloss:0.12263 validation\_0-error:0.02663  
validation\_1-logloss:0.15373 validation\_1-error:0.03748  
[75] validation\_0-logloss:0.12207 validation\_0-error:0.02701  
validation\_1-logloss:0.15366 validation\_1-error:0.03748  
[76] validation\_0-logloss:0.12143 validation\_0-error:0.02701  
validation\_1-logloss:0.15347 validation\_1-error:0.03748  
[77] validation\_0-logloss:0.12076 validation\_0-error:0.02738  
validation\_1-logloss:0.15282 validation\_1-error:0.03748  
[78] validation\_0-logloss:0.12011 validation\_0-error:0.02663  
validation\_1-logloss:0.15275 validation\_1-error:0.03748  
[79] validation\_0-logloss:0.11957 validation\_0-error:0.02588  
validation\_1-logloss:0.15225 validation\_1-error:0.03748



```

[80]    validation_0-logloss:0.11882    validation_0-error:0.02588
validation_1-logloss:0.15221    validation_1-error:0.03748
[81]    validation_0-logloss:0.11804    validation_0-error:0.02588
validation_1-logloss:0.15218    validation_1-error:0.03748
[82]    validation_0-logloss:0.11749    validation_0-error:0.02626
validation_1-logloss:0.15185    validation_1-error:0.03748
[83]    validation_0-logloss:0.11700    validation_0-error:0.02588
validation_1-logloss:0.15145    validation_1-error:0.03748
[84]    validation_0-logloss:0.11646    validation_0-error:0.02551
validation_1-logloss:0.15115    validation_1-error:0.03748
[85]    validation_0-logloss:0.11576    validation_0-error:0.02626
validation_1-logloss:0.15097    validation_1-error:0.03748
[86]    validation_0-logloss:0.11534    validation_0-error:0.02588
validation_1-logloss:0.15089    validation_1-error:0.03748
[87]    validation_0-logloss:0.11478    validation_0-error:0.02588
validation_1-logloss:0.15076    validation_1-error:0.03748
[88]    validation_0-logloss:0.11426    validation_0-error:0.02626
validation_1-logloss:0.15059    validation_1-error:0.03748
[89]    validation_0-logloss:0.11390    validation_0-error:0.02588
validation_1-logloss:0.15004    validation_1-error:0.03748

```

C:\Users\sci\anaconda3\lib\site-packages\xgboost\sklearn.py:888: UserWarning:  
The use of label encoder in XGBClassifier is deprecated and will be removed in a  
future release. To remove this warning, do the following: 1) Pass option  
use\_label\_encoder=False when constructing XGBClassifier object; and 2) Encode  
your labels (y) as integers starting with 0, i.e. 0, 1, 2, ..., [num\_class - 1].  
warnings.warn(label\_encoder\_deprecation\_msg, UserWarning)

```

[0]    validation_0-logloss:0.65329    validation_0-error:0.04989
validation_1-logloss:0.65464    validation_1-error:0.07046
[1]    validation_0-logloss:0.61719    validation_0-error:0.04914
validation_1-logloss:0.61986    validation_1-error:0.07046
[2]    validation_0-logloss:0.58435    validation_0-error:0.04914
validation_1-logloss:0.58815    validation_1-error:0.07046
[3]    validation_0-logloss:0.55429    validation_0-error:0.04839
validation_1-logloss:0.55907    validation_1-error:0.07196
[4]    validation_0-logloss:0.52684    validation_0-error:0.04839
validation_1-logloss:0.53237    validation_1-error:0.07196
[5]    validation_0-logloss:0.50165    validation_0-error:0.04839
validation_1-logloss:0.50816    validation_1-error:0.07196
[6]    validation_0-logloss:0.47850    validation_0-error:0.04764
validation_1-logloss:0.48549    validation_1-error:0.07196
[7]    validation_0-logloss:0.45709    validation_0-error:0.04951
validation_1-logloss:0.46511    validation_1-error:0.07196
[8]    validation_0-logloss:0.43709    validation_0-error:0.04876
validation_1-logloss:0.44518    validation_1-error:0.07196
[9]    validation_0-logloss:0.41837    validation_0-error:0.04726
validation_1-logloss:0.42711    validation_1-error:0.07196
[10]   validation_0-logloss:0.40110    validation_0-error:0.04726

```

validation\_1-logloss:0.41061      validation\_1-error:0.07196

[11]      validation\_0-logloss:0.38526      validation\_0-error:0.04726

validation\_1-logloss:0.39515      validation\_1-error:0.07046

[12]      validation\_0-logloss:0.37023      validation\_0-error:0.04689

validation\_1-logloss:0.38104      validation\_1-error:0.07046

[13]      validation\_0-logloss:0.35624      validation\_0-error:0.04689

validation\_1-logloss:0.36802      validation\_1-error:0.07046

[14]      validation\_0-logloss:0.34321      validation\_0-error:0.04576

validation\_1-logloss:0.35536      validation\_1-error:0.06897

[15]      validation\_0-logloss:0.33110      validation\_0-error:0.04576

validation\_1-logloss:0.34383      validation\_1-error:0.06897

[16]      validation\_0-logloss:0.31977      validation\_0-error:0.04464

validation\_1-logloss:0.33376      validation\_1-error:0.06897

[17]      validation\_0-logloss:0.30924      validation\_0-error:0.04389

validation\_1-logloss:0.32373      validation\_1-error:0.06897

[18]      validation\_0-logloss:0.29882      validation\_0-error:0.04464

validation\_1-logloss:0.31355      validation\_1-error:0.06597

[19]      validation\_0-logloss:0.28907      validation\_0-error:0.04501

validation\_1-logloss:0.30398      validation\_1-error:0.06447

[20]      validation\_0-logloss:0.28000      validation\_0-error:0.04614

validation\_1-logloss:0.29476      validation\_1-error:0.06447

[21]      validation\_0-logloss:0.27152      validation\_0-error:0.04651

validation\_1-logloss:0.28640      validation\_1-error:0.06447

[22]      validation\_0-logloss:0.26336      validation\_0-error:0.04314

validation\_1-logloss:0.27858      validation\_1-error:0.05997

[23]      validation\_0-logloss:0.25574      validation\_0-error:0.04126

validation\_1-logloss:0.27129      validation\_1-error:0.05997

[24]      validation\_0-logloss:0.24857      validation\_0-error:0.04163

validation\_1-logloss:0.26424      validation\_1-error:0.05847

[25]      validation\_0-logloss:0.24179      validation\_0-error:0.04013

validation\_1-logloss:0.25759      validation\_1-error:0.05847

[26]      validation\_0-logloss:0.23549      validation\_0-error:0.04088

validation\_1-logloss:0.25130      validation\_1-error:0.05697

[27]      validation\_0-logloss:0.22962      validation\_0-error:0.04051

validation\_1-logloss:0.24540      validation\_1-error:0.05547

[28]      validation\_0-logloss:0.22400      validation\_0-error:0.04051

validation\_1-logloss:0.24006      validation\_1-error:0.05397

[29]      validation\_0-logloss:0.21887      validation\_0-error:0.03976

validation\_1-logloss:0.23467      validation\_1-error:0.05397

[30]      validation\_0-logloss:0.21396      validation\_0-error:0.03976

validation\_1-logloss:0.22988      validation\_1-error:0.05247

[31]      validation\_0-logloss:0.20934      validation\_0-error:0.03788

validation\_1-logloss:0.22536      validation\_1-error:0.05247

[32]      validation\_0-logloss:0.20497      validation\_0-error:0.03751

validation\_1-logloss:0.22141      validation\_1-error:0.05097

[33]      validation\_0-logloss:0.20061      validation\_0-error:0.03751

validation\_1-logloss:0.21710      validation\_1-error:0.04947

[34]      validation\_0-logloss:0.19655      validation\_0-error:0.03713

validation\_1-logloss:0.21312      validation\_1-error:0.04798

[35]      validation\_0-logloss:0.19269      validation\_0-error:0.03713

validation\_1-logloss:0.20947      validation\_1-error:0.04798

[36]      validation\_0-logloss:0.18935      validation\_0-error:0.03676

validation\_1-logloss:0.20619      validation\_1-error:0.04648

[37]      validation\_0-logloss:0.18605      validation\_0-error:0.03638

validation\_1-logloss:0.20334      validation\_1-error:0.04648

[38]      validation\_0-logloss:0.18270      validation\_0-error:0.03601

validation\_1-logloss:0.20053      validation\_1-error:0.04648

[39]      validation\_0-logloss:0.17955      validation\_0-error:0.03526

validation\_1-logloss:0.19787      validation\_1-error:0.04798

[40]      validation\_0-logloss:0.17656      validation\_0-error:0.03601

validation\_1-logloss:0.19596      validation\_1-error:0.04798

[41]      validation\_0-logloss:0.17375      validation\_0-error:0.03563

validation\_1-logloss:0.19367      validation\_1-error:0.04798

[42]      validation\_0-logloss:0.17128      validation\_0-error:0.03563

validation\_1-logloss:0.19183      validation\_1-error:0.04798

[43]      validation\_0-logloss:0.16875      validation\_0-error:0.03563

validation\_1-logloss:0.18994      validation\_1-error:0.04798

[44]      validation\_0-logloss:0.16636      validation\_0-error:0.03563

validation\_1-logloss:0.18861      validation\_1-error:0.04798

[45]      validation\_0-logloss:0.16421      validation\_0-error:0.03563

validation\_1-logloss:0.18730      validation\_1-error:0.04648

[46]      validation\_0-logloss:0.16179      validation\_0-error:0.03526

validation\_1-logloss:0.18604      validation\_1-error:0.04648

[47]      validation\_0-logloss:0.15946      validation\_0-error:0.03526

validation\_1-logloss:0.18497      validation\_1-error:0.04648

[48]      validation\_0-logloss:0.15734      validation\_0-error:0.03526

validation\_1-logloss:0.18374      validation\_1-error:0.04648

[49]      validation\_0-logloss:0.15560      validation\_0-error:0.03488

validation\_1-logloss:0.18228      validation\_1-error:0.04648

[50]      validation\_0-logloss:0.15390      validation\_0-error:0.03451

validation\_1-logloss:0.18105      validation\_1-error:0.04648

[51]      validation\_0-logloss:0.15190      validation\_0-error:0.03451

validation\_1-logloss:0.18003      validation\_1-error:0.04648

[52]      validation\_0-logloss:0.14999      validation\_0-error:0.03451

validation\_1-logloss:0.17889      validation\_1-error:0.04648

[53]      validation\_0-logloss:0.14876      validation\_0-error:0.03451

validation\_1-logloss:0.17774      validation\_1-error:0.04648

[54]      validation\_0-logloss:0.14705      validation\_0-error:0.03413

validation\_1-logloss:0.17690      validation\_1-error:0.04648

[55]      validation\_0-logloss:0.14545      validation\_0-error:0.03376

validation\_1-logloss:0.17591      validation\_1-error:0.04648

[56]      validation\_0-logloss:0.14439      validation\_0-error:0.03376

validation\_1-logloss:0.17493      validation\_1-error:0.04648

[57]      validation\_0-logloss:0.14286      validation\_0-error:0.03376

validation\_1-logloss:0.17390      validation\_1-error:0.04498

[58]      validation\_0-logloss:0.14192      validation\_0-error:0.03376

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 [62]      validation\_0-logloss:0.13742      validation\_0-error:0.03263  
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 [63]      validation\_0-logloss:0.13664      validation\_0-error:0.03226  
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 [81]      validation\_0-logloss:0.12146      validation\_0-error:0.03038  
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 [82]      validation\_0-logloss:0.12088      validation\_0-error:0.03038

```

validation_1-logloss:0.16541    validation_1-error:0.04348
[83]   validation_0-logloss:0.12034    validation_0-error:0.03038
validation_1-logloss:0.16481    validation_1-error:0.04348
[84]   validation_0-logloss:0.11983    validation_0-error:0.03038
validation_1-logloss:0.16483    validation_1-error:0.04348
[85]   validation_0-logloss:0.11936    validation_0-error:0.03076
validation_1-logloss:0.16444    validation_1-error:0.04348
[86]   validation_0-logloss:0.11883    validation_0-error:0.03076
validation_1-logloss:0.16455    validation_1-error:0.04348
[87]   validation_0-logloss:0.11825    validation_0-error:0.03038
validation_1-logloss:0.16460    validation_1-error:0.04348
[88]   validation_0-logloss:0.11780    validation_0-error:0.03076
validation_1-logloss:0.16423    validation_1-error:0.04348
[89]   validation_0-logloss:0.11738    validation_0-error:0.03038
validation_1-logloss:0.16450    validation_1-error:0.04348

```

C:\Users\sci\anaconda3\lib\site-packages\xgboost\sklearn.py:888: UserWarning:  
The use of label encoder in XGBClassifier is deprecated and will be removed in a  
future release. To remove this warning, do the following: 1) Pass option  
use\_label\_encoder=False when constructing XGBClassifier object; and 2) Encode  
your labels (y) as integers starting with 0, i.e. 0, 1, 2, ..., [num\_class - 1].

```
warnings.warn(label_encoder_deprecation_msg, UserWarning)
```

C:\Users\sci\anaconda3\lib\site-packages\xgboost\sklearn.py:888: UserWarning:  
The use of label encoder in XGBClassifier is deprecated and will be removed in a  
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use\_label\_encoder=False when constructing XGBClassifier object; and 2) Encode  
your labels (y) as integers starting with 0, i.e. 0, 1, 2, ..., [num\_class - 1].

```
warnings.warn(label_encoder_deprecation_msg, UserWarning)
```

```

[0]   validation_0-logloss:0.65348    validation_0-error:0.05064
validation_1-logloss:0.65465    validation_1-error:0.06747
[1]   validation_0-logloss:0.61768    validation_0-error:0.05026
validation_1-logloss:0.61976    validation_1-error:0.06747
[2]   validation_0-logloss:0.58481    validation_0-error:0.04876
validation_1-logloss:0.58796    validation_1-error:0.06297
[3]   validation_0-logloss:0.55494    validation_0-error:0.04876
validation_1-logloss:0.55910    validation_1-error:0.06297
[4]   validation_0-logloss:0.52767    validation_0-error:0.04876
validation_1-logloss:0.53243    validation_1-error:0.06297
[5]   validation_0-logloss:0.50257    validation_0-error:0.04764
validation_1-logloss:0.50833    validation_1-error:0.06447
[6]   validation_0-logloss:0.47952    validation_0-error:0.04764
validation_1-logloss:0.48595    validation_1-error:0.06297
[7]   validation_0-logloss:0.45817    validation_0-error:0.04689
validation_1-logloss:0.46544    validation_1-error:0.06297
[8]   validation_0-logloss:0.43836    validation_0-error:0.04614
validation_1-logloss:0.44638    validation_1-error:0.06447
[9]   validation_0-logloss:0.42013    validation_0-error:0.04539
validation_1-logloss:0.42895    validation_1-error:0.06447

```

[10] validation\_0-logloss:0.40298 validation\_0-error:0.04539  
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 [11] validation\_0-logloss:0.38723 validation\_0-error:0.04539  
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[64]    validation_0-logloss:0.13340    validation_0-error:0.02851
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[65]    validation_0-logloss:0.13195    validation_0-error:0.02813
validation_1-logloss:0.15733    validation_1-error:0.03898
[66]    validation_0-logloss:0.13083    validation_0-error:0.02851
validation_1-logloss:0.15637    validation_1-error:0.03898
[67]    validation_0-logloss:0.12939    validation_0-error:0.02851
validation_1-logloss:0.15599    validation_1-error:0.03898
[68]    validation_0-logloss:0.12838    validation_0-error:0.02888
validation_1-logloss:0.15520    validation_1-error:0.03898
[69]    validation_0-logloss:0.12744    validation_0-error:0.02888
validation_1-logloss:0.15417    validation_1-error:0.03898
[70]    validation_0-logloss:0.12612    validation_0-error:0.02851
validation_1-logloss:0.15395    validation_1-error:0.03898
[71]    validation_0-logloss:0.12513    validation_0-error:0.02851
validation_1-logloss:0.15309    validation_1-error:0.03898
[72]    validation_0-logloss:0.12425    validation_0-error:0.02851
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validation_1-logloss:0.15227    validation_1-error:0.03898
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[76]    validation_0-logloss:0.12126    validation_0-error:0.02813
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[77]    validation_0-logloss:0.12037    validation_0-error:0.02813
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[78]    validation_0-logloss:0.11989    validation_0-error:0.02776
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[79]    validation_0-logloss:0.11927    validation_0-error:0.02738
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[80]    validation_0-logloss:0.11868    validation_0-error:0.02738
validation_1-logloss:0.15059    validation_1-error:0.03748
[81]    validation_0-logloss:0.11809    validation_0-error:0.02738
validation_1-logloss:0.15066    validation_1-error:0.03748

```

C:\Users\sci\anaconda3\lib\site-packages\xgboost\sklearn.py:888: UserWarning:  
The use of label encoder in XGBClassifier is deprecated and will be removed in a  
future release. To remove this warning, do the following: 1) Pass option  
use\_label\_encoder=False when constructing XGBClassifier object; and 2) Encode  
your labels (y) as integers starting with 0, i.e. 0, 1, 2, ..., [num\_class - 1].  
warnings.warn(label\_encoder\_deprecation\_msg, UserWarning)

```

[82]    validation_0-logloss:0.11760    validation_0-error:0.02738
validation_1-logloss:0.15044    validation_1-error:0.03748
[83]    validation_0-logloss:0.11675    validation_0-error:0.02738
validation_1-logloss:0.15004    validation_1-error:0.03748
[84]    validation_0-logloss:0.11639    validation_0-error:0.02738

```

validation\_1-logloss:0.14975      validation\_1-error:0.03748  
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 validation\_1-logloss:0.14950      validation\_1-error:0.03748  
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 [87]      validation\_0-logloss:0.11484      validation\_0-error:0.02701  
 validation\_1-logloss:0.14892      validation\_1-error:0.03748  
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 validation\_1-logloss:0.17220      validation\_1-error:0.04198  
 [50]      validation\_0-logloss:0.15281      validation\_0-error:0.03376  
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 [51]      validation\_0-logloss:0.15095      validation\_0-error:0.03226  
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 [52]      validation\_0-logloss:0.14942      validation\_0-error:0.03338  
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 [53]      validation\_0-logloss:0.14813      validation\_0-error:0.03301  
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 [54]      validation\_0-logloss:0.14681      validation\_0-error:0.03338  
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 [59]      validation\_0-logloss:0.14080      validation\_0-error:0.03338  
 validation\_1-logloss:0.15999      validation\_1-error:0.03898  
 [60]      validation\_0-logloss:0.13921      validation\_0-error:0.03263



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 [61]      validation\_0-logloss:0.13833      validation\_0-error:0.03226  
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 [64]      validation\_0-logloss:0.13489      validation\_0-error:0.03188  
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 [74]      validation\_0-logloss:0.12698      validation\_0-error:0.03038  
 validation\_1-logloss:0.15079      validation\_1-error:0.04048  
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 [77]      validation\_0-logloss:0.12498      validation\_0-error:0.03038  
 validation\_1-logloss:0.14999      validation\_1-error:0.04048  
 [78]      validation\_0-logloss:0.12451      validation\_0-error:0.03113  
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 [79]      validation\_0-logloss:0.12380      validation\_0-error:0.03001  
 validation\_1-logloss:0.14932      validation\_1-error:0.04048  
 [80]      validation\_0-logloss:0.12320      validation\_0-error:0.03038  
 validation\_1-logloss:0.14930      validation\_1-error:0.03898  
 [81]      validation\_0-logloss:0.12275      validation\_0-error:0.03038  
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 [82]      validation\_0-logloss:0.12208      validation\_0-error:0.03038  
 validation\_1-logloss:0.14847      validation\_1-error:0.03748  
 [83]      validation\_0-logloss:0.12164      validation\_0-error:0.03001  
 validation\_1-logloss:0.14836      validation\_1-error:0.03748  
 [84]      validation\_0-logloss:0.12111      validation\_0-error:0.03001

```

validation_1-logloss:0.14847    validation_1-error:0.03898
[85]   validation_0-logloss:0.12052    validation_0-error:0.03001
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[86]   validation_0-logloss:0.11994    validation_0-error:0.03001
validation_1-logloss:0.14796    validation_1-error:0.03748
[87]   validation_0-logloss:0.11955    validation_0-error:0.03001
validation_1-logloss:0.14791    validation_1-error:0.03748
[88]   validation_0-logloss:0.11925    validation_0-error:0.03001
validation_1-logloss:0.14775    validation_1-error:0.03748
[89]   validation_0-logloss:0.11876    validation_0-error:0.02963
validation_1-logloss:0.14773    validation_1-error:0.03898
[90]   validation_0-logloss:0.11840    validation_0-error:0.02963
validation_1-logloss:0.14742    validation_1-error:0.03898
[91]   validation_0-logloss:0.11784    validation_0-error:0.02963
validation_1-logloss:0.14730    validation_1-error:0.03898
[92]   validation_0-logloss:0.11725    validation_0-error:0.02963
validation_1-logloss:0.14717    validation_1-error:0.03898
[93]   validation_0-logloss:0.11663    validation_0-error:0.02963
validation_1-logloss:0.14705    validation_1-error:0.03898
[94]   validation_0-logloss:0.11640    validation_0-error:0.02963
validation_1-logloss:0.14696    validation_1-error:0.04048

```

C:\Users\sci\anaconda3\lib\site-packages\xgboost\sklearn.py:888: UserWarning:  
The use of label encoder in XGBClassifier is deprecated and will be removed in a  
future release. To remove this warning, do the following: 1) Pass option  
use\_label\_encoder=False when constructing XGBClassifier object; and 2) Encode  
your labels (y) as integers starting with 0, i.e. 0, 1, 2, ..., [num\_class - 1].  
warnings.warn(label\_encoder\_deprecation\_msg, UserWarning)

```

[95]   validation_0-logloss:0.11571    validation_0-error:0.02963
validation_1-logloss:0.14713    validation_1-error:0.04048
[96]   validation_0-logloss:0.11504    validation_0-error:0.02963
validation_1-logloss:0.14674    validation_1-error:0.03898
[97]   validation_0-logloss:0.11460    validation_0-error:0.02963
validation_1-logloss:0.14670    validation_1-error:0.04048
[98]   validation_0-logloss:0.11367    validation_0-error:0.03001
validation_1-logloss:0.14655    validation_1-error:0.03598
[99]   validation_0-logloss:0.11336    validation_0-error:0.03001
validation_1-logloss:0.14654    validation_1-error:0.03598
[100]  validation_0-logloss:0.11271    validation_0-error:0.02926
validation_1-logloss:0.14633    validation_1-error:0.03598
[101]  validation_0-logloss:0.11238    validation_0-error:0.02926
validation_1-logloss:0.14617    validation_1-error:0.03598
[102]  validation_0-logloss:0.11213    validation_0-error:0.02926
validation_1-logloss:0.14622    validation_1-error:0.03598
[103]  validation_0-logloss:0.11182    validation_0-error:0.02926
validation_1-logloss:0.14617    validation_1-error:0.03598
[104]  validation_0-logloss:0.11146    validation_0-error:0.02888
validation_1-logloss:0.14603    validation_1-error:0.03598

```

[105] validation\_0-logloss:0.11082 validation\_0-error:0.02888  
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 validation\_1-logloss:0.15221 validation\_1-error:0.03748

```

[81]    validation_0-logloss:0.11804    validation_0-error:0.02588
validation_1-logloss:0.15218    validation_1-error:0.03748
[82]    validation_0-logloss:0.11749    validation_0-error:0.02626
validation_1-logloss:0.15185    validation_1-error:0.03748
[83]    validation_0-logloss:0.11700    validation_0-error:0.02588
validation_1-logloss:0.15145    validation_1-error:0.03748
[84]    validation_0-logloss:0.11646    validation_0-error:0.02551
validation_1-logloss:0.15115    validation_1-error:0.03748
[85]    validation_0-logloss:0.11576    validation_0-error:0.02626
validation_1-logloss:0.15097    validation_1-error:0.03748
[86]    validation_0-logloss:0.11534    validation_0-error:0.02588
validation_1-logloss:0.15089    validation_1-error:0.03748
[87]    validation_0-logloss:0.11478    validation_0-error:0.02588
validation_1-logloss:0.15076    validation_1-error:0.03748
[88]    validation_0-logloss:0.11426    validation_0-error:0.02626
validation_1-logloss:0.15059    validation_1-error:0.03748
[89]    validation_0-logloss:0.11390    validation_0-error:0.02588
validation_1-logloss:0.15004    validation_1-error:0.03748
[90]    validation_0-logloss:0.11345    validation_0-error:0.02626
validation_1-logloss:0.14981    validation_1-error:0.03748
[91]    validation_0-logloss:0.11276    validation_0-error:0.02626
validation_1-logloss:0.14982    validation_1-error:0.03748
[92]    validation_0-logloss:0.11251    validation_0-error:0.02663
validation_1-logloss:0.14984    validation_1-error:0.03748
[93]    validation_0-logloss:0.11207    validation_0-error:0.02626
validation_1-logloss:0.14964    validation_1-error:0.03748

```

C:\Users\sci\anaconda3\lib\site-packages\xgboost\sklearn.py:888: UserWarning:  
The use of label encoder in XGBClassifier is deprecated and will be removed in a  
future release. To remove this warning, do the following: 1) Pass option  
use\_label\_encoder=False when constructing XGBClassifier object; and 2) Encode  
your labels (y) as integers starting with 0, i.e. 0, 1, 2, ..., [num\_class - 1].  
warnings.warn(label\_encoder\_deprecation\_msg, UserWarning)

```

[94]    validation_0-logloss:0.11151    validation_0-error:0.02663
validation_1-logloss:0.14955    validation_1-error:0.03748
[95]    validation_0-logloss:0.11118    validation_0-error:0.02663
validation_1-logloss:0.14905    validation_1-error:0.03748
[96]    validation_0-logloss:0.11083    validation_0-error:0.02663
validation_1-logloss:0.14888    validation_1-error:0.03748
[97]    validation_0-logloss:0.11052    validation_0-error:0.02663
validation_1-logloss:0.14852    validation_1-error:0.03898
[98]    validation_0-logloss:0.10991    validation_0-error:0.02701
validation_1-logloss:0.14850    validation_1-error:0.03898
[99]    validation_0-logloss:0.10958    validation_0-error:0.02701
validation_1-logloss:0.14839    validation_1-error:0.03898
[100]   validation_0-logloss:0.10927    validation_0-error:0.02663
validation_1-logloss:0.14830    validation_1-error:0.03898
[101]   validation_0-logloss:0.10875    validation_0-error:0.02701

```

validation\_1-logloss:0.14844      validation\_1-error:0.03898  
 [102]    validation\_0-logloss:0.10847      validation\_0-error:0.02701  
 validation\_1-logloss:0.14804      validation\_1-error:0.03748  
 [103]    validation\_0-logloss:0.10803      validation\_0-error:0.02663  
 validation\_1-logloss:0.14785      validation\_1-error:0.03748  
 [104]    validation\_0-logloss:0.10764      validation\_0-error:0.02626  
 validation\_1-logloss:0.14762      validation\_1-error:0.03898  
 [105]    validation\_0-logloss:0.10737      validation\_0-error:0.02663  
 validation\_1-logloss:0.14727      validation\_1-error:0.03748  
 [106]    validation\_0-logloss:0.10706      validation\_0-error:0.02626  
 validation\_1-logloss:0.14731      validation\_1-error:0.03598  
 [107]    validation\_0-logloss:0.10656      validation\_0-error:0.02626  
 validation\_1-logloss:0.14745      validation\_1-error:0.03748  
 [108]    validation\_0-logloss:0.10626      validation\_0-error:0.02626  
 validation\_1-logloss:0.14740      validation\_1-error:0.03598  
 [109]    validation\_0-logloss:0.10592      validation\_0-error:0.02626  
 validation\_1-logloss:0.14730      validation\_1-error:0.03598  
 [110]    validation\_0-logloss:0.10537      validation\_0-error:0.02626  
 validation\_1-logloss:0.14725      validation\_1-error:0.03748  
 [111]    validation\_0-logloss:0.10467      validation\_0-error:0.02663  
 validation\_1-logloss:0.14722      validation\_1-error:0.03748  
 [112]    validation\_0-logloss:0.10448      validation\_0-error:0.02663  
 validation\_1-logloss:0.14723      validation\_1-error:0.03748  
 [113]    validation\_0-logloss:0.10407      validation\_0-error:0.02663  
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 [114]    validation\_0-logloss:0.10363      validation\_0-error:0.02663  
 validation\_1-logloss:0.14746      validation\_1-error:0.03748  
 [115]    validation\_0-logloss:0.10334      validation\_0-error:0.02663  
 validation\_1-logloss:0.14745      validation\_1-error:0.03748  
 [116]    validation\_0-logloss:0.10318      validation\_0-error:0.02663  
 validation\_1-logloss:0.14747      validation\_1-error:0.03748  
 [117]    validation\_0-logloss:0.10285      validation\_0-error:0.02701  
 validation\_1-logloss:0.14741      validation\_1-error:0.03748  
 [118]    validation\_0-logloss:0.10262      validation\_0-error:0.02701  
 validation\_1-logloss:0.14698      validation\_1-error:0.03748  
 [119]    validation\_0-logloss:0.10238      validation\_0-error:0.02701  
 validation\_1-logloss:0.14701      validation\_1-error:0.03748  
 [0]      validation\_0-logloss:0.65329      validation\_0-error:0.04989  
 validation\_1-logloss:0.65464      validation\_1-error:0.07046  
 [1]      validation\_0-logloss:0.61719      validation\_0-error:0.04914  
 validation\_1-logloss:0.61986      validation\_1-error:0.07046  
 [2]      validation\_0-logloss:0.58435      validation\_0-error:0.04914  
 validation\_1-logloss:0.58815      validation\_1-error:0.07046  
 [3]      validation\_0-logloss:0.55429      validation\_0-error:0.04839  
 validation\_1-logloss:0.55907      validation\_1-error:0.07196  
 [4]      validation\_0-logloss:0.52684      validation\_0-error:0.04839  
 validation\_1-logloss:0.53237      validation\_1-error:0.07196  
 [5]      validation\_0-logloss:0.50165      validation\_0-error:0.04839



validation\_1-logloss:0.50816      validation\_1-error:0.07196  
 [6]      validation\_0-logloss:0.47850      validation\_0-error:0.04764  
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 [7]      validation\_0-logloss:0.45709      validation\_0-error:0.04951  
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 [8]      validation\_0-logloss:0.43709      validation\_0-error:0.04876  
 validation\_1-logloss:0.44518      validation\_1-error:0.07196  
 [9]      validation\_0-logloss:0.41837      validation\_0-error:0.04726  
 validation\_1-logloss:0.42711      validation\_1-error:0.07196  
 [10]      validation\_0-logloss:0.40110      validation\_0-error:0.04726  
 validation\_1-logloss:0.41061      validation\_1-error:0.07196  
 [11]      validation\_0-logloss:0.38526      validation\_0-error:0.04726  
 validation\_1-logloss:0.39515      validation\_1-error:0.07046  
 [12]      validation\_0-logloss:0.37023      validation\_0-error:0.04689  
 validation\_1-logloss:0.38104      validation\_1-error:0.07046  
 [13]      validation\_0-logloss:0.35624      validation\_0-error:0.04689  
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 [14]      validation\_0-logloss:0.34321      validation\_0-error:0.04576  
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 [15]      validation\_0-logloss:0.33110      validation\_0-error:0.04576  
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 [16]      validation\_0-logloss:0.31977      validation\_0-error:0.04464  
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 [17]      validation\_0-logloss:0.30924      validation\_0-error:0.04389  
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 [18]      validation\_0-logloss:0.29882      validation\_0-error:0.04464  
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 [19]      validation\_0-logloss:0.28907      validation\_0-error:0.04501  
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 [20]      validation\_0-logloss:0.28000      validation\_0-error:0.04614  
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 [21]      validation\_0-logloss:0.27152      validation\_0-error:0.04651  
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 [22]      validation\_0-logloss:0.26336      validation\_0-error:0.04314  
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 [23]      validation\_0-logloss:0.25574      validation\_0-error:0.04126  
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 [24]      validation\_0-logloss:0.24857      validation\_0-error:0.04163  
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 [25]      validation\_0-logloss:0.24179      validation\_0-error:0.04013  
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 [26]      validation\_0-logloss:0.23549      validation\_0-error:0.04088  
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 [28]      validation\_0-logloss:0.22400      validation\_0-error:0.04051  
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 [29]      validation\_0-logloss:0.21887      validation\_0-error:0.03976

validation\_1-logloss:0.23467 validation\_1-error:0.05397  
 [30] validation\_0-logloss:0.21396 validation\_0-error:0.03976  
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 [31] validation\_0-logloss:0.20934 validation\_0-error:0.03788  
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 [32] validation\_0-logloss:0.20497 validation\_0-error:0.03751  
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 [34] validation\_0-logloss:0.19655 validation\_0-error:0.03713  
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 [41] validation\_0-logloss:0.17375 validation\_0-error:0.03563  
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 [53] validation\_0-logloss:0.14876 validation\_0-error:0.03451

validation\_1-logloss:0.17774      validation\_1-error:0.04648  
 [54]      validation\_0-logloss:0.14705      validation\_0-error:0.03413  
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 [55]      validation\_0-logloss:0.14545      validation\_0-error:0.03376  
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 [56]      validation\_0-logloss:0.14439      validation\_0-error:0.03376  
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 [58]      validation\_0-logloss:0.14192      validation\_0-error:0.03376  
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 [59]      validation\_0-logloss:0.14042      validation\_0-error:0.03301  
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 [60]      validation\_0-logloss:0.13956      validation\_0-error:0.03263  
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 [61]      validation\_0-logloss:0.13818      validation\_0-error:0.03263  
 validation\_1-logloss:0.17132      validation\_1-error:0.04498  
 [62]      validation\_0-logloss:0.13742      validation\_0-error:0.03263  
 validation\_1-logloss:0.17069      validation\_1-error:0.04498  
 [63]      validation\_0-logloss:0.13664      validation\_0-error:0.03226  
 validation\_1-logloss:0.17013      validation\_1-error:0.04498  
 [64]      validation\_0-logloss:0.13532      validation\_0-error:0.03188  
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 [65]      validation\_0-logloss:0.13464      validation\_0-error:0.03188  
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 [66]      validation\_0-logloss:0.13395      validation\_0-error:0.03188  
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 [67]      validation\_0-logloss:0.13287      validation\_0-error:0.03188  
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 [68]      validation\_0-logloss:0.13187      validation\_0-error:0.03188  
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 [70]      validation\_0-logloss:0.12984      validation\_0-error:0.03113  
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 [71]      validation\_0-logloss:0.12863      validation\_0-error:0.03113  
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 [72]      validation\_0-logloss:0.12783      validation\_0-error:0.03113  
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 [73]      validation\_0-logloss:0.12698      validation\_0-error:0.03076  
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 [74]      validation\_0-logloss:0.12624      validation\_0-error:0.03076  
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 [76]      validation\_0-logloss:0.12473      validation\_0-error:0.03038  
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 [77]      validation\_0-logloss:0.12404      validation\_0-error:0.03038

validation\_1-logloss:0.16668      validation\_1-error:0.04648  
[78]      validation\_0-logloss:0.12341      validation\_0-error:0.03038  
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[79]      validation\_0-logloss:0.12256      validation\_0-error:0.03038  
validation\_1-logloss:0.16591      validation\_1-error:0.04498  
[80]      validation\_0-logloss:0.12199      validation\_0-error:0.03038  
validation\_1-logloss:0.16588      validation\_1-error:0.04648  
[81]      validation\_0-logloss:0.12146      validation\_0-error:0.03038  
validation\_1-logloss:0.16539      validation\_1-error:0.04348  
[82]      validation\_0-logloss:0.12088      validation\_0-error:0.03038  
validation\_1-logloss:0.16541      validation\_1-error:0.04348  
[83]      validation\_0-logloss:0.12034      validation\_0-error:0.03038  
validation\_1-logloss:0.16481      validation\_1-error:0.04348  
[84]      validation\_0-logloss:0.11983      validation\_0-error:0.03038  
validation\_1-logloss:0.16483      validation\_1-error:0.04348  
[85]      validation\_0-logloss:0.11936      validation\_0-error:0.03076  
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[86]      validation\_0-logloss:0.11883      validation\_0-error:0.03076  
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[87]      validation\_0-logloss:0.11825      validation\_0-error:0.03038  
validation\_1-logloss:0.16460      validation\_1-error:0.04348  
[88]      validation\_0-logloss:0.11780      validation\_0-error:0.03076  
validation\_1-logloss:0.16423      validation\_1-error:0.04348  
[89]      validation\_0-logloss:0.11738      validation\_0-error:0.03038  
validation\_1-logloss:0.16450      validation\_1-error:0.04348  
[90]      validation\_0-logloss:0.11698      validation\_0-error:0.03076  
validation\_1-logloss:0.16403      validation\_1-error:0.04348  
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validation\_1-logloss:0.16398      validation\_1-error:0.04348  
[92]      validation\_0-logloss:0.11550      validation\_0-error:0.03076  
validation\_1-logloss:0.16373      validation\_1-error:0.04348  
[93]      validation\_0-logloss:0.11516      validation\_0-error:0.03038  
validation\_1-logloss:0.16359      validation\_1-error:0.04348  
[94]      validation\_0-logloss:0.11435      validation\_0-error:0.03038  
validation\_1-logloss:0.16368      validation\_1-error:0.04348  
[95]      validation\_0-logloss:0.11364      validation\_0-error:0.03001  
validation\_1-logloss:0.16367      validation\_1-error:0.04348  
[96]      validation\_0-logloss:0.11302      validation\_0-error:0.03038  
validation\_1-logloss:0.16387      validation\_1-error:0.04348  
[97]      validation\_0-logloss:0.11235      validation\_0-error:0.03001  
validation\_1-logloss:0.16381      validation\_1-error:0.04348  
[98]      validation\_0-logloss:0.11178      validation\_0-error:0.02963  
validation\_1-logloss:0.16353      validation\_1-error:0.04348  
[99]      validation\_0-logloss:0.11152      validation\_0-error:0.03001  
validation\_1-logloss:0.16352      validation\_1-error:0.04348  
[100]      validation\_0-logloss:0.11098      validation\_0-error:0.02963  
validation\_1-logloss:0.16336      validation\_1-error:0.04348

```
C:\Users\sci\anaconda3\lib\site-packages\xgboost\sklearn.py:888: UserWarning:
The use of label encoder in XGBClassifier is deprecated and will be removed in a
future release. To remove this warning, do the following: 1) Pass option
use_label_encoder=False when constructing XGBClassifier object; and 2) Encode
your labels (y) as integers starting with 0, i.e. 0, 1, 2, ..., [num_class - 1].
warnings.warn(label_encoder_deprecation_msg, UserWarning)
```

```
[101] validation_0-logloss:0.11048 validation_0-error:0.03001
validation_1-logloss:0.16369 validation_1-error:0.04498
[102] validation_0-logloss:0.10984 validation_0-error:0.02963
validation_1-logloss:0.16374 validation_1-error:0.04348
[103] validation_0-logloss:0.10946 validation_0-error:0.02963
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[26]      validation\_0-logloss:0.23508      validation\_0-error:0.03751

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[27]      validation\_0-logloss:0.22920      validation\_0-error:0.03751

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[28]      validation\_0-logloss:0.22341      validation\_0-error:0.03751

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[47]      validation\_0-logloss:0.15868      validation\_0-error:0.03301

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 [73]      validation\_0-logloss:0.12491      validation\_0-error:0.02851



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[92]      validation\_0-logloss:0.11305      validation\_0-error:0.02776  
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[94]      validation\_0-logloss:0.11185      validation\_0-error:0.02776  
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[95]      validation\_0-logloss:0.11101      validation\_0-error:0.02738  
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[96]      validation\_0-logloss:0.11048      validation\_0-error:0.02738  
validation\_1-logloss:0.15262      validation\_1-error:0.04498

```
C:\Users\sci\anaconda3\lib\site-packages\xgboost\sklearn.py:888: UserWarning:
The use of label encoder in XGBClassifier is deprecated and will be removed in a
future release. To remove this warning, do the following: 1) Pass option
use_label_encoder=False when constructing XGBClassifier object; and 2) Encode
your labels (y) as integers starting with 0, i.e. 0, 1, 2, ..., [num_class - 1].
warnings.warn(label_encoder_deprecation_msg, UserWarning)
```

```
[97]    validation_0-logloss:0.11027    validation_0-error:0.02738
validation_1-logloss:0.15276    validation_1-error:0.04498
[98]    validation_0-logloss:0.10978    validation_0-error:0.02738
validation_1-logloss:0.15305    validation_1-error:0.04498
[99]    validation_0-logloss:0.10903    validation_0-error:0.02738
validation_1-logloss:0.15271    validation_1-error:0.04498
[100]   validation_0-logloss:0.10860    validation_0-error:0.02738
validation_1-logloss:0.15296    validation_1-error:0.04498
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validation_1-logloss:0.15294    validation_1-error:0.04498
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validation_1-logloss:0.15306    validation_1-error:0.04498
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validation_1-logloss:0.15296    validation_1-error:0.04348
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validation_1-logloss:0.15318    validation_1-error:0.04348
[116]   validation_0-logloss:0.10248    validation_0-error:0.02738
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validation\_1-logloss:0.15263      validation\_1-error:0.04348  
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validation\_1-logloss:0.65440      validation\_1-error:0.06447  
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validation\_1-logloss:0.61943      validation\_1-error:0.06447  
[2]      validation\_0-logloss:0.58412      validation\_0-error:0.04651  
validation\_1-logloss:0.58755      validation\_1-error:0.06447  
[3]      validation\_0-logloss:0.55399      validation\_0-error:0.04651  
validation\_1-logloss:0.55831      validation\_1-error:0.06447  
[4]      validation\_0-logloss:0.52652      validation\_0-error:0.04651  
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[5]      validation\_0-logloss:0.50104      validation\_0-error:0.04539  
validation\_1-logloss:0.50660      validation\_1-error:0.06597  
[6]      validation\_0-logloss:0.47778      validation\_0-error:0.04539  
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validation\_1-logloss:0.46339      validation\_1-error:0.06597  
[8]      validation\_0-logloss:0.43597      validation\_0-error:0.04426  
validation\_1-logloss:0.44349      validation\_1-error:0.06447  
[9]      validation\_0-logloss:0.41741      validation\_0-error:0.04389  
validation\_1-logloss:0.42547      validation\_1-error:0.06297  
[10]     validation\_0-logloss:0.40010      validation\_0-error:0.04426  
validation\_1-logloss:0.40850      validation\_1-error:0.06147  
[11]     validation\_0-logloss:0.38409      validation\_0-error:0.04426  
validation\_1-logloss:0.39293      validation\_1-error:0.06147  
[12]     validation\_0-logloss:0.36914      validation\_0-error:0.04389  
validation\_1-logloss:0.37839      validation\_1-error:0.06297  
[13]     validation\_0-logloss:0.35518      validation\_0-error:0.04426  
validation\_1-logloss:0.36474      validation\_1-error:0.06147  
[14]     validation\_0-logloss:0.34222      validation\_0-error:0.04426  
validation\_1-logloss:0.35219      validation\_1-error:0.06147  
[15]     validation\_0-logloss:0.32929      validation\_0-error:0.04239  
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[16]     validation\_0-logloss:0.31724      validation\_0-error:0.04201  
validation\_1-logloss:0.32752      validation\_1-error:0.05847  
[17]     validation\_0-logloss:0.30599      validation\_0-error:0.04276  
validation\_1-logloss:0.31629      validation\_1-error:0.05697  
[18]     validation\_0-logloss:0.29535      validation\_0-error:0.04239  
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[19]     validation\_0-logloss:0.28548      validation\_0-error:0.04201  
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[20]     validation\_0-logloss:0.27625      validation\_0-error:0.04239  
validation\_1-logloss:0.28742      validation\_1-error:0.05547  
[21]     validation\_0-logloss:0.26764      validation\_0-error:0.04013

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 [22]      validation\_0-logloss:0.25954      validation\_0-error:0.03976  
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 [23]      validation\_0-logloss:0.25180      validation\_0-error:0.03939  
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 [24]      validation\_0-logloss:0.24462      validation\_0-error:0.03901  
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 [25]      validation\_0-logloss:0.23778      validation\_0-error:0.03864  
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 [26]      validation\_0-logloss:0.23115      validation\_0-error:0.03864  
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 [27]      validation\_0-logloss:0.22491      validation\_0-error:0.03751  
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 [28]      validation\_0-logloss:0.21909      validation\_0-error:0.03751  
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 [29]      validation\_0-logloss:0.21357      validation\_0-error:0.03788  
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 [30]      validation\_0-logloss:0.20833      validation\_0-error:0.03676  
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 [31]      validation\_0-logloss:0.20343      validation\_0-error:0.03526  
 validation\_1-logloss:0.21838      validation\_1-error:0.04348  
 [32]      validation\_0-logloss:0.19905      validation\_0-error:0.03526  
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 [33]      validation\_0-logloss:0.19448      validation\_0-error:0.03488  
 validation\_1-logloss:0.21037      validation\_1-error:0.04648  
 [34]      validation\_0-logloss:0.19029      validation\_0-error:0.03526  
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 [35]      validation\_0-logloss:0.18623      validation\_0-error:0.03526  
 validation\_1-logloss:0.20303      validation\_1-error:0.04348  
 [36]      validation\_0-logloss:0.18233      validation\_0-error:0.03488  
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 [37]      validation\_0-logloss:0.17870      validation\_0-error:0.03526  
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 [39]      validation\_0-logloss:0.17218      validation\_0-error:0.03301  
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 [40]      validation\_0-logloss:0.16908      validation\_0-error:0.03263  
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 [41]      validation\_0-logloss:0.16661      validation\_0-error:0.03226  
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 [43]      validation\_0-logloss:0.16150      validation\_0-error:0.03113  
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 [44]      validation\_0-logloss:0.15940      validation\_0-error:0.03076  
 validation\_1-logloss:0.18114      validation\_1-error:0.04048  
 [45]      validation\_0-logloss:0.15712      validation\_0-error:0.03076

validation\_1-logloss:0.17960      validation\_1-error:0.04048  
 [46]      validation\_0-logloss:0.15501      validation\_0-error:0.03076  
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 [47]      validation\_0-logloss:0.15281      validation\_0-error:0.03038  
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 [49]      validation\_0-logloss:0.14908      validation\_0-error:0.03038  
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 [50]      validation\_0-logloss:0.14706      validation\_0-error:0.02963  
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 [51]      validation\_0-logloss:0.14536      validation\_0-error:0.02963  
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 [53]      validation\_0-logloss:0.14207      validation\_0-error:0.02851  
 validation\_1-logloss:0.16845      validation\_1-error:0.03898  
 [54]      validation\_0-logloss:0.14055      validation\_0-error:0.02776  
 validation\_1-logloss:0.16685      validation\_1-error:0.03898  
 [55]      validation\_0-logloss:0.13906      validation\_0-error:0.02738  
 validation\_1-logloss:0.16589      validation\_1-error:0.03898  
 [56]      validation\_0-logloss:0.13767      validation\_0-error:0.02738  
 validation\_1-logloss:0.16431      validation\_1-error:0.03898  
 [57]      validation\_0-logloss:0.13640      validation\_0-error:0.02663  
 validation\_1-logloss:0.16309      validation\_1-error:0.03898  
 [58]      validation\_0-logloss:0.13456      validation\_0-error:0.02663  
 validation\_1-logloss:0.16234      validation\_1-error:0.04048  
 [59]      validation\_0-logloss:0.13337      validation\_0-error:0.02588  
 validation\_1-logloss:0.16128      validation\_1-error:0.03898  
 [60]      validation\_0-logloss:0.13223      validation\_0-error:0.02551  
 validation\_1-logloss:0.16012      validation\_1-error:0.03898  
 [61]      validation\_0-logloss:0.13054      validation\_0-error:0.02551  
 validation\_1-logloss:0.15934      validation\_1-error:0.03748  
 [62]      validation\_0-logloss:0.12958      validation\_0-error:0.02551  
 validation\_1-logloss:0.15840      validation\_1-error:0.03748  
 [63]      validation\_0-logloss:0.12807      validation\_0-error:0.02551  
 validation\_1-logloss:0.15765      validation\_1-error:0.03748  
 [64]      validation\_0-logloss:0.12717      validation\_0-error:0.02588  
 validation\_1-logloss:0.15708      validation\_1-error:0.03748  
 [65]      validation\_0-logloss:0.12625      validation\_0-error:0.02551  
 validation\_1-logloss:0.15607      validation\_1-error:0.03748  
 [66]      validation\_0-logloss:0.12484      validation\_0-error:0.02551  
 validation\_1-logloss:0.15542      validation\_1-error:0.03748  
 [67]      validation\_0-logloss:0.12404      validation\_0-error:0.02551  
 validation\_1-logloss:0.15464      validation\_1-error:0.03748  
 [68]      validation\_0-logloss:0.12330      validation\_0-error:0.02551  
 validation\_1-logloss:0.15391      validation\_1-error:0.03748  
 [69]      validation\_0-logloss:0.12217      validation\_0-error:0.02551

```

validation_1-logloss:0.15359    validation_1-error:0.03448
[70]    validation_0-logloss:0.12107    validation_0-error:0.02551
validation_1-logloss:0.15343    validation_1-error:0.03448
[71]    validation_0-logloss:0.11992    validation_0-error:0.02551
validation_1-logloss:0.15282    validation_1-error:0.03448
[72]    validation_0-logloss:0.11895    validation_0-error:0.02551
validation_1-logloss:0.15248    validation_1-error:0.03448
[73]    validation_0-logloss:0.11805    validation_0-error:0.02551
validation_1-logloss:0.15263    validation_1-error:0.03448
[74]    validation_0-logloss:0.11731    validation_0-error:0.02551
validation_1-logloss:0.15203    validation_1-error:0.03598

```

C:\Users\sci\anaconda3\lib\site-packages\xgboost\sklearn.py:888: UserWarning:  
The use of label encoder in XGBClassifier is deprecated and will be removed in a  
future release. To remove this warning, do the following: 1) Pass option  
use\_label\_encoder=False when constructing XGBClassifier object; and 2) Encode  
your labels (y) as integers starting with 0, i.e. 0, 1, 2, ..., [num\_class - 1].  
warnings.warn(label\_encoder\_deprecation\_msg, UserWarning)

```

[66]: GridSearchCV(cv=KFold(n_splits=5, random_state=None, shuffle=False),
                  estimator=XGBClassifier(base_score=None, booster=None,
                                          colsample_bylevel=None,
                                          colsample_bynode=None,
                                          colsample_bytree=None, gamma=None,
                                          gpu_id=None, importance_type='gain',
                                          interaction_constraints=None,
                                          learning_rate=None, max_delta_step=None,
                                          max_depth=None, min_child_weight=None,
                                          missing=nan, monotone_constraints=None,
                                          n_estimators=100, n_jobs=None,
                                          num_parallel_tree=None, random_state=None,
                                          reg_alpha=None, reg_lambda=None,
                                          scale_pos_weight=None, subsample=None,
                                          tree_method=None, validate_parameters=None,
                                          verbosity=None),
                  param_grid={'eta': [0.1, 0.05], 'max_depth': [4, 5],
                              'n_estimators': [50, 75, 90, 120]})

```

```

[59]: grid_xgb.best_estimator_

```

```

[59]: XGBClassifier(base_score=0.5, booster='gbtree', colsample_bylevel=1,
                  colsample_bynode=1, colsample_bytree=1, eta=0.05, gamma=0,
                  gpu_id=-1, importance_type='gain', interaction_constraints='',
                  learning_rate=0.0500000007, max_delta_step=0, max_depth=5,
                  min_child_weight=1, missing=nan, monotone_constraints='()',
                  n_estimators=75, n_jobs=16, num_parallel_tree=1, random_state=0,
                  reg_alpha=0, reg_lambda=1, scale_pos_weight=1, subsample=1,
                  tree_method='exact', validate_parameters=1, verbosity=None)

```

```
[60]: pred_grid_xgb = grid_xgb.predict(x_test)
print(classification_report(y_test, pred_grid_xgb))
```

	precision	recall	f1-score	support
0	0.97	0.99	0.98	572
1	0.95	0.79	0.86	95
accuracy			0.96	667
macro avg	0.96	0.89	0.92	667
weighted avg	0.96	0.96	0.96	667

```
[50]: model4 = xgb.XGBClassifier(**param)

model4.fit(x_train, y_train,
           eval_set = [(x_train, y_train), (x_test, y_test)],
           eval_metric = ['logloss', 'error'],
           verbose = True)

evals_result = model4.evals_result()
```

```
[0]    validation_0-logloss:0.61520    validation_0-error:0.04651
validation_1-logloss:0.61770    validation_1-error:0.06447
[1]    validation_0-logloss:0.55148    validation_0-error:0.04614
validation_1-logloss:0.55592    validation_1-error:0.06597
[2]    validation_0-logloss:0.49800    validation_0-error:0.04651
validation_1-logloss:0.50421    validation_1-error:0.06447
[3]    validation_0-logloss:0.45288    validation_0-error:0.04464
validation_1-logloss:0.46004    validation_1-error:0.06597
[4]    validation_0-logloss:0.41440    validation_0-error:0.04351
validation_1-logloss:0.42215    validation_1-error:0.06297
[5]    validation_0-logloss:0.38126    validation_0-error:0.04276
validation_1-logloss:0.38942    validation_1-error:0.06147
[6]    validation_0-logloss:0.35220    validation_0-error:0.04239
validation_1-logloss:0.36121    validation_1-error:0.06147
[7]    validation_0-logloss:0.32572    validation_0-error:0.04201
validation_1-logloss:0.33492    validation_1-error:0.05397
[8]    validation_0-logloss:0.30278    validation_0-error:0.04314
validation_1-logloss:0.31206    validation_1-error:0.05397
[9]    validation_0-logloss:0.28286    validation_0-error:0.03939
validation_1-logloss:0.29229    validation_1-error:0.04798
[10]   validation_0-logloss:0.26508    validation_0-error:0.03976
validation_1-logloss:0.27518    validation_1-error:0.04648
[11]   validation_0-logloss:0.24955    validation_0-error:0.03864
validation_1-logloss:0.26045    validation_1-error:0.04798
```

[12] validation\_0-logloss:0.23557 validation\_0-error:0.03826  
 validation\_1-logloss:0.24749 validation\_1-error:0.04648  
 [13] validation\_0-logloss:0.22290 validation\_0-error:0.03864  
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 [14] validation\_0-logloss:0.21175 validation\_0-error:0.03751  
 validation\_1-logloss:0.22502 validation\_1-error:0.04348  
 [15] validation\_0-logloss:0.20170 validation\_0-error:0.03638  
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 [16] validation\_0-logloss:0.19252 validation\_0-error:0.03563  
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 [17] validation\_0-logloss:0.18430 validation\_0-error:0.03751  
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 [20] validation\_0-logloss:0.16515 validation\_0-error:0.03301  
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 [25] validation\_0-logloss:0.14433 validation\_0-error:0.02888  
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 validation\_1-logloss:0.15121 validation\_1-error:0.03748



[36] validation\_0-logloss:0.11746 validation\_0-error:0.02476  
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```

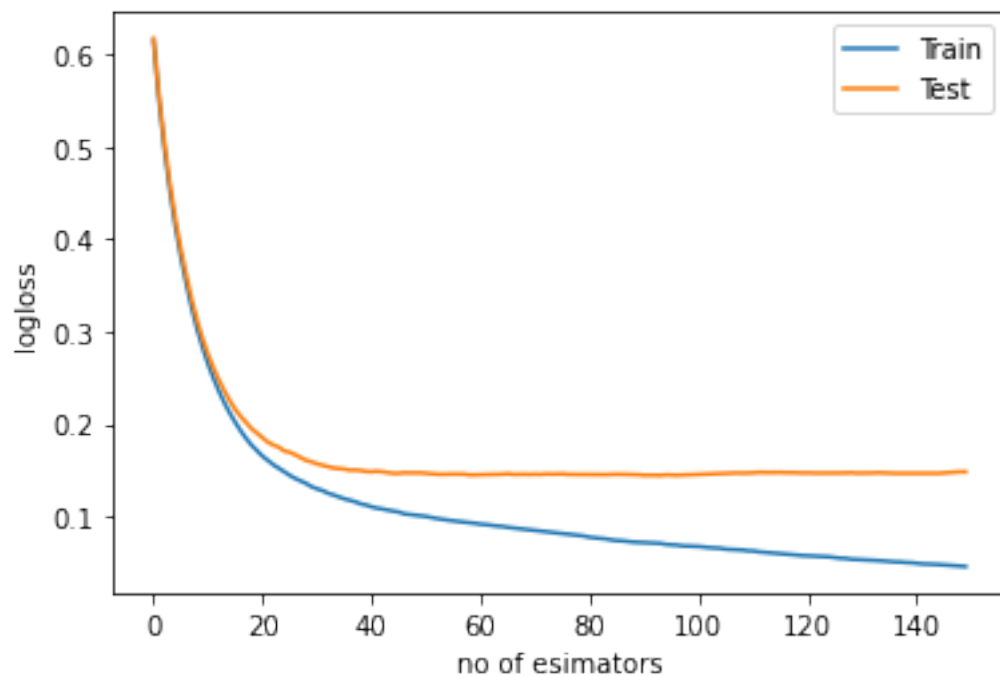
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[149] validation_0-logloss:0.04564 validation_0-error:0.01275
validation_1-logloss:0.14821 validation_1-error:0.04048

```

```

[52]: plt.plot(evals_result['validation_0']['logloss'], label = "Train")
plt.plot(evals_result['validation_1']['logloss'], label = "Test")
plt.xlabel("no of esimators")
plt.ylabel("logloss")
plt.legend()
plt.show()

```



```
[61]: pred_model4 = gbc.predict(x_test)
```

```
[62]: print(classification_report(y_test,pred_model4 ))
```

	precision	recall	f1-score	support
0	0.97	0.99	0.98	572
1	0.94	0.79	0.86	95
accuracy			0.96	667
macro avg	0.95	0.89	0.92	667
weighted avg	0.96	0.96	0.96	667

```
[ ]:
```